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– Planning & Design of Aerodromes

INTEGRATION OF ADVANCED AIR MOBILITY ELEMENTS WITH EXISTING HELIPORTS – CHALLENGES AND WAY FORWARD

(Presented by Hong Kong, China)

SUMMARY

Aircraft utilising electric vertical takeoff and landing (eVTOL) technology has the advantages of cost-effective, low-noise and low-carbon in comparison with traditional helicopters. With its rapid development in recent years and potential for versatile applications, eVTOL aircraft is considered as a potential solution for alleviating road traffic congestion in cities. Being a small and densely populated city where land resources are particularly precious, Hong Kong, China identified some practical considerations that should be taken into account while exploring the feasibility of accommodating eVTOL aircraft operations at existing heliports. This paper discusses the challenges and way forward for integrating Advanced Air Mobility (AAM) elements with existing heliports and calls for the development of new ICAO Standards and Recommended Practices (SARPs) for vertiports which are essential infrastructure for supporting eVTOL aircraft operations.

1. INTRODUCTION

1.1 Advanced Air Mobility (AAM) encompasses innovative aviation concepts such as electric vertical takeoff and landing (eVTOL) aircraft, unmanned aircraft system (UAS), remotely piloted aircraft system (RPAS), UAS traffic management (UTM) and other emerging technologies. These advancements have the potential to revolutionize urban transportation, bringing about an increase in demand for vertiports around the world.

1.2 Given the common vertical takeoff and landing capabilities shared by helicopters and eVTOL aircraft, existing heliports in Hong Kong, China could potentially be repurposed for dual use. However, challenges arise due to the unique operational requirements of various types of aircraft with novel design and local circumstances. Therefore, integrating AAM elements with existing heliports requires careful consideration.

2. DISCUSSION

2.1 In Hong Kong, China, helicopter operations include domestic flights and cross-boundary services to neighboring cities in the Mainland China. Depending on the nature of the helicopter operations, these flights may take off and land at the Hong Kong International Airport, downtown heliports, or various helicopter landing sites. The heliport infrastructure in Hong Kong, China has been utilized to support diverse low-altitude flying activities such as emergency medical services, search and rescue missions, law enforcement, specialized aerial operations and transportation services for high-end travellers.

2.2 Current civil aviation regulations in Hong Kong, China primarily govern conventional fixed-wing aircraft and helicopters. Local legislation has also been enacted to regulate the operations of small unmanned aircraft (SUA) weighing up to 25 kg, which aims to foster the innovative development and diversified application of SUA whilst safeguarding aviation and public safety.

2.3 As the use of larger-sized manned and unmanned eVTOL aircraft for passenger transport and cargo delivery is expected to become more prevalent around the world, there is a need for Hong Kong, China to review the regulatory framework, airspace management, land allocation, supporting infrastructure, etc. in order to capture the opportunities presented by this rapidly developing form of aviation. Amongst others, the feasibility of modifying existing heliports to incorporate vertiport-related facilities by integrating necessary AAM elements is being duly examined.

Challenges of Integrating AAM Elements with Existing Heliports

2.4 *Limited availability of international standards and guidance* – Unlike heliports, the international standards for the planning, design and operation of vertiports for eVTOL aircraft are yet to be available, let alone guidance for the integration of AAM elements with existing heliports. While noting that the guidance materials for vertiports published by other civil aviation authorities are largely based on ICAO's Annex 14, Volume II – Heliports and Doc 9261 Heliport Manual, there exist differences among them, especially the unique requirements for vertiports to cater for the operations of eVTOL aircraft. Notwithstanding the adoption of SARPs for the issuance of remote pilot licences, RPAS operator certificate, RPAS-specific airworthiness requirements, and provisions for C2 Links frequency bands, procedures and systems by the ICAO Council, the absence of globally harmonised standards for vertiports poses a significant challenge to the provision of necessary ground handling facilities to support eVTOL aircraft operations, even at dedicated sites such as existing heliports.

2.5 *Necessary AAM elements for existing heliport* – Modifying existing heliports to integrate AAM elements requires consideration of:

i) Heliport physical and load-bearing characteristics: the dimensions and load-bearing capability of landing and safety areas need to be assessed and re-configured, where necessary, to meet the requirements of different types of eVTOL aircraft, which may differ from those of traditional helicopters based on their design and performance characteristics;

ii) Obstacle environment requirements: height restrictions and airspace constraints must be re-evaluated for each heliport to ensure that approach and takeoff climb surfaces are appropriate for both traditional helicopters and contemporary eVTOL aircraft, taking into account the impact of high-rise buildings on signal interference which may adversely affect accurate positioning and safe landing of eVTOL aircraft;

iii) Charging/refueling stations: charging stations for batteries and/or refueling stations for hydrogen fuel cells may be required, along with adequate storage, handling and fire suppression systems;

iv) En-route alternate heliport/vertiport: consideration should be given to establishing alternate locations along the flight path for emergency landing or diversion of eVTOL aircraft;

v) Meteorological equipment: real-time weather information representative of the conditions at the heliport such as wind speed and direction and visibility should be made available to the onboard or remote pilots of eVTOL aircraft when planning and executing an arrival or departure;

vi) Rescue and firefighting services: adequate equipment for rescue and firefighting services must be provided and personnel must be trained to handle emergencies such as fires involving battery-powered and/or hydrogen-fueled aircraft, lithium batteries of high capacity being charged/stored at the site, etc.;

vii) Communications, navigation and surveillance (CNS) facilities; and

viii) Other necessary infrastructure.

2.6 *Infrastructure upgrade and limitations* – Existing heliports in Hong Kong, China are designed to accommodate helicopter operations only. To install new facilities for supporting AAM operations, high costs are expected to be incurred for the required infrastructure upgrade and additional training for relevant personnel. Moreover, given the rapid evolution of AAM technologies, infrastructure requirements may change over time. Therefore, heliport/vertiport must be designed with flexibility to accommodate future generations of eVTOL aircraft, which may have different size, weight, power and/or operational characteristics.

2.7 *Site selection and social acceptance* – Apart from complying with Hong Kong, China's outline zoning plans with designated land uses, permission must be obtained from landowners or site managers for conducting AAM operations at existing heliports. Additionally, with the anticipated surge in frequency of utilizing existing heliports by eVTOL aircraft, factors such as proximity to residential areas, sensitive land uses (e.g. boundary control points, prisons, hospitals, schools) and noise-sensitive zones must be carefully considered to minimize potential conflicts and disturbances within the community. Extensive community engagement and consultation are needed to address any concerns and ensure that AAM operations align with the needs and expectations of the local community.

2.8 *Environmental impact* – The integration of AAM operations with existing heliports will likely have environmental implications that need to be carefully evaluated and addressed. Factors such as noise, emissions, and the potential impact on local wildlife and ecosystems should be holistically reviewed as part of the planning and development process. An environmental impact assessment may be required to ensure AAM operations are designed and implemented in a way that minimizes any adverse environmental effects.

Way Forward

2.9 *Establishing regulations, standards and certification framework* – To enable the integration of AAM elements at heliports, it is necessary to establish standards and a customized certification regime for the coexistence of conventional aircraft and AAM operations at the same sites without compromising aviation and public safety. To this end, a robust regulatory framework is required to facilitate the safe and efficient application of AAM. The framework must also be compatible with existing regulations for conventional fixed-wing aircraft, helicopters and SUA.

2.10 *Phased integration* – A phased approach to the integration of AAM elements at existing heliports may be necessary, starting with pilot projects and gradually scaling up operations as the necessary infrastructure, regulations and safety measures are put in place. Additionally, exploring innovative infrastructure solutions, such as modular and scalable heliport/vertiport designs, and leveraging advanced technologies may help address the space and capacity constraints at existing heliport facilities.

2.11 *Pilot schemes* – Given the differing characteristics of eVTOL aircraft in terms of payload, operational range, flight duration, control mechanism, safety features, and uncertain public reception, Hong Kong, China will pursue pilot schemes and/or trial flights in a gradual and progressive manner. During the process, the provision of necessary AAM elements at existing heliports could be re-assessed and adapted as more practical applications of AAM are developed.

2.12 *Planning for dedicated infrastructure* – Existing heliport operators are encouraged to proactively plan for dedicated takeoff and landing areas and associated facilities that cater to the needs of AAM operations, such as provisions for charging/refueling and maintenance facilities. Heliport operators may consider to identify and engage relevant stakeholders who intend to operate eVTOL aircraft to ensure that the planning of infrastructure and equipment adequately meets the needs of their intended operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) share experience, challenges and considerations with regard to the integration of AAM elements with existing heliports; and

c) call for the development of new ICAO SARPs for vertiports which are essential infrastructure for supporting eVTOL aircraft operations.

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