

Faculty of Engineering

ASPIRE Summer Research Program 2026-2027

Project Title:

NightWatch: Event-Based Vision for Night-Time Aircraft Collision Avoidance

Supervisor(s): Dr Timothy Molloy

Department: Electrical and Computer Systems Engineering

Email: Timothy.Molloy@monash.edu

Website profile of project supervisor: monash.edu/engineering/timothymolloy

Objective

Develop and evaluate an event-camera perception system to detect and track aircraft at night from sparse optical events, establishing a sensing foundation for vision-based airborne collision avoidance.

Project Details

At night, aircraft can appear only as small, intermittent flashes from navigation and anti-collision lights. This project will exploit an event camera's high dynamic range to build a detection-and-tracking pipeline. It will involve integrating a sensing platform; collecting and annotating data across different trajectories, atmospheric conditions; and establishing baseline methods. A new detector using a learned per-pixel classifier will estimate the probability that each event originates from an aircraft before events are aggregated into detections and tracked with a Bayesian filter. Performance will be measured using detection probability, false-alarm rate, detection delay and tracking accuracy. If feasible, ADS-B data will provide aircraft identity and approximate trajectory reference data for quantitative validation.

Project Timeline

TASK	1	2	3	4	5	6	7	8	9	10
Review, system design & metrics										
Sensor setup & pilot capture; ADS-B optional										
Diverse data collection										
Annotation & dataset split										
Baseline event-processing methods										
Learned classifier & candidate detection										
Bayesian tracking & light intermittency										
Evaluation/demo; optional collision-risk extension										

Prerequisites

Programming experience, preferably in Python, plus a foundation in probability, signal processing, machine learning, computer vision, or robotics. Neural networks and Kalman filtering are helpful but not essential.

Student Placement Agreement

A student placement agreement must be signed by the project supervisor and student before the ASPIRE program commences.

[LV0554-72741 ASPIRE Program Co-Curricular-Student-Placement-Agreement-Short-term.docx](#)