57th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS

Incheon, Republic of Korea
4 – 8 July 2022

AGENDA ITEM 4: AIR NAVIGATION

THE ROADMAP FOR THE PLANNING AND IMPLEMENTATION OF DATA-LINK AIR TRAFFIC CONTROL SERVICES FOR ALL FLIGHT PHASES TO BE PUBLISHED BY CHINA CIVIL AVIATION

Presented by the People's Republic of China

INFORMATION PAPER

SUMMARY

The Roadmap for the Planning and Implementation of China's Civil Aviation Data-link Air Traffic Control (ATC) Services for All Flight Phases is scheduled to be officially published in 2022. On the basis of ICAO ASBU's development planning for technical leads of COMI and COMS, this roadmap will gradually provide services on all flight phases Data-link Air Traffic Control instructions, information and emergency communication by referring to the published EU regulations and the FAA published Air/Ground Data Comm Services Roadmap and their application experience, combining the development needs of Data-link Air Traffic Control Services of China civil aviation and taking into account the current situations on and future development plans for avionic systems, air-ground data-link communication network and ATC information systems ,thereby promoting the development and building of ATM which is characterized by safety, efficiency, intelligence and collaboration and the "smart civil aviation".

THE ROADMAP FOR THE PLANNING AND IMPLEMENTATION OF DATA-LINK AIR TRAFFIC CONTROL SERVICES FOR ALL FLIGHT PHASES TO BE PUBLISHED BY CHINA CIVIL AVIATION

1. INTRODUCTION

1.1 CAAC has started research on and application of Data-link Air Traffic Control (ATC) Services since 2000. Currently, it provides services of CPDLC and ADS-C which are based on FANS 1/A on air routes such as L888, DCL and D-ATIS services at more than 50 major airports in China and D-VOLMET services in the whole airspace. The wide application of the above services in China civil aviation has effectively reduced the probability of misunderstandings, errors and control frequency congestion concerning voice control services and decreased the working hours used for repeated announcements by controllers and retelling and transcribing by pilots, thus improving the availability, flexibility and emergency response of ATC services.

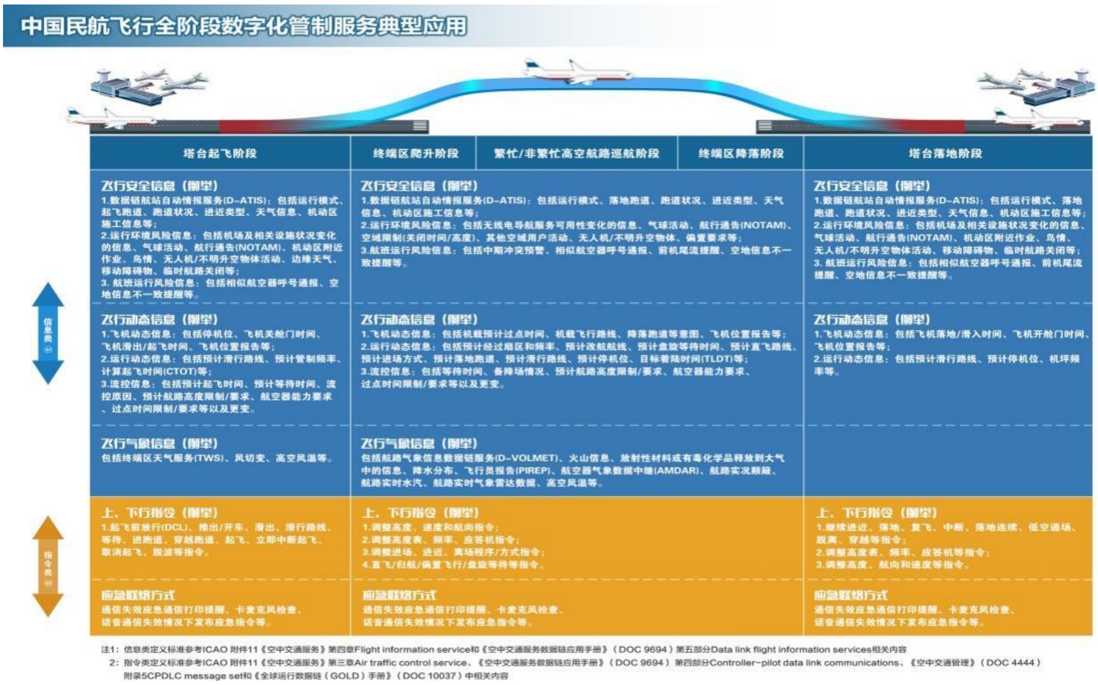
1.2 China civil aviation successfully carried out the first i4D flight test in the Asia & Pacific region in 2019, and successfully launched the pilot work of digital emergency communication and information service based on ACARS ATS protocol in Zhengzhou Control Zone in 2021, which both achieved fruitful results.

1.3 With respect to the application capacity of data-link ATS application avionics systems of passenger aircraft with over 99 seats in China civil aviation, 99% supports the ACARS ATS protocol and 25% the FANS 1/A protocol. Regarding the communication capacity of the Air/Ground data-link avionics systems of the above-mentioned passenger aircraft, 100% supports ACARS and over 50% the VDL mode 2.

1.4 Concerning the network of Air/Ground data-link of China civil aviation, 222 ground stations have been built by the end of 2021, of which 146 possess the function of VDL mode 2. At present, the ACARS network covers the main airports and air routes across China and the VDL mode 2 network covers the main airports and the main air routes in central and eastern China.

2. DISCUSSION

2.1 Data-link Air Traffic Control Services for All Flight Phases can be divided into Data-link Flight Information Services and ATC instruction Services. Data-link Flight Information Services include flight safety information (such as D-ATIS, NOTAM, etc.), flight dynamic information (such as CTOT, TLDT, etc.), flight meteorological information (such as D-VOLMET, TWS, etc.). And ATC Instruction Services contain Controller-Pilot Data-link Communication (CPDLC) and emergency communication (such as Microphone Check). In regard to application scenarios, we focus on phased development plans for five application areas: data-link substitution of ATC instruction, intelligent dissemination of ATC information, autonomous aircraft trajectory prediction and control interaction, automatic weather data collection and warning along air routes, and performance-based communication and surveillance evaluation.



中国民航飞行全阶段数字化管制服务典型应用

	塔台起飞阶段	终端区爬升阶段	繁忙/非繁忙高空航路巡航阶段	终端区降落阶段	塔台落地阶段
信息类㊟	**飞行安全信息（例举）** 1.数据链航站自动情报服务(D-ATIS)：包括运行模式、起飞跑道、跑道状况、进近类型、天气信息、机动区施工信息等； 2.运行环境风险信息：包括机场及相关设施状况变化的信息、气球活动、航行通告(NOTAM)、机动区附近作业、鸟情、无人机/不明升空物体活动、边缘天气、移动障碍物、临时航路关闭等； 3. 航班运行风险信息：包括相似航空器呼号通报、空地信息不一致提醒等。	**飞行安全信息（例举）** 1.数据链航站自动情报服务(D-ATIS)：包括运行模式、落地跑道、跑道状况、进近类型、天气信息、机动区施工信息等； 2.运行环境风险信息：包括无线电导航服务可用性变化的信息、气球活动、航行通告(NOTAM)、空域限制(关闭时间/高度)、其他空域用户活动、无人机/不明升空物体、偏置要求等； 3.航班运行风险信息：包括中期冲突预警、相似航空器呼号通报、前机尾流提醒、空地信息不一致提醒等。			**飞行安全信息（例举）** 1.数据链航站自动情报服务(D-ATIS)：包括运行模式、落地跑道、跑道状况、进近类型、天气信息、机动区施工信息等； 2.运行环境风险信息：包括机场及相关设施状况变化的信息、气球活动、航行通告(NOTAM)、机动区附近作业、鸟情、无人机/不明升空物体活动、移动障碍物、临时航路关闭等； 3. 航班运行风险信息：包括相似航空器呼号通报、前机尾流提醒、空地信息不一致提醒等。
	飞行动态信息（例举） 1.飞机动态信息：包括停机位、飞机关舱门时间、飞机滑出/起飞时间、飞机位置报告等； 2.运行动态信息：包括预计滑行路线、预计管制频率、计算起飞时间(CTOT)等； 3.流控信息：包括预计起飞时间、预计等待时间、流控原因、预计航路高度限制/要求、航空器能力要求、过点时间限制/要求等以及更变。	**飞行动态信息（例举）** 1.飞机动态信息：包括机载预计过点时间、机载飞行路线、降落跑道等意图、飞机位置报告等； 2.运行动态信息：包括预计经过扇区和频率、预计改航航线、预计盘旋等待时间、预计直飞路线、预计进场方式、预计落地跑道、预计滑行路线、预计停机位、目标着陆时间(TLDT)等； 3.流控信息：包括等待时间、备降场情况、预计航路高度限制/要求、航空器能力要求、过点时间限制/要求等以及更变。			**飞行动态信息（例举）** 1.飞机动态信息：包括飞机落地/滑入时间、飞机开舱门时间、飞机位置报告等； 2.运行动态信息：包括预计滑行路线、预计停机位、机坪频率等。
	飞行气象信息（例举） 包括终端区天气服务(TWS)、风切变、高空风温等。	**飞行气象信息（例举）** 包括航路气象信息数据链服务(D-VOLMET)、火山信息、放射性材料或有毒化学品释放到大气中的信息、降水分布、飞行员报告(PIREP)、航空器气象数据中继(AMDAR)、航路实况颠簸、航路实时水汽、航路实时气象雷达数据、高空风温等。			
指令类㊟	**上、下行指令（例举）** 1.起飞前放行(DCL)、推出/开车、滑出、滑行路线、等待、进跑道、穿越跑道、起飞、立即中断起飞、取消起飞、脱波等指令。	**上、下行指令（例举）** 1.调整高度、速度和航向指令； 2.调整高度表、频率、应答机指令； 3.调整进场、进近、离场程序/方式指令； 4.直飞/归航/偏置飞行/盘旋等待等指令。			**上、下行指令（例举）** 1.继续进近、落地、复飞、中断、落地连续、低空通场、脱离、穿越等指令； 2.调整高度表、频率、应答机等指令； 3.调整高度、航向和速度等指令。
	应急联络方式 通信失效应急通信打印提醒、卡麦克风检查、话音通信失效情况下发布应急指令等。	**应急联络方式** 通信失效应急通信打印提醒、卡麦克风检查、话音通信失效情况下发布应急指令等。			**应急联络方式** 通信失效应急通信打印提醒、卡麦克风检查、话音通信失效情况下发布应急指令等。

注1：信息类定义标准参考ICAO 附件11《空中交通服务》第四章Flight information service和《空中交通服务数据链应用手册》（DOC 9694）第五部分Data link flight information services相关内容
2：指令类定义标准参考ICAO 附件11《空中交通服务》第三章Air traffic control service、《空中交通服务数据链应用手册》（DOC 9694）第四部分Controller-pilot data link communications、《空中交通管理》（DOC 4444）附录5CPDLC message set和《全球运行数据链（GOLD）手册》（DOC 10037）中相关内容

2.2 The roadmap is divided into three phases of planning and implementation:

2.2.1 The short-term goal (from 2021 to 2025): fully tap the capacity of existing systems of China’s civil aviation, provide Data-link emergency communication and information services in major airspace and offer Data-link ATC instruction services in selected airspace as a complementary means of traditional voice ATC services.

2.2.2 The medium-term goal (from 2026 to 2030): upgrade avionic systems, Air/Ground data-link communication network and ATC information systems of China’s civil aviation, and integrate data-link with traditional voice ATC services in more airspace, taking into account operational requirements.

2.2.3 The long-term goal (after 2030): promote the mixed use of data-link ATC services which will play a leading role and traditional voice control services in an overall way on the basis of the capability of the new generation of Air/Ground data-link communication network and avionics systems, and achieve the application of All Flight Phases data-link ATC services covering the space, the sky and the ground and supporting application of TBO.

2.3 The roadmap contains phased plans for several areas such as the application of data-link ATC services, avionics systems, data-link communication service provider, ATC information systems and supporting operating specifications as so to facilitate implementation, and puts forward the corresponding access conditions.

In the near term, we will make full use of the capacity of existing avionics systems of China’s civil aviation, improve the coverage of the Air/Ground data-link communication network, establish the ATC information system, promote data-link emergency communication and information services on the basis of ACARS ATS protocol and pilot ATC instruction services based on FANS 1/A protocol. In the medium and long term, we will focus on transition of the Air/Ground data-link network from ACARS to ATN/IPS, with VDL mode 2 and secure satellite communication as the main development direction; and the data-link ATS application protocol will take ATS B2 as the ultimate development goal and support development of TBO technology in an all-round way.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper.

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