Collaborative Research Grant Application – 2025

# Project Title

Deployable SDR‑ML Radar Network for Remote Area Surveillance & Black‑Flight Detection

# Project Summary / Abstract

This project will deliver a sovereign, deployable software-defined radar network augmented by machine learning (ML) and mesh communications, targeted to provide persistent situational awareness (PSA) around remote critical infrastructure and to detect black flights — unregistered aircraft operating over remote Australia, a key concern for the AFP and Defence.  
  
By leveraging commercial off-the-shelf (COTS) SDR platforms, the project focuses on WA-led integration, ruggedisation, phased-array antenna architecture, ML signal processing, and GIS-based geolocation analytics.  
  
We bring deep credibility: the team has previously developed the first reprogrammable SDR (Transpage / ERG Telecommunications) supporting multiple global protocols; commercialised FramScan agricultural sensor systems; and currently support AFP geolocation mapping of SDR direction-finding signals.  
  
With Curtin University’s radio astronomy / phased-array expertise, Lateral Sands’ global design verification and ruggedisation experience, and Defence engagement for operational validation, we propose a 12‑month demonstrator that de‑risks the full program.

# Collaboration (Criterion 1)

Collaborators & Roles:  
• Curtin University (Radio Astronomy / EECMS): Antenna and phased-array design; digital beamforming; signal processing; ML research.  
• Lateral Sands Pty Ltd: Global design verification, ruggedisation, environmental testing, prototype validation.  
• Defence / ADF (13th Brigade, Army RICO): Operational input, field trial validation, alignment with ADF C2.  
• Australian Federal Police (AFP): Operational use-case context for black flights and illicit aviation.  
  
This collaboration links academia, WA industry, Defence, and law enforcement — meeting CRG requirements for broad engagement.

# Feasibility (Criterion 2)

Team Track Record & Experience:  
• ERG / Transpage: Developed the first reprogrammable SDR platform for the global civilian paging market, supporting multiple standards and demonstrating multi-protocol agility.  
• FramScan (Computronics): Commercialised multiple agricultural monitoring products, showing capacity for prototype-to-market delivery.  
• Current AFP support: GIS heat map geolocation work with phase-coherent SDRs (Kraken) directly informs black flight detection.  
• Lateral Sands: Provides global design verification to ensure prototypes meet international standards.  
  
Schedule & Milestones (12 Months):  
• Months 1–3: SDR + phased-array integration; initial ML training; ruggedisation design.  
• Months 4–6: Controlled lab and comms trials; preliminary GIS mapping.  
• Months 7–9: Field deployments in WA remote zone; black flight simulation trials.  
• Months 10–12: ML refinement with field data; demonstrations to Defence & AFP; final report and roadmap.

# Impact (Criterion 3)

Defence Benefits:  
• Low-cost, sovereign ISR layer for remote infrastructure.  
• Direct contribution to 'Trusted Autonomy in all Domains' priority theme.  
  
Dual-use / Civil Benefits:  
• Directly addresses AFP requirement to detect black flights in remote airspace.  
• Enables collaboration across Defence and civil security.  
  
WA Benefits:  
• Builds sovereign SDR/ML integration capability.  
• Supports WA jobs, research, and industry.  
• Foundation for coalition interoperability and export.

# Budget (12-Month Estimate)

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| Category | Amount (AUD) |
| SDR hardware & integration | 120,000 |
| Antenna / phased-array R&D | 60,000 |
| ML development & signal processing | 80,000 |
| Ruggedisation / environmental testing | 40,000 |
| Field deployment logistics & transport | 30,000 |
| GIS / geolocation system & software | 20,000 |
| Personnel / research assistants | 40,000 |
| Contingency & buffer | 10,000 |
| Project management, reporting, overheads | 20,000 |

Total: 420,000 AUD

Requested Grant Funding: 250,000 AUD

Partner Co-contributions / In-kind: 170,000 AUD

# Risk Management

• Integration failures: mitigate via early prototyping and buffer.  
• Environmental failures: Lateral Sands testing for heat/dust/EMI.  
• ML underperformance: retraining with field data; fallback detection.  
• Comms/mesh failure: redundancy and re-routing protocols.  
• Site access: pre-arranged Defence ranges; contingency sites.