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Are you ready to operate RPAS internationally?

Annex 6, Part IV, *International RPAS Operations*

ICAO RPAS Symposium 2022
7 November 2022





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Presenters

■ **Mr. Ron van de Leijgraaf**

- Senior Policy Advisor Unmanned Aviation, Ministry of Infrastructure and Water Management, Netherlands
- Current Chair RPAS Panel - former rapporteur WG5 of the RPAS Panel

■ **Mr. Lance King**

- Senior Policy Advisor Airworthiness and Airspace Integration, Northrop Grumman
- Co-rapporteur WG5 of the RPAS Panel

■ **Mr. Andrew Ward**

- RPAS Policy and Regulation Specialist, Civil Aviation Safety Authority, Australia
- Co-rapporteur WG5 of the RPAS Panel



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Section 1 - Foundations

Mr. Ron van de Leijgraaf



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Background

- **RPAS Panel - WG5 working arrangements**

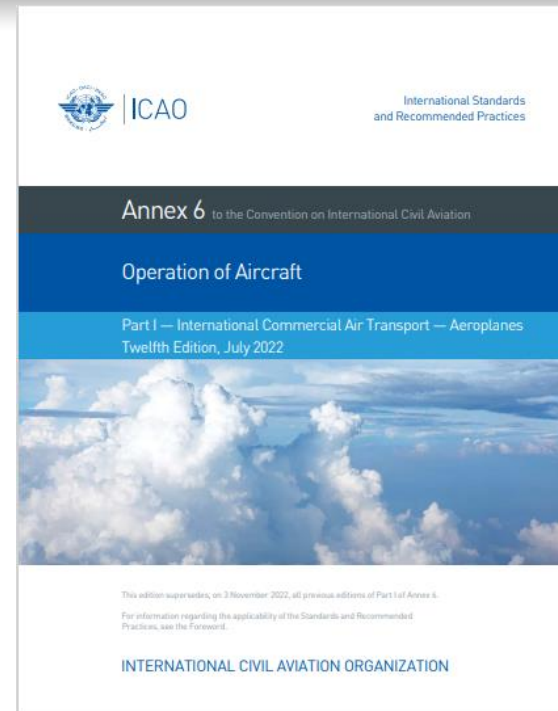
- Work on operations and operator SARPs in parallel
- Safety Management System (SMS) related issues developed with SMP
- Contributions from relevant working groups and expert groups (e.g. DAA, flight recorder)

- **Gap analysis against Annex 6, Parts I, II and III**

- **Didn't recreate the wheel**

- Where existing provisions/terminology made sense no need to change

- **Follows same flow and format as Annex 6, Part I**
 - Assists with cross-referencing of Standards with other Parts
 - Varies only when needed
- **Numerous provisions duplicated from Parts I and III**
- **As with other parts to Annex 6, several Appendices and Attachments included with additional provisions**
 - Some left “for future use” in anticipation of future operations (e.g. passengers on board)





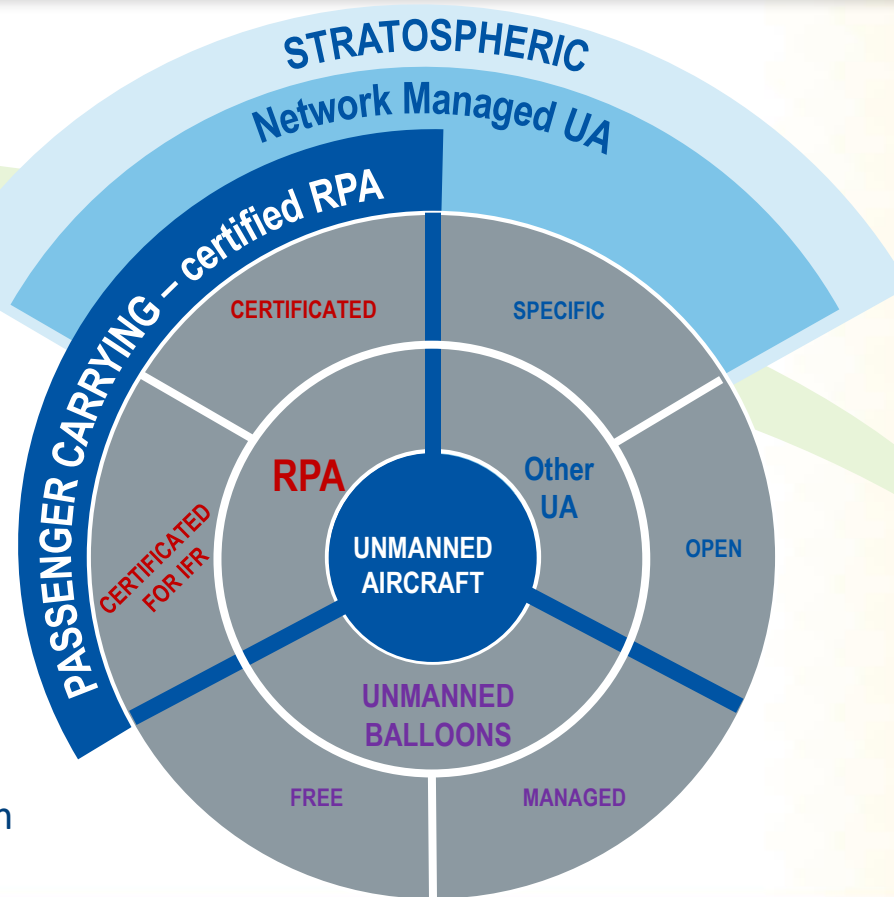
- **IFR International from international airports**
- **Guiding principles:**
 - Minimize hazards to persons, property and other aircraft
 - Address the protection of society from collisions between aircraft and crashes
 - Provisions apply equally to commercial air transport and general aviation (incl. aerial work) conducted by RPAS
 - Integrate in existing aviation system, without negatively affecting manned aviation. If not possible restrict to specific conditions or areas



- **IFR RPAS operations within controlled airspace, and controlled aerodromes**
- **RPAS operators will require an RPAS Operator Certificate (ROC)**
- **Content to cover other RPAS operations might be generated**
- **RPAS operator will be responsible that C2 Link services meet appropriate performance requirements**
- **During flight, RPAS control may be transferred from one RPS to another**



Categorization



Unmanned aircraft:
an aircraft which is
intended to be
operated with **no
pilot on board** -
(Annex 7, 2.2)



Categories

Open – Low risk

Specific – Medium risk /
regulated lower risk

Certified – Traditional aviation
approach

<p style="text-align: center;">1</p> <p style="text-align: center;">INTERNATIONAL</p> <p style="text-align: center;">HIGH RISK (CERTIFIED)</p> <p>a) Operations: international RPAS</p> <p>b) Regulation: full certification in accordance with Annexes 1, 6 and 8</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">INTERNATIONAL</p> <p style="text-align: center;">MEDIUM/LOW RISK (SPECIFIC/OPEN)</p> <p>a) Operations:</p> <ul style="list-style-type: none"> • cross-border UAS • high seas UAS <p>b) Regulation:</p> <ul style="list-style-type: none"> • Annex 6, Part IV <u>not</u> applicable • future SARPs (Annexes 6 and 8)? • future SARPs (Annex 2, new App.)? • certificates scaled to fit
<p style="text-align: center;">3</p> <p style="text-align: center;">DOMESTIC</p> <p style="text-align: center;">HIGH RISK (CERTIFIED)</p> <p>a) Operations: domestic certified RPAS</p> <p>b) Regulation:</p> <ul style="list-style-type: none"> • national regulations • States encouraged to use Annex 6, Part IV 	<p style="text-align: center;">4</p> <p style="text-align: center;">DOMESTIC</p> <p style="text-align: center;">MEDIUM/LOW RISK (SPECIFIC/OPEN)</p> <p>a) Operations: domestic UAS</p> <p>b) Regulation:</p> <ul style="list-style-type: none"> • national regulations • future ICAO guidance? • impact from quadrant 2



- **Majority of definitions already adopted in other ICAO Annexes and Documents**
- **Some notes added to existing definitions to clarify applicability to RPAS**
- **Only three (3) new definitions introduced**
 - Remote crew member (added as a result of the CG-1 review)
 - RPAS-Recorder System – includes definitions for RPA-Recorder system (RPA-RS) and RPS-Recorder System (RPS-RS)
 - State of the RPS service provider



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Schedule

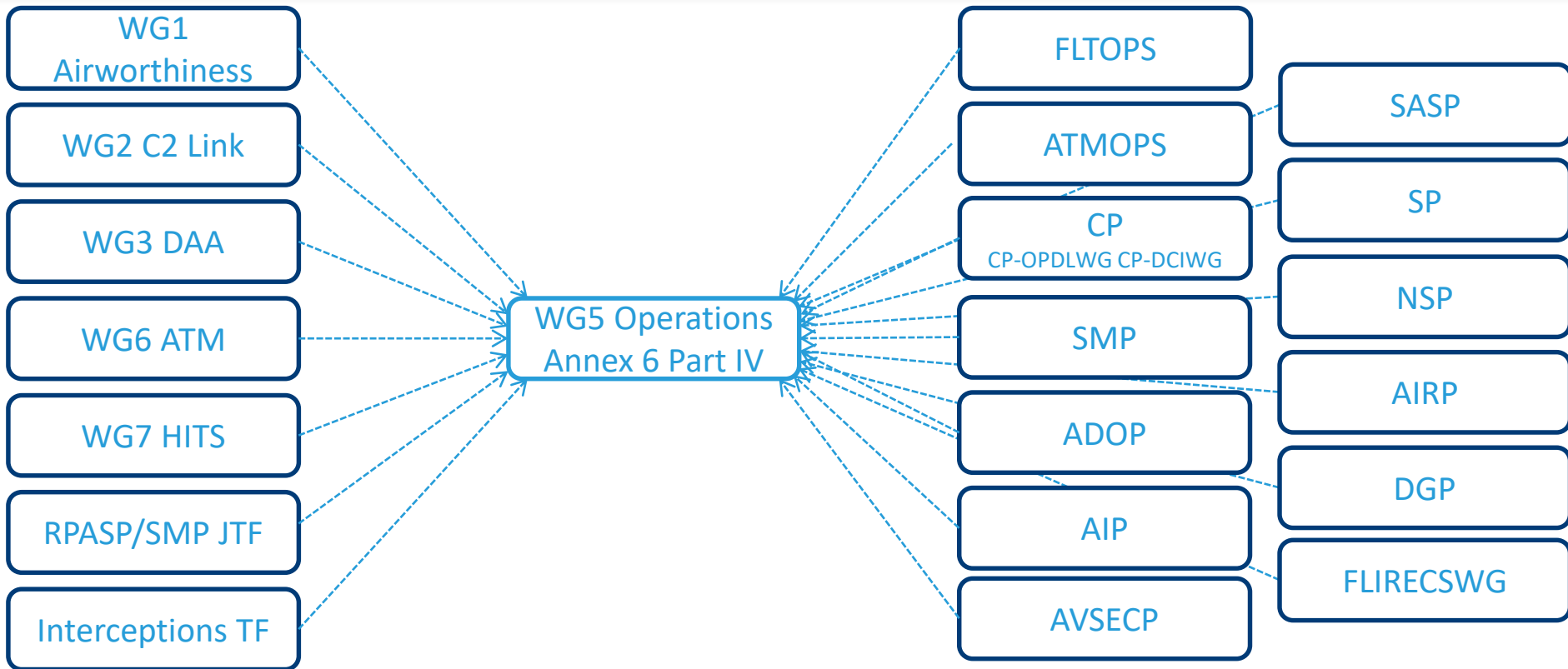
- **State Letter 2022/70 released on 23 August**
 - Responses/comments due by 23 February 2023
 - Adjudicate inputs/comments
- **Air Navigation Commission (ANC) final review - Q3 2023**
- **Adoption - Q1 2024**
- **Effective - Q3 2024**
- **Applicability - Q4 2026**



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Consultation

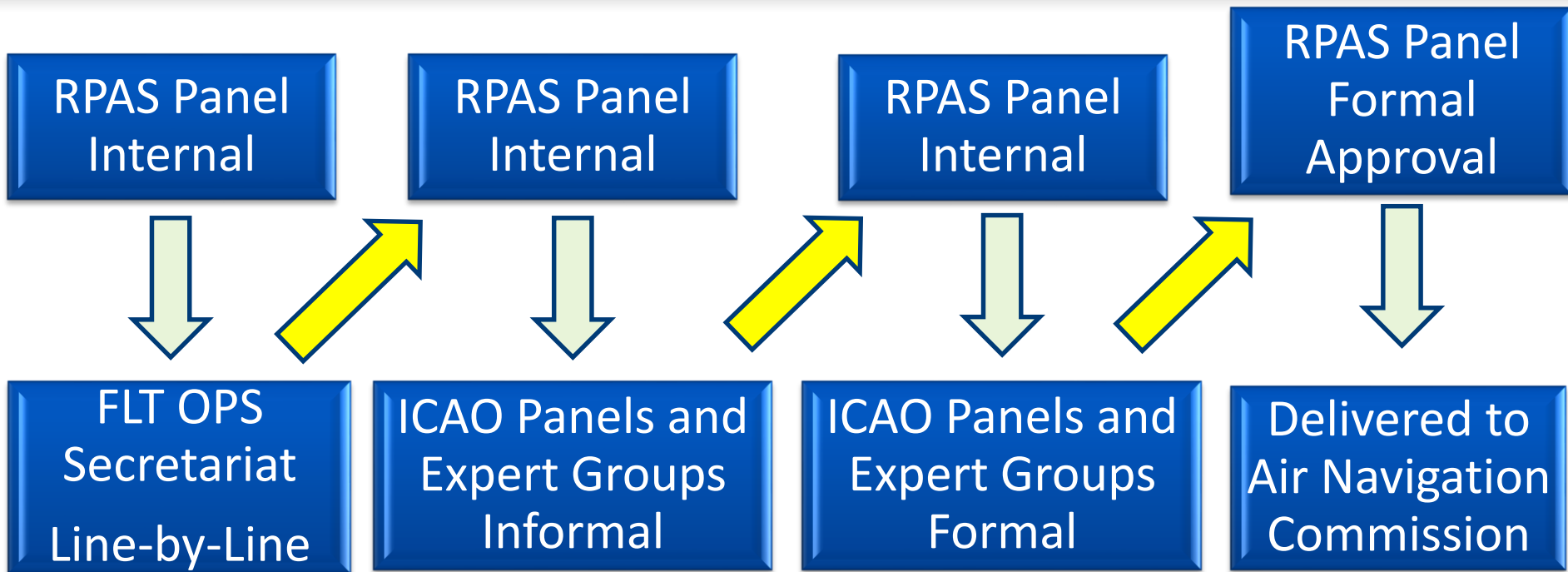




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Consultation





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Section 2 – RPAS Rules

Mr. Lance King



■ RPAS specific operating rules

- Flight plans are required in accordance with Annex 2.
- Performance and equipment requirements for the operational airspace.
- Similar requirements for operations from other than aerodromes/heliports.
- Operation of launch and recovery equipment ensures no impact on safety.
- Expected to follow pre-programmed and predictable flight profiles when lost C2 Link.
- Transponder to squawk Mode A Code 7400 when in lost C2 Link state.
- Changed Annex 6, Part I, Night IMC equipage requirements to requirements for knowledge of procedures for flights over heavily populated areas.



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Remote Flight Crew

■ Remote Flight Crew

- Licensed crew members are charged with duties essential to the operation of a remotely piloted aircraft system during a remote flight duty period.
- Crew composition, duties, training Standards similar to other Parts of Annex 6
- Provides that remote crew members be at and remain at their stations except when their absence is necessary for the performance of duties
- Specific standards established for RPAS related to handovers, multiple RPICs



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Remote Pilot Station

■ RPS

- Multiple PICs, inflight change of Remote Pilot in Command (RPIC)
 - Requires each RPA to have an RPIC
 - Does not limit the number of RPICs over a single flight
 - Does not limit the number of RPAs a single RP can be considered as a RPIC
- Multiple RPS
 - Provides for more than one RPS to control an RPA in both nominal and off-nominal events
 - Ensures safety is not compromised as control of the RPA transfers between RPs
- Handovers
 - Passes control of the RPA from one RPS to the next
 - Requires a single operator to have operational control of both RPS
 - Requires operators to develop procedures for all airborne and ground RPS transfers





■ DAA operational requirements

- RPAS operated IFR has a DAA capability
- DAA requirements comply with collision avoidance and right-of-way rules
- Does not necessarily require installed equipment.
- An automated system performs appropriate collision avoidance manoeuvres, except where the remote pilot (RP) can adequately perform the manoeuvre
- The remote pilot can intervene in the management of automated hazard avoidance manoeuvres except when a lost C2 Link state exists.
- Provides the State of the Operator a way to approve operations without automated DAA based on risk assessments for an equivalent level of safety.

■ Reasons why ELT not required

- No requirement to activate search and rescue (SAR) protocols
- RPA location would be valuable, but should be able to be accomplished via other means
- Opportunity to revisit depending on future RPAS configurations

■ No SAR responses

- No reasons for rescue, today
- Possibility of putting rescuers at risk
- Ground events related to a downed RPA would be handled by local authorities much more quickly than activating a SAR network.



■ RPAS-RS

- Significant input from/coordination with AIGP and FLIRECSWG
- Duration requirements mirror language in previously adopted RPAS SARPs
- Some functions to be recorded have yet to be determined

■ RPA-RS

- Weight limit established for full RPA-RS requirement – with partial requirements established for lighter RPA
- Similar protections and crashworthiness

■ RPS-RS

- RPS-RS requirements include those traditionally required on a conventional flight deck
- RPS-RS in contracted RPS addressed



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Section 3 – Oversight

Mr. Andrew Ward



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RPAS Operators Certificate

- RPAS Operator Certificate (ROC)
- Certification/supervision
- RPAS operator requirements
- ROC format/content
- Those already holding an AOC may have an easier path to gaining an ROC.

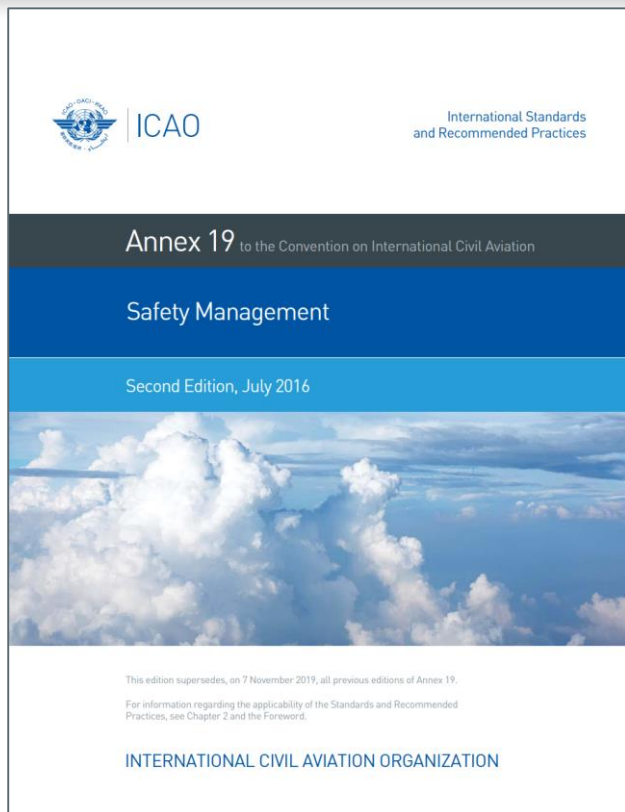




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Safety Management



- RPAS Operator requires an SMS
 - Does not diverge from Annex 19 principles
 - recognizes the potential for significant 3rd party service provision beyond that seen in conventionally piloted aviation
- Safety-critical service providers either fall under RPAS operators' SMS or need to have their own, SMS
 - C2CSP, RPS service provider, etc.
- Fatigue risk management

■ The Annex 10, Volume VI, Part II C2 System SARPs:

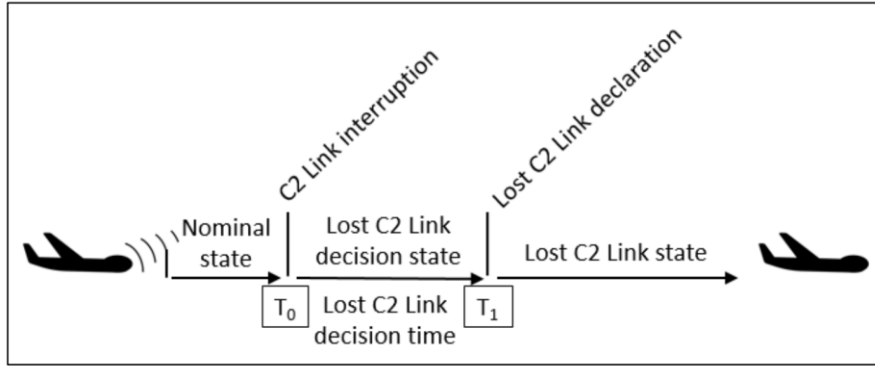
- Provide high-level technical requirements that can be applied to current or future C2 Link technology
 - Will not need to change every time the technical solution changes or a new technology is introduced
 - Provide a framework for any new technology concept
- Standardize C2 Link:
 - Performance - Performance based Required Link Performance (RLP), high level concept and process
 - Management - Performance based, response to commands to Establish/Terminate, Switchover, and Report Status
 - Compatibility - Performance based, management of interference and protection of systems
 - Security - Performance based security controls
 - Actual values for each of the above to be established in the Manual on C2 Links for RPAS (under development)



■ Provision of C2 Link

- Addresses oversight, performance, establishment, assurance and security
- Oversight of the C2 Link service provision is the responsibility of the State of the Operator
- Operator is responsible for monitoring C2 Link service provision quality
- Includes approval of a Service Level Agreement between RPAS operator and service provider (which would detail the QoS requirements)
- States to develop list of pre-authorized C2 Link service providers to ensure compliance with national requirements (e.g., use of approved spectrum)

■ References to Annex 10, Volumes V and VI for C2 Link standards



Details of lost C2 Link ATM coordination and charted procedures being developed by RPASP/ATMOPSP-JTF and WG-6

■ Lost C2 Link Standards

- RPA must be capable of following pre-programmed and predictable flight path
- Operator required to establish lost C2 Link procedures
- 7400 transponder code
- Remote PIC to provide ATC notification



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Documentation

- **Manuals, logs, electronic documents, etc.**
 - Flight manual
 - Operator's maintenance control manual
 - Maintenance programme
 - Journey logbook
 - Operator record-keeping
 - Records of emergency and survival equipment carried
 - Flight recorder records



- **Security requirements developed in coordination with AVSEC Panel**
 - Annex 6, Part IV places responsibility on the operator to ensure RPA and RPS are secure from unauthorized access
 - Annex 8 provides for airworthiness requirement for security of RPA, RPS, and Cybersecurity of the C2 and any physical links to the RPS





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