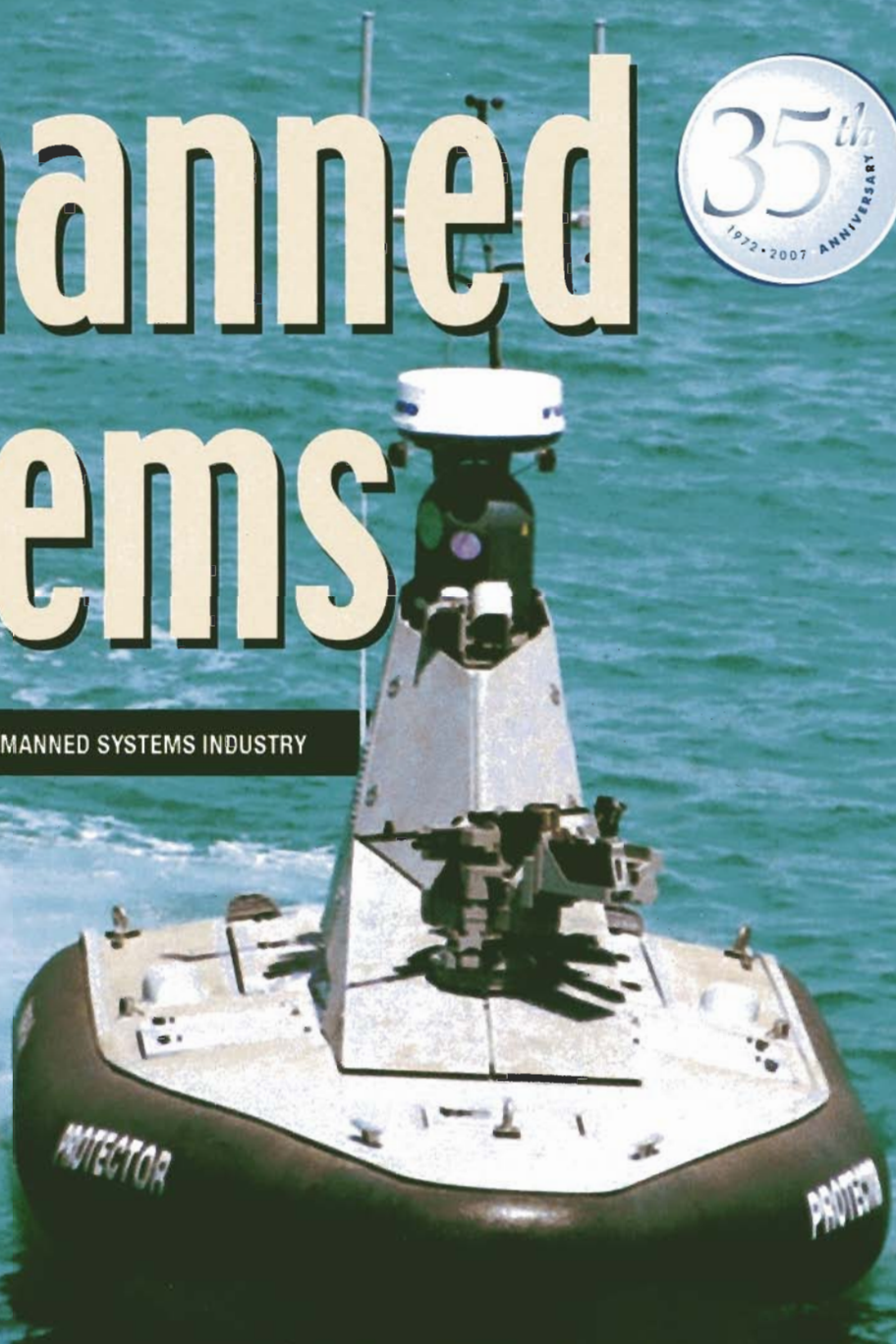


Unmanned Systems



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Aussie UAV Activities: Gaining Momentum

By Peter A. Smith

Despite enthusiasm by former and current senior Australian defence leaders for the country to gain early operational experience with military unmanned aerial vehicles (UAVs) to develop doctrine — the rate of progress has been slow.

But recent months have seen acceleration in planning, funding, and decision-making. And momentum is clearly developing for Australia to employ a variety of UAVs in a spectrum of military roles.

These include Tactical UAVs (TUAVs) for the Australian Army, Small UAVs (SUAVs) for Australia's Special Forces, and High Altitude Long Endurance (HALE) UAVs for wide area military and civil surveillance, both maritime and ground. The prospect for Unmanned Combat Air Vehicles (UCAVs) remains on the capability agenda, but not in near term.



Skylark UAV



Global Hawk UAS

JP 129 TUAV

The contract for a TUAV for the Australian Army was signed in December 2006 with Boeing Australia to provide the LAI I-View 250A along with comprehensive support services and training, plus integration of the L-3 Communications Common Tactical Data Link. Contract value is estimated to be about \$US 110 million.

Planning has already started for facilities for the Army's new Surveillance and Target Acquisition Regiment at Enoggera in Queensland. But due to protracted decision-making and contract negotiations, initial operational capability has slipped two years to late 2009.

Air 7000 Phase 1

This is the most ambitious and innovative of the Australian Defence Force's (ADF) UAV projects with an anticipated value approaching \$US 1.2 billion. The ADF requirement is for a Multi-mission Unmanned Air System (MUAS) capable of undertaking HALE

operations for maritime patrol and other surveillance, partially replacing the AP-3C Orion manned maritime patrol aircraft currently in service.

Early Australian interest was sparked by a Northrop Grumman Global Hawk visit to Australia in 2001, involving a trans-Pacific crossing and six weeks of evaluation and trials in Australia with significant Defence Science and Technology Organisation (DSTO) involvement. This was supplemented by trials in 2006 of the General Atomics Aeronautical Systems Inc. (GA-ASI) Mariner (physical trials) and Global Hawk (simulation).

Australia is currently developing its Air 7000 Phase 1 acquisition options, with strong emphasis on developing an Australian-unique Integrated Ground Environment (IGE) potentially capable of integrating both manned and unmanned mission planning, management and analysis. A draft Request for Tender (RFT) has been issued for an industry partner to work with the military in developing this proposal.

Selection of the HALE platform will be strongly influenced by the U.S. Navy's Broad Area Maritime Surveillance (BAMS) project. The Australian Government has approved formal negotiations to participate in BAMS.

Air 6000 Phase 2C

Air 6000 is the RAAF's multi-phase project to acquire a new air combat capability to replace current F/A-18 Hornet and F-111 manned aircraft beyond 2010, with the F-35 Joint Strike Fighter tentatively designated as the primary replacement manned aircraft and Super Hornet also under consideration.

Phase 2C of the project will address potential new capability options for the longer term, and UCAVs will be one of the options considered. No decision is planned before 2014 and initial operational capability is not expected before 2018.



Aerosonde UAV

Skylark

In late 2005, Australia announced the acquisition of four Skylark SUAV systems to provide surveillance capability of ADF operations in Iraq. The nature of the operation is such that little public information is available.

Army Interim TUAV

In 2006, the Australian Army finalized a \$US 10 million contract with Boeing Australia for provision of Boeing/Insitu ScanEagle services for six months. While no formal requirement was published, the contract provides services to the ADF in Iraq similar to those provided to the USMC there, and is understood to be based on an unsolicited proposal by Boeing Australia, which is also the JP-129 prime.

Aerostats

In a little publicized move, the ADF has acquired three aerostats from TCOM, a U.S. company, to trial their potential for extended duration (five days) communications relay on behalf of the Tactical Information Exchange Integration Office and for battlefield surveillance.

DSTO Defense Science Trials

Under its Automation of the Battlespace Initiative (ABSI), DSTO at Edinburgh and Woomera in South Australia has undertaken a wide range of research and development, aimed primarily at demonstrating the use of small, inexpensive, autonomous, cooperative UAVs (principally Aerosondes) in electronic warfare roles. Particular emphasis has been placed on autonomous swarming, with successful demonstrations in Australia and the USA.

Meantime, DSTO has collaborated with the U.S. military in C4ISR On The Move activities in the USA, and with Asian defence science organizations on other projects.

The Australian DoD, through DSTO, provides funding (\$US 20 million in 2006) to investigate defense-relevant new technology applications. Two recent projects involve UAVs. The first was the successful use of the Aerosonde SUAV by Saab Systems Australia for radio relay including high rate data as well as voice. The second, currently under way, involves Thales Australia developing the Jandu turbojet powered, high speed, medium range SUAV, originally conceived by TJI Technologies in Perth, WA.

Focusing Unmanned Aviation Down Under

With the strong support of the Aerospace and Electronic Systems Society (AESS) of the Institute of Electrical and Electronics Engineers (IEEE), the Queensland University of Technology (QUT) hosted its second unmanned aviation workshop on 7-8 December on its Gardens Point campus in Brisbane, Australia. Organized by Dr. Rod Walker and the staff of the University's Australian Research Centre for Aerospace Automation (ARCAA) and supported by Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), the event drew 120 attendees from four continents, including representatives from France, UAE, India, Spain, the United Kingdom, and the United States.



The workshop's two-day agenda was divided into three sessions covering standards and regulations, operations, and technology.

The Standards and Regulations session featured presentations by EuroControl, ASTM International, EuroCAE, Australia's Civil Aviation Safety Authority, and RTCA. Representatives described the status and future direction of their organizations' efforts on behalf of unmanned aviation. The topics included airspace access, collision avoidance, airworthiness, operator certification, and spectrum allocation. The session concluded with an open discussion on these "hot button" topics moderated by Dr. Walker.

Operational Experiences, the bridging session of the workshop's three sessions, provided details of Australia's Department of Defence's Unmanned Aircraft Roadmap, the GA-ASI Mariner's experiences during its recent North West Shelf Trial, transferable lessons learned from Kalkara target drone operations, AAI's Aerosonde's activities in civil airspace, and BAE Systems' recent establishment of a UAS airfield near Sale, Australia.

The final session, New Technology, explored the use of bird-watching radar for UAS collision avoidance, unmanned helicopters for inspecting hard-to-access infrastructure, such as powerlines and bridges, predicting air traffic flight paths, tools for assessing flight risks to cultural areas, and the foibles of using vision-based sensing for collision avoidance.

QUT and CSIRO have developed into mature, multi-faceted players in the robotic aircraft community, capable of contributing to the solution of the challenges facing that group. The conduct and quality of the ARCAA Workshop clearly establishes Australia as an innovator, both in technologies and procedures, on the world unmanned aviation stage.

Unmanned Systems: 'Down Under'



Skylark 2 UAV

Maritime Surveillance

Given the length of Australia's coastline, much of it uninhabited, and the recent history of incursions by boat people and foreign fishermen, it is not surprising that there has been increased interest in the use of UAVs for maritime surveillance, particularly over the oil and gas reserves of the North West Shelf.

An initial trial in 2005 by the Australian Coastwatch organization in the Torres Strait area used the Aerosonde SUAV cued to targets by a surface wave radar (SWR) system. Cueing issues with the SWR caused difficulties in assessing the effectiveness of the UAV to identify and classify a variety of targets.

Last year, Coastwatch called tenders for a further UAV trial, utilizing larger UAVs with more capable sensors for multi-role activities, including wide area surveillance and cued targeting. No winner has been announced. Industry sources expect Surveillance Australia, the manned aircraft Coastwatch incumbent, teamed with GA-ASI to offer Mariner, as a leading contender.

In late 2006, Australian DoD conducted two trials to assess the capability of HALE UAVs to undertake military surveillance of the North West Shelf in conjunction with patrol boats. Both the Mariner physical trial and the Global Hawk virtual trial have been completed and described by DoD as successful, but no detailed results have been published.

Also last year, to assess the potential for SUAV operations from naval Armidale patrol boats, the RAN funded a short-term trial of AeroVironment Aqua Puma out of Darwin.

Aerosonde

This Australian SUAV manufacturer and operator was acquired by AAI last year, gaining the benefits of being part of a major U.S. UAV company. Aerosonde continues to operate largely autonomously, with AAI support on systems integration, particularly in U.S. military environments.

Aerosonde has continued to be particularly active in civil and military science applications with Australian, Asian and North American customers. Recent highlights included an SUAV endurance record of over 38 hours, and autonomous swarming involving up to six UAVs.

BAE Systems Australia

BAE Systems Australia has been established as the company's Centre of Excellence for autonomous technologies, particularly in UAV research and development. It has established a trials facility at West Sale, Victoria. The company's multi-platform experimental UAV Kingfisher has been used to demonstrate advanced capabilities in airborne autonomous systems.

Unmanned Technologies Australia

This Australian industry consortium, part funded by the Australian Government's Industry Cooperative Innovation Program, launched in 2005 a new AIRCOMS project, described as "developing unique airborne communications and surveillance capabilities suitable for a wide range of military and civil applications". Latest reports indicate priority being given to a radio relay payload. Participants include Codarra Advanced Systems, CAE, LSM Advanced Composites, Production Parts and Lavender Engineering.

ARCAA

A major development in civil UAV applications research occurred in 2005 with the formation of the Australian Research Centre for Aerospace Applications (ARCAA), a joint initiative of the Queensland University of Technology (QUT) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). (See related story.)



For Project Wyamba

Trials and Training Areas

There is increasing activity aimed at providing Australian and regional UAV users with upgraded trials and training areas, with an emphasis on dedicated airspace and mission management/communications systems.

Most military UAV trials and development activities have to date been flown at the Woomera Trials Area in South Australia, used also for manned aircraft and missile trials, particularly by the RAAF. Woomera has become increasingly congested, and while an upgrade plan is being prepared, alternative trials sites are under development or consideration.

BAE Systems has already established and activated its West Sale location, and the Queensland Government as part of its aviation and aerospace hub strategy has been promoting the possible enhancement of Kingaroy Airport, north-west of Brisbane, as a multi-user UAV trials and training precinct. This remains in the study phase.

Aerosonde continues to use its trials facility at Hamilton in western Victoria, as well as Woomera, and is known to be investigating possible options with better facilities and/or easier access.

University Research Activities

Australian universities continue a high level of interest in UAV research.

At the University of Sydney, the Department of Aeronautical and Mechanical Engineering maintains a high level of activity in UAV applications in its UAV Research Group, while its Australian Research Council Centre of Excellence for Autonomous Systems involves a team of 200 researchers — reportedly the world's second-biggest such center.

The Royal Melbourne Institute of Technology through its Lawrence Wackett Research Centre maintains a long time interest in UAV research with particular emphasis on design technologies.

At Monash University, also in Melbourne, the Aerobotics Research Group has a primary focus on electrically powered UAVs.

Unmanned Underwater Vehicle Activities

DSTO's UUV Technology Group has been working with West Australian company Nautronix on Project Wyamba to develop a mid-sized UUV to be used to deliver and lay a small number of self-surfacing buoys that will form the basis of a self initiating, long baseline navigation and communications array. The system recently demonstrated capability to communicate with an Aerosonde UAV.

Separately, the Australian Department of Customs has issued a Request for Expressions of Interest for acquisition of five remotely



ScanEagle UAV

operated vehicle (ROV) systems to be used at major Australian ports to inspect the hulls of commercial vessels, particularly those entering Australia from Asian ports known to be sources of contraband.

Unmanned Ground Vehicle Activities

In 2005, DSTO formed a Centre of Expertise in Defence Autonomous and Uninhabited Vehicle Systems with the University of Sydney's Centre for Field Robotics with the objective of enabling multi-vehicle projects including UAV, UUV and UGV systems.

During 2006, a first result of this initiative was for a successful DSTO trial involving an autonomous Aerosonde UAV swarm geolocating an emitter source at the Woomera trials range and providing commands for a DSTO UGV to transit to the emitter over several miles.

Peter Smith, an Australia-based AUVSI member, is a consultant on defense and aerospace matters. He is a member of various government and industry advisory bodies and former chairman of Aerosonde Pty Limited.

Learn more about Unmanned Systems: 'Down Under' at AUVSI's Unmanned Systems Asia-Pacific 2007, 15 - 16 March, 2007; in conjunction with the Australian International Airshow in Avalon. Contact AUVSI for more information at meetings@auvsi.org or visit www.auvsi.org



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