# Aerospace 2.0: Open Tooling, Intelligent Flight, and Responsible Systems Design at Scale

Seminar date: May 29, 2026


## ABSTRACT

Aerospace engineering is entering a period in which serious aircraft experimentation is again within reach of individuals, laboratories, startups, and small teams. Low-cost sensors, open-source flight controllers, electric propulsion, digital fabrication, and simulation-first workflows have compressed the path from concept to prototype, flight test, and deployment. This seminar frames this transition as Aerospace 2.0: a new engineering design era built on accessible hardware, free and open-source tooling, and capable autonomous systems. These developments raise a central question: what role should formal aerospace engineering training play when aircraft design, construction, and flight testing are easier to attempt than ever?

This seminar advances the claim that wider access makes formal aerospace engineering training more valuable and in demand, not less. Easier experimentation gives trained engineers greater leverage to apply judgement, de-risk development, and operationalize new systems through the disciplined application of dynamics, control theory, avionics architecture, experimental testing, and safety assurance and verification. Dr. Nathaniel Mailhot explores this claim through case studies spanning airship design, ultralight flexible-wing aircraft prototypes, industrial multirotor applications, and networked multi-agent systems. The discussion is anchored by his PhD research and startup work on weight-shift aircraft, where robotic piloting, embedded adaptive control, simulation-to-flight validation, and open-source flight-dynamics modelling advanced a novel control problem toward practical flight.

The seminar then broadens to recent support-engineering work for global ArduPilot users and partners, greenhouse-gas and methane monitoring with NRC-linked collaborators, and NORAD modernization work on multi-agent systems and aerial autonomy implications for security and civil integration. Taken together, these examples show that the growing scale of Aerospace 2.0 increases the relative importance of aerospace engineering judgement. When more people can develop, modify, and operate uncrewed systems, demand for sound judgement outpaces the supply of trained engineers. Aerospace engineering offers a disciplinary framework for moving prototypes toward trusted systems by connecting vehicle performance to integration risk, operational consequence, and safety-critical evidence. Aerospace engineers are therefore well positioned to shape this future, from civil applications and public safety to security, defence, and safe airspace integration, while helping society navigate autonomous systems that increasingly perceive, communicate, coordinate, and act in shared environments.

## Speaker Bio

Dr. Nathaniel Mailhot is currently a postdoctoral researcher at Carleton University and Program Coordinator for Carleton's NSERC CREATE UTILI (Uninhabited Aircraft Systems Training, Innovation, and Leadership Initiative) program. He received the B.A.Sc. in Mechanical Engineering (2016), M.A.Sc. in Mechanical Engineering (2018), and Ph.D. in Mechanical Engineering (2024), each from the University of Ottawa. His doctoral research developed adaptive weight-shift flight control for flexible-wing aircraft through an industry partnership with Romaeris Corporation, spanning robotic piloting systems, embedded adaptive reinforcement learning, flight-test-informed modelling, simulation-to-flight validation, and open-source aircraft-dynamics simulation. He was awarded an NSERC Postgraduate Scholarship - Doctoral for his research excellence.

He previously worked as a Mitacs Accelerate Fellow and later as Manager of Robotics Engineering at Romaeris, where he led and supported the design of crewed aircraft and uncrewed aircraft systems (UAS), including team recruitment and development, avionics integration, digital twin development, flight-test readiness, mission execution, and post-flight engineering iteration. His NRC IRAP-supported collaboration established the Eurogia Eureka UAV-GHG multinational consortium with European industry partners, focused on UAS-enabled greenhouse-gas emissions monitoring.

Dr. Mailhot is an official ArduPilot developer team member and ArduPilot Partner Program support engineer for global ArduPilot users and commercial partners. He serves as a Google Summer of Code mentor for ArduPilot and is chair and lead organizer for the 2026 international ArduPilot Developer Conference in Ottawa. He recently joined ADGA Group as a Technology Design and Planning Architect supporting counter-UAS systems for Joint Forces Command. His current research focuses on safety-critical online adaptation, data-driven digital twins, resilient networked autonomy, and coordinated drone swarms.