International Civil Aviation Organization

Twenty Eighth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/28) of APANPIRG

Bangkok, Thailand, 01 July - 05 July 2024

Agenda Item 5: Aeronautical Mobile Communications Service and Aeronautical electromagnetic spectrum utilization

5.3 Update on status of datalink applications and VHF capability sharing by States

STATUS OF LDACS DEVELOPMENT IN CHINA

(Presented by China)

SUMMARY

This paper focuses on introducing the status of L-band digital aeronautical communication system (LDACS) development in China. The LDACS standardization progress in ICAO is first described, followed by the introduction of the LDACS development activities in China, which includes policy support, the LDACS prototype development, compatibility test, LDACS mobility management and multi-link, flight trial planning, etc.

1. INTRODUCTION

1.1 LDACS is an important data link technology defined in the future communication infrastructure (FCI) for aviation. It is an important component of ICAO GANP and ASBU. Civil Aviation Administration of China (CAAC) pays high attention to the progress of LDACS-related developments. In China, the development of LDACS kicked off several years ago. CAAC released policies to support the development of LDACS and to include it in the future aviation communication infrastructure.

1.2 This paper first describes the current status of LDACS standardization in ICAO, followed by the LDACS development in China, including policy support, the LDACS prototype development, compatibility test, LDACS mobility management and multi-link, flight trial planning, etc.

2. DISCUSSION

Status of LDACs Standardization in ICAO

2.1 The Communications Panel (CP) is developing the LDACS SARPs. The Project Team "Terrestrial Data Link" (PT-T) of CP DCIWG works on LDACS standardization since the first PT-T Meeting in December 2016. LDACS SARPs and guidance is being developed. Coordination with navigation system panel (NSP) and surveillance panel (SP) is conducted.

2.2 At the DCIWG/6 in October 2022, PT-T prepared the complete set of documents required for LDACS Proposal for Amendment (PfA) endorsement. The LDACS PfA is foreseen to become effective at the beginning of 2027.

LDACS Development in China

Policy Support

2.3 CAAC released policies to support the development of LDACS in China. The roadmap of LDACS research, development and deployment was developed. Related policies can be found in IP/11 from CNS SG/27. Supported by these policies, research and equipment development related to LDACS were carried out.

LDACS Prototype Development

2.4 The development of LDACS airborne equipment has now completed the hardware design and the development of the RF front-end, baseband signal processing, protocol stack processing and duplexer. The design of the amplifier and ARINC 600 structure is now completed. The development of the related hardware expected to be completed by the end of June 2024. Compared with the previous SDR-based prototype equipment, the newly-developed LDACS prototype presents better performance improvement in terms of receiver sensitivity, anti-interference performance, spurious emission and spectrum emission template. It is planned to carry out the validation in accordance with the requirements of SARPs.

2.5 The development of the protocol stack software will be completed in accordance with the latest LDACS technical manual. It is expected that interoperability validation will be carried out with other LDACS prototype devices to ensure consistency.

LDACS Compatibility Test

2.6 LDACS is planned to be deployed in the L-band with the forward link assigned between 1110 to 1146 MHz and the reverse link between 964 to 1000 MHz, which is close to or co-channelling with the existing aviation CNS systems, including GNSS L5/E5a/B2a signals, DME and surveillance system.

2.7 For LDACS compatibility with DME and GNSS L5/E5a/B2a, the test platforms have been built and the tests are currently undergoing. For the compatibility between LDACS and surveillance systems, theoretical analysis is conducted and corresponding laboratory tests are carried out. Parts of the test results are summarized and presented in PT-T meetings.

ATN/IPS and LDACS Mobility Management

2.8 The experimental set-up for the ATN/IPS network has been established in CNS/ATM Lab of CAAC, as shown in Figure 1

2.9 The performance of PMIPv6-based intra-domain handover was evaluated. The results reveal that LDACS link switching took an average of 112 ms and network intra-domain switching took an average of 655 ms. The intra-domain handover packet loss rate is below 0.8%. Further reduction is still required.

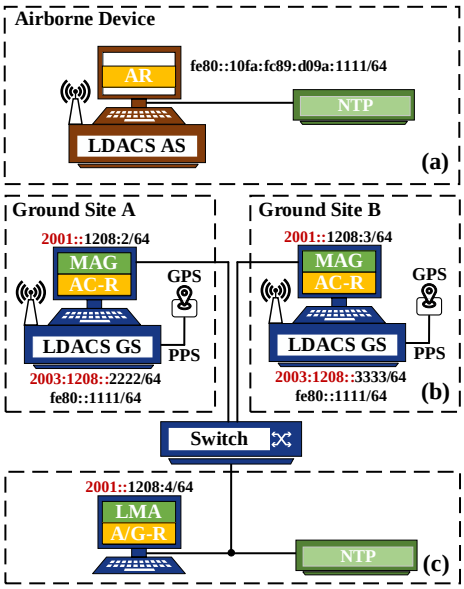

Figure 1 Configuration of the LDACS Mobility Management test environment.

2.10 The research on data link selection and bandwidth allocation within the ATN/IPS is undergoing, which is based on the framework of the future communication infrastructure. In specific, the development of a centralized link selection scheme is currently in progress, with the objectives of ensuring stable transmission of airborne traffic and reducing the frequency of link handovers for aircrafts.

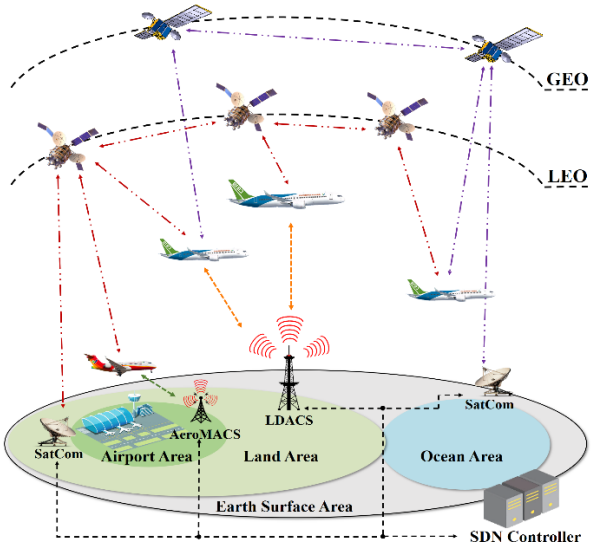

Figure 2 Multilink scenario in the ATN/IPS

2.11 In terms of the network security, initial programming and testing trials are ongoing, including both key exchange, encryption and decryption, etc.

LDACS Flight Trial

2.12 LDACS flight trial is planning in 2024 to validate the functionality and performance of LDACS communication, navigation, mobility management, etc. The ground station locations are preliminarily confirmed. The current focus is to select the proper frequencies used for each ground station.

3. ACTION BY THE MEETING

3.1 The meeting is invited to

a) note the information contained in this paper;

b) discuss any relevant matters as appropriate.

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