

THE AUSTRALIAN ARMY AND UNMANNED AERIAL VEHICLES... 20 YEARS AND FINALLY IN-SERVICE

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Abstract

The Australian Army is now properly in the Tactical Unmanned Aerial System (TUAS) game with the successful fielding of the RQ-7B SHADOW 200 TUAS.

It's been a long path though, with many lessons learned, and enabled so successfully only with the assistance of US partnering and some key individuals doing some very hard work. This paper is that story.

1 Introduction

The Australian Army has long held desires to field a TUAS capability. The requirements emerged out of the conflicts and technology developments of the 1980's, but their cutting edge, lack of precedent, and falling victim to bureaucratic and contracting problems resulted in the path being in excess of twenty years to be realised. This paper aims to provide historical context to the Australian Army TUAS capability and to highlight the hard work and partnering required to eventually deliver a world class capability.

2 A Short History

2.1 Project NINOX, Land 53

Project Land 53, more commonly known by its program name, Ninox (named after the Powerful Owl, *Ninox strenua*), was a land systems program charged with enhancing the Army's night fighting and surveillance capabilities. UAS activities, within Phase 2, were broken into two sub-phases, 2A to evaluate systems and technologies, and 2B to go and buy a system.

Land 53 Phase 2A commenced in 1990 after the Augmented Chief of Staffs Committee

approved a series of studies, culminating in 1993 with a concept technology demonstration involving UAS supplied by Israel Aircraft Industries (IAI). For the trials, IAI were contracted to bring out to Australia two Scout Air Vehicles (AV) and one Searcher AV.

No systems at this stage of UAS development had automated take-off and landing capabilities and required an external pilot to launch and recover the aircraft (think radio controlled aircraft control handsets). The automated functions of the UAS once airborne (waypoint navigation and sensor operation) were undertaken by a mix of Aviation aircrew and Artillery personnel.

These trials included scenario based flying out of Kunanurra and Tindal in an exercise environment flying in support of a composite reconnaissance force commanded by 1 Avn Regt and made up of 2 Cav Regt ground elements, Kiowa, Iroquois and Nomad. The trials also involved the fitting of MOSP and SPIRIT payloads into a (manned) Nomad belly (via temporary modification orders) for sensor capability demonstrations.

Acquisition bureaucracy followed for the next three years as the program was progressed up the chains of command until 23 May 96 when the capability committees agreed that Phase 2B, the acquisition of UAS, should proceed as a high priority. Year of Decision (YOD) was scheduled for 97/98, ironically the same year that Project Air 87 Armed Reconnaissance Helicopter (ARH) went for decision.

1997 was an important year for both of these programs. When Land 53 Phase 2B went to committee, it was decided to break it away from Land 53 and create a separate program, titled Joint Project 129 (JP129). The program was broken into two phases; Phase 1 was a risk mitigation phase

(more studies and trials), and Phase 2 was the acquisition. Concurrently, Air 87, which was initially charged with a mandate to supply the Army with a Broad Area Aerial Surveillance (BAAS) capability, had this requirement transferred to JP129 due to the success of the Defence Science and Technology Organisation (DSTO) Project INGARA trials and the realisation that there were no ARH on the market with broad area radar capabilities.

2.2 Project INGARA

A DSTO program, Project INGARA was an in-house developed Synthetic Aperture Radar (SAR) system designed as a plug and play payload for small aircraft. In the early 1990's the capability concept was to acquire six of these systems to be held with 173 General Support Squadron for plug and play installation on Nomad aircraft with a subsequent development goal to miniaturise it small enough to be installed onto the Land 53 UAS. The Nomad plan faded away quickly with the sudden retirement of the Nomad fleet in 1995.

DSTO continued their development work however, integrating the system first onto the Aircraft Research and Development Unit (ARDU) C-47B Dakota for Exercise KANGAROO 95 and then onto a King Air 350 operated by 173 General Support Squadron as part of the commercial fleet that replaced the Nomad. The King Air INGARA system first flew for Army on Exercise PHOENIX in Aug 98 and then again on Exercise CROCODILE in 99. These trials and development continued right through into what turned into the first phase of JP129. While never introduced onto Army manned or unmanned platforms, the INGARA system is still being used today to inform programs such as the AP-3C upgrade program and Air 7000 (Maritime Patrol UAS).

2.3 Project WARRENDI, JP129

Warrendi, Aboriginal (Nurrunga/Kaurna) for 'to seek' was designated JP129, and established as a two phase program under Royal Australian Air Force (RAAF) leadership with Phase 1 being a Risk Mitigation Phase (RMP) to explore issues of military utility and to develop concepts of operation for BAAS and Focal Area Aerial Surveillance (FAAS). Phase 2 was to follow with acquisition of systems.

2.4 JP129 Phase 1

The BAAS requirement, handed to JP129 from Project Air 87, primarily trialled capabilities existing in the DSTO Project INGARA (Strip-mode and Spotlight mode SAR, and Ground Moving Target Indicator (GMTI) modes) on 173 General Support Squadron King Air's. The BAAS trials and analysis of JP129 Phase 1 resulted in the recommendation of a follow-on phase to permanently acquire a suite of radars and additional aircraft for the King Air fleet within 173. It was proposed as a separate phase due to the large cost involved. This requirement was not endorsed and has since disappeared for the Army with the transfer of King Air fixed wing capability to the RAAF in 2010.

The FAAS elements of JP129 Phase 1 were studied by leasing a Vertical Take-off and Landing (VTOL) UAS in 1999, the Bombardier Guardian. This trial on Exercise CROCODILE 99 in Tindal aimed to test the validity of an EO/IR sensor on board a tactical UAS supporting a Brigade. The trial, also involving DSTO, demonstrated the utility of the system to the Joint Task Force (JTF) Commander and paved the way for JP129 Phase 2.

2.5 JP129 Phase 2

Commencing in 2001, Phase 2 aimed to decide its system in 2003/4 (six years after the original Land 53 Phase 2 UAS Year of Decision (YOD)), however, delays to development of the Operational Concept Document (OCD) and Plan ELANUS (the JP129 Introduction Into Service (IIS) Plan), and release of the tender resulted in delay of Second Pass Approval until 2005. That approval was for new facilities in Enoggera and the acquisition of two IAI Malat I-VIEW 250 UAS through the prime contractor, Boeing Australia Limited (BAL).

Unfortunately, BAL and its subcontractors experienced a range of technical issues resulting in an inability to deliver the full scope of the contract within an acceptable timeframe. Subsequently, and driven by an operational imperative to field a TUAS capability as soon as possible, DMO and Boeing Australia agreed to terminate the contract in Sep 08.

2.6 SCANEAGLE

The utility of TUAS directly supporting ADF deployed forces in the Middle East was quickly realised and subsequent operational requirements defined the need for a persistent and capable TUAS platform. A short search of available and in-service systems revealed the answer, the InSitu SCANEAGLE, in service under a lease with the US Marine Corps.

The SCANEAGLE is a small-UAS (15 kg, 2.9m wingspan), staying aloft for up to 18 hours with its unleaded petrol two-stroke engine, and has an operational range up to 100km. While the AV has an endurance of up to 18 hours, it can only carry one payload at a time, either a daytime electro-optic camera or an infra-red camera, limiting sortie length to an average of 8-12 hours.

A contract was signed with BAL who facilitated a strategic partnership with InSitu and within very short contracting time the first 20 STA Regt soldiers completed their training in the US (Washington and New Mexico). These soldiers deployed first into Iraq where they rendezvoused with the delivered equipment and their contractor support team (SCANEAGLE utilises civilian contractors for launch and recovery operations and maintenance within the confines of the Forward Operating Base (FOB)). The detachment was flying in support of ADF Force Element a few days later (Dec 06). This capability was fully integrated into the battle groups operations and included the installation of both remote viewing terminals (RVT) and ground control stations (GCS) into the battle groups armoured vehicles (ASLAV and Bushmaster).

Six months later the contract was extended to cover a second operational area and another detachment was flying in Afghanistan in ADF support in Jul 07. This detachment also developed armoured vehicle installations as well as converting power supplies to combat net radio batteries so that the RVT could be man-packed.

The success of the arrangement of the Australian Army SCANEAGLE prospered and InSitu has now expanded to have a base in Brisbane as InSitu Pacific Limited (IPL) with assistance from the Queensland Government, where up until very recently they conducted the training for the 20 STA Regt soldiers and also hold and repair equipment.

The Iraq detachment has since ceased operations with the withdrawal of ADF troops from Iraq in early 2009, and the Afghanistan detachment recently ceased SCANEAGLE operations in early 2012. In ADF support, SCANEAGLE has cumulatively clocked up in excess of 45,000 flying hours of training and operations. For six years it was the backbone of the Australian Army's TUAS capability

3 The ADF SHADOW 200 Program

3.1 JP129 Phase 2 Restart

The SHADOW 200 program is tasked to acquire two SHADOW 200 TUAS via Foreign Military Sales (FMS) through the US Army. The Australian SHADOW 200 system is not that of the US Army - the Australian solution is mounted on ADF Unimog trucks (vice HMWWV), incorporates ADF Combat Net Radio (CNR) comprising the Harris PRC-152 radio (vice US Army SINCGARS radios), has an extra Air Vehicle, four extra Portable GCS, additional launch and recovery equipment to enable split based operations, Weatherhaven controlled environment tentage and Australian Processing, Exploitation and Dissemination (PED) equipment. The ADF harnesses the US Army Performance Based Logistics (PBL) contract, utilises US Army training (through Fort Huachuca) for the first three years, and acquired US Army simulation solutions through the Joint Systems Integration Laboratory (JSIL).

3.2 Milestones

Key SHADOW 200 program milestones executed to date include:

- Price and Availability (P&A) (Quote) - Dec 08 to Apr 09 (four months);
- Letter of Request (LOR) (Request for Tender (RFT)) - Lodged Dec 09;
- Letter of Offer and Acceptance (LOA) (Contract) - Received Jun 10, signed Aug 10; and
- [Note: the FMS Case signature was for two production run systems, signed in mid-2010 for delivery in mid-2013 - three years (FMS is not necessarily fast!), however, in parallel we aimed to

accelerate the program by diverting a system from US Army inventory (Chief of Army to Chief of Staff US Army) - we succeeded in Oct 10.]

- LOA Amendment 1 (Contract Change Proposal (CCP) 1) - Dec 11.
- [Note: the Amendment (CCP) to account for a diverted system took more than a year to catch up.]

In parallel to the programmatics, production and certification milestones include:

- Training commences (in same month as diversion offer) - Oct 10;
- Simulators delivered - Jun 11; System 1 delivered - Aug 11;
- Airworthiness Board - Sep 11;
- [Note: 4 AwB's of SCANEAGLE saw us pass with flying colours (no system specific Corrective Action Requests (CARs)).]
- Operating Permit and First Flight - Oct 11;
- [Note: First ADF software patch ID'd, written, regression tested, JCCB'd, Airworthiness Release - 5 days!]
- [Note: First exercise flew 220 hours broke the US Army record for a fielding exercise (over 100 systems fielded).]
- Deployed, IOC Declared, Removed from PoC List - Dec 11;
- [Note: Deployed direct from South Australia.]
- [Note: Reward for contracting, training, equipping and deploying.]
- Takeover from SCANEAGLE and System 2 delivered - Apr 12; and
- [Note: Training to takeover - 18 months.]
- [Note: FMS Amendment not in place until four months after the equipment was delivered and the same month the equipment was deployed. A great example of faith, trust and risk management.]
- Second fielding exercise - Jul 12.

3.3 Where to?

- 2,000 hours already surpassed;

- ADF CNR installed and certified; Flying area expansion (from Woomera and Afghanistan, to WBTA and SWBTA);
- Install onto ADF vehicles Q2 2013;
- ADF Training System Q2 2013;
- Exercise HAMEL (ISO a Brigade in the field with a mobile solution); and
- FOC Q4 2013.
- [Note: Requirements (1990) to FOC (2013) is 23 years.]

4 Lessons learned

4.1 FMS is not fast

...without intervention. We know this through other FMS programs (ABRAMS tank, M777 artillery, C-17, Super Hornet, etc), however, if a good relationship can be cashed in on, and that relationship can be fostered, you may be able to get a US Production Slot Shuffle or Diversion from Inventory. In the ADF SHADOW 200 case we got a Diversion (1 year for the first system, 20 months for the second). It came at a compromise though - no vehicles, no ADF CNR... these will come at the original 3 year production point.

This requires Chief level engagement - in this case, three, Generals Leahy, Gillespie and Morrison have all written letters to make this happen. Diversion runs a risk though, non-standard, rapid-induced workarounds make it complex in both schedule and contracting (equipment is dribbling in over two years and it takes seven FMS cases to manage this project).

4.2 Communications are key

The SHADOW 200 program utilises monthly telecons combine with six-monthly Case Meetings (combined with key milestones such as P&A, LOR, Acceleration and then PMRs). For this you need the right people – Some people don't do communications and relationships well... these people need to know, or be kept in, their place... a misplaced sly remark or ill-communicated phrase over a telecon does have the ability to undo large bodies of work. The right people need to be chosen for this kind of work.

Face-to-face is also important: Off-the-shelf from an overseas supplier equals travel, even to an English speaking provider (two teams

separated by a common language – especially in the case of Alabaman's)... How many weeks of emails and telecons were worked through and then solved in an hour of being face-to-face... face-to-face is priceless.

To enable face-to-face requires a travel budget... either establish a project better (ie, resident teams in the location of your supplier, co-location of project with customer/sustainment units) or bear the burden (time and cost) of travel – the job cannot be done without getting face-to-face.

4.3 Hard work

Good news, there are some individuals out there, uniformed and public servant who are motivated to do incredible work. From these selected key individuals, who racked up some amazing time off in lieu due to their devoted work hours, small programmatic miracles were produced. I would like to take this opportunity to acknowledge them as Army owes them a lot, in particular two brilliant young APS engineers, Mr McKinnon and Mr Lancaster who drove the system to certification. This was also reciprocated on the US side – within the PM Office and AAI – no payoff for the US or themselves, doing it primarily to contribute to OEF and the ICAT. To Steve Moore, Dave Sickmeier, Helen Hodge, Cindy Vanburg, Leon Kilgore, Ken Bernhardt, Heath Philips, MAJ Peterson, Terry Farcas, Fred Kogel, CJ Jacobs, KO, SAFTA, Tooele Army Depot, AMCOM, 2/14 Training Battalion, AAI of course, QinetiQ, and everyone else who has assisted, we owe you our thanks – these US personnel didn't do it just once, they did it all over again when the second Diversion was approved.

4.4 Faith and risk

Rapidity combined with a small (very busy) team can and will result in project documentation (CRP, PMP, MAA) not staying up to date... this needs to be worked with, and trust placed in the key staff to steer the ship without constant document updates. We got this from our Chain of Command.

Build trust quickly and once established, let trust drive the program. But also identify who can't necessarily be trusted and devote good oversight to those activities. Risk – ID, treatment

and monitoring is key and important to a projects success. These need to be monitored, communicated and managed across the integrated planning team.

Personnel, especially in small teams, can carry the greatest. In a small team on a rapid path it is difficult to afford the staff being deployed or turning over, especially if that person was the one person authorised to travel to do the last PMR...

A couple of examples of our US partner embodying faith, trust and risk include: Diversion approval; Access to training; Workarounds for dismounted operations; Workarounds for CNR differences; Air freight of both systems and all simulation equipment; Loan of MMF contents; Push-pack of spares; UAS-I expedition; Southern Hemisphere software patches; Support to ADF airworthiness processing; and Rapid overhaul of unserviceable ACE boxes.

5 Conclusion

The JP129 program has had our share of walking on eggshells, but SHADOW 200 is a success. There are many sustains – off-the-shelf, FMS, be prepared for complexity with the right people, coalition relationships, communications, manage your risks, invest in faith and trust (when earned). And, there are many improves – resource effectively, do not choose the wrong people, let a Project Manager manage their project, support and reinforce positional stability.

All involved in both the Australian and US side of the SHADOW 200 relationship can be proud.

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