FURKAN SÖNMEZ

Senior Embedded Software & Verification Engineer | DO-178C (DAL A/B) Specialist

Ankara, Turkey | +90 535 670 11 25 | s.furka@gmail.com | linkedin.com/in/frknsonmez | furkansonmez.dev

PROFESSIONAL SUMMARY

Senior Embedded Software & Verification Engineer with **6+ years of specialized experience** architecting, developing, and certifying real-time, safety-critical airborne software under **RTCA DO-178C (DAL A and DAL B)** and **DO-330 (Tool Qualification TQL-5)**. Proven end-to-end lifecycle expertise encompassing High-Level and Low-Level Requirements (HLR/LLR) in IBM DOORS and Polarion, model-based control design in MATLAB/Simulink, static and dynamic code verification (LDRA, Cppcheck), and formal Stage of Involvement audits (SOI 1, 2, 3) alongside Certification Authorities and DERs. Deep technical specialization in aviation Battery Management Systems (DO-311 / DO-311A), Nose Wheel Steering control, and multi-core embedded architectures on TI C2000, STM32, and Infineon AURIX TriCore MCUs with ARINC 429, CAN, SPI, and UART protocols. Currently pursuing an MSc in Systems Engineering in Defense.

CORE TECHNICAL COMPETENCIES

- **Safety-Critical Standards & Processes:** RTCA DO-178C (DAL A, DAL B), RTCA DO-330 (Tool Qualification, TQL-5), RTCA DO-254, RTCA DO-311 / DO-311A, ARP4754A, ARP4761, MISRA C:2012, AUTOSAR Classic, Agile / Scrum & Waterfall
- **Verification, Validation & Testing:** Requirements-Based Testing (RBT), Software-in-the-Loop (SIL), Hardware-in-the-Loop (HIL), Structural Coverage Analysis (Statement, Branch/Decision, MC/DC), Static Code Analysis, Early Worst-Case Execution Time (WCET) Analysis, Fault Injection, Stage of Involvement (SOI#1, SOI#2, SOI#3) Certification Audits
- **Programming & Scripting Languages:** Embedded C, C++, Python, MATLAB, DXL (DOORS eXtension Language), Assembly, Bash / Shell Scripting
- **Embedded Systems & RTOS:** Real-Time Operating Systems (FreeRTOS, AUTOSAR OS), Bare-Metal Firmware, Board Bring-Up, Dual-Bank Bootloaders (OTA, CRC, Secure Flash), Finite State Machines (FSM), Event-Driven Architecture, Memory Management
- **Control Algorithms & Estimation:** PID Closed-Loop Controllers, Kalman Filter / Extended Kalman Filter (EKF), Sensor Fusion, Battery Management Algorithms (State of Charge - SoC, State of Health - SoH, Thermal Runaway Protection, Cell Balancing)
- **ALM, Modeling & Verification Tools:** IBM Rational DOORS (DXL Scripting), Siemens Polarion ALM, LDRA Testbed, Cppcheck, MATLAB / Simulink, Speedgoat Real-Time HIL, Cameo Systems Modeler / MagicDraw (SysML/UML), Qt Framework, Tkinter, Ncurses, Git, SVN, Jira, Confluence, CMake, Doxygen
- **Microcontrollers & Processors:** Texas Instruments TI C2000 (TMS320F28x), STMicroelectronics STM32 (ARM Cortex-M0/M0+/M4), Infineon AURIX TriCore, Microchip AVR, 8051
- **Protocols, Security & Lab Hardware:** ARINC 429, CAN / CAN bus (CAN 2.0A/B), SPI, I2C, UART, RS-485, RS-232, Ethernet (TCP/IP), Wi-Fi, XMODEM, JTAG/SWD, REST API, SHA-256 Hashing, HMAC, Oscilloscopes, Spectrum & Logic Analyzers

PROFESSIONAL EXPERIENCE

Senior Embedded Software & Verification Engineer | **ASPILSAN Enerji** *(Ankara, Turkey)* — **Jul 2025 – Present**

- **Safety-Critical Software:** Architect and develop safety-critical airborne embedded C software compliant with RTCA DO-178C DAL B guidelines, executing target-level debugging and hardware-software integration on target microcontrollers.
- **Tool Qualification (DO-330):** Design, qualify, and document TQL-5 verification and test automation tools per RTCA DO-330 using C++ and Python (Qt/Tkinter GUIs), accelerating verification throughput and eliminating manual testing overhead.
- **Requirements Engineering:** Author High-Level Requirements (HLRs) and Low-Level Requirements (LLRs) in IBM Rational DOORS; engineer custom DXL scripts automating bidirectional traceability matrices and verification coverage metrics.
- **Certification Artifacts:** Generate, baseline, and maintain DO-178C lifecycle data packages including Plan for Software Aspects of Certification (PSAC), Software Development Plan (SDP), Software Verification Report (SVR), and Software Accomplishment Summary (SAS).
- **Code Quality & Verification:** Execute static analysis, MISRA C:2012 compliance auditing, and dynamic structural coverage analysis (Statement, Decision, and MC/DC) utilizing LDRA Testbed and Cppcheck to verify zero defects.
- **Formal Peer Reviews:** Direct and moderate formal technical peer reviews of software architectures, source code, and test cases acting as Author, Review Leader, and Reviewer under DO-178C process rigor.
- **System Architecture & Interfaces:** Decompose system allocations into software architectural models and Hardware-Software Interface (HSI) specifications, defining formal system and integration verification procedures.
- **Protocols & Security:** Implement high-integrity communication stacks and bootloaders over ARINC 429, UART, SPI, and I2C, embedding SHA-256 cryptographic hashing and HMAC verification for secure firmware authentication.

Senior Embedded Software Engineer | **AEE Aircraft Electronic Engineering GmbH** *(Munich, Germany / Hybrid)* — **Mar 2025 – Jun 2025**

- **DAL A Flight Software:** Engineered and validated flight-critical embedded software for an airborne DAL A Nose Wheel Steering (NWS) system under RTCA DO-178C and ARP4754A safety processes.
- **Requirements & ALM:** Authored formal High-Level Requirements (HLRs) and requirements-based verification test procedures within Siemens Polarion ALM, ensuring 100% bidirectional traceability.
- **Model-Based Design & SIL:** Built dynamic MATLAB/Simulink models featuring PID closed-loop controllers and Kalman Filter state estimation algorithms for Software-in-the-Loop (SIL) verification.
- **Real-Time HIL Testing:** Conducted real-time simulation and automated verification testing on Speedgoat Hardware-in-the-Loop (HIL) platforms using customized automated test scripts.
- **Production Test Firmware:** Programmed bare-metal production verification firmware for ARM Cortex-M0 and 8051 microcontrollers to automate hardware manufacturing test fixtures.

Embedded Software & Systems Engineer | **Capgemini Engineering** *(Munich, Germany / Hybrid)* — **Feb 2024 – Mar 2025**

- **AUTOSAR / RTOS Development:** Developed real-time embedded C firmware under AUTOSAR methodology and FreeRTOS for advanced Battery Management Systems (BMS) deployed on Infineon AURIX TriCore multi-core microcontrollers.
- **DO-330 Tool Verification:** Engineered formal verification test suites and validation scripts for TQL-5 airborne navigation software tools in compliance with RTCA DO-330.
- **Requirements-Based Testing:** Formulated HLRs and LLRs, developing comprehensive requirements-based dynamic test cases to validate safety and diagnostic requirements per ARP4754A.
- **SysML/UML Architecture:** Architected model-based system and software designs in Cameo Systems Modeler / MagicDraw using SysML and UML methodologies.
- **HIL Automation & Tools:** Automated Hardware-in-the-Loop (HIL) test harnesses in Python integrating REST APIs, and built cross-platform C++/Qt desktop diagnostic tools for hardware and test engineers.

Senior Embedded Software Engineer | **ASPILSAN Enerji** *(Ankara, Turkey)* — **Mar 2021 – Dec 2023**

- **Aviation BMS Architecture:** Spearheaded embedded C software development for aviation Battery Management Systems (BMS) on TI C2000 DSPs and STM32F4 MCUs, delivering core algorithms for State of Charge (SoC), State of Health (SoH), cell balancing, and thermal runaway protection.
- **DO-311 Compliance:** Delivered DO-311 / DO-311A compliant embedded firmware for low- and high-voltage aviation emergency battery power units, successfully completing qualification testing.
- **Life Cycle Process Definition:** Established the DO-178C software development lifecycle environment, authoring core certification plans: Software Development Plan (SDP), Software Verification Plan (SVP), SQAP, and SCMP.
- **SOI Audits & Certification:** Represented the software engineering team through formal Stage of Involvement (SOI#1, SOI#2, SOI#3) certification audits alongside Aviation Certification Authorities and DERs.
- **Verification & WCET:** Authored HLRs and LLRs in IBM DOORS; drove 100% MISRA C:2012 compliance, static analysis, structural coverage analysis, and early Worst-Case Execution Time (WCET) budget validation.
- **HW/SW Integration & Debugging:** Executed board bring-up and real-time debugging across ARINC 429, CAN 2.0B, UART, SPI, I2C, and RS-485 utilizing digital storage oscilloscopes, logic analyzers, and bus monitors.
- **MBD & Diagnostic Tooling:** Modeled control behaviors in MATLAB/Simulink and built Python/Qt GUI diagnostic tools for automated manufacturing validation and calibration.

Embedded Firmware & Hardware Engineer | **Eysa Teknoloji** *(Bursa, Turkey)* — **Sep 2019 – Jul 2020**

- **Firmware & Networking:** Developed ultra-low-power embedded C firmware for ARM Cortex and AVR microcontrollers, integrating multi-protocol communication (UART, SPI, I2C, RS-485, Wi-Fi, and GSM/GPRS over TCP/IP).
- **Fail-Safe Bootloader:** Engineered a fail-safe, over-the-air (OTA) dual-bank bootloader for STM32 Cortex-M0+ microcontrollers featuring CRC validation, fallback recovery, and secure flash memory partitioning.
- **PCB Design & EN 54 Compliance:** Designed, simulated, and tested multi-layer PCBs and wireless mesh firmware for an EN 54-compliant smart fire detection network scaling to 1,500+ IoT nodes; passed rigorous EMI/EMC compliance testing.
- **Lab Verification:** Formulated laboratory test specifications and debugged analog/digital signal integrity using oscilloscopes, spectrum analyzers, and logic analyzers.

EDUCATION

Master of Science (MSc) in Systems Engineering in Defense | **Hacettepe University & Defense Industry Academy (SSB)** — **Feb 2026 – Present**

Coursework: Systems Engineering Fundamentals, Data Analytics & Statistics, Operations Research, Machine Learning, Software Quality Management, Object-Oriented Software Architecture, Software Project Management.

Bachelor of Science (BSc) in Electrical and Electronics Engineering | **Middle East Technical University (METU NCC)** — **Oct 2013 – Dec 2019**

CERTIFICATIONS & TECHNICAL TRAINING

- **RTCA DO-178C Certification:** Software Considerations in Airborne Systems and Equipment Certification — Turkish Aerospace Industries (TAI)
- **RTCA DO-254 Certification:** Design Assurance Guidance for Airborne Electronic Hardware — Turkish Aerospace Industries (TAI)
- **IBM Rational DOORS:** Requirements Management & DXL Scripting (TTC1841) — Turkish Aerospace Industries (TAI)
- **Aviation Software Testing:** Software Testing and Verification Methodologies (TTC1891) — Turkish Aerospace Industries (TAI)
- **Project Technical Management:** Technical Project Lifecycle & Governance (TTC1045) — Turkish Aerospace Industries (TAI)

LANGUAGES

English: Full Professional Proficiency (Professional working experience in Germany & Turkey) | **Turkish:** Native | **German:** Elementary (A2)