Introduction to the K-UAM

NASA AEGW International AAM Day

2021. 3.
Korea Aerospace Research Institute (since 1989)

- A government funded organization to lead civil aerospace R&D
- Four main R&D Directorates: Aeronautics, Satellite, Space Launcher and Future Tech
- Locations: HQ @Deajeon, Flight Center & NCFPTC* @Goheung, Space Center @Naro and Tracking Station @Jeju
- R&D projects for UAM
  - Optionally Piloted PAV(OPPAV) Project
  - UTM, low noise prop–rotor design, autonomous landing, and GTE based hybrid propulsion, etc.

*NCFPTC: National Comprehensive Flight Performance Test Center
CONTENTS

1. K-UAM ROADMAP
2. UAM TEAM KOREA
3. K-UAM GC
4. K-UAM R&D PROJECTS
Government leading roadmap for UAM in Korea (June ‘20)

1st Phase
Preparation stage (2020-2024)
- Explore issues and challenges
- Revise related laws and regulations
- Test and demonstrate civil usage

2nd Phase
Initial stage (2025-2029)
- Commercialize some routes
- Connect inner and outer city hubs
- Establish linked transportation system

3rd Phase
Growth stage (2030-2035)
- Expand routes
- Place hubs in the core city
- Turn into Business profit-making

4th Phase
Mature stage (2035-)
- Generalize UAM transportation
- Create Intercity routes
- Conduct autonomous operation
<table>
<thead>
<tr>
<th>Key Strategy</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1. Revise Regulatory Framework for UAM</td>
<td>Conduct the “K-UAM Grand Challenge” to set up K-UAM regulatory frameworks</td>
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<tr>
<td>2. Create Robust UAM Ecosystem</td>
<td>Designate regulation-free special zones for UAM operation and demonstration</td>
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<tr>
<td>3. Phased Services to Increase Public Perception</td>
<td>Begin cargo delivery service prior to passenger on board service</td>
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<td>4. Build Infra. considering Multi-modal Transport</td>
<td>Join PPP-funding for a large-scale capital investment required by infrastructures such as vertiport</td>
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<td>5. Support Sustainable and Healthy Ecosystem</td>
<td>Prepare rules of UAM operators (fleet operators, etc.) referring to those of ground transport</td>
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<tr>
<td>6. Expand International Cooperation</td>
<td>Join and support international cooperative works on UAM</td>
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</tbody>
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1. K-UAM ROADMAP
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8 Major Tasks of the UAM Team Korea

1. Continue to implement the K-UAM roadmap and discover new policies and R&D projects
2. Support and join K-UAM GC
3. Common field of interests of participating organizations are jointly ordered as cooperative project of participating organizations
4. Share the acquired information of market and technology trends with UAM Team Korea member
5. Support to strengthen the UAM ecosystem
6. Prepare the UAM special law (2023 goals) according to K-UAM roadmap
7. National level major conferences plan and host, marketing to major customers, and Investment attraction
8. Joint marketing to public services major customers in defense, fire fighting, police, forestry, and medical fields
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K-UAM GC (Grand Challenge)

Goals of K-UAM GC

• Evaluate the safety and reliability of UAM under Korean environment before launching initial commercial service in Korea in ’25.
• Provide technical basis for the K-UAM regulatory frameworks, which will be established in ‘23, by demonstrating key features of UAM at remote area, airport, and urban area
• Encourage collaborative UAM R&D and ecosystem building through Public–Private Partnerships

Strategy of K-UAM GC

• Who wants to provide UAM commercial services in Korea, will be asked to show safety compliance in Korean environment and K-UAM GC will be a good chance
• K-UAM GC is a demonstration program and other R&D projects are being prepared to fill the technical gaps
• The detail GC information, such as how to participate, what are required and benefits, will be announced in the mid of this year by MOLIT
## K-UAM GC schedule

<table>
<thead>
<tr>
<th>Programs</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
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<tbody>
<tr>
<td>K-UAM GC Preparation [GC 0]</td>
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<td>K-UAM GC at Suburb [GC 1]</td>
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<tr>
<td>K-UAM GC at Urban [GC 2]</td>
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<tr>
<td>GC 2 @exUrban (Airport)</td>
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<tr>
<td>GC 2 @Urban (Seoul Capital Area)</td>
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*) Orange: flight test or execution phase

* NCFPTC: National Comprehensive Flight Performance Test Center
K-UAM GC (Grand Challenge)

Scope of K-UAM GC*

- **Aircraft**: Operational safety, control robustness under PIC, HQ & RQ, Noise source measuring & modeling
- **Airspace**: UAM airspace integration & management, UAM traffic management, CNSi systems for UAM
- **Operation**: Operations of fleets, traffic controls, PSU’s, vertiports, supplementary data services, service platform providers including licensing
- **Infrastructure**: Vertiport design, construction, and operation, Vertiport operational algorithm, Charging equipment & facility, Security check process & equipment
- **Community**: Noise ground impact measurement and simulation, Urban micro weather measurement and prediction

* Will be finalized and announced in the mid of ‘21 by MOLIT
# K-UAM GC Test Infrastructures

- Mobile test facilities for the phased approach of the GC

<table>
<thead>
<tr>
<th>Infrastructures</th>
<th>Details</th>
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<tbody>
<tr>
<td>Structures @ FTC*</td>
<td>(Elevated) FATO (40x40), Hanger(40x20), Apron, etc</td>
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<tr>
<td>Mobile Noise LAB</td>
<td>WAMS(^1), Aircraft tracking equipment, Lidar, Mobile LAB(DAQ, trailer), etc</td>
</tr>
<tr>
<td>Mobile GSE**</td>
<td>Mobile charger(200kW), Stationary super charger(400kW), etc</td>
</tr>
<tr>
<td>Mobile CNS facilities</td>
<td>Radar, ADS-B, RTK, CEAS(^2), On-board K-CNS device</td>
</tr>
<tr>
<td>Mobile MMF***</td>
<td>Aircraft monitoring, Navigation/Test Management, Comm./DAQ, etc</td>
</tr>
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\(^1\) FTC: Flight Test Center  
\(^2\) GSE: Ground Support Equipment  
\(^3\) MMF: Mission Monitoring Facility

1) Wireless Acoustic Measurement System  
2) Communication Environment Analysis System
K-UAM GC (Grand Challenge)

Concept of K-UAM GC CNSi

Scope of K-UAM GC

1. Comm. Network
3. Mobile RADAR
4. On-board monitoring device
5. Multi-GNSS Signal Quality monitoring
6. Mobile Mission Monitoring System
7. Mobile e-charger
8. Vertiport @NCFPTC

Vertiport @ICN
Vertiport @GMU
Multi-GNSS
SBAS
SATCOM
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# K-UAM Programs

## Programs to execute the K-UAM Roadmap for ICS in ‘25

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<th>25</th>
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<tbody>
<tr>
<td><strong>Key Milestones</strong></td>
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<td><strong>ICS</strong></td>
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</table>
| K-UAM Design Project (KUDes) | | | | | | **KUFStd** 
| K-UAM GC Preparation [GC 0] | | | | | | v.0
| K-UAM GC at Suburb [GC 1] | | | | | | v.1
| K-UAM GC at Urban [GC 2] | | | | | | ICS**
| GC 2 @exUrban (Airport) | | | | | | 
| GC 2 @Urban (Seoul Capital Area) | | | | | | 
| iUAM-OVECS | | | | | | 
| K-UAM CNSiUS | | | | | | 

(KUFStd) K-UAM Flight Standard / (ICS) Initial Commercial Service / ⬇️: flight test or execution phase

iUAM-OVECS: Developments of Integrated UAM Operation and Verification Environment based on Cyber phySics

K-UAM CNSiUS: K-UAM CNSi Acquisition & Utilization Program

Initial Commercial Service (ICS)
K-UAM R&D Programs

◎ iUAM–OVECS*

- Develop a CPS** to validate K-UAM GC operational safety during the GC, verify the K-UAM Flight Rules, and to support initial commercial service in ‘25
- Interconnect physical components and cyber components in K-UAM environment
- Verify operational procedures, communications among stakeholders, supplementary data services, and licensing requirements
- Step by step approach to support K-UAM programs in time

* iUAM–OVECS: Developments of Integrated UAM Operation and Verification Environment based on Cyber physSics
** CPS: Cyber–Physical System

Programs

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<tr>
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<th>‘23</th>
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<th>‘25</th>
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<tbody>
<tr>
<td>Cyber World</td>
<td>iUAM–OVECS-0</td>
<td>iUAM–OVECS</td>
<td>iUAM–OVECS-1 @ GC-1</td>
<td>iUAM–OVECS</td>
<td>iUAM–OVECS-2 @ GC-2</td>
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<td>iUAM–OVECS</td>
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[Step by step approach]

[Key components of the CPS for K-UAM]
K-UAM R&D Programs

**K-UAM CNSiUS***

- Establish CNSi infrastructure and operation system at initial commercial service routes
- Secure and share CNSi data, based on commercial mobile network, among stakeholders
- Demonstrate K-UAM CNSi and ATC integration to forecast K-UATM after 2030

*K-UAM CNSiUS: K-UAM CNSi Acquisition & Utilization System*
K-UAM roadmap, UAM Team Korea, K-UAM GC, R&D projects, and more are being prepared in Korea.

International participations are welcome to any K-UAM activities.

But the more prepare, the much more needed.

Let’s gather global efforts on UAM
  • NASA’s AAM International Day is a great chance to begin international collaborative work
  • Make a regular and formal channel where we can share and discuss our UAM activities
Thank you
감사합니다

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