MATTHEW ANDERSON

Field Roboticist System Integrator UAS Expert

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EDUCATION

University of Sydney and Université Libre de Bruxelles 2018
Ph.D. - *A Methodology for Aerodynamic Parameter Estimation of Tail-Sitting Multirotors*

University of Sydney 2010
B.Eng, Hons. I (Aeronautical)

EXPERIENCE

Aerospace Robotics and Control Lab (ARCL), Caltech 2019 – Current
PostDoc / Lecturer

- Developed a UAV-borne volcanic gas sampling and autonomy system (SciTech 2021)
- Led flight operations for multistatic SAR UAS experiments (JPL collaboration) (IGARSS 2021)
- Ensured UAS regulatory compliance for both NASA (public) and Part 107 UAS
- Overhauled design of low-level firmware and robotic hardware (JPL collaboration)
- Designed tech. demonstrator aircraft for the Autonomous Flying Ambulance project (SciTech 2021)
- Helped support 10+ technically diverse ARCL robotics projects towards success
- Developed and lectured *Experimental Robotics* course (ME/CS/EE 129)

DARPA Subterranean Challenge (SubT), Jet Propulsion Laboratory 2018 – 2019
PostDoc / Hardware Integrator (Pre-Print)

- Led hardware development of a team of heterogeneous robots for underground exploration
- Performed sensor integration, design, and operations for both custom and COTS systems
- Coded embedded low-level software, including interfacing with ROS
- Developed a redundant, highly-reliable robot safety systems for remote operations
- Formulated safety procedures and protocols for underground operations (including flight)
- Acted as on-Lab and Remote Field Test Lead for teams of varying sizes and levels of experience

Self-Employed 2017 – 2018
UAS GCS Operator / Support Crew

- Flew high-risk missions including multi-vehicle and UAS-detection field trials as GCS Operator
- Consulted for UAS projects (airframe, components, autopilot, operations)
- Provided technical and logistical support for UAS operations

The University of Sydney -– Aeronautics Department / ACFR 2013 - 2018
Researcher / UAV GCS Operator

- Designed Phase 1 submission for the Wasp AE replacement for the Australian Army
- Supported several projects designing, building and operating UAVs for research
- Unofficial 'go-to guy' for UAV Lab support (undergrad theses, PhD work, wind tunnel, etc.)

Aeronautics Department, The University of Sydney 2010 – 2018
Lecturer and Tutor

- Guest lectured for *Professional Engineering 2* and *UAV Operations*
- Tutored subjects including *Safety Systems*, *Mechanical Design*, *Prof. Eng. 1 and 2*, *Aircraft Design*

TECHNICAL SKILLS

Robotics

- Field testing (including Field Lead) in extreme environments with limited time and resources
- System architecture of complex systems with challenging SWaP constraints
- Field serviceability and survivability of systems (including selection, modification, and operation)
- Integration of COTS and in-house systems/sensors, both during initial builds and retro fits

Aeronautics

- Aircraft design including sizing optimisation, performance modelling and airframe construction
- System identification of both conventional and unconventional designs
- UAS operations for both standard operations and flight testing (both as PIC and GCO)
- Experimental testing including wind tunnel testing and flow visualisation
- Software development including flight controllers, design, and flight analysis software

Software

- Coding: MATLAB, C/C++, Arduino, git, ROS, python, bash
- UAS: ArduPilot, Mission Planner, qgroundcontrol, PX4, multi-rotor, fixed-wing
- CAD: Solidworks, Inventor
- General: Microsoft Office, LaTeX, ROS, Windows, Linux

Certifications

- UAS: Part 107 (FAA), Fixed-Wing Gold Wings (MAAA)
- Safety: First Aid / CPR (American Red Cross), Mental Health First Aid (National Council)

OTHER

Interests

- Rock climbing, kayaking and adventure
- Radio control aircraft (pylon racing, gliding) and autonomous control

Selected Awards

- Best Paper (Unmanned Aerial Systems) (ICRA 2020), 2020
- Earth Science & Technology Directorate Team Bonus Award (SubT, JPL), 2019
- Best Written Paper (Propulsion) and Best Overall Congress Paper (AIAC 2017), 2017

PUBLICATIONS

Published

10. Riviere B., Hoenig W., **Anderson M.**, Chung S.-J., "*Neural Tree Expansion for Multi-Robot Planning in Non-Cooperative Environments*," IEEE Robotics and Automation Letters, 6 (4), 6868-6875, doi:10.1109/LRA.2021.3096758
9. Hawkins B., **Anderson M.**, Prager S., Chung SJ., Lavalle M., "*Experiments with Small UAS to Support SAR Tomographic Mission Formulation*," 2021 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 2021
8. Lavalle M., Seker I., Ragan J., Loria E., Ahmed R., Hawkins B. P., Prager S., Clark D., Beauchamp R., Haynes M., Focardi P., Chahat N., **Anderson M.**, Matsuka K., Capuano V., Chung SJ., "*Distributed Aperture RADAR Tomographic Sensors (DARTS) to Map Surface Topography and Vegetation Structure*," 2021 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 2021
7. **Anderson M.**, Backus S. B., Hughes E., Curtis A., Chung SJ., Stolper E., "*Development and Deployment of an Autonomous UAV-Borne Gas and Particulate Sample Capture System for Fumarole Sampling*," AIAA Scitech 2021 Forum, 2021
6. Tang E., Spieler P., **Anderson M.**, Chung SJ., "*Design of the Next-Generation Autonomous Flying Ambulance*," AIAA Scitech 2021 Forum, 2021
5. Bouman A., Nadan P., **Anderson M.**, Pastor D., Izraelevitz J., Burdick J., Kennedy B., "*Design and Autonomous Stabilization of a Ballistically-Launched Multirotor*," 2020 IEEE International Conference on Robotics and Automation (ICRA), 2020
4. **Anderson M.**, Wong KC, Hendrick P., "*Modelling Small Electric Brushless Motors and Propellers*," 17$^{\text{th}}$ Australian Aerospace Congress (AIAC), 2017
3. **Anderson M.**, Lehmkuehler K., Wong KC, "*Flight Experimentation Towards Enhanced UAV Capabilities – The Multi-rotor Air-Crane*," 17$^{\text{th}}$ Australian International Aerospace Congress (AIAC), 2017
2. **Anderson M.**, Wong, KC, Hendrick, P., "*Modelling Propellers in FINE/Open using OpenLabs*," 4$^{\text{th}}$ Australasian Unmanned Systems Conference, 2014
1. **Anderson M.**, Lehmkuehler K., Ho, D., Wong, KC, Hendrick, P., "*Propeller Location Optimisation for Annular Wing Design*," International Micro Air Vehicle Conference and Flight Competition (IMAV2013), 2013

Preprint

1. Agha A., Otsu K., Morrell B., Fan D. D., Thakker R., Santamaria-Navarro A., Kim S.-K., Bouman A., Lei X., Edlund J., Ginting M. F., Ebadi K., **Anderson M.**, Pailevanian T., Terry E., Wolf M., Tagliabue A., Vaquero T. S., Palieri M., Tepsuporn S., Chang Y., Kalantari A., Chavez F., Lopez B., Funabiki N., Miles G., Touma T., Buscicchio A., Tordesillas J., Alatur N., Nash J., Walsh W., Jung S., Lee H., Kanellakis C., Mayo J., Harper S., Kaufmann M., Dixit A., Correa G., Lee C., Gao J., Merewether G., Maldonado-Contreras J., Salhotra G., Silva M. S. D., Ramtoula B., Kubo Y., Fakoorian S., Hatteland A., Kim T., Bartlett T., Stephens A., Kim L., Bergh C., Heiden E., Lew T., Cauligi A., Heywood T., Kramer A., Leopold H. A., Choi C., Daftry S., Toupet O., Wee I., Thakur A., Feras M., Beltrame G., Nikolakopoulos G., Shim D., Carlone L., Burdick J., "*NeBula: Quest for Robotic Autonomy in Challenging Environments, TEAM CoSTAR at the DARPA Subterranean Challenge*," `http://arxiv.org/pdf/2103.11470`