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By Electronic Transmission

Senator Glenn Sterle
Chairman
Senate Rural and Regional Affairs and Transport References Committee
PO Box 6100
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CANBERRA ACT 2600

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Dear Senator Sterle,

**SUBMISSION TO THE SENATE REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE INQUIRY INTO REGULATORY REQUIREMENTS
THAT IMPACT ON THE SAFE USE OF REMOTELY PILOTED AIRCRAFT
SYSTEMS, UNMANNED AERIAL SYSTEMS AND ASSOCIATED SYSTEMS.**

INTRODUCTION

The Australian Airline Pilots' Association (AusALPA) represents more than 5,000 professional pilots within Australia on safety and technical matters. We are the Member Association for Australia and a key member of the International Federation of Airline Pilot Associations (IFALPA) which represents over 100,000 pilots in 100 countries. Our membership places a very strong expectation of rational, risk and evidence-based safety behaviour on our government agencies and processes and we regard our participation in the work of the Australian Parliament as essential to ensuring that our lawmakers get the best of independent safety and technical advice.

AusALPA is grateful to the Committee for the opportunity to make submissions and to appear if necessary to assist the Committee in its deliberations on what we as pilots recognise as an inevitable disruptor to aviation safety as we know it.

Clearly, the Terms of Reference (ToRs) are very broad and certainly as we would expect for such an important and wide-ranging Inquiry. There are quite a few ToRs that are beyond our immediate expertise, so we will not comment further on those. However, we will make some generalised comments prior to listing our main concerns.

GENERAL COMMENTS

Economic Gains

We acknowledge that the positive economic potential for RPAS is huge.

Inefficient manned aircraft activities will be replaced with more efficient RPAS activities, but there will be a cross-over where human decision-making must be on-site rather than remote. On the other hand, many more activities that were not previously conducted due to the prohibitive costs of using manned aircraft will now be conducted with RPAS, creating positive economic gains for the wider community.

There will be an impact on pilot employment, mostly and primarily in general aviation, although that is likely to be characterised by a role transfer from aircraft to RPAS piloting and absorption of excess pilots into air transport operations.

The Collision of Economic Models

The emerging technology has successfully crossed the previously very wide and distinct historic moat between model aircraft and manned aircraft and consequently has challenged the regulatory framework based on that historical separation of aviation activities. We now face the challenge of ensuring that the emerging economic model of RPAS activities does not threaten the existing ultra-safe economic model of traditional air transport activities.

AusALPA asserts that, at least in our current regulatory and technology state, the emerging very small RPAS technologies provide very localised benefits and might reasonably be considered as nano-economic competitors to a worldwide aviation system that contributes at all level of economic activity. We recognise the need to make room for RPAS, even to the point of promoting it to replace inherently risky manned operations, but cannot allow that cohabitation to threaten the safety of the existing systems.

Sharing Airspace

The cohabitation of RPAS and manned aircraft operations presents no safety problem where there is no overlap in operational envelopes.

To that extent, we commend to the Committee the IFALPA position on UAS/RPAS (attached), subject to the caveat that it was essentially targeted at the threat to air transport aircraft of sharing controlled airspace with large RPAS. The thrust of that position, which to us is non-controversial, is:

The safe integration of UAS operations into civilian, non-segregated airspace can only be achieved if UAS are regarded in all ways as aircraft. UAS and their operations must comply with all existing rules and regulations applicable to other aircraft in the same class of airspace. It is not acceptable for such rules and regulations to be changed for manned aviation in order to integrate UAS and their operation.

As a subset of UAS, Remotely-Piloted Aircraft Systems (RPAS) should be fully certified and compliant with the provisions described herein before being allowed to operate in non-segregated public airspace.

Non-compliant UAS will require segregated airspace or mitigation by special authorizations.

The problem for us in Australia is not cohabiting with sophisticated RPAS controlled by sophisticated operators – it is entirely about how to avoid being in the same piece of

time and space with high performance RPAS in the hands of unsophisticated and unknowledgeable amateurs.

How Big is the Potential Problem?

AusALPA suggests that this is a major dilemma for the Committee to establish. There has been an explosion of availability of RPAs and the price points are very accessible to a wide range of retail customers. There are no effective filters on who may buy very small RPAs and, even if we had any idea of Australian-based retail sales (which we understand we do not), there is no way of knowing what the internet-based market is providing.

Importantly, AusALPA believes that there is no practical or politically acceptable way to control access to the very small RPAS market. So we are working on the basis that very small RPAS will become almost household items.

OUR MAIN CONCERNS

As noted above, we do not have all of the right answers, so our hope is to suggest or highlight areas worthy of further examination. Our main concerns are presented briefly, given the constraints of time and resources.

Increasing incidents within Australian airspace

Anecdotally, our members are advising of increasing sightings of RPAs in airspace which should be free of any collision risk from this source. Verification and investigation is difficult: the ATSB does not currently include RPAS/UAV reports within its public database.

There have been over 160 drone Air proximity events reported in the last 12 months in Australia. By way of illustration of what we might expect in the future, albeit from the admittedly much larger US market, the FAA now receives about 100 reports a month from pilots who say they've seen drones flying near aircraft and airports, compared with only a few sightings per month last year. The Australian reports are not readily visible on the ATSBs website to stakeholders, thus complicating external efforts to monitor the emerging risks.

AusALPA believes that these events should be analysed and transparently reported by the ATSB. It is not clear if the growing number of unauthorised drone incursions was assessed by CASA when CASR Part 101 was relaxed recently. It is also highly likely that no rigorous assessment was made of the potential impact, if any, that a reduction in controls may have on undesirable operations due to the widening of the unsophisticated user base.

We believe that the ATSB needs to be actively monitoring and publicising the extent of inappropriate RPAS operations that endanger manned aircraft.

Inadequate Collision Risk Modelling

AusALPA believes that the CASA collision risk modelling is inadequate for both aircraft and persons on the ground.

Risk is usually measured as the mathematical product of likelihood and consequences. In this case, we consider that the likelihood of a collision is increasing exponentially as a function of the user base and we are most concerned that the consequences of a

collision may not be sufficiently covered by existing bird strike certification requirements that determine the aircraft's survivability.

Consequently, we believe that the current legislation covering the operation of sub-2kg RPAs is inadequate. It allows virtually uncontrolled recreational operation and minimal control of commercial operations of the sub-2kg category and, while there are rules in place, there is no requirement for training, licensing or registration of these RPAs, many of which are capable of operation at high speed and at considerable height.

The 2kg limit was justified on the basis of single research project which acknowledges that there is little specific research data regarding the consequences of a collision between an aeroplane or helicopter and one of these devices, while focusing on a highly contestable approach to health consequences for persons on the ground.

However, there is considerable data regarding collisions between aircraft and other objects which gives clear indication of the hazards posed by RPAs of this size. In any event, AusALPA suggests that a new energy criterion may need to be developed that separates the collision safety case for aircraft from that for people on the ground.

Both EASA and the FAA have taken the potential hazards into account in the development of their rules which require registration and licensing for drones above 250gms. Australian CASR Part 101 subpart G provides no clear distinction between a UAV/Drone and a model aircraft. The European and US legislation is backed by research which acknowledges the potential hazards posed by larger sub-2kg RPAs to both other aircraft and the community at large.

Examples of other states risk studies:

https://www.eurocockpit.be/sites/default/files/study_realconsequencesoftoydrones.pdf

<https://vtnews.vt.edu/articles/2015/10/102815-engineering-jetenginedronestrike.html>

Regulatory Divisors

From the outset, AusALPA recognises that the effectiveness of the available regulatory options is limited, simply because we are regulating for the inherently compliant. Regulation will not prevent criminal or terrorist activities.

As a starting point, AusALPA suggests that the Committee should examine whether the historical regulatory divide between commercial and recreational use remains valid in this context.

Commercial activities are typically regulated as a matter of public policy because people are put at risk, predominantly as passengers, in aviation operations conducted for "hire and reward". The degree of regulation was most commonly responsive to the inherent risk to the person, the ability of the person to manage that risk and the scale of the risk in terms of the potential 'body count' – the third party risk was managed much more broadly. At least for the foreseeable future, passenger-carrying RPAS are not driving this public policy outcome, so the traditional approach is turned on its head.

RPAS regulation is overwhelmingly about third party risk. The question that arises is fairly straightforward: which activities create the greatest third party risk?

AusALPA would suggest that the primary considerations must include RPA mass, frequency of use and location of use. While we recognise that several years ago, the division between private/recreational and commercial use was a reasonable proxy for all three of those prime considerations, the explosion of availability of affordable RPAs has undermined that connection. Noting that safety regulation should not be overly influenced by the market consequences of that regulation, the reality seems to be that

the new sub-2kg rules broadened the base of barely constrained users while undermining the market for the highly invested and highly constrained commercial users.

Given the limited resources available, we should focus on identifying the right mass/energy risk profile so that we can then target the highest risk airspace followed by the most frequent users. Like wildlife, countermeasures may be required.

RPA Identification/Registration

Ideally, we want to prevent collisions rather than investigate the aftermath. Registration may be almost as useful to the former as it clearly is to the latter.

Setting out a practical registration scheme with strong deterrents against non-compliance serves notice to all users that they are operating in a highly regulated system, hopefully leading them to explore and understand the legal and safety constraints on RPAS operation.

Following an incident, enforcement action is impossible if the RPAS owner/operator cannot be identified.

AusALPA believes it should be possible to microchip all RPAs above the prescribed critical risk mass either at manufacture or “after market”. It should be necessary to provide valid identification to purchase a regulated RPAS in big primary and secondary markets. Ideally, identification/registration would also be linked to a scheme that provided for evidence of appropriate awareness/regulatory competence. While this whole process would be an additional administrative burden, it need not be onerous given that an identical scheme applies to the purchase of mobile phones/sim cards. Clearly, there is a cost involved, but in our view that only moderates the solution, not the requirement.

Enforcement

AusALPA considers the penalty regime for inappropriate RPAS operation to be inadequate or at best unclear when negligence or recklessness results in a serious incident or accident to a manned aircraft. The standard CASA penalty regime of 50 penalty units, currently \$9000, is not considered adequate for actions with serious consequences.

The next available enforcement step comes under section 24 of the *Civil Aviation Act 1988* which contemplates up to two years imprisonment for acts that threaten the safety of an aircraft or of persons on board an aircraft. We suspect that establishing intent will be problematic under that provision, whereas the strict liability provisions accorded to section 20A may also fail contextually if applied to RPAS operations.

AusALPA believes that Committee should explore the adequacy of the current deterrent framework to specifically address negligent or reckless operation of RPAS, particular where the outcome involves damage, injury or death.

Education and Awareness

AusALPA fully supports CASA and related parties in their pursuit of an effective education and awareness campaign. It is an essential component of an effective risk management scheme and requires the support and assistance of all stakeholders. Committee members may find the UK Dronesafe website a good example of a unified stakeholder program:

<http://dronesafe.uk/>

AusALPA is committed to assist our local education and awareness programs to the greatest extent that our resources allow.

Mitigating Otherwise Uncontrolled Risks

In many respects, managing the risks from RPAS operations is entirely reactive, particularly as the disruptive nature of the technological advances has far outpaced our regulatory response. This is not an Australian problem, it is a worldwide problem.

There is worldwide recognition that there will be compliance “leakage”, given that we can neither fully control the supply sources nor prevent modification or recoding. AusALPA believes that there needs to be a concerted effort to induce industry to create robust 3D geo-fencing software that creates vertical and lateral barriers to RPAS operations. However, we recognise that there are costs associated with these software solutions and adoption may be a longer term proposition.

Consistent with our previously expressed view on managing the collision risk, it may be necessary to enforce exclusion zones based on identified high risk airspace, both military and civil. Enforcement in this context means either physical or virtual interdiction (or both) and Committee members should be aware that there a range of technologies either in development or in limited production that target errant RPAs in protected airspace. One example may be found at:

<http://money.cnn.com/2016/11/04/technology/dubai-airport-drone-hunter/>

Constraining CASA Regulatory Activities

We understand that part of the CASA decision-making on RPAS regulation was recognition of the resource constraints that CASA faces. While that is pragmatic, AusALPA cannot support a situation where CASA modifies or avoids a safety compliance role as a consequence of internal budgetary deliberations – rather, we prefer that the requirements be explicitly costed and that there is some level of independent scrutiny and accountability for such decisions.

RECOMMENDATIONS

AusALPA recommends that the Committee:

1. Recognise that RPAS will create net economic benefits but must not be allowed to jeopardise safe manned air transport operations;
2. Reinforce that sharing airspace between RPAS and manned aircraft requires strict regulation and control;
3. Encourage the ATSB to closely monitor the emerging threat of inappropriate RPAS to manned air transport operations and to maintain publicly accessible data that allows monitoring of the effectiveness of RPAS risk management rules;
4. Ensure that an appropriate set of robust collision risk models for aircraft and persons on the ground are developed and used to inform the determination of an appropriate mass/energy risk divisor for regulatory purposes;
5. Support the establishment of a practical RPAS Identification/Registration scheme, linked to evidence of knowledge of compliance requirements;
6. Review the adequacy of the current deterrent framework to specifically address negligent or reckless operation of RPAS;

7. Support the development of a world standard all-stakeholder education and awareness scheme;
8. Encourage the development and implementation of robust vertical and horizontal geo-fencing software for RPAS autopilots
9. Recognise that legislative provision may need to be made for physical and virtual interdiction of errant RPAs in identified high risk airspace; and
10. Highlight the undesirability of CASA making decisions on safety related roles on financial or other resource grounds rather than public risk.

Yours sincerely,

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Attachments: 1. IFALPA Position 13POS04 *Unmanned Aircraft Systems* [12 October 2012]



Unmanned Aircraft Systems

Background

This position paper on Unmanned Aircraft Systems is intended to protect and enhance aviation safety to the highest standards by promoting a single level of safety worldwide for all users of civilian airspace.

IFALPA believes that UAS technology is not capable of replacing human capabilities, particularly in complex and safety-critical situations. Therefore, IFALPA strongly opposes the use of UAS to supplant the role of pilots in any type of air transport operations.

The safe integration of UAS operations into civilian, non-segregated airspace can only be achieved if UAS are regarded in all ways as aircraft. UAS and their operations must comply with all existing rules and regulations applicable to other aircraft in the same class of airspace. It is not acceptable for such rules and regulations to be changed for manned aviation in order to integrate UAS and their operation.

As a subset of UAS, Remotely-Piloted Aircraft Systems (RPAS) should be fully certified and compliant with the provisions described herein before being allowed to operate in non-segregated public airspace.

Non-compliant UAS will require segregated airspace or mitigation by special authorizations.

Design and Operation

- ▶ The design standards and certification regulations for civilian and military UAS that operate in non-segregated, civilian airspace must be subject to the same directives as manned aircraft.
Note.- The special characteristics of these systems and their operations have to be taken into account.
- ▶ A safety assessment with target levels of safety appropriate for the commercial operation must be proven to the certification authorities. Human factors are at least as important in remotely piloted aviation as in manned flight. Human factors shall be considered
- ▶ Flight critical components of the communication / data-link and of the ground control station have to be regarded as aircraft parts and therefore included in the certification criteria. They may either be part of a UAS as a whole or under separate type designations.
- ▶ Human factors are as important in unmanned aviation as in manned flight. Human factors shall be considered in the design of control stations/devices and in particular the controls, displays, software, and interface as well as the operation of a UAS.
- ▶ The operational concept of a UAS should:
 - Provide all information necessary to enable the pilot-in-command to exercise responsibility for the flight, and
 - Enable the pilot to control the flight path as necessary for the safe conduct of the flight.
- ▶ Pilots controlling UAS should be free from distractions that compromise safety of operations (“sterile cockpit” concept).

13POS04

Air traffic control

- ▶ A UAS should behave like a manned aircraft and be subject to the Rules of the Air. The operation of UAS in civilian airspace should not make any difference - for example through special flight procedures - to the daily operation of other air traffic participants (commercial and general aviation).
- ▶ Each UAS must have a designated pilot-in-command at all times, who shall ensure that the UAS complies with the Rules of the Air and ATC instructions and clearances. A remote pilot shall not operate more than one UAS at any time.
- ▶ The response time of a UAS - following ATC instructions - should be comparable to that of a manned aircraft. Delays due to data-link/communication transmission time are not acceptable.
- ▶ UAS must be equipped to provide collision avoidance at all times and safe separation when positive ATC separation is not provided (See and Avoid). They must be equipped with Mode C/S transponders, or other approved systems, that are compatible and cooperative with airborne collision avoidance systems installed on manned aircraft.
- ▶ UAS have to fit into the existing and future ATM environment and the generally accepted performance criteria for the environment they are operating in.
- ▶ State-operated UAS should not be exempt from the above requirements.

Security

- ▶ Personnel responsible for preflight preparation, programming, and servicing as well as operating and remotely controlling the UAS shall be security background checked in accordance with standards equivalent to or higher than national laws.
- ▶ Persons entering the UAS control/programming station shall be screened in accordance with ICAO Annex 17 provisions for persons other than passengers entering security restricted areas.
- ▶ Secure data-link / communication as well as software programming shall be assured to counter cyber-attacks.
- ▶ Security controls and procedures shall be in force at the UAS control/programming station in order to prevent unlawful interference and/or potential use of the UAS as a weapon

Licensing and duty time

- ▶ The criteria for the selection, licensing, instruction, and training of UAS Operators/Pilots must be established by the Certification Authorities.
- ▶ The duty time of remote pilots and associated crewmembers must be adequately limited.
- ▶ These criteria and limitations have to be based on the existing regulations for pilots and scientific data.

Legal

- ▶ The same legal rules should apply to UAS as manned aircraft.

Dangerous goods

- ▶ Dangerous goods shipments shall not be carried on a UAS unless a level of safety equivalent to that of manned aircraft can be achieved.
- ▶ UAS carrying dangerous goods must be fitted with an inflight leak/fire detection system, and a fire suppression system.
- ▶ Dangerous goods shipments aboard UAS must comply with the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, including packaging, labelling, per package quantity limitations, notification of pilot-in-command, and reporting requirements.

Note.- Lower standards for UAS are not acceptable.

- ▶ Special attention shall be given to the requirement for notifying the appropriate authorities, including emergency response personnel, of dangerous goods information in case of an incident or accident.
- ▶ UAS shall not carry weapons or armaments while operating in civilian airspace.

Ground operations - Airport layout

- ▶ The impact of UAS operations at civilian aerodromes should be considered thoroughly.
- ▶ UAS operations at civilian aerodromes should not require special procedures causing disruption to normal operations, especially in inclement weather.

Safety Management Systems

- ▶ UAS Operators shall implement Safety Management Systems in accordance with ICAO provisions and approved by the State of the Operator.