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K-UAM GRAND CHALLENGE PROGRESS AND DEVELOPMENT PLAN

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

This paper provides information on the implementation status and future development plan of the Korea Urban Air Mobility (K-UAM) Grand Challenge. This paper includes the necessary discussion points for the legislation and regulation related to K-UAM and technical items to be reviewed through the K-UAM Grand Challenge.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objectives: Aviation Safety and Air Navigation Capacity and Efficiency
<i>Financial implications:</i>	Not determined
<i>References:</i>	

1. INTRODUCTION

1.1 The main goal of the Grand Challenge (GC) is to verify the safety of the urban air mobility (UAM) system, a new concept of transporting passengers and cargo safely and conveniently using eco-friendly and low-noise distributed electric propulsion for vertical take-off and landing aircraft, has emerged worldwide due to the saturation of the existing ground transportation network caused by the concentration of population in the urban area and requirement to reduce carbon emissions.

1.2 The Republic of Korea (ROK) established an organization, ‘Drone Transport Division’ dedicated to UAM under the Ministry of Land, Infrastructure and Transport (MOLIT) in August 2019 to lay the groundwork for industrial support and policy implementation in preparation for the initial commercialization of UAM in 2025. It also launched the UAM Team Korea (UTK), a public-private policy consultative council for industry-academia-research-government collaboration, in 2020.

1.3 The ROK has announced and is implementing the K-UAM Roadmap (2020), which outlines institutional reorganization, support for the private industry, and the direction of infrastructure construction for the deployment of a stable UAM ecosystem and global market leadership.

1.4 The ROK published the K-UAM Operation Concept 1.0 in September 2021, containing UAM service structure and operation method, as the initial step toward the commercialization of UAM in 2025. It is also implementing K-UAM Grand Challenge (GC) to verify the safety and reliability of UAM prior to commercialization, establish the operational concept and technology standard adapted to domestic conditions, and provide field demonstration support to the private industry.

1.1 K-UAM GC plans to demonstrate R&R and operations of (a) UAM aircraft and UAM air operators, (b) public airspace and UAM air traffic management, and (c) vertiport construction and operation, in two phases (2023–2024) in rural and urban areas. Ground and CNSi infrastructures for the GC phase 1 are under construction at National Complex Flight Test Center in Goheung.

2. DISCUSSION

Legislation and Regulation

2.1 The ROK is conducting a comprehensive review of UAM as a transportation system in preparation for its commercialization in 2025, as well as preparing an act regarding K-UAM to encourage private industry participation in UAM projects and resolve institutional uncertainties.

2.2 The UAM act regarding K-UAM will support the establishment and industrialization of the domestic UAM ecosystem by introducing regulatory special cases for business, safety, security, and vertiport in the demonstration and pilot project areas prior to amending the existing aviation-related laws such as aircraft, flight, vertiport, air traffic management, and business license.

2.3 Working groups (WG) for issued topics were established to develop technical recommendations for the K-UAM act centered on UTK participating organizations. Airspace management WG, cyber and physical security WG, the UAM data protocol WG, and the smart city connectivity WG are now functioning.

2.4 The Vertiport WG, the first UTK-affiliated WG to finish its tasks in FY21, published the "Guideline on the Establishment and Operation of a Korean Vertiport" in early 22nd, and the K UAM GC will validate its Vertiport design and operation standards and zoning plan.

2.5 The K-UAM GC will be used to ensure the safety of field demonstration and pilot projects for the K-UAM act and to develop the pertinent technology standard. To this end, the Korea Office of Civil Aviation (KOCA) and the K-UAM Grand Challenge (K-UAM GC) Office at the Korea Aerospace Research Institute plan to establish a cooperative system and utilize K-UAM GC to prepare the UAM demonstration and pilot projects.

2.6 Although the use of certified UAM aircraft or equipment in urban field demonstration is scheduled for the K-UAM GC 2nd phase to begin in 2024, the K-UAM GC 1st phase also plans to use aircraft or equipment proven in safety and reliability considering the global current status of UAM aircraft certification.

Technical Items to be reviewed through Grand Challenge

2.7 UAM in Korean environment demonstrates the integrated operations of K-UAM in accordance with K-UAM Operation Concept 1.0. The details for each field will be determined by KOCA, the K-UAM Grand Challenge Office, and UTK based on the proposals submitted by the participating companies and organizations.

2.8 R&R among UAM stakeholders will be verified and reviewed, and information sharing suitability and business areas in the initial commercialization phase will be clarified, through the GC.

2.9 The GC will demonstrate the basic performance and flight characteristics of UAM aircraft based on the existing aircraft suitability verification measures (FAR, ADS, etc.) in order to confirm the safety of UAM aircraft and develop technical standards suitable for operation in domestic urban areas.

2.10 It will also review the operating procedures and the role of UAM air operators, the maintenance system, and review the operating standards through a verification of the flight control system.

2.11 As UAM is expected to utilize a corridor with an existing required navigation performance (RNP) based on performance-based navigation (PBN), the GC will propose the standard pertaining to the corridor's design, operation, and management and establish the corridor regulatory draft through the field demonstration.

2.12 As the K-UAM Operation Concept 1.0 suggests CNSi operation, Korean mobile telecommunication carriers (SKT, KT, LG U+, etc.) will participate in GC to demonstrate the efficacy of 5G communication links for UAM use and review the plan to secure a stable UAM CNSi environment at the average flight altitude (600 m above the ground).

2.13 All information necessary for K-UAM operation will be shared with all stakeholders through the System Wide Information Management (SWIM). The GC plans to develop the K-UAM SWIM use-case data package by the end of 2022 by identifying and structuring all information necessary for the safe operation of K-UAM.

2.14 Although the vertiport design standard will vary from the existing heliport standard, since its global standard is still incomplete (FAA EB105 and EASA VP Design Guideline), the standard considering the domestic city centers and building environments will be derived and reviewed by the GC.

2.15 The public airspace surrounding a vertiport will be divided into two zones — a wide monitored zone and a narrow-controlled zone — and the vertiport operator must approve the use of a vertiport controlled zone in advance. The GC will conduct a technical review of the zone classification criteria, the detailed roles of each UAM entity (VPO, UATMSP, UAO, etc.), and the transfer method/standard of control authority and communication.

2.16 In addition, GC will establish standards for obstacle limitation surfaces and take-off/landing slopes for UAM that are suitable for urban environments with high-rise buildings for the safe take-off and landing on vertiport and the selection of vertiport locations. To this end, GC will conduct a technical review of the newly proposed UAM standard and consider implementing it for commercial pilot services in 2025.

3. **CONCLUSION**

3.1 UAM is a new type of transportation emerging in the globe. Korea expects to expand cooperation at developing a new UAM system.

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