Global Regulation of Air Navigation

Key Focus Areas

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Preface

This book supplements an earlier book written by the author titled *Air Navigation Law* (Springer, 2012). *While Air Navigation Law* addressed legal as aspects of air navigation, this book discusses the backdrop of regulatory history of air navigation in the context of the 14th Air Navigation Conference of The International Civil Aviation Organization (ICAO) held from 26 August to 6 September 2024 and the key focus areas discussed therein. Where applicable and relevant, a comparative discussion on maritime law is included.

ICAO has been pivotal in establishing global standards that ensure the safe and efficient management of international air travel. Over time, ICAO has continually refined principles and techniques in air navigation, which have significantly influenced the regulation and utilization of the world's airspace. Its responsibilities extend beyond simply managing air traffic, encompassing the creation of policies that cover a broad spectrum of concerns, including safety, security, operational efficiency, environmental sustainability, and technological progress.

A central goal of ICAO has been to develop a unified framework for air navigation, especially as aviation began its rapid expansion during the 20th century. Following its formation in 1944 through the Convention on International Civil Aviation, also known as the Chicago Convention, ICAO embarked on a mission to standardize the complex and varied air navigation systems used by different nations. The organization's ambition was to create a global set of principles that all aircraft could follow, regardless of national origin, to ensure not only safe navigation but also the efficiency and sustainability of the international air traffic management system.

One of ICAO's early contributions to air navigation was the establishment of international standards and recommended practices (SARPs) that form the foundation of global aviation protocols. These SARPs are documented in the Annexes to the Chicago Convention, each addressing specific aspects of civil aviation, such as technical operations, aircraft maintenance, search and rescue, accident investigation, and environmental conservation. Through these standards, countries worldwide are required to adhere to common guidelines, creating a consistent approach to air navigation safety and efficiency.

ICAO has also concentrated its efforts on the issue of airspace management, recognizing that effective air navigation is largely dependent on how airspace—a shared resource among nations—is organized. As commercial aviation surged after World War II, the need for structured airspace became evident. ICAO contributed significantly to the development of air traffic control systems, which were designed to manage the growing number of aircraft in the skies while minimizing collision risks and maintaining smooth traffic flow. This work led to the creation of controlled airspace, where aircraft must adhere to specific routes and protocols to ensure safe distances between them.

Another major step forward in air navigation came when ICAO spearheaded the standardization of communication, navigation, and surveillance (CNS) systems. Early on, ICAO coordinated the use of international radio frequencies, ensuring seamless communication between pilots and air traffic controllers across borders. This initiative was vital for modern air traffic control. Furthermore, ICAO played a key role in the development and promotion of radar technology and other navigation aids, such as VOR (VHF Omnidirectional Range) and ILS (Instrument Landing System), which remain fundamental components of global air navigation today.

The rise of satellite technology in the latter half of the 20th century introduced both new opportunities and challenges for air navigation. ICAO realized that traditional radar systems, while reliable, were limited in coverage—especially over oceans and remote areas. As a response, ICAO took substantial steps toward integrating satellite-based systems into global air traffic management. One notable achievement was the Global Navigation Satellite System (GNSS), which provides precise location and timing data to aircraft, offering more accurate and flexible navigation options even in regions without ground-based systems. ICAO has been instrumental in coordinating the international use of GNSS, ensuring that different satellite systems like GPS (U.S.), GLONASS (Russia), and Galileo (EU) are compatible for civil aviation purposes.

Safety remains the core principle underlying ICAO's air navigation strategies. One of the organization's critical responsibilities is to identify and mitigate emerging risks in the aviation industry. ICAO introduced the Global Aviation Safety Plan (GASP) to help the aviation community

implement long-term safety improvements. The GASP includes initiatives directly tied to air navigation, such as advocating for the adoption of safety management systems (SMS) by air navigation service providers (ANSPs). These SMS frameworks encourage proactive risk assessment, which helps detect and address potential hazards before they lead to accidents, thereby fostering a stronger culture of safety throughout the industry.

In addition to its safety efforts, ICAO has consistently driven technological innovation in air navigation. During the 1990s, ICAO launched the concept of Communications, Navigation, and Surveillance/Air Traffic Management (CNS/ATM) systems, which emphasized transitioning from ground-based to satellite-based technologies. The CNS/ATM initiative aimed to improve both safety and efficiency, especially in regions with high air traffic density. A key component of this system was the introduction of Automatic Dependent Surveillance-Broadcast (ADS-B), a technology that uses satellite data to provide real-time updates on aircraft positions. ADS-B has greatly enhanced situational awareness for pilots and air traffic controllers alike, allowing for better aircraft separation and more accurate tracking, especially in remote regions. ICAO has actively promoted global adoption of ADS-B, recognizing its value as a cornerstone of future air navigation.

More recently, ICAO has focused on advancing performance-based navigation (PBN). Traditionally, aircraft navigation relied on fixed ground beacons that dictated specific flight paths. PBN, on the other hand, allows aircraft to navigate using satellite systems, enabling more direct routing and reducing dependency on ground infrastructure. ICAO has strongly advocated for the global implementation of PBN, particularly in congested airspace, as it can increase airspace capacity, lower fuel consumption, and reduce emissions. PBN exemplifies how ICAO continues to merge advanced technologies with its guiding principles of safety and efficiency, ensuring that air navigation evolves alongside technological advancements.

ICAO's role in fostering global collaboration has been crucial to its success in air navigation. By uniting member states and industry stakeholders, ICAO has created an international platform for sharing best practices, innovations, and challenges. This cooperation has been especially important in harmonizing air navigation procedures across nations and ensuring that even those with limited resources or technical expertise can implement

international standards. Through its Technical Cooperation Bureau (TCB), ICAO has provided critical support to countries in need, offering technical guidance and training to help them establish robust air navigation systems, regardless of their size or economic status.

One of the challenges ICAO faces today is balancing the increasing demand for air travel with the need for environmental sustainability. As global awareness of climate change grows, ICAO has made substantial efforts to incorporate environmental considerations into air navigation. The ICAO Global Air Navigation Plan (GANP) includes measures aimed at reducing aviation's environmental impact through more efficient air traffic management and fuel-saving technologies, such as continuous descent operations (CDO) and reduced vertical separation minima (RVSM). These strategies not only improve operational efficiency but also contribute to ICAO's broader environmental objectives, including the reduction of CO2 emissions and noise pollution.

As the aviation industry continues to evolve, ICAO's work in air navigation will remain at the forefront. One emerging area of focus for ICAO is the integration of unmanned aircraft systems (UAS), commonly known as drones, into regulated airspace. The rapid proliferation of drones introduces new challenges for air navigation, particularly in terms of maintaining safety and avoiding conflicts with manned aircraft. ICAO has already begun developing SARPs for UAS operations, including standards for pilot certification, operational restrictions, and airspace management. As drones become more prevalent, ICAO will play a key role in ensuring that these technologies are safely incorporated into the broader airspace system.

Another forward-looking initiative by ICAO involves the development of space-based air traffic management systems. With commercial space travel on the horizon, driven by companies like SpaceX and Blue Origin, ICAO will need to establish protocols for how space vehicles interact with conventional air traffic. While this represents uncharted territory for ICAO, the organization's long history of managing international airspace makes it well-positioned to guide the next era of aviation development.

In its history, ICAO has proven its ability to adapt to the changing needs of global aviation. From its early efforts in standardizing communication and

navigation systems to its current work on satellite-based navigation, performance-based routing, and the integration of unmanned aircraft, ICAO has consistently taken steps to ensure that air navigation remains safe, efficient, and environmentally sustainable. Its leadership in this domain extends beyond simply keeping planes in the sky, to managing airspace in a way that serves the interests of all nations and stakeholders.

The techniques and principles that ICAO has developed have had a profound impact on the aviation industry. They have shaped everything from how aircraft navigate busy airways to how new technologies, such as drones and space vehicles, will be incorporated into the air traffic management systems of the future. As ICAO continues to innovate and evolve, it will remain a cornerstone of global aviation, ensuring that air navigation systems keep pace with the rapid changes occurring in the world.

Montreal, October 2024

Chapter 1

The 14th ICAO Air Navigation Conference: Priority Focus Areas

1. Introduction

The 14th ICAO Air Navigation Conference (AN-Conf/14) was held at ICAO headquarters in Montreal from 26 August to 6 September 2024. The conference, themed "Performance Improvement Driving Sustainability," aimed to establish a global consensus on performance enhancement measures that will enable ICAO, member States, and the aviation industry to address aviation's global environmental challenges, while taking into account the rapid advancements in aviation operations and technologies, and the constraints on available resources.

Participation in the Conference was open to all 193 ICAO Member States. The presence of senior officials with decision-making authority, accompanied by high-level technical advisors specializing in air navigation and safety, was considered by ICAO and its member States as crucial for the Conference to achieve its intended objectives. Non-Member States and international organizations, as invited by the ICAO Council, were given the opportunity of attending as observers. Member States and international organizations were further encouraged to involve non-traditional aviation innovators in their preparations for the Conference[1].

The Conference was expected to provide a platform for in-depth technical discussions, leading to a consensus on high-level recommendations regarding air navigation and safety. These recommendations would be submitted *post* conference for approval to the ICAO Council and, where relevant, subsequently endorsed by the 42nd Session of the Assembly in 2025.

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[1] The Conference proceedings were conducted in Arabic, Chinese, English, French, Russian, and Spanish, with a single plenary session to allow experts to collectively address interrelated issues in safety and air navigation. In addition, preparatory information sessions were scheduled for 26 August 2024, designed to facilitate the Conference's proceedings and promote focused discussions on the topics under review.

As a key component between the 41st (2022) and 42nd (2025) Sessions of the Assembly, AN-Conf/14 served as a venue to present the work prioritized in the ICAO 2023-2025 Business Plan, identify new priorities for the Organization's future activities, and offer strategic guidance. It was expected that this would ensure that the Business Plan, which is to be presented at the 42nd Assembly, includes a revised work programme and the necessary resources.

Given the pressing environmental challenges faced by aviation, the Conference was expected to seek to align efforts with safety and air navigation strategies, building on agreements reached at the 41st Session. The intention was to focus on existing and new technical initiatives that contribute to the long-term goal of achieving net zero carbon emissions in international aviation by 2050, while ensuring the continued safety, efficiency, and resilience of the global aviation system.

AN-Conf/14 was conducted according to precise rules and criteria established at the seventh meeting of its 223rd Session, held on 15 June 2023, of the Air Navigation Commission where the Commission resolved that the preparation and conduct of AN-Conf/14 would be governed by specific guiding principles. These principles were formally communicated to Member States via State letter ST 15/1-23/12, dated 10 July 2023, and are detailed as below.

In accordance with these guiding principles, items for inclusion in the Conference agenda must be clearly defined and should only be considered if they cannot be resolved through other mechanisms, such as ICAO expert groups or regional bodies like the Planning and Implementation Regional Groups (PIRGs). This ensures that the Conference addresses only matters requiring a broader platform for resolution.

Items that relate to the existing work programme of ICAO were allowed to be admitted for discussion provided they present opportunities for significant shifts in direction, such as a reprioritization or changes in the scale or scope of the work. Moreover, such items must have attained sufficient maturity to justify seeking global input or direction.

Furthermore, items that are limited in scope or involve new, complex procedures or technologies were only to be included if they have progressed to the point where a worldwide consensus is evidently necessary. Similarly, matters

addressing inconsistencies within ICAO documentation will be considered only if they carry significant implications warranting broad attention.

Discussion items intended to facilitate the exchange of views could only be included where there is a demonstrated need for a comprehensive debate on the applicability of new concepts or techniques to civil aviation.

The Air Navigation Commission decided that the AN-Conf/14 focus should be on topics that have not already been addressed by the ICAO Council or should propose substantial amendments to existing work, such as reprioritizing or expanding the scale or scope of current initiatives. Actions already undertaken by the Council, including approval of the Organization's technical work programme, decisions arising from past Assemblies, and recommendations from air navigation or other high-level conferences with ongoing relevance, are to be considered. Finally, items that cover multidisciplinary areas and have reached sufficient maturity to warrant global direction were also considered suitable for inclusion in the Conference agenda[2].

This book will discuss the focus areas as were presented by the participating States and the collective response of AN-Conf/14 in its conclusions and recommendations.

2. Priority Focus Areas

The ICAO Council's directives have provided a clear focus for the Secretariat to begin identifying critical unfunded activities under Priority Focus Areas (PFAs) and propose measures to allocate resources accordingly. These measures include assigning human resources, securing funds, and promoting targeted resource mobilization efforts. The Council also instructed the Air Navigation Commission and other relevant committees to evaluate the PFAs and adjust their work programs based on their importance.

One of the key PFAs centers on advanced air mobility (AAM) and new entrants to aviation. The goal is to ensure the harmonized development of

[2] https://www.icao.int/Meetings/anconf14/Pages/guiding-principles-for-the-preparation-and-conduct-of-the-conference.aspx

these areas across different regions, fostering interoperability where necessary. This PFA is designed to support collaboration between various aviation sectors and ensure that AAM and new entrants adhere to ICAO's safety provisions. It also addresses a wide array of topics, including economic regulation and international legal considerations, guiding states in adopting and regulating these emerging aviation operations.

Another critical PFA is focused on crisis preparedness and response. It aims to build a flexible framework within ICAO to help states meet their obligations under the Chicago Convention and other international regulations. This initiative also tackles various forms of crises, from disruptions to airport operations to health-related and humanitarian emergencies. The PFA provides for the establishment of governance structures, coordination mechanisms, and communication strategies to improve crisis response capabilities across the aviation sector.

The evolution of the Universal Safety Oversight Audit Programme (USOAP) and the Universal Security Audit Programme (USAP) is another focal point. This PFA is designed to improve ICAO's monitoring functions while increasing State engagement with its audit programs. It seeks to ensure that these programs remain effective and aligned with the safety and security systems in member states. Additionally, this initiative includes securing funding for ongoing activities, enhancing data analytics, and studying ways to improve the effectiveness of ICAO's monitoring efforts.

Cybersecurity is a pressing concern in aviation, and one of the PFAs focuses on developing a robust framework to counter cyber threats. This framework is essential for maintaining the safety, security, and efficiency of civil aviation. The PFA aims to develop harmonized standards, policies, and guidance materials while fostering collaboration across the aviation industry. Activities include building capacity for implementation support, enhancing oversight, and developing a trust framework to ensure resilience in the face of cyber challenges.

To achieve the long-term aspirational goal (LTAG) of net-zero carbon emissions by 2050, ICAO requires a comprehensive strategy that includes technological advancements, sustainable fuels, and market-based measures. This PFA prioritizes activities like monitoring LTAG progress, enhancing

regulatory frameworks, and supporting capacity-building initiatives. It also focuses on accessing financing for clean energy projects in aviation. Additional activities based on recent conferences have been integrated to support the global framework for aviation decarbonization.

The Transformational Objective is another initiative aimed at enhancing ICAO's ability to serve its member states more effectively. It introduces necessary changes in corporate management and innovation to create a more agile and adaptable organization. The goal is to improve collaboration with partners, foster a cultural shift within ICAO, and enhance the efficiency of internal operations, including digitalization. This will enable the organization to better meet the evolving demands of the global aviation community while improving governance.

It can be concluded that the implementation support PFA focuses on creating organization-wide processes to guide capacity development and resource mobilization in line with ICAO's implementation support policy. This includes developing methodologies for prioritizing support activities, aligning standards development with implementation efforts, and strengthening donor engagement and fundraising. The aim is to streamline the organization's efforts in assisting states with safety oversight and incident investigation[3].

3. The Need for a Global Framework

Hungary (on behalf of the European Union Member States) submitted a compelling working paper[4] to the conference saying that the aviation industry is seeing a rise in regional initiatives aimed at sharing, analyzing, and aggregating large volumes of data to enhance safety intelligence. Programs like Data4Safety (D4S) in Europe, the Aviation Safety Information Analysis and Sharing (ASIAS) initiative in the United States, and the AP-SHARE demonstration project in the Asia-Pacific region are key examples of these efforts. Airlines also participate in initiatives such as the International Air Transport Association (IATA) Flight Data Exchange (FDX). These initiatives

[3] For the discussion in AN-Conf/14 see PRIORITY FOCUS AREAS, *AN-Conf/14-WP/3*, 30/4/2.

[4] NEED FOR A GLOBAL FRAMEWORK FOR AVIATION SAFETY DATA AND INTELLIGENCE MANAGEMENT, *ANConf/14-WP/57*, 27/6/24.

reflect a broader global effort to refine aviation safety through collaborative data-sharing and intelligence generation.

ICAO's Assembly Resolution A41-6 underscores the need for global frameworks and plans to support its strategic objectives, particularly in the realm of aviation safety. The Global Aviation Safety Plan (GASP) highlights the role of safety data sharing as a key driver for achieving its objectives. ICAO Annex 19, which outlines states' obligations to collect, analyze, and exchange safety data, supports these efforts. This regulatory framework encourages states to use safety data to enhance their safety programs, aligning their activities with global safety standards.

In addition to Annex 19, ICAO provides detailed guidance through documents like the Safety Management Manual and the upcoming Safety Intelligence Manual. These documents offer comprehensive strategies for managing safety data, from data collection methods to the skills needed for safety analysis. They emphasize the importance of sharing safety information at regional levels, as such cooperation can help monitor existing risks more effectively and quickly identify emerging threats. This collective effort at the regional level ensures a more proactive approach to mitigating aviation safety risks.

The success of these regional initiatives is rooted in advanced technologies, particularly in big data and data science. These technologies enable the extensive collection and analysis of data from multiple aviation domains, helping identify systemic safety issues before they escalate. Strong governance structures also play a critical role by safeguarding data protection and providing ethical guidelines for the use of results. In addition, efforts to improve communication and compatibility between participating systems have already begun, leading to the possibility of collaborative studies and comparisons of regional safety intelligence. This global collaboration is further supported by the development of standardized taxonomies, such as the flight data monitoring taxonomy.

Given these advancements, ANConf/14 was advised that there is a growing need for high-level discussions within ICAO to enhance the existing framework for managing safety data and intelligence on a global scale. A comprehensive global framework would facilitate the aggregation of safety information from regional initiatives, helping validate global safety risks

and identify new threats. Such a system would allow for timely action at the global level, ensuring that the international aviation community remains responsive to evolving safety challenges.

Establishing a global framework would bring significant benefits to the entire aviation community. It would create opportunities to access a wealth of global safety information and intelligence, enabling a more cohesive approach to managing safety risks. Additionally, this framework would address key issues such as data protection, confidentiality, and the roles and responsibilities of various stakeholders. The ICAO Council, as outlined in Article 55 of the Chicago Convention, is well-positioned to lead these efforts by conducting research and facilitating the exchange of information among contracting states.

In conclusion, the establishment of a global framework for aviation safety data and intelligence management has the potential to revolutionize how the international aviation community addresses safety risks. By aggregating safety information from regional initiatives, this framework would support the development of global aviation safety intelligence. It would also provide clarity on governance procedures, enhance data protection, and foster collaboration among stakeholders. To move forward, ICAO must initiate discussions and work towards building this framework, ensuring the future of global aviation safety strategies is firmly grounded in shared intelligence.

4. Accident Investigations

IATA – which is the global association representing the air transport industry – submitted a working paper[5] to the conference saying that the obligation of states to investigate and publish aircraft accident reports is governed by Annex 13 of the Convention on International Civil Aviation, which focuses on aircraft accident and incident investigations. The primary goal of these investigations, as set out by ICAO, is to generate safety-related information that can help understand the causes of accidents and prevent future occurrences. Annex 13, along with related guidance material, provides a detailed

[5] ENHANCING ACCIDENT INVESTIGATIONS AND THE PUBLICATION OF ACCIDENT INVESTIGATION REPORTS Presented by the IATA, International Business Aviation Council (IBAC) and International Federation of Air Line Pilots' Associations (IFALPA), *AN-Conf/14-WP/731*,28/6/24.

framework for conducting aviation accident investigations, ensuring that final reports are issued as quickly as possible.

These final reports play a crucial role in disseminating official information about an accident, offering not only factual details but also safety recommendations. These recommendations are aimed at improving aviation safety frameworks to prevent similar accidents in the future. When accident reports are delayed, incomplete, or not thoroughly investigated, key stakeholders such as airlines, manufacturers, regulators, and infrastructure providers are deprived of critical information that could enhance overall aviation safety. Moreover, for survivors of accidents and families of victims, incomplete investigations can cause confusion and undermine public trust in aviation safety systems.

The 2023 IATA Annual Safety Report revealed a concerning statistic: fewer than 49% of all commercial passenger and cargo accidents between January 2018 and December 2023 have resulted in the publication of final accident reports. This means that 51% of such accidents have not seen the release of a complete report, highlighting a significant shortfall in compliance with ICAO's Annex 13 requirements.

IATA has raised this issue, stressing the need for consistent State compliance with the guidelines in Annex 13. This is not only important for ensuring aviation safety but also for maintaining public confidence in the industry. Timely accident investigations and reports are critical for identifying safety risks and preventing future incidents.

To address these concerns, IATA has emphasized the importance of prompt accident investigations by the State of Occurrence. According to Annex 13, states are required to initiate investigations into all aircraft accidents within their territory and produce initial reports within 30 days, with final reports made public within 12 months. IATA has called on states to prioritize these responsibilities and adhere to the established timelines in order to prevent further aviation accidents.

Moreover, IATA has been working to support states in meeting their accident investigation obligations. This includes advocating for ICAO to provide capacity-building resources, such as training and technical assistance, to improve the quality and timeliness of accident reports. IATA's

efforts extend to collaboration with industry stakeholders to raise awareness about the importance of compliance with Annex 13 and to improve the overall effectiveness of accident investigations.

The lack of timely accident reports presents a challenge for all stakeholders involved in aviation safety, from operators to regulators. Without access to this vital information, efforts to reduce accidents and improve flight safety are hindered. To tackle this issue, IATA is working closely with the ICAO Accident Investigation Panel (AIGP) to identify the reasons behind delayed or incomplete reports. A five-point roadmap has been developed by IATA to encourage better compliance with Annex 13 and promote the timely production of thorough accident investigations.

Ultimately, the objective of Annex 13 is to enhance safety by understanding the causes of accidents and taking measures to prevent them from happening again. Failure to adhere to its requirements jeopardizes the ability to achieve this goal and compromises the safety of the global aviation community. IATA continues to push for improvements in this area, emphasizing the need for thorough, transparent, and timely accident investigation reports to ensure continuous safety advancements in aviation.

5. Resilience in the Air Navigation System

IATA and The International Business Aviation Council (IBAC)[6] presented a working paper[7] on resilience of the air navigation system where they said airspace disruptions can stem from various causes, including geopolitical tensions, civil unrest, armed conflict, natural disasters, industrial action, or

[6] IBAC promotes the growth of business aviation, benefiting all sectors of the industry and all regions of the world. As a non-profit, international trade association, IBAC represents the interests of business aviation – for the industry, by the industry – through its official observer status at the International Civil Aviation Organization (ICAO), worldwide advocacy, and globally recognized, voluntary safety standards programmes: the International Standard for Business Aircraft Operations (IS-BAO™), and the International Standard for Business Aviation Handlers (IS-BAH™). Founded in 1981, the IBAC organization is managed by the Director General and an international staff and is directed by a Governing Board comprised of representatives designated by each of its 15 member associations from around the world.

[7] RESILIENCE IN THE AIR NAVIGATION SYSTEM, *AN-Conf/14-WP/751* 28/6/24 Revision No. 1, 2/8/24 and AN-*Conf/14-WP/75* Revision No. 1.

cyber-attacks on aviation systems. Some disruptions, like natural disasters, may be predictable; regions prone to hurricanes or typhoons can anticipate and prepare for these events. However, disruptions caused by political or military factors often persist for long periods, leaving civil aviation with limited information about evolving ground situations. The impact is exacerbated when adjacent or overlapping airspaces are not well-coordinated, leading to broader inefficiencies.

The discussion in the working paper aimed to introduce a framework for managing prolonged disruptions in airspace or aviation services and ensuring resilience in operations. As the aviation industry grapples with challenges posed by climate change—such as more frequent natural disasters—and geopolitical conflicts, interruptions in air navigation services are becoming more common. The updated Global Air Navigation Plan (GANP) emphasizes resilience alongside capacity in its approach to managing air traffic. Additionally, the Global ATM Operational Concept (GATMOC) highlights the need for the global air navigation system to accommodate traffic demands, particularly during high-volume periods, while maintaining flow efficiency. Resilience, therefore, is critical to overcoming service interruptions and reducing temporary limitations in airspace capacity.

When disruptions occur, their effects often ripple across regions beyond the immediate area of impact. Therefore, air navigation systems need to be robust not just within the disrupted airspace but also in adjacent regions, as traffic is often rerouted through neighboring airspaces. The number of such disruptions has been rising, placing strain on available airspace capacity and complicating airline operations, especially when rerouting traffic around closed airspaces.

Contingency plans must address the operational challenges faced by airlines during extended disruptions, considering fuel consumption, aircraft performance, and crew duty limitations. ICAO's guidelines, including air traffic flow management and civil-military cooperation, provide a foundation for optimizing airspace and improving airline operations when normal traffic flows are disrupted. Moreover, better communication among states, air navigation service providers, and airlines can enhance preparation for disruptions. Collaborative exercises to test contingency plans are recommended to improve response strategies and identify risks early.

In the event of prolonged disruptions, contingency planning should extend beyond temporary rerouting, considering the broader impacts on global air traffic. Optimizing airspace usage, along with measures like air traffic flow management, can help airlines adapt to shifting traffic flows and improve operational efficiency. Sharing timely, accurate information is essential to risk assessment and decision-making when resuming normal operations.

In addition to managing airspace disruptions, the global aviation industry recognizes the importance of sharing safety data and intelligence. States can improve safety outcomes by exchanging information that helps identify risks and respond proactively. The U.S. and Australia have conducted a proof-of-concept study validating the benefits of such data sharing, demonstrating that safety intelligence exchange can support risk management and decision-making in aviation. Strengthening this global information-sharing network will enhance aviation safety on an international scale.

6. Facilitating Safety Intelligence Through Global Safety Information Management Exchange

A. Submission of Costa Rica

The Republic of Costa Rica introduced a formal working paper[8] advocating the harmonization of regulatory frameworks across the global air transport industry, emphasizing that such alignment is crucial for fostering efficient and competitive sectoral growth at an international level. The harmonization process, as argued, seeks to streamline regulations and operational practices among various national jurisdictions, facilitating cross-border cooperation and mutual recognition of certifications, standards, and safety protocols. ICAO has long been a proponent of such regulatory alignment, as evidenced by its leadership in advancing Standards and Recommended Practices (SARPs) under the authority of the Convention on International Civil Aviation (Chicago Convention) and numerous Assembly resolutions.

The Working paper added that when effectively implemented, harmonization can reduce the regulatory and administrative burdens placed on national civil aviation authorities (CAAs), streamline operational proce-

[8] CREATING REGULATORY HARMONIZATION, *AN-Conf/14-WP/1141*, 28/06/24.

dures, and optimize the use of resources by eliminating duplicative oversight and compliance processes. Regional cooperation, particularly through mechanisms like regional safety oversight organizations (RSOOs), has further advanced the establishment of common regulatory frameworks, resulting in the more consistent regulation of aviation operations and services across regions.

Despite the theoretical soundness of regulatory harmonization, the realization of its practical benefits remains constrained. This limitation is particularly evident in modern aviation business models, which frequently span multiple jurisdictions and are subject to overlapping regulatory and certification requirements. Such duplication consumes significant time and resources, imposing administrative challenges for CAAs. The persistence of these regulatory inefficiencies signals a gap in the effective practical implementation of harmonization policies. Moreover, ICAO audits and those conducted by other oversight bodies typically rely on SARPs and related guidance, which may not reflect the latest developments in the aviation sector. This rigid, compliance-focused audit approach, particularly where the application of guidance materials varies, can result in findings that prioritize form over substantive safety performance. Consequently, States may be disinclined to adopt harmonized frameworks, especially if audit processes penalize innovative business models that utilize economies of scale and collaborative approaches, as advocated by RSOOs.

For regulatory harmonization to be truly effective, ICAO must align its initiatives with its overarching strategic objectives, including those endorsing regional collaboration. This alignment necessitates updates to SARPs, relevant guidance materials, and the Universal Safety Oversight Audit Programme (USOAP) Protocol Questions. A specific amendment proposal, contained in the appendix to the Costa Rican working paper, suggests revisions to Annex 6 — Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes, to better reflect current operational realities in the aviation sector. Additionally, successful implementation of harmonization requires that States establish or strengthen mechanisms for risk management and safety performance measurement to ensure that safety standards meet the expectations of all relevant stakeholders.

In conclusion, comprehensive regulatory harmonization is essential to fostering innovation and ensuring the sustainable development of the global air transport industry. The proposal contained in the working paper represents only one element of the broader regulatory framework that requires review and revision to achieve the desired outcomes. By undertaking a coordinated approach aligned with its strategic objectives, ICAO can facilitate genuine regulatory harmonization, thereby improving safety, efficiency, and competitiveness across the global aviation industry. The Conference is therefore encouraged to adopt recommendations urging States to update their regulations and procedures to account for advancements in aviation business models, eliminate redundancies, enhance risk management capabilities, and continue pursuing collaborative efforts towards the sustainable development of civil aviation systems and more effective safety oversight. Additionally, ICAO should revise its SARPs to integrate collaborative processes and ensure that audit criteria are applied consistently to minimize subjective interpretations during State audits, all while promoting international cooperation and mutual recognition of certifications and licenses.

B. Submission of Other Entities and States

Hungary submitted a working paper[9] emphasizing the growing significance of regional initiatives for data sharing, analysis, and aggregation, particularly as they pertain to safety intelligence. Examples cited include the European Data4Safety (D4S) program, the Aviation Safety Information Analysis and Sharing (ASIAS) initiative in the United States, and the AP-SHARE demonstration project in the Asia-Pacific region. Airlines also have the option to participate in the IATA Flight Data Exchange (FDX). ICAO Assembly Resolution A41-6 and the Global Aviation Safety Plan (GASP) underscore the critical role of sharing safety data and exchanging information to enhance safety performance globally.

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[9] NEED FOR A GLOBAL FRAMEWORK FOR AVIATION SAFETY DATA AND INTELLIGENCE MANAGEMENT, *AN-Conf/14-WP/57*, 27/6/24. The paper was presented by Hungary on behalf of the European Union and its Member States and other Member States of the European Civil Aviation Conference, European Organization for the Safety of Air Navigation (EUROCONTROL), and by Singapore and the United States.

Annex 19 of ICAO, as well as supporting documents like the Safety Management Manual (ICAO Doc 9859) and the forthcoming Safety Intelligence Manual (ICAO Doc 10159), provide detailed guidance on key topics, including safety intelligence strategies, data collection systems, and reporting protocols. The sharing of safety data at a regional level adds considerable value, enabling more effective monitoring of existing risks and timely identification of emerging threats. These initiatives leverage advanced data science techniques, supported by robust governance frameworks, to proactively address systemic safety concerns.

Given the need for a coordinated global approach, there is a compelling argument for ICAO to initiate high-level discussions to enhance existing frameworks, safeguard safety data, standardize governance procedures, and facilitate the aggregation of safety intelligence across regions. This would enable more consistent identification of global safety risks and inform timely responses to emerging threats. A global framework for aviation safety data and intelligence management would also support the evolution of global safety strategies in alignment with GASP objectives.

The United States and Australia submitted a working paper[10] stressing the importance of global data exchange for ensuring aviation safety. Their proposal calls for the creation of foundational systems for data collection and voluntary safety reporting, while protecting data from unauthorized use. The Global Safety Information Management Exchange (GSIME) initiative provides a model for data exchange, with the aim of fostering a more collaborative and informed global approach to aviation safety.

In light of these submissions, the Conference was urged to adopt recommendations supporting enhanced regional and global safety data sharing, the development of standardized criteria for safety analysis, and the establishment of a comprehensive global framework for managing aviation safety intelligence.

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[10] FACILITATING SAFETY INTELLIGENCE THROUGH GLOBAL SAFETY INFORMATION MANAGEMENT EXCHANGE, AN-Conf/14-WP/101. See also, TOWARD ENHANCED ALIGNMENT OF GASP AND GANP IN TERMS OF DATA USAGE AND PROTECTION, (Presented by the Republic of Korea) *AN-Conf/14-WP/147, 30/6/24.*

7. Enhancing the Alignment of GASP and GANP

A. Existing Links

The ICAO Secretariat presented a working paper[11] which started by saying that the Global Aviation Safety Plan (GASP, Doc 10004) and the Global Air Navigation Plan (GANP, Doc 9750) provide comprehensive frameworks that facilitate the development and implementation of regional, subregional, and national aviation plans. These frameworks ensure that efforts to improve international civil aviation safety, capacity, and efficiency are consistent, harmonized, and well-coordinated. Both the GASP and GANP are designed to complement each other, and their alignment can be improved through a set of recommendations provided by expert groups. This paper presents those recommendations, which are based on the work of the Global Plans Task Force (GPTF) and further reviewed by the GASP and GANP Study Groups in collaboration with the ICAO Secretariat. This process is part of the ongoing revision of both Global Plans, ahead of the 42nd ICAO Assembly.

The importance of these global frameworks, as well as regional and national plans, is recognized in Assembly Resolution A41-6, which supports the Strategic Objectives of ICAO. The GASP and GANP not only support these objectives but also provide the foundation for aviation safety management approaches and the evolution of the air navigation system. The GASP offers tools to assist States and the aviation industry in implementing safety management practices through State Safety Programs (SSP) and Safety Management Systems (SMS). Meanwhile, the GANP addresses the operational improvements necessary to enhance safety within the air navigation system, aligning with the performance ambitions set forth by the GASP.

B. Ongoing Work

In December 2022, the GASP Study Group began reviewing the GASP for the 2026-2028 edition, which is set to be presented for endorsement at the 42nd ICAO Assembly in 2025. As part of this process, the group reviewed recommendations from the High-level Conference on COVID-19 (HLCC

[11] WORK TOWARDS ENHANCED ALIGNMENT OF GASP AND GANP, *AN-Conf/14-WP/4*, 4/4/24.

2021) and the 41st ICAO Assembly (A41), which called for a closer alignment between the GASP and GANP. Given the complexity of these recommendations, the GASP Study Group recognized the need to collaborate with the GANP Study Group. In January 2023, ICAO formed the Global Plans Task Force (GPTF), comprising members from both study groups, to address the open recommendations.

The GPTF met nine times between February and December 2023. Its first task was to review all open recommendations regarding the alignment of the Global Plans, focusing on identifying interdependencies, assessing the relationship between regional and national plans, and evaluating the presence of key elements such as vision, mission, and objectives in both documents. The task force also analyzed how each plan identifies issues and establishes actions to meet desired outcomes. Through this analysis, the GPTF identified a series of factors that needed to be addressed to improve alignment and remove elements that were counterproductive to this effort.

C. Recommendations

The task force developed five key recommendations, which were subsequently reviewed by ICAO expert groups, particularly the GASP and GANP Study Groups. These recommendations aim to improve the alignment between the GASP and GANP by establishing a common performance framework, revising roles and responsibilities of key stakeholders, clarifying the process for plan development, and encouraging a more collaborative approach to managing aviation risks.

One of the main recommendations involves defining links between the GASP and GANP through a common performance framework that includes a comprehensive set of indicators. The study groups also proposed revising roles and responsibilities of key aviation stakeholders and ICAO in both plans to include traditional and emerging industries as stakeholders. Additionally, the process for developing the Global Plans should be clarified, particularly in terms of how these plans contribute to ICAO's work program and address new technologies and entrants. Finally, the scope and time horizons for each plan should be clearly defined, and a collaborative approach to managing various types of aviation risks should be considered.

Overall, these recommendations mark a significant step toward enhancing the alignment and effectiveness of the GASP and GANP. By addressing the recommendations outlined by the GPTF, ICAO aims to ensure that both Global Plans continue to support the Strategic Objectives of the organization and contribute to the safety and efficiency of international civil aviation.

D. Views of Europe

The European perspective was presented[12] in this context by Hungary (on behalf of EU members, ECAC[13] and EUROCONTROL)[14] which said that This paper emphasizes the importance of ICAO's Global Plans in achieving its Strategic Objectives and introduces the European perspective on how to advance global aviation planning through improved cohesion and more transparent decision-making. Drawing from the Global Plans Task Force's recommendations, the paper suggests a forward-thinking strategy that advocates for an overarching alignment framework. This framework would include a governance mechanism that encompasses all three ICAO Global Plans—aviation safety, security, and air navigation—facilitating a more proactive approach to managing these areas. A key point is the need for an integrated, performance-based approach, supported by a single process for managing changes to address both present and future challenges, including innovation and sustainability.

The paper highlighted that sustainable aviation is crucial for achieving the United Nations' Sustainable Development Goals (SDGs). ICAO plays

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[12] PRINCIPLES FOR THE GOVERNANCE OF THE ICAO GLOBAL PLANS, *AN-Conf/14-WP/55*, 27/6/24.

[13] Founded in 1955 as an intergovernmental organization, the European Civil Aviation Conference (ECAC) seeks to harmonize civil aviation policies and practices amongst its Member States and, at the same time, promote understanding on policy matters between its Member States and other parts of the world. ECAC's mission is the promotion of the continued development of a safe, efficient and sustainable European air transport system.

[14] EUROCONTROL is a pan-European, civil-military organization dedicated to supporting European aviation. EUROCONTROL is committed to the European Union's vision for a Single European Sky, and supports its Member States and civil and military stakeholders (including air navigation service providers, airspace users, airports and aircraft/equipment manufacturers) in a joint effort to make aviation in Europe safer, more efficient, more cost-effective and with a minimal environmental impact.

a significant role in ensuring that international civil air transport remains safe, secure, efficient, economically viable, and environmentally responsible. To this end, ICAO has established five Strategic Objectives, which are closely tied to the three Global Plans: The Global Air Navigation Plan (GANP), the Global Aviation Safety Plan (GASP), and the Global Aviation Security Plan (GASeP). These Global Plans act as vital references for global, regional, and national aviation initiatives, aiming to ensure consistency and continuity in modernization efforts. The ICAO Assembly, through triennial meetings, endorses the work of these Global Plans, but they must offer long-term planning to support ongoing efforts by ICAO, states, and the aviation industry.

Despite their importance, the Global Plans are currently being developed and updated separately, supported by distinct groups without a fully cohesive approach. This has been raised in several working papers presented at various ICAO conferences and assemblies. After the High-level Conference on COVID-19 (HLCC 2021) and the 41st ICAO Assembly, recommendations emerged for a more integrated strategy for global aviation planning. As a result, ICAO initiated the Global Plans Task Force (GPTF) in early 2023 to improve alignment between the GANP and GASP and bridge the gaps between the plans. The GPTF reviewed and presented recommendations that will require short- and long-term implementation actions, including the creation of a unified development process for all three Global Plans.

The GANP has been shaped significantly by the rapid digitalization and modernization of Air Traffic Management (ATM) and Air Navigation Services (ANS), as well as by global climate goals. However, the GASP has yet to fully reflect technological advancements or environmental sustainability objectives. Additionally, the GASP does not include specific goals for integrating new technologies and innovative business concepts into aviation safety. As the aviation industry evolves, it becomes increasingly essential to incorporate future-oriented considerations into the Global Plans to maintain their relevance in managing aviation safety, security, and air navigation within a dynamic and rapidly changing environment.

The ICAO Assembly's 2019 Resolution A40-27 stressed the importance of innovation in aviation. One recommendation from the Global Plans Task Force is to revise the development process for the Global Plans, ensuring

it includes new technologies, such as unmanned aircraft systems, artificial intelligence, and sustainable aviation fuels. As the aviation industry continues to advance, adopting a holistic and forward-thinking approach to the Global Plans will allow ICAO and its stakeholders to better manage changes and innovations. It also emphasizes the need for more transparent decision-making processes, particularly in translating strategic objectives into practical changes in the air transport system.

There is also a need for more inclusive governance and involvement of ICAO member states in developing the Global Plans. At the regional level, the implementation of these plans lacks clarity and requires better governance from the top down. Moreover, there is no structured way for regions to address their specific issues and incorporate them into the Global Plans, highlighting the need for a bottom-up approach.

For ICAO's Global Plans to be effective, a strong governance mechanism must be established to ensure complementarity, consistency, and coherence. Such governance should support an integrated approach to managing interacting risks and ensure decision-making transparency. Key guiding principles include a top-down governance structure, a common aviation performance framework, and a streamlined process for routine updates. This governance approach should enable ICAO and its member states to remain agile in responding to changes and technological advancements in the aviation sector.

Routine maintenance of the Global Plans is also critical, particularly as the current time-based approach, with updates every three years, lacks flexibility. This process should distinguish between routine updates that do not require high-level endorsement and more significant changes that necessitate strategic decisions from ICAO's governing bodies. Strategic changes should be made with input from ICAO Panels and expert groups, ensuring that all stakeholders are involved in the decision-making process.

The European perspective was rounded up in the paper which concluded that creating an overarching alignment framework and governance for ICAO's Global Plans will yield numerous benefits. These include improved alignment with global aviation strategies, greater efficiency in monitoring performance, and a more holistic approach to capacity building. Ulti-