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AGENDA ITEM 3: AVIATION SAFETY

CURRENT STATUS AND IMPROVEMENT PLANS FOR SOUTH KOREA'S SPECIAL FLIGHT AUTHORIZATION SYSTEM

(Presented by the Republic of Korea)

INFORMATION PAPER

SUMMARY

This paper introduces the operation status of the Special Flight Authorization for UAV, which was introduced by the Korean government to ensure safe drone operation at night and BVLOS (Beyond Visual Line of Sight), and shares recent improvements in safety standards.

CURRENT STATUS AND IMPROVEMENT PLANS FOR SOUTH KOREA'S SPECIAL FLIGHT AUTHORIZATION SYSTEM

1. INTRODUCTION

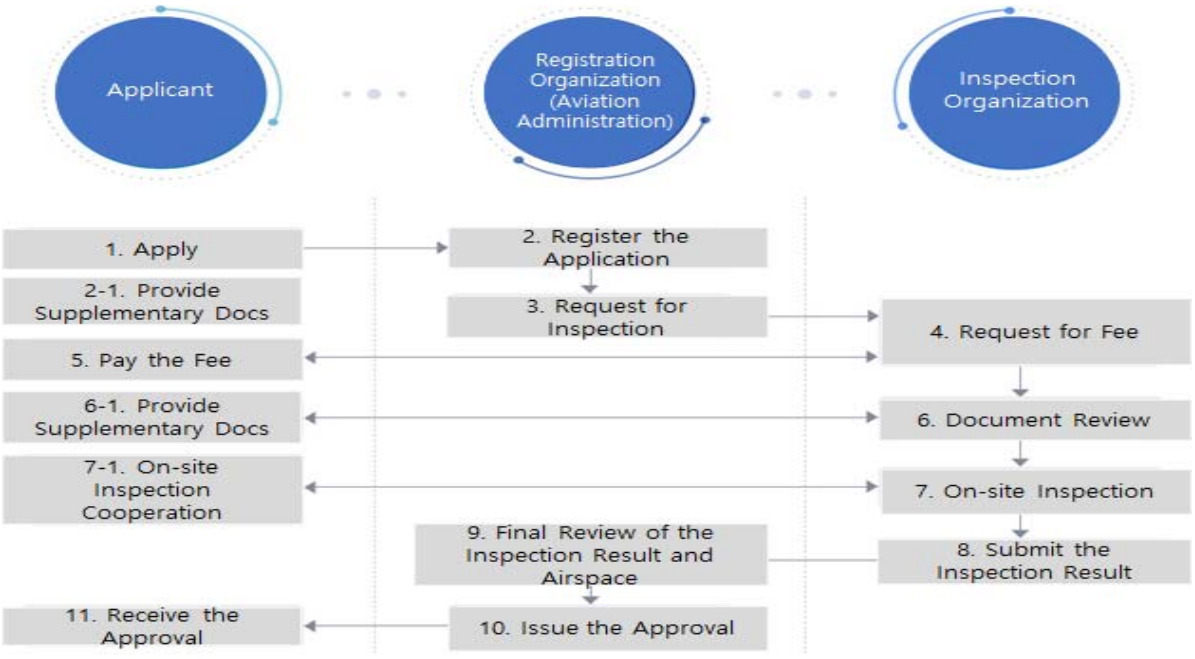
1.1 With the increasing use of drones, the possibility of accidents stemming from their usage also rises. In particular, flights during nighttime or 'Beyond Visual Line of Sight (BVLOS)' operations possess additional risk factors compared to daytime or 'Visual Line of Sight (VLOS)' flights. Therefore, higher safety standards and regulations are required. In response, the South Korean government introduced the Special Drone Flight Authorization System from December 2017. This system presents fundamental regulations and safety standards for the safe operation of drones, attributing legal responsibility for any violations. The system is applicable to all drone users(except for the military, police, customs, public institutions, or emergency flights according to Article 131-2 of Korea Aviation Safety Act) and mandates safety inspections to proactively identify potential risks and ensure that users comply with safety standards, enabling safer flights.

2. DISCUSSION

<u>The authorization procedure for the special flight authorization</u>

2.1 In order to obtain special flight authorization for nighttime or BVLOS flight, the applicant must apply and submit the necessary documents via the Drone One-Stop Public Service website (https://drone.onestop.go.kr/). The submitted application undergoes an initial review at regional aviation offices, which are the authorization authorities. After completing the initial review, the regional aviation office requests a safety inspection to Korea Institute of Aviation Safety Technology, or KIAST. Based on the established safety standards and internal regulations, KIAST conducts a special flight authorization safety inspection. Excluding exceptional cases, the inspection is typically completed within 30 working days after the receipt of application. The final authorization results are then issued to the applicant, who receives a special flight authorization which is valid for up to six months. [Table 1] illustrates the entire process from application to notification of results.

[Table 1. UAV Special Flight Authorization Procedure]



2.2 The inspection for special flight authorization is categorized into document review and on-site inspection. The document review involves the evaluation of the submitted documents (11 types in total), notably pilot qualifications, insurance certificates, safety certification (for drones exceeding 25kg take-off weight), drone specifications, flight plans, and more. The flight plan must include an emergency response manual. Using electronic maps, the flight path can be confirmed, and potential risk factors such as airspace issues can be identified.

2.3 On-site inspections target risks not identified during the document review. This stage involves examining the drone's condition and flight plan, inspecting the take-off/landing zones and flight paths for potential hazards, and offering related safety recommendations. Additionally, actual flight tests are conducted to evaluate flight status and emergency response capabilities. Major inspection items during the on-site stage are shown in [Table 2], where various factors, such as the surrounding environment, are taken into consideration.

[Table 2. Key items of checklist for a UAV Special Flight On-site Examination]

- Verification of Models and Specifications for Core Components
  - Drone Frame and Landing Gear
  - Transmitter and Receiver
  - Propeller (or Rotor Blade)
  - Motor (or Engine), Battery
  - GPS, ECS(Motor Speed Controller), FCC(Flight Controller)
- Verification of Key Equipment and Site Conditions
  - Propeller (or Rotor Blade) Condition
  - Battery (Fuel) Charging Status
  - Camera Operational Status (Including FPV)
  - GCS and Manual Control Device Operational Status
  - Remote Control Distance Measurement Test (Line-of-Sight Range)
  - Communication Equipment (Frequency and Operating Channels, etc.)
  - Terrain and Obstacle conditions along Landing Sites and Flight Paths
  - Emergency Landing Site
  - Proficiency of Operating Personnel in Emergency Response Manual and Training
  - Weather Conditions on Inspection Date (Temperature, Wind Direction, Wind Speed, etc.)

The Current Status of Special Flight Authorization and Safety Standards

2.4 Since the system's introduction, the number of applications in 2022 stood at 1,799, with 1,438 authorizations granted. Over the past five years (2018-2022), the average annual growth rate was 139.2% for applications and 151.4% for authorizations. The authorization rate is approximately 80% in comparison to the applications.

[Table 3. The Current Status of Special Flight Applications and Authorizations]

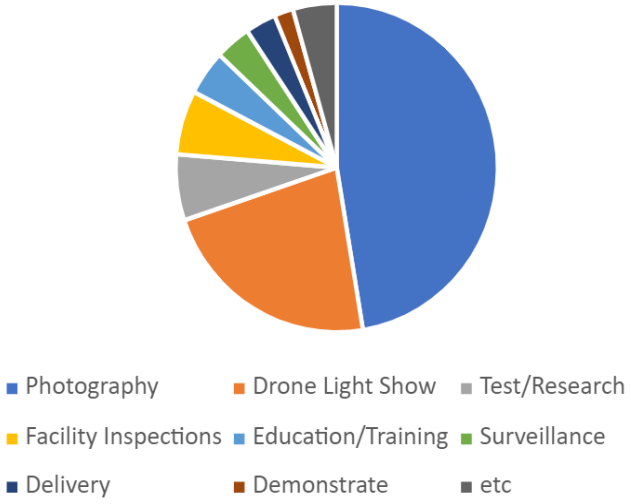
Year	2018	2019	2020	2021	2022	Sum	Growth rate(%)
Number of Application	55	165	291	504	784	1,799	139.2
Number of Authorization	36	145	207	408	642	1,438	151.4
Authorization Rate	65.5	87.9	71.1	81.0	81.9	79.9	-

2.5 The primary purposes of using the special flight authorization system for nighttime

flights include photography, light shows, facility inspections, and education. For BVLOS flights, the majority are for delivery, wildfire surveillance, facility inspections, safety monitoring, and research testing. [Table 4] depicts the statistics based on flight purposes.

[Table 4. UAV Special Flight Authorization by Purpose]

Category	Number of Authorization (cases)	Percent-Age (%)
Photography	682	47.4
Drone Light Show	322	22.4
Test/Research	94	6.5
Facility Inspections	91	6.3
Education/ Training	63	4.4
Surveillance	52	3.6
Delivery	44	3.1
Demonstrate	27	1.9
ETC	63	4.4
sum	1,438	100.0



2.6 Specifically, safety standards for special flight authorization are divided into 'general' and 'specific' criteria. The specific criteria are further broken down into standards for nighttime and BVLOS flights. Considering advancements in drone equipment, flight technology, and changing conditions, the safety standards were updated. (No. 2023-343 Notice of the Ministry of Land, Infrastructure, and Transport, dated 30th June 2023). Details are provided in [Table 5].

[Table 5. UAV Special Flight (Night and BVLOS) Safety Standards]

Category		Main Standards
General		• Confirm the presence of obstacles in the take-off/landing area and flight path • Equipped with technology for 'fail-safe' and collision avoidance • Possess a function to send out a signal of location of UAV in the event of a fall • Equipped with emergency operations manual
Specific	Night Flight	• Place an observer if it's difficult to keep an eye on the drone constantly • Equipped with collision avoidance lights and autopilot • Equipped with visual assistance equipment to monitor obstacles during flights • Control public access to or install lighting facilities around the launch/landing area
	BVLOS	• At least one observer (however, in areas where there is no risk of damage in the event of a fall, an observer may be excluded if contingency plans are in place). - When an observer is placed, the pilot and observer must be able to communicate at all times • UAV must be capable of manual, automatic, or semi-automatic flight • Pilots should verify in advance that CCC equipment is available within the planned flight area • Maintain communication with UAV at all times during flight • Equipped with a Ground Control System (GCS) • Equipped with facilities (FPV, etc.) that check flight status

Major Issues with the Special Flight Authorization System

2.7 Complexity of authorization Process: After an application is submitted for special flight authorization, the review process takes approximately 30 days. However, in special cases, it can take up to three months. In industries requiring rapid responses, such as drone photography or light shows, many apply for authorizations close to the event date, making it challenging to secure adequate review time.

2.8 Discrepancy Between Technological Advancements and the System: Originally, the special flight authorization system was designed based on the technological conditions and standards at the time of its introduction. There exists a gap in addressing rapidly evolving technologies. A difference in perspective is noticeable between the industry which is eager to adopt new technologies and services and regulatory authorities prioritizing safety.

2.9 Insufficient Operational Analysis: There's a lack of systematic analysis to address real-world operational issues, making it challenging to provide concrete directions for system improvements.

Proposed Improvements and Solutions

2.10 Optimization of Administrative Procedures: By consolidating fragmented data such as aircraft registrations and pilot certifications, we can streamline administrative processes, thereby alleviating the submission burdens and elevating the efficacy of the authorization workflows.

2.11 Regulatory Evolution in Response to Technological Advancements: It is imperative to establish a nimble regulatory framework capable of adapting to emerging technologies and evolving contexts. Persistent oversight of the prevailing regulations, paired with benchmarking of international best practices, will ensure timely and informed amendments as required.

2.12 Augmented Analysis of Operational Performance: An enhanced and systematic approach to analyzing on-ground operational challenges is paramount. This will not only expedite the detection of inefficiencies in the system but also pave the way for the formulation of targeted remedial strategies.

[Table 6. Major Improvements to Special Flight Safety Standards]

Category		Before (~ June 2023)	After (July 2023~)
General		• 30 days for special flight authorization process • Installing a GPS location signal transmitter	• Forgo safety checks on extension of already approved flight for once (30-day review period → 5 days) • Equipped with location signal transmitting capabilities
Specific	Night Flight	• Place one or more observers • Equip Autopilot Mode • Equip an infrared camera with a visual aid (FPV) • Install take-off/landing lighting facilities, search lights	• Deploy observers when continuous UAV observation is not possible (photography, goggle flying, etc.) • Equipped with autopilot • Equipped with sub visual aids • Provide access control or lighting facilities around the take-off/landing area
	BVLOS	• Place one or more observers • Duplicated communications (such as RF and LTE)	• No obligation to place observers when emergency response measures (e.g., parachutes) are in place in the event of a fall in non-hazardous areas • Always communicate with UAV in flight

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper.

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