International Civil Aviation Organization

Twenty Fourth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/24) of APANPIRG

Web-conference, 30 November – 4 December 2020

Agenda Item 5: Navigation

5.1 Other navigation related issues

NAVIGATIONAL AIDS CHECK BY USING DRONE IN THE REPUBLIC OF KOREA

(Presented by the Republic of Korea/Korea Airports Corporation)

SUMMARY

This paper provides information about development and practical use on Navigational Aids Check by using Drone in the Republic of Korea.

1. INTRODUCTION

1.1 Navigational Aids are an important facility essential for the safe aircraft operation from takeoff to landing. Regular ground checks are conducted by maintenance personnel and government-led flight inspections are conducted on a regular basis of 90~ 240 days according to the stability of each facility.

1.2 The inspection methods carried out on the ground has limitations since it cannot check aerial signals above a certain altitude. The best way to check the aerial signal from the ground is to use a mast, or to check the signal at nearby building roof or the mountaintop. These checks can neither measure the radio signals of the aircraft approach course nor check the overall bearing.

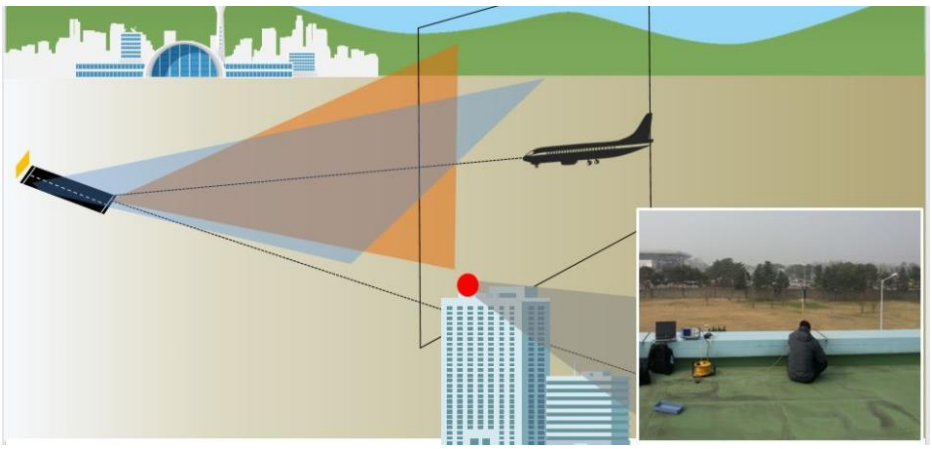

Figure 1. Limitation of Navigational Aids ground check

2. DEVELOPMENT OF DRONE SYSTEM FOR NAVIGATIONAL AIDS CHECK

2.1 Since 2016, Korea Airports Corporation(KAC) began to develop an ultra-compact and lightweight receiver that can be mounted on drones to overcome the limitations of navigational aids check on the ground. Prototypes were produced to conduct field test at local airports in 2017. As a result, KAC successfully developed drone system, the following year in 2018, to inspect Navigational Aids.

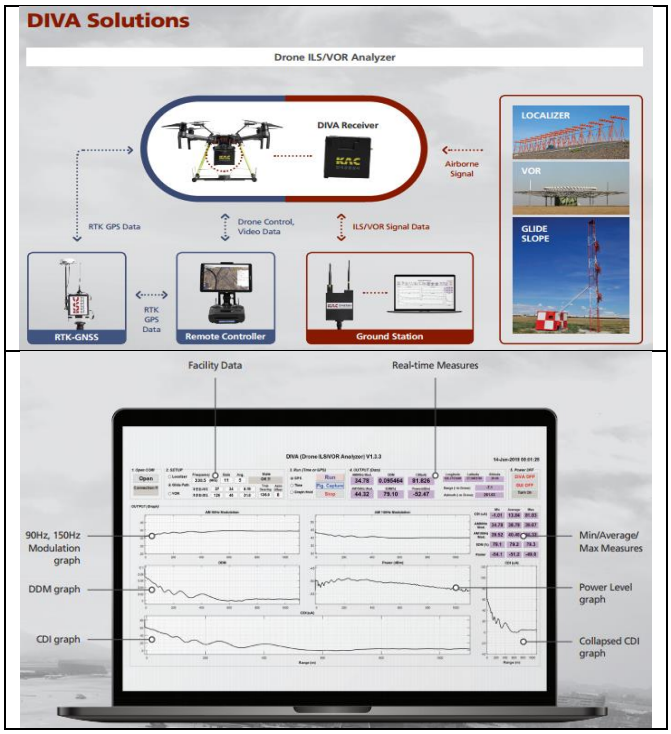

Figure 2. Block diagram of drone system for Navigational Aids check and Software for Analysis

2.2 KAC's Drone System for Navigational Aids check(DIVA) can accurately check the airborne radio signal of Navigational Aids such as ILS, VOR, and TACAN just in about 20 minutes flight through a pre-designated route. Additionally, PAPI and ALS checks are currently under development.

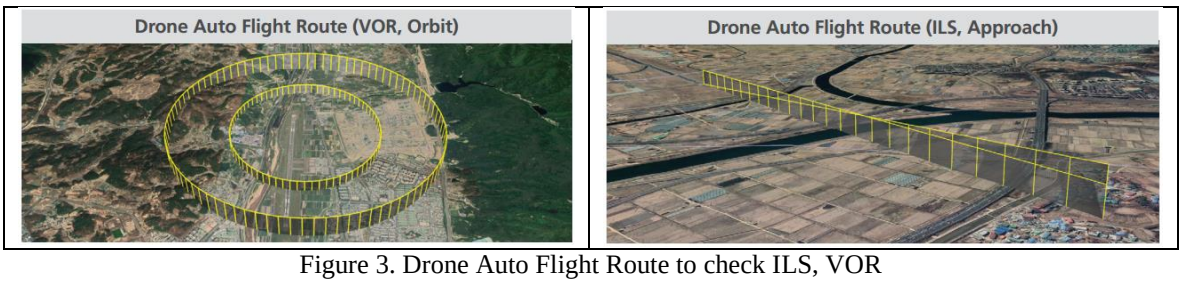

Figure 3. Drone Auto Flight Route to check ILS, VOR

2.3 Navigational Aids check using drone system has the advantage of being able to closely inspect aerial radio signal from the user's(aircraft) perspective. Compared to the aircraft, it is easier to control flight speed and path with drones, which can be used to inspect a certain section suspected with distorted aerial radio signal at a preferred flight speed and path. In addition, drones can hover in the air to continuously check any changes in radio signal at a specific point.

3. NAVIGATIONAL AIDS DRONE CHECK NATIONWIDE

3.1 Korea Airports Corporation is taking the lead in the world for Navigational Aids Check using drones at airports and EN Route sites nationwide. KAC established Drone system at each six divided regions nationwide where technical personnel, of the main airport in each region, provide technical support to check Navigational Aids at the competent sites.

3.2 Also Navigational Aids maintenance personnel acquire the drone pilot qualification to directly control the drone and analyze the Navigational Aid signals in real time. In addition, the 'Guidelines on the operation procedure and safety management of drone around the airport' and the 'Standard Operation Procedure for Drone System' are provided to prevent accidents that may occur at the airport due to drone flight.

3.3 Recently, with the acceleration of development around the airports, structures such as new apartments, steel towers, and wind turbines are increasing. Such structures can cause distortion of radio signals of Navigational Aids. When radio wave distortion occurs due to obstacles, the origin of radio wave obstacles can be identified by surveying the air wave environment using a drone. These are the ways KAC is using drones for Non-disruptive operation of Navigational Aids.

Figure 3. Example of surveying the air wave environment using drone

3.4 Last year, Korea Airports Corporation has completed commercialization by obtaining European CE certification for the receiver of Navigational Aids for drones and sold 5 sets of drone systems to the Republic of Korea Air Force. KAC is also providing technical consultation for drone check in Brazil and Colombia based on the contract with IDB (Inter-American Development Bank).

4. CONCLUSION

4.1 Korea Airports Corporation has developed a drone check method that can be used from the aircraft's perspective, which is a paradigm innovation for Navigational Aids. In addition, KAC established drone system nationwide so that Navigational Aids in the Republic of Korea will be checked with drones.

4.2 Korea Airports Corporation plans to expand its business in the future, starting with the sales business with the Air Force in Korea as well as the technical consulting business of the two countries in Brazil and Colombia. In 2021, KAC plans to produce the new version of the Navigational Aids signal receiver equipment for drones and contribute to the safer world’s aviation industry by spreading the Navigational Aids Drone check.

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

a) note the information contained in this paper, and

b) discuss any relevant matter as appropriate

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