



**Seventh ATS Coordination Meeting of Bay of Bengal, Arabian Sea
and Indian Ocean Region (BOBASIO/7)
New Delhi, India, 18 – 19 September 2017**

AGENDA ITEM 6: ATM coordination (Airspace Restructuring, AIDC Implementation, AIS, ATM Contingency Plan- Level 1 and Level 2 and SAR Agreements)

**ATS INTER-FACILITY DATA COMMUNICATION (AIDC) IMPLEMENTATION IN
INDIA & WITH ADJACENT ATS UNITS IN THE SUB-REGION AND THE ISSUES
THEREOF**

(Presented by India)

SUMMARY

This paper summarizes the present status of AIDC implementation in India & with adjacent ATSUs in the sub Region. The paper also tries to highlight the major issues involved in the implementation of AIDC.

Strategic Objectives:

A: Safety

C: Environmental Protection and Sustainable Development of Air Transport

Global Plan Initiatives:

GPI-17 Data link applications

GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 ATS Inter-facility Data Communications (AIDC) is an effective tool to reduce manual intervention and ground-ground coordination errors between adjacent ATS Units.

1.2 India initiated AIDC operational trials after commissioning of automation systems at major ATS units in India. Trials within India have been successful. AIDC has been operationalized between some of the ATSUs and plans are underway to operationalize AIDC between other major ATSUs in a phased manner.

1.3 India has also initiated AIDC trials with adjacent ATS Units of neighboring states in the sub-region. Trials have been mostly successful. AIDC has been operationalized between some of the ATSUs.

2. DISCUSSION

2.1 India is currently using APAC AIDC ICD version 3 in all the automation systems currently installed at various ATS units.

Implementation within India

2.2 Extensive trials have been carried out between dissimilar automations systems at major ATS units and the results have been quite encouraging.

2.3 Successful trials have been carried out between various ATS units listed below and some of these ATS units are already exchanging live AIDC messages. AIDC operations between Chennai and Mumbai have been put in regular operations.

- Delhi – Ahmedabad, Varanasi, Nagpur
- Chennai – Mumbai, Kolkata, Trivandrum, Mangalore, Trichy, Hyderabad, Bengaluru
- Kolkata – Chennai, Nagpur, Varanasi, Guwahati
- Mumbai – Chennai, Ahmedabad, Nagpur

2.4 During trials, several interoperability and operational issues were encountered between dissimilar ATS Automation Systems which have been resolved to some extent. Some of the pending technical issues may require support from the vendors.

Implementation with Neighboring States

2.5 India is having boundaries with adjacent ATSUs of both intra and inter (MID/AFI) Region states and has plans to establish AIDC with Bangladesh, Myanmar, Thailand, Pakistan, Nepal, Seychelles, Malaysia, Indonesia, Sri Lanka, Kenya, Oman and Maldives, Mauritius and Somalia.

2.6 Successful trials have been carried out with adjacent ATSUs of neighboring states in the sub-region between:

- Chennai – Kuala Lumpur (Malaysia),
- Chennai – Male (Maldives)
- Ahmedabad – Karachi (Pakistan).
- Delhi – Karachi (Pakistan) (Successful one way)

2.7 Further AIDC trials are planned between Delhi – Lahore, Mumbai – Muscat, Kolkata – Dhaka and Varanasi – Kathmandu subject to readiness of adjacent ATSUs.

2.8 Teething issues were experienced during trials with Kuala Lumpur, Male and Karachi. Some of the issues are highlighted below in Table-1 for the benefits of all the states planning to carry out AIDC testing.

LOCATION OF AIDC SYSTEM ATSU 1	AIDC SYSTEM PAIR	TARGET DATE OF IMPLEMENTATION
Ahmedabad ACC	Karachi ACC/Pakistan	2Q2018
Chennai ACC	Colombo ACC/Sri Lanka	4Q2017
Chennai ACC	Jakarta ACC/Indonesia	2019 The partner yet to communicate their readiness
Chennai ACC	Kuala Lumpur ACC/Malaysia	With effect from 15-May-2017, AIDC has been implemented between Chennai and Kuala Lumpur with ABI and EST messages without voice confirmation. CDN is done with voice confirmation. TOC/AOC will be implemented later.
Chennai ACC	Male ACC/Maldives	In the final stages of testing.
Chennai ACC	Yangon ACC/Myanmar	4Q2018 The partner yet to communicate their readiness
Delhi ACC	Karachi ACC/Pakistan	4Q2018
Delhi ACC	Lahore ACC/Pakistan	4Q2018
Kolkata ACC	Dhaka ACC/Bangladesh	4Q2018
Kolkata ACC	Yangon ACC/Myanmar	-
Kolkata ACC	Kathmandu ACC/Nepal	Not operational yet due to limited ATC functionality at Kathmandu (AIDC functionality not available)
Mumbai ACC	Karachi ACC/Pakistan	2018
Mumbai ACC	Male ACC/Maldives	-
Mumbai ACC	Muscat ACC/Oman	
Mumbai ACC	Seychelles ACC/Mauritius	AIDC capability to be explored at Seychelles end.
Varanasi ACC	Kathmandu ACC/Nepal	Not operational yet due to limited ATC functionality at Kathmandu (AIDC functionality not available)

- 2.8.1 **Chennai – Kuala Lumpur:** AIDC messages ABI, EST, ACP, CDN, MIS, REJ, TOC, AOC, MAC were exchanged between Chennai Operational Segment and Kuala Lumpur simulator Segment.
- 2.8.1.1 Initially ABI messages sent from Chennai were rejected by Kuala Lumpur system citing CRC errors.
- 2.8.1.2 After detailed analysis at Chennai, it was observed that the rejection was due to incorrect calculation of checksum by the Kuala Lumpur system. Kuala Lumpur Automation system was replacing the alignment characters with space characters prior to CRC calculation leading to discrepancy in the CRC checksum. After sorting out the CRC errors by Kuala Lumpur, the AIDC messages exchange was successful.
- 2.8.1.3 With effect from 15-May-2017, AIDC has been implemented between Chennai and Kuala Lumpur with ABI and EST messages without voice confirmation. CDN is done with voice confirmation. TOC/AOC will be implemented later.
- 2.8.2 **Ahmedabad – Karachi:** Trial operations commenced from 05th June 2014. Initially it was observed that messages were rejected due to CRC errors, route errors and mismatch in the coordination timing. Coordination protocol dialogue time out was observed.
- 2.8.2.1 After synchronizing Karachi AMSS/AFTN system time with India's AMSS/ AFTN system time, the AIDC messages could be successfully exchanged between the two systems. Further AIDC trials for limited hours are in progress between Karachi and Ahmedabad.
- 2.8.3 **Delhi – Karachi/Lahore: Trials carried out in September 2014.** Trials were successful one-way and all messages from Delhi to Karachi/Lahore were received successfully at Karachi.
- 2.8.3.1 Messages from Karachi to Delhi like ABI were rejected by Delhi system, mostly showing error message no 61 cyclic redundancy check error (CRC).
- 2.8.3.2 While analyzing ABI messages, it was observed that Karachi and Lahore systems were generating extra spaces. Accordingly, adjustments are required at Karachi and Lahore end to avoid generation of unnecessary extra spaces so that messages may be received by Delhi system.
- 2.8.3.3 After migrating to the new ATM automation system and new AMSS system at Delhi, the technical issues may get resolved as it will be the same OEM for the ATM automation systems at both the places,.
- 2.8.4 **Chennai – Male:** AIDC messages ABI, EST, ACP, CDN, MIS, REJ, TOC, AOC, MAC were exchanged between Chennai and Male. Trials were conducted w.e.f 25th Nov 2014.
- 2.8.4.1 Trials were mostly successful barring some LRMs. For instance, at times reference ID in ODF 3 is not as per the ICD requirement. Similarly, Seconds field included in Lat/Long is received which is also not as per ICD.
- 2.8.4.2 Further trials are required and both the States have to sign LoA to move towards operationalizing AIDC.
- 2.9 The above results clearly indicate the success of AIDC trials both within India and with neighboring state ATSUs. Close bilateral cooperation is now required for expeditious implementation of AIDC.

2.10 In order to meet the intended objectives of early AIDC implementation, concerned states are required to review and sign the Bilateral Agreement/LoA/MoU in an expeditious manner.

2.11 It may also be noted that PAN Regional ICD for Asia/Pac version 1.0 has been promulgated in 2014 as an ICAO document. However, its implementation shall require synchronization of technology, refresh cycles and maintaining backward compatibility of the automation systems for smooth exchange of AIDC messages.

3. ACTIONS BY THE MEETING:

3.1 The meeting is invited to:

- a) note the contents of this paper and Annexure -1.
- b) urge all states to share their plan with adjacent state ATSUs for an expeditious AIDC implementation in a time bound manner.
- c) discuss any relevant matters as appropriate.

Annexure -1

Source: Report of the third meeting of ATS inter-facility data communication task force meeting (APA TF/3) 26 – 28 April 2017 [Original Paragraph numbers have been retained]

Chapter 5: AIDC IMPLEMENTATION CONSIDERATIONS

5.1 Introduction

5.1.1 The effectiveness of AIDC functionality depends on many factors, including ATM automation systems, manufacturer of the equipment, Communication network, weather-related factors, operational and technical 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.

5.1.2 Every effort should be made to avoid common errors through sharing of experiences of ATSUs, who have successfully implemented AIDC.

5.1.3 All States/Administrations have been requested to designate a focal point 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.

5.2 Pre-implementation Checklist

5.2.1 Prior to the implementation of AIDC, following may have to be considered by ATSUs. ATSUs can choose to adopt these recommendations with their counterparts based on the local requirements.

No.	Considerations	Yes / No	Remarks, if any
i.	AIDC Version	N/A	Version of AIDC ICD adopted by ATSU
ii.	The communications network (e.g. AFTN, etc.) is able to support AIDC operations effectively without overloading the existing infrastructure.		
iii.	List of AIDC messages applicable between the two ATSUs (ABI, EST, CPL, etc.) and parameters are agreed.		AIDC parameters to be included in the LOAs.
iv.	AIDC parameters of ATM automation systems have been configured for the AIDC connection (e.g. parameters for Coordination messages, Enable/Disable AIDC etc.).		
v.	ATM automation systems and associated sub-systems are time synchronized (GPS / UTC).		
vi.	Comprehensive tests with AIDC use cases completed with pairing ATSUs to ensure correct implementation and avoid unexpected responses.		
	Check and ensure that the Change Over Point (COP) is consistent between		

vii.	the two ATSU.		
viii.	Procedures to revert to Voice coordination have been defined by ATSU in cases where deviations from COP cannot be handled by ATM automation systems.		
ix.	Contingency procedures have been published to cover AIDC failures. This procedure shall also address any increase in additional workload as a result of AIDC failure.		
x.	Operational and technical personnel are trained to handle AIDC.		
xi.	Communication network performance latency is monitored and recorded.		
xii.	Standard Operating Procedures (SOPs) for AIDC operations are published. Special cases where AIDC is not applicable have been identified (e.g. VVIP movements).		
xiii.	A Safety Assessment for the implementation of AIDC is carried out.		

5.4 Handling Implementation Issues

5.4.1 Over a period of time during testing and implementation of AIDC across ICAO-APAC region, several error messages and issues were encountered by different concerned ATSU. Some of these issues are of common nature and some of them may be unique for a particular ATSU. Such messages compiled from various ATSU are provided in Table 5-1 below, with a brief description of the errors, possible causes and recommended actions. These AIDC issues are not exhaustive and listed as reference only.

Table 5-1: Table of Common AIDC Issues

No.	Fault Category	Fault Description	Cause	Recommended Actions
i.	ATM Automation system	Rejection of AIDC messages by receiving system due to Error message 61, Cyclic Redundancy Check (CRC) Error.	Error is likely because sending ATM automation system is generating extra undesirable spaces	This error can be overcome by making changes in sender ATM automation system so as not to generate any extra spaces while transmitting AIDC messages.
ii.	ATM Automation/AFTN system	Coordination protocol dialogue timeout	Likely non-synchronization of time in the pairing ATM automation/AFTN systems	Automatic time synchronization through GPS servers in ATM automation/AFTN systems at both receiving and sending system is required to be done for smooth exchange of AIDC messages.

iii.	Communication Network	a) Latency in communication network (AFTN link), resulting in message time-out errors b) Message timeout errors due to possible re-routing of messages in case of failure of direct AFTN link.	If due to network latency, no automatic system response is received by the sender system in a fixed time, then the sender system generates a LTO (time out response).	Expand the bandwidth of existing AFTN link or increase the message time-out parameter for all messages to avoid generation of time out response.
iv.	Airspace Design/ Procedures	ABI messages of some of the aircrafts are not correlated with Flight plan available in ATM automation system.	Rejection of ABI messages exchanged between system due to route error and mismatch in coordination timing. ATM automation system may reject the incoming ABI message because of unrecognised route portion (depends on how common airways are defined in the pairing 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)	Modification in airways (like imaginary points) may be considered in the database of both pairing ATSUs ATM systems for effective acceptance of AIDC messages.
v.	AIDC message format	AIDC messages in pre-2012 format		ATM system to be modified to support ICAO FPL 2012 format
vi.	AIDC message format	Some ATM automation systems rejected latitude/longitude represented up to seconds (041627N0733138E).	As per AIDC-ICD seconds is not part of the standard LAT/LONG format	ATM automation system may conform to AIDC ICD
vii.	AIDC message format /training	Incorrect route truncation. Truncated routes are not getting accepted by receiving ATSU.	ICAO route truncation indicator is not supported by many receiving ATSUs. 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	Manufacturer and States must ensure that ATM automation system must be designed/ changed as per APAC ICD mandated by ICAO. To avoid human errors, a comprehensive training backed up by regular

			significant risks associated with the transmission of incorrect route information to the receiving ATSU. While the majority of instances investigated are the result of human error, there have been occasions when the ATM automation system behaved unexpectedly. With the increasing use of route modifications, the accuracy of route handling and transmission between automated systems need to be ensured.	refresher training is required to be imparted to controllers/system operators.
viii.	AIDC message flow	Non-receipt of ACP messages within designated time span results in unnecessary LRM messages	In some of the ATM automation systems, there is no provision of automatic acceptance of EST messages and messages are accepted manually at receiving ATSU.	It is recommended that AIDC messages like EST are accepted automatically to avoid frequent LRM messages.
ix.	AIDC message flow	Even after sending a rejection (REJ) or counter coordination message (CDN) by receiving ATSU, the transmitting ATSU continues to send the CDN message	Unnecessary/ multiple generation of automatic CDN messages by transmitting ATSU, without waiting for an acknowledgement, might be due to system getting into some loop or may be due to some other system problem	As per PAN-ICD protocol, transmitting system must wait to receive response for a CDN message. This response may be ACP, REJ or CDN. The temporary solution may be to stop automatic generation of CDN messages by the system.

5.5 HMI Considerations

ATSUs should consider the following recommendations for configuration of the ATM automation systems for AIDC HMI presentation:

- i. AIDC HMI should allow some flexibility to initiate or respond to AIDC messages (if required).

- ii. The ATM automation system should allow to define the mode of Message exchange off-line for AIDC i.e. fully automatic or manual. For example automatic/manual responses for the messages like EST, CPL, PAC, CDN, etc.
- iii. Dedicated AIDC message exchange window to display readily the current status and actual content of messages exchanged should be considered. In addition, AIDC message exchange status may preferably be considered to be displayed via the data block of individual aircraft on the Air Situation Display.
- iv. ATM automation system should allow the creation of flight data record on receipt of an ABI message, if a flight data record is not available to minimize the possibility of LRM messages in case flight plan is not available in the receiving ATSU.
- v. The use of colour to distinguish the various states of AIDC process may be considered.
