

Towards an Australian Defence Unmanned Aircraft Systems (UAS) Industrial Ecosystem

A submission to the 2015 Defence White Paper Public Consultation by the association of Australian Certified UAV Operators (ACUO)



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Executive Summary

This submission to the Australian Defence White Paper public consultative process proposes the development of a National Unmanned Aircraft Systems (UAS) industry strategy which links Defence requirements with broader national capacities, providing enhanced capability availability and supportability through commercial means.

This submission holds the proposed National Unmanned Aircraft Industry Strategy should be jointly developed by the Federal Department of Industry; Australian research and development organisations; Australian manufacturing industry at a broad level; Australian UAS manufacturing industry in the particular, and Australian commercial UAS operators.

This submission calls for the establishment of domestic sourcing thresholds for Group I and Group II UAS adopted by the Australian Defence Forces as a means of reducing the cost of acquisition, operation and support to Defence by leveraging commercial requirements.

This submission calls for a revised approach to the development of industry engagement for the planned acquisition of the Northrop Grumman MQ-4C Triton as the objective solution for Project Air 7000, Phase 1B. Specifically, ACUO calls for an extensive review before Second Pass approvals examining how Australian industry can engage constructively and meaningfully with this important project to provide enduring and efficient support for Triton in Australian service.

This submission proposes formal establishment of project offices for developing and acquiring an Australian Defence Force MALE UAS and Royal Australian Navy maritime UAS. Such project offices should be structured to allow for force experimentation, phased capability development, and intelligent approaches to future objective capability with deep and continuing engagement with Australia's UAS industrial base at the broadest possible level.

This submission proposes establishment of a commercially provided UAS training capability for the Australian Defence Force at the Group I and Group II level by leveraging the more than 160 commercially certified UAS operators already trading in the Australian domestic market.

Lastly, this submission proposes stepped up engagement of Defence in the development of a coherent national and international regulatory regimes for UAS of both civil and military types.

ACUO approves the public release of this submission by the Department of Defence.

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1. Introduction

The Australian Department of Defence has been progressively developing unmanned aircraft systems (UAS) capabilities through a variety of programs and experimentation activities since the end of the Second World War. Despite this enduring engagement, the actual capabilities currently fielded by the Australian Defence Force are thin when examined in comparative terms with Asian neighbours such as India, Singapore and South Korea. This same disparity continues when examining the respective UAS capabilities of key allies such as the United States, the United Kingdom and, as a result of 2014 agreements, with NATO.

This disparity comes despite efforts within the Defence Capability organisation to develop coherent approaches to UAS capability in the broad, the most enduring expression of which was a short lived roadmap for unmanned systems which was made available to industry in June 2004. ACUO believes that the 2015 Defence White Paper is an opportunity for the launch of a more substantive UAS capability program for the ADF, one which is intrinsically linked to the evolving commercial UAS industrial base. ACUO holds that such linkages stand to facilitate more successful defence capability development, broader capability reach & inter-service operability, and an overall better return on investment in this technology, for the Australian Defence Force as a whole.

2. A National UAS Industry Strategy

Australia is unusual in global terms in that it does not have a national strategy for its UAS sector, neither in the Defence specific nor the broader commercial market contexts. Defence's own short-lived public domain Unmanned Systems roadmap was issued a decade ago. Likewise, in wholly commercial terms the only consideration of UAS industrial capacity as a national asset was a brief inclusion in the Australian Federal Government Aviation White Paper of 2003. The 2009 Aviation White Paper was wholly silent on UAS industry policy. For an industry undergoing extraordinary global growth, this national strategy void contrasts sharply with the priority being accorded to the sector by governments in the United States, Europe, Asia and the Middle East.

Australia's UAS industry has achieved much in the past decade.

- There are now more than 160 certified commercial UAS operators.
- There are a multitude of small airframe, sensor, avionics and operating system developers.
- There are a small number of more capable entities which have UAS in limited rates of series production for commercial and military customers globally.

This national industrial base will grow regardless of what actions governments do or do not take; but the absence of considered national planning means the sector is also exposed to headwinds and shackles that only benefit the industrial bases of other nations.

These domestic headwinds and shackles include:

- Australian universities regularly launch new research programs with funding support from the Australian Research Council to develop capabilities which are already available commercially in the national and international marketplace.
- CSIRO and DSTO launch research programs that have extraordinary potential but in isolation to the domestic industrial base which might be capable of carrying these into the global market.
- Federal and State government law enforcement entities buy UAS at significant cost but, as with the early history of railways in Australia, different systems with different support needs are adopted by different states with the result that efficiencies cannot be developed in the broad.
- Defence buys and operates a variety of UAS types, but by not engaging with the national industrial base in effective ways, is then required to carry alone the heavy fiscal burden of research and development, testing, production, training, operational work up and all allied costs associated with such technology shifts.

Australia cannot afford to approach Defence capability planning and development in isolation from extant national realities, particularly given the demands this places on the Federal budget. Defence may be partially unique in its capability needs, but it nonetheless remains an intrinsic element of the Australian economy.

Likewise, Australian industry cannot provide cost effective and efficient means of capability supply and support to Defence if the overall patterns of demand operate in isolation to wider market realities. The interests of both sides of this complex supply and demand dynamic require considered approaches lest economics alone render one or both parties incapable of playing their respective roles to the satisfaction of the other. In this context, the absence of a national UAS industry strategy stands as a reflection of disparate interests, whose collective strength remains under developed and whose potential to support Defence needs is likewise compromised. A coherent industrial ecosystem is now required to address these challenges.

ACUO proposes:

Recommendation 1: Defence, as part of its new Defence industry policy framework emerging out of the 2015 White Paper, commit to supporting creation of a national UAS industry strategy with this to be first issued by the end of CY2016.

Recommendation 2: That this national UAS industry strategy be coordinated by either the Department of Industry or the Department of Prime Minister as a functional extension of both the 2015 Defence White Paper and ongoing reviews of the Australian innovation system. Via this leadership, the UAS industry strategy will engage with all Australian Federal and State agencies, Australian industry in the broad and Australian research and development entities.

Recommendation 3: That the proposed national UAS industry strategy be treated as a living document, the evolution of which provides currency with the demands of the full spectrum of civil and military users in Australia, as well as prospective international markets.

Recommendation 4: That the proposed national UAS industry strategy be identified and accepted as a key source of guidance by Defence in its planning of future UAS capabilities, including all UAS related research and development activities by DSTO and the RPDE organisation.

3. A Domestic Industry Sourcing Threshold.

Australia is somewhat unusual in global military UAS market terms in that Defence does not have any established domestic industry capability thresholds in place for the sourcing of systems. This contrasts markedly with the examples of Germany, France, Italy, Turkey, South Korea, Japan and Singapore where domestic sourcing rules apply to tactical class UAS between Groups I and III. This domestic sourcing policy can be understood from several perspectives:

- First, it provides a basis for sustaining high levels of in-country technical capability specific to the UAS sector, this supporting not only current operational needs but also future requirements, including support and operation of higher Group capabilities which may be acquired on the international market.
- Second, recognising UAS are the result of a convergence of multiple technology domains, it facilitates ongoing cross pollination between concepts, knowledge and applications. This is an essential feature of national technological competency in the broad, and more specifically underpins the rapid pace of UAS technological development.
- Third, it facilitates the use of spiral acquisition methods, wherein ‘build, operate, learn, redesign and build’ methods act offset system obsolescence and attrition.
- Fourth, it facilitates broad sourcing of relevant technologies in the international marketplace, meaning currency can be maintained with leading edge initiatives and concepts from any specific nation, as well as incorporating domestic research and development outcomes. Group I and II UAS tend to reflect commercial technology trends in the first instance, rather than the closed loop development-cycles of military grade technology as applies to higher platform classes.
- Fifth, it facilitates offsetting cost overheads of developing and sustaining manufacture of small military UAS by exploiting the existing and rapidly evolving commercial market for these same low end technologies.

ACUO proposes:

Recommendation 5: Defence, in conjunction with the Department of Industry and CSIRO, establish a joint working party of Australian UAS sector manufacturers, certified operators, research and development agencies, Cooperative Research Centres and universities, to prepare and complete a detailed feasibility study of a national Group I and II UAS program by the end of CY2015.

Recommendation 6: Based on a successful finding by that study, that Defence, the Department of Industry and CSIRO explore joint funding of a national Group I and II UAS development program, involving civil and defence variants with common core technologies, manufacturing methods and support structures. Development of this program would occur between CY2016 and CY2018, allowing development of a direct correlation with initial operational capability targets for Land 129 Phase 4.

Recommendation 7: Defence establish a domestic sourcing regime for its Group I and Group II tactical UAS, with this to be first applied with respect to Land 129 Phase 4, the acquisition of a new generation family of small UAS.

4. Air 7000 Phase 1B and FMS Sourcing

The reliance on the US Foreign Military Sales program for sourcing Australian Defence Force capabilities is a historical reflection of troubled programmatic experiences by the Defence Material Organisation in handling complex system acquisitions. Defence now plans FMS acquisition of the Northrop Grumman MQ-4C Triton, a derivative of the RQ-4B Global Hawk, under Project Air 7000 Phase 1B. As a maturing system, it is already clear an FMS acquisition of Triton will provide few opportunities for Australian industry, and where such does emerge, will tend to be of a generic nature or offering. The classes of Australian industry work already announced by Northrop Grumman for the project reinforce this assessment.

ACUO reiterates the concerns expressed relative to the FMS system as expressed by the Australian Business Defence Industry unit in their submission of 30 September 2014, specifically, that the logical end state of offshore purchasing in this form will result in an industrial base not capable of providing the necessary levels of through life support for ADF operational capabilities. ACUO is of the view that in such conditions, alternative approaches need to be taken to explore how Australian acquisition and fielding UAS can be exploited in scientific, industrial and technological terms, to the direct benefit of Defence.

ACUO proposes:

Recommendation 8: That as part of its progress towards Second Pass approvals for Air 7000 Phase 1B, Defence initiate an open review of Northrop Grumman's proposed Australian industry engagement strategy. That this review include scope for full input by Australian industry, Australian universities and research agencies, and other government agencies at the State and Federal level who may have an interest in leveraging this unique form of national capability. That this review be used as a test bed for a formal program of industry engagement reviews for FMS acquisitions as a standing element of forward Defence policy for Industry.

Recommendation 9: That as part of the proposed National UAS industry strategy, a study be conducted into the potential development of a wholly Australian-industry developed, stand-alone universal payload pod which can be fitted to the wing hard points of an MQ-4 series UAS, and with the exception of

power supply, be operated independently of all air vehicle flight control and sensor management systems.

Recommendation 10: That if found to be technically feasible, DSTO and CSIRO jointly lead a project which engages Australian industry in development of such a pod as a commercial product for all Global Hawk series aircraft internationally. That once developed, Defence make access to this pod available on a commercial fee-for-carriage basis to companies, research agencies and government agencies seeking to collect commercial or scientific data in pre-negotiated regions otherwise largely inaccessible by extant sensor means. That as part of this commercial linkage, Defence contract out customer development, payload integration and pod preparation to Australian industry on a multiyear basis.

ACUO believes that users for such a pod could include:

- The Australian Antarctic Survey, the Australian Bureau of Meteorology and universities (remote area mid atmospheric sampling missions).
- The Australian Geological Survey and Federal and state environmental agencies (wide area hyperspectral monitoring).
- Commercial airborne data survey companies (as an alternate to own aircraft operations in wide area operations).
- Internationally, NASA, NOAA and related national scientific research agencies.

ACUO notes that Australian SMEs have a strong record of commercial achievement in development of airborne pod systems, for example, the 'Airpod 101' from Air Affairs Australia.

5. ADF MALE UAS Capability

The Australian Defence Force has for a number of years fielded leased IAI Heron MALE UAS via the Project Nankeen services arrangement with Canadian firm MDA in support of deployed operations. As announced by the Australian Government 28 October, Defence will retain two of the five Heron air vehicles engaged via the lease along with its associated command and control infrastructure. This approach will also see the retention of the valuable Australian-developed ISR processing suite. ACUO backs this retention decision as a means of ensuring hard-won operational expertise is not lost.

Defence consideration of the future role MALE capability will be play in its force structure is necessarily going to require complex evaluations. This includes decisions relating to armed strike capabilities. This consideration comes as Europe, under the leadership of the European Defence Agency, and the individual United States Services, each explore next generation MALE capabilities with accompanying industrial programs. In this context, any Australian acquisition of a new military off the shelf MALE system from United States or Israeli manufacturers before 2025 can only be considered as an interim capability measure, given the rapid pace of development of MALE technology in the broad, particularly that associated with operations in denied environments. ACUO believes Australia is best served now by retaining Heron, AND positioning to be an informed, early adopter of next generation capabilities.

ACUO proposes:

Recommendation 11: That Defence continue to sustain a basic MALE capability in the form of Heron with an objective timeframe out to at least 2025, but competitively develop cost effective Australian industry support activities for its next service phase to 2020-2025.

Recommendation 12: That as an interim step towards any future MALE capability, Defence initiate a ‘holding pen’ future advanced UAS project to act as a focal point for early and highly informed engagement with emerging next generation MALE and HALE development programs in both the United States and Europe. This holding pen project should be explicitly chartered to include detailed examination of opportunities for Australian industry on an ongoing basis, with Defence Exports unit and Department of Industry personnel integrated at the outset.

6. RAN UAS Capability

The RAN has been considering options for the development of maritime tactical UAS capabilities for well over a decade, with more considered analysis over the past decade recently resulting in the creation of NMP1942 as a mechanism to acquire a basic tactical capability for deployment aboard Armidale class patrol boats. This project is most likely to result in an acquisition of a fixed wing Group II or Group III solution which will clearly be extensible to other RAN platforms.

ACUO welcomes NMP1942 as a capability entry point for the RAN, but also notes that as with warship types, no single form of UAS can fulfil all prospective maritime missions. Australia’s acquisition and introduction into service of the Canberra-Class LHDs, the Hobart Class AWDs and the proposed Project Sea 5000 Future Frigate provide opportunities for consideration of more sophisticated UAS, including vertical take-off and landing (VTOL) types, as operational enablers.

VTOL UAS are the focus of intensive and generationally rapid development globally, with navies assessing a wide variety of platforms with equally wide operational capabilities. In parallel, a corresponding trend is emerging in manned rotary wing aviation with the provision of optionally piloted capabilities as a means of allowing a single type to operate in expanded operational modes. ACUO believes this hybrid capability should be assessed by Defence given that optional piloting conversion kits are being developed for a variety of existing manned rotary wing types. This may facilitate evolution of significant VTOL UAS capability as part of a mid-life upgrade for existing Australian Defence Force rotary wing assets in the decade ahead, rather than the prospect of another stand-alone system.

Rapid evolution in the VTOL UAS sector in the broad raises challenges, but also represents a clear opportunity for Australia to explore this market segment at an early and intelligent way well before committing to outright purchase of an objective capability solution. Such exploration brings with it corresponding opportunity to assess, identify and pursue potential Australian industry engagement at the global supply chain level, and on an enduring basis.

ACUO proposes:

Recommendation 13: Defence formally raise a maritime UAS ‘holding pen’ project to act as a focal point for early and highly informed exploration of all classes of UAS in all maritime warfare profiles. The raising of such a project now, is expressly for the purposes of ensuring Defence is pre-positioned to engage meaningfully and comprehensively with the rapidly evolving domain of maritime UAS in the broad, particularly that of VTOL UAS but also including VTOL ‘optionally-piloted’ solutions. This holding pen project should be explicitly chartered to include detailed examination of opportunities for Australian industry on an ongoing basis.

Recommendation 14: That Phase One of the proposed maritime UAS ‘holding pen’ project, be structured around the existing NMP1942 project, with a follow on phase providing a conduit for ongoing system acquisition and evolution of fixed wing tactical UAS to support whole of service requirements across multiple platform types, noting the proposed national sourcing threshold contained at Recommendation 7 of this submission.

Recommendation 15: That Phase Two of the proposed maritime UAS ‘holding pen’ project, competitively acquire a number of Group II or Group III VTOL UAS in the 2016-2017 timeframe, as a means of facilitating ‘intelligent experimentation’ at sea ahead of seeking to develop an objective operational capability in later years. That these VTOL systems be first integrated aboard the Canberra Class LHDs and then widened to include other major combatants. This proposal mirrors the incremental approach being taken by France and Italy with respect to their own naval VTOL UAS requirements.

Recommendation 16: That Phase Three of the proposed maritime UAS ‘holding pen’ project, be structured as a whole of Federal Government agency initiative which includes the active participation of the Australian Customs and Border Protection Service, the Australian Antarctic Survey and other interrelated agencies to facilitate access to tactical class UAS in a cost effective manner. This approach is aimed at removing duplication of acquisition processes and support structures, and facilitate development of a wider capability mix where assets are transferrable between user groups on an ‘as required’ basis.

7. Defence UAS Operator Training and Exercise Support

Access to UAS capabilities within the Australian Defence Force are currently limited due to the withdrawal from general service of the Group I Elbit Skylark system and the restricted scope of access to regular non-segregated airspace for Shadow 200B and Heron. While purchase of replacement Group I systems is planned under Project Land 129 Phase 4, those new systems can be expected to be likewise restricted in their ability to operate outside of designated defence airspace. Defence has in recent years periodically sought to overcome this training capability shortfall through the award of a short services contracts to Insitu Pacific, amongst others, to provide UAS in the context of specific exercises.

Training is a critical element of successful UAS operations in terms of control of air vehicles, understanding of operations and implementation of doctrine for usage. Without such exposure, the Australian Defence Force is inherently limited in how far it can leverage UAS as a standard element of operations in the broad. The ADF's combination of few assets and restricted operating environments contrasts significantly with the extant reach of the Australian national commercial UAS operators base, which is present in every Australian state and territory.

ACUO proposes:

Recommendation 17: Defence investigate the potential for contracting-in of commercially certified UAS operators to provide familiarisation exposure, basic operator training to an RPL 1 level, and low level exercise support for small unit training by Reserve as well as regular force units. That this contracting-in model be predicated on standard commercially available UAS, at corresponding commercial market rates to ensure cost effective supply rather than premium mark-ups for specialised and highly optimised solutions, unless these are specifically sought for a particular exercise or training requirement with unique characteristics. That this contracting-in model likewise be structured to link locally based Defence units, with local commercial UAS service providers in order to keep service overheads low for both parties, and to provide flexibility in sourcing and delivery arrangements.

Recommendation 18: That Defence investigate the creation of a form of Special Reserve service wherein holders of commercial RPL1 licences can engage directly with the ADF to provide depth of knowledge and experience which can be drawn upon as required for operational purposes.

ACUO notes that the relative cost per hour of contracting small commercially supplied Group I fixed wing and multicopter type UAS is far below that of specialist military grade systems, making this option highly affordable to Defence. While commercial products will be restricted in the ultimate level of capability they can provide, the focus of this recommendation should be understood at all times as basic training and familiarisation. Defence already accepts this approach as a basis for its ab-initio and basic training of pilots for manned aircraft, the training aircraft used in those roles having few modifications or specialisations. The proposed Special Reserve concept is predicated on the awareness that many commercial RPL1 licence holders have a Defence background or a personal interest in Defence career opportunities.

8. Air Traffic Integration

A fundamental operational limitation on the extant capabilities held by the Australian Defence Force is the absence of a national air traffic integration regime for all forms of UAS. While this is a policy matter where Defence is a stakeholder amongst wider aviation interests, Defence has unfulfilled opportunities available to it which are not being progressed, either domestically or internationally.

Primary policy responsibility for UAS integration into the national airspace resides with the Australian Civil Aviation Safety Authority (CASA), with extensive work now underway on

revised regulatory structures as exist under Part 101 and initial work emerging on a proposed Part 102 which would facilitate beyond line of sight operations. Part 102 is critical to the future capacity of Australian Defence Force UAS, particularly those in Groups III and above, to operate in non-segregated airspace in normalised operations at large. Defence currently engages with these regulatory efforts via CASA's UAS Standards Consultative Committee (SCC), participation of which is strongly welcomed by ACUO as a starting point.

ACUO proposes:

Recommendation 19: Noting CASA is significantly under resourced in handling UAS regulatory and policy matters, Defence initiate, host and resource a twelve month, broad consultation and development process, which results in a first draft of a proposed Part 102 as a means of expediting the development of UAS regulations in a manner which ensures Australian Defence Force airspace access needs, can be progressed in a timely manner. This initiative would run in parallel to the existing CASA UAS SCC process addressing the evolution of Part 101 and its day to day requirements. This 'division of labour' would allow separate, focussed, but parallel consideration of effective regulatory arrangements as required for the significantly different capabilities of UAS when assessed in Group terms.

Recommendation 20: The Australian Defence Science and Technology Organisation, in conjunction with the CSIRO, commission and conduct a detailed technical safety analysis of kinetic energy impacts of Group I and Group II UAS on human beings in the event of accident or incident. CASA has identified a need for such research but is not resourced to conduct this form of research on an objective basis. The absence of authoritative and independent research of this kind has an ongoing impact on the capacity of the regulator to make informed, evidence-based decisions on appropriate rules for the operation of UAS of all types, whether civil or military. The final report of this joint study must be prepared in a format allowing its public release if the full value of the study is to be achieved.

Recommendation 21: The Australian Defence Science and Technology Organisation, in conjunction with the Australian Army (via 20STA), CSIRO, CASA and the peak industry association of Australian Certified UAV Operators (ACUO), establish a national operations research initiative to explore the parameters of safe operation of Group I and Group II UAS in urban areas. The specific objectives of this program would be to examine and develop a step by step approach to facilitating small UAS operations by military and civil systems in increasingly dense urban environments, in a manner consistent with existing and emerging regulatory guidance under CASA existing Part 101 and proposed Part 102. This initiative should use Brisbane as its focus, noting the existence of significant urban corridors in that city as well as the home-base presence of 20STA and the CSIRO's Australian Research Centre for Aerospace Automation (ARCAA). CASA's UAS program office is likewise Brisbane based.

ACUO notes the siting of Defence operational bases in a number of parts of Australia, including Amberley, Darwin, Newcastle and Townsville, giving rise to challenges for the safe operation of commercial UAS in areas subject to military air traffic control, but over

non-Defence lands. ACUO is aware that current procedural arrangements for such area approvals are largely being left to development at a base by base level, rather than being the subject of clearly articulated and promulgated guidance at a national level. Noting the development of the 'OneSKY' architecture linking civil and military air traffic control is now being progressed with Federal Government approval, as well as Defence's own evolving UAS airspace access requirements, it is appropriate that Defence take the functional lead to resolve these matters.

ACUO proposes:

Recommendation 22: That Defence, Air Services Australia, CASA and the association of Australian Certified UAV Operators, form a focussed working party to address specific issues of commercial UAS area approvals in regions where military controlled airspace restrictions apply over non-Defence lands. That this working party aim to complete its work within a 12 month period after its formation. That the subsequent policy structures automatically be subject to review by the same entities on an 24 month cycle to ensure currency with broader regulatory provisions as required by CASA.

Defence is also at an early stage of a more sophisticated level of engagement with regulatory agencies on UAS matters at a global level, with this lead by Defence's Director Airworthiness Coordination and Policy Agency. That engagement has thus far included discussions with the United Kingdom's Civil Aviation Authority; the European Aviation Safety Agency (EASA) and the United States Federal Aviation Administration (FAA) on the civil side, and NATO on the military specific side. ACUO welcomes this broadening, aviation being inherently international with stand-alone national regulatory postures unsustainable.

ACUO proposes:

Recommendation 23: Defence, as part of its international cooperation activities, and in cooperation with CASA, directly engage and support moves by EASA and the FAA for the expansion of the transatlantic JARUS regulatory standardisation initiative to involve all Asian and Oceanic states.

ACUO notes that JARUS has emerged as the standards development focal point for all current global regulatory policy development flowing from International Civil Aviation Organisation guidance, and extension of JARUS regionally is a logical next step.

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