A New Safety Focus for the Australian Remotely Piloted Aircraft Systems (RPAS) Sector

A submission to the Senate Standing Committee on Rural and Regional Affairs and Transport inquiry into Regulatory requirements that impact on the safe use of Remotely Piloted Aircraft Systems, Unmanned Aerial Systems and Associated Systems.

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1. Executive Summary

1.1. This submission to the Senate Standing Committee on Rural and Regional Affairs and Transport, addresses the Inquiry into *Regulatory requirements that impact on the safe use of Remotely Piloted Aircraft Systems, Unmanned Aerial Systems and associated systems*.

1.2. ACUO maintain the recent amendments to CASA regulations are too lenient in how they regulate untrained and unqualified RPAS operators. Further, ACUO is concerned that the directions being taken by CASA for RPAS regulation are not sufficiently harmonised with international efforts to provide a seamless integration of manned and unmanned aviation. We are concerned that CASA's focus on deregulation is at the expense of developing requisite systems for safe integration of RPAS into Australian skies.

1.3. In the introductory pages which follow we outline the common Terminology in use (Section 2), provide key Acronyms and Abbreviations (Section 3), and provide a brief on the Association and what we stand for (Section 4).

1.4. In Section 5 we provide a top level analysis of the Australian RPAS industry. This examines the historical context of how the industry developed; its maturation; provides a breakdown of the commercial operators sector by activities and state, and provides insight into some emerging trends.

1.5. In Section 6, the main portion of this submission, we address the amendments made to the Civil Aviation Safety Regulations Part 101 between 2014 and 2016. We examine the first principles of aviation regulation specific to RPAS as arise from the Chicago Convention of 1944 and the obligations placed by this on Australia. We take a close look at the regulatory reform process undertaken by CASA, examining three key questions:

1. How comprehensive was the risk assessment and safety case used by CASA as a basis for creating the concept of 'Excluded RPA"?
2. What is the likely impact of the removal of training and certification for operators of 'Excluded RPAS'?
3. What is the capacity and integrity of CASA's own mechanisms and systems for ensuring compliance with the deregulated system CALA2016 has brought into being?

1.6. The analysis of Section 6 finds the safety of Australian skies has been compromised as a result of the 2016 reforms to Part 101. We argue new regulatory actions are required immediately to remove these new sources of risk. Review and overhaul of Part 101 should be treated by CASA as a significant near term priority. We stop short of calling for the immediate overturn of all of the 2016 amendments to CASR Part 101, recognising that elements such as terminological harmonisation with International Civil Aviation Organisation guidance is essential to sound forward development of the commercial RPAS sector as a whole. However, we urge significant enhancements to CASA monitoring and enforcement activity specifically addressing the RPAS sector. If CASA cannot act in the manner recommended by this submission, then the fall-back position of ACUO must be to continue to seek the repeal of the 2016 amendments on the basis of unacceptable risk. ACUO shares this assessment with the bulk of the Australian aviation community.

1.7. In Section 7 we detail how insurance is applied to RPAS operations here in Australia and overseas, and present broad proposals for dealing with insurance obligations. In the main, the insurance industry shares the same risk and safety concerns as ACUO with respect to the 2016 CASR Part 101 reforms.

1.8. In Section 8 we detail new technology which will allow the RPAS industry to grow and expand. We chart international efforts to develop an Unmanned Traffic Management (UTM) system and what Australia should be doing in readiness for the same. We examine the potential of Automatic Dependent Surveillance-Broadcast systems (ADS-B) as a fundamental enabler of enhanced air traffic integration of all classes of RPAS. We also examine the emerging requirement for Australia to actively explore Trusted Autonomous Systems technology as a key part of future national air traffic systems. We contend the only logical forward direction for CASA and AirServices Australia regulatory action is to pursue a national UTM system which facilitates the safe integration of all types of RPAS into a common air traffic management architecture. In turn that architecture, which should be thought of as an essential yet undeveloped element of national infrastructure, will provide the fundamental basis for significant aviation sector growth in the broad.

1.9. This submission holds that the Australian commercial RPAS sector is at a critical juncture, with the need for closely integrated regulatory and industry policy actions required if the benefits of this new class of aviation are to be wholly exploited. Australia has a strong historical record of achievement in the RPAS sector in both regulatory as well as industrial terms. However, that record is not a basis for complacency. The commercial RPAS sector is global in all respects, and Australia must act in the near term lest the opportunities available be missed. To this end, this submission includes two Appendices, presenting the texts of The Riga Declaration of March 2015 and The Warsaw Declaration of Nov 2016. Combined, these two documents provide the guiding principles for the development of a wholly integrated approach to RPAS regulation and corresponding industry policy framework now being developed for the whole of the European Union. These two Declarations signpost potential opportunities which Australia can and should use as guidance for the development of its own corresponding policy structures, regulation being used as a means by which to promote sectorial growth and prosperity. To this end, an integrated declaration of similar affect prepared by the Australian Federal Government and supported by a corresponding industry policy white paper is earnestly awaited by the Australian RPAS sector in the broad.

1.10. This submission presents a total of 20 recommendations aimed at giving policy effect to the views expressed above.

Release Authorisation:

ACUO approves the public release and publication of this submission in its entirety by the Australian Senate Standing Committee on Rural and Regional Affairs and Transport.

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2. Note on Terminology:

The terms; 'Unmanned Aerial Vehicle' (UAV); 'Unmanned Aircraft System' (UAS); 'Remotely Piloted Aircraft System' (RPAS); and 'Drone' are, in the broad, all references to one and the same thing, this being:

> "An aircraft or aircraft-system that is flown from a remote location without a pilot located in the aircraft itself."

Normally the operator of such an aircraft is located on the ground, but could also be stationed in a vehicle, a boat or even another (manned) aircraft. The locational delta between the aircraft in question and the pilot can be a matter of tens of meters or, as is the case with some large endurance classes of systems, transcontinental or intercontinental.

'**Drone**' historically refers to a UAS which exists to act as a target for live-fire air defence weapons training by armed forces, with this remaining the correct terminological reference. Popular culture uses the term as a generic descriptor for all classes of unmanned or remotely piloted aircraft, but particularly in relation to military systems with weapons carriage capabilities. The term 'Drone' is not used within this submission unless in a quote from an external document.

'**UAV**' was the original term adopted by CASA in July 2002 and is still widely in use including much of CASA certification, licencing and guidance material. This term predominated at the time of the formation of the Australian Certified UAV Operators and its legal incorporation.

'**UAS**' is the more up-to-date internationally accepted term in use today, with this now recognised as the overarching 'class' terminology by the International Civil Aviation Organisation (ICAO) as well as by CASA.

'**RPAS**' is defined by ICAO as a form of UAS which is non-autonomous in its capacities, the aircraft being subject to direct pilot control at all stages of flight despite operating 'remotely' from that pilot. CASA has recently shifted to use of the term RPAS as its primary day to day terminology.

Recreational 'remotely piloted' aircraft are considered by CASA as 'Model Aircraft', and are flown only for sport and recreation purposes, under the administration of the MAAA and the Civil Aviation Safety Regulations (CASR) 1998 - Part 101.G.

This submission will make reference throughout to UAVs, UAS and RPAS, with application dependent upon the phase of discussion in question. Background discussion of ACUO for example, will refer to UAV and UAS operators given the historical origins of the association as noted above.

ACUO notes that the UAS sector as a whole is continuing to undergo significant technological advancement with this driving much of the ongoing revision of terminologies and definitions. This is not unusual in a new industry, and mirrors terminological and definitional flux as seen in the rise of commercial aviation and the motor transport industry in the early 20th century. Notwithstanding, the ongoing work of ICAO with respect to standardising terminology and definitions can be expected to result in a 'lock in' within short years with the terms UAS and RPAS already holding legal status in a number of jurisdictions.

3. Abbreviations and Acronyms:

AAUS	Australian Association of Unmanned Systems
AC	Advisory Circular
ACMA	Australian Communications & Media Authority
ACUO	Australian Certified UAV Operators Inc.
ADS-B	Automatic Dependent Surveillance - Broadcast
AFCS	Autonomous Flight Control System
AGL	Above Ground Level
AICC	Aviation Industry Consultative Committee
AIP	Aeronautical Information Publication
ALARP	As Low As Reasonably Practical
AMSL	Above Mean Sea Level
AsA	AirServices Australia
ATC	Air Traffic Control
ATM	Air Traffic Management
ATSB	Australian Transport Safety Bureau
AUVSI	Association of Unmanned Vehicle Systems Int.
AWO	Aerial Work Operations
BAK	Basic Aeronautical Knowledge
BVLOS	Beyond Visual Line Of Sight
CAA	Civil Aviation Act
CAAS	Civil Aviation Authority of Singapore
CALA	Civil Aviation Legislation Amendment 2016
CAR	Civil Aviation Regulations 1988
CASA	Civil Aviation Safety Authority (Australia)
CASR	Civil Aviation Safety Regulations 1998
COA	Certificate of Airworthiness
CRC	Cooperative Research Centre
CS	Certification Standards
CTA	Controlled Airspace
CTZ	Control Zone
DAA	Detect & Avoid
DAMP	Drug and Alcohol Management Plan
DoD	Department of Defence
DSTG	Defence Science and Technology Group
EASA	European Aviation Safety Agency
ERSA	En Route Supplement
EVLOS	Extended Visual Line Of Sight
EU	European Union
FAA	Federal Aviation Administration (USA)
FCS	Flight Control System
FOI	Flight Operations Inspector
FW	Fixed Wing [aircraft type]
GA	General Aviation
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
IREX	Instrument Rating Examination
JARUS	Joint Aviation Rule Making Authorities
LiPo	Lithium Polymer [battery]
MAAA	Model Aircraft Association of Australia
MOS	Manual Of Standards
MTOM	Maximum Take-Off Mass
NAS	National Airspace System
NASA	National Aeronautical and Space Administration
NFRM	Notice of Final Rule Making
Nm	Nautical Mile
NOTAM	Notices to Airmen
NPRM	Notice of Proposed Rule Making
NTU	Nanyang Technological University (China)
PANS	Procedures for Air Navigation Services
PPL	Private Pilot Licence
PRD	Prohibited, Restricted & Danger areas
RA-AUS	Recreational Aviation Australia (manned)
RC	Remote Control (model aircraft)
RePL	Remote Pilot Licence
ReOC	RPA Operator Certificate
RPA	Remotely Piloted Aircraft
RPAS	Remotely Piloted Aircraft Systems
RPS	Remote Pilot Station
RTH	Return To Home
RTL	Return to Launch site
SAA	See and Avoid (Principle)
SACAA	South African Civil Aviation Authority
SARP's	Standards and Recommended Practices
SCC	Standards Consultative Committee (CASA)
SESAR	Single European Sky ATM Research
SME's	Small and Medium Enterprises (Business)
SOC's	Standard Operating Conditions
SOP's	Standard Operating Procedures
TAAAF	The Australian Aviation Association Forum
TM-UAS	Traffic Management-Unmanned Aerial Systems
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicles
UOC	UAV Operator Certificate
UTM	Unmanned Traffic Management System
UVSI	Unmanned Vehicle Systems International
VLOS	Visual Line Of Sight

4. ACUO, the Association

The Association of Australian Certified UAV Operators Inc. (ACUO) is a not-for-profit association launched in 2009 by seven of the first eight certified Australian UAV Operators. The association was formally registered in Queensland on the 31st March 2010.

The ACUO membership has decades of experience in commercial UAV/RPAS operations and an impeccable record of safety. Since commercial UAV/UAS/RPAS operations formally began in this country in November 2002, there has not been a single accident or incident resulting from ACUO member's thousands of hours of commercial UAV flight operations. This record is one ACUO members are understandably proud of, and one they are eager to protect by maintaining the highest standards of safety and risk management.

ACUO is bound by its Constitution to:

- Protect the interests of CASA Certified UAV Operators
- Establish the association as a responsible authority and;
- Promote the growth and expansion of the commercial UAV/UAS/RPAS industry in Australia

Specific objects of the association are:

- To improve the standards of unmanned aviation for commercial purposes whilst promoting and maintaining a sound regulatory framework in which to do so.
- To improve the safe and responsible flight activities of commercial unmanned aircraft within an easily accessible and low cost environment.
- To foster and encourage the formation and growth of development of unmanned aviation controllers, and to provide the guidance and training impetus for inexperienced controllers and new entrants to the industry.
- To revive, encourage and promote interest in Australian commercial unmanned aviation by encouraging participation in unmanned flying.
- To act as an information resource for counsel to organisations or individuals whose decisions may affect commercial unmanned aviation activities and operator rights.

ACUO currently has a total of 112 members, representing approximately one eighth of all commercially certified UAV Operators in Australia. ACUO membership is based on stated intent of an applicant to join the association via explicit process. As a matter of policy and practice, ACUO does not automatically accredit delegates to its conferences and seminars with membership as an artificial mechanism for increasing apparent organisation size and representation reach.

The seven founding members of ACUO were the first certified UAV/UAS/RPAS Operators in Australia, with a combined experience of more than 100 years in commercial UAV operations of all types, from fixed-wing UAVs to conventional rotary UAVs and the new multicopter types, both in Australia and internationally.

ACUO was the first commercial RPAS association of its type in the world and only in the last couple of years have we seen similar associations being formed in Europe, the Americas and Asia. ACUO is the only RPAS industry body directly representing the commercial sector of 'unmanned' aviation in Australia. ACUO is administered by a ten member Management Committee, elected annually by their peers. The Management Committee of ACUO all provide their time to the association on a voluntary basis.

ACUO represents the commercial RPAS sector as a member of the Federal Government's Aviation Industry Consultative Committee (AICC) under the auspices of the Transport Minister, the Honourable Darren Chester MP. ACUO is also a member of The Australian Aviation Association Forum (TAAAF), standing with a host of respected manned aviation associations in support of developing and advancing the Australian aviation industry. TAAAF support the contents of this submission and the recommendations it makes.

ACUO is a Non-Corporate Partner Organisation member of UVS International, the global unmanned systems industry associated headquartered in Paris. ACUO is Australia's representative on the International RPAS Coordination Council, a prestigious industry body initiated by UVS International to coordinate RPAS standards globally. ACUO also participates in a variety of international RPAS committees focusing on issues of importance to the commercial sector of unmanned aviation, including RPAS Insurance, RPAS Flight-Crew Training and RPAS Airworthiness and Maintenance.

ACUO regularly provides advice on UAS related issued to governments, public and private enterprise, businesses and organizations on the fundamentals of UAV/UAS/RPAS operations in the Australian national airspace, and associated issues.

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5. The existing industry and likely future social and economic impact of RPAS technology.

5.1.0. An Industry in Growth and Transition.

5.1.1. The Australian commercial remotely piloted aircraft systems sector has experienced dramatic structural change over the course of the past 15 years with this driven by a combination of technological change, ongoing regulatory reforms, sectorial convergence and business model evolution. There is every reason to anticipate these four forces will remain dynamic well into the next decade, meaning overall sectorial stabilisation is unlikely to occur for at least another decade. Market forces in adjacent sectors will have a corresponding impact. In such an evolving environment, the overall outlook for the commercial RPAS sector can be best understood as one of moving plateaus of maturation between surges of disruption.

5.1.2. The Australian commercial RPAS sector is currently one overwhelming structured around service-based business models. The sector is likewise dominated by small to medium enterprises, few of which fit the paradigm of the technology 'start-up' given their adoption of commercially available 'out of box' solutions as the basis for business launch. The start-up model can however be expected to become increasingly relevant as the service-based business model becomes increasingly standardised. In such conditions new sectorial entrants are increasingly required to leverage new technological solutions as a means of attaining competitive advantage. In turn this can be expected to generate new linkages with the wider Australian research and development sector as well as the venture finance community. Such linkages are, at present, less than optimal with the factors behind this closely aligned with wider national challenges in ensuring the success of small to medium enterprises at large. The Federal Government's National Innovation and Science Agenda is a positive for the commercial RPAS sector in terms of immediate support, however more needs to be done.

5.1.3. For governments at both the Federal and State levels, the evolution of the Australian commercial RPAS industry poses particular challenges. The industry as exists to date has developed outside of the wider general frameworks of national industry policy, all too often falling into gaps between traditional sectorial classifications. The underpinning technological basis of RPAS exacerbates this challenge. As a product of technological convergence RPAS can on the one hand be considered as an extension of the information technology and commercial telecommunications industries, but are at the same time aircraft in the truest sense of the Chicago Convention of 1944. No Australian Government information technology roadmap or white paper issued in the past decade has specifically addressed the challenges of building the national RPAS sector other than through limited generic reference to the domains of robotics or automation, or a combination of both. Likewise no Australian Government aviation industry roadmap or white paper issued over the past decade has sought to discuss the specifics of RPAS industry development other than via recognition that growth of the sector would require ongoing reform of aviation regulations.

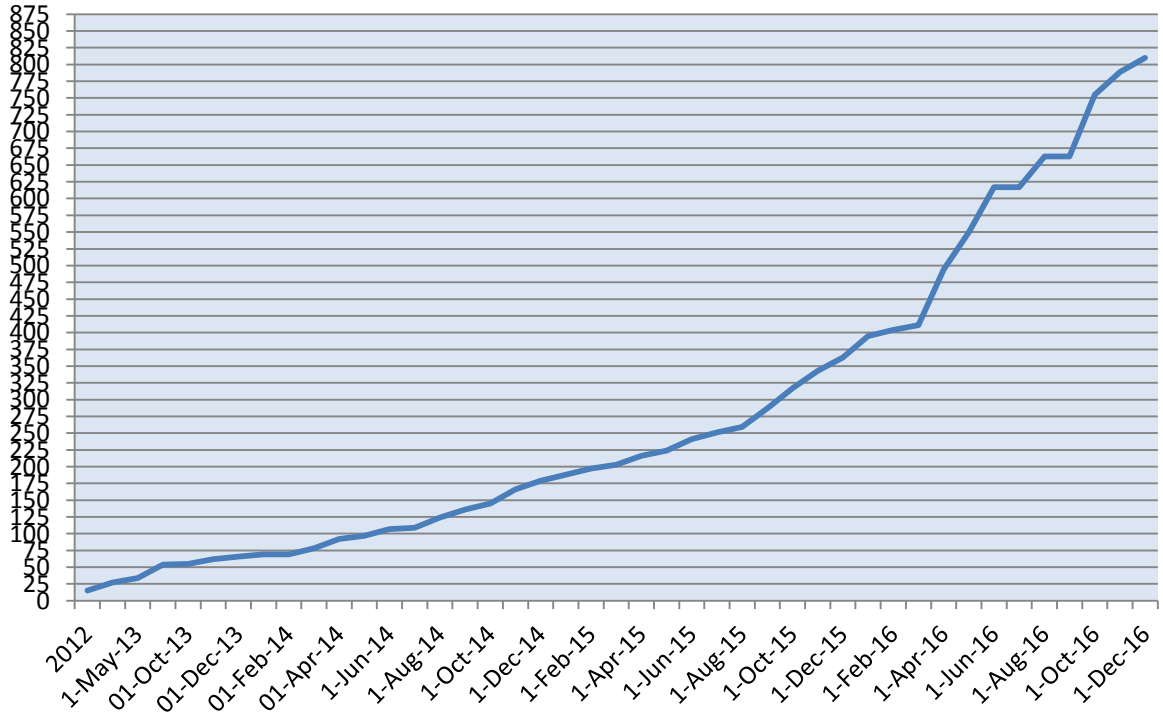
5.1.4. In this context the current inquiry by the Senate Standing Committee on Rural and Regional Affairs and Transport represents the first focussed consideration of the Australian RPAS sector on a holistic basis by an arm of Australian government at large. As such it is critical that the Committee appreciate the opportunity this inquiry represents in terms of shaping the Australian commercial RPAS sector over the long term.

Recommendation 1: An Australian Commercial RPAS Futures Task Force be established and facilitated under the auspices of the Federal Department of Industry, Innovation and Science to develop a national roadmap for the sector. This task force should include representation from: Commercial RPAS operators, particularly SMEs; the information technology sector; the venture capital community; the Cooperative Research Centre and research sector community; the agricultural sector; the spatial industries sector and the Civil Aviation Safety Authority. Given the increasing importance placed on RPAS capabilities by the Australian Department of Defence, representation from the Centre for Defence Industry Capability and the Defence Science and Technology Group should be included. The task force should consult widely and report back to the Federal Government within six months of formation. The European Commission Riga and Warsaw Declarations should be used as key guidance in planning the Task Force work program and potential recommendations.

5.2.0. The Commercial RPAS Operators Industry Base.

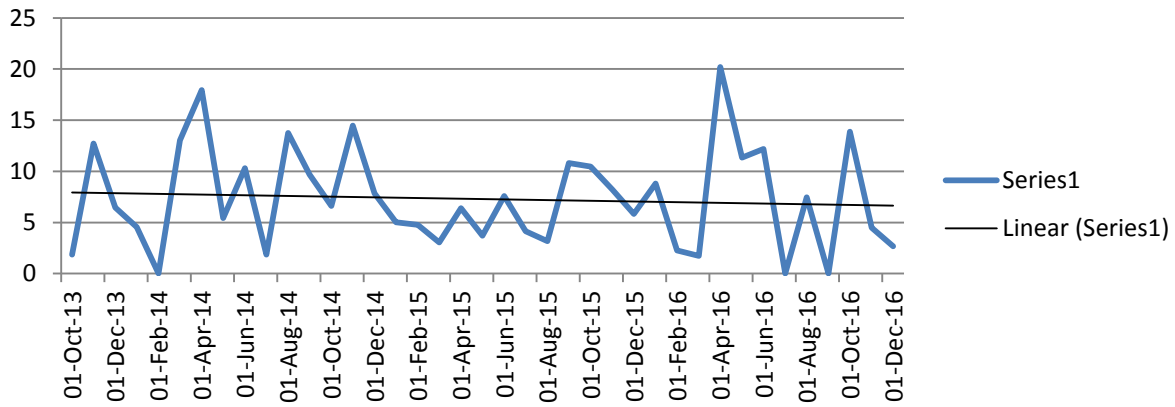
5.2.1. Australian introduced the capacity to be qualified as a certified RPAS operator under CASR Part 101 in July 2002. By 2012, that number had risen to just 15. Over the past four years that number has now grown to 810 certified operators as at 1 December 2016. The difference between the Part 101 UOC holders in 2012 compared to current figures can be usefully held to define a first plateau period, the second comparable period running from 2012 until the current day. Table 1, based on collection of CASA published UOC certificate data by ACUO on the first of every month since mid-2013 and augmented with historical data samples for December 2012 and May 2013, illustrates this overall pattern.

Table 1: CASA approvals of Part 101 UAS operator certificates
Period: Dec 2012 - 1 Dec 2016



5.2.2. While this uptake indicates an overall substantive increase averaging between six and eight percent on an overall basis, the month by month CASR Part 101 operator certificate issue rate indicates substantial variations in this growth pattern. As illustrated by Table 2, the overall growth in Part 101 UOC holders over the past three years has followed a peak and trough cycle with extended periods between each. The average linear growth rate over this period sits between six to eight percent. It should be noted that the apparent slow decline is a statistical attribute emerging from the same peak and trough approvals pattern coupled with the use of an October 2013 start date.

Table 2: Monthly % variation in new UOC approvals by CASA - Period 1 Oct 2013 - 1 Dec 2016



5.2.3. The data of Table 2 points to a possible slowdown in new UOC approvals in the immediate aftermath of the revisions of Part 101 from September 2016, however the peak and trough pattern should again be considered before seeking to extract definitive interpretation here. This includes considering the clear historical pattern of slowdowns in the final quarter of each calendar year studied. Further, CASA's own publication of new UOC certificate holders on its website does lag behind the actual issued approvals, meaning conclusive findings await further data release by the regulator. In the event the downturn of final quarter CY2016 did become sustained, it would suggest a direct slowdown in new UOC applications to CASA as potential sector entrants became aware of impending regulatory changes during the first half of2016. This would not indicate a slowing of overall sectorial growth however, as the advent of CALA has resulted in another 2500 plus uncertified commercial operators using those amendments to commence business activity. Given the limits on what types of operations can be conducted commercially without holding a UOC, and noting the sustained six to eight percent average monthly growth rate, the more likely forward scenario for UOC approvals is that they will continue to grow and pass the 1000 mark during CY2017.

5.2.4. The types of commercial activity being conducted by certified UAS operators is overwhelmingly focussed on aerial photography and aerial survey, as is illustrated by Table 3 below. As an indicator of operations focus growth patterns, Table 4below sets out a comparable historical snapshot as at 1 March 2015. This indicates that the dominant operations areas remain aerial photography, aerial spotting and aerial survey. Aerial work is a clear emergent category and has close associations with primary production, as is the category of aerial application. Aerial advertising operations are likewise a growth area while training remains a stable proportion of the market. Powerline inspection is declining, this most likely reflecting current regulatory barriers to commercial beyond visual line of sight operations.

Table 3: UAS certificate holder operations focus -By CASA category reports - As at 12 Dec 2016

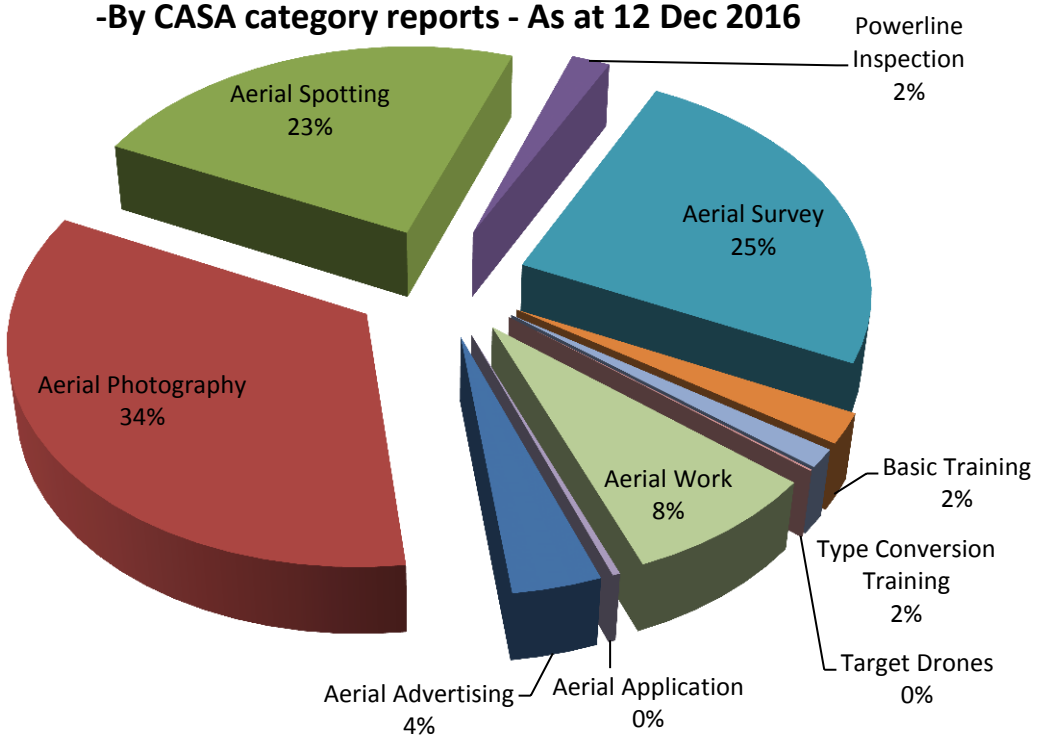
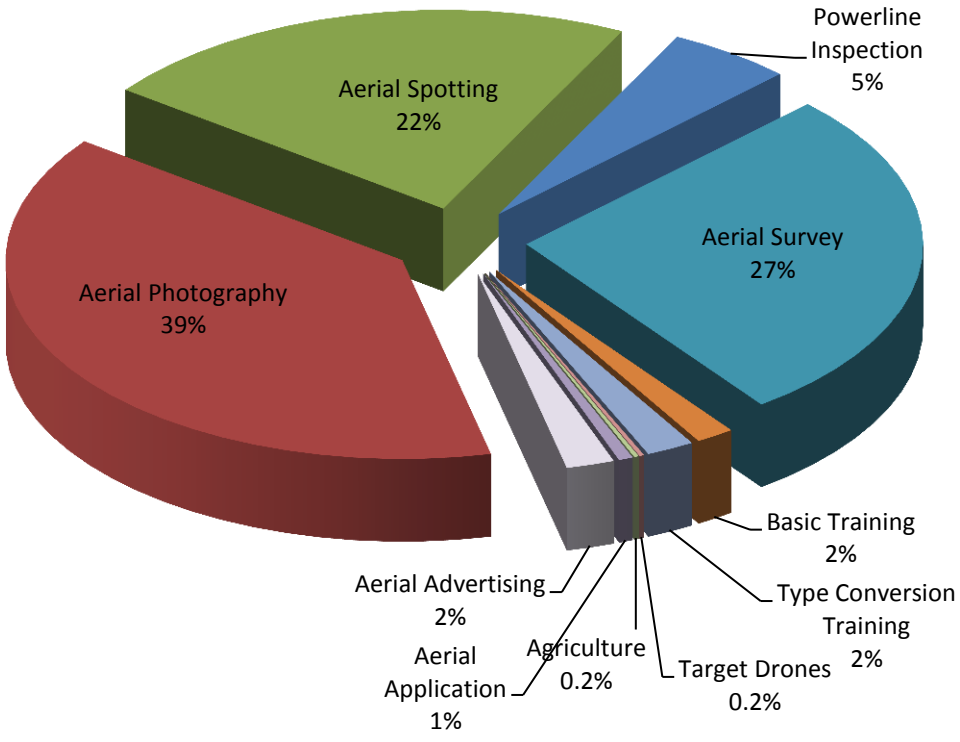
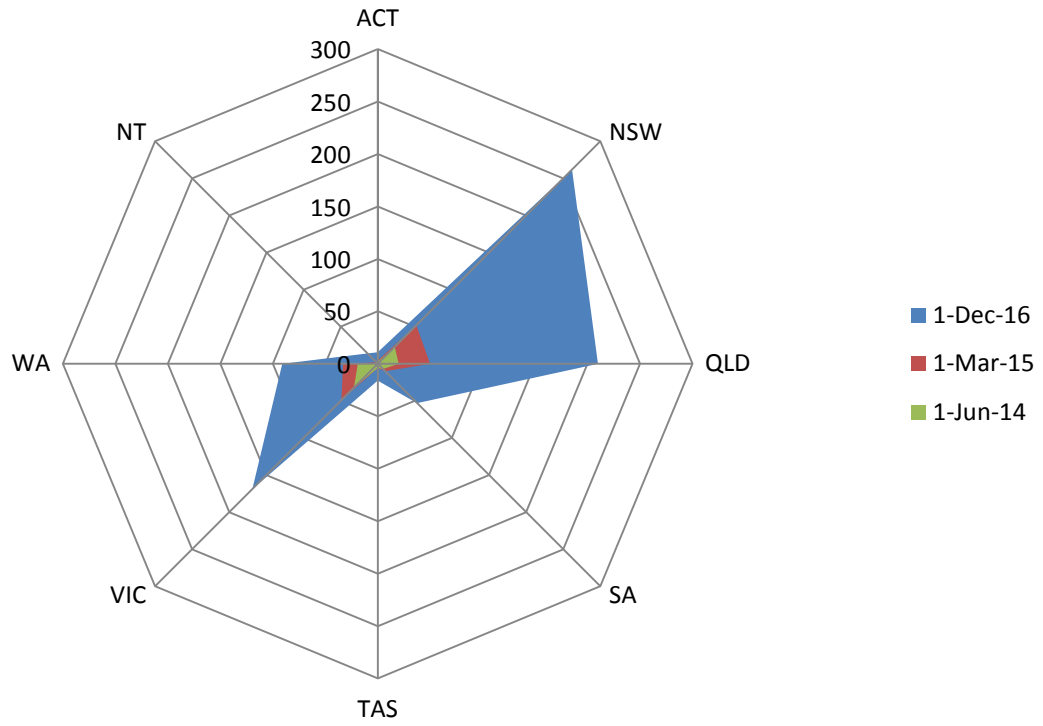


Table 4: UAS certificate holder operations focus - by CASA category reports - As at 1 Mar 2015



5.2.5. Analysis of the geographic spread of CASR Part 101 UOC holders reveals the national commercial operator base is concentrated in the eastern states, with the vast bulk located in New South Wales and Queensland. Table 5 illustrates this distribution in terms of changes over the past 30 months.

Table 5: State and Territory Distribution of CASA Certified UAS Operators - Comparative 1 Jun 2014 - 1 Dec 2016



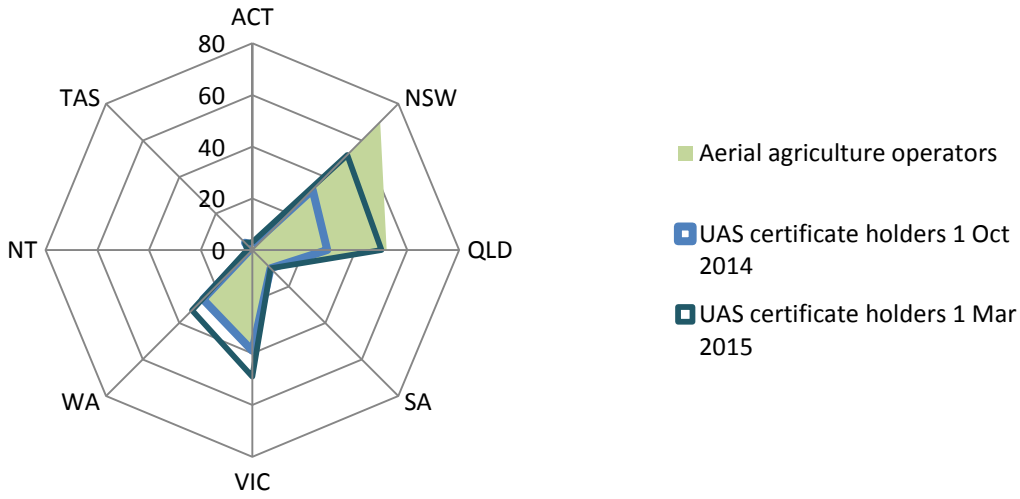
5.2.6. The rapid changes in this geographical distribution are revealing in terms of providing guidance on future growth trends. As shown by Table 6, in mid 2014 Victoria was the dominant focus of sectorial growth with 32 UOC holders, well ahead of the then closely matched New South Wales, Queensland and Western Australia. Yet just nine months later New South Wales and Queensland had seen increases to match and just surpass Victoria, while Western Australia had clearly slowed in comparable uptake rates. The most recent data sample, from 1 December 2016, shows growth has continued in Victoria but at a rate unlikely to facilitate matching either New South Wales or Queensland.

Table 6: State and Territory Distribution of CASA Part 101 UOC Holders – Actual numbers by indicated date.

	1-Dec-16	1-Mar-15	1-Jun-14
ACT	11	3	2
NSW	262	52	23
QLD	210	50	20
SA	53	10	7
TAS	16	4	4
VIC	169	49	32
WA	91	33	19
NT	14	2	0

5.2.7. Whilst further analysis is again required, the changing position of Victoria may indicate market saturation within the framework of Part 101 UOC holders. The same may also apply to all geographic areas save New South Wales and Queensland where larger population bases coupled with larger land areas appear to be continuing to facilitate growth, particularly through association with the agricultural sector. As is illustrated by Table 7, a snapshot analysis of CASA Part 101 UOC holders and CASA registered manned aerial agriculture operators as at 1 March 2015 indicates close alignment between the geographic distributions patterns of each. ACUO's analytics team is continuing to explore this apparent trend, the snapshot data in Table 7 needing to be qualified with the observation that CASA's own online UOC holder database has ceased to identify agriculture as a defined operational category, absorbing it into the broader grouping defined as air work.

Table 7: State and Territory Comparative Distribution of CASA certified UAS Operators and CASA registered Aerial Agriculture Operators - As at 1 Mar 2015.



6. Current and future regulatory requirements that impact on the safe commercial and recreational use of Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Systems (UAS) and associated systems

6.1.0. First Principles:

6.1.1. The first principle in understanding remotely piloted aircraft systems (RPAS) is to appreciate that these are, first and foremost, aircraft. Because they are aircraft, they are subject to national and international regulatory controls, the foundation stone of which is the Convention on International Civil Aviation, done at Chicago 7 December 1944 (the Chicago Convention). The Chicago Convention specifically seeks to coordinate and harmonise all international civil aviation "in a safe and orderly manner" with this facilitating international air transport services" on the basis of equality of opportunity and operated soundly and economically" (Convention 1944, preamble paragraph 3).

6.1.2. Article 8 of the Chicago Convention specifically addresses RPAS, referred to in the terminology of the time as 'pilotless aircraft', observing:

> *"No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to ensure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft."*

6.1.3. As stands, Article 8 has come to have a profound impact on the emerging international regulatory regime for RPAS in the broad. While at face value its primary thrust might simply be taken to mean RPAS are generally permitted, Article 8 in fact acts to present a series of concepts which must be addressed by Convention signatory states in domestic regulations. These concepts comprise:

- A notional definition of an RPAS, specifically as aircraft;
- A requirement for special authorisation before flight;
- A requirement for action of the State relative to that special authorisation;
- A juxtaposition of the unmanned aircraft to civil aircraft;
- A requirement for control of the unmanned aircraft; and,
- A requirement to ensure safety of civil aircraft against operations of unmanned aircraft.

6.1.4. Australia ratified the Chicago Convention in 1947, that treaty since providing the foundation of all air law and aerospace regulation approved by the Australian Parliament with authority for implementation now vested jointly in the Australian Civil Aviation Safety Authority (CASA) and Air Services Australia. CASA implemented its first enabling regulations to support Article 8 in July 2002, these expressed as CASA Regulations Part 101 (CASR Part 101).

6.1.5. CASR Part 101 was internationally pioneering, representing the first explicit codification of Article 8 by any national air safety regulator. Its development won CASA international recognition not only for its content but also the means by which it was brought into being in the first instance.

6.1.6. CASR Part 101 was developed through an extensive consultation process with industry as well as corresponding international regulators, including the US Federal Aviation Administration (FAA) and the then European Joint Aviation Authorities, now part of the European Aviation Safety Agency (EASA), and Eurocontrol. Those key international regulators used the Australian initiative as a catalyst to begin work on their own corresponding regulatory frameworks.

6.1.7. The International Civil Aviation Organisation (ICAO), the enabling body established under the auspices of the United Nations to oversee implementation of the Chicago Convention, followed suit and commenced development of its own overarching regulatory and policy guidance on the implementation of Article 8 in 2004. This first resulted in the issuing of *Circular 328, Unmanned Aircraft Systems*, in 2011, followed by Document 10019, *Manual on Remotely Piloted Aircraft Systems (RPAS)* in March 2015. As explicit guidance on the interpretation of Article 8, these two ICAO documents, particularly the second, now represent the primary international baseline for all forms of RPAS regulation. This includes formalising terminology, ensuring the regulatory treatment of RPAS as aircraft, ensuring safe operations and procedures, type certifications and airworthiness approvals, RPAs registration requirements, responsibilities of RPAS operators, detection and avoidance requirements and integration of RPAS into air traffic management systems. Document 10019 specifically identifies that:

> *"The goal of ICAO in addressing RPAS is to provide an international regulatory framework through Standards and Recommended Practices (SARPs), with supporting Procedures for Air Navigation Services (PANS) and guidance material, to underpin routine operation of RPAS throughout the world in a safe, harmonized and seamless manner comparable to that of manned operations. Most importantly, introduction of remotely piloted aircraft into non-segregated airspace and at aerodromes should in no way increase safety risks to manned aircraft (Document 10019, page V)".*

6.1.8. ACUO is of the view that this guidance should be fundamental to forward CASA and AirServices Australia regulatory actions with respect to all class of RPAS, whether used recreationally or commercially. Such an approach would ensure Australia remains harmonised with international practices rather than finding itself on a tangent that places all airspace users at risk.

> **Recommendation 2: That as a signatory to the Chicago Convention, Australia pursue a strategy of rolling updates to CASR Part 101 that at all times remain in accordance with International Civil Aviation Organisation guidance to ensure harmonised regulatory structures at a global level as a key element of ensuring coherent and safe integration of RPAS into national and international skies.**

> **Recommendation 3: That in accordance with ICAO guidance, the clear goal of all forward revisions to CASR Part 101 be the *integration* of RPAS into shared airspace, rather than the development of regulatory structures which promote *segregation*.**

6.2.0. CASR Part 101 Reform – NPRM1309S Processes

6.2.1. The philosophical basis of aviation regulation and the reform of the same begins with the requirement to do no harm. The standard operating procedures (SOPs) for RPAS evidenced in the original structure and content of CASR Part 101 were carefully evolved by CASA and industry over a decade long process prior to those regulations coming into force. There is atop of this now more than a decade of CASA and industry working under those regulations. As such, Part 101 as implemented in 2002 can be considered as a fundamental baseline upon which the historical safety of the commercial RPAS sector was developed in Australia. Further, that baseline was developed using cautious, evidence-based reforms developed jointly by CASA and industry with close ongoing consultation the key to this. Industry in fact played a pivotal role in educating CASA staff immediately following the introduction of Part 101, advancing CASA's knowledge base of fundamental UAV operating concepts and embedded risk management systems. Those operating concepts and systems are the foundation of all CASA certified RPAS operations today.

6.2.2. CASA played an instrumental role in the development of both ICAO Circular 328 and Document 10019, at times co-chairing the international working group tasked with their development. Those insights provided CASA with early awareness of the need for reform of CASR Part 101, resulting in the issuing of Notice of Proposed Rule Making 1309S (NPRM1309S) in May 2014. This marked the beginning of a consultative process that ended with the issuing of revised regulations that came into force on 29 September 2016.

6.2.3. As issued, NPRM1309S set out four propositions under which:

1. Part 101 terminology would be brought in line with the new ICAO guidance;
2. Requirements for RPAS pilot training and certification would be clarified;
3. Elements of the approvals processes would be simplified; and lastly,
4. RPA of less than 2kg gross weight operating under the Part 101 Standard Operating Conditions, would not require CASA certification

6.2.4. In addition, CASA committed itself to the conduct of a comprehensive risk assessment on the safety of the proposed new amendments and to only proceeding if such a risk assessment produced a low risk. ACUO acknowledges the amendment process to the Part 101 regulations which came into effect on 29 September 2016 was many years in the making with industry being given significant opportunity to participate through a formal, though very short, consultation period specifically linked to NPRM109S. However, post the closure of that NPRM1309S consultation process, CASA undertook significant alterations to each of the four fundamental proposals considered by industry. Whilst such changes to a suite of proposals is in itself not unusual, the revised concepts ultimately progressed by CASA between late 2015 and 2016 were not subject to the same levels of industry-wide consultation and review, as would be consistent with sound regulatory evolution.

6.2.5. ACUO is of the view that in handling NPRM1309S responses, CASA:

- **Failed to treat all respondents inputs equally**. Evidence for this is that CASA treated two separate industry petitions, signed by multiple entities in strong opposition to Proposition

Four and the deregulation of sub-2kg systems, as single responses. One of those petitions, organised by ACUO and lodged in June 2014, was signed by 54 of the extant 106 CASR Part 101 UOC holders at that time. CASA holds it received a total of 63 industry responses in total to the NPRM, whereas accurate acknowledgement of industry input where a petition is seen as multiple voices, would be predicated on a figure of at least 117 responses. The content and recommendations of the second petition remain unknown to ACUO and as such cannot be commented on here. Notwithstanding, ACUO is of the view that had comprehensive analysis of NPRM1309S responses been conducted by CASA on the basis of recognising individual respondents, this would have made plain overwhelming industry opposition to Proposition Four and the compelling underlying safety challenges for that position.

- **Failed to re-engage with industry in an open and transparent manner** as revised concepts for the revision of CASR Part 101 were being developed post NPRM1309S. There were at least 4 iterations of the amendments that were canvassed via the CASR Part 1010 Standards Consultative Committee (SCC), however, what followed with further refinements were only canvassed selectively.

- **Failed to provide a full-draft Part 101 amendment to industry,** which would have facilitated full industry understanding of the ramifications of the amendments, prior to the tabling of CALA2016 in the Federal Parliament in March 2016. Industry was instead required to wait until Ministerial release before the scale of change decided upon was made clear.

6.2.6. It is ACUO's assessment that the process used by CASA to develop the Civil Aviation Legislation Amendment (Part 101) Regulation 2016 (CALA 2016) failed in terms of process. In turn, that failure has resulted in the creation of extensive new problems for aviation safety affecting all users of the Australian skies. This contrasts with the approach taken with the development of the original CASR Part 101, and does no credit to the regulator as it seeks to rejuvenate its relationship with the wider Australian aviation community, not just the RPAS sector, following the May 2014 Aviation Safety Regulation Review. ACUO notes the finding of that review that "CASA and industry need to build an effective collaborative relationship on a foundation of mutual trust and respect" *(Aviation Safety Regulation Review, 2014, page 1)*.

Recommendation 4: CASA be asked to provide the current Senate inquiry with copies of all responses to NPRM1309S so as to facilitate Committee scrutiny of views and opinions direct from that consultation process, and comparison of these to the ultimate form of CALA2016.

Recommendation 5: CASA be directed to ensure that its consultation processes for future reforms to CASR Part 101 use genuinely open and transparent consultative measures to ensure full opportunity for aviation industry inputs at all stages of the development process. That this direction include requirements for early circulation of all draft changes and revised changes, with industry being given opportunity to comment on the final proposed draft a minimum of eight weeks prior to its being presented to the Parliament as an intended regulatory change.

6.3.0. Civil Aviation Legislation Amendment (Part 101) Regulation 2016 (CALA 2016).

6.3.1. As implemented, CALA 2016 set out a series of core actions which evolved the NPRM1309S concepts in radically new directions:

- Part 101 terminology was brought into line with ICAO guidance;
- Requirements for RPAS pilot training and certification were removed for certain classes of RPA being used in commercial roles;
- The concept of 'Excluded RPA' which would not require regulator approval for commercial operations was introduced, this primarily addressing RPAS of less than 2kg gross weight operating under new Standard Operating Conditions, but also including larger UAS up to 25kgs MTOM being operated over private lands without Hire & Reward;
- A voluntary system of registration was introduced for 'Excluded RPA' class operators, including in commercial roles; and
- Creation of a series of new offences under Part 101 reflecting the overall CALA2016 changes.

6.3.2. A more detailed summary of CALA2016 provisions, and top level ACUO position on each, is provided at Table 8.

6.3.3. Noting the obligations of Australia under Article 8 of the Chicago Convention, when examined at the higher order level, CALA 2016 gives rise to three key questions for policy makers assessing the integrity of the regulatory actions.

- The first of these is the question of how comprehensive was the risk assessment and safety case used by CASA as a basis for creating the concept of 'Excluded RPA"?

- The second question is the likely impact of the removal of training and certification for operators of 'Excluded RPAS'?

- The third question is whether CASA's own mechanisms and systems have the capacity, robustness and integrity for ensuring compliance with the deregulated system CALA2016 created.

Each of these questions is discussed in more detail below.

6.4.0. CALA 2016 Risk Assessment and Safety Case

6.4.1. Under section 3.2 of the NPRM1309s preamble, CASA claimed:

> *"CASA has conducted a risk assessment for small RPA of 2 kilograms and below and has established that such RPA have a very low kinetic energy, pose very little risk to aviation and have a low potential for harm to people and property on the ground and other airspace users."*

Table 8: Analysis of Key CALA 2016 Regulatory Measures	
Measure	**ACUO assessment**
The standardisation of terminology to align with ICAO Circular 328 and Document 10019 definitions, including formal adoption of the term RPA to designate this class of aircraft.	Strongly supported. This is a key step in ensuring CASR Part 101 remains in alignment with ICAO guidance. In turn, this ensures Australia directly contributes to a harmonised global RPAS regulatory environment characterised by coherence and consistency regardless of nation.
The introduction of new RPAS classification system, including a class called 'Excluded RPA'.	Strongly opposed. Australia is unique in regulating to specifically exclude a form of aircraft as defined by Article 8 of the Chicago Convention as being outside the jurisdiction of normalised aviation regulatory controls. Such a two tier system is inconsistent with all ICAO guidance as well as prevailing regulator approaches in all other Chicago Convention countries.
Relaxing existing training and pilot qualification requirements and allowing commercial operation of Excluded RPA without training or RePL.	Strongly opposed. There is simply too much to know to expect Excluded RPA operators to do this voluntarily, let alone successfully. It should be noted that CASA only released tenders for development of a supporting RPAS Application suite, intended to assist Excluded RPA operators in understanding their obligations, on 19 August 2016. No contract has yet been awarded.
The introduction of a notification system requiring persons operating Excluded RPA for reward or hire to advise CASA on an initial 5 day advance notification and for CASA to bring into being a corresponding database system that handles such notifications.	Supported in principle. The notification system as exists is not robust enough to capture unsafe behaviour. There needs to be a corresponding monitoring and auditing system to gauge operator voluntary compliance is meeting actual compliance.
Allowing private landowners to use RPA up to 25 kg in weight without a UOC or RePL provided they adhere to standard RPA Operating Conditions. Capacity of the same private landowners to use RPA up to 150kg in weight without a UOC but provided the operator holds a RePL.	Strongly opposed. There is simply no safety case to support the notion that someone can safely operate a sophisticated piece of machinery without appropriate training to deal with the many variables RPA operations requires and entails. On private lands such as farms, there is a significant risk posed by such unregulated activities to operations by manned aerial application aircraft, general aviation traffic and regional commercial airline operations.
A ban on autonomous flight operations pending future regulatory development but with CASA retaining capacity to allow autonomous flights on a case by case basis prior to this.	Supported. This is a sensible approach as long as adequate risk assessments are captured.
Removal of requirements for RePL holders to possess a current Aeronautical Radio Operators Certificate.	Supported. There are some RPA operators, such as those in remote regions, who are unlikely to operate near manned traffic to warrant it. It can be added easily enough if required later.
Relaxation of requirements for all RPA operators to avoid *all* aerodromes, replacing it with a requirement that such aircraft must keep away from only *controlled* aerodromes.	Strongly opposed. Most mid-air collisions occur in good daylight visibility, below 2000ft AGL and within 5nm of an aerodrome. These are precisely the areas CALA alows untrained operators to cohabitate. Untrained operators should also not be permitted in controlled airspace.
Creation of new offences under Part 101 relating to the environment wherein an RPA can be operated, failure to hold appropriate licences or certifications, record keeping and notifications.	Strongly Agree. State police and council officers [for instance] should have the powers to issue on the spot fines, and in the most serious cases, confiscate the equipment and sell it to recover costs.

6.4.2. Based on this assessment, CASA argued there were three available options by which regulatory changes could be developed for this class of system. These were:

Option 1: CASA would not issue approvals for RPA operating under the conditions laid out in CASR 101.235.

Option 2: All RPA with a gross weight less than or equal to 150 kilograms would require CASA approval.

Option 3: Division of RPA by weight, where RPA with a gross weight less than or equal to 2 kilograms would not require CASA approval.

6.4.3. The NPRM outlined the risk implications and evaluations of each of option, postulating as per Table 9 below:

Table 9: CASA NPRM1309S Options Postulates

	Pros:	**Cons:**
Option One: The probability of an accident was assessed as possible (might occur at some time in the future) and the consequence was assessed as major (could result in death at worst case). This resulted in a risk level which was assessed as *high*.	Would remove the need for CASA to issue approvals.	• The high level of risk would require mitigation treatment to reduce the severity of the harm and is considered unacceptable.
Option Two: The probability of an accident was assessed as possible (might occur at some time in the future) and the consequence at the larger gross weights was assessed as major (could result in death at worst case). This resulted in a risk level which was assessed as *high*.	CASA would have visibility of all RPA operators.	• Would result in an increased workload to issue approvals due to the increasing number of operators of RPA in the small category.
Option Three: The probability of an accident was assessed as possible (might occur at some time in the future) and the consequence was assessed as *minor* (minor injury or first aid treatment case). This resulted in a risk level which was assessed as low.	Posed low risk, which could be managed by routine procedures as demonstrated by use of like provisions for regulation of small model aircraft.	• CASA would not have any visibility of the RPA less than 2 kilograms. • Objections from operators with RPA below 2 kilograms who have gone through the current approval process. • CASA would have no knowledge of the level of competency of RPA operators. • CASA would have no knowledge of types or location of RPA operations.

6.4.4. As described in section 3.3 of the NPRM preamble, these risk assessments were all predicated on operators of RPAS under 2kgs being strictly limited to the *original* CASR Part 101 Standard Operating Conditions, which included staying out of controlled airspace, and more than 3nm from the boundary of any aerodrome.

6.4.5. Sound regulatory development would have seen multiple risk assessments conducted by CASA. These would have examined not just each of the three options proposed in the original NPRM, but also the implications of each of the key post NPRM changes, specifically:

- Internal CASA changes to the original Standard Operating Conditions.
- The addition of 'Landowners' to the new 'Excluded RPA' class.
- Variation in the weight limits proposed under the new 'Excluded RPA' class.

6.4.6. Industry was highly critical of CASA's preferred option three, even under the original Standard Operating Conditions. The removal since then of basic training, and the removal of two critical safety buffers from the Standard Operating Conditions, means CALA2016 creates an environment where accidents are waiting to happen.

6.4.7. ACUO notes that none of CASA's risk evaluations have ever been made available for public or industry scrutiny.

6.4.8. ACUO maintain that CASA's risk assessments are flawed and are not supported by international research. Recent assessments from the United States, the United Kingdom, South Africa and Canada all tell an entirely different story to the CASA position. Most international assessments strongly suggest a weight limit of only 250 grams should be considered 'harmless', whilst everything above that weight has the potential to kill or seriously injure people if operated negligently, and should require mandatory registration and minimum knowledge and experience levels to operate them.

6.4.9. The USA, UK, Canada, Ireland and India have either already adopted mandatory registration and minimum knowledge standards for all RPAS operators, or are moving towards the same now. The common European model being developed by the European Aviation Safety Agency takes this position further, calling for mandatory registration for all RPAS operators regardless of use. Only those in the lowest entry-level categories of RPAS designated 'toys' will be deregulated, though they will be heavily limited by the technology itself to the immediate proximity of the pilot, typically 50m vertically and 100m horizontally. These technical limitations will also be required to conform to established standards being embedded in the new RPAS regulations.

RECOMMENDATION 6: The Senate Committee seek detailed explanation from CASA about its specific risk assessments made in support of developing the safety case for CALA2016. This explanation should particularly focus on n the risk evaluations related to changes made post-NPRM including:

a) Internal CASA changes to the original Standard Operating Conditions.
b) Changes following the addition of 'Landowners' to the new 'Excluded RPA' class.
c) Changes following an increase to the weight limit of 25kgs for the new 'Excluded RPA' class.

6.4.10. Documentation, presentations, files and notes from CASA internal meetings held to discuss the Part 101 amendments, including internal opposition to the removal of basic training requirements by CASA's own UAS Flight Operations Inspectors (FOI's), are likely to reveal where CASA's risk evaluation methodologies fell over and what remedial actions may be required to fix these fundamental processes.

6.5.0. Removal of Training and Certification

6.5.1. Under the original May 2014 NPRM, training was to have been for all RPAS operations except those for practice; training and demonstration purposes (See 3.1.4 of the NPRM Preamble). Under CALA 2016 there are now no training requirements at all for the 'Excluded RPA' class of operators.

6.5.2. The CALA amendments, whilst bringing the original Part 101 regulations up to date with ICAO terminology, have gone beyond international efforts in harmonization. Most western signatories to the ICAO convention now require formal training for all commercial RPAS operators in particular, but some countries like the USA, Canada, Ireland and South Africa require all RPAS operators to have a minimum level of basic aeronautical knowledge. The EASA proposed model of RPAS regulations also stipulate minimum aviation knowledge levels for all except 'toys'. This complies with the requirements for each signatory State to ensure RPAS operators, like all other aviation pilots, hold a 'special authorization' to operate in the national airspace. A 'special authorization' implies the holder has been 'inducted' into the aviation system and holds a formal authorization, be it a licence, a certificate or similar.

6.5.3. The recent CALA amendments provide a means for 'special authorization' for Excluded RPA' class operators under CASR98 Part 101.048 (1)(a) & (b), however, the nature of the 'authorization' as such, is only playing with words to reflect that operators in the new 'Excluded RPA' class can now be deemed to *hold* a 'special authorization', even though they have undertaken no aviation training and hold no formal aviation qualification. Registrants in the 'Excluded RPA' class require only a CASA Aviation Reference Number (ARN) and a willingness to identify broad regions of interest where they might propose to operate RPAS at some point in the future. There is no requirement for training or for formal qualification and no requirement for public liability insurance.

6.5.4. CASA's online registration system exacerbates these problems. This system prompts the applicant to:

- observe all relevant regulations and the Civil Aviation Act
- only operate within the Standard Operating Conditions; and
- to acknowledge they have read and understood their obligations in law.

6.5.5. Such a registration system, however, provides no actual safety oversight. The registration system only provides CASA with a broad data-set of basic information about the applicant, and subsequently makes very sweeping assumptions that all registrants for the 'Excluded RPA' class have sufficient aptitude (off the street) to:

- Be able to navigate the relevant aviation legislation and regulations to find the 1% of information that is relevant to RPAS operators, spread across;
  - The Civil Aviation Act
  - Five volumes of CAR88
  - Five volumes of CASR98
  - Four Advisory Circulars (AC's), and
  - The CASA web-pages of guidance material (that in many places contradicts other guidance)
- Understand aviation language & terminology that is otherwise foreign to the general public;
- Understand what the regulations are actually saying, and how they apply to the new 'Excluded RPA' class of operators (under a very broad range of differing conditions and situations); and,
- Be able to fully understand their obligations in law.

6.5.6. It should be noted that CALA 2016 contains a number of ambiguities that can be, and frequently are, interpreted in many different ways, and not always correctly.

6.5.7. There are no final checks and balances to verify an online registrant has absorbed all the RPAS relevant information and understands it, and no evidence required of formal training that would have taught such. The applicant is required only to 'accept', via a click of the mouse, that they fully understand everything in order to complete the registration process. This is akin to accepting the terms and conditions required to join almost anything online these days, and as many of us know, most click the button without ever having read the actual content. In our circumstances however, there are serious ramifications if registrants do not observe the terms and conditions of RPAS operation – that is the Standard Operating Conditions.

6.5.8. CASA maintains CALA2016 reflects a balanced response to existing and emerging safety risks, without imposing unnecessary costs, or unnecessarily hindering participation in aviation and its capacity for growth. ACUO contend CASA has failed to balance '*participation in the aviation industry*' with '*a minimum level of aviation knowledge*' required *to* safely participate in the aviation industry.

6.5.9. ACUO contends registrants without formal training are not sufficiently knowledgeable to *know* whether they have interpreted the regulations correctly, and hence are *not in a position to know* whether they have properly understood their obligations in law.

6.5.10. To illustrate this point, the UK CAA recently conducted an online survey of 500 members of the public who own or use an RPAS for leisure purposes (See: http://dronesafe.uk/wp-content/uploads/2016/11/CAA_Consumer_Drone_Users_report.pdf). According to the final report, released in November 2016, only 36% of survey respondents were made aware of the UK 'Dronecode' guidance material by the manufacturer or vendor when buying their system. Further, whilst 54% of RPAS owners surveyed said they were aware of the UK 'Dronecode', few could recall specific rules when asked. ACUO contends a similar lack of knowledge would be readily found in Australia. The experience of walking into a chain electronic retailer anywhere in an Australian shopping centre will readily see store salespersons willing to sell a consumer grade system but with that same individual wholly unable to answer questions regarding regulatory structures or legal obligations. This is despite CASA urging retailers to supply buyers with its information brochures.

6.5.11. ACUO concerns about the widespread nature of this already deficient knowledge base are heightened by our members receiving RPAS services requests from clients which frequently challenge the limits of legal operation. Certified professional operators with years of experience often still require time to pause and assess whether a client's request can be undertaken legally and safely within the regulations. Some of these assessments can take days, if not weeks to gather the right information, assess the risks fully and then obtain the requisite approvals. Where prior to the amendments a certified operator might still turn down a request because it was assessed that it could not be done legally or safely, we now have complete novices registering with CASA and simply going and doing it themselves anyway, without understanding the consequences of their actions and the risks they pose to aviation and public safety.

6.5.12. Such situations are why sound regulatory practices require formal training in aviation as a necessary precondition. Aviation is an industry with inherent risks requiring critical, fundamental knowledge with which to understand how the aviation system functions safely. To expect a novice with no aviation background to understand even the basic principles of aviation, is complete folly. Without the basic building block of 'training' we undermine the very safety systems put in place to protect aviation and public safety. To then also permit untrained novices to operate to less stringent Standard Operating Conditions than is necessary to maintain safety, in the same airspace with manned aircraft, is regarded as a reckless decision by CASA. We challenge CASA to produce to the Senate Committee any data or research which conclusively demonstrates otherwise.

6.5.13. ACUO observes that even at the most basic level of recreational 'model aircraft' flying through the Model Aeronautical Association of Australia (MAAA), participants are provided with the underpinning safety knowledge required to operate their class of aircraft safely. Further, model aircraft operators conduct their sport in an environment which is largely contained, is known to manned aircraft, and is safely managed for them to do so. It is because they are so tightly regulated in operation that 'model aircraft' pilots don't require formal training or qualification. Despite that absence, and to their credit, the MAAA nonetheless provides the means for personal development through their own internal 'Wings' training scheme.

6.5.14. All aviation activities will have some impact on other aviation activities because they share a common airspace. For this reason, it is absolutely critical that all participants understand how the other participants behave in a given situation and a given airspace. Therein lies the basis for the Basic Aeronautical Knowledge test, or BAK for short. This is the minimum standard of aviation knowledge required to operate in Class G (unalerted) airspace with other manned aircraft. Of course, higher training standards are required to operate in controlled airspace and other areas with inherently higher risks, particularly where traffic density is greater around aerodromes.

6.5.15. Recreational manned aircraft pilots can sit a Basic Aeronautical Knowledge (BAK) course almost anywhere in the country which has an aerodrome, and is normally offered through the association of Recreational Aviation Australia (RA-Aus). The course can be completed in a weekend for less than $500. This training course is available Australia-wide and provides the bare minimum essential aviation knowledge required to operate safely in Class G airspace. It is a mandatory requirement for all recreational pilots to be knowledgeable about the airspace they operate in, and how to behave as the other aviation interests do in that airspace. Without this underpinning knowledge, a century of aviation has taught us that accidents and incidents happen and people die.

6.5.16. Even the most benign aviation activities such as recreational flying require some level of understanding about '*how we do things in aviation*', in order to protect not just themselves, but all other aviation activities, and the unsuspecting public beneath.

6.5.17. Abandoning minimum knowledge standards for RPAS operators, in itself, does not create an unsafe situation. If the particular RPAS activity could be contained and safely managed, as it is with the majority of recreational model aircraft, it might be reasoned that BAK standards would be an onerous requirement for RPAS pilots. However, when CASA amended the RPAS regulations recently they didn't just abandon the minimum training standards and qualifications required for 'Excluded RPA' class of operators, they also permitted these untrained operators the freedom to do so in airspace that is not segregated from manned aviation. In *any other* aviation activity this requires formal training and qualifications. Allowing untrained, unqualified and uninsured RPAS operators the freedom to do so alongside manned aircraft is akin to letting children ride pedal-cars on the freeway. Just because they can, doesn't mean we should allow it.

6.5.18. If we want to allow RPAS operators the freedom to do so in non-segregated airspace with manned aircraft, they *must* have the same minimum standards of aviation knowledge required of all pilots and operators in the same airspace, or RPAS operators must be restricted from operating in the same airspace as manned aircraft. ACUO believes it makes good sense to move towards the EASA model which advocates mandatory registration and training for the operators of all RPAS over 250g. This would also provide a bona-fide 'authorization' with which to satisfy both Article 8 of the ICAO convention and section 20AB of the Civil Aviation Act.

6.5.19. Training and qualifications provide the basis for personal development, for assessing competency, and where necessary, for regulatory enforcement. Without this, CASA has no effective 'control' over what happens in this sector, and right now it is one sector that is teetering on the edge of acceptable risk with extremely high rates of non-compliance.

6.5.20. ACUO would also like to make it clear that 'training costs' as quoted by CASA, AAUS and others are misleading in the extreme. It does *not* cost anywhere near $5,000 to do a course of Basic RPAS Training. Most of the 37 certified training organizations in Australia currently offer an entry-level course of Basic RPAS Training over five days for less than $2,000, typically around $1,500. That amount is less than the cost of the popular new Phantom 4Pro RPAS from DJI. Basic RPAS training gives students the best possible start in business with the fundamental aviation knowledge required to operate their RPA systems safely, and in accordance with the regulations. More often than not the experience of the training instructors will also provide valuable insights into how to run an RPAS business successfully and cost effectively, and how best to risk manage certain RPAS activities. Without formal training, novice operators are relying purely on guesswork as to whether they comply with the regulations, and all too often, they are not.

Recommendation 7: That CASA apply mandatory training and qualifications to the minimum requirements for the 'Excluded RPA' class of operators. Further:

- **a) That the minimum training standard for all recreational 'Excluded RPA' class of operators be a course of Basic Aeronautical Knowledge (BAK).**
- **b) That the minimum training standards for all commercial 'Excluded RPA' class of operators be a course of Basic RPAS Training – Level 1 (VLOS), or a course of training for the Certificate III in Aviation (Remote Pilot-VLOS).**

c) **That these compulsory training courses are specific to RPAS and cover not just the fundamental aviation knowledge required, but basic RPAS safety, maintenance and operation, particularly regarding the use, the safekeeping and the safe transportation of Lithium batteries.**

Recommendation 8: That CASA make amendments to the online registration system for the 'Excluded RPA' class of operators to include a field for registering a personal aviation qualification.

Recommendation 9: That CASA suspend all operators in the 'Excluded RPA' class until proof of a qualification is provided in the registration system.

6.6.0. Part 101 Enforcement and the RPAS Safety Challenge

6.6.1. When CASA embarked on its NPRM1309S consultation process in 2014, Australia already had an increasingly 'problematic' recreational RPAS sector. This community had enjoyed virtually unenforced regulations for a decade, and without effective CASA oversight, had given rise to a generation of recreational users with no aviation background and no concept of the dangers they posed to aviation and public safety. This rise coincided with the widespread introduction of multicopter RPAS onto the market.

6.6.2. The impact of CASA's continued 'soft-approach' to regulatory enforcement, including a near complete absence of any educational initiatives, has given rise to a very high rate of regulatory non-compliance in Australia. As Table 10 illustrates, this non-compliance challenge has magnified since 2014 as RPAS technology has matured and become easier for amateurs to access and to use. The fact that CASA has now quashed the training and licencing requirements for this very same sector of the RPAS industry, will only exacerbate the problem, as is suggested by the extraordinary incident rates for 2015 in Australia compared to other select nations as presented in Table 11.

Table 10: ATSB Incident Reports – 2011-2015

Prior to 2011	**Nil RPA occurrences. It should be noted Australia had nearly a decade of incident-free RPA operations from UOC holders between July 2002 and the end of 2011.**
2011 and 2012	**2 occurrences. This period coincides with the rapid emergence of commercially produced multicopters.**
2013	**10 occurrences including one investigation (AO-2013-167). Of these 3 involved some form of encounter with manned aircraft, including the investigation. The rest related to technical issues with approved operator RPA's.**
2014	**21 occurrences including two investigations (AO-2014-052 and AO-2014-056). Of these 15 involved some form of encounter with manned aircraft, including the two investigations. The rest related to technical and communication issues with approved operator RPA's.**
2015	**151 RPAS-related occurrences have been reported to the ATSB including two investigations (AO-2015-035 and AO-2015-112). Of these, 118 involved manned aircraft crews reporting sightings/encounters with RPAS. The rest related to technical and communication issues with approved operator RPAs, including the two investigations. It should be noted that in the large majority of RPAS incidents reported, the operator is never identified.**

TABLE 11: Australian RPAS Incident Reports select international comparative - 2015 only			
Country	**Population**	**RPAS Incident Reports**	**Ratio (population/incidents)**
Germany	80m	61	1 : 1,311,475
UK	62m	56	1 : 1,107.143
USA	318m	650+	1 : 489,231
Australia	24m	151	1 : 160,000

6.6.3. The data in tables 10 and 11 demonstrates two glaring challenges:

1. Australia had an alarming increase in the number of reported RPAS incidents in 2015. ACUO suggests this may reflects anticipation among untrained operators of CALA2016 provisions.
2. The rate of non-compliance in Australia is more than 3 times the rate in the USA, and more than 6 times the rate in European countries [per capita], yet CASA seems resolved to accepting the status quo without further thought to new enforcement policies or measures

6.6.4. What has not been revealed by CASA since the new amendments is how well the 'Excluded RPA' class of operators is complying with the CALS2016 amendments. ACUO is not aware of any monitoring program from CASA of the new 'Excluded RPA' class, and there is nil information from CASA on whether they in fact have the 'Excluded RPA' class under a formal program of surveillance. A copy of the current CASA Surveillance Manual (v2.3) shows there have been increased surveillance actions added to those for certified RPAS operators, but no indication whatsoever of surveillance actions on the 'Excluded RPA' class of operators, even though they are subject to the same 'special authorization' as certified operators and should be subject to the same scrutiny. This would appear to be a serious oversight on CASA's behalf and requires immediate remedial action.

6.6.5. In manned aviation, the very aviation infrastructure in use daily provides the focus point for any enforcement action. In unmanned aviation this premise is obsolete as unmanned aircraft can launch and land virtually anywhere. CASA alone is not sufficiently resourced to tackle effective enforcement of the unmanned sector of aviation across Australia. In other countries like the UK, government has initiated joint undertakings between the CAA and local police services, to better police the public areas frequented by errant RPAS users, and to jointly work to prosecute offenders where caught. This has raised the 'deterrent value' significantly in the UK. Where before an errant RPAS user would be free to operate knowing the CAA or any other authority was unlikely to catch them, now any local policeman can make the case, making errant RPAS users think twice now about where and how they operate their systems in public. The figures for the UK in Table 11 suggest this initiative is having some success at reducing RPAS incidents in that country, though concerns remain.

6.6.6. As previously noted, the new EASA concept for the future of RPAS operations in Europe seeks to limit the technology of the 'Open Category' of RPAS to no more than 50m vertically, and 100m horizontally. This largely removes the need for any training and a 'special authorization' under ICAO Article 8. This in turn should simplify administration requirements for the category at large. That 'Open Category' RPAS will be internally limited to very short range operations only, and therefore highly unlikely to impact manned aviation. This means enforcement of the 'Open Category' will be simplified under the EASA model, becoming a predominantly police role, monitoring hazardous operations in public areas, operations involving privacy issues etc.

6.6.7. Australia should be exploring similar structures and enforcement powers for state and Federal police. Consideration should also be given to empowering Council Officers to act as delegated authorities for CASA for enforcement purposes. In parallel all Australian jurisdictions need to examine new methods of policing and enforcement, with potential measures including on the spot fines; confiscation of RPAS and other equipment; and where necessary, public auctions of confiscated equipment to recoup enforcement costs.

6.6.8. The introduction of the new 'Excluded RPA' class of operators is unheralded in Australia. The decision to initiate this new class of RPAS was made without industry-wide support, without hard data to support the initiative, and without wider regard for the implications on aviation and public safety. There is a significant lack of information available about this strange new part of the RPAS industry in Australia. What information CASA may have gleaned from its registration system is unlikely to provide a basis for safety oversight, nor provide real indicators that the registrant actually understands the regulations or their obligations in law. As a matter of urgency the wider Australian aviation industry needs to know how well this new class of RPAS operators, the untrained and unqualified 'Excluded RPA' class, are coping with their regulatory obligations if indeed at all.

RECOMMENDATION 10: ACUO recommend the Senate instructs CASA to commission an urgent independent audit of 'Excluded RPA' class operators over a one year period. That at random, this audit select and examine ten registered operators from the 'Excluded RPA' class per month in order to assess:

- **Operator knowledge of the amended regulations & Standard Operating Conditions;**
- **The number of RPAS operations and the location of RPAS operations since registration with CASA;**
- **Operator compliance with the amended regulations and SOCs, and any breaches of the amended regulations in the conduct of RPAS operations; and**
- **Operator standards of operation, including maintenance, logs, paperwork etc.**

RECOMMENDATION 11: A national forum on 'RPAS Enforcement' be held during the second half of CY2017 under the auspices of the Council of Australian Governments. This forum should include delegates from CASA, AsA, the airlines, HIA, RA-Aus, ACUO, MAAA, Federal Police, State Police, local government and other stakeholders. The forum would be chartered to discuss and make recommendations regarding:

a) **Identification of the parameters of the enforcement challenge, the characteristics of illegal users and the types and techniques of illegal usage;**
b) **Extant measures to reign-in illegal and unauthorized RPAS use; and**
c) **New enforcement measures such as:**
    I. **On the Spot Fines**
    II. **Lawful Confiscation of equipment**
    III. **Auctioning confiscated equipment to recoup enforcement costs**

Recommendation 12: The Senate Standing Committee on Rural and Regional Affairs and Transport conduct an examination of international approaches to enforcement of RPAS regulations as a follow on to the current inquiry. This follow on study should include engagement with authorities in the United States, at the Pan European level as well as European national entities, and with India, Singapore and Japan.

6.7.0. Office of Best Practice Regulation Review

6.7.1. The preceding discussion has sought to demonstrate that significant safety and regulatory challenges remain before CASA, despite CALA2016 now being in force. In this context, it should be observed that the CALA 2016 Explanatory Statement, issued under the authority of the Minister for Infrastructure and Transport and tabled in the Federal Parliament 30 March 2016, observes in the broad that:

> "*The Office of Best Practice Regulation assessed that the proposed legislation would have minor impacts and that no further analysis in the form of a Regulation Impact Statement is required (OBPR ID: 16320). CASA expects this Amendment Regulation would deliver a positive impact for the very small RPA hire and reward sector by reducing the level of regulatory burden. Under the proposed legislation this sector, which forms more than 40 per cent of the RPA industry, would not be required to obtain a UOC or RePL."*

6.7.2. ACUO asserts that this was a narrow-minded view by CASA, to something that has since proved to be an extremely polarizing issue for the industry, and for parliament, and remains so. The Office of Best Practice Regulation is a part of the Department of Prime Minister and Cabinet and has a high level policy coordination role. Its primary objective is the removal of red tape, particularly that which may impact on economic development, but it is also required to ensure policy which addresses risk management is approached on a fully comprehensive basis. In this context, and noting the matters raised in this submission, for the Office of Best Practice Regulation to assess CALA2016 as having "minor impacts", raises concerns as to the substance of the CASA submission it considered in the first instance.

6.7.3. There are obvious differences in the way CASA make such assessments, and how industry make such assessments, and these differences also need to be rectified swiftly before CASA can accurately map the impact of regulations on industry, on other sectors of aviation, and on public safety.

6.7.4. ACUO requests the senate investigate how CASA determines the necessity for Regulation Impact Assessments, and why a RIA was not conducted for the RPAS industry given that the actual industry impact (post amendment) is closer now to 60%, not 40%.

> **Recommendation 13: CASA be asked to provide the current Senate inquiry with its CALA2016 submission to the Office of Best Practice Regulation, and the corresponding Office of Best Practice Regulation assessment of CALA2016, so as to facilitate Committee scrutiny of the effectiveness of that review mechanism in relation to air safety regulatory development in practice.**

7. Insurance requirements of both private and commercial users / operators, including consideration of the suitability of existing data protection, liability and insurance regimes, and whether these are sufficient to meet growing use of RPAS.

7.1.0. RPAS Deregulation and Insurance

7.1.1. The CALA amendments have created a unique situation in Australia, whereby anyone can now call themselves a 'commercial' (even 'professional') RPAS operator, with nothing more than a willingness to purchase a RPAS and fly it. Whilst this was initially seen as a boon for innovation and sector growth, in reality it undermines the very professionalism the industry desperately needs to demonstrate as it shifts from early growth into maturation as an acknowledged safe part of the national aviation system.

7.1.2. CALA has also had the unintended consequence of now legally permitting RPAS flights in and over areas that would have once been 'off-limits' to untrained and unqualified RPAS operators. This now includes Controlled Airspace and within 3NM of non-towered aerodromes. Such areas prior to CALA were simply 'out of bounds' to anyone who was not qualified. Such qualification included being knowledgeable about the airspace they were operating in; being radio qualified and capable; and, fully cognisant of the other aviation activities in that same airspace, regardless of the actual RPAS activity being undertaken.

7.1.3. The CALA deregulation measures remove such fundamental safeguards. RPAS pilots are operating in the same airspace with qualified and trained manned aircraft pilots, but without the same level of knowledge or qualification. Further, exempted RPAS are only operating under voluntary compliance with CASA regulations, CALA allowing them to legally fly without any minimum training qualification being attained. This raises the important question of how an untrained operator can demonstrate compliance with CASA regulations if they are not trained in those regulations in the first instance.

7.1.4. The flow on impact of CALA on Australian aviation and public safety, given the above, must be considered as significant. There is no legal requirement to identify or mark the RPAS to be able to determine who owns it if there is an accident or incident. Further, under current Australian regulations there is no legal requirement to hold public liability insurance cover, whether a recreational or a commercial RPAS operator. ACUO is of the learned view that by default, large numbers of exempted RPAS operators are doing so without any insurance cover at all.

7.1.5. ACUO is of the view that to adequately protect the public from errant activity, particularly that leading to, or directly or indirectly causing an accident or incident, there needs to be two levels of traceability, accountability and responsibility as inherent features of the CASA regulatory environment for commercial RPAS. These comprise:

a. A mandatory registration system for all recreational RPAS operators; and,
b. Mandatory minimum public liability insurance requirements for recreational RPAS operators under the 'Excluded RPA' class and outside of MAAA jurisdiction.

7.2.0. Insurance and Certified RPAS Operators

7.2.1. For Australian certified RPAS service providers, it is the client who stipulates the amount of public liability insurance cover required. Typically, public liability cover is to the value of $10m or $20m, although some larger organizations are now seeking greater cover to the amount of $30m. Without verified public liability insurance, most client organisations will not permit RPAS operators entry to facilities in the first instance, nor progress to operating a system over or around the same.

7.2.2. For Australian certified RPAS service providers, insurance premiums for public liability cover are considered by ACUO to be reasonable, typically $1,000 for $10m cover.

7.2.3. ACUO is of the view that the Australian insurance industry has taken a pro-active approach to RPAS operations cover. Our ongoing engagement at the organisational as well as the individual association member level indicates insurance companies are strongly focussed on ensuring safe evolution of our industry and share our concerns as to the risks posed by untrained and uninsured operators in the broad.

7.3.0. Excluded RPA Practice Concerns.

7.3.1. As noted above the 'Excluded RPA' class of operators are legally allowed to operate without training, without qualifications and without insurance. The sole accountability mechanism is voluntary registration of operations with CASA.

7.3.2. Many of these 'Excluded RPA' class operators are freelance, meaning they do not use formal business structures and have little or no overheads other than the RPAS equipment they operate. Cash transactions for services are commonplace. Should something go wrong such operators will frequently walk away and sacrifice the RPAS rather than face a compensation bill.

7.3.3. Instances of 'Excluded RPA' incidents in Australia where insurance is an important factor include aircraft falling through the roof of a house; driving through house windows and crashing into cars. When RPAS accidents and incidents occur, the likelihood of identifying the operator is often remote unless the operator comes forward voluntarily. ACUO holds that Australian public exposure to RPAS accidents and incidents, particularly those involving recreational RPAS, is unacceptable.

7.3.4. In August 2016 a DJI Inspire 1 RPAS collided into the front of a new Mercedes GLS as it was being driven across the Sydney Harbour Bridge. The impact left part of the RPAS embedded in the car bodywork and other debris scattered across the road. Because of heavy traffic the vehicle was travelling at a slow speed; had the traffic been moving faster the incident could have affected several vehicles and resulted in greater damage in general. Because the operator of the RPAS remains unknown, and despite police investigations, the owner of the motor vehicle has been left with the repair bill. While this specific incident came prior to CALA entry into force, the example is cited here as it attracted widespread media attention due to the initial belief of the motor vehicle occupants that their vehicle had been hit by a person jumping from the bridge.

7.3.5. ACUO concerns regarding current RPAS insurance arrangements in Australia are amplified by the situation that insurance is in fact available to 'Excluded RPA' class operators if they have undertaken a formal course of training and hold a personal licence as a minimum qualification. Typical premiums suggest an operator of a DJI Phantom 4 RPAS can obtain $10m public liability insurance cover for as little as $250. Despite this, since many 'Excluded RPA' class operators are not formally trained and qualified, nor have sought such training, insurance companies will rightly not provide them with coverage.

7.4.0. European Insurance Practices.

7.4.1. European Union aviation insurance regulations (EC Regulation 785/2004) in place since 2004 stipulate all aircraft operators, regardless of aircraft size or use, must hold third party public liability insurance. The regulations also include recreational RPAS over 20kgs maximum take-off weight, and all RPAS used in commercial roles. The minimum public liability cover required is approximately £660,000 (approximately AUS$1.1m) for all RPAS under 500kgs.

7.4.2. Since 2004 the European commercial RPAS market has changed considerably with critiques being made by a number of European Union member states seeking the review of corresponding aviation insurance coverage structures. For example, in 2015 the United Kingdom House of Lords called for the European Commission to increase the minimum amount of public liability cover required by commercial RPAS operators on an across the board basis.

7.4.3. The UK itself is currently reviewing the insurance requirement for RPAS to assess whether the current requirements provide an acceptable level of cover for the public, and how to use insurance requirements to encourage self-regulation of the RPAS market, particularly by leisure users. This could include mandating all owners of RPA of a certain weight to have insurance as a feature of the civil aviation regulatory system.

7.4.4. The UK is also strongly considering a mandatory registration system, as applies in the USA, Canada and Ireland on the basis this will reinforce the accountability and responsibilities of RPAS operators at large. In contrast it should be noted that the US system does not have a requirement for RPAS operators to hold public liability insurance.

Recommendation 14: That CASA be required to publicly release as part of its annual report to Parliament details on an ongoing basis of the composition of the 'Excluded RPAS' category registrants, based on recreational versus commercial users.

Recommendation 15: That CASA be directed to commission an independent and publicly releasable report examining what levels of coverage would be appropriate for a compulsory system of public liability insurance for all RPAS users, whether commercial or recreational.

8. The use of current and emerging RPAS and other aviation technologies to enhance aviation safety.

8.1.0. Unmanned Traffic Management.

8.1.1. The emergence of RPAS as a distinct segment of aviation gives rise to clear challenges to other airspace users. RPAS are different from other aircraft types in that the pilot is not physically present within the air segment and instead relied on datalink systems to ensure real time command and control. In manned aircraft the presence of the human within the aircraft cockpit is seen as a fundamental enabler of safe operations, including operations within the proximity of other aircraft. This same human presence is likewise considered a fundamental element of safety, indeed the first tier of safety, in all other modes of transport, whether ground based or maritime.

8.1.2. The second tier of safety in manned aviation, specifically safe separation of air traffic has been the development of air traffic control (ATC) systems. These systems operate at both the national and international level to provide a common operating environment based on the fundamental rules of the air as laid out by the annexes to the Chicago Convention. In Australia the delivery of air traffic control services under the Airservices Act of 1995 is the responsibility of Airservices Australia.

8.1.3. Airservices Australia released its inaugural operational concept for 'Management of Remotely Piloted Aircraft Systems (RPAS) in ATM operations" (Document C-REF0266) on 10 May 2016. This important document sets out the fundamental basis for how Airservices will manage current RPAS operations at the domestic level as well as provide guidance on how the national air traffic management system will be evolved to remain current with corresponding RPAS technological and regulatory structure evolution. Document C-REF0266 sets out two cases for where Airservices will accept responsibility for provision of separation services for RPAS, these being:

- Where the equipment levels and capability for the RPAS are highly reflective of conventionally piloted aircraft (Para 3.2.1); and,
- Where the equipment levels and capability of RPAS are not reflective of conventionally piloted aircraft, then situational arrangements based on the location and latitude of the RPAS operation (para 3.2.2).

8.1.4. An example of the first stated case is the Royal Australian Air Force's planned Northrop Grumman MQ-4C Triton system, which has a 40 meter wingspan and is capable of remaining in the air for 30 hours at a time. The Triton system will carry a combination of air traffic transponders, a detect and avoid radar and piloting camera to ensure the ground based pilot has situational awareness near that of the pilot of a manned aircraft.

8.1.5. An example of the second stated case is a commercially available multicopter, particularly when being operated in proximity to airports. Document C-REF0266 states that in the broad *"ATC responsibilities are dependent on the location and height of the RPAS operation. RPAS operations in controlled airspace do not automatically trigger responsibilities for ATC. If the RPAS operation is below 400 feet AGL and away from the movement area, runway or approach/departure path of a controlled aerodrome, ATC do not have any responsibilities* (Para 3.3.2)." In the event that the operator of the multicopter sought to fly higher than 400 feet AGL or within or over the airport movements area, ATC does become responsible for safety of other aircraft and is required to ensure safe segregation of the RPAS from other airspace users. The 400 feet AGL restriction is consistent with the CASR Part 101 framework in requiring commercial RPAS to remain below that height ceiling in all forms of operation unless specific exemption has been provided. Airservices propose that the future Australian ATC environment will feature what they term 'RPAS advise and fly' or 'RPAS Green' zones where direct ATC service provision arrangements are not required provided the RPAS operator gives prior notification.

8.1.6. In general terms, the responsibility framework laid out by Document C-REF0266 serves to address a broad variety of scenarios and circumstances of commercial RPAS operations. However, Document C-REF0266 is also fundamentally limited in its vision, the proposed 'green zone' approach failing to consider the emergence of a wide variety of commercial RPAS business models, particularly those based on courier and logistics services, conduct of advertising services, commercial security services and RPAS used by government agencies in law enforcement, environmental monitoring and incident response in and around urban areas. Commercial RPAS used in such roles are likely to feature miniaturised detect and avoid sensors; advanced precision navigation systems; highly redundant command and control datalinks; machine to machine information exchange capabilities allowing automatic route planning and optimisation based on evolving environmental conditions; and automatic emergency recovery systems such as airbags and parachutes. Such RPAS are now at an advanced stage of commercial readiness internationally, examples being courier and urban delivery systems developed by Google, Amazon and Domino's. In turn such RPAS have direct potential to lead to a density of RPAS traffic at low altitude above Australian towns and cities which will require significantly more capable structural and regulatory arrangements than those currently proposed by Document C-REF0266.

8.1.7. The emergent low altitude RPAS traffic density challenge is recognised internationally as being far from hypothetical. Since 2014 the United States National Aeronautical and Space Administration (NASA) and Federal Aviation Administration are both now two years into parallel major research programs tasked with developing what they have termed Unmanned Traffic Management (UTM) architectures intended to provide ATC services for RPAS operating between 100 feet AGL and 400 feet AGL. Likewise the European Commission announced at the end of November 2016 that it was launching what it terms a "U-Space" or "unmanned airspace" research program, this again addressing RPAS operations in the 100 feet AGL to 400 feet AGL airspace category. In December 2016, the Civil Aviation Authority of Singapore and Nanyang Technical University launched a four year research program aiming at development of a complete national UTM system covering that island state. While these international projects are intended to result in operational architectures from 2019-2020, Australia has no corresponding national initiative in what represents the cutting edge of emerging commercial RPAS operations, nor does it hold observer or participant status with any like US or European initiative. The sole Australian UTM initiative is a commercial activity being undertaken by Telstra in cooperation with a number of private partners.

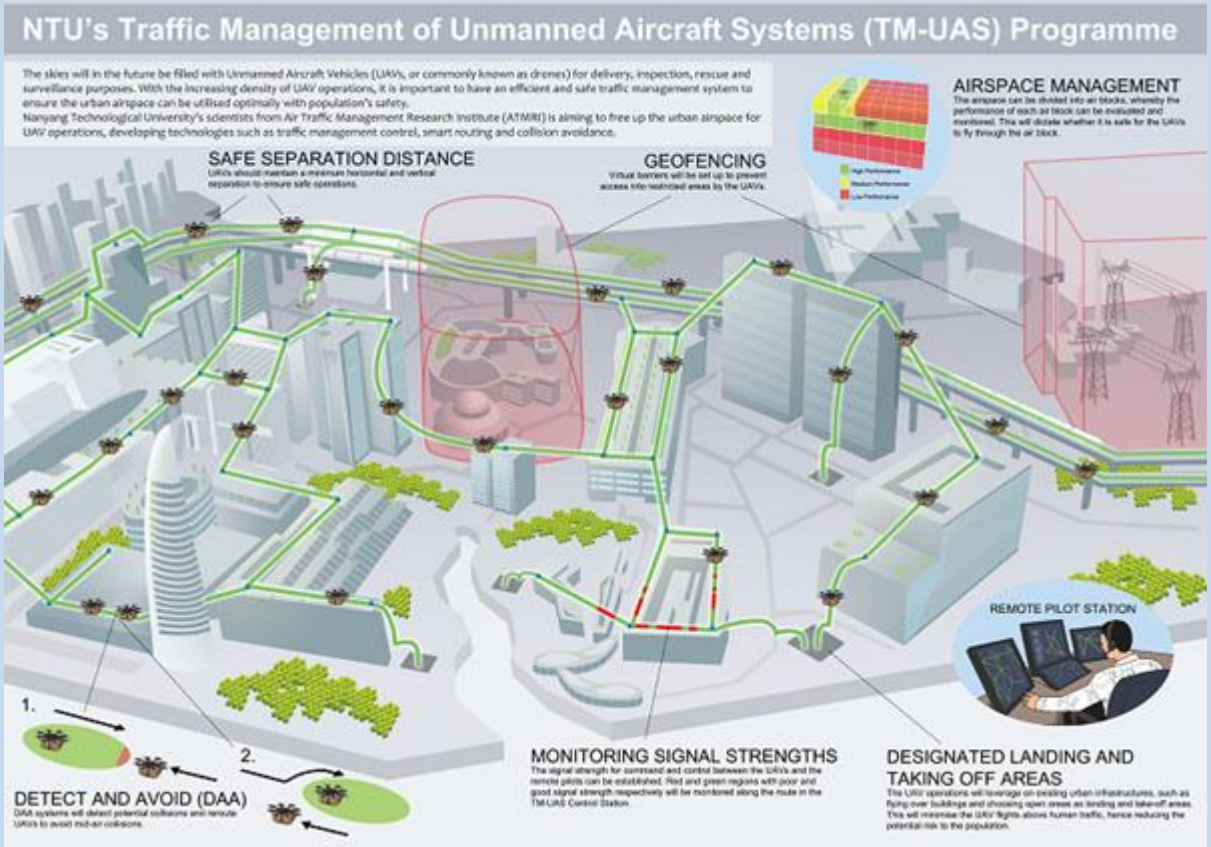
8.1.8. UTM or U-space architectures are predicated on an ATC concept considerably more sophisticated than those currently used to support manned aviation as well as the early anticipated form of next generation systems such as will be delivered by the Australian OneSky, the European SESAR and the United States NextGen programs. That sophistication is a direct effect of the need for an RPAS-specific ATC architecture to facilitate not just separation of aircraft, but also provide the means of actual piloting of individual RPAS as a means of ensuring compliance with operational safety requirements. Such an architecture necessarily means extensive use of automation; machine-based decision making; system bandwidth which allows not just transmission of flight directions but also two way control links, and extensive system redundancy. In the most advanced concepts of UTM, this same architecture would also provide the means by which data gathered by RPAS sensors would be provided to ground based users. That is, the UTM system extends to facilitate sensor control and tasking, data collection, and data transfer to operators.

8.1.9. The emerging capabilities of UTM shows strong parallels with the emergence of commercial software platforms, this including the use of platform business models, around which a complete common RPAS ecosystem would develop. Individual RPAS manufacturers in such an environment would be able to focus on aircraft design rather than operating systems, mirroring developments in the personnel computer market where a small handful of operating systems define all aspects of the market while multiple vendors exploit the benefits of commonality by focussing on niche segments such as applications design and implementation, peripherals manufacture and suchlike.

Case Study: Singapore's National UTM Research Initiative.

Singapore has been an early adopter of commercial as well as military RPAS but faces the fundamental challenge that as a small island state, its available airspace is extremely limited. In addition, airspace access is an important economic and security consideration, the country depending on international air services as a key element of trade while its Air Force is challenged by an absence of training areas. The emergence of the commercial RPAS industry has exacerbated those pressures, resulting in a situation where conflicting user needs all too often means applications to fly in Singaporean airspace are rejected even where the proposed operations otherwise would comply with national RPAS regulatory requirements. That restriction on airspace access for RPAS is in turn seen as presenting obstacles to the development of the commercial RPAS industry as a whole, this including secondary impacts on Singapore's significant information technology base.

In December 2016, the Civil Aviation Authority of Singapore and Nanyang Technological University (NTU) announced a four year, joint research and development program intended to facilitate a national UTM system as a means of overcoming this airspace access challenge. The proposed architecture will include features such as designated air corridors for RPAS; Defined no-fly zones around sensitive areas such as airports and other critical infrastructure with these enforced using geofencing; Detect and avoid systems for fitting to RPAS to assist in collision prevention; and, a national network of ground 'coordination' stations which can schedule RPAS traffic flows, monitor aircraft speed and ensure safe separation. The development program is expected to draw upon a wide variety of technological and research disciplines, including automation, robotics, sensor processing and data fusion. Initial development activity will rely primarily on laboratory-based work using simulation to test concepts, with actual field trials to commence from 2018.



8.1.10. If allowed to develop wholly commercially, ownership and control of a future Australian national UTM architecture risks allowing control of large portions of the commercial RPAS marketspace to monopoly entities with significant competition implications. However, without providing a coherent and common operating platform which can be scaled nationally and globally, a UTM system is destined to fail because separate systems prevent the development of the network effects as provided by a common platform. Perth cannot have a separate UTM system to Sydney or Cairns because a defining economic feature of aviation is its capacity to build markets by virtue of overcoming geographic distance through common means. Any alternative approach would see Australia effectively replicating the Federation lessons from individual state development of railway networks. Likewise, Australia cannot have a UTM system which is radically different to those developed across the rest of the world. In such circumstances, Government remains the most logical developer of the standardised architecture, treating UTM as an element of national infrastructure. Such an approach to a national UTM system does not mean however that there is not scope for extensive commercial sector involvement. Government powers clearly make possible competing the design, development and roll-out of any such system as well as potentially outsourcing operational management provided this continued to facilitate a single national UTM platform.

Recommendation 16: That the Federal Department of Infrastructure and Regional Development be tasked with conducting a national unmanned traffic management (UTM) requirements scoping study with this to be conducted as a joint government and industry initiative, including participation by Airservices Australia, CASA, commercial RPAS operators, RPAS manufacturers, and commercial information technology and communications sector companies. That the study be launched by July 2017 and be specifically tasked with examining how to launch a national UTM test-bed project based on performing extended courier RPAS services in a state capital city by the end of CY2018.

Recommendation 17: That Airservices Australia be tasked with establishing observer roles on the European Commission U-Space and NASA and FAA UTM projects by no later than the end of CY2017 to ensure timely access to lessons from those initiatives for corresponding Australian endeavours. In addition, such engagement should be intended to result in development of means for Australian industry and research agencies to directly participate in those international initiatives.

8.2.0. Automatic Dependent Surveillance – Broadcast (ADS-B).

8.2.1. A critical dimension of air traffic safety, whether manned or unmanned, is situational awareness. Automatic Dependent Surveillance-Broadcast or ADS-B is a form of transponder which when fitted to an aircraft, provides users with both a means to notify of their presence to other airspace users, and in turn to be informed of the location of proximate aircraft which could become a threat to safety. Since December 2013 Australia has been rolling out a national ADS-B network requiring all manned aircraft operating under instrument flight rules to be equipped with a transponder. The original completion target of February 2017 has recently been extended to 2020.

8.2.2. Historically, ADS-B equipment has been large, however miniature transponders are increasingly becoming commercially available meaning a broad spectrum of small RPAS can now be equipped with the devices. The typical power output of such systems up to 2015 was around 0.5W, meaning a signal range of up to 10km. New devices entering the market in late 2016 are demonstrating power output in the order of 250 watts from a 50 gram avionics unit with signal range of above 300km. ADS-B has already been identified and trialled by NASA as a key enabler for its future UTM architecture, providing individual RPA altitude, airspeed and location information. NASA has also shown that existing ADS-B ground stations can directly integrate that RPA data into an existing recognised air picture for use by air traffic controllers.

8.2.3. Based on current developmental trends and price-points, the mandatory implementation of basic ADS-B equipment for all RPAS operations in controlled airspace is an option which needs to be full assessed by Australian regulators in close cooperation with the national RPAS sector as well as all other airspace users. Such adoption would provide a number of enhancements to aviation and public safety, without significant cost burden to RPAS operators. Such enhancements would include:

- A level of safety oversight & situational awareness that provides the RPAS operator not only geo-locational information of the RPA in operation, but all other ADS-B equipped aircraft in the immediate vicinity.
- A simple and effective remote means of electronic identification of an RPAS and its operator.
- A new surveillance tool allowing CASA and Airservices Australia to track and monitor RPAS operations for enforcement purposes.

8.2.4. It should be noted that the 'Prototype' European Aviation Safety Agency RPAS rules, intended to ensure a common set of regulations across all European Union member states, identify these same benefits as part of plans to mandate such technology so as to allow RPAS to operate in non-segregated airspace alongside manned aircraft.

8.2.5. At the most basic level, 3rd party ADS-B capabilities can currently be obtained for RPAS at a price point of around A$200, meaning such technology is feasible for popular entry-level systems such as the DJI Phantom series. If Australian and other national regulators were to mandate ADS-B as standard equipment, the small form factors of current and emerging production units as already exist indicate they could be easily incorporated into existing small consumer and commercial RPAS without difficulty or performance degradation. Production phase integration would also further reduce the cost of individual ADS-B units compared to separate post purchase fitout.

8.2.6. For more capable RPAS, proportionate improvements in the capabilities of available ADS-B units, specifically in terms of power output and range of system broadcast, are accompanied by parallel cost increases. Individual unit costs of around A$2000 are rapidly reached, meaning such systems take on a level of impost for all but those routinely operating in controlled airspace or in BVLOS modes. The most sophisticated ADS-B systems for RPAS peak at around A$5000 to A$6000, these being fully compliant with all possible forms of ADS-B capability and are directly comparable with the costs for fitting ADS-B to a manned aircraft.

8.2.7. CASA does not yet have a mandated position in the adoption of ADS-B as a mandatory element of its RPAS air safety regulations but has, on at least one occasion, issued necessary 24 bit addresses to allow for trials of development systems in Australian airspace. Airservices Australia regulations include a provision for ADS-B Out, that is broadcast location but not receive other airspace user proximity data, as part of mandated equipment requirements for commercial RPAS operators seeking to fly in controlled airspace. That Airservices requirement can be waived in circumstances where the commercial RPAS is flying within visual line of sight at altitudes of below 400ft AGL. Airservices RPAS Air traffic management operations concept as released May 2016 notes technologies such as ADS-B may provide part of a future equipment requirements but also observes current devices are uncertified and the cost of achieving this may result in such solutions becoming financially prohibitive. Airservices is continuing to study ADS-B for RPAS as part of its ongoing surveillance technologies working group mechanism, however ACUO is of the view that a more intensive assessment process is required in order to expedite development of a formal policy and regulatory position. ACUO is of the view that ADS-B shows particular applicability as part of not only a future Australian UTM system, but also as an important risk mitigation technology for safe beyond line of sight commercial RPAS operations at altitudes above 400ft AGL. However, widespread adoption of ADS-B for UTM roles might also overload that system meaning a requirement for detailed advance assessments of the implications this might have for the technology as a feature of Australian ATC architectures.

Recommendation 18: That CASA and Airservices Australia be tasked with commissioning an independent issues paper on the potential role of ADS-B as part of the future national RPAS regulatory environment with this to include examination of options for how certification might be expedited through innovative mechanisms such as the proposed Defence Cooperative Research Centre on Trusted Autonomous Systems; an ADS-B "collective" or via a Federal Government research arm such as the Commonwealth Scientific and Industrial Research Organisation. The issues paper should also include an assessment of likely costs to Government and industry if ADS-B were to be made mandatory equipment for some or all classes of commercial RPAS operations, and provide an assessment of implications for the integrity of the wider ADS-B architecture if adopted as part of a national UTM system.

8.3.0. Trusted Autonomous Systems.

8.3.1. The rapid evolution of commercial RPAS has given rise to extensive interest within the manned aviation community on means by which enabling technologies for unmanned flight might be repurposed to enhance the efficiency and safety of wider air traffic. This includes adoption of RPAS autopilot technologies, robotic control systems (where a physical robot replaces a member of flight crew), miniaturised and modular avionics and sensors, datalink technologies, flight planning systems and situational awareness systems. Such adoption stems not only from the potential to enhance the capabilities and performance of manned aircraft, but also in support of ensuring manned aircraft remain concurrent with continually evolving national and international regulatory requirements. The payoffs from adoption of such technologies and capabilities include reducing pilot workload, including transitioning two person cockpits to single person operation, and speeding up reaction cycles in the response to emerging conditions. However, as manned aircraft become more capable and begin to display increasing levels of autonomy, key questions emerge as to the level of assurance or 'trust' a pilot can have in the expanding array of attributes his or her aircraft demonstrates.

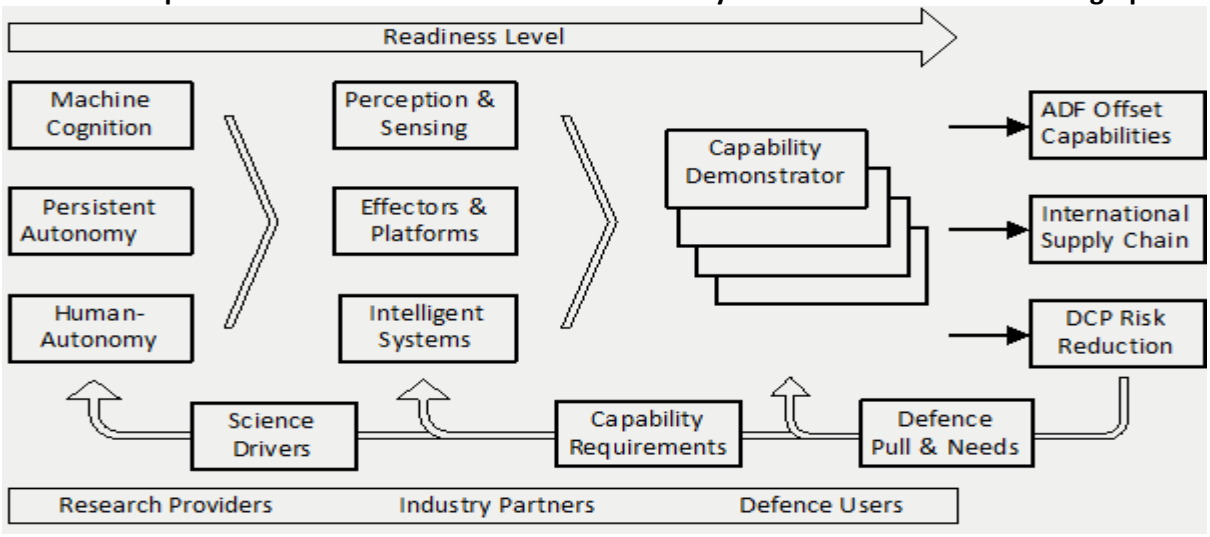
8.3.2. The relationship between humans and machines, particularly the capacity of machines to fail and harm their human operators or passengers, is a root source of the concept of certification. Certification uses scientific methods to determine the operating parameters of a given technology and to ensure that it can be applied in routine and predictable ways to achieve a given outcome. Certification in this context is a key element of risk determination and mitigation, with corresponding flow on effects to likely system safety. As growth in autonomy as a behavioural feature of manned as well as unmanned aircraft becomes increasingly commonplace, certification assumes increasing importance as a fundamental element of ensuring 'trust' of these systems at large. Certification however, is an expensive process with specific expertise in unmanned systems software and hardware not readily available in Australia.

8.3.3. Commercial aviation shares its growing 'certifiable trust' challenge for autonomous systems with a variety of other sectors. This includes mining, where autonomous vehicles are becoming standard items of equipment, and the military, where autonomy of a variety of forms features as part of current and emerging weapon systems. This shared problem gives rise to an opportunity for Australia to actively explore solutions through multidisciplinary and multi-sector approaches.

8.3.4. The Australian Defence Science and Technology Group is currently exploring establishment pf a Defence Cooperative Research Centre (CRC) in Trusted Autonomous Systems, the objective being to bring this into being before the end of CY2017 (See http://www.dst.defence.gov.au/partner-with-us/university/proposed-defence-crc-trusted-autonomous-systems). As proposed, this CRC would work with universities and industry to develop agile technology demonstrators to showcase new approaches to autonomy which deliver significantly greater operational capabilities, whilst ensuring

human control is not compromised. The primary research program would address machine cognition, human-autonomy integration and persistent autonomy. A parallel functional technology program would explore system perception and sensing, platforms and effectors, and intelligent systems. Identified capability demonstrator areas identified include: wide-area ocean surveillance, counter insurgency operations, cyber-electronic warfare operations, urban and littoral operations, humanitarian assistance and disaster relief operations. RPAS technologies are specifically being targeted in planning for the CRC with the objective of supporting emergent Defence capability requirements.

Table XX: Proposed Defence CRC In Trusted Autonomous Systems Research Model. DSTG graphic.



8.3.5. ACUO is of the view that the Defence Cooperative Research Centre (CRC) in Trusted Autonomous Systems concept is one which has strong potential to provide a focussed and industry shaping impact on the Australian RPAS sector in the broad. There is a highly symbiotic relationship between military and civil RPAS at large, this reflecting not only shared origins but also shared dependence on the convergence of wider enabling technologies. Further, the shared operational environment of the national airspace system means common solutions to safe integration and regulatory coordination is required. For this reason, consideration of an offsets stream addressing civil sector applications is worth detailed consideration by DST-G. A logical starting point for such activity would be the shared military and civil national air traffic control system being developed under OneSky, which if linked with the proposed Defence CRC in Trusted Autonomous Systems, may provide an appropriate foundation for the development of a national UTM solution. A second direct activity would be providing a cost-effective, standing certification mechanism or service for RPAS avionics, whether commercial or military, as a means of encouraging domestic focus on new RPAS subsystem product development and assisting the national RPAS sector in entering global supply chains.

Recommendation 19: That DST-G be directed to ensure linkages with the Australian commercial RPAS industry are a fundamental element of plans for the Defence CRC in Trusted Autonomous Systems.

Recommendation 20: That the proposed Defence CRC in Trusted Autonomous Systems include exploration of UTM technologies, in close cooperation with AirServices Australia, CASA and the OneSky project as a core element of its standing work program.

9: Annex One: RIGA DECLARATION

"FRAMING THE FUTURE OF AVIATION"
Riga - 6 March 2015

Today Europe is taking a decisive step towards the future of aviation. The European aviation community gathered in Riga to exchange views on how, and under which conditions, drones can help create promising new opportunities in Europe, offering sustainable jobs and new prospects for growth both for the manufacturing industry and for future users of drones in all sectors of society. Drones offer new services and applications going beyond traditional aviation and offer the promise to perform existing services in a more affordable and environmentally friendly way. They are a truly transformational technology.

The Latvian Presidency of the Council of the European Union, European Commission representatives, Directors General of Civil Aviation of the EU Member States, data protection authorities and leaders of manufacturing industry and service providers confirmed the importance of joint European action, building on the orientations given in the EC Communication on opening the Remotely Piloted Aircraft Systems (RPAS) market (1).

The aviation community stressed the necessity for European regulators to ensure that all the conditions are met for the safe and sustainable emergence of innovative drone services. At the same time regulations must help the industry to thrive and adequately deal with citizens' concerns.

The aviation community established the following principles to guide the regulatory framework in Europe:

1. **Drones need to be treated as new types of aircraft with proportionate rules based on the risk of each operation.**

   The provision of drone services must not be less safe than is accepted from civil aviation in general. The incremental integration of drones in the aviation system must not reduce the level of safety presently achieved in civil aviation. Although no-one is on board the drone, people in other aircraft or on the ground could get hurt in case of an accident or an unscheduled landing. The way safety is regulated must be proportional to the operational risk involved.

   Rules should be simple and performance based, to allow a small start-up company or individuals to start low-risk, low-altitude operations under minimal rules and to develop, with light-touch risk-based regulation, similar to the modern product safety regulations applied in other sectors. Higher risk operations would be gradually subject to more stringent regulations or operational limitations. At the other end of the spectrum, where the operational risk is highest, such as with large drones operating alongside manned aircraft, the regulation will need to be quite similar to that applying to manned aviation, with strict standards on the design, manufacturing, maintenance and operation of drones, as well as on the training of drone pilots and maintenance personnel.

2. EU rules for the safe provision of drone services need to be developed now.

Safety rules, including on remote pilot and operator qualifications, should be developed at the European level by the European Aviation Safety Agency, building on the experience developed in the EU Member States. The essential requirements should be *harmonised at the global level* to the maximum extent possible, and full use should be made of the established cooperation in the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) and at ICAO, and should be completed by international industry standard setting bodies. Important efforts need to be put into resourcing these activities, especially JARUS, in order to ensure that the progressive risk-based approach is consistent with what is done in the rest of the world.

This basic regulatory framework should be put in place without delay, in order to help the private sector to take well-informed investment decisions, and to provide a basic set of rules for the many operators who are increasingly eager to begin providing services. The European Aviation Safety Agency should consult stakeholders by the middle of 2015 on the regulatory framework for the operations of drones and on concrete regulatory proposals for low-risk operations. By the end of 2015, the Agency will use the results of the consultation to propose a position on these matters. The proposal for the revision of the basic European Safety Regulation, which the European Commission has announced for 2015, should contain the necessary new provisions and essential requirements for the progressive risk-based regulation of drones, based on the Agency's recommendations.

3. Technologies and standards need to be developed for the full integration of drones in the European airspace.

The success of drone activities and safety regulations also depends on the financial effort to develop and validate key missing technologies and the ensuing required standards. Both industry and public authorities stressed the need for adequate investment in the technologies that are required to integrate drones into the aviation system – the SESAR programme. CleanSky and other initiatives should complete the SESAR investments. That would create spin-off benefits for traditional aviation and so frame the future of flying.

4. Public acceptance is key to the growth of drone services.

The respect of citizens' fundamental rights, such as the right to privacy and the protection of personal data, must be guaranteed. Many drone services involve data-gathering such as filming, etc. The responsible authorities, such as the national and European Data Protection Authorities, should develop the necessary guidelines and monitoring mechanisms to ensure the full respect of existing protection rules, including in relation to drones. Rules need to clarify what is acceptable and what is not, and they require to be properly enforced.

Drones may cause nuisances and negative externalities, such as noise. These nuisances need to be addressed, possibly at the local level, to maintain public acceptance.

Drones also pose potential security risks. The design of drones can and should take into account those risks by using methods such as cyber-defence or geofencing. However, the malicious use

of drones cannot be entirely prevented by design or operational restrictions. It is the task of the national police and justice systems to address those risks.

5. The operator of a drone is responsible for its use.

When a drone service is delivered in prohibited airspace, in an unsafe manner, or for illegal purposes, the authorities should be able to act and hold the operator accountable. Where lacking, this will need to be clarified in national law. Moreover, in order to enforce responsibility, it will be necessary for drones to have at all times an identifiable owner or operator. The regulator should seek the least bureaucratic way to achieve this. For instance, the mandating of electronic identity chips on drones – "iDrones" – as is today envisaged in some states, could be formalised through a safety rule, which would contribute to the effective implementation of privacy and security requirements. Standardised web-portals in the Member States for the registration of operators and their operations could be another solution. The involved authorities need to work closely together.

Drone accidents will happen. Member States should clarify the applicable insurance and third-party liability regime and monitor the compensation mechanisms for potential victims. The establishment of compensation funds to cover victims of accidents caused by uninsured drone users, as used in the motor insurance sector, could be envisaged. Reporting on drone incidents should be integrated into the overall incident reporting requirements. Systematic and coherent incident reporting will improve safety and will be instrumental for insurance companies in their risk analysis on which third party liability insurance premiums are based.

To allow a short reaction time, the development of drone services and drone technologies needs close monitoring. To this end, the EU should establish an easy access for SMEs to information required for drone manufacturing and service provision, together with an observatory to keep track of the growing number of operations in Europe and the evolution of innovation. This monitoring will permit informed decisions relative to the establishment of priorities for future legislation. It will also help regulators to learn from experience and verify that the rules are fit for purpose, namely to ensure that new technologies and drone services can develop in full respect of the required high levels of safety, security, privacy and environmental protection. An annual progress report should be published.

The European aviation community gathered in Riga today is committed to working together on the basis of these principles to allow businesses to provide drone services everywhere in Europe as from 2016 onwards.

Note 1: COM(2014)207 on a New era for aviation - Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner. See also the EESC opinion TRAN/553 of 15 October 2014.

Source: http://ec.europa.eu/transport/sites/transport/files/modes/air/news/doc/2015-03-06-drones/2015-03-06-riga-declaration-drones.pdf

10: Annex Two: Warsaw Declaration

"Drones as a leverage for jobs and new business opportunities"
Warsaw - 24 November 2016

The Polish Minister of Infrastructure and Construction Mr Andrzej Adamczyk hosted the Warsaw High Level Conference also attended by the European Commissioner for Mobility and Transport Ms Violeta Bulc, the Executive Director of European Aviation Safety Agency Mr Patrick Ky, the acting President of the Polish Civil Aviation Authority Mr Piotr Samson, the Executive Director of the SESAR Joint Undertaking Mr Florian Guillermet, a number of Directors General of Civil Aviation from the EU Member States, representatives of ICAO, international associations, European bodies, Agencies, together with leaders of the industry. The conference called for a number of well-coordinated actions to develop the EU drone ecosystem and to deliver it by 2019, building on the guiding principles given in the Riga Declaration.

The conference:

- Noted the enormous potential of the drone services market with estimates ranging as high as one hundred billion euros in the coming years.

- Urged the further development of this potential to support EU competitiveness and global leadership.

- Discussed a range of possible applications, business models and technological developments, including autonomous drones, and agreed that EASA should further study the interaction between drones and manned aircraft.

- Called for the swift development of a drone ecosystem that is simple to use, affordable, commercially and operationally friendly, yet capable of addressing all societal concerns such as safety, security, privacy and environmental protection.

- Welcomed the progress being made towards a flexible framework of safety regulation at EU level based on the operation centric approach, taking into account subsidiarity.

- Noted EASA's initiative to develop detailed drones rules on the basis of this emerging framework.

- Called for the safety rules to be kept simple, proportionate to the risk of the operation, performance-based, future-proofed, and based on global standards. Urged industry to develop open standards to support performance-based regulation.

- Urged industry to develop open standards to support performance-based regulation.

- Acknowledged the need for urgent action on the airspace dimension, in particular the development of the concept of the "U-Space" on access to low level airspace especially in urban areas.

- Invited the European authorities to outline, within six months, this concept. This outline should address issues relating to business models and governance and include the concept of operations.

- Confirmed the need for continuous investment in the integration of drones in the aviation system, in particular through the SESAR Joint Undertaking, and called for the use of the full

range of funding mechanisms, including their combination.

- Called for full participation by the whole EU drone community in demonstrators to test as rapidly and as efficiently as possible the feasibility of the requirements and standards of the U-Space.

- Confirmed the need to tackle, in a timely manner, security issues, including cyber-security, and to enhance cooperation between security, defence and safety actors.

- Called for education and safety promotion campaigns to be developed to increase awareness of all actors, in particular those without an aviation background.

- Called for the creation of an effective coordination mechanism between the European Commission, the relevant European Agencies, including the European Defence Agency, and all stakeholders reflecting the drone services market, to monitor, advise and assist with:

  - the establishment of the regulatory framework, including the timely delivery of industry standards;
  - the efficacy and funding of drone integration projects; and
  - the development of the U-Space.

Source: https://ec.europa.eu/transport/sites/transport/files/drones-warsaw-declaration.pdf

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