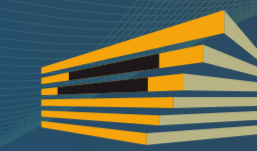


## TITAN series | Low-cost drones for applications used in events monitoring



### TYPE OF RESULT

New technology

New product

New service

New knowledge or skill



### COMMERCIAL MATURITY LEVEL

Conceptual idea

Proof of concept (design)

Validated in a controlled environment

Validated in a real environment

Successfully implanted



### PROTECTION LEVEL

Non-applicable

Patent

Software

Know-how

Utility model

### Description of the solution. Problem solved

In recent years, drones have become very popular, partly due to the rise of open-source flight controllers such as ARDUPILOT or Pixhawk, that have allowed developers to innovate at affordable cost. The increasingly appearance of commercial solutions developed by popular brands (e.g., DJI) and the vast array of applications that are benefited from all the possibilities offered by using drones have also contributed to such popularity.

Among some of the applications that have aroused most interest, we find use of drones for event monitoring (recitals, parades, sport events or even protests) since they are able to fly closer to people, with higher manoeuvrability and less risk than other alternatives as manned helicopters or crane arms, collecting data that can be used for safety, journalism or cinema purposes, among others.

Also, applications using drones have become very popular since they automate or relieve repetitive tasks or highly costly human resources. For example, among such applications the following stand out: inspection of crops or large natural spaces in order to assess the state of vegetation; identify objectives or search for people; among many others. Overall, it is expected that in Spain drone industry prospective achieve great progress in the next three decades as shown in Figure 1.

2035		
Flota drones uso profesional	Volumen de negocio anual (M€)	Puestos de trabajo (ud)
51.400	1.220	11.000
2050		
Flota drones uso profesional	Volumen de negocio anual (M€)	Puestos de trabajo (ud)
53.500	1.520	11.500

Figure 1. Drone market in Spain (2035 and 2050)

In all the above-mentioned applications, drones are the central and fundamental part of the system. However, it always goes together with additional subsystems proper of the specific application for what it is intended. For example, for applications related to filmography, drone is usually equipped with a video camera embedded in a stabilizer; and both drone and camera are controlled by an opera-

tor by a radio channel. Whereas, on those applications aimed at video surveillance or searching for people, first person cameras and subsystems enabling the image transmissions to the operator to be visualised in real time are integrated in the system. Also, in applications for monitoring of crops or natural spaces, drone is equipped with different types of sensors that collect relevant information. Usually, its flight is automated for doing autonomous tasks by following patterns that assure that all the desired surface is scanned.

In each one of the situations mentioned above, the aircraft requirements vary greatly (e.g., weight limit, size, flight control, communications, required minimum flight time, costs and limit price, etc.). Within this framework, the Institute for Applied Microelectronics (IUMA) has acquired the capacity to develop drones with flexible features and specifications that are able to cover a wide range of applications at low cost. Such drones integrate an open source Pixhawk flight controller and PX4 firmware, and they incorporate a mini PC on-board with an embedded Linux that is able to communicate with the flight controller and control practically any kind of sensor that you want to add to the system (camera or video camera, multispectral or hyperspectral sensors, thermal camera, LiDAR, etc.). Including such on-board PC on the platform also guarantees high flexibility in communications with ground station and allows to carry out several types of autonomous flight missions. Besides, the on-board PC features may vary extremely ranging from a PC with a reduced price, size and cost to systems with higher computational capacity that even include low consume GPUs. This allows to execute costly computational tasks on-board in case of need; or even to process collected data in real time and make decisions automatically based on the results obtained, which widens even more the range of application of the platforms developed.

Compared to existing commercial solutions, our solution offers a higher modularity and flexibility, since it can be adapted to any kind of application and its particularities. This is particularly attractive to those that are interested in developing new applications based on drones.

### Fields of commercial application

These are the main target sectors for this solution:

- **Precision agriculture.** Development of aircraft and

their adaptation for overflying determined crop areas in autonomous missions, as well as for transportation and control of sensors in charge of collecting relevant data about such crops.

- **Environmental monitoring.** Development of aircraft and their adaptation for overflying specific crop areas in autonomous or manual flight mode missions, as well as for transportation and control of sensors in charge of collecting relevant data about such crops.
- **Security.** Development of aircraft and their adaptation for integrating first person cameras that can be controlled remotely and allow visualisation in real time of the monitored areas.
- **Other.** Development of drones for any application that has established specifications that must be fulfilled or that integrate any kind of data acquisition system.

### Market opportunity

IUMA'S knowledge and capacities allow to provide a service for developing "pre-commercial" prototypes that require a drone equipped with different systems and that must comply with particular specifications in order to achieve any kind of specific application. Such service may assure that the user would be able to get an aircraft suited to the needs of its application and that it has all the necessary for being used and validated, reducing time-to-market and development costs.

### Competitive advantage

It is a totally open solution that can be adapted to any work environment and that has a very competitive price. Also, having an embedded mini-PC running a Linux operative system maximises flexibility of the obtained solutions, widening even more the application range of the developed platforms. Compared to existing commercial solutions, this solution offers a higher modularity and flexibility, since it can be adapted to any kind of application and its particularities. This is particularly attractive to those that are interested in developing new applications based on drones.

#### AUTHOR

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