FAR 23 Amendment 64
An Applicants' Perspective

"double the safety at half the cost"

MERLIN

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Merlin is building the world's **most experienced Pilot**, enabling existing and future aircraft to fly with **reduced crew,** and eventually autonomously.

Dave Weston — Cert Lead
Paul Wright — Design Cert Lead & Software Cert Specialist
Matt Pollock — Senior Avionics Engineer

Caravan

Autonomous certification program (STC) program underway with CAANZ and the FAA for Cessna 208B Grand Caravan

Prescriptive vs. Performance.

- **Reduce cost & complexity** : Remove barriers for introduction of new safety enhancing technologies & keep pace with emerging technology.
- **Performance based requirements** : *establish outcomes* that must be achieved rather than *prescriptive technical requirements*.
- **Risk based requirements :** Levels 1-4 based on max passengers, Catastrophic $<10^{-6}$, 10^{-7}, 10^{-8} or 10^{-9} respectively.
- **Means of Compliance :** Industry Standards (ASTM), FAR 23 Amdt. 63 or *Applicant Proposed MOC*.
- **What about Autonomoy?** Safety enhancing technologies that introduce *new features*, *functions* and *operational concepts* to the aircraft?

https://www.aviation.govt.nz/assets/aircraft/2017-design-delegation-seminar/far23-rewrite.pdf

www.faa.gov/about/office_org/headquarters_offices/avs/offices/air/directorates_field/small_airplanes/media/p23_reorg_arcfinal.pdf

RECOMMENDATION	REALITY
Regulator Test Article Conformity: • Labour intensive & logistically challenging. • Test article(s) located oversees. • Recommend *Configuration Management* as alternative.	**Merlin NZ STC Implementation:** • Test Article production under part 145/148. • Aircraft/part configuration managed as per standard 148/145 processes. • Normal practice for CAANZ STCs.
Showing Compliance / Finding Compliance: • FAA Level of Involvement minimised based on level of risk. • Consider risk of improper analysis or test compromising certification data. • Regulator reviewing fewer compliance reports.	**Merlin NZ STC Implementation:** • STC Application made through Part 146 ADO. • FOC assigned to CAA or 146 DDH per risk. • Normal practice for CAANZ STCs.

RECOMMENDATION	REALITY
Use of Video Recordings in Testing: • Labour intensive & logistically challenging. • Use Video Recordings to witness testing unless a specific reason for not allowing for specific test.	**Merlin NZ STC Implementation:** • Certification Testing not yet commenced. • Test articles in Kerikeri, Mojave, Boston & Others. • *Significant scope*: System bench testing, software testing, simulator HF testing and A/C ground & flight testing.
Production Manual: • Creation of a *Production Manual* to help new startup aircraft companies gain necessary procedures for *Production Certificate*.	**Merlin NZ STC Implementation:** • Existing Type Certified Aircraft. • Certification via STC. • Part production using Part 148 MO. • Aircraft modification using Part 145 MRO.

RECOMMENDATION	REALITY
Design Organisation Handbook (*Exposition*): • Organizations with clear and well organised handbooks can perform the same certification activities faster and more efficiently. • FAA provides guidance on what should be in an ODA manual yet there is still a significant amount of local interpretation.	**Merlin NZ STC Implementation:** • Flight Structures Part 146 ADO engaged as Lead Certification Organisation (SOC & FOC). • Beca Part 146 ADO engaged as Software Certification Organisation (SOC & DO-178). • Merlin internal design control procedures receive oversight from Part 146 ADO's and Merlin Certification Lead (current DDH). • Merlin Strategy to utilise Part 146 ADO capabilities to certify autonomy in New Zealand, supported by Part 100 SMS and Part 135 Operations.

RECOMMENDATION	REALITY
Certification Plan Acceptance: • Cert plan frequently held up awaiting special conditions, exemptions, ELOS etc. • Held up because regulator asks for more detailed compliance information on individual sections.	**Merlin NZ STC Implementation:** • Establish baseline cert basis and MOC in PSCP. • Identify features, functions & rules requiring special attention and concurrently develop *Issue Papers* as *Design Concept* matures.
Foreign Validation Costs: • Harmonization of the part 23 regulations across international CAAs, along with the ASTM standards has the potential to have a significant positive impact on the time and cost involved with foreign validation.	**Merlin NZ STC Implementation:** • FAR 23 is acceptable cert basis. • FAA Validation concurrent with CAANZ STC. • Key aspects/challenges: > Harmonised Cert Basis & Issue Papers. > Resolve differences in STC process (FAA/CAA) > Integrate ‘Tech Assist’ alongside Validation.

Prescriptive vs. Performance.

- **What does compliance look like** : Performance based requirements can be challenging;
  > Time/cost to develop requirements.
  > More time to negociate with regulator(s).
  > New dynamic between Applicant & Regulator.
- **Concurrency Risk**: Cert requirements developed concurrently with Design.
- **146/DDH/SOC Familiarity :** New understanding required for SOC and FOC signatories (training?).
- **Regulatory Defaults :** Default to known FAR 23/25 requirements e.g. *Human Factors*, *System Safety*, *Software Certification*, *Development Assurance*.
- **Validation Impact :** Challenging to harmonise CAANZ and FAA across STC Process, Cert Basis and Issue Papers.

Prescriptive vs. Performance.

- **Regulator Collaboration**: Development of Performance Requirements concurrent with Design neccesitates close regulator collaboration.
- **Bispoke Performance Requirements**: Performance Requirements can leverage specific configurations and operational limitations. *Proprietary Cert Basis*!
- **History is Important:** Existing knowledge base is huge – Rules, ACs, Policy, NPRM etc.

  Don't need to re-invent the wheel, just need to adapt it so that its fit for purpose.
- **Bringing Engineering & Certification Closer:** *Performance requirements* can directly reflect the *Intended Purpose/Function* of the *Design*.
- **New & Novel Features and Functions** .

Vision: The world's most experienced Pilot

Currently integrated on several platforms, the Merlin Pilot can scale to the most complex aircraft, even next generation aircraft not yet in operation.

Piston

Turbo Prop

Heavy Turbo Prop

Transport Class

Commercial / Commercial Cargo

Future Platforms (eVTOL)

CURRENT INTEGRATIONS

Merlin is currently working with the USAF to bring our autonomous technology to its C-130J Super Hercules fleet.

FUTURE INTEGRATIONS

Let’s ascend to new heights.

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