EASA
European Aviation Safety Agency

# Workshop on Modelling & Simulation: AIAA CQbA Status Review

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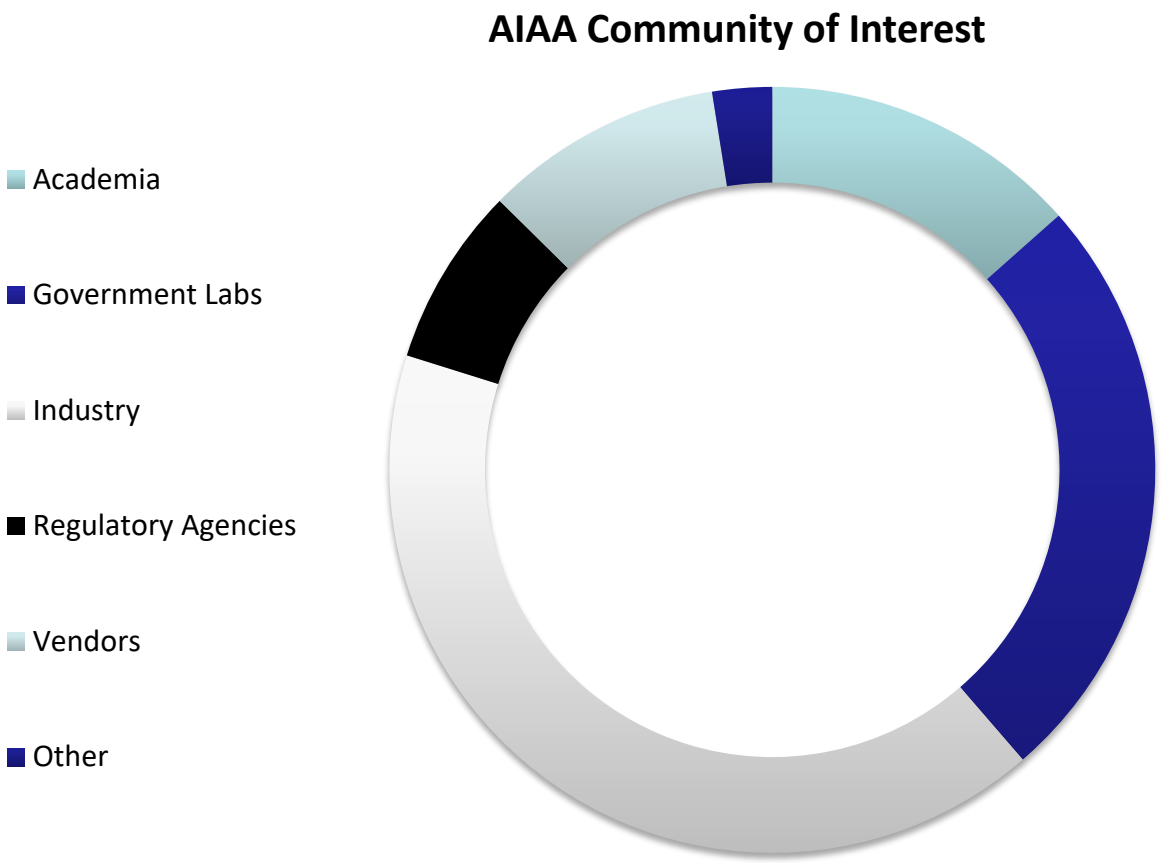
# Background

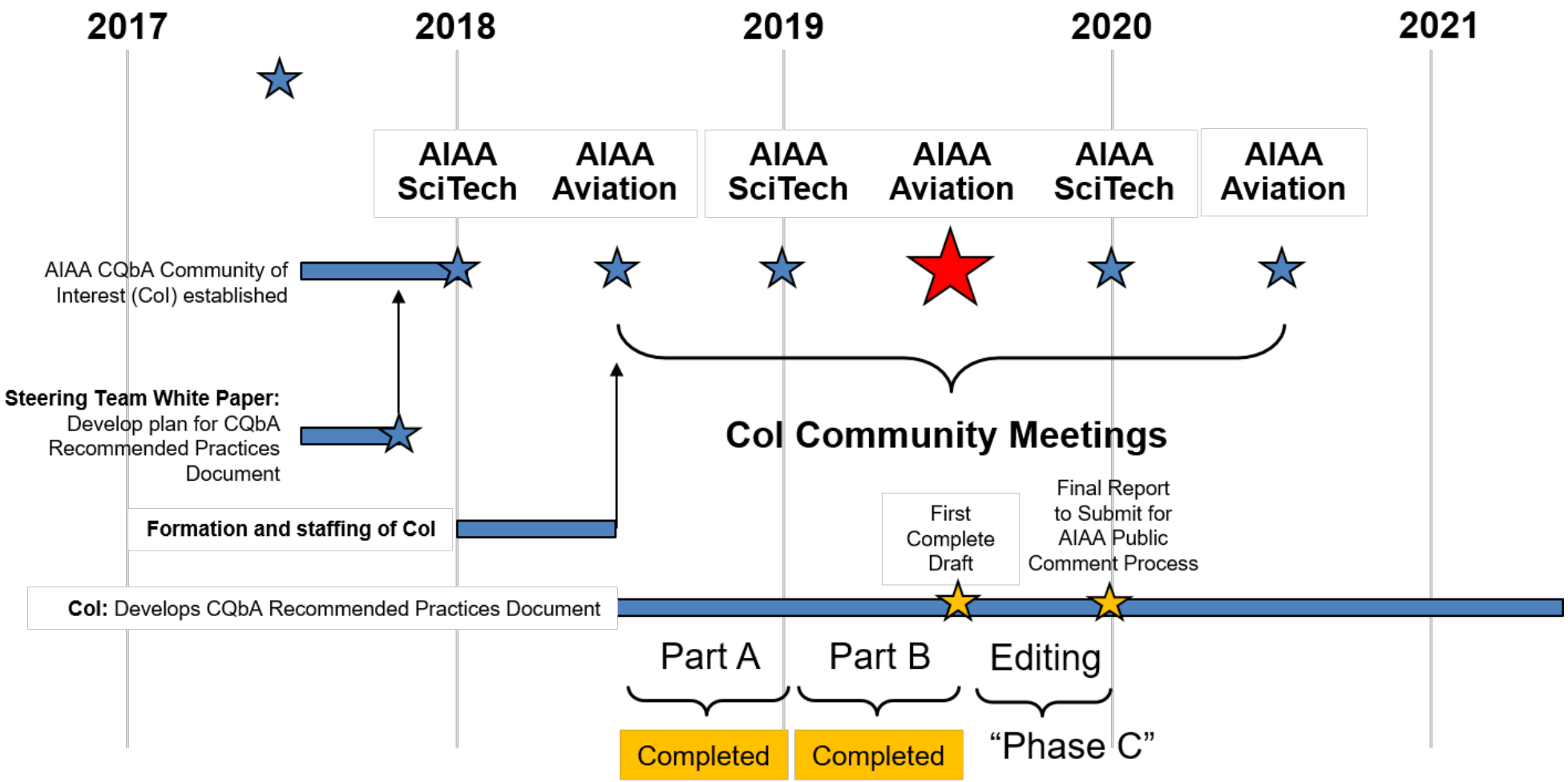
- During panel discussions at 2017 American Institute of Aeronautics and Astronautics (AIAA) Aviation conference, Certification and Qualification by Analysis (CQbA) was identified as a topic becoming more and more important
- To address this issue, a Community of Interest (CoI) was established, with focus on Flight Modelling
- Main goal: to develop **“recommended practices”** in the application of analysis processes to generate numerically-derived simulation data to build and strengthen trust between regulators and airframe/engine manufacturers in the use of CQbA

# AIAA CQbA CoI

- Status June 2019: 119 registered participants

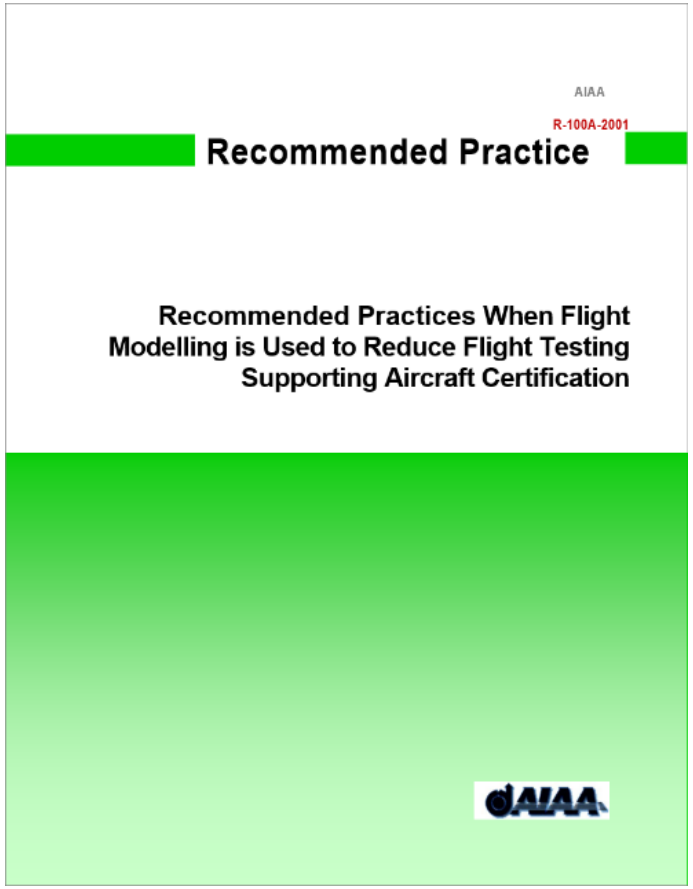


# Timeline


2017
2018
2019
2020
2021
AIAA SciTech
AIAA Aviation
AIAA SciTech
AIAA Aviation
AIAA SciTech
AIAA Aviation
AIAA CQbA Community of Interest (CoI) established
Steering Team White Paper: Develop plan for CQbA Recommended Practices Document
Formation and staffing of CoI
CoI Community Meetings
First Complete Draft
Final Report to Submit for AIAA Public Comment Process
CoI: Develops CQbA Recommended Practices Document
Part A
Part B
Editing
Completed
Completed
"Phase C"

# Recommended Practices document (1/4)

- The CoI has been working on the Recommended Practices document since early 2018
- Mainly through regular Webex meetings
- Supported by DLR Sharepoint site
- Impressive progress in relatively short time


AIAA
R-100A-2001
Recommended Practice
Recommended Practices When Flight Modelling is Used to Reduce Flight Testing Supporting Aircraft Certification

# Recommended Practices document (2/4)

- Focus is on Flight Modelling
  - Aircraft performance and flight handling
  - Aim to reduce physical flight testing
  - Increased reliance on analysis (CFD, desktop simulation,…)
  - Addresses structural aspects (loads, aeroelasticity) as well
    - Does not address systems aspects

- The document is not EASA/FAA A(M)C material, but may serve to support future CQbA discussions

# Recommended Practices document (3/4)

- For CQbA to be successfully applied, six tasks have been identified:
  - Task 1: Configuration Management
    - “Version Control” – Completeness of Records, Administrative Processes
  - Task 2: Model Verification
    - “Code Verification”
  - Task 3: Application Verification
    - “Solution Verification”
  - Task 4: Model Validation
  - Task 5: Justification of Analysis Adequacy
    - Errors/uncertainties, extrapolation
  - Task 6: Applicability Assessment

# Recommended Practices document (4/4)

- These six tasks have been applied to several example applications (not addressing all applicable requirements):
  - Ice Shapes on Unprotected Surfaces
  - External Radome Addition on the Fuselage of a Previously Certified Airplane
  - Addition of Winglets to a Previously Certified Airplane
    - Climb Performance (14 CFR/CS 25.121)
    - Lateral Control (14 CFR/CS 25.147(c)(d)(f))
    - Static Loads (14 CFR 25.301(b))
    - Flutter (14 CFR 25.629)
  - New Airplane

# Some Items of Discussion within CoI

- Develop common understanding of definitions and terminology
- Some example applications are reflecting state of the art, others are more visionary
- Concern voiced by Industry representatives on any additional burden imposed when simulation/analysis is used for state of the art applications
- Errors and uncertainties
  - “Deterministic” versus “probabilistic”

# Summary

- The AIAA CQbA CoI has been developing a Recommended Practices document since early 2018 on Flight Modelling
  - To be finalized early 2020
- Document contains a set of recommended practices (tasks) for reducing flight testing relative to established aircraft certification practices
- Many similarities with other CQbA activities
  - Dynamic seat testing, crashworthiness, bird strike,..
- It is not too late to join the CoI….

# Q&A

Any questions…?