

A Study on the Management of Public Services by Using Drones : Based on the Search for Missing persons

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ABSTRACT

This research is to diagnose and analyze current status of public service using drones through search of missing persons that was carried out recently in Busan and South Gyeong-sang Province and develop technologies in the future. The drone is especially used in police activities, and if the emergency situation of the fire is applied to the scene of the fire, it is more prominent in the search task of the missing person. Therefore, through real-time video transmission and transmission service using drones, one can expect to expand direct service support related to public safety.

However, there are many things to check and worry about since it is the starting stage, and some things to consider in the development of the drone industry and the provision of public services that utilize it. First, it needs to pass a qualification test that is conducted by the Ministry of Land, Infrastructure and Transport (Korea Transportation Safety Authority) in order to operate drones with commercial purposes and weighing more than 12kg. This is also a minimal qualification, requiring a lot of hands-on experience to operate on a realistic mission. As seen in the latest search for missing persons, the area of the expert who checks the information from a distance to a real time must be the area where sufficient experience has been accumulated.

Second, it is still uncertain whether or not it will make any profits from drones. Except for some private tasks such as quarantine, disaster prevention, and preventive measures to prevent forest pests, drones are mostly used by public organizations. Therefore, if profit generation is not secured in various

areas based on drones, they will be little more than a leisure industry such as RC. Therefore, it is important to think deeply about how to provide more stable creative services.

Third, Chinese companies dominate the drone manufacturing industry. From a general configuration perspective, drone blades and frames are about 50 %, flying control computing (FCC) is about 15 %, motor systems are about 15 %, and motor systems are about 10 % battery, and other components are included. Among these, about 70 percent of components such as drones. Blades, frames, and motors are items that can be sufficiently manufactured and competitive. Thus, there is still an opportunity for domestic companies to emerge as global companies through some of the transitions currently being invested in the FCC sector.

Keyword: Public Services, Public Management, Drone Industry, Missing Search, Convergence.

I. INTRODUCTION

Advances in science and technology bring about changes in government activities to prevent and solve social problems. In particular, disaster safety problems are on the rise and are causing huge social costs. The problem is that not only does the disaster damage the lives of citizens or the natural environment of the people, but also the loss of personnel who provide public services such as rescue and search personnel that are used to respond to the disaster is huge. According to the Korea Fire Service, 51 fire fighters have died in the past 10 years since 2008 and nearly 1,725 people died in the first five years since 2012. This is an increasing trend, with the opinion that more often than not, the reporting process for the nation's competitive-related organizations will be complex and not reported (one of the following is the Korea economy and one of the following days). [1]

Introduction and use of drones is highly likely to be implemented in response to these problems, and they are drawing attention in recent years as they are more likely to be used in terms of their access and cost compared to current aircraft such as helicopters and aircraft. As one of the types of small unmanned defense equipment, drones were developed for military purposes as early as the 1930s, but have provided various public services such as sports, transportation of goods, disaster surveillance, prevention and crime prevention. The drone is derived from the term "buzz of bees" and today refers to Unmanned Aerial Vehicle, which is "capable of flying without a pilot" and a camera, sensor, communication system, etc. are burned and the weight and size of the drone can be varied from 25g to 1200kg. [2]

This research is to diagnose and analyze current status of public service using drones through search of missing persons that was carried out recently in Busan and South Gyeong-sang Province and develop technologies in the future.

II. THEORETICAL DISCUSSION

II.I. The Convergence of Technology and Public Services

In the field of administration or policy science, science technology is usually approached as one of the most technical means to achieve policy goals, and one of the representative examples of convergence of technology and public services is the system. As is widely known, unlike the traditional form of cash payment or in kind payment, voucher provides a special payment method to the user and deposits cash to use public services.

The users use the necessary public services through the payment method. In addition to the government's financial policies, various information related to the budget execution can be monitored in real time. For auxiliary projects that use the e-national help system, project costs are carried out in a similar way to the accounting of the state of occurrence, rather than the entire project cost deposit into the account at the beginning of the project.

The drone can also be classified as a new type of public service provided through this context, as follows if divided by the functions of the drone. First, for transport services, it can be explained in the form of a combination of public service and spot service that uses human resources to deliver in kind to the users. However, if a programmed drone is used for continuous and repetitive transportation routes, it is converted into a pure spot service, which would lead to reduced labor costs.

Second, monitoring previously inaccessible space or terrain has identified electrical signals by attaching sensors or by photographs via aircraft or satellites. The disadvantage of the former is that it is not possible to monitor sensors in the event of failure, and the latter is an economic problem that requires a large amount of money and On the other hand, if drones are used, these two technical problems can be mitigated in many areas.

II.II. Public Services Using Drones

The drone, which is one of the key areas of the fourth industrial revolution, is being used in various private and is also engaged in providing public services. The convergence of the two sectors, which caused the aforementioned development of technology and the duality of public services, is being attempted anew at the central government's policy level. According to the Ministry of Land, Infrastructure and Transport (2017), the government has selected drone industry as one of the seven new areas of land transport, and a meeting of the ministers of regulatory reform has also been designed to support the joint growth of domestic manufacturing and utilization industries. [3-4] Meanwhile, the Ministry of Trade, Industry and Energy recently conducted pilot projects in two areas by utilizing the drone in May 2016 for inspection of power facilities and delivery and logistics. [5-7] This indicates that planning to expand use of drones in public areas such as land, transportation, police, forests, and facilities as its main government body. Meanwhile, the Korea Forest Service has already reduced the investigation time to about 10 percent by applying

drones to the task of preventing fires, while the Korea Land Information Corporation uses drones to investigate the current status of ownership of public land and public facilities.

The drone is especially used in police activities, and if the emergency situation of the fire is applied to the scene of the fire, it is more prominent in the search task of the missing person. [8-9]

III. CASE ANALYSIS

III.I. Status of Disappearance

The following Table 1 shows the status of reporting and processing of missing children for the last five years. Although reports show that normal children are on the decline, the number of people with intellectual disabilities and dementia continues to rise. In particular, it is important to note the number of unreleased dogs, among which the number of intellectually disabled people increased sharply from nine in 2013 to 77 in 2017.

Table 1. Status of Registration and Processing of Missing Children, etc.

		2013	2014	2015	2016	2017
Total	Report reception	38,695	37,522	36,785	38,281	38,789
	undiscovered	19	14	11	30	191
A normal child	Report reception	23,089	21,591	19,428	19,870	19,956
	undiscovered	0	2	3	13	100
People with intellectual disabilities (of all ages)	Report reception	7,623	7,724	8,311	8,542	8,525
	undiscovered	9	5	4	11	77
Dementia (of all ages)	Report reception	7,983	8,207	9,046	9,869	10,308
	undiscovered	10	7	4	6	1

* Source : National Index System (http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=1610). [10]

Next, the time it takes to find the missing person is as shown in Table 2. As of the first half of 2016, about 80 percent of the cases found within a day of receipt of the

report were found, and five percent were found to be longer than a month. In this case, the impact on society is severe and extensive.

Thus, for safety related public services, such as fire and police in response to disasters and accidents, the time is critical, and the damage increases exponentially. Therefore, the time taken to find missing persons is very important in searching for them, so the development and use of technologies that can reduce the number of missing persons can be noted.

Table 2. Time to Find Missing Persons after Reporting their Disappearance

	1H	3H	6H	12H	1D	2D	3D	7D	30D	1Y	2Y
2015	9,865	6,535	3,829	3,753	3,422	2,877	1,250	2,332	1,908	912	16
2016 (1~6M)	6,211	3,486	1,849	1,876	1,698	1,483	593	916	722	186	0
Ration	32.66	18.33	9.72	9.86	8.93	7.80	3.12	4.82	3.80	0.98	0.0
	79.5					15.73			4.77		

III.II. Search Cases Using Drones

The major specifications of the ultra-light flying device used in the disappearance of a college student in Busan's Geumjeong-gu, Busan, are shown in Table 3 below. In addition, the area around Mt.Geumjeong was searched for between April 10 and 14 by drones equipped with a thermal infrared camera and an ultra-definition camera, considering the special circumstances of the disappearance.

Table 3. Major Specifications of the Missing Person Search Ultra-Light Flight Device

Specifications	Max Speed	18 m/s	Engine	6010
	Cruising Speed	8 m/s	Rotor	2170R
	Stalling Speed	0 m/s	weight	10 Kg
			Max pay load	15.5 Kg
	L × W × H(mm)	1668 x 1518 x 727	Fuel Capacity	TB48S 5700mAh / 6ea

The following Table 4 describes the major specifications of the cameras on the drones that carried out the actual search mission. The drone allows rapid navigation of a wide

range of locations where people cannot travel or access on foot, but it cannot obtain information about the search site in itself.

Table 4. Major Specifications for Cameras Fitted to Ultra-Light Flight Devices

A thermal camera	
Resolution and sensor type	640 x 512 Uncooled VOx Microbolometer
Wavelength band	7.5 - 13.5 μm
Measurable temperature band	High gain: $-25^{\circ}\text{C}\sim+150^{\circ}\text{C}$, Low gain: $-40^{\circ}\text{C}\sim+550^{\circ}\text{C}$
Accuracy	Accuracy : $\pm 2^{\circ}\text{C}$ or 2%
Temperature resolution capability	0.05°C (50mK)
Digital zoom lens capability of thermal camera	1.0-14.0x continuity Zoom
Real-time image camera	
Real-time image resolution	1,600 x 1,200 Fixel
Digital zoom lens capability of real-time image	1.0-16.0 continuity Zoom

As a result, the missing persons were searched by attaching a practical camera and a deterioration camera to the aircraft. Multi-mode Deterioration Camera Mode and Realistic Camera Mode are used on the drone prepared to support the search, and PIP shows both Deterioration Camera and Misfire Camera on one screen. Temperature detection for missing persons was confirmed through the display of the highest and lowest temperature center point on the real-time screen. During the flight, the temperature range enabled automatic and manual control, resulting in more efficient search activities through comparative monitoring with nearby objects.

Degradational cameras were better equipped to obtain advanced information by responding more sensitively to changes in surroundings by supporting 19 color palettes. The control function, which is one of the various software installed in the drone, is able to set the temperature range, analyze the alarm mode Max / Min / Center point, zoom, save the image / video, and connect the screen monitor to the screen monitor immediately.

The search will allow the drone to search 10,000sqm2 and the ground (300 people) for Five hours, compared to the existing search operation. In addition, real-time video transmission and storage of images will enable real-time video inspection by the field command office and the responsible police department. Fig 1 shows the images taken by the drones performing missing missions.

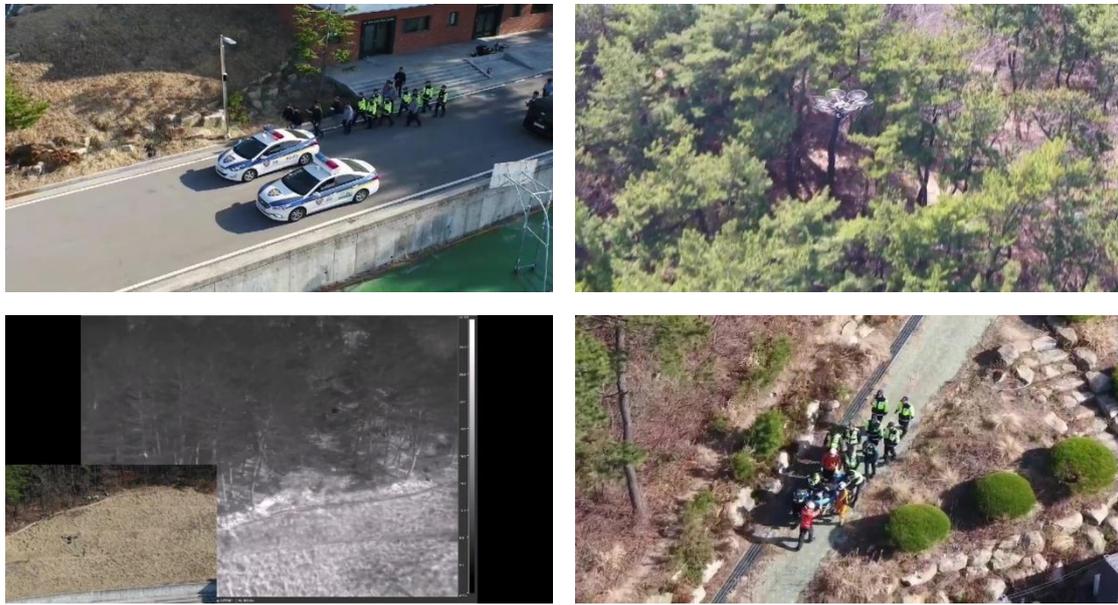


Fig 1. Search for Missing Persons and Acquisition Video

The use of real-time video information transmission function using drones can be applied to such cases of missing persons such as "golden time" or to fires. Therefore, through real-time video transmission and transmission service using drones, one can expect to expand direct service support related to public safety.

IV. CONCLUSION

Many of the disasters that have occurred in recent years have become national issues, most notably Golden Time. Although there were no major problems in arriving at the site of the response workers, it took a long time for them to get in and out of the accident.

Along with easing regulations by South Korean Government, variety of services are also being developed in drone industries. In Japan, drone services that are applied with variety of applications to drones, which are platforms, are appearing. It already commercialized new operation & Maintenance (O&M) services for renewable energy such as safety and performance inspection of solar panels by combining drone and 3D mapping technology and software. In addition, a fine dust measurement sensor is used to measure fine dust concentration between PM5.5 and 2 at an altitude of 1 to 2 kilometers, and various environmental pollution prediction services are also carried

out. As such, the possibility of development is positively reviewed through filming of areas with dangerous access or applying drones to industries where expensive resources must be injected. However, there are many things to check and worry about since it is the starting stage, and some things to consider in the development of the drone industry and the provision of public services that utilize it.

First, it needs to pass a qualification test that is conducted by the Ministry of Land, Infrastructure and Transport (Korea Transportation Safety Authority) in order to operate drones with commercial purposes and weighing more than 12kg. This is also a minimal qualification, requiring a lot of hands-on experience to operate on a realistic mission. As seen in the latest search for missing persons, the area of the expert who checks the information from a distance to a real time must be the area where sufficient experience has been accumulated.

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Third, Chinese companies dominate the drone manufacturing industry. From a general configuration perspective, drone blades and frames are about 50 %, flying control computing (FCC) is about 15 %, motor systems are about 15 %, and motor systems are about 10 % battery, and other components are included. Among these, about 70 percent of components such as drones, blades, frames, and motors are items that can be sufficiently manufactured and competitive. Thus, there is still an opportunity for domestic companies to emerge as global companies through some of the transitions currently being invested in the FCC sector.

It is hoping that businesses and universities will work together in foreign markets and produce positive results by establishing a platform in all phases of drone industry (R&D, service, education), which is one of the most important keyword fields of 4th industrial revolution.

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