



ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

ENHANCING THE INTEGRATION OF REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) SAFETY DATA INTO STATE SAFETY PROGRAMMES (SSPs)

(Presented by Qatar)

EXECUTIVE SUMMARY

RPAS operations are expanding rapidly from small local drones to large remotely piloted aircraft, sharing controlled airspace, which creates new safety concerns due to the remote control and the absence of an onboard pilot. Multiple States have started improving their State safety programmes (SSPs) by adding Remotely Piloted Aircraft Systems (RPAS) data, but additional support will be necessary to fulfil the requirement of Annex 19 — *Safety Management* for complete coverage of civil aviation activities. This working paper advocates ICAO to deliver operational guidance through RPAS-specific safety performance indicators (SPIs), standardized taxonomies and adaptable reporting templates while supporting capacity development and anonymous worldwide data sharing. Every State will be able to collect, share and take action on RPAS safety information through these measures, which will provide strong oversight as unmanned operations expand globally.

<i>Strategic Goals:</i>	This working paper relates to the Strategic Goal <i>Every flight is safe and secure</i> .
<i>Financial implications:</i>	The activities can be undertaken within the 2026-2028 Regular Programme Budget and/or extra-budgetary contributions.
<i>References:</i>	Annex 19 — <i>Safety Management</i> Annex 6 — <i>Operation of Aircraft</i> — Part IV - <i>Remotely Piloted Aircraft Systems</i> Doc 10004, <i>Global Aviation Safety Plan (2023–2025 Edition)</i> Doc 10115, <i>Manual on Remotely Piloted Aircraft Systems (RPAS)</i> Doc 9859, <i>Safety Management Manual (SMM)</i> , Fourth Edition, 2018 Doc 10159, <i>Safety Intelligence Manual</i> , Advance Unedited Version, 2025

1. INTRODUCTION

1.1 *Rising prominence of RPAS.* Remotely Piloted Aircraft Systems (RPAS) technology has rapidly established itself as a fundamental component of civil aviation through its application in small drones for photography, inspection and delivery services, as well as large drones that perform extended or high-altitude missions. The worldwide expansion of RPAS operations occurs because of technological progress and emerging commercial applications while ICAO Member States observe identical airspace growth that reflects the worldwide transition to civil unmanned operations.

1.2 *Unique safety challenges.* RPAS safety challenges arise from their remote station operation through command and control (C2) Links instead of onboard pilots: C2 Link loss or latency, the requirement for reliable detect and avoid (DAA) systems instead of pilot “see and avoid,” and human factors risks related to remote station design and procedures.

1.3 *SSP framework and RPAS.* Annex 19 — *Safety Management* requires every State safety programme (SSP) to include all aviation domains including RPAS. The SSP and operators’ safety management systems (SMSs) should enable regulators to identify and resolve RPAS safety issues in the same way they do for conventional flight operations. The adaptation process for many States is just the beginning because RPAS incident reporting, risk analysis, and national safety performance indicator inclusion remain unfinished.

2. BACKGROUND

2.1 *Annex 19 requirements.* States must operate both mandatory and voluntary reporting systems for all aviation activities according to Annex 19, while they may need to modify their laws/regulations to promote reporting from RPAS operators, remote pilots, and establish safety-performance indicators and targets within their State safety programmes (SSPs). The SMS duties under Amendment 2 (effective 2025) now apply to specific RPAS operators which oblige States to integrate unmanned operations into their SSPs and oversight systems.

2.2 *Current gaps in RPAS data integration.* Despite Annex 19 requirements, many States still struggle to integrate RPAS safety data into their SSPs. Four common gaps hinder progress:

- a) *limited reporting and data collection.* Smaller or low-risk RPAS often fall outside mandatory occurrence-reporting rules, so near-misses, fly-aways and loss-of-control events go unreported or are logged in ad-hoc systems separate from national safety databases;
- b) *need for standardized taxonomy.* The development of an RPAS-specific extension to the Accident/Incident Data Reporting (ADREP) system would allow States to classify unmanned-aircraft events in a standardized way which would facilitate better data aggregation and more meaningful cross-border trend analysis;
- c) *safety performance indicators (SPIs).* The current safety performance metrics of many SSPs often include accidents, runway incursions and loss-of-separation events. The safety performance picture of SSPs would be enhanced by adding indicators that are specific to unmanned operations such as C2 Link integrity, RPAS–manned airprox frequency and GPS–interference occurrences; and
- d) *capacity and expertise.* The regulators in emerging RPAS markets are eager to improve their capabilities. The guidance and training will enable them to develop the necessary personnel, skills, and analytical tools to develop robust regulations and data processes for unmanned operations.

2.3 *Global Aviation Safety Plan (GASP) alignment.* The ICAO *Global Aviation Safety Plan* (GASP, Doc 10004) requires States to implement risk-based safety management systems that use data to drive their operations. ICAO supports this with a harmonized safety performance indicator framework and online catalogue, but these tools have so far centered on manned aviation. Extending them to RPAS will fulfil GASP Goal 3 on SSP implementation and give States the actionable, data-based insight needed to improve safety across all aviation sectors.

3. DISCUSSION

3.1 *Need for ICAO guidance on RPAS safety data integration:* While Annex 19 provides valuable high-level direction, States would benefit from more detailed guidance to integrate RPAS fully into their safety-data collection and risk-management processes. By issuing targeted, practical material that focuses on the key areas outlined below, ICAO can support consistent and effective implementation for every State.

- a) *RPAS-specific SPIs.* ICAO is invited to consider engaging its SM and RPAS Panel to create specific SPIs for unmanned operations, which may include but not limited to C2-Link integrity and RPAS–manned airspace interaction rates, system-reliability events, and remote-pilot human-factor occurrences. The ICAO Indicator Catalogue should include an “unmanned aviation” section to provide States with a standardized reference, which enables them to implement these SPIs in their SSPs while meeting Annex 19 requirements and creating a unified RPAS safety data system at a national, regional and a global level;
- b) *taxonomies and classification for RPAS occurrences.* The ADREP and CAST/ICAO Common Taxonomy Team (CICTT) frameworks provide a solid foundation for ICAO to consider adding RPAS-specific categories including “C2 Link loss”, “RPAS fly-away”, “RPAS–aircraft conflict”, “airspace violation” and “remote-pilot error”. A harmonized scheme would fulfil Annex 19’s call for standardized reporting, enable States to classify unmanned events consistently, and streamline the integration, analysis and exchange of RPAS safety data across regions;
- c) *reporting templates and guidance for different RPAS operations.* If feasible, ICAO may wish to explore the implementing of a tailored reporting template system for RPAS occurrences which would provide basic online forms for small visual line-of-sight (VLOS) drones to encourage voluntary reporting and detailed manned aviation style forms for larger beyond visual line-of-sight (BVLOS) or certificated operators. Such tailored guidance would help States integrate RPAS into their mandatory and voluntary reporting systems, meet Annex 19 data-collection expectations, and promote consistent formats that support effective analysis and information-sharing;

3.2 *Enhancing data sharing and analysis capabilities.* In addition to developing guidance materials as described above, ICAO can play a coordinating role in strengthening global RPAS safety data exchange:

- d) *capacity Building for States.* States actively work to enhance their safety-data systems by adding RPAS capabilities. ICAO together with Regional Aviation Safety Groups (RASGs) and Regional Safety Oversight Organizations (RSOOs) should provide collaborative capacity-building programmes which deliver specific training, workshops, and practical tools to update reporting regulations, teach analysts about RPAS taxonomy, and showcase early adopter success stories. Such cooperation would enable every State to integrate unmanned operations with confidence and a harmonized global approach to RPAS safety management; and
- e) *global sharing of de-identified data:* The focus on safety-information exchange in Annex 19 could be supported by ICAO through the enhancement of integrated Safety Trend Analysis and Reporting System (iSTARS)/ADREP platforms to create a secure

global de-identified repository for RPAS occurrences including near-misses with airliners and critical system failures. The consolidation of anonymized reports would provide Member States with a broader understanding of emerging trends that may be difficult to detect individually while periodic ICAO analyses based on the annual Safety Report would keep all stakeholders actively informed about evolving RPAS risk areas.

3.3 *Benefits of the proposed actions.* The development of RPAS-specific safety data guidance and the promotion of global data sharing will yield several important benefits:

- a) *sharpen risk visibility.* States could track unmanned-aircraft incidents with tailored indicators, spot trends early and act before accidents occur;
- b) *ensure harmonization.* A common ICAO framework would standardize reporting and analysis worldwide, easing cross-border collaboration as RPAS operations expand internationally;
- c) *enable data-driven decisions.* Regulators and industry could base safety measures and technical standards on real-world RPAS trends and failure patterns; and
- d) *protect safety and public trust.* Integrating RPAS into SSPs keeps aviation's high safety record intact and sustains public confidence as the unmanned sector grows.

4. CONCLUSION

4.1 States can enhance their SSPs through the adoption of ICAO guidance on developing and selecting RPAS-specific SPIs, harmonized taxonomy, tiered reporting templates and tailored capacity-building. States can elevate their SSPs, seamlessly incorporating unmanned operations with the same data-driven excellence as manned aviation.

4.2 The proactive measure will improve the worldwide RPAS safety framework while providing regulators with immediate data for rapid mitigation actions, strengthening aviation's excellent safety performance, and public confidence as RPAS operations expand.

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