Australian Government
Civil Aviation Safety Authority

UAS Regulatory Developments

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BACKGROUND

The Civil Aviation Safety Authority (CASA) is a world leader in unmanned aircraft system (UAS) operations having published the first operational regulation in the world in 2002, i.e., Civil Aviation Safety Regulation (CASR) Part 101, “Unmanned Aircraft and Rocket Operations”. While this regulation has in the past provided the framework under which all classes of remotely piloted aircraft (RPA) can be operated in Australian airspace, the advances in technology and the rapid increase in activity levels have shown it to be outdated.

CASA has established a project to review this regulation and to provide more comprehensive guidance to industry on the regulatory requirements and approval processes for commercial operations of UAS in Australia. The guidance will consider the long term integration of RPA into normal aviation operations in all classes of airspace.

The project is being undertaken in two phases. Phase 1 will involve the development of a suite of guidance material aimed at operators, remote pilots, manufacturers and maintainers of UAS in the operation, construction and maintenance of UAS and the means whereby they may be safely and legally operated. Phase 2 will consist of a review of CASR Part 101, and where necessary, amendments. The Regulations will have to include issues relating to the maintenance and manufacture of UAS, licensing, security, and the use of airspace. Industry and public education relating to risk management of UAS within the aviation and the general community will be imperative to ensure that everyone understands the safety issues relating to UAS operations.

While action is underway to further develop policies and procedures, and amend the regulation to cater for the unmanned aircraft scene as it can be forecast, there remains a number of further developments that are currently outside of the resources available in the organisation. Without them, the questions surrounding safety standards and the ability of industry to conduct operations safely and effectively remain unanswered

INTRODUCTION

This Paper will discuss the current UAS regulations and guidance material in Australia and the work being undertaken to review and re-write these set of documents. The paper will also provide an update on the level of operations being conducted in Australia and will present some future development proposals.

UNMANNED AIRCRAFT SYSTEMS REGULATIONS

Current Regulations

CASA commenced its development of regulations pertaining to the operational use of UAS in 2000, which resulted in the publication of Civil Aviation Safety Regulation (CASR) Part 101, Unmanned Aircraft and Rocket Operations in 2002. These regulations provide the framework under which all classes of UAS can be operated in Australian airspace. The regulations are supported by Advisory Circular (AC) 101-1 - Unmanned Aerial Vehicle Operations, Design Specification, Maintenance and Training of Human Resources.

CASR Part 101 identifies three classes of remotely piloted aircraft (RPA):

- Micro RPA – under 100g. These are largely exempt from regulation.
- Small RPA – 100g to 150kg. These may be flown by an unqualified person in certain conditions without any form of certification. There are operational requirements but no airworthiness requirements to operate this class.

- Large RPA – 150kg and above. These must have a certificate of registration, a certificate of airworthiness and its remote pilots must be qualified and licensed.

The regulatory interest Australia has been focused on in the past has been primarily on the large class of RPA, which require personnel approval, a UAS operators' certificate, and a certificate of airworthiness, either in the experimental or restricted category. However, there are a growing number of small to medium sized organizations manufacturing and operating small RPA for commercial operations, research and development applications in accordance with a variety of rules and requirements. Consequently, this class of UAS requires greater attention as this point in time.

Regulatory Development

CASR Part 101 was drafted in anticipation of a rapid growth in civil operations of UAS both nationally and internationally. It was also expected that other States would quickly move to develop their own regulations. However, because of the paucity of civil operational experience to draw on from other States in 2002, there was limited detail included in the regulation or advisory material relating to remote pilot qualifications, risk management, airworthiness, or the operational approval processes etc. Effectively the regulation only provided a basis for CASA oversight with minimal guidance to industry.

The consequence of this situation is that CASA has had to treat every application for the operation of an RPA as a standalone exercise, requiring significant education of applicants and a high probability of inconsistent responses which may be considered to be a safety risk. The rapid increase in activity levels of recent times and the demand for CASA approvals for a range of operations for humanitarian, law enforcement, security and commercial activities increases the probability that without adequate guidance to Industry and CASA staff, unsafe decisions could be adopted. The Australian Government Aviation Policy White Paper, published in December 2009, also includes an expectation that CASA will support the use of RPA by enhancing its oversight of the operation of UAS.

To this end, a project to review the regulation and guidance material relating to UAS was approved in June 2011. The project objective is to provide more comprehensive guidance to industry on the regulatory requirements and approval processes for commercial operation of UAS in Australia. The guidance will consider the long term integration of UAS into normal aviation operations in all classes of airspace. The project will be undertaken in two phases:

Phase 1 will involve the development of a suite of Advisory Circulars:

AC 101-1 - General

AC 101-4 - Training and Licensing

AC 101-5 - Operations

AC 101-6 - Manufacturing and Initial Airworthiness

AC 101-7 - Maintenance and Continuing Airworthiness

AC 101-8 - Safety Management

Phase 2 of the project will consist of a review and where necessary amendment of CASR Part 101.

Areas being considered for review include:

- dispensing with the weight break of 150 kilograms,
- the separation of UAS from model aircraft, rockets and balloons,
- the consideration of using kinetic energy to determine a harmless threshold, and

- the development of a risk assessment framework to categorise UAS.

The suite of ACs will be harmonised with the work done by ICAO to date and will support the emerging work of other regulatory authorities and organisations such as RTCA, EUROCAE and JARUS. To this end, the terms and definitions will be consistent with those used by ICAO as found in ICAO Circular 328. The term Unmanned Aerial Vehicle is being replaced with the terms unmanned aircraft system (UAS) and remotely piloted aircraft (RPA).

The ACs will provide better guidance to operators, remote pilots, manufacturers and maintainers of UAS in the operation, construction and maintenance of UAS and the means whereby they may safely and legally operate them.

Interface with Industry

CASA consults widely on the regulatory development process. The Standards Consultative Committee (SCC) is a joint industry-CASA forum that brings together representatives from a diverse range of aviation industry and other groups, to make recommendations to CASA on the development of regulations, standards and other associated advisory material. A UAS Working Group is a sub-committee of the SCC and has been formed to develop the UAS regulation and guidance material.

CASA has established a webpage dedicated to UAS which will provide the latest information on the safety regulation of UAS as well as provide advice to industry on upcoming UAS matters and events.

AUSTRALIAN AIRSPACE USE FOR UAS OPERATIONS

Australia has a large amount of uncongested, albeit separated, airspace that has been made available for RPA operations. Australia has several RPA-designated areas which include; West Sale in Victoria, Marulan in New South Wales and Kingaroy in Queensland. Further, there are a number of research programs underway that support the safe and efficient utilisation of airspace by both manned and unmanned aircraft. Some examples include:

- Development of an Automated Separation Management System capable of providing separation assurance in complex airspace environments,

- Development of a Detect and Avoid system for manned and unmanned aircraft capable of collision avoidance with dynamic and static obstacles,

CASA is working closely with industry, academia, military and other government departments to ensure these operations are conducted safely.

DESIGN STANDARDS

There are currently no standards or airworthiness requirements for the design and certification of UAS anywhere in the world. Yet, the growth of UAS demands the development of standards and airworthiness requirements for the design and certification of UAS. Regulators can choose to do this in isolation or work together for a common solution

Currently, to design and build a UAS in Australia, a manufacturer would have to start with the current design standards relating to manned aircraft and then negotiate with CASA for a reduction to the requirements on a case by case basis. This makes the task of design and certification onerous on both the regulator and the manufacturer. CASA would prefer to have a set of regulations together with suitable guidance material that outlines the acceptable deviations to the requirements based on the level of operation. That way the industry can determine the requirements before presenting their case to CASA for a final determination. CASA would then perform a suitable risk analysis of the application and if satisfied issue a type certificate for the UAS together with an operators certificate.

With respect to developing standards, regulations and guidance material, CASA is committed on an international level to ensuring that these standards are developed in unison with ICAO and other Regulatory Authorities. CASA is represented on the ICAO Unmanned Aircraft Systems Study Group (UASSG) and is closely monitoring the work being done by RTCA Special Committee 203, EUROCAE Working Group 73, and the Joint Authorities for Rulemaking on Unmanned Systems (JARUS). The information disseminated by UVS International has been an invaluable source for CASA to keep abreast of what is happening in Europe particularly.

CASA is likewise equally committed and is working collaboratively with industry to ensure that common rules and regulations are developed expeditiously that provide an equivalent level of safety to manned aircraft operations and thus allow full and seamless integration of UAS into non-segregated airspace.

TRAINING AND LICENCING REQUIREMENTS FOR REMOTE PILOTS

Licensing and training requirements are been developed similar to those for manned aviation and includes both the aeronautical knowledge and operational components. Specific adjustments have been made to account for the unique nature and characteristics of the remote pilot station (RPS) environment and RPA applications (from both a technical and flight operations perspective, e.g. Visual Line of Sight (VLOS) or beyond VLOS) as well as aircraft type (e.g. aeroplane, helicopter, multi-rotor). In that context, qualifications for certain categories of remote crew (e.g. VLOS helicopter, RPA observer) may be significantly different from those of the traditional qualifications pertaining to manned aviation.

Training requirements are essential to the establishment of effective RPA operations. A defined set of training requirements has been established that are specifically designed for RPA; these include human factors, safety management systems, risk assessment and management, among others. Adoption of these requirements by the segments of aviation industry involved in UAS training and operations will ensure that appropriate flying standards are set, safety levels are maintained, and public trust in UAS is gained.

A set of competencies has been established to cover UAS training requirements. While these need to be contextualised for UAS, some of the training criteria may apply to all, while some will be unique to certain types and classes of vehicles.

CASA is currently working with the Australian Transport & Logistics Industry Skills Council to develop a specific training program for UAS, particularly aimed at overcoming the deficiencies in the relevant part of CASR part 101 pertaining to the eligibility for certification as a remote pilot. The first major steps have been taken by an agreement to competencies for specific training for a proposed Level 1 Remote Pilots Licence (RPL). This ab initio qualification is relevant to operating remotely pilot aircraft systems, within visual line of sight (VLOS), below 400 feet above ground level (AGL), in day visual meteorological condition (VMC), outside of controlled airspace, greater than 3nm from an aerodrome, outside of populous areas.

UAS OPERATIONS IN AUSTRALIA

There are currently 18 holders of Operator's Certificates in Australia who operate UAS for commercial purposes. All of these operate aircraft in the 'small UAS' category and are broken up as follows:

- Fixed Wing – 8
- Rotary Wing – 6
- Multi Rotor – 3
- Airship - 1

The number of enquiries being made to CASA relating to UAS strongly suggests interest in this sector will grow rapidly over the coming years. An average of 15 enquiries a month are being received from organisations exploring the possibility of operating UAS. Due to the huge bushfire problem in Australia during the summer months, there are a number of operators considering the use of RPA for fire-fighting related tasks. Australia has many unique species of flora and fauna that are being threatened by the introduction of exotic species either by design, accident or natural processes. This has led to a considerable number of invasive, feral and pest species which have flourished and now impact the environment adversely. Some 83% of mammals, 89% of reptiles, 90% of fish and insects and 93% of amphibians that inhabit the continent are endemic to Australia. The use of RPA to locate, identify and eradicate noxious weeds and introduced species of insects, such as the red fire ant, and to track feral animals, such as foxes is attracting considerable interest by government agencies.

The types of operations which are currently active in Australia include:

- Aerial Photography
- Noxious weed identification and eradication
- Vegetation Monitoring
- Fire Fighting Support
- Pollution Monitoring
- Mine Site Surveys
- Electricity power line and pole surveys
- Law Enforcement
- Crop spraying
- Feral animal tracking
- Location and eradication of harmful introduced species of insects

RESEARCH PROJECTS

While action is underway to further develop policies and procedures, and amend the regulation to cater for the unmanned aircraft scene as it can be forecast, there remains a number of further developments that are currently outside of the resources available to the organisation. Without them, the questions surrounding safety standards and the ability of industry to conduct operations safely and effectively remain unanswered. These initiatives include the development of an operational risk matrix and the collection of data and an operational analysis of kinetic energy levels that would not cause severe injury to persons in the event of an impact. The resolution of these two tasks can be achieved in parallel with other initiatives and will complement the action underway to enhance UAS operations.

CASA currently imposes operational restrictions on small RPA weighing more than 100 grams because it does not have sufficient data on the potential injury that could be caused to people on the ground resulting from blunt ballistic impact. The injury potential from a small RPA correlates to the impact kinetic energy, characteristic diameter of its part that contacts the body, attitude on impact, and the frangibility of the unmanned airframe. Further consideration should be given to the different configurations of airframes (small rotorcraft, fixed wing etc.) and how the kinetic energy and blunt trauma models can be related to accepted risk metrics. CASA is looking to collect data and to conduct an operational analysis of kinetic energy levels to determine the potential harm to people on the ground due to small RPA operations. The required outputs of this research will include:

- The appropriate cut-off point for prescriptive regulation, whereby less prescriptive industry / professional standards of practice can be adopted.

- Risk mitigation measures for small UAS (i.e., shrouding of propeller blades and effectiveness of frangible designs).

The proposed project will contribute to CASA's ongoing initiative of developing and maintaining safety standards for UAS. These issues are currently outside of the resources available within CASA and without their resolution, the questions surrounding safety standards and the ability of industry to conduct operations safely and effectively remain unanswered.

Resolution of this issue can be done in parallel with other initiatives and will complement the actions currently underway to enhance CASA's UAS operations.

A second proposal concerns the development of an operational risk matrix for UAS operations. Of primary concern to CASA are the risks posed to other airspace users and the people and property over-flown due to UAS operations. Regulation and oversight activities need to be appropriately tailored to ensure the management of these risks to tolerable levels. The aggregate level of risk posed by UAS operations is a complex function of the aspects of the design, manufacture, maintenance, operation, equipage and operating environment (e.g., nature of the areas over-flown and the airspace environment). A framework for assessing and evaluating this risk, across the diversity of RPA types and operating environments, is needed to ensure an appropriate tailoring of CASA policy, rulemaking and oversight activities.

This task will develop the risk assessment models and a suitable framework (i.e. matrix) for evaluating the baseline (i.e. high-level generic and unmitigated) risks associated with RPA operations over inhabited areas and within civil non-segregated airspace.

The expected outcomes from this project are recommendations in relation to: the classification of UAS operations; the tolerability of their associated baseline risk, and; common technical and operational strategies that can be employed to mitigate risk.

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