



FAA UAS SYMPOSIUM

Type Certification for UAS – Back to the Future



Federal Aviation
Administration



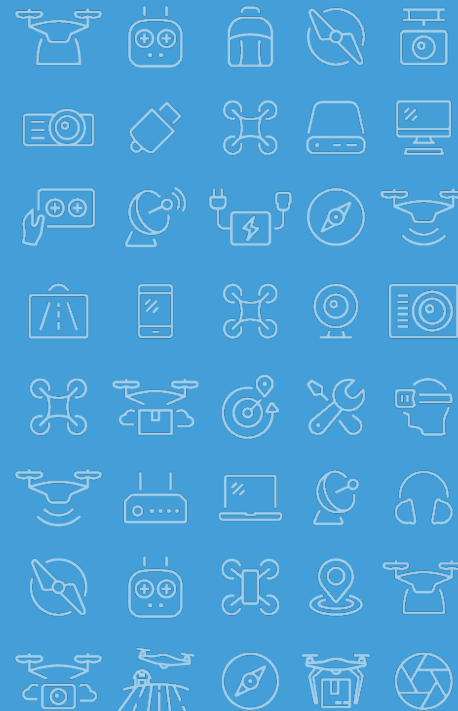
Type Certification for UAS – Back to the Future



**Melvin Johnson,
FAA Aircraft
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Service**



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**FAA UAS
SYMPOSIUM**

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Overview



- Type Certification
- 14 CFR 21.17(b)
- Performance Based Airworthiness Criteria
- Means of Compliance
- TC Workshop



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Type Certification

- Title 49 U.S.C. § 44701 directs the FAA to promote safety of flight of civil aircraft by prescribing minimum standards
- We do this by prescribing minimum standards for the design, material, construction, quality of work, and performance of
 - Aircraft
 - Aircraft Engines
 - Propellers
 - Appliances
- When we find a product is properly designed and manufactured, performs properly, and meets prescribed requirements, we issue a design approval in the form of a TC



Type Certification

- Our current process and requirements have been developed over the course of more than 50 years of certification experience
- Reflects decades of aviation lessons learned
 - Accidents
 - Incidents



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Managing Risk for UAS

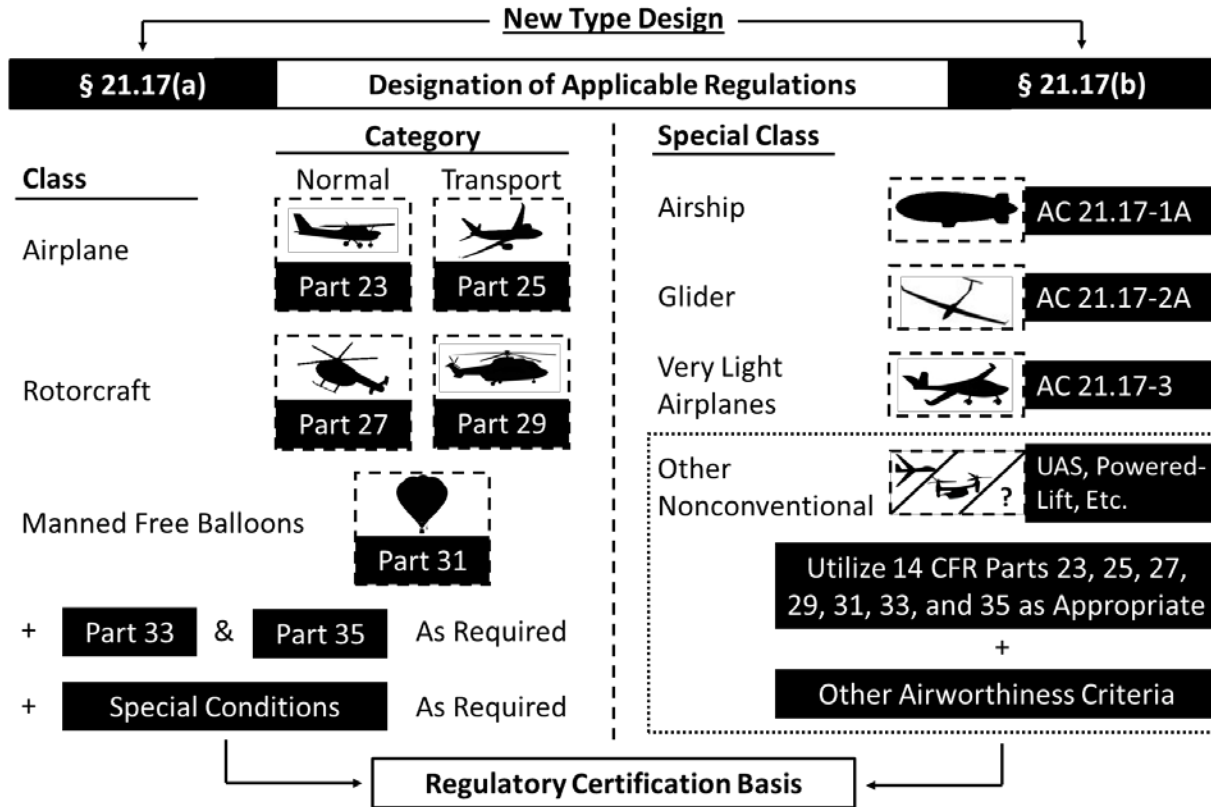
- Certification manages risk through “Safety Assurance”
 - Confidence a proposed product or action will meet FAA safety expectations to protect the public
 - FAA risk-based processes are well-proven
- Certification is an acknowledgement that FAA requirements are met for:
 - Aircraft, Aeronautical Products, Airmen, Mechanics, Controllers, Operators, etc.

What is §21.17(b)?

§ 21.17(b) - For special classes of aircraft, including the engines and propellers installed thereon (e.g., gliders, airships, and other nonconventional aircraft), for which airworthiness standards have not been issued under this subchapter, the applicable requirements will be the portions of those other airworthiness requirements contained in Parts 23, 25, 27, 29, 31, 33, and 35 found by the [FAA] to be appropriate for the aircraft and applicable to a specific type design, or such airworthiness criteria as the [FAA] may find provide an equivalent level of safety to those parts. [Amdt. 21-92]

- Allows the FAA to tailor the certification basis for each product
- Can include
 - FAR's (14 CFR Parts 23, 25, 27, 29, etc.)
 - Other airworthiness criteria

Designation of Applicable Regulations



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Performance Based Requirements

Administrator Huerta

December 2016 in Reference to Issuance of Part 23, Amdt 64

“In the past, it made sense, ... to be quite specific about what you need to do to build the airplane. And the FAA viewed its role as overseeing and telling the industry, ‘this is how you need to build the airplane.... to ensure safety.’

Technology has come a long way, and the pace of innovation has [increased] at exponential rates. ... And so that’s why we’ve adopted risk-based decision-making ... , and that is why we are evolving much more broadly to performance-based regulations.” <https://youtu.be/rM41Kf3RAHo?t=1627>



Prescriptive vs. Performance-Based



Prescriptive Regulatory System	Performance-Based Regulatory System
Establishes specific technical requirements that must be met by applicants and approval holders	Establishes <i>outcomes</i> that must be achieved; allows flexibility in how the applicant or approval holder achieves those outcomes
<i>Example:</i> Emergency exits must be movable windows, panels, canopies, or external doors...that provide a clear and unobstructed opening large enough to admit a 19-by-26-inch ellipse.	<i>Example:</i> The airplane must be designed to facilitate rapid and safe evacuation in conditions likely to occur following an emergency landing.



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Performance-Based Regulations

Pros and Cons



Pros	Cons
Greater agility in accommodating innovation and new technologies	Defining requirements in terms of performance can be challenging.
Stronger focus on achieving the desired safety performance	Defining what compliance looks like can be difficult
Improved understanding of risks	Compliance planning requires more effort
Potential for stronger safety culture within regulator and industry	



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Yamaha Fazer R

- Broke hazards down to basic level, proposed mitigations
- Team from LAACO, EPSB, RCSB, and SASB developed certification basis
- Performance-Based requirements, coupled with operational considerations



UAS Performance Based Requirements



- Yamaha Fazer R Certification Basis published 83 FR 19021, Document 2018-09102
- <https://www.federalregister.gov/d/2018-09102>
- Utilized as a building block for future projects

UAS Communication:

1. The applicant must define the type, methods, and operational limits of communication, including the mitigation of any hazard created by any loss of communication between the flight crew and between the flight crew and the UAS.
2. A means must be provided to allow for all communication necessary to safely operate the UA.



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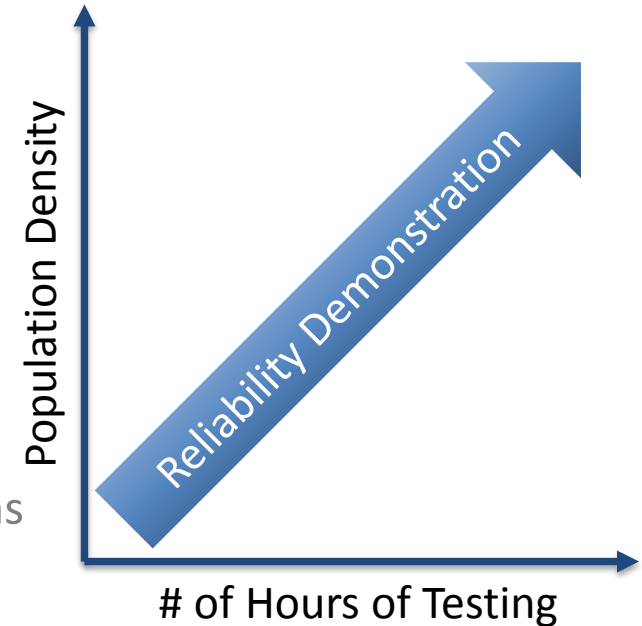
Means of Compliance (MoC)

- Means of Compliance have evolved through decades of type certification
- Reliability demonstrations were once heavily utilized
- Utilizing analysis and other techniques became more efficient and cost effective for manned aviation
- For smaller UAS, reliability as a MoC is an effective way to demonstrate compliance



Endurance & Durability Testing

- Testing to demonstrate the UAS has an established reliability commensurate with the risk
- Number of hours necessary dependent on population density
- Hours divided into two categories
 - Portion of hours will be conducted in operationally representative conditions
 - Remainder will prescribe specific test conditions (corners of flight envelope)
- Multiple UA utilized to demonstrate hours



Specific Demonstration Tests

- Verification and validation of specific systems and proposed limitations
 - For example: verification and validation of proposed C2 range, geofencing
- Includes forced failure tests
 - Most critical OEI testing
 - GPS degradation/failure
 - Control station failure



Proposed Design Checklist

- Items pulled from existing regulations and best practices for design
 - Will not be so prescriptive as to dictate design elements
- Provides level of confidence in overall design
- Framed as Yes/No questions



LAACO TC Workshop(s)

- There will be upcoming workshop(s) at the LAACO
 - Full day – will get into full details of TC process
 - Will discuss performance based airworthiness criteria
 - Utilizing reliability as MoC
- Applicants will be contacted with the dates and information
- For more information, contact the LAACO

ACO Address & Contact Info

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Questions?



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Networking Reception – Level 400 Foyer

Morning Plenary starts at 8 AM



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