



# FAA UAS SYMPOSIUM

## UAS Type Certification – Worth the Effort?

#UAS2018



Federal Aviation  
Administration



# UAS Type Certification – Worth the Effort?



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# Why is Certification Needed?



FAA can only act within its defined rules

Today there are only 3 Civilian paths

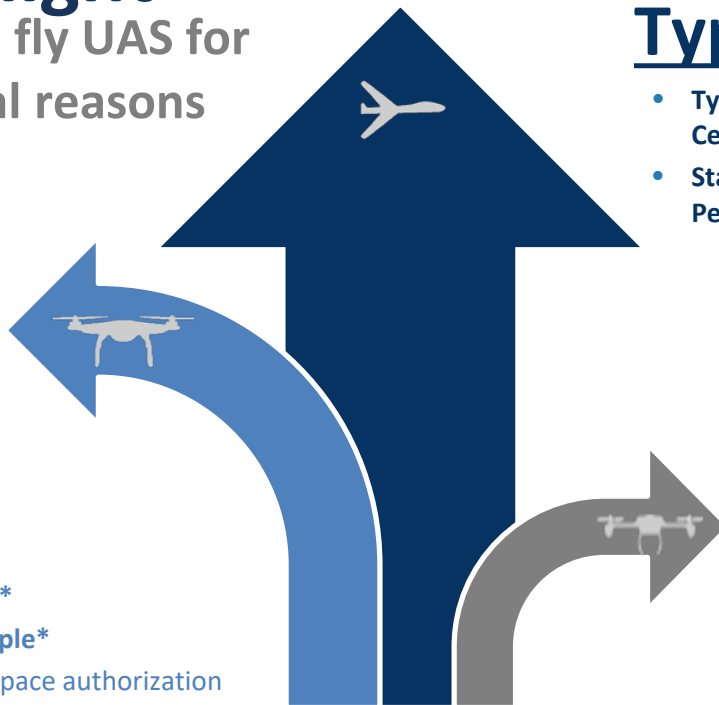
# Paths to Flight

Multiple way to fly UAS for non-recreational reasons

## Part 107

- UAS < 55 lbs.
- Class G Airspace\*
- Visual Line of Sight\*
- At or below 400ft\*
- Fly during day\*
- Fly at or below 100mph\*
- No operations over people\*

\* Can receive a waiver or airspace authorization to fly beyond requirement



## Type Certificate

- Type Certificate required for Standard Airworthiness Certificate
- Standard Airworthiness Certificate needed for Carrying Persons or Property for Compensation or Hire

## 333 Exemption/FESSA 2210

- Stopgap until Part 107 was Published
- UAS over 55 lbs.
- Pilot reqs. on case-by-case basis
- Requires COA for airspace authorization
- FESSA 2210 expands to BVLOS for Critical Infrastructure

# Type Certification

The approval of a design for a product (aircraft, aircraft engine, or propeller). To obtain the approval, an applicant must show compliance to the applicable airworthiness standards, including noise and emissions.



The United States of America  
Department of Transportation  
Federal Aviation Administration

## Type Certificate

Number \_\_\_\_\_

This certificate is issued to certify that the type design for the following product, when used under the conditions and limitations as prescribed in the Federal Aviation Regulations and the Type Certificate Data Sheet meets the aircraft, engine, and propeller type design standards established by the Federal Aviation Administration.

This certificate, and the Type Certificate Data Sheet which is a part hereof, shall remain in effect until surrendered, suspended, or annulled in a termination date as otherwise established by the Administrator, the Federal Aviation Administration.

Date of application: \_\_\_\_\_  
Original Date of issuance: \_\_\_\_\_  
Date of re-issuance: \_\_\_\_\_

By Director of the Administration  
(Signature) \_\_\_\_\_  
(Title) \_\_\_\_\_

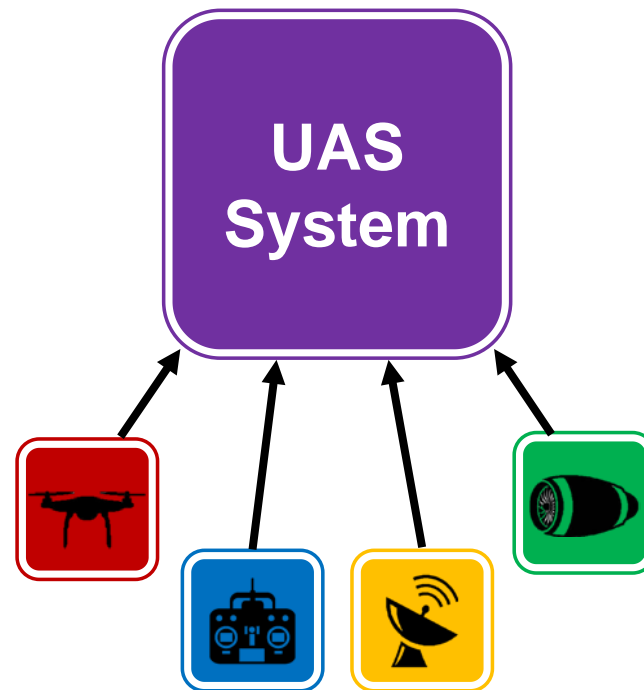
This certificate may be transferred if endorsed as provided on the reverse hereof.  
Any alteration of this certificate and/or the Type Certificate Data Sheet is punishable by a fine not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-9 (2-82)(Representations)

# UAS Type Certification



- UAS type certified as a system
  - Aircraft +
  - Control Station +
  - Any engines and propellers are certified as a part of the UAS



# Safety Continuum – Managed Risk



Part 25 Transport Category Passenger Aircraft

Large Part 25 Business Jets

Part 23 Commuter Aircraft

Part 23 Business Jets

Part 23 Light Jets, Twins

Part 23 Single Engine

Light Sport Aircraft

Amateur Built

Models

Toys

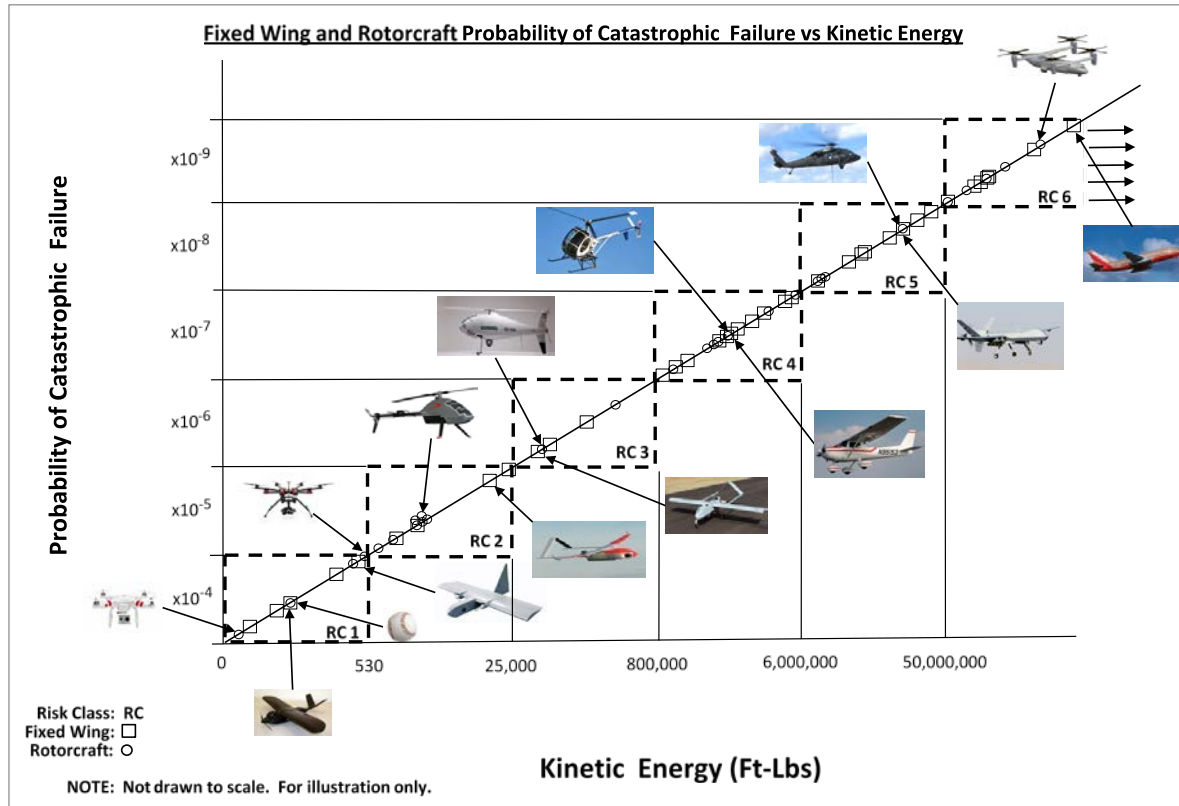
Level Of Certification Rigor & Oversight

Society's  
Demand for  
Safe Outcomes

*Societally Accepted Risk*  
*Desire for Low Cost*  
*Potential for Innovation*



# UAS Safety Continuum & Classification





# New Type Design

21.17(a)

Designate Applicable Regulations

21.17(b)

Category

Class

Normal

Transport

Special Class



AC 21.17-2A

Airplane

Part 23

Part 25

Airship



AC 21.17-1A

Rotorcraft



Tilt-Rotor



25 + 29 + TR

Part 27

Part 29

Other

Manned free balloon



Part 31

nonconventional



UAS

+ Part 33 , Part 35 *As required*

+ Special Conditions *As required*

Utilize Parts 23,25, 27, 29, 31, 33, 35 as appropriate

Regulatory Certification Basis

Unique Airworthiness Requirements

# Why § 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
    - Special Conditions
    - Other Tailored Requirements
    - Standards

# Type Certification Process



- Organized into 5 phases
  - Conceptual Design, Requirements Definition, Compliance Planning, Implementation, and Post Certification Activities
- Descriptive Data (Drawings) + Compliance Data (Analysis/Test) = TC
- Details described in Order 8110.4C, Type Certification
  - [rgl.faa.gov](http://rgl.faa.gov)
- Efficiency of accomplishing the TC is presented in the FAA and Industry Guide to Product Certification (CPG)

# Type Certification Process



## Conceptual Design

- Process Orientation
- Pre-Project Guidance
- Familiarization Briefing

## Requirements Definition

- UAS Conceptual Design
- CONOP
- Risk Classification
- Preliminary TCBM
- Operational Risk Assessment
- Certification Basis Established
- ATO/AFS Coordination

## Compliance Planning

- Applicant's Responsibility
- FAA Involvement-LOPI
- Certification Plan
- Conformity Inspection Plan
- Applicant's Responsibility
- Oversight and Delegation
- Interim TCBM
- ATO/AFS Coordination

## Implementation

- Compliance Data Generation
- Compliance Substantiation
- Compliance Showing
- ATO/AFS Coordination
- Issue TC

## Post Certification Activities

- Type Inspection Report
- Data Retention
- Required Documents at Delivery
- TC Holder Info
- Continued Airworthiness
- ICA Changes
- Post Certification Evaluation

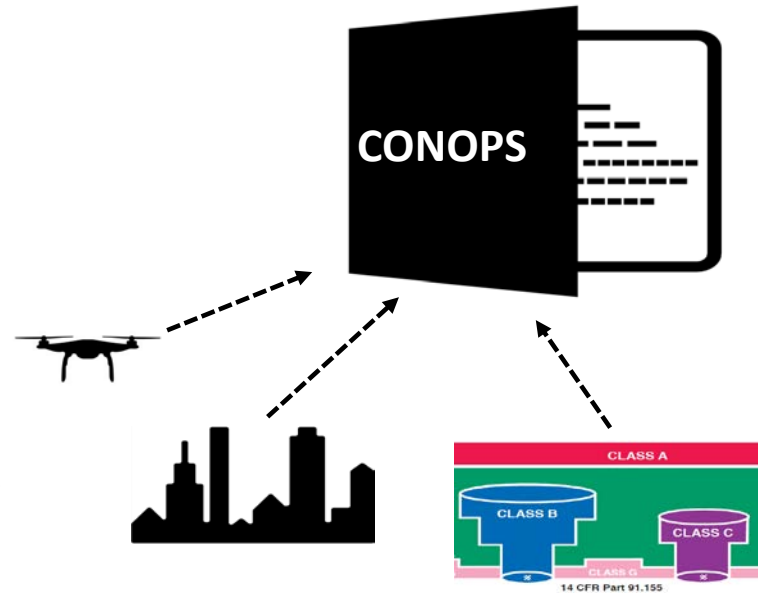
# Conceptual Design



- Propose the Basic Configuration of the:
  - Aircraft
  - Engine & Propeller
  - Control Station

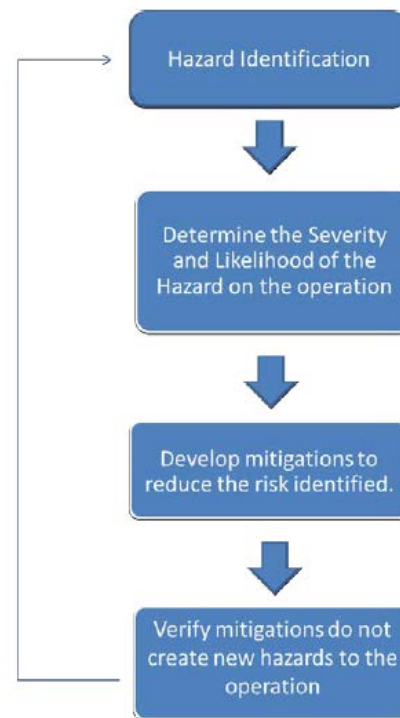
# CONOPS

- Gives FAA clear understanding of proposed operations
- Includes:
  - Description of UAS
  - Details of Intended Use
  - Proposed Area of Operations
  - Intended Classes of Airspace
- Enables development of ORA



# Operational Risk Assessment

- Section 21.17(b) allows type design approval with cert basis developed from any source of airworthiness requirements deemed acceptable by FAA
- § 21.17(b) process will leverage existing aviation standards and practices as appropriate for risk class of UAS by tailoring applicable certification requirements
- Applicant should mitigate all hazards associated with design and CONOPS to acceptable level of safety through airworthiness requirements and operational limitations



# Operational Risk Assessment



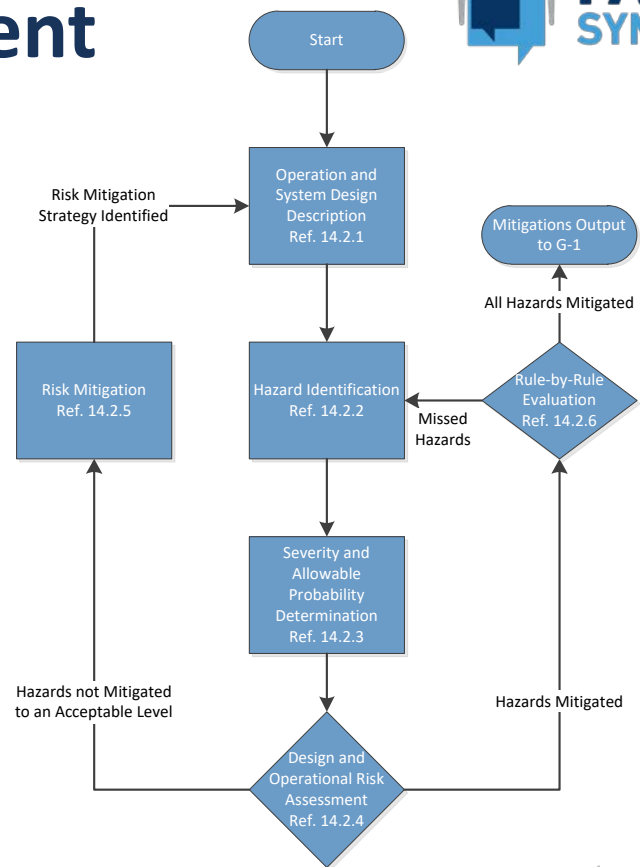
- ORA process identifies hazards associated with each UAS function and mitigations for each hazard
- Mitigations for specific hazard can include airworthiness requirements, operational limitations, or combination
- Contains all hazards for UAS and CONOPS, and proposal for airworthiness requirements and operational limitations that will mitigate the hazards
- Airworthiness requirements and operational limitations will be output to G-1 Issue Paper (IP) to define cert basis for project



# Operational Risk Assessment



- To verify completeness of ORA, a Rule-by-Rule Evaluation is performed
  - Review existing manned aircraft, engine, and propeller regulations and determine applicability of regulation and hazard
  - For Risk Classes 1 and 2, utilize ASTM F2910-14



# Operational Integration

- Type Certification does not grant Operational Approval
- Existing Operational Rules are still Applicable
  - §§ 61, 91, 119, 135, etc.
- Exemptions or waivers may be required for operational approval
  - Requires coordination with FAA Flight Standards Service (AFS) and Air Traffic Organization (ATO)

# Requirements Definition



- All requirement contained in the G-1
- Published in Federal Register
- Public comments
- Final requirements published in Federal Register

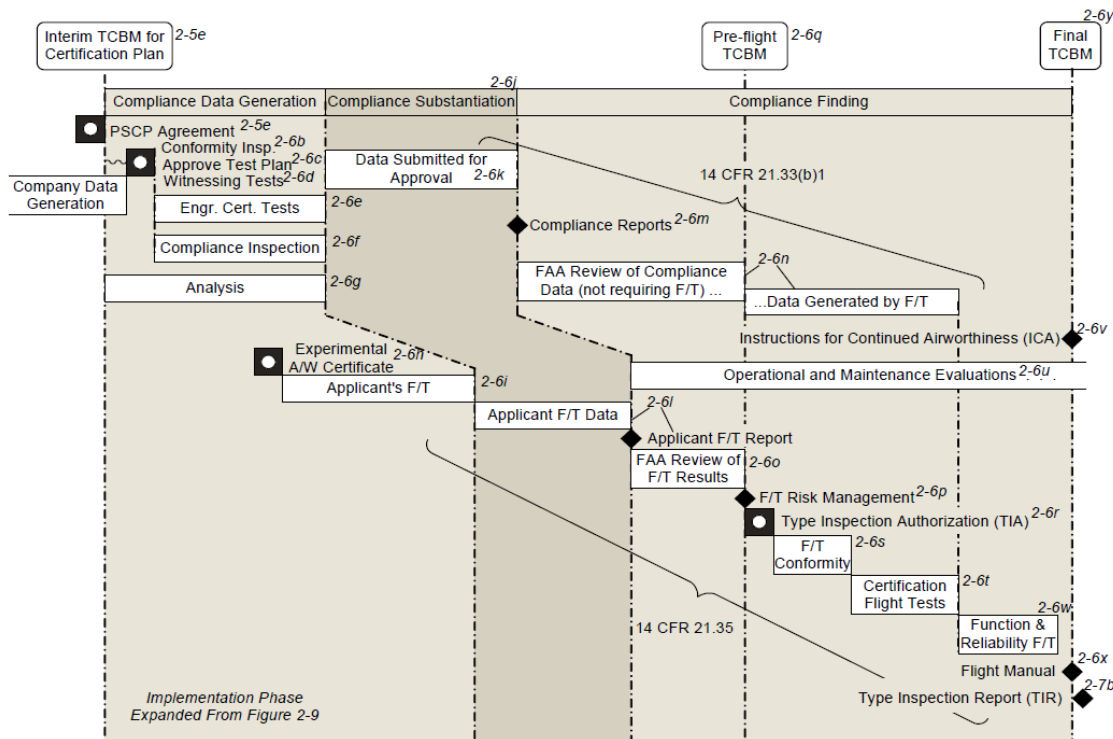
# Compliance Planning

- ORA Expansions
- PSCP (Project Specific Certification Plan)



# Implementation Phase

- This phase can be divided into 3 parts
  - Compliance Data Generation
  - Compliance Substantiation
  - Compliance Showing



# Compliance Data Generation



- Purpose
  - Develop data for showing compliance
- Activities in this sub-phase include
  - Running tests
  - Developing compliance data

# Compliance Substantiation



- Purpose
  - Preparation and presentation of various data in a logical order with explanation of how the data shows compliance
  
- Activates in this sub-phase include
  - Writing compliance reports (sometimes called substantiation reports)
  - Writing flight test reports

# Descriptive Data

- Drawings
  - Drawings for parts, assemblies, & installations
  - Material processing
  - Tolerances
- Building to C of A
- The Descriptive Data has been shown compliant with Certification Basis- G-1 (FAR 21.31)



# TC

- TADA



*The United States of America  
Department of Transportation  
Federal Aviation Administration*

*Type Certificate*

*Number \_\_\_\_\_*

*This certificate issued to  
certifies that the type design for the following product with the operating limitations and  
conditions thereon as specified in the Federal Aviation Regulations and the Type  
Certificate Data Sheet meets the airworthiness requirements of part \_\_\_\_\_ of the Federal  
Aviation Regulations.*

*This certificate, and the Type Certificate Data Sheet which is a part hereof, shall  
remain in effect until surrendered, suspended, revoked, or a termination date is otherwise  
established by the Administrator of the Federal Aviation Administration.*

*Date of application:*

*Original Date of issuance:*

*Date of re-issuance:*

*By Director of the Administration*

*(Signature)*

\_\_\_\_\_

*(Title)*

\_\_\_\_\_

This certificate may be transferred if endorsed as provided on the reverse hereof.

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FAA FORM 8110-9 (2-82)/Representation

# Partners, not Adversaries

- Open and timely communication
- Commitment to meeting schedules
- Early identification of potential issues
- Strive to resolve issues quickly at the project level
- Respect each other's role on the team
- Develop an amicable working relationship



# Partnership for Safety (CPG)



- We're on the same team
  - FAA view: The certification process is a team effort
  - Our goals are the same: To field a compliant, safe, and reliable product
- We each have our own roles
  - You are responsible for producing a compliant, safe, and reliable product
  - We are responsible, on behalf of the public, to verify that you have shown compliance
- We strive to work as partners, not adversaries



# Summary & Contact



- Type certification manages risk through safety assurance
- Collaboration on certification process is the key to success
- Operational integration is still a large challenge
- The Los Angeles Aircraft Certification Office is the focal for UAS certification applicants
  - 3960 Paramount Blvd, Lakewood, CA 90712
  - Ph: (562) 627-5222

