OLEG PETROV

Sunnyvale, CA

PROFESSIONAL SUMMARY

- Coordinate and oversee the work of several teams of designers and junior engineers to assure project deliverables are completed on time and within the requirements.
- Strong experience in recruiting, project management, including coaching other managers.
- Aerodynamic analysis and CFD: Solidworks Flow Simulation, Ansys Fluent, XFLR5, AVL
- Manufacture-driven design, negotiations with manufacturers, making drawings and manufacturing requirements
- Mechanical design in Solidworks: complex curved surfaces/bodies, FEA analysis (Solidworks Simulation, Ansys Mechanical), topology optimization, assembly motion analysis, weight distribution and CG analysis
- Composite structures design and analysis: carbon fiber/fiberglass laminates, sandwich cores, resin infusion (VARI) and prepreg/autoclave processes, layup optimization
- Final product prototype assembling, flight testing, telemetry data analysis, and test equipment development
- Microcontrollers – electronics development and coding (C, C++, VC++): STM32, ESP32, ARM7
- Battery management system design – hardware and software/firmware
- Expert level in C/C++ (10+ years) in various frameworks and environments
- Full-stack web development: backend services in Python and Node.js with PostgreSQL databases, RESTful APIs, WebSocket real-time communication; frontend applications in TypeScript/JavaScript with React (Vite), HTML/CSS; E2E testing with Playwright; real-time video streaming via WebRTC (Janus media server); experience building end-to-end platforms including live dashboards, remote diagnostics interfaces, and vehicle control systems
- AI-augmented software development: leveraging LLM-based coding tools (Claude Code, Cursor, GitHub Copilot, Codex) for spec-driven design, automated test generation, and AI-assisted code review with A/B evaluation of AI-generated outputs
- 10+ years of experience as a software/firmware/hardware engineer
- 10+ years of electrical circuit design, electronics equipment development (digital, analog, power), PCB Layout in Autodesk Eagle, Mentor Graphics ISD

- 8+ years of professional experience using Solidworks as a Mechanical design engineer
- Object-oriented methodologies and design patterns
- Embedded firmware development: Boot-loader, interrupts, watchdogs, ADC/DAC, timers, memory management, real-time applications, performance analyzing and optimization, debugging, in-circuit debugging (IAR + JTAG/JLink), coding for interfaces: UART, USB, PCI, 1Wire, CAN, SPI, I2C, RS-232, ModBus
- Embedded development for Linux-based OS and RTOS (NuttX), device driver development
- IoT and distributed systems: WiFi, Bluetooth, Ethernet (TCP/IP), CANbus, Web Sockets
- GUI programming, math algorithms, multi-threaded programming
- Debugging, testing, troubleshooting, memory leaks detection, creating test programs; electrical diagnostics using oscilloscopes, logic analyzers, multimeters, generators
- 2D/3D Graphics programming (OpenGL, Direct3D), real-time Windows applications, device control and data acquisition
- Python scripting (Blender 3D, automation)

WORK EXPERIENCE

Alef Aeronautics (Armada Aeronautics), San Mateo, CA — Jun 2018 – Present

Director of Research and Development / Tech Lead, Software/Firmware/Electrical Engineer

- Lead the project of developing the prototype of a personal flying VTOL vehicle prototypes. Coordinated several teams to performing software development, electrical components, engineering analyses, assembling and testing of the product.
- Developed the battery management system (BMS) both hardware and firmware: schematic and PCB design, evaluation, bench testing, testing in the vehicle in flight. C++ firmware code for the built-in microcontrollers. The system performed: sensing of multiple parameters of the battery/cells (voltages, currents, temperatures), safety switching, charging control and monitoring, overall diagnostic and monitoring system for bench testing, in-flight monitoring and performance evaluation. Managing the team and hands-on participation in the project.
- Developed a 0.25MW power distribution/management/protection module for the vehicle: Schematics/PCB design.
- Development of multiple modules of the vehicle based on microcontrollers: STM32, ESP32 both hardware and firmware, bare-metal C/C++ code.
- Extended the main flight controller functionality by adding new devices, flight parameters/profiles/modes, additional communication capability, extended

logging and diagnostics. C++ code embedded development for a Linux based real time operating system RTOS NuttX.

- Flight control software development based on PX4 (C++) and ArduPilot autopilot stacks: extended flight algorithms, implemented new flight modes (autonomous hover, transition, waypoint navigation), integrated additional sensor inputs, and tuned PID controllers for VTOL-specific dynamics. Developed redundancy software modules including sensor voting/failover logic, redundant communication channel management, and automatic fault detection and recovery routines to ensure flight safety. Configured and programmed companion computers (Raspberry Pi, NVIDIA Jetson) for high-level mission planning, real-time telemetry processing, and onboard data logging. Maintained and improved the code of the flight controllers based on ARM7 microcontroller running on RTOS (Linux based), C/C++.
- Developed RTOS (Linux based) communication/measurement/power control device drivers.
- Built a distributed system of connected controllers based on IoT components (WiFi, Bluetooth), Ethernet (TCP/IP, Web Sockets), CANbus.
- Mechanical Design of structural elements of the frame/wing/gears/propulsion actuator mechanisms of the prototype. Performed FEA structural analysis (Solidworks Simulation, Ansys Mechanical) including static stress, fatigue, vibration/modal and thermal analyses. Topology optimization to minimize weight while meeting structural load requirements. Assembly motion analysis and interference/collision detection. Weight distribution and center-of-gravity analysis for flight stability. Prepared detailed drawings and manufacturing specifications.
- Designed and analyzed composite material structures for airframe components: carbon fiber and fiberglass reinforced polymer (CFRP/GFRP) laminates with sandwich core construction (honeycomb, foam cores). Developed layup schedules and ply orientation strategies for optimal strength-to-weight ratio. Worked with both vacuum-assisted resin infusion (VARI) and prepreg/autoclave manufacturing processes. Led composites manufacturing R&D: mold design and fabrication, layup process optimization, cure cycle development, quality control procedures including void content reduction and delamination prevention. Performed laminate failure analysis (Tsai-Wu, max stress criteria) using FEA.
- Performed aerodynamic calculation, analysis and optimization of the whole vehicle and its components: CFD simulations (Solidworks Flow Simulation, Ansys Fluent), airfoil and wing analysis using XFLR5, stability and control analysis using AVL (Athena Vortex Lattice). Evaluated lift, drag, pitching moment characteristics; optimized wing geometry, propeller placement and duct design to maximize aerodynamic efficiency and flight stability.
- Wrote the firmware of the controllers, vehicle Web Server interface for remote monitoring and diagnostics of the whole system using JavaScript, Node.JS, HTML, CSS. Developing client modules communicating with the server through Web Sockets, (C++).

- Participated in a project Windows Desktop application of a control program for the propulsion test stand, using the QT framework, QT Creator, QML, C++, VC++, MFC.
- Designed and developed flight testing/tuning rigs, propulsion test stands, and other specialized ground support equipment for prototype evaluation and component validation.
- Performed circuit and PCB design of the vehicle controllers, power distribution and battery connection/charging/protection module.
- Organized and performed the flight testing of the prototypes, including flight log review, telemetry data analysis, post-flight performance evaluation, and iterative tuning of flight controller parameters.
- Adopted AI-augmented development practices using LLM-based coding tools (Claude Code, Cursor, GitHub Copilot, Codex) to accelerate firmware and software development. Applied spec-driven design methodology where detailed technical specifications were used to guide AI-assisted code generation, reducing iteration cycles while maintaining code quality and architectural standards.
- Implemented automated testing workflows with LLM in the loop, using AI coding assistants to generate unit and integration tests from existing codebases. Conducted A/B evaluation of AI-generated code outputs across multiple tools and prompting strategies to identify optimal approaches for different development tasks.
- Architected and developed the Central Management and Monitoring System (CMS) — a full-stack platform for real-time vehicle diagnostics, control, and telemetry. The system comprised: a central server application (Python, Qt, PostgreSQL) providing data aggregation, command dispatch, and persistent storage; diagnostics and hub modules built on STM32 and Microchip SAMD21 microcontrollers (C/C++ firmware) for sensor data acquisition, system health monitoring, and inter-module coordination; driving system actuator controllers based on Teensy 4.1 (C/C++ firmware) interconnected via CAN bus network for coordinated motion control; and a web frontend (TypeScript, JavaScript, React, Node.js, PostgreSQL) with real-time video streaming via WebRTC using Janus media server, providing operators with live dashboards, remote diagnostics, and vehicle control interfaces.

Environment: Software Project Management, Web Design, C++, Node.js, HTML, CSS, Firmware, TCP/IP, Embedded Systems, PCB Design, Schematics design, Power switching, Battery Management Systems, Battery chargers, JavaScript, TypeScript, React, Python, PostgreSQL, STM32, ESP32, Microchip SAMD21, Teensy 4.1, NuttX RTOS, PX4, ArduPilot, Companion computers (Raspberry Pi, NVIDIA Jetson), QT, QML, WebRTC, Janus, Solidworks, Solidworks Simulation, Solidworks Flow Simulation, Ansys Mechanical, Ansys Fluent, XFLR5, AVL, CFD, FEA, Composites (CFRP/GFRP), VARI, Prepreg, WiFi, Bluetooth, CANbus, IoT, Claude Code, Cursor, GitHub Copilot, Codex, AI-Assisted Development, Spec-Driven Design

Cisco Microsystems, Milpitas, CA — Mar 2018 – Jun 2018

Senior Software Engineer

- Architected math backend and developed in code a standard MOS score system (call quality metrics) for the VoiP Broadsoft Media Engine (BME), C++, QT framework.
- Participated in development of the BME, upgraded BME for newer versions of WebRTC, worked on integration of OpenH264, audio codecs, Communicator application UI, Google Assistant addition, Webex Teams Broadworks.

Environment: Webex Teams Broadworks, WebRTC media engine design, Google Assistant integration, Video conferencing UI design

Broadsoft (acquired by Cisco), San Jose, CA — Feb 2015 – Mar 2018

Senior Software Engineer

- Architected math backend and developed in code a standard MOS score system (call quality metrics) for the VoiP Broadsoft Media Engine (BME), C++, QT framework.
- Took part in the project of creating a multiplatform prototype/performance profiler of a new meeting room for the VOIP communicator, created UI and the main logic of the module using QT Framework, QT Creator, C++, QML.
- Participated in development of the BME, upgraded BME for newer versions of WebRTC, worked on integration of OpenH264, audio codecs, Communicator application UI, Google Assistant addition, Webex Teams Broadworks. Bluetooth devices audio streams and device configuring.

Environment: WebRTC media engine design, C++, QT Framework, QT Creator, QML, Bluetooth audio

Prezera (Slite), Mountain View, CA — Sep 2014 – May 2015

Software Engineer

- Developed AWS server components as well as individual applications. Used tools and frameworks: JavaScript, RESTful interfaces, JSON, MongoDB, JQuery, Socket.io, Express, Node.js.

Environment: JavaScript, RESTful interfaces, JSON, MongoDB, JQuery, Socket.io, Express, Node.js

Expert Service LLC, Togliatti — 2003 – 2009

CEO / Founder

- Founded and managed a B2B office technology company providing end-to-end sales, servicing, and technical support of office equipment for business clients: computers, printers, copiers, consumables, and monitors.
- Oversaw network equipment installation, configuration, and ongoing support for small and mid-size business clients, including LAN/WAN setup, server deployment, and infrastructure maintenance.
- Delivered B2B software deployment, configuration, and support services; managed vendor relationships and supply chain logistics.
- Handled all aspects of business operations: client acquisition, contract negotiation, financial management, and team supervision.

Environment: B2B sales, office equipment servicing, network installation and support, software deployment, business management

Scientific and Technical Center of AvtoVAZ (NTC VAZ), Togliatti — Jun 2000 – Feb 2001

Junior Research Scientist – Electrical Systems

- Participated in the development of electrical modules for the VAZ-2110 (Lada 110) vehicle platform as part of a multidisciplinary engineering team.
- Designed and tested automotive electrical subsystems including body electronics modules, lighting control circuits, and dashboard instrumentation interfaces.
- Developed embedded firmware for microcontroller-based vehicle control units; performed bench testing and in-vehicle validation of electrical modules.
- Created schematic diagrams and PCB layouts for prototype electrical assemblies; prepared technical documentation per automotive industry standards.
- Participated in electromagnetic compatibility (EMC) testing and environmental qualification of electronic modules (vibration, temperature cycling).

Environment: Automotive electrical systems, embedded microcontrollers, schematic/PCB design, EMC testing, C/C++, automotive industry standards

Salut LLC, Togliatti — Aug 1994 – Nov 1996

Software/Firmware Engineer

- Led the development of a controller for automatic control of the pitch of blades and RPM of the main motor of a two-seat helicopter. Schematic and PCB design OrCAD.
- Led the development of a specialized engineering CAD/CAM system for aerospace: designing and modelling, physics emulation, overlap detection, mass distribution, torque, tension and other math calculation functions, 3D visualization (OpenGL), C++.
- Led the development of programs for calculations of aerodynamics properties and spatial analysis.

Environment: C/C++, CAD/CAM Systems, OrCAD, OpenGL

SKILLS

CAD/Simulation	Solidworks, Solidworks Simulation, Solidworks Flow Simulation, Ansys Mechanical, Ansys Fluent, XFLR5, AVL, Blender
EE/PCB Tools	Autodesk Eagle, Mentor Graphics ISD, OrCAD, PCAD, Quartus II, oscilloscopes, logic analyzers, JTAG/JLink
Programming	C/C++, TypeScript, JavaScript, HTML, CSS, QML, Python, Java, SQL, VHDL, Assembler, Objective C, Powershell
Environments	VS Code, Qt Creator, Microsoft Visual C++/Visual Studio, Eclipse, IAR Embedded Workbench, Xcode
Frameworks/Libraries	Qt, React, Vite, Node.js, Express, PostgreSQL, MongoDB, Socket.io, Playwright, WebRTC, Janus, OpenGL, Direct3D, MFC, STL, ATL, Win32, PX4, ArduPilot
Microcontrollers	STM32, ESP32, ARM7, Atmel AVR, Microchip SAMD21, Teensy 4.1, Raspberry Pi, NVIDIA Jetson
Protocols/Interfaces	UART, USB, SPI, I2C, CAN, RS-232, ModBus, TCP/IP, WebSocket, WiFi, Bluetooth, Ethernet, RESTful APIs
Operating Systems	Windows, macOS, Linux/UNIX, NuttX RTOS, Android
Methodologies	Agile, Jira, Trello, OOP Design Patterns
Version Control	Git (CLI, GUI), GitHub, pull requests, branching, merging, conflict resolution
AI Development	Claude Code, Cursor, GitHub Copilot, Codex, spec-driven design, LLM-augmented testing, AI code evaluation (A/B)

EDUCATION

- Postgraduate Studies at Togliatti State University
  “Automation of Technological Processes in Manufacturing”, M.S. in Computer Science
  Sep 1997 – Jun 2000

- Volga Institute of Technology
  B.S. in Computer Science
  Sep 1992 – Jun 1997
  Diploma project: Created a universal expert system development environment for educational purposes; later chosen as the best expert system and approved as an educational standard in the institute.

- Radio Engineering Technical School
  Diploma of Engineer
  Sep 1988 – Jun 1992

PUBLICATIONS

- US Patent No. US-2021-0300535-A1: System and Methods for Providing Vertical Take Off and Landing and Forward Flight in A Small Personal Aircraft, 3/27/2020
- US Patent No. US-2021-0300546-A1 (Continuation): Systems and Methods for Providing Vertical Take Off and Landing and Forward Flight in A Small Personal Aircraft, 3/27/2020