**ATS Inter-Facility Data-Link Communication (AIDC) IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT**

**Draft – March 2016**

Version 0.1

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1. Introduction

The ATS Inter-Facility Data-Link Communication (AIDC) Implementation and Operations Guidance Document (IGD) is the result of the task entrusted to the Asia/Pacific ATS Inter-Facility Data-Link Coordination Task Force (APA/TF) by APANPIRG. This main objective of this document is to provide guidance, complementing relevant ICAO standards, on AIDC implementation within the APAC region. The ultimate goal will be that countries within APAC region are able to meet the regional AIDC targets according to APAC seamless ATM plan and continue to advance on Flight and Flow Information for a Collaborative Environment (FF-ICE) according to GANPs ASBU.

The Communications, Navigation, Surveillance and Air Traffic Management (CNS/ATM) environment is an integrated system including physical systems (hardware, software, and communication networks), human elements (pilots, controllers and engineers), and the operational procedures for its applications.

Recognized by ICAO under its Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBU) framework as an effective tool to reduce manual intervention and ground-ground coordination errors between adjacent ATS Units, the ATS Inter-facility Data Communications (AIDC) is a data link application that provides the capability to exchange data between air traffic service units during the notification, coordination and transfer of aircraft between flight information regions. It is an automated system that facilitates routine coordination by providing a reliable and timely data exchange between ATS units in which accurate information can be derived directly from the system, thus effectively reducing controllers’ workload and hence human errors.

1.1 The arrangement of AIDC IGD

The AIDC IGD will define the following:

Chapter 2 Acronyms List and Glossary of Terms

Chapter 3 Reference Documents

Chapter 4 AIDC messages – Message sets to be used for AIDC Implementation

Chapter 5 AIDC Implementation – Information to support the implementation activities including checklist and how to handle implementation issues.

Chapter 6 Harmonization Framework for AIDC Implementation – Information on the harmonization framework on AIDC implementation activities and plan.

Chapter 7 System Integrity and Monitoring – Information on the infrastructure supporting the AIDC implementation including performance criteria, validation, monitoring, etc.

Chapter 8 AIDC regulations and procedures – Information on relevant regulations procedures such as training procedures, licensing, etc.

1.2 Document History and Management

Chapter 4 **AIDC Messages**

4.1 **Introduction**

4.1.1 This chapter describes the permitted fields and formats of AIDC messages. AIDC message fields conform to ICAO definitions contained in PANS-ATM Appendix 3 except as described below for Fields 14 and 15, as well as a “Text” field that is used in some AIDC messages.

4.1.2 ATS data in AIDC messages is enclosed between parentheses. Only one ATS message is permitted to be included in each transmission.

4.1.3 Unless specified otherwise by the ATSU, the optional elements in the AIDC message fields described in this chapter and shown in Table 4-6 should be made available in the system by the manufacturer and be user configurable.

4.2 **Message Field Requirements**

Fields in AIDC messages do not always require the full contents of the defined ICAO message field. This section specifies the usage of specific elements from message fields defined in the PANS-ATM as well as additional information that may be included in Fields 14 and 15.

4.2.1 **Field 3 requirements.**

4.2.1.1 All AIDC messages should use Field 3a (Message type) only.

4.2.1.2 Fields 3b (Message number) and 3c (Message reference data) are not used, since in AIDC messages the reference numbers contained in these fields are included in the Optional Data Field (ODF), option 2 and 3. See Chapter 3, Para 3.2.3.2.

4.2.2 **Field 7 requirements.**

4.2.2.1 Where Field 7 is required in an AIDC message, Field 7a (Aircraft Identification) must be included. Fields 7b (SSR Mode) and 7c (SSR Code) are optional but should be included if the information is available and applicable.

4.2.3 **Field 13 requirements**.

4.2.3.1 Where Field 13 is required in an AIDC message only Field 13a (Departure aerodrome), is required. Field 13b (Departure time) is not to be transmitted. The use of ZZZZ in Field 13 is supported.

4.2.4 **Field 14 requirements**

The following section describes the allowed contents of Field 14 (Estimate data), as well as providing examples of how Field 14 data can be incorporated in an AIDC message.

4.2.4.1 Field 14 may contain a number of mandatory and optional items. The following Table 4-1 provides an overview on the type of information that may be included in Field 14.

Table 4-1. Contents of Field 14

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Example** | **Mandatory/Optional** | **Comment** |
| Position  (14a) | 46N150W  1545S16545E | M | Normally a waypoint or system calculated position on or near the FIR or ACI boundary as agreed to |
|  | GOOFY |  | by bilateral agreement.  Field 14a is followed by an oblique stroke “/” |
| Estimated time  (14b) | 2200 | M | The estimate for the position in 14a |
| Level  (14c) | A090  F330  F330F370 | M | The coordinated level of the aircraft  While 14c is mandatory, the support for the block level format is  optional |
| Supplementary crossing data  (14d) | A120  F350 | Included when applicable | Use in conjunction with 14e to indicate that an aircraft may be on climb or descent at, or within tolerances of, the FIR boundary |
| Crossing condition  (14e) | A B C | Included when applicable | (A) The aircraft may be on climb from the level specified in 14d  (B) The aircraft may be on descent from the level specified in 14d  (C) The aircraft is cruise climbing from the level specified in 14d.  The support for the cruise climb format is optional |
| Mach Number | GM084  EM076  LM083 | O | Used when a Mach Number speed restriction has been assigned to the aircraft by ATC. |
| Offset and weather deviation | W25R W100E O30L | O | When an offset or weather  deviation is in effect, the position in  14a should be a position on the flight planned route, rather than the  offset route |

**Note1.** Each item of optional information in Field 14 is separated from the previous item by an oblique stroke “/”;

**Note2.** The order that the item is included in Field 14 is the order in which it is listed in Table 4-1. For example, if an AIDC message were to include an assigned Mach Number as well as a weather deviation, the Mach Number information would precede the weather deviation information in Field 14.

4.2.4.2 Supplementary Crossing Data and Crossing Conditions in Field 14

4.2.4.2.1 Field 14 may contain information that an aircraft is on climb, descent or cruise climb to the specified level. This is achieved by including supplementary crossing data and crossing conditions in Field 14.

4.2.4.2.2 The inclusion of cruise climb information in AIDC messages should only be made following bilateral agreement.

*Example:*

|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| DUMBO/2130F310F290A | The aircraft is estimating DUMBO at 2130, assigned F310 and is climbing from (or “above”) F290. |
| 30N160W/0215F310F330B | The aircraft is estimating 30N160W at 0215, assigned F310 and is descending from (or “below”) F330. |
| ADSAM/1547F360F340C | The aircraft is estimating ADSAM at 1547 and is cruise climbing from F340 to F360. |

4.2.4.3 Block level information in Field 14

4.2.4.3.1 Field 14 may contain information that an aircraft is operating in a block level clearance. It is permissible to include supplementary crossing data and a crossing condition with a block level, but if this occurs the supplementary information may only be a single level (i.e. it cannot be a block level).

*Example:*

|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| MINNY/2125F320F340 | The aircraft is estimating MINNY at 2125, and is operating in a block of levels between F320 and F340 (inclusive). |
| 46N150W/0244F310F350F290A | The aircraft is estimating 46N150W at 0244, and has been assigned a block of levels between F310 and F350 (inclusive) and is climbing to the cleared block and will be at or above F290 at 46N150W. |

4.2.4.3.2 The AIDC format does not support a cruise climb into a block clearance.

4.2.4.3.3 The inclusion of block level information in AIDC messages should only be made following bilateral agreement.

4.2.4.4 Mach Number information in Field 14

4.2.4.4.1 Field 14 may contain information that an aircraft has been assigned a speed restriction (Mach Number). When included in an AIDC message, any Mach Number information should always follow directly after the level information and be separated from the level information by an oblique stroke “/”.

*Example:*

|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| BUGGS/0349F350/GM085 | The aircraft is estimating BUGGS at 0349 at F350 and has been instructed to maintain M0.85 or greater |
| 4305N17510W/0215F310/EM076 | The aircraft is estimating 4305N17510W at 0215 at F310 and has been instructed to maintain M0.76 |

4.2.4.4.2 The absence of speed information in Field 14 of an AIDC message provides advice that any previously notified speed has been cancelled.

*Example:*

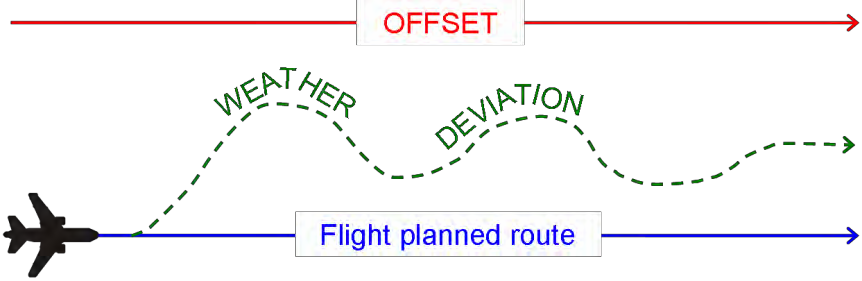
|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| SPEDY/1237F310F330B/LM083  Subsequently followed by: SPEDY/1238F310 | The aircraft is estimating SPEDY at 1237, assigned F310 and will cross SPEDY at or below F330, maintaining M0.83 or less.  The aircraft is now estimating SPEDY at 1238, is maintaining F310 (i.e. no longer on descent at SPEDY), and the Mach Number restriction has been cancelled. |

4.2.4.4.3 The inclusion of Mach Number information in AIDC messages should only be made following bilateral agreement.

4.2.4.5 Offset and Weather Deviation Information in Field 14

4.2.4.5.1 Field 14 may contain information that an aircraft is subject to either a weather deviation or offset clearance. When included in an AIDC message, any offset and weather deviation information should always be the last information in Field 14, and should be separated from preceding information by an oblique stroke “/”.

4.2.4.5.2 It is important that the difference between an offset and a weather deviation is correctly understood. This difference is depicted in the diagram below.



4.2.4.5.3 An offset is a flight trajectory that is parallel to the original route, offset by a specified distance and direction. Once an aircraft is established on the offset, separation may be applied solely based on the offset path.

4.2.4.5.4 A weather deviation permits an aircraft to operate anywhere between the original route and the specified distance and direction from the original route. Separation must therefore be applied to the entire airspace in which the aircraft has been cleared to operate in.

4.2.4.5.5 The following examples show various combinations of weather deviations and offsets, combined with other optional information allowed in Field 14.

*Example:*

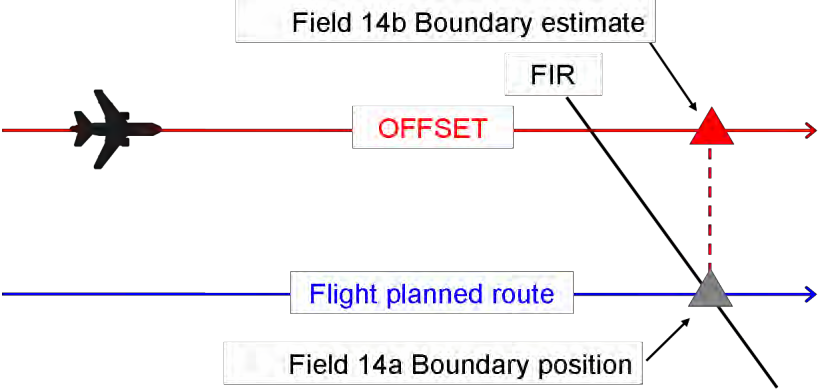
|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| 2830S16300E/0140F330/W20L | The aircraft is estimating 2830S16300E at 0140, maintaining F330, and has been cleared to deviate up to  20NM to the left of route. |
| GOOFY/2330F310/GM084/O30R | The aircraft is estimating GOOFY at 2330, maintaining F310, instructed to maintain M0.84 or greater, and has been cleared to offset 30NM to the right of route. |
| 41N040W/0215F310F330/W25E | The aircraft is estimating 41N040W at 0215, is operating in a block of levels between F310 and F330 (inclusive), and has been cleared to deviate up to 25NM either side  of route. |
| DAFFY/0215F310F350F370B/W100L | The aircraft is estimating DAFFY at 0215, and has been assigned a block of levels between F310 and F350 (inclusive), will cross DAFFY at or below F370, and has been cleared to deviate up to 100NM to the left of route. |

4.2.4.5.6 The absence of offset or weather deviation in Field 14 of an AIDC message provides advice that any previously notified off-track information has been cancelled.

*Example:*

|  |  |
| --- | --- |
| **Field 14** | **Explanation** |
| 34N040W/1519F330/W15R  Subsequently followed by:  34N040W/1520F330 | The aircraft is deviating up to 15NM right of track.  The aircraft is back on track (and one minute later than previously coordinated). |

4.2.4.5.7 When an aircraft is offsetting or deviating, the coordination point included in Field 14a should be a position based on the flight planned route rather than the offset route. The estimate included in Field 14b shall be the estimate for the “abeam” position for the position included in Field 14a.



4.2.4.5.8 The inclusion of offsets and weather deviation information in AIDC messages should only be made following bilateral agreement. Depending on their operational requirements, some ATS Units may choose to only implement the weather deviation format. If applicable, this should also be specified in bilateral agreements.

4.2.5 **Field 15 requirements**

4.2.5.1 The following section describes the allowed contents of Field 15 (Route), as well as providing examples of how Field 15 data can be incorporated in an AIDC message.

4.2.5.2 A number of different AIDC messages (e.g. ABI, PAC, CPL, CDN and PCM) may contain Field

15 (Route) information. Depending on the AIDC message being used, this route information may be either the current cleared route of the aircraft, or a proposed amendment to it.

4.2.5.3 While Field 15 may be optional in an AIDC message (refer Table 4-6), if it is included, all Field

15 sub-fields (15a, b and c) must also be included.

Table 4-2. Contents of Field 15

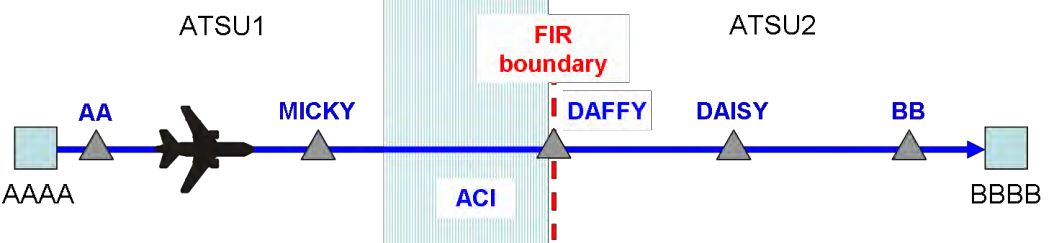
|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Example** | **Mandatory**  **/Optional** | **Comment** |
| Speed  (15a) | M084  N0488 | M | (Included in a flight plan as the initial requested speed for a flight).  In AIDC messaging:   if a speed has been specified in Field  14c, then the speed in Field 15a should be the same value; otherwise,   it should represent the expected speed of  the aircraft at the coordination point included in Field 14a. |

|  |  |  |  |
| --- | --- | --- | --- |
| Level  (15b) | F310 | M | (Included in a flight plan as the initial requested flight level for a flight).  In AIDC messaging:   if a block level has been specified in Field 14, then the level in Field 15a should be a single level within the block; otherwise,   it should be the level specified in Field  14c. |
| Route  (15c) |  DAFFY   HNL   EGLL   3415S16000E   60N050W   A123, AB456   BLI235100   M080F350   M084   F370   M084F370   1230   T   DCT | M | The route (or proposed route) of flight. It may contain any or all of the following elements:   Waypoint   Navigation aid   Aerodrome   Latitude/longitude   Latitude/longitude   ATS route   Place/bearing/distance   Speed/level changes (See Note 2)   Speed restriction   Level restriction   Speed/Level restriction (See Note 2)   Time associated with a restriction. May include a suffix of “A”, “B” or “L”   Truncation indicator (‘T’)   Direct to |

**Note 1:** The contents of Field 15c are defined in PANS-ATM Appendix 3, with the exception of level/time/speed restrictions which are described within this document in paragraph 2.4 **Restriction Formats**. Planned speed/level changes from the filed FPL are included in some AIDC implementations although they do not reflect the current cleared profile of the aircraft.

**Note 2:** Flight planned speed/level changes and level/time/speed restrictions as defined in 2.4 **Restriction Formats** cannot both be included in Field 15 because in some cases they both use the same format. ATS Units should specify in bilateral agreements which group of information (if any) will be supported.

4.2.5.4 At the minimum, Field 15 in an AIDC message should commence at a position prior to the ACI associated with the adjacent FIR. Some ATS Units may include route information commencing at the Departure aerodrome.



4.2.5.5 Field 15 information transmitted by ATSU1 to ATSU2 should commence at (or before) MICKY.

This permits ATSU2 to calculate the profile of the aircraft commencing at the ACI boundary.

4.2.5.6 **ATS Route**

4.2.5.6.1 An ATS route may only be preceded and followed by a waypoint that is defined to be on that

ATS route.

4.2.5.7 **Latitude/Longitudes**

4.2.5.7.1 Latitude and longitude in Field 15 must either be both in whole degrees, or both in degrees and minutes.

4.2.5.8 **Flight Planned Speed/Level Changes**

4.2.5.8.1 Some ATSUs may include flight planned speed/level changes in Field 15c although they do not reflect the current cleared profile of the aircraft. An ATSU receiving Field 15c data containing planned FPL level speed changes should accept the information. However, the receiving ATS Unit may choose not to use the planned FPL level speed changes to update their flight plan, and may choose not to forward it in any subsequent AIDC messages.

4.2.5.9 **Time/Speed/Level Restrictions**

4.2.5.9.1 While the information in Field 14 defines the conditions for crossing the ACI or FIR boundary, ATSU 1 may include in Field 15 time/speed/level restrictions that have been issued in a clearance to an aircraft. These clearances may include a requirement for an aircraft to cross a position at a specific time or to change level and/or speed at or by a specific time or position.

4.2.5.10 **Truncation Indicator**

4.2.5.10.1While it is desirable for Field 15 to describe the entire route to destination, on occasions this may not be possible. If it is not possible to define the route to destination, it is necessary to truncate (delete the remainder of the route) and insert a truncation indicator (‘T’).

4.2.5.10.2Bilateral agreements should define the use and meaning of the truncation indicator. For example the truncation indicator may represent:

 the point at which the route in Field 15 rejoins the original flight planned route, or

 the end of the oceanic cleared route.

4.2.5.10.3The truncation indicator should only follow a significant point in Field 15 and should not follow an ATS Route, or “DCT”.

**Note**. A significant point also refers to a significant point followed or preceded by:

 A Speed/level change; or

 A speed and/or level and/or time restriction

*Examples of Field 15c*

|  |  |
| --- | --- |
| SY L521 AA | Navaid, ATS Route  Note that both “SY” and “AA” are defined on airway L521 |
| SY L521 GEROS 32S160E 3425S16300E LUNBI AA | Navaid, ATS Route, waypoint, lat/long (dd), lat/long (ddmm) |
| SY GEROS GEROS045100 ESKEL L521 AA | Place/bearing/distance |
| SY L521 GEROS/M085F370 L521 AA DCT BB | Speed/level change, DCT |
| SY L521 LUNBI T  SY L521 GEROS 32S160E 3425S16300E T SY L521 LUNBI/M085F370 T | Truncation indicator |
| SY L521 GEROS/F370 L521 F370/LUNBI AA  SY GEROS/2245L 32S160E ESKEL/M085F390 AA SY L521 M084F350/GEROS/1230A ESKEL/M083  L521 AA | Restrictions |

4.2.6 **Field 16 Requirements**

4.2.6.1 Where Field 16 is required in an AIDC message, only Field 16a (Destination aerodrome), is required. Field 16b (Total estimated elapsed time) and Field 16c (Alternate aerodrome(s)) are not to be transmitted. The use of ZZZZ in Field 16 is supported.

4.2.7 **Field 18 Requirements**

4.2.7.1 Field 18 should contain other information from the current flight plan and is used to update the flight plan at the receiving ATSU.

4.2.7.2 When transmitting Field 18 in an AIDC message, all Field 18 indicators should be included, even if the change only affects data in an individual Field 18 indicator. However, ATS Units may agree by bilateral agreement to omit specific indicators (e.g. EET/) if required. If omitting indicators, ATS Units should have due regard to the potential effect to downstream ATS Units.

4.2.7.3 The contents of Field 18 in AIDC messages should be specified in bilateral agreements between

ATS Units.

Note: Some legacy implementations allowed provision for the modification of individual sub fields by communicating only that specific subfield. This is not recommended practice.

4.2.7.4 In some AIDC messages, Field 18 may contain only a RMK/ indicator which is used to convey free text data information. This applies to the MAC, EMG, LRM and MIS messages.

4.3 **AIDC message groups**

4.3.1 From a technical and operational perspective it is advantageous to standardize AIDC implementation to the full extent possible. This document identifies a group of messages as a “core” message set in Table 4-3, which is recommended to be supported by all ATSUs. This will aid standardization of system and procedure development.

4.3.2 It is nevertheless acknowledged that even a limited message set implementation, such as only CPL and ACP, can bring significant benefits to ATS units. Some ATSUs may, due to technical, financial, or operational reasons, have a need to gradually implement the AIDC message set or may even determine that not all messages in the core message set are required.

4.3.3 Unless specified otherwise by the ATSU, the non-core messages shown in Table 4-3 should be supported by the manufacturer in ground systems and their availability be configured by the ATS Unit as required.

4.3.4 The specific AIDC messages to be used between ATSUs should be included in bilateral agreements.

Table 4-3. AIDC Messages

|  |  |  |  |
| --- | --- | --- | --- |
| **Core** | **Non-core** | **Message Class** | **Message** |
| X |  | Notification | ABI (Advance Boundary Information) |
| X |  | Coordination | CPL (Current Flight Plan) |
| X |  | Coordination | EST (Coordination Estimate) |
|  | X | Coordination | PAC (Preliminary Activate) |
| X |  | Coordination | MAC (Coordination Cancellation) |
| X |  | Coordination | CDN (Coordination Negotiation) |
| X |  | Coordination | ACP (Acceptance) |
| X |  | Coordination | REJ (Rejection) |
|  | X | Coordination | PCM (Profile Confirmation Message) |
|  | X | Coordination | PCA (Profile Confirmation  Acceptance) |
|  | X | Coordination | TRU ( Track Update) |
| X |  | Transfer of Control | TOC (Transfer of Control) |
| X |  | Transfer of Control | AOC (Acceptance of Control) |
| X |  | General Information | EMG (Emergency) |

|  |  |  |  |
| --- | --- | --- | --- |
| **Core** | **Non-core** | **Message Class** | **Message** |
| X |  | General Information | MIS (Miscellaneous) |
| X |  | Application Management | LAM (Logical Acknowledgement  Message) |
| X |  | Application Management | LRM (Logical Rejection Message) |
|  | X | Application Management | ASM (Application Status Monitor) |
|  | X | Application Management | FAN ( FANS Application Message) |
|  | X | Application Management | FCN (FANS Completion Notification) |
|  | X | Surveillance Data  Transfer | ADS (Surveillance ADS-C) |

4.4 **Core AIDC messages**

**4.4.1 Introduction**

4.4.1.1 This chapter lists down the basic core AIDC messages (ABI, EST, ACP, AOC and TOC) that are recommended to be adopted when implementing AIDC. These messages are also identified are part of the ASBU B0 recommendations pertaining to AIDC implementation.

4.4.1.2 These AIDC messages are referenced from the PAN AIDC ICD version 1.0 under Chapter 4 for AIDC messages.

4.4.2 **ABI (Advance Boundary Information).**

4.4.2.1 Purpose.

4.4.2.2 An ABI message is transmitted to provide information on a flight to the receiving ATSU. The purpose of the ABI is to synchronize the flight plan information held between two ATS Units.

4.4.2.3 The transmission of the initial ABI will normally be triggered at an agreed time or position prior to the common boundary or ACI, or possibly by a change in flight state. Before coordination occurs, amendments to information contained in a previously transmitted ABI should be notified by the transmission of another ABI.

4.4.2.4 Message format.

ATS Field Description

3 Message type

7 Aircraft identification

13 Departure aerodrome

14 Estimate data

16 Destination aerodrome

22 Amendment field

Field 22 should contain as a minimum the following fields:

9 Number, type of aircraft and wake turbulence category

15 Route

Field 22 may optionally include any or all of the following fields:

8 Flight rules and type of flight

10 Equipment

18 Other information

*Example*

An ABI message containing the minimum contents of Field 22, with full route details to destination.

(ABI-IBE6175-LEMD-41N040W/0700F330-KMIA

-9/B744/H

-15/M084F350 41N030W 41N040W 41N050W 40N060W 38N065W DANER A699 NUCAR DCT HEATT

An ABI message containing a supplementary crossing condition and Mach Number in Field 14, a truncated Field 15 containing a level restriction, and an agreed subset of Field 18:

(ABI-ICE615-BIKF-62N030W/0700F350F310A/GM080-KJFK

-8/IS

-9/B752/M

-10/SDIJ5RXW/SD1

-15/M080F350 62N030W 60N040W/M080F370 57N050W DCT OYSTR DCT STEAM T

-18/PBN/A1L1)

An ABI containing a weather deviation in Field 14, a speed/level change in Field 15 and the entire Field 18 from the original FPL:

(ABI-ANZ716/A1565-YSSY-ESKEL/0743F370/W20R-NZAA

-8/IS

-9/A320/M

-10/SDE1E3FGHIM2RW/LB1

-15/N0448F370 EVONN L521 ESKEL/N0448F390 L521 LUNBI DCT

-18/PBN/A1C1D1O1S2T1 REG/ZKOJI EET/YBBB0009 NZZO0121 SEL/HLAM CODE/C8178C OPR/ANZ RALT/YSNF RMK/TCAS EQUIPPED)

4.4.3 **EST (Coordination Estimate)**

4.4.3.1 Purpose.

4.4.3.2 An EST message is used to initiate coordination for a flight.

4.4.3.3 The transmission of the EST message is used in conjunction with (and generally following) an ABI message and is triggered at an agreed time or position prior to the common boundary or ACI, or possibly by a change in flight state.

4.4.3.4 The only valid response to an EST message is an ACP message, which closes the coordination dialogue.

4.4.3.5 Message Format

ATS Field Description

3 Message type

7 Aircraft identification

13 Departure aerodrome

14 Estimate data

16 Destination aerodrome

*Example*

(EST-DLH454-EDDF-BOPUT/1248F360/LM083-KSFO)

(EST-QFA811/A2277-WSSS-20N070E/1417F350F370/W20L-YAYT)

4.4.4 **ACP (Acceptance)**

4.4.4.1 Purpose.

4.4.4.2 An ACP message is used to confirm that the coordination proposed in a received CPL, CDN, EST or PAC message is acceptable and to close the coordination dialogue. The agreed coordination conditions are updated in accordance with the proposed coordination.

4.4.4.3 An ACP message is linked to the original AIDC message using message identifier and reference identifier information described in section 3.2 Message Headers, Timers and ATSU Indicators.

4.4.4.4 Message Format.

ATS Field Description

3 Message type

7 Aircraft identification

13 Departure aerodrome

16 Destination aerodrome

*Example*

(ACP-ACA860-NZAA-KSFO)

(ACP-UAL816/A3312-YSSY-KLAX)

4.4.5 **TOC (Transfer of Control)**

4.4.5.1 Purpose.

4.4.5.2 The TOC message is sent to propose executive control of a flight to the receiving ATSU.

4.4.5.3 Message Format

ATS Field Description

3 Message type

7 Aircraft identification

13 Departure aerodrome

16 Destination aerodrome

*Example*

(TOC-TAP451-LPPT-KJFK)

(TOC-QFA135/A2217-YMML-NZCH)

4.4.6 **AOC (Acceptance of Control)**

4.4.6.1 Purpose.

4.4.6.2 The AOC message is transmitted in response to a received TOC message to indicate acceptance of executive control of a flight.

4.4.6.3 Message Format.

ATS Field Description

3 Message type

7 Aircraft identification

13 Departure aerodrome

16 Destination aerodrome

*Example*

(AOC-TAP451-LPPT-KJFK)

(AOC-QFA135/A2217-YMML-NZCH)

4.5 **Application management messages**

4.5.1 **LAM (Logical Acknowledgement Message)**

4.5.1.1 Purpose.

4.5.1.2 The LAM is transmitted in response to each AIDC message (except for another LAM or LRM)

that has been received, and found free of syntax and semantic errors.

4.5.1.3 A LAM is linked to the original AIDC message using message identifier and reference identifier information described in Chapter 3, *Communications and Support Mechanisms*.

4.5.1.4 Non-receipt of a LAM may require local action.

4.5.1.5 Message Format.

ATS Field Description

3 Message type*Example*

(LAM)

For examples of the way in which the LAM is linked to the original AIDC message refer to

Chapter 6, *Implementation Guidance Material.*

4.5.2 **LRM (Logical Rejection Message)**

4.5.2.1 Purpose.

4.5.2.2 The LRM is transmitted in response to each AIDC message not eligible for a LAM to be sent.

4.5.2.3 An LRM is linked to the original AIDC message using message identifier and reference identifier information described in Chapter 3, *Communications and Support Mechanisms*.

4.5.2.4 The LRM will identify the first message field found that contains invalid information if this field information is available.

4.5.2.5 Receipt of an LRM may require local corrective action.

4.5.2.6 Message Format.

ATS Field Description

3 Message type

18 Other information (limited to RMK/)

4.5.2.7 Field 18 is used to convey technical information, and will only use the RMK/ sub-field. This text will comprise an error code, supporting text and the message field number in which the error occurred (where applicable).

4.5.2.8 The following format is used in the RMK/ sub-field of the LRM to report errors:

<error code>/<field number>/<invalid text>

4.5.2.9 The <error code> should contain the appropriate error code number from Chapter 5, *Error Codes*, Table 5-1. The <error code> is described using up to three numeric characters without leading zeros. When multiple errors are detected in an AIDC message, only a single LRM should be generated in response. This LRM would usually contain the error code of the first error detected.

4.5.2.10 The <field number> will contain the field number corresponding to the error code extracted from Table 5-1. Where multiple field numbers are assigned to an error code, only the first field number containing the error will be sent. Where no field number is referenced in Table 5-1, the <field number> sub-field will be empty. The field number can be described using up to six alphanumeric characters.

**Note:** Some ATSUs may not support a non-numeric <field number> (e.g. “HEADER”), and will leave this sub-field blank. Whilst this is acceptable in order to preserve backwards compatibility with existing systems, the preferred implementation is for any non-numeric field numbers for Table 5-1 to be supported within the LRM.

4.5.2.11 The <invalid text> will contain the error text corresponding to the error code extracted from

Table 5-1 (not including any of ‘explanatory text’ that may have been included in Table 5-1). If

the specific error can be identified, it may optionally be appended to the Table 5-1 error text. The invalid text field can contain up to 256 characters, and may contain an oblique stroke “/”.

**Note:** Some ATSUs may not include the error text from Table 5-1, in the <invalid text> field of transmitted LRMs, and will leave this sub-field blank. Whilst this is acceptable in order to preserve backwards compatibility with existing systems, the preferred option is for the LRM

<invalid text> field to at least contain the error text from Table 5-1.

4.5.2.12 The following shows a number of LRM examples. Where more than one LRM format is shown, the format of the first one is the preferred option.

*Example*

(LRM-RMK/1/HEADER/INVALID SENDING UNIT)

**OR**

(LRM-RMK/1/ /INVALID SENDING UNIT) (See Note following paragraph 4.8.2.2.4)

(LRM-RMK/17/16/INVALID AERODROME DESIGNATOR)

**OR**

(LRM-RMK/17/16/)

(See Note following paragraph 4.8.2.2.5)

(LRM-RMK/57//INVALID MESSAGE LENGTH) (LRM-RMK/27/15/ INVALID LAT/LONG 130S165E)

(The actual error “130S165E” may be optionally appended to the error text from Table 5-1, see

Para 4.8.2.2.5).

For examples of the way in which the LRM is linked to the original AIDC message refer to

Chapter 6, *Implementation Guidance Material*)

4.5.3 **ASM (Application Status Monitor)**

4.5.3.1 Purpose.

4.5.3.2 The ASM message is transmitted to an adjacent ATSU to confirm that end-to-end messaging is available with that ATSU.

4.5.3.3 The transmission of an ASM message normally occurs when no AIDC messages (including Application messages) have been received from the adjacent ATSU within a specified time as defined in bilateral agreement.

4.5.3.4 Message Format.

ATS Field Description

3 Message type

*Example*

(ASM)

Table 4-6. PAN AIDC Messages and their Field Composition

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Message** | **3**  **a b c** | **7**  **a b c** | **8**  **a b** | **9**  **a b c** | **10 a b** | **13 a b** | **14**  **a b c d e** | **15**  **a b c** | **16**  **a b c** | **18** | **19** | **20** | **21** | **22** | | | | | | |
| **8**  **a b** | **9**  **a b c** | **10 a b** | **14**  **a b c d e** | **15**  **a b c** | **18** | **Text** |
| ABI | M - - | MOO |  |  |  | M - | MMMOO |  | M - - |  |  |  |  | OO | MMM | OO |  | MMM | O |  |
| CPL | M - - | MOO | MM | MM M | MM | M - | MMMOO | MMM | M - - | M |  |  |  |  |  |  |  |  |  |  |
| EST | M - - | MOO |  |  |  | M - | MMMOO |  | M - - |  |  |  |  |  |  |  |  |  |  |  |
| PAC | M - - | MOO |  |  |  | M - | MMMOO |  | M - - |  |  |  |  | OO | OOO | OO |  | OOO | O |  |
| MAC | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  | OOOOO |  | O |  |
| CDN | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  | OO | OOOOO | OOO | O | O |
| ACP | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  |  |
| REJ | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  |  |
| PCM | M - - | MOO |  |  |  | M - | MMMOO |  | M - - |  |  |  |  | OO | OOO | OO |  | OOO | O |  |
| PCA | M - - | MOO |  |  |  | M - |  |  | M - |  |  |  |  |  |  |  |  |  |  |  |
| TRU | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  | M |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Message** | **3**  **a b c** | **7**  **a b c** | **8**  **a b** | **9**  **a b c** | **10 a b** | **13 a b** | **14**  **a b c d e** | **15**  **a b c** | **16**  **a b c** | **18** | **19** | **20** | **21** | **22** | | | | | | |
| **8**  **a b** | **9**  **a b c** | **10 a b** | **14**  **a b c d e** | **15**  **a b c** | **18** | **Text** |
| TOC | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  |  |
| AOC | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  |  |
| EMG | M - - | MOO |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |
| MIS | M - - | MOO |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |
| LAM | M - - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LRM | M - - |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |
| ASM | M - - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FAN | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  | M |
| FCN | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  | M |
| ADS | M - - | MOO |  |  |  | M - |  |  | M - - |  |  |  |  |  |  |  |  |  |  | M |

**Chapter-5: MESSAGE ERROR DESCRIPTION AND RESOLUTION**

**5.1 Introduction**

The effectiveness of AIDC functionality depends on many factors, including ATC automation systems, manufacturer of the equipment, AFTN connectivity, weather-related factors, Controllers training, Airspace Design, Coordination procedures between different ATSU’s, etc. Some problems/difficulties observed during implementation/testing of AIDC procedures are of common nature irrespective of different OEM’s and different States. Such problems, their possible cause and their solution evolved over time may be of great help to States in the process of implementing AIDC.

Every effort should be made to minimize the errors with the help of OEM, in coordination with neighbouring ATSU and with the help of guidance material available from the States who have successfully implemented AIDC.

All States/Administrations have been requested to designate Focal point (Nodal Officer) for AIDC implementation. The updated list is available on ICAO APAC website. In case of any issues, support can be requested through these Focal Points..

AIDC implementation in any State cannot happen in a day. Along with patience, it requires change of mindsets, change in the working environment, change of attitude and the will to do so.

**5.2 Pre-implementation Checklist**

Before AIDC is implemented, some pre-conditions have to be fulfilled. Some of the following items may need extensive testing. A quick guidance on such conditions is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Pre-condition Description** | **Yes / No** | **Remarks, if any** |
| i. | ATC automation systems are compliant with ICAO PAN AIDC ICD version 1.0 (For existing systems, older APAC ver 3.0 may still work). |  |  |
| ii. | ATC automation systems’ adaptation data have been properly configured with the pairing stations. |  |  |
| iii. | ATC automation systems and and associated sub-systems are time synchronized (GPS / UTC). |  |  |
| iv. | Media used (like AFTN, etc) meet the Required Network Communication Performance. |  |  |
| v. | The adapted timings for AIDC messages like ABI, EST, CPL, etc. are as per the LOAs. |  |  |
| vi. | Design and test relevant use cases with pairing ATSU to ensure that unexpected AIDC messages are not generated by the ATC automation system. |  |  |
| vii. | AIDC is ON from the ATC automation systems (some systems may not have AIDC ON / OFF feature and may always remain in ON condition). |  |  |
| viii. | Airspace design is such that there is no discrepancy over the jurisdiction of COPs. |  |  |
| ix. | Trajectory deviations / diversions are successfully handled by ATC automation systems through AIDC. |  |  |
| x. | AIDC does not create overload situation of ATC automation systems. |  |  |
| xi. | AIDC does not create overload situation of AFTN / AMSS / Media. |  |  |
| xii. | Concerned ACCs have proper sectorization keeping in mind the controllers workload. |  |  |
| xiii. | AIDC HMI is controller friendly. |  |  |
| xiv. |  |  |  |
| xv. | Controllers / flight data operators have been trained to handle AIDC. |  |  |
| xvi. | Designated personnel have been trained to monitor / calculate media latency. |  |  |
| xvii. | LOAs between the pairing stations have been signed. |  |  |
| xviii. | Testing has been carried out under controlled conditions (Keep all the records of unexpected / unusual behaviour for faster troubleshooting). |  |  |
| xix. | Standard Operating Procedures (SOP) have been deliberated and published. |  |  |
| xx. | Cases have been identified where only Voice communication would be valid (eg. VVIP movements, activation of Danger areas). |  |  |
| xxi. | In case of AIDC failures, contingency procedures have been published. |  |  |
| xxii. | Number of LHDs reported before AIDC implementation have been recorded. |  |  |
| xxiii. | Number of LHDs reported during AIDC testing have been recorded. |  |  |
| xxiv. | Safety Assessments have been carried out. Hazards, Mitigation procedures, etc. have been identified / risk accepted. |  |  |
| xxv. | The overall system has been fully checked and is ready for AIDC implementation. |  |  |

AIDC implementation would be smooth and effective if all the above checklist answers are YES. In case of any NO, analyse the reason and try to rectify the issue.

Table 5.1 Implementation Issues (for guidance only)

| Issue reference | State/ Administration (AIDC Paring Stations) | Date of First Report | Description of fault | Fault Type | State/ATSU/Vendor | Priority  (assessed by TF or RO) | Actions Taken/Updated Date/Status (Open/Closed) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **AIDC-ISSUE-1** | India/Pakistan (Delhi/Lahore) | Sep-14 | Messages from Lahore to Delhi like ABI were rejected by Delhi system due to Error message61, Cyclic Redundancy Check (CRC) Error. | Technical | Delhi-AutoTrac-III (RAYTHEON) / Lahore-Aircon2100 (INDRA).   **Note: Delhi is in the process of implementing new automation system from INDRA.** | HIGH | Error is perhaps because Lahore System is generating extra spaces. Action is required at Lahore to avoid generation of extra spaces (OPEN).   **Note: After INDRA automation at Delhi, the issue may get resolved because of the similar automation systems from the same OEM.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India/Pakistan (Delhi/Karachi) | Sep-14 | Messages from Karachi to Delhi like ABI were rejected by Delhi system due to Error message61, Cyclic Redundancy Check (CRC) Error.  **Karachi has done changes through OEM. Re-testing is in progress.** | Technical | Delhi - AutoTrac-III (RAYTHEON) / Karachi-Aircon2100 (INDRA).  **Note: Delhi is in the process of implementing new automation system from INDRA.** | HIGH | Error is perhaps because Karachi System is generating extra spaces. Action is required at Karachi to avoid generation of extra spaces (OPEN)  **Note: After INDRA automation at Delhi, the issue may get resolved because of the similar automation systems from the same OEM.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Delhi/Varanasi) |  | AFTN Latency Issues observed at times. | Technical | Delhi - AutoTrac-III (RAYTHEON) / Varanasi-Aircon2100 (INDRA). **Note: Delhi is in the process of implementing new automation system from INDRA.** | LOW | **New AMSS installation at Delhi in progress (OPEN). Likely by December 2016.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Delhi/Nagpur) |  | AFTN Latency Issues observed at times. | Technical | Delhi - AutoTrac-III (RAYTHEON) / Nagpur-Aircon2100 (INDRA).  **Note: Delhi is in the process of implementing new automation system from INDRA.** | LOW | **New AMSS installation at Delhi in progress (OPEN). Likely by December 2016.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Delhi/ Ahmedabad) |  | AFTN Latency Issues observed at times. **Ahmedabad HMI issues for automated exchanged messages solved in-house to a great extent and are under testing.** | Technical | Delhi - AutoTrac-III (RAYTHEON) / Ahmedabad-Aircon2100 (INDRA).  **Note: Delhi is in the process of implementing new automation system from INDRA.** | LOW | **New AMSS installation at Delhi in progress (OPEN). Likely by December 2016.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India  (Ahmedabad/ Nagpur) |  | AFTN Latency Issues observed at times. |  | Ahmedabad-Aircon2100 (INDRA) / Nagpur-Aircon2100 (INDRA) | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India/Pakistan (Ahmedabad/ Karachi) | 2014/06/05 | ABI messages exchanged between two system and messages were rejected due route error and mismatch in coordination timing. Modification in airways was required for Ahmedabad and Karachi DBM. On 12.06.2014 required modification were made in airways (like imaginary points) for effectively acceptance of AIDC messages. ABI messages of some of the aircrafts were not correlated with Flight plan available in ATS automation system.  **Karachi has done changes through OEM. Re-testing is in progress.** | Technical/ Operational | Ahmedabad-Aircon2100 (INDRA) / Karachi-Aircon2100 (INDRA) | HIGH | Coordination protocol dialogue timeout was observed. Karachi AMSS/AFTN system time was also synchronized. Automatic time synchronization through GPS server in AMSS/AFTN system at Ahmedabad and Karachi was done for smooth exchange of AIDC messages. Rejection of AIDC messages have reduced. Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Varanasi/ Nagpur) |  | Some HMI issues at both the stations. |  | Varanasi-Aircon2100 (INDRA) / Nagpur-Aircon2100 (INDRA). | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Kolkata/ Varanasi) |  | Some HMI issues at Varanasi.  **AIDC being done for limited hours.** | Technical | Kolkata-Aircon Icon (INDRA) / Varanasi-Aircon2100 (INDRA). | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India  (Kolkata/Nagpur) |  | Some HMI issues at Nagpur.  **AIDC being done for limited hours.** | Technical | Kolkata-Aircon Icon (INDRA) / Nagpur-Aircon2100 (INDRA). | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Kolkata/ Chennai) |  | **Under trial phase.** Timely non-receipt of LAM/LRM was not received. |  | Kolkata-Aircon Icon (INDRA) / Chennai-AutoTrac-III Plus (RAYTHEON). |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India  (Chennai/ Nagpur) |  | Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Nagpur-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India/Sri Lanka  (Chennai/ Colombo) | 2015-08-06  2015-10-06 and  2015-12-06     **2015-06-11** | Though the initial test in Nov 2014 was quite successful. The test in June 2015 were not successful, due to technical issues at Colombo. Re-testing have to be done after rectification at Colombo.  **The Re-testing was done after rectification of identified technical issues at Colombo. Testing was successful. Will start trials for limited hours.** |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Colombo-INTEL CAN |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India/Maldives (Chennai/Male) | 2014-11-25 | Trials were mostly successful barring some LRMs, like reference ID in ODF 3 is not as per ICD. | Technical | Chennai-AutoTrac-III Plus (RAYTHEON) / Male-SELEX. |  | Message transaction rate is 100% and the message delivery was successful (CLOSED) |
| **AIDC-ISSUE-1** | India (Chennai/ Trivandrum) |  | Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trivandrum-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Chennai/ Mangalore) |  | Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message. |  | Chennai-AutoTrac-III Plus (RAYTHEON) /Mangalore-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Chennai/Trichy) |  | Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trichy-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Chennai/ Hyderabad) | 2015-03-24 | The SSR Codes received through AIDC message are getting retained in Chennai FDPS for days and are not available for re-use. Controller have to use Chennai adapted pool of limited SSR codes for track correlation. As a result the adapted Chennai pool of SSR codes gets exhausted very soon. AIDC testing is temporarily suspended. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Hyderabad-SELEX |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Chennai/ Bengaluru) | 2015-03-24 | The SSR Codes received through AIDC message are getting retained in Chennai FDPS for days and are not available for re-use. Controller have to use Chennai adapted pool of limited SSR codes for track correlation. As a result the adapted Chennai pool of SSR codes gets exhausted very soon. AIDC testing is temporarily suspended. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Bengaluru-SELEX |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India  (Mumbai/ Ahmedabad) |  | **Ahmedabad HMI issues for automated exchanged messages solved in-house to a great extent and are under testing.** |  | Mumbai-AutoTrac-III (RAYTHEON) / Ahmedabad-Aircon2100 (INDRA) | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | India (Mumbai/ Nagpur) |  | Some HMI issues at Nagpur. |  | Mumbai-AutoTrac-III (RAYTHEON) / Nagpur-Aircon2100 (INDRA) | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-1** | Maldives | 2014-09-17 | Melbourne reported that Field 15 route information contains seconds in the LAT/LONG information generated from our system | Technical | MALDIVES/VRMM/SELEX |  | Vendor investigated and provided updated software /22May2015/Closed. |
| **AIDC-ISSUE-1** | Singapore | 2015-11-11 | Rejection of ABI message due to unknown point in route | Technical | Singapore/Singapore/THALES | HIGH | Need to update ATMS dataset to include SIDs/STARs that may be filed by operator/17 Nov 2015/Closed |
| **AIDC-ISSUE-2** | India (Delhi/Varanasi) |  | Some HMI issues at Varanasi. | Technical | Delhi - AutoTrac-III (RAYTHEON) / Varanasi-Aircon2100 (INDRA). **Note: Delhi is in the process of implementing new automation system from INDRA.** | LOW | **New AMSS installation at Delhi in progress (OPEN). Likely by December 2016.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India  (Delhi/Nagpur) |  | Some HMI issues at Varanasi. | Technical | Delhi - AutoTrac-III (RAYTHEON) / Nagpur-Aircon2100 (INDRA).  **Note: Delhi is in the process of implementing new automation system from INDRA.** | LOW | **New AMSS installation at Delhi in progress (OPEN). Likely by December 2016.** Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India  (Ahmedabad/ Nagpur |  | Some HMI issues at Nagpur. |  | Ahmedabad-Aircon2100 (INDRA) / Nagpur-Aircon2100 (INDRA) | LOW | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India  (Kolkata/Chennai) |  | Under trial phase. The acceptance of EST message is in manual mode. |  | Kolkata-Aircon Icon (INDRA) / Chennai-AutoTrac-III Plus (RAYTHEON). |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India (Chennai/Nagpur) |  | The ICAO route truncation indicator is not supported by aircon2100 system. |  |  |  |  |
| **AIDC-ISSUE-2** | India/Maldives  (Chennai/Male) | 2014-11-25 | Seconds field included in Lat/Long is received which is not as per ICD. Testing planned again in presence of Male OEM. | Technical | Chennai-AutoTrac-III Plus (RAYTHEON) / Male-SELEX. |  | Message transaction rate is 100% and the message delivery was successful (CLOSED) Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India  (Chennai/ Trivandrum) |  | The ICAO route truncation indicator is not supported by aircon2100 system. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trivandrum-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India (Chennai/ Mangalore) |  | The ICAO route truncation indicator is not supported by aircon2100 system. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Mangalore-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | India (Chennai/ Trichy) |  | The ICAO route truncation indicator is not supported by aircon2100 system. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trichy-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-2** | Maldives | 2014-09-17 | Melbourne reported a small number of messages contain a route designator in field 15 prior to Entry COP | Technical | MALDIVES/VRMM/SELEX |  | Vendor is investigating/22Jun2015/Open. |
| **AIDC-ISSUE-2** | Singapore | 2015-11-11 | Rejected EST message due to invalid flight plan state (coordinated) were queued in erroneous folder. | Operational | Singapore/Singapore/THALES | LOW | Air Traffic Control Support Officer would verify the information on the EST message against the coordinated flight plan. To follow up with the upstream ATSU if any discrepancies were discovered/12 Nov 2015/Closed |
| **AIDC-ISSUE-3** | India (Kolkata/Chennai) |  | The ICAO route truncation indicator is not supported by INDRA system. |  | Kolkata-Aircon Icon (INDRA) / Chennai-AutoTrac-III Plus (RAYTHEON). |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-3** | India  (Chennai/Nagpur) |  | Airspace configuration issue. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Nagpur-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-3** | India (Chennai/ Trivandrum) |  | Airspace configuration issue (UTV/LTV airspace configuration) |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trivandrum-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-3** | India  (Chennai/ Mangalore) |  | Airspace configuration issue. |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Mangalore-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-3** | India  (Chennai/Trichy) |  | Airspace configuration issue |  | Chennai-AutoTrac-III Plus (RAYTHEON) / Trichy-Aircon2100 (INDRA) |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-3** | Singapore | 2015-11-11 | Message time out parameter set too short whereby ACP messages from downstream ATSU were not processed. More prevailing with network was busy. | Operational | Singapore/Singapore/THALES | HIGH | Need to update ATMS dataset to increase the timeout parameter/17/Nov 2015/Closed |
| **AIDC-ISSUE-3** | Maldives | 2014-03-13 | Colombo reported Msg ID out to VCCC had wrong ID sent from our system | Technical | MALDIVES/VRMM/SELEX |  | Configuration corrected/15Mar2014/Closed |
| **AIDC-ISSUE-4** | India  (Kolkata/Chennai) |  | AFTN Latency issues observed at times. |  | Kolkata-Aircon Icon (INDRA) / Chennai-AutoTrac-III Plus (RAYTHEON). |  | Last updated: 30-Nov-2015. |
| **AIDC-ISSUE-4** | Maldives | 2014-04-06 | When Male sends ABI message within Colombo domestic squawk range, it causes complication in their system | Technical | MALDIVES/VRMM/SELEX |  | Colombo changed their domestic SSR allocation/16Mar2015/Closed |
| **AIDC-ISSUE-5** | Maldives | 2014-11-25 | Reference ID of Optional Data Field 3 (ODF) is incorrect in message received by VOMM | Technical | MALDIVES/VRMM/SELEX |  | Reported issue to Vendor/27Nov2014/Open. |
| **AIDC-ISSUE-6** | Maldives | 2014-11-25 | Chennai automation system rejected latitude/longitude represented with seconds (041627N0733138E) | Technical | MALDIVES/VRMM/SELEX |  | Vendor investigated and provided updated software on /22May2015/Closed. |
| **AIDC-ISSUE-7** | Maldives | 2015-11-19 | Colombo reported LRM received from VRMM saying invalid SSR equipment in FPL | Technical | MALDIVES/VRMM/SELEX |  | Reported issue to Vendor/20Nov2015/Open |
| **AIDC-ISSUE-8** | Maldives | 2015-11-19 | ABI and CPL message in ICAO 2012 FPL format sent from Colombo rejected | Technical | MALDIVES/VRMM/SELEX |  | Reported issue to Vendor/20Nov2015/Open |

**5.3 Handling Implementation Issues**

Over a period of time during testing and implementation of AIDC across ICAO-APAC region, several error messages were encountered by different concerned ATSU’s. Some of these messages are of common nature and some of them may be unique for a particular ATSU. Such messages compiled from various ATSU’s are given below with a little description of the errors contained in those messages. The list of messages is not exhaustive and different ATSU’s may face similar or a new type of error messages.

1. **Error Message: Rejection of ABI messages by receiving system due to Error message61, Cyclic Redundancy Check (CRC) Error.**

Error message 61 or cyclic redundancy check (CRC) error had been experienced by almost all of the ATSU’s

**Cyclic redundancy check** (CRC): A Cyclic redundancy check is an **error**-detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short *check value* attached, based on the remainder of a [polynomial division](https://en.wikipedia.org/wiki/Polynomial_long_division" \o "Polynomial long division) of their contents. On retrieval, the calculation is repeated and, in the event the check values do not match, corrective action can be taken against data corruption.

A CRC-enabled device calculates a short, fixed-length binary sequence, known as the *check value* or *CRC*, for each block of data to be sent or stored and appends it to the data, forming a *codeword*. When a codeword is received or read, the device either compares its check value with one freshly calculated from the data block, or equivalently, performs a CRC on the whole codeword and compares the resulting check value with an expected *residue* constant. If the check values do not match, then the block contains a data error. The device may take corrective action, such as rereading the block or requesting that it be sent again

CRCs are specifically designed to protect against common types of errors on communication channels, where they can provide quick and reasonable assurance of the [integrity](https://en.wikipedia.org/wiki/Data_integrity" \o "Data integrity) of messages delivered. However, they are not suitable for protecting against intentional alteration of data.

**Cause:** Error is perhaps because sending system is generating extra spaces. Action is required by sending system to avoid generation of extra spaces.

**Solution:** This error can be overcome by making changes in sender ATM system to not to generate any extra spaces while transmitting AIDC messages.

1. **Error Message: AFTN Issues.**

The AFTN network was selected as the media to support the exchange of AIDC messages as the established infrastructure is already available and it has the ability to re-direct messages through alternate paths in the event of a direct connection failure. Through the various technical testing with adjacent FIRs, several issues were encountered:

1. **AFTN Latency:** Latency generally is the amount of time a message takes to traverse a system. In computer network, it is an expression of how much time it takes for a packet of data to get from one designated point to another. It is sometimes measured as the time required for a packet to be returned to its sender.

AFTN latency in AIDC messages is not acceptable or acceptable up to a certain limit as system expects automatic system response for all AIDC messages in a time bound manner. If no automatic system response is received by the sender system in a fixed time, then the sender system generates a LTO (time out response).

1. **Message timeout errors** due to the re-routing of messages caused by the failure of the direct AFTN link.
2. **Rejected EST message** due to missing or multiple flight plans;

**Solution:** The probable solution may be to expand the bandwidth of existing AFTN network or increase the message time-out parameter for all messages to avoid generation of LTO messages.

1. **Error Message: Rejection of ABI messages exchanged between system due to route error and mismatch in coordination timing.**

ABI messages of some of the aircrafts are not correlated with Flight plan available in ATS automation system

**Cause:** This problem may be because of how common airways are defined in the pairing automation systems. Some airways may be defined up to a certain extent in next FIR, while others may be defined only up to the FIR boundary. This may cause the system to reject the incoming ABI message because of unrecognised route portion.

**Solution:** To overcome this problem minor modifications in the airways may be required at both the pairing Data base (DBM). Modification in airways (like imaginary points) may also be considered in airways for effectively acceptance of AIDC messages.

1. **Error Message: Coordination protocol dialogue timeout observed.**

**Cause:** Time not synchronised in both pairing AMSS/AFTN systems.

**Solution:** Automatic time synchronization through GPS server in AMSS/AFTN system at both receiving and sending system is required to be done for smooth exchange of AIDC messages.

1. **Error Message: Timely non-receipt of ACP messages results in unnecessary LRM messages.**

**Cause:** Messages may be accepted manually at receiving ATSU. In some of the automation system installed there is no provision of automatic acceptance of EST messages.

**Solution:** It is recommended that AIDC messages like EST are accepted automatically to avoid frequent LRM messages. As it is discussed earlier also that system expects response for every AIDC message in a fix time. Non receipt of response within a fix time span results in frequent LRM and LTO messages.

1. **Error Message: Truncated routes are not getting accepted by accepting unit.**   
    Melbourne reported a small number of messages contain a route designator in field 15 prior to Entry COP.

**Cause:** ICAO route truncation indicator is not supported by many accepting unit.

Incorrect route truncation. The Asia/Pacific ICD clearly states the rules required for truncating a route after the last known significant route point. If these rules are not followed there are significant risks associated with the transmission of incorrect route information to the downstream ATC unit. While the majority of instances investigated are the result of human error, there have been occasions when the automation system behaved unexpectedly. With the increasing use of route modifications, the accuracy of route handling and transmission between automated systems is of great importance.

**Solution:** Manufacturer and States must ensure that automation system must be designed/changed as per APAC-ICD mandated by ICAO. To avoid human errors, a comprehensive training backed up by regular refresher training is required to be imparted to controllers/system operators.

1. **Error Message: Even after sending a rejection or counter coordination message by accepting unit, the sending station continues to send the CDN message.**

E.g. a CDN message is sent by sender system to an accepting system. The receiving system in response to incoming message will send either an acceptance (ACP) message, rejection message (REJ) or counter- coordination message (CDN). The sender system should wait for the above messages from receiving system and then send the appropriate message.

**Cause:** Unnecessary generation of CDN messages without acknowledgement.

**Solution:** As per PAN-ICD protocol, transmitting system must wait to receive response for a CDN message. This response may be accept, reject or counter-coordination. Multiple generation of automatic CDN messages, without waiting for an acknowledgement, might be due to system getting into some loop or may be due to some other system problem. The temporary solution may be to stop automatic generation of CDN messages by the system.

1. **Error Message:**
2. **The SSR Codes received through AIDC message are getting retained in FDPS** for days and are not available for re-use. Controller has to use adapted pool of limited SSR codes for track correlation. As a result the adapted Station pool of SSR codes gets exhausted very soon.
3. **Use of incorrect ORCAM SSR code** by ATSU-1 may cause complication in ATSU-2 system.

**Cause:** This problem may be because of wrong adaptation of SSR codes in automation system by transmitting system.

**Solution:** Every AIDC partner must ensure proper allocation of SSR codes in their automation system as per ICAO regional allocation of SSR codes due to availability of limited number of SSR codes.

1. **Error Message: Some automation systems rejected latitude/longitude represented upto seconds** (041627N0733138E).

**Cause:** As per AIDC-ICD seconds is not part of the standard LAT/LONG format.

**Solution:** Automation system may conform to AIDC ICD.

1. **Error Messages: ICAO FPL 2012 Format.**
2. ABI and CPL message in ICAO 2012 FPL format were rejected, reported LRM received with invalid SSR equipment in FPL.
3. Reference ID of Optional Data Field 3 (ODF) is incorrect in messages.

**Solution:** Pairing Systems may be modified to support ICAO FPL 2012 format.

1. **HMI Issues:** Some of HMI issues found in India across all of the automation systems.

a. Separate CWP is required for radar and planning controller for efficiently carrying out AIDC functionality.

1. Multiple AIDC HMI is preferred as it may not be practicable for RADAR controller alone to handle AIDC.
2. Dedicated AIDC message exchange window like DLD window to display readily the current status and actual content of messages exchanged is preferred.
3. There should be provision for automatic as well as manual mode of message exchange.

1. Status of AIDC coordination and provision for hand-off may be made available in Data Block.

1. Flexible provision for automatic/manual responses for the messages like EST, CPL, PAC, CDN, etc.

d. Non provision of creation of flight plan with ABI message, if a flight is not available. Some automation system creates flight plan from incoming ABI message in case of non-availability of flight plan whereas others reject ABI message altogether in case of non- availability of flight plan.

e. The clocks of the AFTN and Automation System need regular synchronisation. This problem is frequently encountered by various automation systems that messages are getting rejected due to different time stamping at the time of receiving and sending the messages.

f. Colour combinations should facilitate easier comprehension of AIDC state.

g. Pending ACP from ATSU-2, incoming PAC is sometimes displayed in sector inbound list only. It is required that same be available in coordination list also.

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Chapter 6 **HARMONIZATION FRAMEWORK FOR AIDC IMPLEMENTATION**

6.1 **Introduction**

6.1.1 This chapter describes the steps that should be taken to harmonize AIDC implementation between ATS units. As the successful transmission and reception of AIDC messages are dependent on various external factors, the need to harmonize implementation plans and timelines if AIDC implementation is to be successful.

6.1.2 AIDC messages can be transmitted through existing AFTN networks or by the use of dedicated data channels between ATS units. There may be a need to upgrade existing infrastructure to cater for sufficient bandwidth for handling AIDC messages.

6.1.3 The framework details and template will be described in greater details in the next section

6.2 **Harmonization Framework**

The various items that will require harmonization between ATS units are listed below. These are the minimum required and individual ATS units may choose to include additional items as required. A coordinated approach to implementing AIDC is crucial to allow ATS units to improve on coordination efficiency and remove associated errors that could arise with manual voice coordination.

4.2.1 **Bilateral agreements**

4.2.1.1 TBN

4.2.2 **ATC procedures**

4.2.2.1 TBN

.

4.2.3 **ATS Routes**

4.2.3.1 TBN

4.2.4 **AIDC version**

4.2.4.1 TBN

4.2.5 **AIDC messages**

4.2.5.1 TBN

4.2.6 **Infrastructure**

4.2.6.1 TBN

**6.2 TEMPLATE OF HARMONIZATION FRAMEWORK FOR AIDC IMPLEMENTATION**

|  |  |  |  |
| --- | --- | --- | --- |
| **Harmonization Framework for AIDC Implementation between ATSU1 and ATSU2** | | | |
| **No.** | **Harmonization items** | **Description** | **Remarks** |
| 1 | Bilateral agreements | - Date of implementation to be stated in bilateral agreement between ATS units  - AIDC messages and parameters to be implemented  - ATS routes /coordination points to be determined  - Agreed fallback procedures in the event of unsuccessful message exchanges  - AIDC suspension conditions  - data link for AIDC messaging (eg AFTN, dedicated line, etc) | Any other unique agreement details to be included based on the requirements of ATS units. |
| 2 | ATC Procedures | * AIDC message parameters and activation conditions * Fallback procedures |  |
| 3 | ATS routes | * ATS routes * Coordination points |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 4 | AIDC version | -AIDC version to be used by ATS unit |  |
| 5 | AIDC messages | -AIDC messages to be exchanged |  |
| 6 | Infrastructure | -Infrastructure required  - Alternate/backup links in the event of failure of primary transmission channel |  |

**7. AIDC INTEGRITY AND PERFORMANCE MONITORING**

Safety issues relating to human errors in ATS transfer were identified by the 18th and 20th Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/18 and RASMAG/20 meetings) where AIDC was considered as an important means of mitigating Large Height Deviation (LHD\*Note 1). In addition, AIDC is also recognized as an effective tool to foster better collaborative air traffic management between neighboring ATS units, supporting the ICAO ASBU Module B0-FICE, identified as one of the regional priority modules under the ICAO Asia/Pacific Seamless ATM Plan.

The procedures described in this section aim to ensure system performance by validation, reporting and tracking of possible problems revealed during system monitoring with appropriate follow-up actions.

\*Note 1

Large Height Deviation (LHD) means any vertical deviation of 90m/300ft or more from the flight level expected to be occupied by the flight.

**7.2 AIDC PERFORMANCE CRITERIA**

The efficiency gained by adopting AIDC is significant. With continued growth in ATC traffic, more efficiency gained by using AIDC is anticipated.

However, if AIDC messages are not transmitted and received in a timely manner between automation systems, aircraft can potentially cross boundaries without coordination or transfer of control responsibility taking place.

In order to effectively use the AIDC application for the interchange of ATC coordination data, performance requirements need to be specified. These specified performance requirements need to be mutually agreed between neighboring ATS units implementing AIDC. The following are recommended performance parameters for - application response time and operational response time

**Response Messages**

a) **Application Response**

i) Every ~~ASIA/PAC~~ AIDC message received by an ATSU, except a LAM or LRM, shall be responded to with a LAM or LRM. While no LAM is generated for a valid LRM, an ATSU may choose to respond to an invalid LRM with an LRM. Such a response is termed an Application Response, and is generated automatically by the automation system. A LAM shall be transmitted when the receiving automation system found the received message to be syntactically correct and the message data was accepted for further processing or presentation. Otherwise, an LRM message shall be transmitted.

ii) The timeout value Talarm associated with an application response should typically be less than 180 seconds measured from the transmission time of the original message and may be specified by bilateral agreement, corresponding to the nominal value associated with the accountability timer.

iii) The transmission of an application response should be triggered after the semantic and syntactic checks have been performed on the incoming message. This is because the purpose of an application response is to indicate that a received AIDC message has both been received and is semantically and syntactically correct. Failure to receive an expected application response (i.e. a LAM or LRM) within Tr seconds (≤Talarm) shall result in a re-transmission (up to a maximum number Nr) of the original message. The timeout timer Tr shall be reset upon re-transmission. Failure to receive an application response within Talarm seconds from the original transmission of the message shall result in a warning being issued.

iv) The transmission of a LAM or LRM shall be triggered by the ATC application process, not the communications process. This is because an application response indicates that the received message was examined by the ATC application process(s), not just the communications functions. Note the distinction between an ATC application process, which implements a critical ATC function such as Coordination or Transfer of Control, and a communications process, which is responsible for the reliable delivery of data, but not data interpretation.

v) Receipt of an LRM should cause the ATSU to take a corrective action before re-transmitting the rejected message with a new message identification number. This corrective action may be automatic or manual.

b) **Operational Response**

i) Several ~~ASIA/PAC~~ AIDC messages require a response, in addition to the normal application response, by another AIDC message. Such a response is termed an Operational Response.

Table 1 below indicates the required response to a received message. ~~ASIA/PAC~~ AIDC messages not listed in Table 1 have no operational response.

|  |  |
| --- | --- |
| **Received Message** | **Required Operational Response** |
| CPL | ACP or CDNNote |
| EST | ACP |
| PAC | ACP |
| CDN | ACP,CDN, or REJNote |
| PCM | PCA |
| TOC | AOC |

Table 1 : Required Operational Response

**Note.** An REJ is not available in an Initial Coordination Dialogue initiated by a CPL, EST or PAC. An REJ is only available in a CDN dialogue while an REJ is not a valid response to a CDN message within an Initial Coordination Dialogue.

ii) Failure to receive a response within an adapted operational response timeout period Top shall result in a warning being issued.

iii) The value of Top is dependent on whether manual processing is required to generate the operational response. In general, Top should be less than a value when a manual action is required to trigger the operational response.

For example, the performance requirements specified in Asia/Pacific Regional Interface Control Document (ICD) v3.0 are as follow:

|  |  |
| --- | --- |
| Talarm | 180 seconds |
| Top | ≤600 seconds |

Table 2 : Performance figures



The performance of the AIDC will also rely on the performance of the supporting infrastructure: AMHS/AFTN, and communication layer such as Common IP-based networks. In this connection, the following end-to-end communication requirements are recommended between any two AIDC peers:

Maximum One-Way Latency (ms): 300 ms

Maximum Round Trip Time (ms): 600 msNormally, the latency of the communication link (in msec) is sufficient to support to the application of AIDC (in second), for example, each AIDC message sent will result in at least one technical response (LAM or LRM), and where necessary an operational response (e.g. EST/ACP, TOC/AOC). Some AIDC application timeout with reference to the agreed ICD as mentioned above is required to be set based on performance of the communications circuit.

**7.2.1 Reliability (Suggest to move under Section 7.2)**

Reliability is a measure of how often a system fails and is usually measured as Mean MTBF expressed in hours. Continuity is a measure equivalent to reliability, but expressed as the probability of system failure over a defined period. In the context of this document, failure means inability to deliver AIDC messages to the adjacent ATC centres. This includes the failure of AIDC system only. For the other factors such as the failures of communication link and the counterpart AIDC systems are not counted in this document. The reliability performance requirement of AIDC is given in ICAO Doc 9694 “Manual for Air Traffic Services Data Link Applications” (99.9%).

**7.2.2** Av**ailability (Suggest to move under Section 7.2)**

7.2.1 Availability is a measure of how often the system is available for operational use. It is usually expressed as a percentage of the time that the system is available.

7.2.2 Planned outages are often included as outages because the efficiencies provided to the Industry are lost, no matter what the cause of the outage. However, some organisations do not include planned outages because it is assumed that planned outages only occur when the facility is not required.

7.2.3 Availability is calculated as

*Availability (Ao) = MTBF/(MTBF+MDT)*

*where MTBF= Mean Time Between SYSTEM Failure*

*MDT = Mean Down Time for the SYSTEM*

*The MDT includes Mean Time To Repair (MTTR), Turn Around Time (TAT) for spares, and Mean Logistic Delay Time (MLDT)*

*NB: This relates to the failure of the system to provide a service, rather than the time between individual equipment failures. Some organisations use Mean Time Between Outage (MTBO) rather than MTBF.*

7.2.4 Availability is directly a function of how quickly the SYSTEM can be repaired. Ie: directly a function of MDT. Thus availability is highly dependent on the ability & speed of the support organisation to get the system back on-line. The availability performance requirement of AIDC is given in ICAO Doc 9694 “Manual for Air Traffic Services Data Link Applications” (99.996%).

**7.3 AIDC SYSTEM VALIDATION (Suggest to rename from “ATC SYSTEM VALIDATION” to “AIDC SYSTEM VALIDATION”)**

**7.3.1 System Validation Guidelines**

ATS units should conduct a validation process before introduction of their new AIDC equipment and procedures. Such processes shall include before and during implementation:

1. A system safety assessment for new implementations is the basis for defining system performance requirements. Where existing systems are being modified to utilize additional services, the assessment shall demonstrate that the ATS Provider’s system will meet safety objectives;
2. Integration test results confirming interoperability for operational use of AIDC messages; and
3. Establishment of the operational instruction (OI)/ Letter of Agreement (LoA) or Memorandum of Understanding (MoU) between ATS units and mutual agreement on the associated parameters for the set of AIDC messages to be implemented.

**7.3.2 System safety assessment**

In accordance with the provisions of ICAO SMS manual (Doc9859), the objective of the system safety assessment is to ensure the ATS units that the introduction and operation of AIDC is safe. The safety assessment should be conducted for initial implementation as well as any future enhancements and should include:

a) Identifying failure conditions;

b) Assigning levels of criticality;

c) Determining risks/ probabilities for occurrence;

d) Identifying mitigating measures and fallback arrangements;

e) Categorising the degree of acceptability of risks; and

f) Operational hazard ID process

g) HMI verification

Following the safety assessment, ATS units should institute measures to offset any identified failure conditions that are not already categorized as acceptable. This should be done to reduce the probability of their occurrence to a level as low as reasonably practicable. This could be accomplished through system automation or manual procedures.

During tactical AIDC operation, apart from the application messages to be sent from ATM personnel, the logical/system messages and the associated error code/messages feedback from counterparts are found necessary to be captured, e.g. through the error queue ~~Problem Message Queue (PMQ)~~ of the Flight Data Processor (FDP) of the ATM System, and the expiry of accountability timer of the system to provide each event a resolution/action. Prompt response to the counterparts or associated contingency arrangement, e.g. backup system and fallback procedures, etc. should be in place and to be agreed with between the two AIDC partners.

**7.3.3 Integration test**

ATS units should conduct trials (both operational and technical) with adjacent ATS units with AIDC equipment to ensure they meet the operational and technical requirements stated in the agreed test procedure. During the technical test, it is recommended to verify as much AIDC messages as possible since it could reduce safety risk associated with system testing after system commissioning. Regarding trials for operational and technical, please find examples given in Appendix B and C respectively.

**7.3.4 Recommendations for AIDC Validation (before commissioning)**

1. Engage both technical and operational experts in the process of AIDC implementation starting from initial stage;
2. Define the objectives for trials in the test procedure;
3. Use an appropriate communication link between two ATS units to conduct validation tests;
4. Conduct validation through technical tests on technical platforms including operational system (i.e. Prior to conducting an actual trial with neighbouring ACCs for AIDC tests, a simulator testing for mimicking virtual ACC counterpart for AIDC messages exchange should be conducted);
5. Define operational requirements and specify scope of operational improvements (determine what AIDC messages set is required to be supported) at initial planning stage of the operational trial with agreed test procedure(bilateral agreement);
6. Interoperability between ATM automated systems supporting latest version of AIDC ICDs with full/selected message sets;
7. Interoperability between ATM automated systems from different vendors;
8. Interoperability between ATM automated systems supporting different Cyclic Redundancy Check (CRC) initial values (bilateral agreement);
9. Synchronizing the system time of the communication link to common source (e.g. GPS, satellite );
10. Develop a comprehensive and detailed testing plan including testing scripts to evaluate the process of the implementation;
11. Define the contingency arrangement in the test procedure;
12. Document the test result and share the lessons learnt with the counterparts, and
13. Adopt Target of Opportunity (TOO) during testing wherever appropriate and applicable.

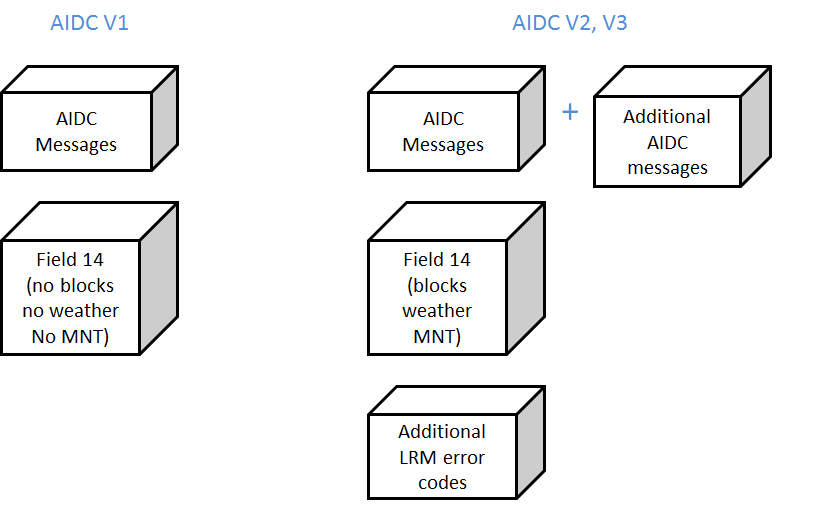
According to the conclusion of The First Meeting of ATS Inter-Facility Data Communication Task Force Meeting (APA TF/1), States/Administrations in the Asia/Pacific Regions is encouraged to use the Pan Regional ICD for AIDC for any planned new ATM automated system or updating ATM automated systems for AIDC function.

There is also an initial suite of messages proposed to allow States/Administrations to enter into the AIDC environment (ABI, EST, ACP, TOC, AOC), details of which are available in the ICAO Asia/Pacific Seamless ATM Plan.

**7.3.5 Compatibility Issue between AIDC Versions 1, 2 and 3**

The enhancements introduced during the development of AIDC ICD Version 2 and 3 were designed to permit continued interoperability with AIDC ICD Version 1. For example, when a block level format was defined for Field 14, it was explicitly stated that this was an optional format only to be used with agreement between the two ATS units.

The following diagram depicts the significant differences between AIDC Version 1 and the subsequent AIDC versions.



The diagram shows that AIDC messages supported in AIDC Version 1 is included in AIDC V2 and V3. As such, an AIDC V1 ATS Unit is interoperable with an AIDC V2 or 3 ATS Unit. The additional messages in AIDC V2 and V3 are not supported by AIDC V1. However, this could easily be controlled procedurally by simply not sending these messages.

The optional Field 14 formats should not be included in messages sent to an AIDC V1 ATS Unit, which makes Field 14 interoperable too.

The additional LRM error codes were designed to support the new AIDC messages and the Field 14 formats. Because an AIDC V2 or V3 ATS Unit will not be receiving these messages or formats from an AIDC V1 ATS Unit, this means that they will not send these error codes to an AIDC V1 ATS Unit. Therefore AIDC messaging is also interoperable between an AIDC V2/V3 ATS Unit and an AIDC V1 ATS Unit.

**7.3.6 Agreement for Validation**

States should coordinate with adjacent ATS units to confirm that their tests procedures to ensure harmonization of procedures during testing.

**7.4 ~~SYSTEM~~ AIDC IMPLEMENTATION AND PERFORMANCE MONITORING**

States/Administrations in a position to do so are encouraged to submit identified issues using the AIDC issues form to the ICAO Regional Office for consolidation and sharing by States/Administrations implementing AIDC. In addition, States/Administrations in the APAC Region are encouraged to share their implementation plans and experiences with concerned States/ATS units for an expeditious AIDC implementation in a harmonized and timely manner.

**7.4.1 The monitoring process**

When problems/issues are discovered, the initial analysis should be performed by the organization(s) identifying the problem/issues. In addition, the problem/issue should be logged in the AIDC issues table. As some problems or abnormalities may involve more than one organization, the originator should be responsible for follow-up action to rectify the problem and take lead to record the information in the AIDC issues table. It is essential that all information relating to the problem/issue is documented and recorded and resolved in a timely manner.

The following groups should be involved in the monitoring process and problem/issue tracking to ensure a comprehensive review and analysis of the collected data:

a) ATS Providers;

b) Organizations responsible for ATS system maintenance (where different from the ATS provider);

c) Relevant State regulatory authorities; and

d) Communication Service Providers being used (if appropriate).

**7.4.2 Distribution of information**

It is important that information that may have an operational impact on other parties be shared by States/Administrations and distributed by the ICAO Regional Office , as soon as possible. In this way, each party is made aware of problems already encountered by others, and may be able to contribute further information to aid in the solution of these problems.

**8. AIDC REGULATIONS AND PROCEDURES**

8.1 Introduction

AIDC is a two way communications facility between countries by means of system interaction which using ATS Message Handling System (AMHS) and/or Aeronautical Fixed Telecommunications Network (AFTN) as a medium of exchanging data.

8.2 Regulations/Mandate for AIDC Implementation

1. ICAO encourages implementation, and proposes mandates where needed;
2. In the Asia/Pacific Region, wide implementation is still progressing. AIDC is a priority number one in regional Seamless ATM Implementation Plan;
3. NAT has widely implemented (AIDC rollout 2010-2013)

8.3 Personnel ~~Licensing and~~ Training

Air traffic controller training is defined with specified regulations, international and domestic, that prescribe minimum requirements for organizations certified for such a training. These requirements include creation of the Operations Manual, defining responsible personnel, programs of training with training objectives and financial plans.

In order to provide safe, orderly and efficient flow of air traffic and to ensure a harmonized training process, each state need to provide an AIDC training which is recommend by ICAO training standards, programs and learning objectives as reference. These standards should increase the availability of air traffic controllers and improve overall air traffic safety. Good quality of training procedures will create a good feed back to the training and enhance improvement of the training process.

Normally this is achieved by:

1. The conduct of appropriate Training Needs Analysis (TNA) to identify the gap between trainee skill/knowledge and the required skill/knowledge;
2. Development and delivery of appropriate training to maintainers;
3. Competency based testing of trainees; and
4. Ongoing refresher training to ensure that skills are maintained even when fault rates are low

The training shall consist of:

1. Theory;
2. Simulator; and
3. Examination

Quick reference shall be made available at all time, at every workstation for quick guidance and references to the ATCO. As the main objective of AIDC is to replace the voice coordination and to reduce the workload of an ATCO, therefore, all procedure shall retain as normal voice coordination and shall be operate by En-route rated ATCO without the needs to creating a licence specific for AIDC operation.

8.4 Factors to be considered when implementing AIDC

1. AFTN connection stability and speed

ATN systems (AFTN/AMHS Gateways and ATN Routers) are not required for AFTN based AIDC connectivity; that is, it is possible to make a simple connection without those systems. Complicating the AIDC connection by introducing unnecessary elements will have negative implications such as:

* The reliability and response time of the AFTN-based AIDC connection will be degraded due to communications having to pass through ATN systems unrelated to AIDC on the communication route.
* The response time of the AFTN-based AIDC connection will further be degraded because AMHS (AFTN/AMHS Gateway) uses a store-and-forward communication system, which is not amenable to the interactive nature of AIDC communications.
* Message handling will be made considerably more difficult, especially in case of trouble in the system or communication line, since the AFTN/AMHS Gateway will be handling messages of different natures.

1. Availability of Direct Speech Circuit (DSC)

DSC should be available at all time which will be functioning as a secondary coordination method in case of AIDC failure.

1. The capability to revert to verbal coordination, manual transfer of control and manual data link transfers (i.e. Address forwarding) should be retained. Frequent DSC connectivity check should be conducted regularly.
2. Well trained ATCO

* Only a well trained ATCO (on AIDC) are allowed to operate with AIDC to avoid misjudgement on the approval

1. Recording facilities

* Recording facilities shall be made available and the recording shall be kept at least for 31 days

1. Schedule maintenance and failure

* States should be aware that maintenance on AIDC and AFTN systems may have an operational effect on other states. Such effect may for example include loss of the AIDC function due to flooding of messages or out of sequence messages following an AIDC server reboot. Any maintenance affecting the AIDC and AFTN systems should therefore be prior coordinated with the counterparts states and backup procedures shall be in placed.

8.5 Procedures to Handle Non-compliant ATMS or Erroneous AIDC Transmissions

Each state should have a system that can detect an AIDC message which coming via AFTN.

For Non-compliant ATMS, there should be a mutual agreement between states to agree which message they would like to use. Each state has to make sure that their ATM systems are capable to recognize all AIDC message.

Due to technical issues, if certain delay and issues occur in future, the respective parties will be liable for damages and delay/non functionality of the same. If Erroneous of AIDC Transmissions happens, each state shall check either the problem from their side or others. Each state shall come out with evidence showing that their transmission line is serviceable. In the meantime, AIDC operatiom shall be stop until further advised.

For the intermittent AIDC transmissions, if the delay created an error message, the ATCO (either both) shall stop the AIDC operation until the AIDC transmission connectivity are back to normal. During the AIDC operational stoppage, any coordination shall be made by voice.

If any litigation arises in respect of the agreement (s) executed with a third party for the resolution of technical issues or for the expenses pertaining to the AIDC system, the respective parties shall bear the responsibility of the cost incurred.

8.6 Emergency Recovering Procedures

Each state is required to have an AIDC recovery procedure. The procedures shall restoring the system and line to operation in the event of a system/line outage, both expected and unexpected. Identify redundant/diverse systems/line for providing service in the event of an outage and describe the process for recovery from various types of failures, the training of technical staff who will perform these tasks, the availability and back-up of software and operating systems needed to restore the system to operation, the availability of the hardware needed to restore and run the system, back-up electrical power systems, the projected time for restoring the system, the procedures for testing the process of restoring the system to operation in the event of an outage, the documentation kept on system outages and on potential system problems that could result in outages. Redundant AFTN line is mandatory; to make sure the availability of AFTN line is 99.9%.

For AIDC recovering procedure, after AIDC back to normal (including AFTN), each state should

1. Counter check with other state either their system already back to normal or not;
2. Test message should be transmit to make sure both states establish. If yes, continue normal AIDC; and
3. Both states shall come out with full report as a precaution for both countries, if the same problem occurs again.

Planned outages will be subject to detailed planning and testing in a separate "staging" environment. In addition to, validating all steps to be performed during the outage, back-out plans are developed and tested. In this case, maybe we need to consider an AIDC communication using INTERIM or TEST BED environment.

Appendix A

AIDC Issue table



Appendix B

See Attachment 1

Appendix C

See Attachment 2