



WORKING PAPER

ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

AVIATION SAFETY AND AIR NAVIGATION KEY INITIATIVES AND ACTIVITIES

(Presented by the Council of ICAO)

EXECUTIVE SUMMARY

This working paper presents an overview of the key initiatives and activities in the areas of aviation safety and air navigation over the next triennium 2026-2028, in line with the ICAO Strategic Plan 2026-2050 and Business Plan 2026-2028. It also identifies the safety trend and highlights the ongoing and future work to address associated risks.

Action: The Assembly is invited to:

- a) note the key initiatives and activities of ICAO in the areas of aviation safety and air navigation over the next triennium 2026-2028, in line with the ICAO Strategic Plan 2026-2050;
- b) urge States, together with international organizations, and assisted by the industry where appropriate, to provide support and voluntary contributions (financial or in-kind) to the accomplishment of the key initiatives and activities; and
- c) urge States to consider ICAO's initiatives and activities when planning and executing their own initiatives and activities to further enhance aviation safety and air navigation efficiency.

<i>Strategic Goals:</i>	This working paper relates to the Strategic Goals <i>Every Flight is Safe and Secure</i> ; and <i>Aviation Delivers Seamless, Accessible, and Reliable Mobility for All</i> .
<i>Financial implications:</i>	The activities referred to in this paper will be undertaken subject to the resources available in the 2026-2027-2028 Regular Budget and from extra budgetary contributions.
<i>References:</i>	ICAO Strategic Plan 2026-2050 ICAO Business Plan 2026-2028 Doc 10184, <i>Assembly Resolutions in Force (as of 7 October 2022)</i> Doc 10186, <i>Report of the Technical Commission of the 41st Session of the Assembly</i> Doc 10209, <i>Fourteenth Air Navigation Conference (Montréal, 26 August to 6 September 2024) Report</i> Doc 10004, <i>Global Aviation Safety Plan (GASP)</i> Doc 9750, <i>Global Air Navigation Plan (GANP)</i>

1. INTRODUCTION

1.1 International civil aviation is a key driver of social and economic development worldwide. Despite the significant impact of the Covid-19 pandemic, the aviation sector has recovered quickly. The global air passenger traffic reached over 4.5 billion in 2024 and according to the forecast, will be reaching 12.4 billion by 2050.

1.2 The rapid growth in air traffic will present new challenges and opportunities for aviation. To lead the long-term development of international civil aviation and tackle the existing and emerging challenges, ICAO has developed the Strategic Plan 2026-2050 available at: <https://www.icao.int/about-icao/Council/Pages/strategic-plan-2026-2050.aspx>, which sets out six strategic goals to support the vision and mission of the Organization. The ICAO work programmes in the areas of aviation safety and air navigation contribute to all the strategic goals, and especially to: *Every Flight is Safe and Secure*, *Aviation Delivers Seamless, Accessible, and Reliable Mobility for All*, and *Aviation is environmentally Sustainable*. In line with the Strategic Plan 2026-2050, the safety aspirational goal of ICAO is to achieve zero fatalities in international aviation from accidents and acts of unlawful interference.

1.3 ICAO convened the Fourteenth Air Navigation Conference (AN-Conf/14) from 26 August to 6 September 2024, with the theme of “*Performance improvement driving sustainability*”. Twenty-two recommendations from AN-Conf14 have further informed the work programme of the Organization for the next triennium and beyond. Further details on the outcomes of AN-Conf/14 are provided in A42-WP/30-TE/4.

1.4 ICAO, regional organizations, States and industry need to work together to carry out the key initiatives and activities to further enhance aviation safety and air navigation efficiency. A global commitment is needed to accomplish the key initiatives and activities in a timely manner.

1.5 The key initiatives and activities cover many of the work items in the ICAO Business Plan 2026-2028. They support the implementation of the Global Aviation Safety Plan (GASP) and the Global Air Navigation Plan (GANP). Initiatives and activities related to the universal safety oversight audit programme (USOAP) and to regional cooperation and implementation support are discussed in A42-WP/4-EX/1 and A42-WP/32-TE/6, respectively.

2. SAFETY TRENDS AND MANAGING OPERATIONAL SAFETY RISKS

2.1 Aviation continues to be the safest mode of transportation. In terms of safety trends, despite yearly variations, the global accident rate has been decreasing in general over the past decade. However, there is no room for complacency. As per the ICAO 2025 Edition Safety Report - State of Global Aviation Safety, compared to 2023, there was an increase in 2024 in the accident rate, number of fatal accidents and fatalities for scheduled commercial operations of aircraft with a certified maximum take-off mass (MTOM) over 5 700 kg. In 2024, the global accident rate was 2.56 accidents per million flight departures, representing a 36.8 per cent increase over 2023; and 10 fatal accidents occurred resulting in 296 fatalities, while there was one fatal accident and 72 fatalities in 2023. Nevertheless, if compared with the pre-pandemic year of 2019, the global accident rate in 2024 was lower than that in 2019 (2.94 accidents per million flight departures) noting that the total number of passengers transported in 2024 surpassed the 2019 level and the number of flight departures recovered close to that of 2019.

2.2 Fatal accidents that occurred in recent years mainly involved the following occurrence categories (listed in no particular order): loss of control in-flight (LOC-I), controlled flight into terrain (CFIT), runway excursion (RE), runway incursion (RI), mid-air collision (MAC), abnormal runway contact (ARC) and bird strike (BIRD).

2.3 Runway safety continues to be a challenge in aviation safety. RI and RE are identified as two of the five global high-risk categories of occurrences (G-HRCs) within the ICAO GASP framework. ICAO has established the Runway Safety Programme Partnership, where the activities and deliverables of its partners complement the policy framework set by ICAO. The second edition of the Global Runway Safety Action Plan <https://www.icao.int/Aerodromes/RunwaySafety/Pages/default.aspx>, published in 2024 outlines recommended actions for all runway safety stakeholders. ICAO will continue to work with the runway safety partners on further initiatives in enhancing runway safety.

2.4 ICAO continues to work on other G-HRCs through a wide array of activities, such as: a) provisions to ensure the performance of surveillance and collision avoidance systems, considering operational experience and emerging technologies, such as the new airborne collision avoidance system to mitigate MAC; b) addressing automation dependency as part of personnel training and licensing through management of automation systems, manual flying and pilot monitoring, to reduce LOC-I events; and c) provisions related to digital data sets to improve safety through automated processes for digital data validation and verification on terrain, obstacle and aerodrome mapping data sets to mitigate CFIT.

2.5 Turbulence encounter is being recognized as an additional operational safety risk. Work is ongoing on the introduction of improved turbulence forecast produced under the World Area Forecast System and the development of hazardous weather information service, which covers, among others, enhanced forecasts for clear air turbulence. By having timely information on turbulent conditions, pilots could alter flight paths or adjust altitude to avoid dangerous turbulence. Further work is also envisaged regarding the crew actions to secure the aircraft in the event of a turbulence encounter.

2.6 The overall observed safety trend also demonstrates that the safety risk assessment related to conflict zones needs improvement, considering the shifting boundaries of activities which are hazardous to civil aviation. Additionally, the increasing trend of Global Navigation Satellite System (GNSS) radio frequency interference (RFI) incidents resulting from conflict zones poses a direct and growing threat to the safety and security of civil aviation. Further discussion on GNSS RFI, including actions and mitigation measures, is provided in A42-WP/34-TE/8.

2.7 Activities are ongoing to improve comprehensive safety data collection, processing and analysis, as well as the sharing and exchange of safety information and safety intelligence to support data-driven decision making -and effective safety management at all levels. ICAO will continue to take appropriate action to address safety recommendations derived from accident investigations.

2.8 Regarding accident investigation and accident data, research has shown that only 41 per cent of fatal accidents involving civil aircraft of a maximum mass over 5 700 kg between 1990 and 2016 had resulted in a publicly available final report. Through ongoing initiatives by the aviation community and ICAO, the publication rate of final reports has improved to 76 per cent from investigations completed by 2022. The final report of an aircraft accident investigation is the foundation for initiating safety actions to prevent further accidents from similar causes. The timeliness of the publication of final reports ensures the effective dissemination of safety information, including safety recommendations and lessons learned arising from the accident investigations. The lack of completed final reports and the difficulties in the establishment of independent aircraft accident investigation authorities, who must be objective and impartial with the conduct or objectivity of an investigation, have been recognized as a Global Challenge. In this regard, ICAO will continue its efforts to address related issues, including further enhancing the timely publication of final reports and preliminary reports for accidents that attract significant public attention.

2.9 In addition, extensive work is being carried out in other operational areas related to:

- a) mitigation of risks posed by thermal runaway of lithium batteries transported as cargo or carried by passengers on aircraft;
- b) developing new risk assessment models and tools relating to aerospace medicine, including mental health, mitigating medical risk in older pilots to increase the upper age limit of commercial pilots engaged in international operations or alternatively migrate to a performance-based standard, the management of public health emergencies through the Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation (CAPSCA) and other priority items by incorporating recent advances in medical science and technology;
- c) addressing critical issues related to digital identity and information security; and

- d) addressing human factors influences on the safety and effectiveness of the complex aviation system and on the performance of humans in the system.

3. **FURTHER STRENGTHENING GLOBAL AVIATION INFRASTRUCTURE AND IMPROVING AIR NAVIGATION PERFORMANCE**

3.1 With regards to aircraft operations, a wide spectrum of activities is ongoing to improve the overall safety of the system. New requirements for retrieval of accident data will allow for a faster and more comprehensive analysis of accidents, ensuring that lessons continue to be learned and applied. Additional aircraft equipage will help to improve both access to aerodromes in all-weather operations, and to assist the crew with the identification, avoidance and mitigation of risks such as RE and CFIT. Where applicable, these requirements are being extended to commercial helicopter operations to ensure an equivalent level of safety to aeroplane operations. The increasing use of digital certificates creates an opportunity to improve the security and assurance of this information, and extensive work is ongoing on how to manage this process in a globally harmonized way. Finally, extensive work is ongoing to develop ICAO provisions for the safe integration of remotely piloted aircraft systems (RPAS) into the aviation system, as well as guidance material for unmanned aircraft systems (UAS) and UAS traffic management (UTM) systems.

3.2 The focus of ICAO in the air traffic management (ATM) domain will continue to be guided by the vision and principles outlined in the *Global Air Traffic Management Operational Concept* (Doc 9854). This foundational document is being updated to align its vision with the ICAO Strategic Plan 2026-2050 and to define the future operational concept that will shape the evolution of ATM through 2050 and beyond. Key focus areas include: a) the ongoing development of air traffic flow management; b) enhanced airspace management and optimization, with an emphasis on optimizing separation across flight information region boundaries, strengthening civil-military cooperation, and advancing both the flexible use of airspace and implementation of free route airspace; c) the enhancement of air traffic services (ATS) through transitioning to flight and flow information for a collaborative environment (FF-ICE) services, expanding air-ground and ground-ground ATS data link services, and advancing the connected aircraft concept. These efforts in the ATM domain will support the realization of trajectory-based operations. The growth of air traffic, combined with new airspace users, will require search and rescue (SAR) services to consider the potential for accident sites in locations which may differ from current projections. ICAO will continue to promote cooperation and develop guidance for the optimization of SAR services.

3.3 Information, connectivity and service delivery are key to the future of the air navigation system. ICAO focuses on harmonizing system-wide information management (SWIM) and securing the exchange of information by providing the necessary confidentiality, integrity and availability. To ensure that interconnected systems remain safe and resilient to cyber threats, trust in information authenticity will be addressed while ensuring interoperability across communications and information management systems. ICAO also focuses on digitalizing aeronautical information and shifting the provision of information to a service-oriented architecture.

3.4 In the field of aerodromes, ICAO will focus on developing provisions to enhance safety at and in the vicinity of aerodromes, including runway safety and wildlife strike hazard management. Aerodromes face challenges in adapting and effectively expanding existing infrastructure due to the rapid growth of air transport, compounded by the introduction of new entrants and technologies. ICAO continues to advance airport collaborative decision-making through total airport management to improve the efficiency of passengers and aircraft movement. Ongoing work supports operations of new entrants, including integration of RPAS at aerodromes and providing vertiport infrastructure for advanced air mobility (AAM). In the next triennium, work will commence to assess and facilitate the progressive safe

entry into operations of aircraft powered by alternative energy sources, such as electricity and hydrogen, at aerodromes to help achieve the ICAO Long-term Aspirational Goal (LTAG).

3.5 ICAO is promoting further enhancement of aeronautical meteorological service to realize integration of meteorological information in users' operational decision-makings. Current focus is given to promoting the transition of the delivery of meteorological information to the SWIM-enabled information service, and the introduction of globally harmonized meteorological information service on en-route hazardous weather conditions (i.e., turbulence, convective clouds, aircraft icing, etc). Implementation of space weather information service will also be strengthened in view of the current solar cycle entering a solar maximum period. Future seamless provision of a comprehensive set of high-quality, high-resolution meteorological information from aerodrome surface to higher altitude, will support the optimization of pre-flight/in-flight planning and contribute to the reduction of carbon fuel consumption and thereby the achievement of the LTAG.

3.6 Regarding CNS systems, RFI can pose a significant threat to the operation of aircraft globally, as evidenced by the recent escalation of GNSS jamming and spoofing incidents. The International Telecommunication Union (ITU) Radio Regulations, updated through the World Radiocommunication Conference (WRC) every four years, govern frequency management. For the upcoming WRC in 2027, studies under Agenda Item 1.7 address a potential identification or reallocation of the frequency band immediately above the radio altimeter (RA) band (4200-4400 MHz) to international mobile telecommunications. Without sufficient mitigation measures, this could result in a serious degradation of the function of the RA. The RA, as the only means to provide a direct measurement of the actual height above ground, is a highly safety critical system. However, aviation experts are currently underrepresented in the preparatory studies, risking a lack of awareness among national radio regulators regarding the associated safety implications. In this context, reference is made to Assembly Resolution A41-7: Support of the ICAO policy on radio frequency spectrum matters. Further details are provided in A42-WP/33-TE/7.

3.7 In the longer term, timely evolution of CNS systems is necessary to keep up with the increased pressures on the spectrum resource. ICAO will focus its work on leveraging the state-of-the-art radio-systems technology and spectrum engineering, evolving towards a more integrated CNS technologies in a performance-based and service-oriented manner.

4. SAFE INTEGRATION OF NEW ENTRANTS AND TECHNOLOGIES

4.1 It is crucial to maintain or exceed the current high levels of safety and overall efficiency of aviation, while working towards successful integration of new aircraft types and aerospace vehicles into the existing airspace management system. This integration demands innovative airspace strategies to ensure that diverse operations with different needs can be safely incorporated with the present and future demands of other operations in controlled airspace. While many issues related to higher airspace operations require further consideration, certain needs must be addressed in the near term as determined by the AN-Conf/14.

4.2 The 41st Session of the ICAO Assembly recognized that the rapidly evolving AAM ecosystem calls for ICAO's leadership to ensure a globally harmonized regulatory framework for safe operations. Accordingly, the Organization, together with relevant stakeholders, is developing a holistic vision of AAM, to support a gap analysis of existing ICAO provisions, and present recommendations for future work taking into consideration multi-level governance, inter-modality and social acceptance dimensions.

4.3 The development of electric and hybrid aircraft, as well as aircraft powered by other energy sources, such as hydrogen, is evolving rapidly. Currently, several types of electric and hybrid-powered aircraft are undergoing type certification processes. To address aviation safety risks and to facilitate the growth of this industry, a coordinated certification methodology among States is essential for the cross-

border exchange and international operations of such aircraft. In the meantime, aerodrome and aircraft compatibility issues will need to be identified and managed appropriately.

4.4 ICAO will review the safety risk management provisions to support safety practitioners in the appropriate application of available methodologies and tools. It will also explore additional methods of identifying hazards and managing safety risk, suitable for complex socio-technical systems such as aviation.

5. ENHANCING OVERALL AVIATION RESILIENCY AND CRISIS PREPAREDNESS AND RESPONSE

5.1 States, air navigation services providers, operators and other stakeholders may face a range of potential crises that can disrupt the aviation system. These crises may involve disruptions, or potential disruptions, of aerodromes operations, air traffic management and related support services, public health -related events such as disease outbreaks and humanitarian-related crises such as natural disasters. A comprehensive framework is being developed that outlines the principles, policies and guidelines for effective crisis preparedness and response within ICAO to support States in implementing relevant contingency and emergency plans. Work will also be undertaken on integrated risk management, considering safety, security, facilitation, environment and economics, to enhance the resilience of the aviation system.

5.2 Proposals are being developed to support safety risk management of aircraft operations related to significant volcanic eruptions and areas of volcanic ash in the atmosphere by integrating quantitative volcanic ash concentration information produced under the international airway volcanic watch (IAVW).

5.3 Building increased trust and confidence among aircraft accident victims and their families in both individual investigations and the overall investigation process is essential. To this end, ICAO guidance is being developed to provide timely, regular and relevant updates on the progress of investigations. Additionally, the inclusion of support for aircraft accident victims and their families in emergency plans remains an ongoing activity.

6. CONCLUSION

6.1 Aviation safety and air navigation efficiency play a fundamental role in sustaining the rapid growth of international civil aviation. In line with the ICAO Strategic Plan 2026-2050 and Business Plan 2026-2028, ICAO will continue its efforts in pursuing the key initiatives and activities in the areas of aviation safety and air navigation over the next triennium. The accomplishment of all these key initiatives and activities requires more resources than ICAO currently has, as they cover new projects arising from recommendations of recent events such as AN-Conf/14. In the past decade, there has been a constant decrease in the resources of ICAO for aviation safety and air navigation, including the availability of necessary expertise in certain areas. Lack of required resources could result in significant delays or even non-achievement of outputs, and in this context, ICAO needs to keep reprioritizing its work programme in order to align with its capacity and ensure successful delivery of outputs. It is essential that ICAO, States, international organizations and industry work together and provide the necessary resources to accomplish these initiatives and activities in the interest of aviation safety and air navigation efficiency.