International Civil Aviation Organization

HLSC/15-WP/76
26/1/15
English and French only[1]

WORKING PAPER

SECOND HIGH-LEVEL SAFETY CONFERENCE 2015 (HLSC 2015) PLANNING FOR GLOBAL AVIATION SAFETY IMPROVEMENT

Montréal, 2 to 5 February 2015

Theme 2: Future approach to manage aviation safety
Topic 2.1: State safety programme

CANADA'S APPROACH TO MANAGING THE RISKS OF REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)

(Presented by Canada)

SUMMARY

This working paper presents Canada's approach to managing the risks of remotely-piloted aircraft systems (RPAS) and its strategy that permits RPAS operations in Canadian airspace. The rapid growth of the RPAS sector has highlighted an increased need for domestic and international efforts to address the existing and future risks of this emerging sector of civil aviation. Canada has used an existing regulatory instrument as an interim step to address the growing use of RPAS and introduce more stringent safety requirements. Canada is also advancing a longer term strategy to develop RPAS regulations in accordance with ICAO Standards and Recommended Practices (SARPs).

Canada has applied the principles of risk management to its regulatory framework to allow the operation of small remotely-piloted aircraft (RPA), 25 kilograms (kg) and under, involved in non-recreational operations that pose a lower risk to civil aviation. Canada's current policy for small RPAS is the foundation of its future regulations. Canada seeks a proactive approach that effectively manages the risks of RPAS while respecting the importance of innovation within civil aviation.

Action: The conference is invited to:

a) take note of Canada's interim approach in addressing the levels of risk for different categories of RPAS based on the operation of the system;
b) agree on the need for greater collaboration among Member States to identify and quantify the risks of RPAS operations to civil aviation without hindering innovation within the sector; and
c) agree on the increased need for timely guidance from ICAO to ensure a consistent international approach to mitigating the risk of introducing RPAS to national airspace systems.

[1] English and French versions provided by Canada.

1. INTRODUCTION

1.1 Canada has observed dramatic growth in the global RPAS industry and a diversification of RPAS applications in critical economic sectors. Industry growth is attributed to technological advances and significant investment in research and development by the private sector. The availability of RPAS technologies to members of the public, rapid sector growth, and maturing RPAS piloting community has introduced safety concerns in Canada and abroad. Canada has witnessed an increase in reported incidents involving RPA and civil aircraft, particularly in the vicinity of aerodromes and major hub airports.

1.2 RPA are now readily available to a variety of potential users for a range of operations. The range of RPAS designs and technology has challenged regulators to develop a consistent regulatory approach as RPAS present different levels of risk to airspace systems based on the operational context of an RPAS, pilot knowledge, and variances in RPAS design.

1.3 In response to a growing RPAS sector and the wide spectrum of users, Canada has implemented a multi-phase RPAS strategy that includes both regulatory and non-regulatory instruments. The objective of the strategy is to proactively leverage existing legislative and regulatory authorities to introduce more rigorous safety requirements, create greater awareness of the legal responsibilities of RPAS operators and mitigate the risks that RPAS could pose to other airspace users as well as people and property on the ground.

2. MANAGING THE RISKS OF RPAS OPERATIONS

2.1 RPAS face similar, but not identical risks to its manned counterparts. RPAS also pose unique risks to manned aircraft based on their operational context while presenting opportunities to address and mitigate the hazards of the operation. The principal risk involved in the operation of an RPAS is a catastrophic event resulting in a fatality involving airspace users, or with persons and property on the ground.

2.2 The level of risk (the likelihood and severity of an event) is defined by factors inherent to the RPAS operation, the operating environment, and the class of RPAS as determined by its physical parameters. The combination of these factors may result in a situation where a variety of different risk mitigation measures may be required to restrict the location of the operation, impose piloting and maintenance requirements, and require effective safety procedures to ensure an overall safe and reliable operation.

2.3 ***Physical characteristics:*** The components and composition of an RPAS are critical determinants in assessing the level of risk. The physical properties of an RPA, including its overall mass, physical materials, or overarching design, can affect the overall energy an RPA imparts on an object and the risk of a catastrophic event. The absence of quantitative scientific research limits the abilities of governments to develop regulations based solely on physical parameters. It is expected that future research on RPAS will assist Canada and other jurisdictions to inform appropriate thresholds for future rulemaking activities. Canada's current approach to define RPAS categories based on weight is similar to approaches used by other ICAO Member States.

2.4 ***Location of operation:*** The level of risk is strongly influenced by the location of an RPAS operation. Operating an RPAS in proximity to an aerodrome or a populated area can increase potential exposure to a catastrophic event. To minimize the likelihood of an incident, altitude and airspace limitations could be imposed on RPAS operators to minimize risks to civil aviation. Environmental or meteorological conditions can also affect the reliability of an RPAS and increase the potential for interference with frequency spectrum or the ability of a pilot to maintain visual line of sight (VLOS).

2.5 ***Pilot knowledge:*** The aeronautical knowledge of a pilot remains a critical risk to both aviation safety and the public. The increasing availability of RPAS to the public has created a community of pilots who may not have the requisite knowledge to operate an RPAS safely. A lack of aviation knowledge may lead to the operation of an RPAS in a situation or environment where it would pose a higher risk to aviation safety. In addition, a pilot of an RPAS may not have an aviation background to perform detect and avoid functions that would include knowledge of airspace, the ability to recognize aerodrome and aviation markings, or identify meteorological conditions. In addition, there are common risks between non-recreational and recreational pilots that may not require differentiation between these user categories.

2.6 Beyond VLOS operation are more complex and introduce increased risks to aviation safety. The absence of reliable sense and avoid technologies prohibits the authorization of beyond VLOS operations. Significant research and development will be required in advance of regulations permitting mainstream use of RPAS beyond VLOS.

3. CANADA'S APPROACH TO REGULATING RPAS

3.1 Canada has a permissive legal framework that allows recreational and non-recreational RPAS operations under the *Canadian Aviation Regulations*. An RPA being operated for recreational purposes is considered a "model aircraft" (35 kg and under) and is required to be operated safely without being a risk to aviation safety. An RPA being operated for non-recreational purposes is considered an "unmanned air vehicle" (UAV) and must apply to Transport Canada, the Canadian civil aviation regulatory and oversight authority, for a Special Flight Operations Certificate (SFOC). As a result of these regulations, Canada has a mature model aircraft community that has demonstrated its ability to operate safely, a growing base of recreational RPA users, and a nascent RPA (UAV) sector in the Canadian aviation industry. Canada intends to remove the distinction between recreational and non-recreational user categories in its accelerated rulemaking strategy.

3.2 Canada is committed to applying risk management to maintain an effective level of oversight over its civil aviation activities. The SFOC process allows Canada to review the risks involved in an RPAS operation on a case-by-case basis. Canada observed a dramatic increase in the number of SFOCs issued for RPAS; between January 2007 and January 2012, Transport Canada issued 293 SFOCs for RPAS operations across Canada. The year 2012 saw an increase with 353 SFOCs issued for RPAS operations, and 945 SFOCs were issued in 2013. A total of 1 672 SFOCs were issued in 2014.

3.3 Given the pace of regulatory development, Canada has used the regulatory exemption process as an interim step in a broader rule-making strategy to remove the need for certain RPAS operators to obtain a SFOC if the operator complies with the conditions set out in the exemption. The exemptions allow for the operation of non-recreational RPAS without applying for an SFOC. The exemptions apply to a lower risk RPAS operation by complying with a series of operating conditions that pertain to the flight procedures, pilot knowledge requirements, reporting requirements, and system requirements to mitigate the potential risk of the RPAS to aviation safety and persons and property on the ground. The SFOC process has been preserved to focus on higher risk operations that do not qualify under the conditions set out in the exemptions.

3.4 Canada recognizes the diversity of the RPAS market and the challenge of regulating a new and evolving sector of civil aviation. In the absence of robust RPAS regulations and comprehensive international standards, Canada adopted a prescriptive approach in establishing conditions of operations for RPAS. The stringent operating conditions were based on the principles of risk management inherent in Canada's State Safety Plan (SSP) and legal framework. The conditions were based on the risks pertaining

to the operation location, the RPAS design, and knowledge of RPAS pilots, resulting in an assessment of their overall risk to aviation safety.

3.5 Canada's prescriptive approach to the conditions is an interim step in developing future RPAS regulations. The conditions are expected to be the foundation for future RPAS regulations while offering substantive guidance and certainty to industry to plan RPAS operations, develop ground school curriculums, and advance their business models. Furthermore, Canada's RPAS operating conditions are consistent with the levels of safety required for manned aircraft, and reflect the traditional areas of aviation recognized by ICAO (operations, equipment, and personnel).

3.6 In developing an exemption from the SFOC process to allow lower risk RPAS operations, Canada has recognized the rapid growth of the RPAS sector and is moving forward with an accelerated rulemaking strategy for small RPA of 25 kg and under, operated within VLOS. Canada intends to have regulations for this lower risk RPAS category in place in 2016. Canada's Unmanned Air Vehicle Systems Program Design Working Group, composed of both government and RPAS industry members, is developing recommendations for future regulations for RPA over 25 kg within VLOS and for RPAS beyond VLOS.

3.7 Canada has also launched an outreach and awareness campaign that leverages both traditional communication methods as well as social media to raise awareness of the risks of RPAS operations as well as the legal responsibilities of those who operate RPAS'. The objective is to change the behaviours of RPAS operators by providing guidance on how to operate safely and creating greater awareness of potential risks, which may assist in reducing the likelihood of an incident.

4. CONCLUSION

4.1 Canada's unique geography, vast territory, and diverse range of climates offer a unique environment in which to employ RPAS technologies in a variety of applications. Canada's permissive legal framework has allowed small and medium sized businesses to benefit from this new sector of civil aviation. The SFOC process has allowed Canada to permit RPAS operations with an effective oversight tool. The exemptions have provided Canada with the opportunity to practice sound risk management that provides the growing RPAS sector with the certainty to plan operations and the confidence to pursue innovation in civil aviation.

4.2 The rapid pace of innovation within the RPAS sector necessitates increased focus from regulators and the private sector on the risk of small RPAS to civil aviation. Future RPAS research and development activities should include testing on the potential for engine ingestion of an RPA, and the potential impact on aircraft systems, fuselage skin, and windscreens for both general aviation and commercial aircraft. Additional data will assist governments in developing risk-based regulations while assisting industry in creating new safety technologies and risk mitigation tools.

4.3 Canada is committed to increasing regional and international collaboration to address the risks of RPAS while recognizing the need for accelerated rulemaking activities to accommodate the growth of the sector. Canada will continue to integrate ICAO Standards and Recommended Practices into its policy instruments and rulemaking activities for RPAS.

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