

The Australian UAS Experience



Reece Clothier

Australian Research Centre for
Aerospace Automation

OVERVIEW

- A snapshot of the UAS industry, opportunities, the research and ongoing initiatives in Australia
- A possible way for the New Zealand industry to move forward

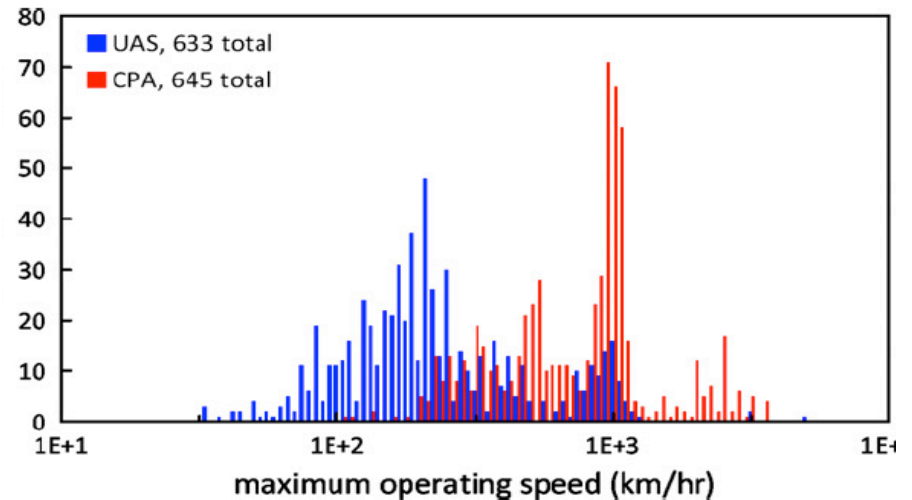
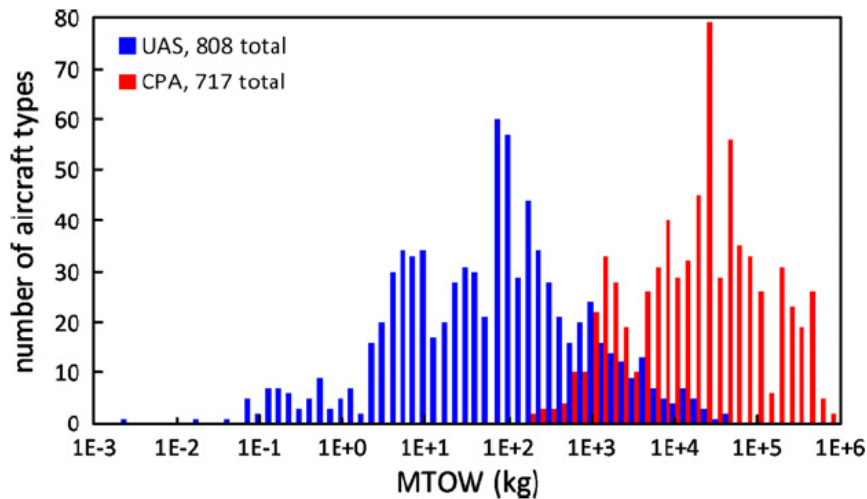
AUSTRALIA



- Australia – unique position to benefit from, and take a leading role in, the uptake of UAS technologies
 - The “tyranny of distance”
 - Unique operating and regulatory environment
 - Strong industry-government-regulator relationship
 - Established and world leading research & education
 - An industry of competitors who are working together to address the regulatory issues facing the industry

What are UAS?

- Probably easier to say what they are not...



UAS data supplied from a database compiled and maintained by the Defence Science and Technology Organisation (DSTO), Australia. CPA data obtained from Aviation Week and Space Report and Jane's All the World's Aircraft.
REF: Clothier et al. (2011) "Definition of an airworthiness certification framework for civil unmanned aircraft systems", Safety Science. 2011

A SNAPSHOT OF THE INDUSTRY



cyberQuad
Cyber Technology, WA



ScanEagle
Insitu Pacific Ltd, QLD



Kingfisher II
BAE Systems Australia, VIC



Flamingo – Silvertone, NSW



CyberEye II – Cyber Technology, WA



Medium Airship
Airship Solutions, NSW

A SNAPSHOT OF THE INDUSTRY



Aerosonde Mark 4.7
AAI, Aersonde VIC



Kestrel Automated Target
Detection Software,
Sentient, VIC



CM160 Gimbaled
Camera
UAV Vision, NSW



i-Flight 650
Flight Vision, NSW



T2000UAV-L, Mode 3/A
Transponder
Microair, QLD



Phoenix Jet Aerial Targets
Air Affairs Australia, NSW



ARCAA Rotor-Wing UAS
ARCAA, QLD

ADF TRIALS, OPERATIONAL PLATFORMS, PROCUREMENT



- 2001 Global Hawk (Demonstration)
- 2005 - Skylark I
- 2006 Mariner (Demonstration)
- 2007 ScanEagle (Contracted Service)
- 2009 Heron (Contracted Service)
- 2010/2011 Shadow 200B TUAS
- 2013 – 2015 Small “Tier 1” UAS (Skylark replacement)
- 2020? ADF HALE Multi-mission UAS (AIR-7000-1B)

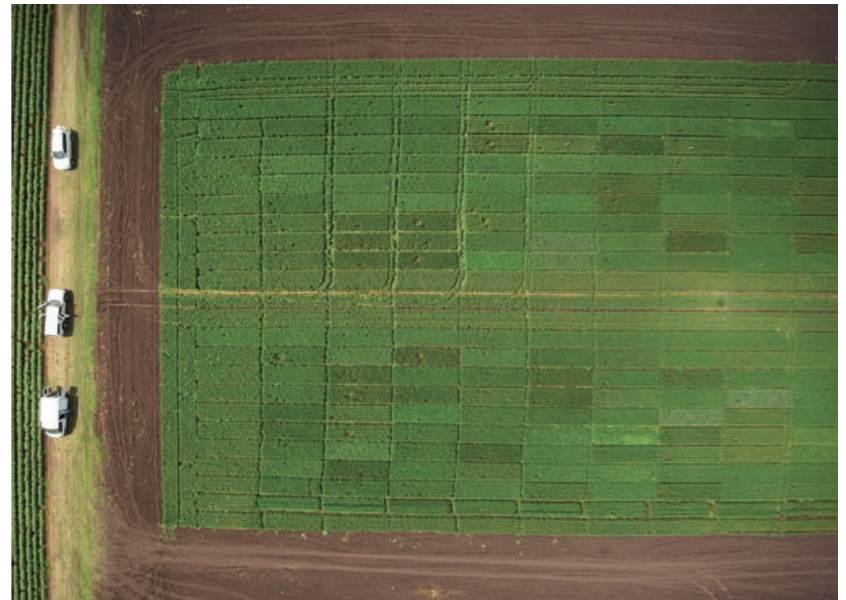


KEY CIVIL & COMMERCIAL OPPORTUNITIES

- Primary industries
 - Crop management, spraying, diseased crops...



ARCAA UAS with plant disease-spore detection sensor fitted



ARCAA Helicopter UAS performing crop phenotyping

KEY CIVIL & COMMERCIAL OPPORTUNITIES

- Management of distributed infrastructure
 - Maritime navigation
 - buoys, channel markers, etc.
 - Power lines
 - Pipelines
 - Road
 - Rail



Photo of power lines captured from a UAS (CRC-SI)

KEY CIVIL & COMMERCIAL OPPORTUNITIES

- Environmental management
 - Feral animals
 - Erosion & salinity
 - Weed monitoring
 - Animal migration & population surveys
 - Illegal fishing



ARCAA automated marine mammal detection from an aircraft

KEY CIVIL & COMMERCIAL OPPORTUNITIES

- Civil Services
 - Search and rescue
 - Bushfires
 - Policing
 - Disaster recovery
 - Shark patrol



Sharks off South Stradbroke Island – Photo: Sarah Marshall



Bushfire WA 2010 – Photo: Channel 10



QLD Floods 2011 – Photo: Lyndon Mechielsen, Jono Searle

SNAPSHOT OF RESEARCH

- Australian Research Centre for Aerospace Automation
- Collaboration between Queensland University of Technology (QUT) and Commonwealth Scientific and Industrial Research Organisation (CSIRO)
 - ARCAA Vision:
 - “to see autonomous aerospace technologies increasingly serve the needs of humanity, and to enhance Australia’s economic, social and environmental prosperity.”



ARCAA CAPABILITIES



- 40+ researchers, engineering & support staff
- Custom-built research facility
- Small rotor-wing & fixed-wing UAS
- Automated Cessna 172
- Experienced flight test team & support equipment
- Research into autonomous algorithms, sensor systems, safety and efficiency systems for all manner of civil applications



RESEARCH IN SENSE-AND-ACT TECHNOLOGIES

- Integrated vision-based sensor system on-board the ARCAA C172
- Full closed-loop control of the ARCAA C172
- Controlled experiments involving head-on and overtaking scenarios with a C182
- Range of FoV, image processing & control law configurations explored



Range to intruder: 10357 meters (closest approach 00170 meters)

Frame: 05800 (15Hz)

Approx. Time to closest approach: 103.57 seconds

Searching for target ...

Ground-based Sense and Avoid

- Research led by Boeing Research & Technology Australia & Insitu Pacific as part of the ARCAA Smart Skies Project
- Investigate the effectiveness of a COTS radar/ADS-B situational surveillance system in support of UAS operations in non-segregated airspace



RESEARCH INTO STATIC OBSTACLE AVOIDANCE



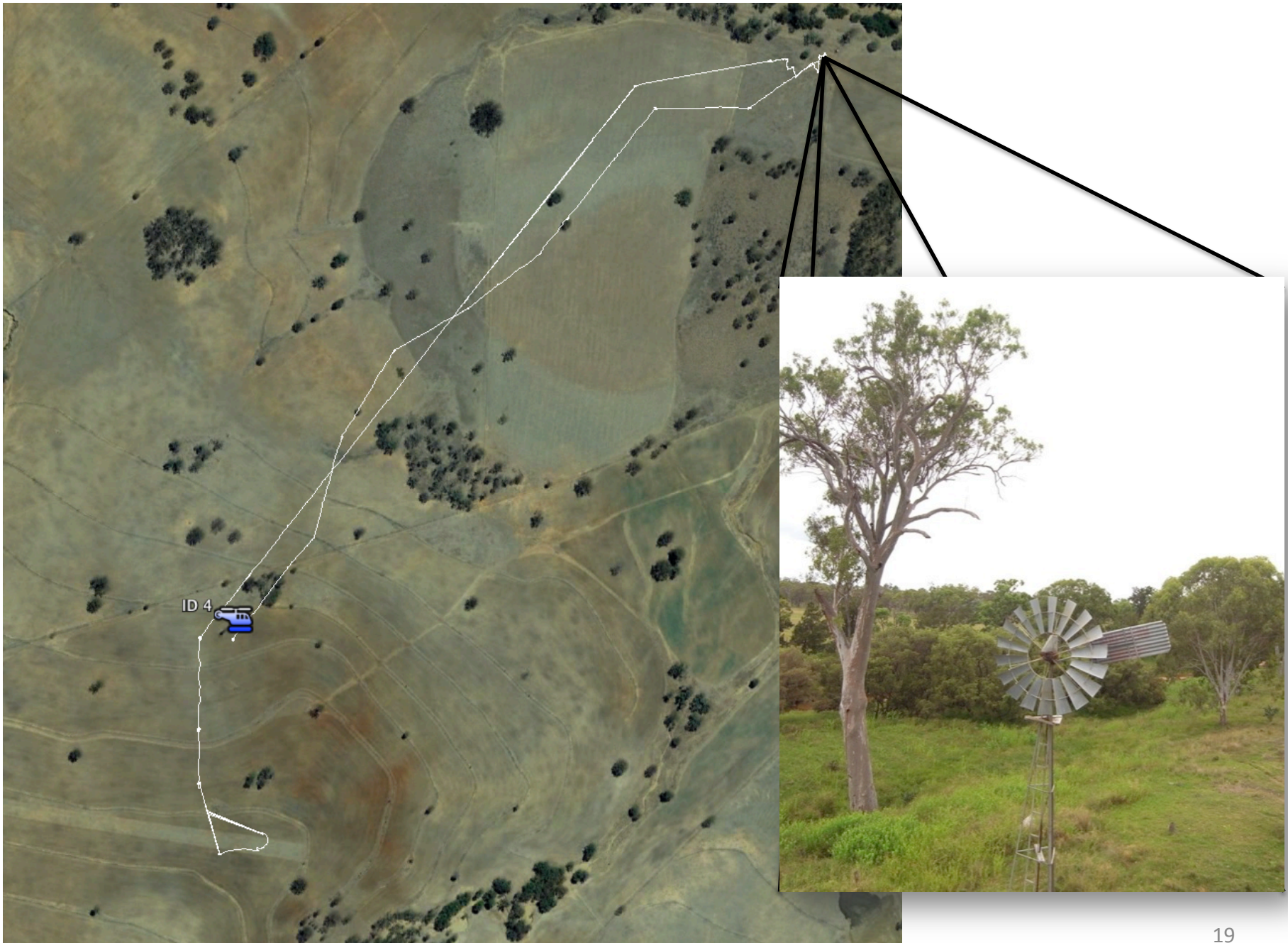
- Led by ARCAA/CSIRO Research Team
- Stereo vision and scanning laser system for the autonomous detection of obstacles on the ground
- Autonomous mission re-planning to avoid obstacles



RESEARCH INTO STATIC OBSTACLE AVOIDANCE



CSIRO / ARCAA Autonomous Helicopter

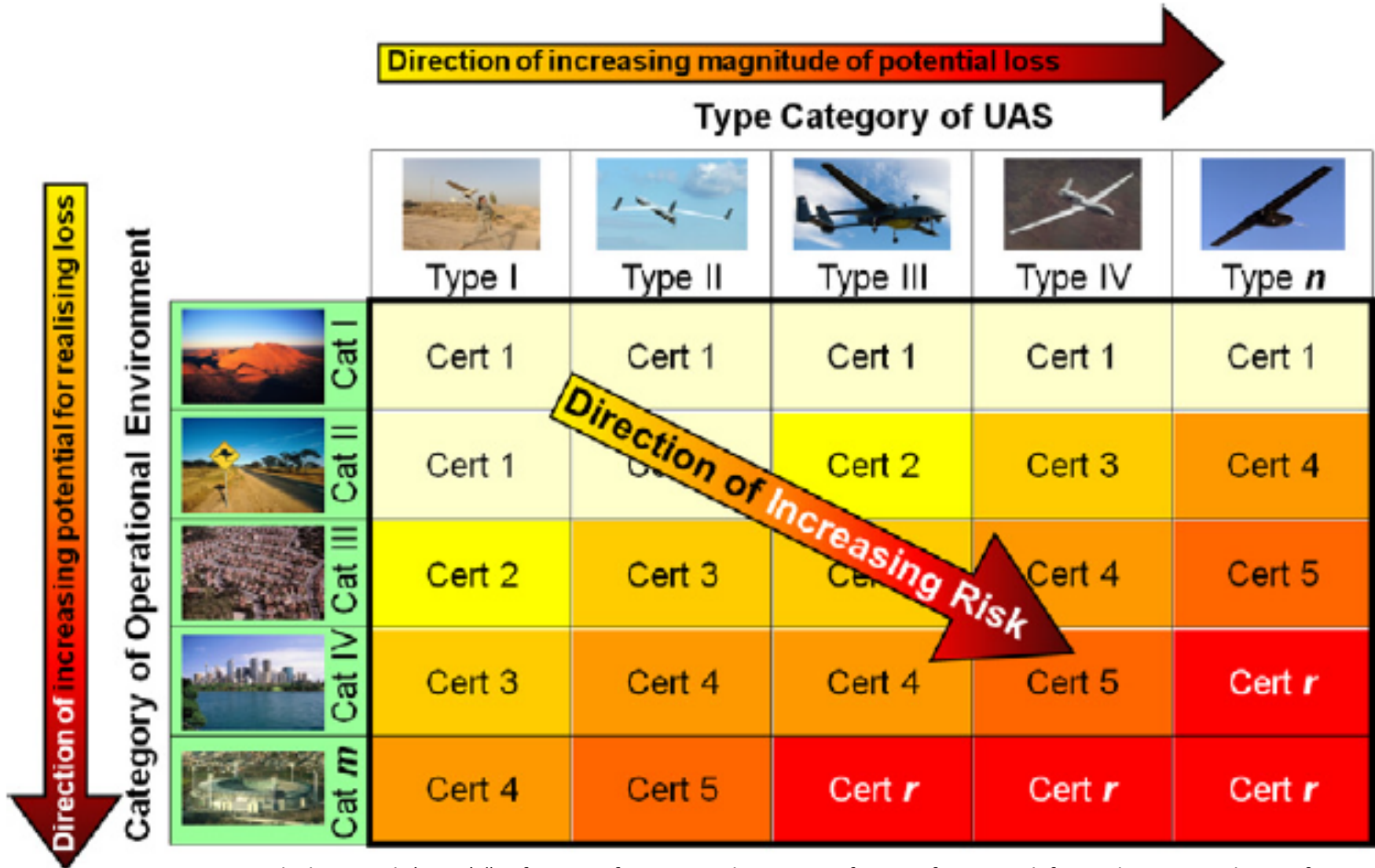


REGULATIONS & INDUSTRY ADVOCACY

- Work with the regulator through industry working groups
 - Australian Aerospace Industry Forum
 - [AAIF Recommendations Document](#)
 - Airworthiness, training and licensing of personnel, small UAS operations, definition of “populous area”
- Industry advocacy
 - Association for Unmanned Vehicle Systems Australia (AUVS-A)



Airworthiness Certification Categories



UAV OUTBACK RESCUE CHALLENGE

- Started by ARCAA in 2007
- Objective is to inspire the next generation of the aviation workforce and to increase public and industry awareness of UAS technologies
- High School and open competition – to “rescue” the lost Outback Joe
- Similar high school event now being run in South Australia



UAS AND NEW ZEALAND

- Wealth of opportunities in NZ to exploit UAS
 - Maritime
 - Coastline surveillance (customs and defence)
 - Search and rescue
 - Fisheries management
 - Environmental management
 - deforestation, illegal clearing, tracking of endangered species...
 - Search and rescue
 - Disaster recovery
 - On demand communications
 - Drug detection and law enforcement
- Importance of getting industry, government & research together to address all elements of industry development
 - Industry network & capability
 - Advocacy (regulatory and commercial)
 - Research & education

UAS AND NEW ZEALAND



- Important to recognise what is unique about the NZ airspace environment & how it is managed
 - What comes out of the ICAO, FAA or from Australia will not necessarily reflect the needs of NZ
 - Do you, as an industry, know what you want and more importantly what you need from regulations?
- Establishing a working relationship with the regulator, air navigation service provider, other airspace user groups and the communities you are over-flying

MORE INFORMATION

Email:

r.clothier@qut.edu.au



ARCAA Website:

www.arcaa.aero



AUVS-Australia Website:

www.auvsi.org/AUVSI/Australia/Home/Default.aspx



UAV Outback Rescue Challenge

www.uavoutbackchallenge.com.au/



CASA UAS Rules and Guidance Material:

www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100374

QUESTIONS?



Photo: Copyright © 2011 ARCAA

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