Lehrstuhl Flug-Triebwerksdesign

Brandenburgische Technische Universität Cottbus

Research: Certification assessment of Thermal Management System

Objective: Develop a first-pass **certification pathway** for a novel aircraft TMS—mapping applicable regulations and guidance, defining safety and environmental qualification evidence, and producing a gap-to-compliance plan—using standards-driven analysis, system-safety methods, and light MATLAB sizing/thermal margin checks.

Scope of Work

1. **Regulatory & Guidance Mapping (What applies, why, and where)**

- Identify and justify applicability of: **EASA/FAA** (CS-23/25/27/29 as relevant; **14 CFR** Parts 23/25/33/35), **Part 21** design/production, and TMS-adjacent rules (e.g., **§25.1309** / CS-25.1309, fire protection, EWIS, flammability).
- Environmental qualification envelope via **RTCA DO-160G/H** (temp/altitude, vibration, fluids susceptibility, sand/dust, icing, power input, EMI/EMC).
- Development & safety frameworks: **ARP4754A** (system development assurance), **ARP4761A** (safety: FHA/PSSA/SSA/FTA/FMEA), and if software/CCAs are in scope: **DO-178C** / **DO-254** (+ DO-331 model-based, DO-160 Section 16/21 interactions).

2. **Safety & Compliance Artifacts (paper study + simple MATLAB checks)**

- Perform **FHA → DAL assignment** for TMS functions (coolant circulation, HX control, fan/pump drive, sensor/logic).
- Draft **PSSA** with architecture options (redundancy, monitoring, fail-safe/fail-operational strategies) and preliminary **FTAs**/**FMEAs**.
- Define **environmental qualification matrix** (DO-160 sections, categories, margins, acceptance criteria) and **conformity configuration** (hardware/software baselines, critical items).
- Build light **MATLAB** calculators for steady-state/transient thermal margins (e.g., worst-case heat loads, coolant flow bounds, HX UA targets, fail-case degraded cooling) to support §25.1309 probability/margin narratives.

3. **Certification Plan & Test Strategy**

- Compile a **Certification Compliance Checklist** (rule-by-rule) and **Means of Compliance** (analysis/test/sim).
- Outline **Qualification & Acceptance Test Plans** (environmental, functional, endurance, abuse/fault injection), including **derivation of test severities** from operational envelope.
- Produce a **Gap Analysis & Roadmap**: missing evidence, recommended design mitigations, required analyses, prototype tests, and documentation set (PSAC/PHAC if applicable, safety case, derating/thermal margin justification).

Deliverables

- **Certification Basis & Applicability Report** (rules, guidance, MoC rationale).
- **Safety Package (FHA, PSSA, initial SSA, FMEA/FTA)** with DALs and architectural implications.
- **DO-160 Qualification Matrix** (sections, categories, severities, acceptance criteria).
- **MATLAB mini-tool** for thermal margin checks (inputs: mission heat loads, ambient, coolant props; outputs: UA/flow requirements, margin to limits, degraded-mode results).
- **Compliance Checklist & Test Strategy**, plus a prioritized **Gap-to-Compliance Plan**.
- **DER/DOA-ready slide deck** summarizing findings and next steps.

Required Profile

- Proven familiarity with **ARP4754A/ARP4761A**, **DO-160**, and §25.1309/CS-25.1309 compliance narratives.
- TMS/thermal fundamentals (UA analysis, coolant loops, pumps/fans, HX sizing), and **MATLAB** for quick analyses.
- Understanding of SW/CCAs certification hooks (DO-178C/DO-254) to flag evidence needs.
- Strong documentation skills for certification-grade artifacts.
- MATLAB (no heavy CFD required).

➢ **Are you interested or do you know someone who likes this?**
Please send the below documents to Mr. Karunakar Reddy Konda konda@b-tu.de

- CV
- A short description (max. 600 words) explaining (1) your skill set relevant to the job (2) and a technical problem (ideally related to above description but not mandatory) you have worked in the past.