

Certification of Unmanned Aircraft Systems (UAS)

Risk-Based Approach

Presented to: 10th Annual Rotorcraft Symposium

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Rotorcraft Directorate
FAA

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Agenda



- **UAS Integration**
- **Incremental Approach**
- **The Safety Continuum**
- **Applying the Safety Continuum to UAS Certification**
- **Draft Advisory Circular**
- **Strategic Goals**



Challenge: Safe UAS Integration

Rapid Industry Growth



Open Market & Airspace

Rapidly Evolving Use Cases

Innovative Technology

Low Regulatory Burden

Judicious Integration

Defined CONOP & Mitigations

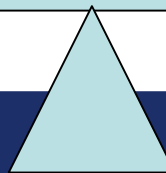
Standardization

Risk Based Regulations

FAA Safety Goals



Seek Balance



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UAS Integration

“How do we begin to accomplish safe, judicious integration of UAS while balancing the desired pace of industry with the safety expectations of the FAA?”

- We Know How to Certify New Things**
- Risk Based Approach to Certification**
- Regulatory Continuum – Performance Based**
- Real Action – 13+ open TC projects**



How Are We Regulating UAS?

Relying on successful history of integrating new technologies into the National Airspace System (NAS) safely



Well- proven risk-based approach to safety & oversight

Scaled level of certification rigor, setting accepted level of safety based on societal safety expectations & demands

FAA is using a risk-based approach to UAS Certification & Integration

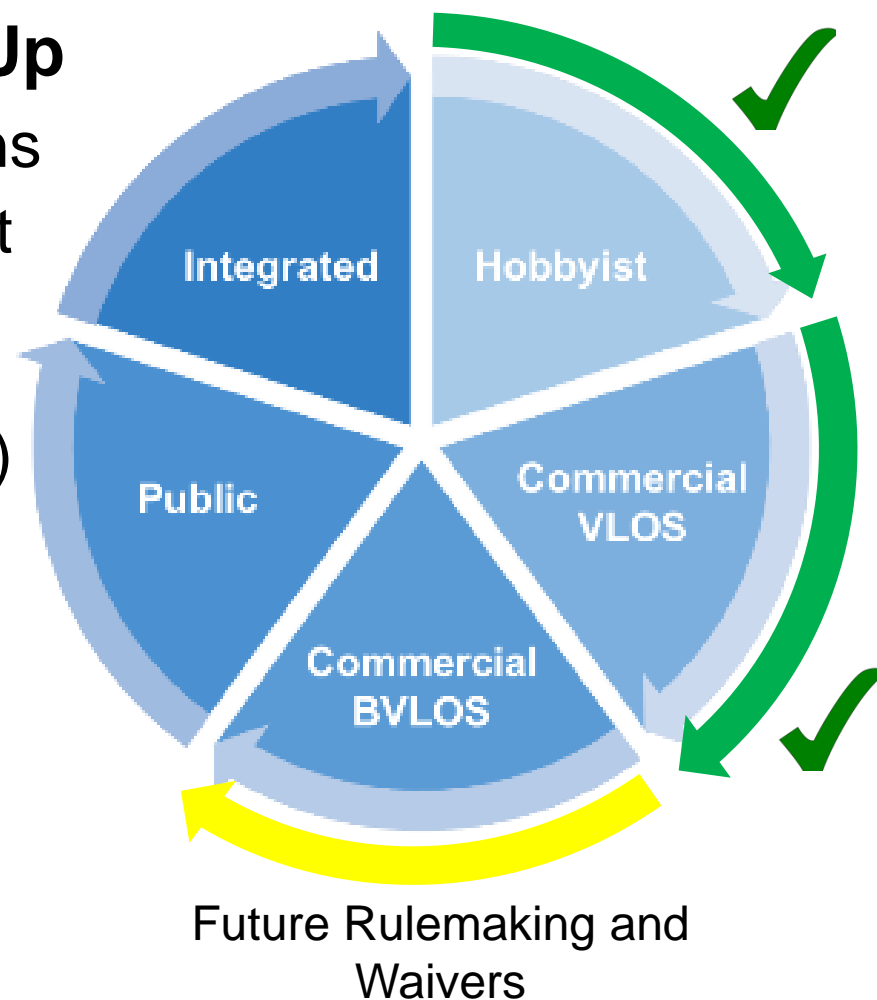


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Incremental Risk-Based Integration

Start With Low Risk & Work Up

- Hobbyist/Recreational Operations
- Low Altitude Visual Line Of Sight (VLOS) Operations
 - Part 107 – August 29
- Operations Over People (Future)
- Beyond Visual Line Of Sight Operations (Future)
- Expanded UAS Operations (All Sizes and Airspace)
- Fully Integrated/Controlled UAS Operations



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The Small UAS Rule (Part 107)

- First rules for routine operation of small UAS
- Effective August 29, 2016
- Must weigh less than 55 lbs. and be registered
- UAS operators must obtain a Remote Pilot Certificate
- 400 feet or below , visual line-of-sight, daylight operations, not over people



Expanding Beyond the 107 Rule

- **Certain sections of Part 107 are waiverable**
 - Top five requested waivers:
 - Nighttime operations (most requested), Operations over people, Beyond Line of Sight, Above 400 ft, Use of Visual Observers,
 - Challenge: The limit of what is acceptable under Part 107 vs. the need for airworthiness certification
- **Waivers and Pathfinder projects will help us decide future rule priorities**
- **Lessons learned will help address airspace integration, including equipage for C2 and Detect & Avoid**

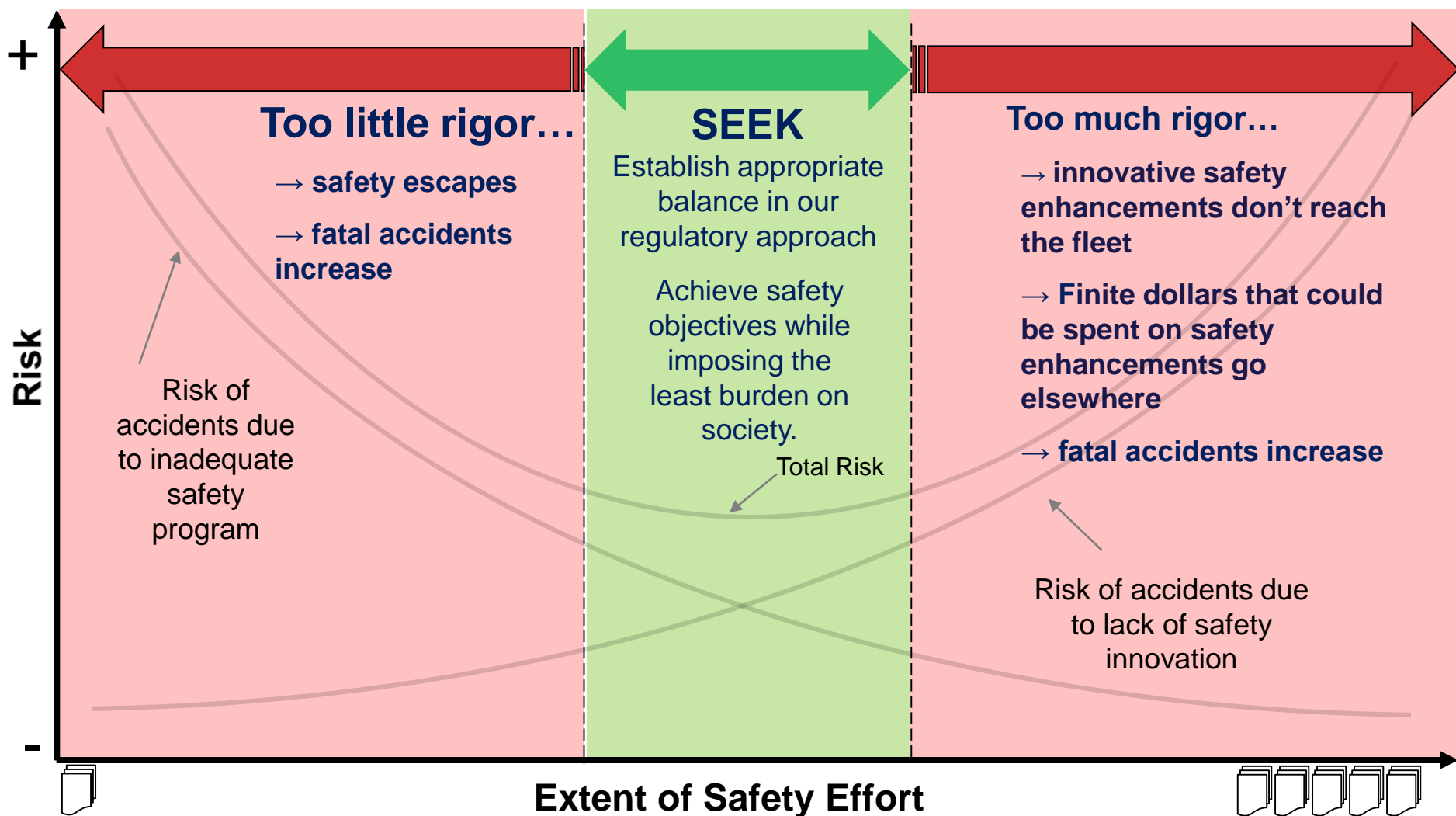


Certification Process/Progress

- **13+ TC Projects (Under Current 21.17(b) Regulatory Structure)**
 - Ranging in Size from 5 lb. to 15,000 lb.
 - Exercising our §21.17(b) regulation for Special Class
 - Learning what future rule changes are necessary
- **Long Term**
 - We don't want to TC/PC sUAS UNLESS operational risk or level of integration requires airworthiness
 - Considering Part 21 change – Similar to Light Sport Airworthiness Process to Expand Beyond 107 Rule
 - Predicated upon mature Industry Standards

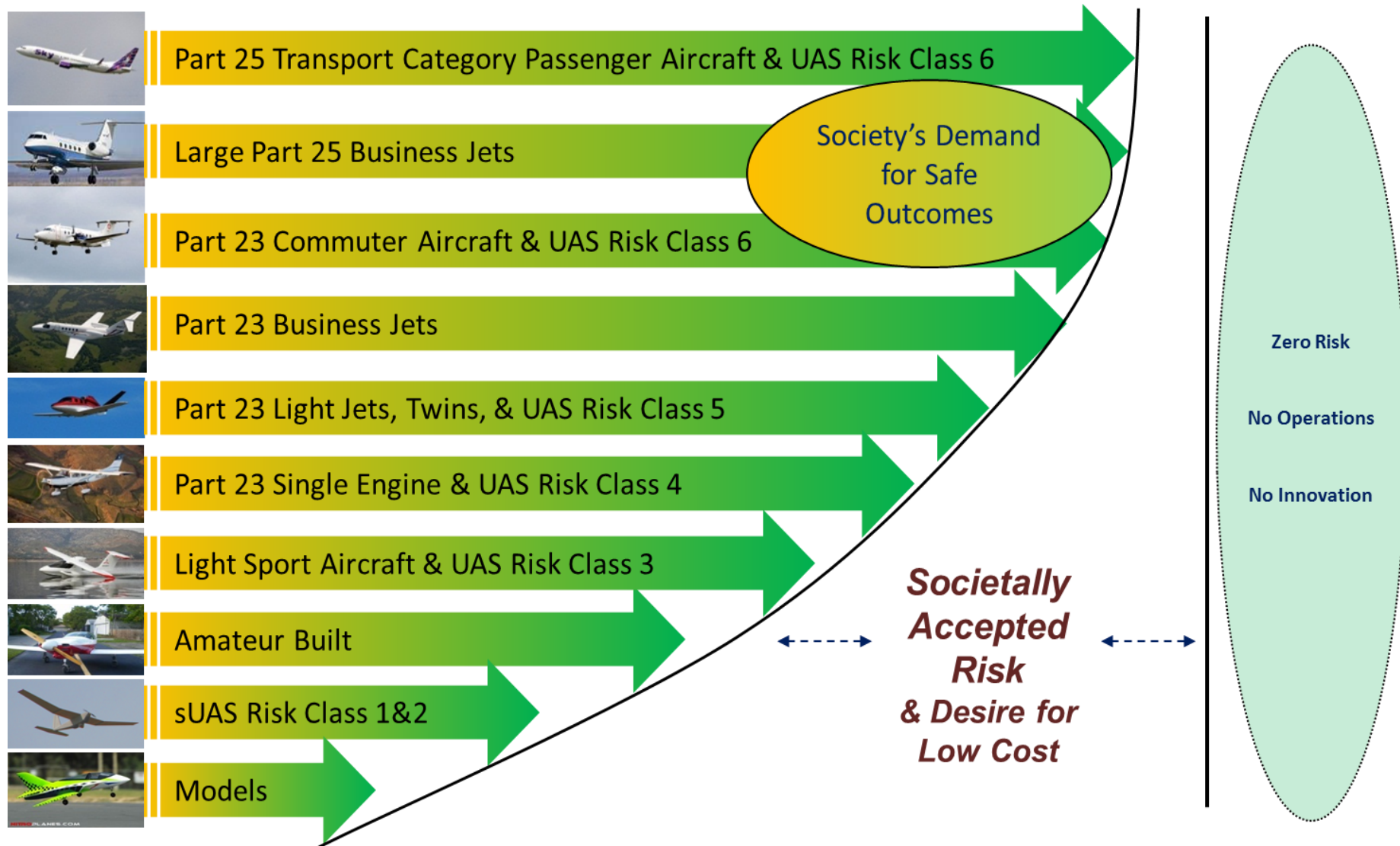


System Safety – The Safety Continuum



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Applying Our Safety Continuum



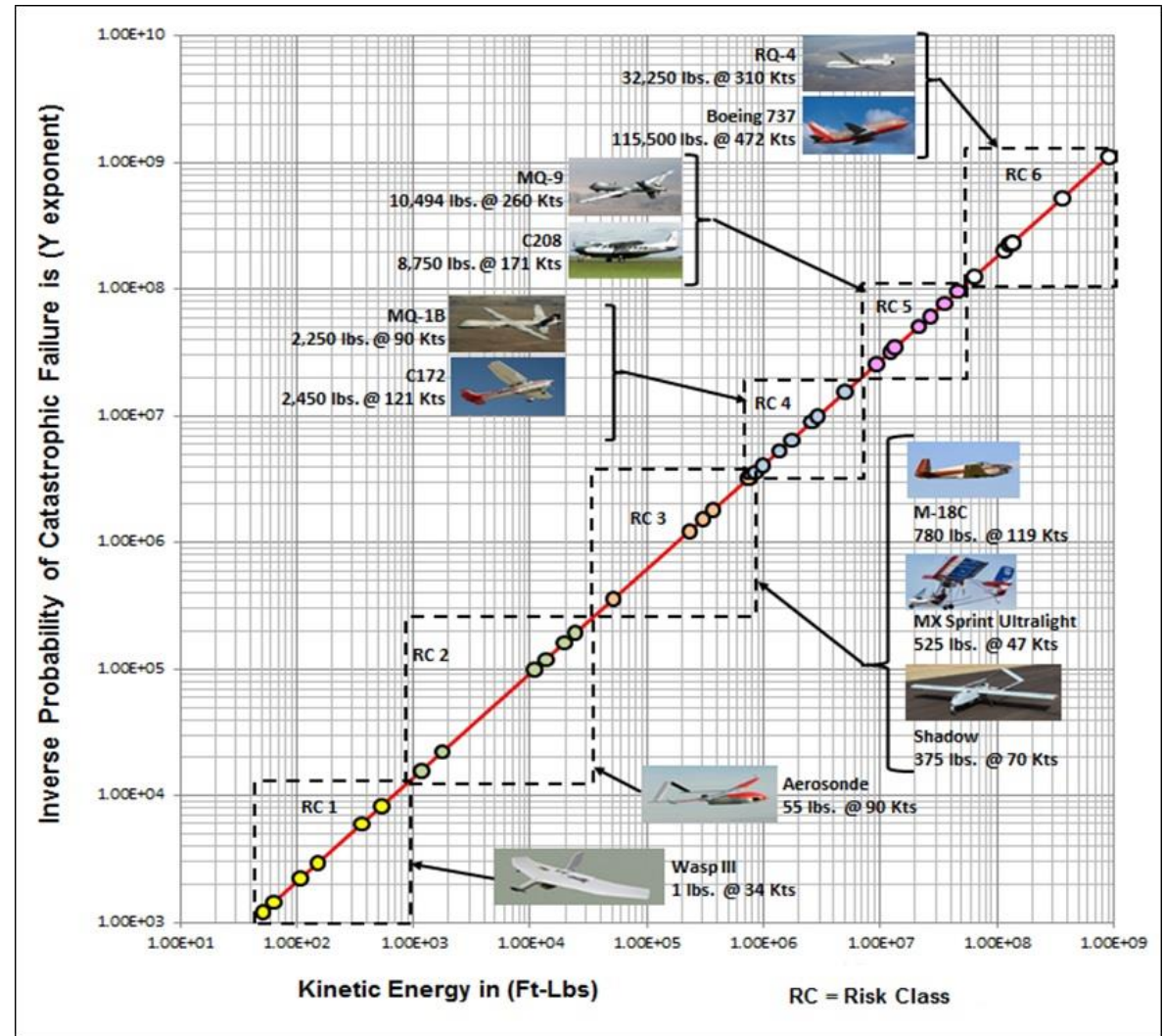
Level Of Certification Rigor



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UAS Classes

- UAS risk classes match Continuum for manned aircraft
- Natural groupings by size, energy, airspace, etc.
- Assumes Part 91 Ops



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Utilizing § 21.17(b) Special Class

§ 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
 - Special Conditions
 - Industry Standards
 - Other Tailored Requirements




Certification Basis

- **Certification basis will be worked with the applicant**
 - Defined in a G-1 Issue Paper
 - FAR's, SC's, Industry Standards
 - Published in Federal Register for public comment
- **Certification basis will be custom tailored to each UAS and its CONOPS**
 - Risk mitigated through operational and geographic limitations in addition to design assurances
 - Change in CONOPS may require amending TC



Initial Draft Advisory Circular for UAS

- **Provided process for certification under 14 CFR 21.17(b)**
 - Background on risk based approach
 - Initial risk classes
 - Guidance on cert basis development
- **Not a new concept**
 - § 21.17(b) Currently used for Airships, VLA, Tiltrotor



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Design Standards and Assumptions for Type Design Approval Under 14 CFR 21.17(b) of Fixed Wing Unmanned Aircraft Systems (UAS) Date: DRAFT AC No: 20-XX-XX
Initiated By: ACE-100 Change:

1. **Purpose.** This advisory circular (AC) provides guidance for obtaining a type certificate under Title 14, Code of Federal Regulations (14 CFR) part 21 for fixed wing unmanned aircraft (UA) and its control station in the Special Class aircraft category under § 21.17(b).

2. **Applicability.**

a. The guidance in the document is provided to those who seek a type design approval for an unmanned aircraft and its control station under § 21.17(b).

b. This AC provides an acceptable means, but not the only means, of meeting the requirements of part 21 for the issuance of a type certificate. It does not fully address requirements for operational integration of the UAS design or pilot certification aspects, as these are functions performed by FAA Air Traffic and Flight Standards, respectively, and are mission and aircraft dependent. This AC focuses on basic design features necessary for issuance of a type certificate, leveraging existing aviation design standards and practices wherever appropriate for UAS. Operational approval and integration into FAA airspace may require additional compliance demonstrations to the FAA and will require coordination with Flight Standards and Air Traffic on a case-by-case basis.


c. Existing operational rules and equipment requirements apply unless specific negotiations for unique operational approvals are coordinated with the FAA for operations such as pipeline surveillance and precision agriculture. For additional information on UAS operations, see the FAA UAS Integration Roadmap available at:
http://www.faa.gov/uas/media/UAS_Roadmap_2013.pdf

d. The basic concepts in this AC cover all UAS, but only directly addresses fixed wing aircraft at this time. It may be superseded by specific regulations and guidance for small UAS or other future rulemaking efforts. This material is not regulatory, nor does it establish minimum standards. Although this guidance is tailored for applicants interested in obtaining a

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Revised UAS Certification Material

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Draft AC 20-XX-XX

- (Design Standards and Assumptions for Type Design Approval Under 14 CFR 21.17(b) of Fixed Wing Unmanned Aircraft Systems (UAS))

Background and History

Training Materials

Instructions for ACO & Directorate

New AIR UAS Order

Process for Obtaining UAS TC

New AIR UAS AC

Technical Requirements

UAS TC Handbook



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FAA Regulatory Vision

Existing

- Issuing Type Certificates (TC) with the process we have
- Using §21.17(b) for certification of commercial operations not covered by 333 exemptions, part 107, or waiver.
- UAS TC projects under 21.17(b) will inform future part 21 revisions.
 - Customize scalable certification requirements, expectations for demonstration of compliance, and FAA involvement in the detailed compliance finding

Future

- Part 21 and 91 changes to implement risk-based approach based on the Risk Categories to utilize FAA resources efficiently.
- The proposed part 21 change & 23 regulatory re-write will promote innovation and implement risk-based oversight for manned and unmanned aircraft.



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EASA Has a Similar Approach



OPEN:

Low risk
Low involvement of
Aviation Authority
Limitations : Visual
line of sight,
Maximum Altitude,
distance from airport
and sensitive zones

Like Our 107 Rule



SPECIFIC

Increased risk
Operations
Authorisation with
operations manual
Specific qualification
of drone, personnel,
equipment based on
safety assessment

**Waivers/Exemptions/Future
Part 21 Changes**



CERTIFIED

Regulatory regime
similar to manned
aviation
EASA and Authority
Certificates

Like Our 21.17(b) Rule



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Strategic Goal, Risk-Based Certification

Rising to the Challenge

- **Creating Our Regulatory Continuum Now**

- Working pathfinders and 13 projects under the current regulatory structure
- International Collaboration - ICAO, EASA, etc.

- **Ready for the Future**

- Our certification projects inform future rule changes
- Considering further changes for low and medium risk UAS

- **Importance of Industry Engagement**

- Engage **EARLY** and **OFTEN** about new technologies
- Upfront involvement will help the FAA determine the certification basis and get out of the critical path to certification

<https://www.faa.gov/uas/>



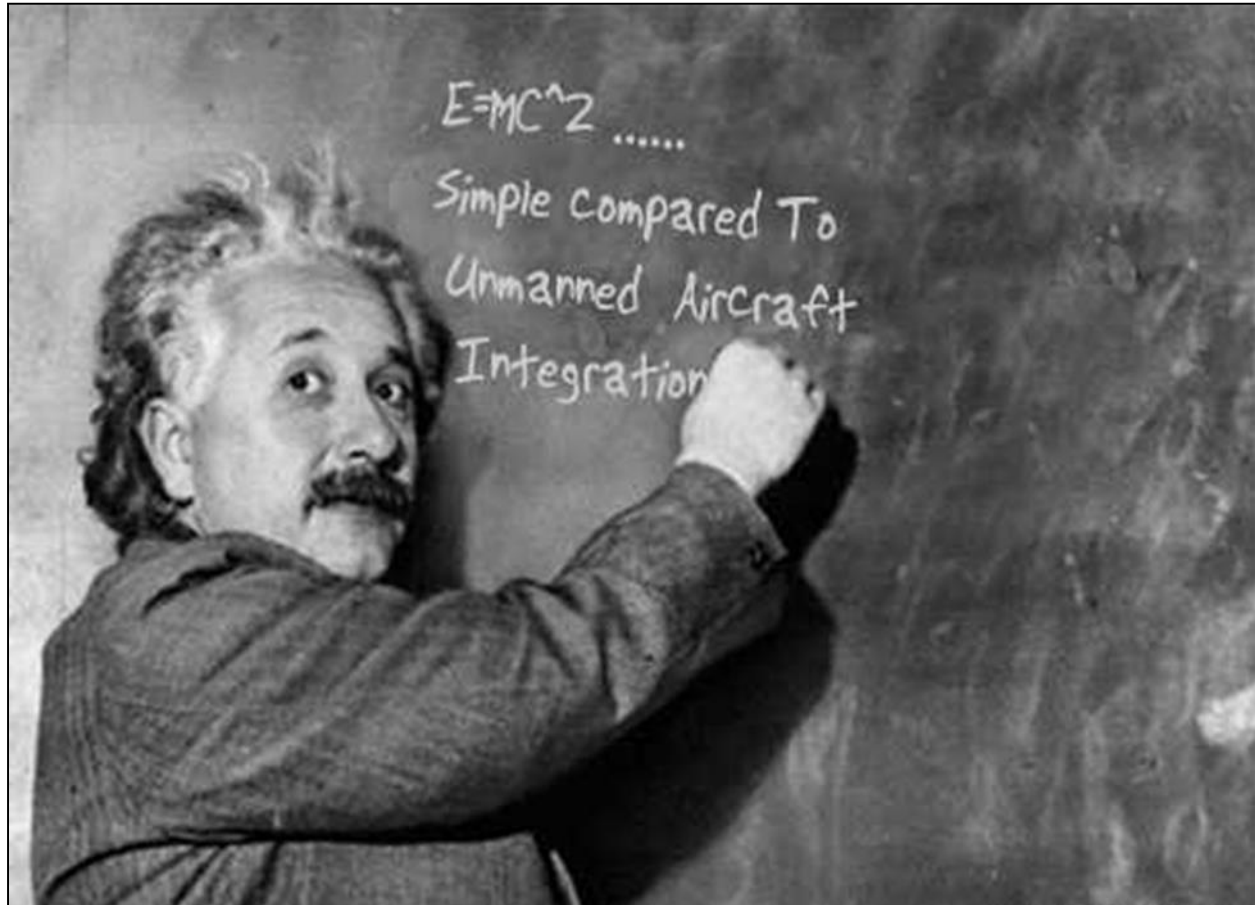
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UAS Success - Key to Future

- **UAS Provide Ways to Safely Prototype New Technology**
- **Automation & Flight Control Technology**
- **Auto Collision Avoidance - Air/Ground**
- **Automatic Landing**
- **Refuse to Crash Logic**
- **Propulsion Systems**



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