

ICAO RPAS Symposium

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***Certifying RPAS and
Their Components
(Remotely Piloted
Aircraft, Remote Pilot
Station, C2 Link)***

Interesting Title for the Panel!

- We used to call the Remotely Piloted Aircraft System
 - UA,
 - GCS,
 - and C2 links!
- But Annex 8, amendment 108 hardly mentions C2 links, and
- Command and Control links – no longer in FAA's or EASA's Type Certification basis
- With SATCOM, Networked Comms, and Cellular – this makes sense
- As technology changes and we gain more experience, we learn more about how we should certify RPAS

Ground Stations – What makes sense?

- If it looks, flies, and talks like an RPAS
 - Certify the GCS as part of the Aircraft
 - Or, certify GCS by itself - Annex 8 allows both
 - But, make requirements risk-proportionate!
- However, when it doesn't (look, fly, talk like an RPAS)
 - Apply new concepts to how the ground stations are certified
 - Especially for “Fleet Operations”
 - HAPS when “on station” in the stratosphere
 - Small Drone Delivery
 - Advanced Aerial Mobility

New concepts on how the ground stations are certified for “Fleet Operations” - Let's future proof the Rules!

- A Command Unit (CU) remotely controls the UA?
 - For RPAS with active pilot-in-the-loop concept of operations, and
 - In an air traffic controlled environment (ATCE), this makes sense
- But more advanced autonomy in UA and airspace management mean more than one vehicle can be managed by a single remote pilot
 - Allow “m:N” humans to aircraft
 - In Cooperative Control Environments (CCE), where Operators deconflict from each other using industry-defined/ANSP-approved Cooperative Operating Practices (COPs)
 - sUA have already broken the 1:1 RPIC to aircraft paradigm
- AAM Corridors and U-Space are CCE environments where Operators will want to use CCE and m:N to reach economic scale and real societal benefit
- **Command Unit becomes outdated when we “manage” rather than “control”**

New concepts on how the ground stations are certified for “Fleet Operations” - Let's future proof the Rules!

- Commercial Off the Shelf (COTS) components, e.g. computer equipment, displays, network routers, etc.
 - Becoming a bigger part of GCS configuration
- Requirements for using only approved design organizations or certified components will limit the use of the “best of breed” components available in the industry
- Changes to COTS equipment will be difficult to track - will drive quite a large burden onto Regulators to approve changes
 - Worst case – changes will be avoided due to the resulting burden
 - Not a good scenario – particularly with needed **security** updates

New concepts on how the ground stations are certified for “Fleet Operations” - Let's future proof the Rules!

- In CCEs Autonomous Fleet management begins to look more like airline air operations centers (AOC)
 - A small team manages the flights of a large number of highly automated aircraft
- AOCs are certified in **operational approvals** - not as part of aircraft Type Certificates
- In order to “future proof “ our rules, we could remove the ground station used in a CCE from the type certificate just as an AOC is not part of an aircraft type certificate

- FAA policy limits the boundary of Type Certification to UA only and approves the ground-based Associated Elements through an **operational approval**
- Annex 8 provides the flexibility for States to approve Ground Stations through a document equivalent to a Type Certificate
- If done right, such an equivalent document approving Associated Elements could be rigorous enough, but also flexible enough to:
 - Provide an appropriate approval mechanism for m:N human to aircraft ratios
 - Allow COTS without an undue burden on Industry or Regulators

A wide-angle photograph of Earth from space. The top half of the image shows a vast field of stars against a dark blue background. A thin, bright blue line separates the stars from the Earth's atmosphere. The bottom half of the image shows the Earth's surface, with a white cloud layer and a brownish-green landmass visible at the very bottom.

Discussion

Discussion other topics of interest to all High-Altitude Operations seeking certification

- HAPS Appropriate means of safety analysis for ground as well as air risk
- Environmental criteria e.g. DO-160 like requirements for the stratospheric environment
 - Temperature, pressure, etc.
 - Turbulence
 - Lightning
 - EMI
 - Space weather
- Conformance to shared intent - guidance material
- DAA requirements and guidance material
- Communications – opportunity to discuss Voice Over IP
- Component failure rates and test methods for ultra-long duration missions