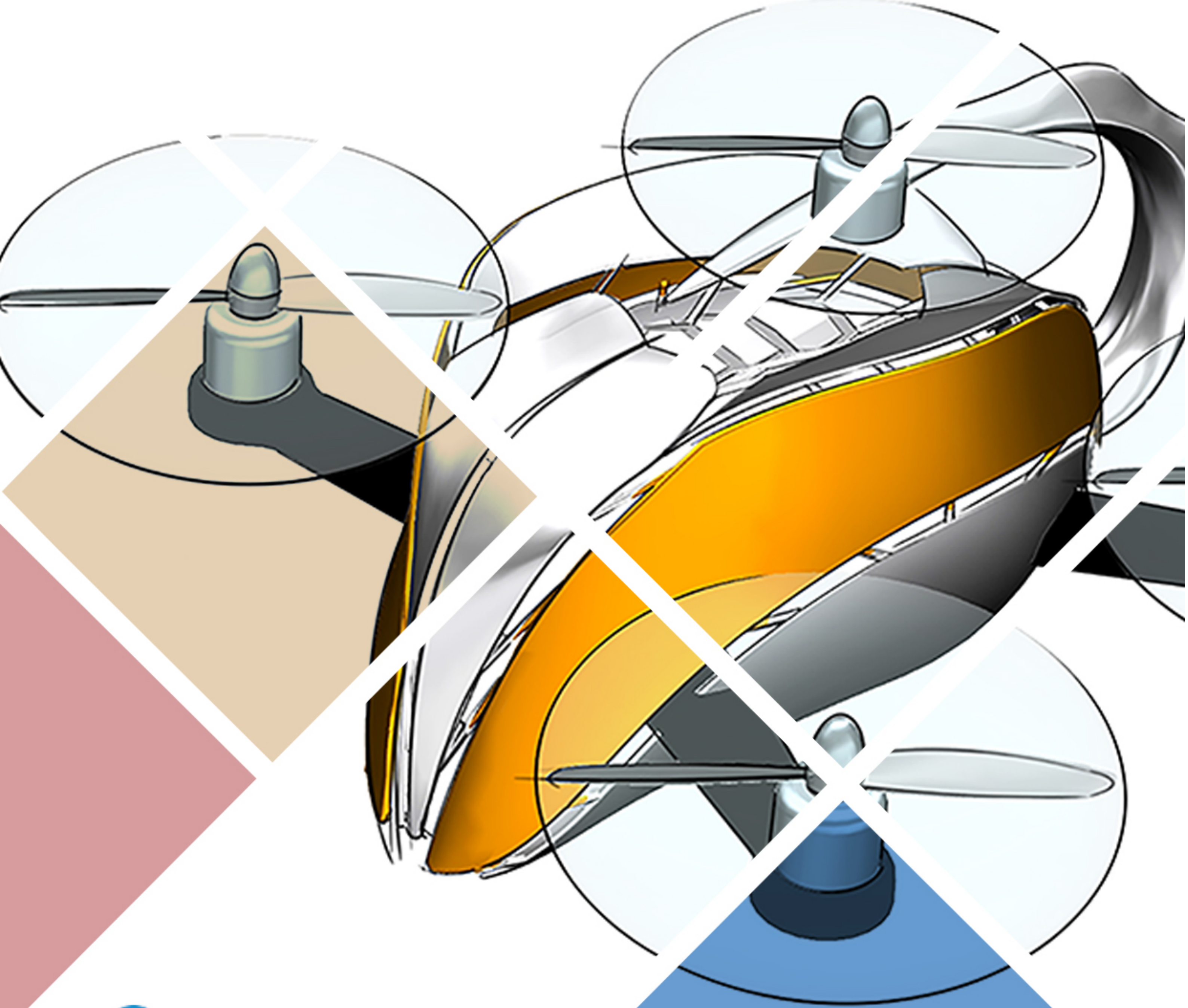


DRONE TEAM

Drone It Yourself!

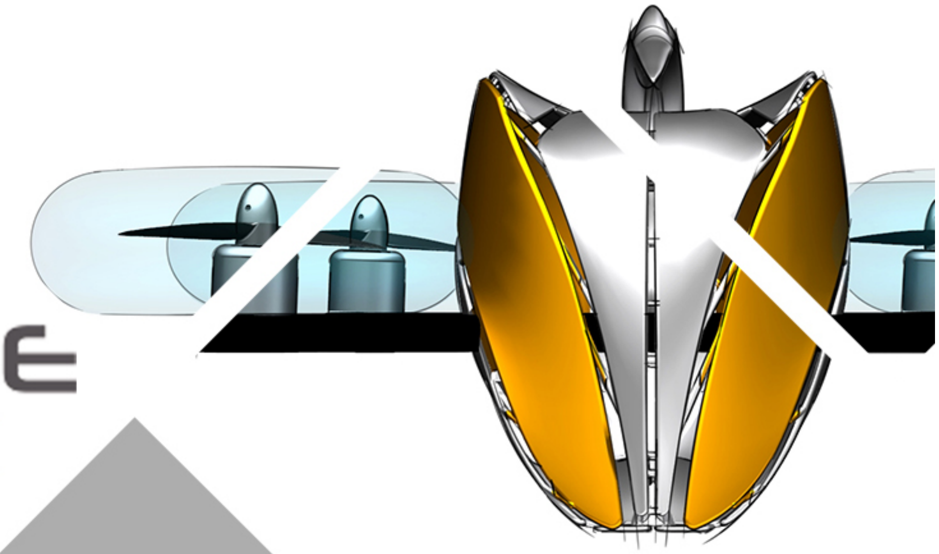
MAKING AND DESIGNING A TOY DRONE
THROUGH MULTIDISCIPLINARY
COLLABORATIVE WORK
Project no. 2015-1-ES01-KA202-015925

Co-funded by the
Erasmus+ Programme
of the European Union

BY NC SA

Drone It Yourself! consists of the following modules:

0. INTRODUCTION TO THE DRONETEAM PROJECT
1. BASIC TOY DRONE FRAME
2. MODULE OF FLIGHT CONTROL
3. MODULE OF COMMUNICATION CONTROL
4. MODULE OF ADVANCED FRAME
5. MODULE OF GPS-COMPASS CONTROL
6. MODULE OF PROBLEM MANAGEMENT
7. MODULE OF FLIGHT STABILIZATION SYSTEM
8. MODULE OF FIRST PERSON VIEW
9. DRONETEAM E-LEARNING PLATFORM
10. OTHER DEVELOPMENTS
11. GLOSSARY



DRONE TEAM

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

DRONE TEAM

INTRODUCTION TO THE DRONETEAM PROJECT

2015-1-ES01-KA202-015925

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1 INTRODUCTION TO THE DRONETEAM PROJECT

DroneTeam was born of knowledge and complementarity of the four participating VET Schools from Spain, Croatia, Poland, Slovenia and a Spanish Technology Centre expert in toys.

Using a toy drone you work on the concepts of product innovation, project-based learning, multidisciplinary working relationships, improving language proficiency and knowledge of technology and trends.

The DroneTeam project consisted of 9 Intellectual Outputs (IO). The first three IOs enable the development of a basic drone. Basic drone concept is a drone with the essential components to be able to fly. The IO 4 to IO8 correspond to the development of an advanced drone, a drone with Advanced Flight Controller which permit auto-flight and sensors as GPS, Magnetometer, Barometer, Accelerometer, Gyroscope. Also, First Person View (FPW) and Telemetry are implemented in an advanced drone.

The first 8 IOs are produced into the development of two drones. You can visit the DroneTeam Official Website (http://www.droneteamproject.eu) and inside Results Section you can download all the files related to these developments. However, the supporting documentation is related in the following chapters of this guide.

The IO9 is the DroneTeam eLearning Platform where you can follow up to 16 mini-courses that will provide you with an expert vision of the drone sector. And you can find more free educational resources in DroneTeam eLearning Platform

You can also find 3D CAD files or prepared for 3D printing in STL format, poster components, manuals and applications, highlighting the main application developed that allows the control of any drone. This application, called DronE can be downloaded on, virtual reality simulators and an augmented reality application. Also in this area, you will find a poster about components and their assembly, a glossary of specific terms and crosswords, useful for your English classes, etc.

Based on the development of a complex toy, just like a drone, with students from different disciplines and knowledge (peer learning) so that they starting with some basic requirements, are able to evolve a basic model and generate their own toy. They can work in: design, 3D printers, motors, electronics and electricity, batteries, environment, mechanics, aerodynamics, meteorological knowledge, how to fly, coding and communications, photography and video, security, new English words, etc., improving the Key Competencies.

1.1 HOW TO START:

When we would like to teach students or stakeholders in drones, it is necessary to understand the drone components, their function, and their characteristics, which are essential and which are advanced or improve the flight experience.

It is also convenient to know the regulation in your country, which is changing since this sector is evolving and governments have begun to legislate, but there are new situations that must be contemplated.

On the other hand, it is necessary to know the basic concepts, as well as the components and their replacements because it is quite common to have to replace components such as broken propellers, etc.

In addition, it is convenient to use a flight simulator first to get some skill in handling.

All these tips are useful for all those who are new to the drone sector.

Nowadays, there is a wide offer of drones and components, existing web pages specialised in the sale of this type of components. One of the most famous is Hobbyking. But you have to be careful and make sure that where the product is requested to Hong Kong or USA, since it can take even two months to arrive. In the DroneTeam project, we have used components and also assembled drones to disassemble them. During three years of project, the price of components has not changed much, but assembled drones have decreased in price. Therefore, today it is convenient to review all options according to your needs:

PROS OF MAKING YOUR OWN DRONE:

- Upgrading: If you build your own drone, each part can be replaced or changed with an improved one.
- Enriches learning: You will gain tons of knowledge on assembling the parts.
- A sense of self-achievement: building a drone will give you a feeling of achievement.

PROS OF BUYING A DRONE:

- Ready to fly: can be put into flight almost immediately. Only require assembly the battery and may be propellers.
- No technical know-how required: You do need technical knowledge. • Assistance: You can have manufacturer warranty.
- All components are compatible and tested.

1.2 BUT, WHAT IS A DRONE?

We can say a drone is a flying robot. Drones are remotely controlled or they can fly autonomously through flight plans programmed in their embedded systems working in conjunction with onboard GPS and other sensors. Drones are more formally known as Unmanned Aerial Vehicles (UAVs)

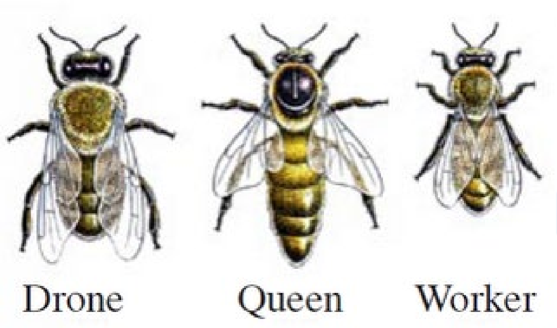
Although the word drone is widely used, it is also convenient to explain another terminology that is usually applied in regulations:

- Drone = professional use is a term of military origin. Now we call them Unmanned Aerial Vehicles (UAVs)
- For recreational use = multirotors, quadcopters, hexacopter, octocopter, etc.

How did we get here?

- The first drones cost millions of euros (military technology). The first commercial drones were high-end products (From 30,000€).
- The technology of smartphones, GPS, sensors, processors, allow having low-cost drones.

WHERE DOES THE DRONE WORD COME FROM?

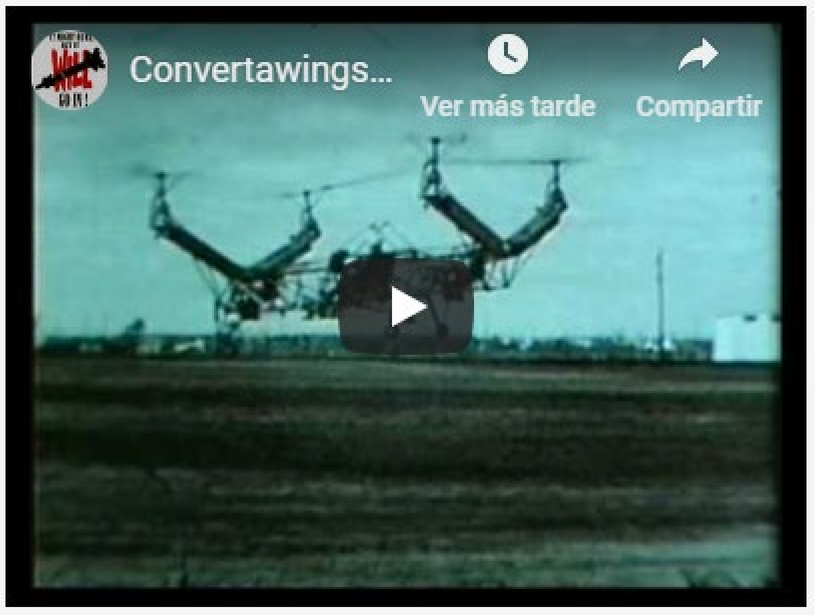


Is dating more than 100 years the origin of drones. Historically, it dates back to 1917. Several models were designed during World War I, but they didn't work ...

Photo: Havilland DH82B "Queen Bee"

In homage to the "Queen Bee", the word "drone" It was adopted by the English Navy as an alias for the successive devices that were built.

An example of a rotor:

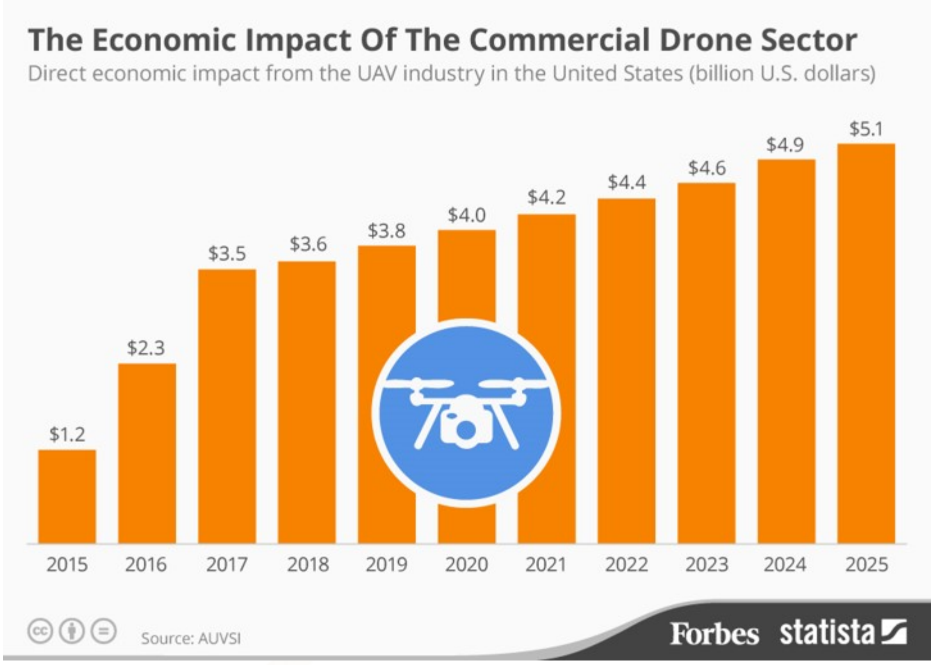


https://youtu.be/DJB0lJA0w0U

1.3 DRONE SECTOR DATA

To focus the topic, it is important to have clear information about the drone sector:

- According to Forbes, it is projected that the economic impact of the drone industry will be in the year 2025 from 8 to 10 trillion dollars (USD).



- More than 100,000 jobs will be created directly related to the drone industry.

- Drones offer more manageable solutions: they are 10 times simpler to pilot than a helicopter.

- We can find drones of 5cms and 50 metres.

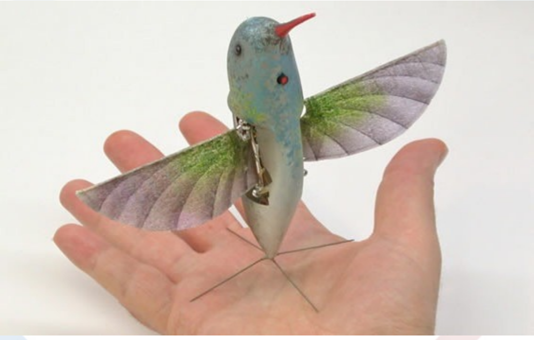
So we can say we are in the Age of Drones. For your knowledge, in this section some possibilities of the drones are gathered from the professional and from the leisure point of view.

1.4 THE AGE OF DRONES.

1.4.1 MILITARY USES.

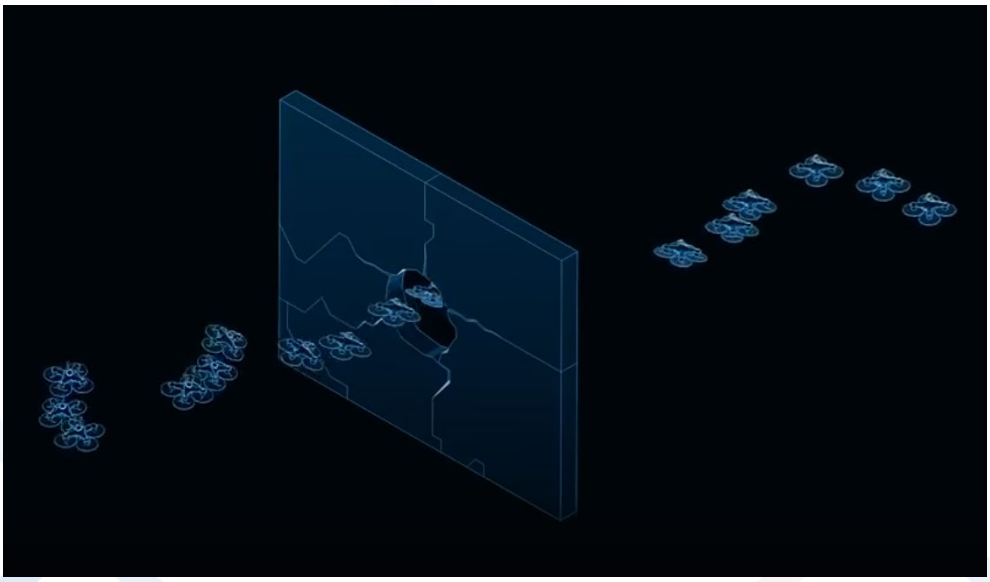
It should mean that the drone industry has evolved because of the strong investment in military technology. Many are the examples of military uses. It is not interesting here to make a list of developments that are known, but simply pay attention to innovative projects that are being carried out or that project a future on the use of drones that can be for military purposes.

The **Black Hornet Nano** is a military micro drone (10 × 2.5 cm and 16 g, including batteries). This drone can be used for espionage. With three cameras and the appearance of a hummingbird:



Draws attention to the possibilities that drones can offer in the military environment. We highlight the **Slaughterbots** campaign, a video that aims to raise awareness of the use of drones combined with artificial intelligence and facial recognition. It is a fictional video that aims to control the investment and development of these weapons. With an impressive staging, the video allows us to reflect on the use of drones with military uses.

EF-2
"EyeFire"
Anti-Personnel System
SS-4
"Stinger"
Anti-Personnel System
DX-1
"Vanguard"
Delivery/Breach System
ST-3
"SoftTouch"
Stealth Elimination
BB-6
"BreachBaby"
Explosive Entry System

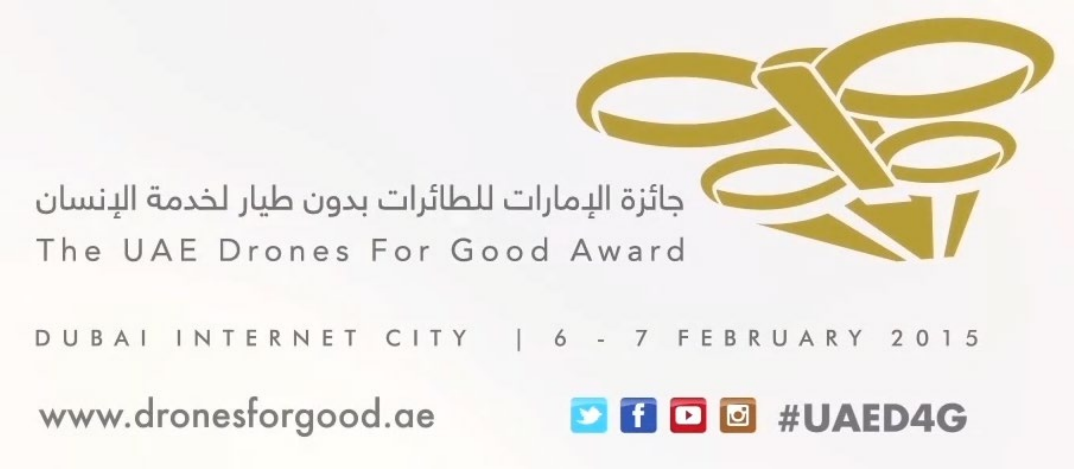


https://youtu.be/TlO2gcs1YvM

1.4.2 DRONES FOR GOOD.

Much more interesting is the use of drones to improve the lives of people. Many are the professional uses that are emerging. The drones provide efficiency in maintenance processes and safety for operators. In this regard we can highlight the UAE Drones for Good Award that rewards technological innovations and the use of drones since 2015.

UAE Drones for Good is an annual international contest and award by the government of the United Arab Emirates. The prize for the winner is 1 million dollars. From drones that locate mines, drones that are perfect for rescues in complex areas, hybrid drones that are peace to submerge, drones that work collaboratively in swarms ...


جائزة الإمارات للطائرات بدون طيار لخدمة الإنسان
The UAE Drones For Good Award
DUBAI INTERNET CITY | 6 - 7 FEBRUARY 2015
www.dronesforgood.ae
#UAED4G

https://youtu.be/P--YkskXWt4

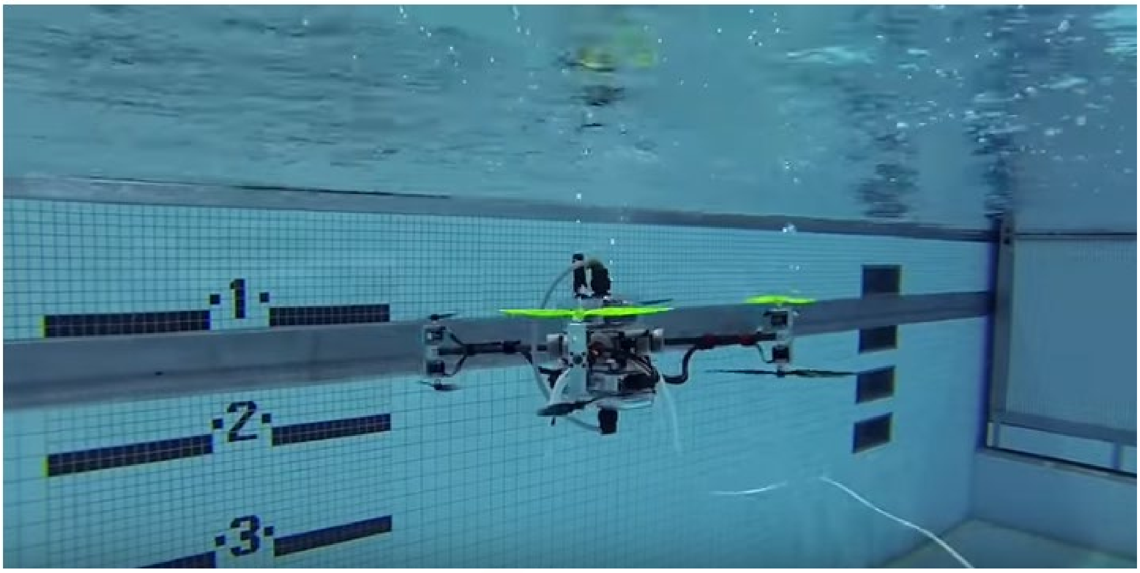
1.4.3 PROFESSIONAL USES.

Many are the examples of professional uses. Here we bring some videos that show the professional potential of drones:

AERONES
TECH INSIDER
Ti

Drones to put out fires: https://youtu.be/Bm2BVTTir4c

drones for rescues. This prototype was awarded in Drones for Good :
https://youtu.be/6yunaYjPsZs



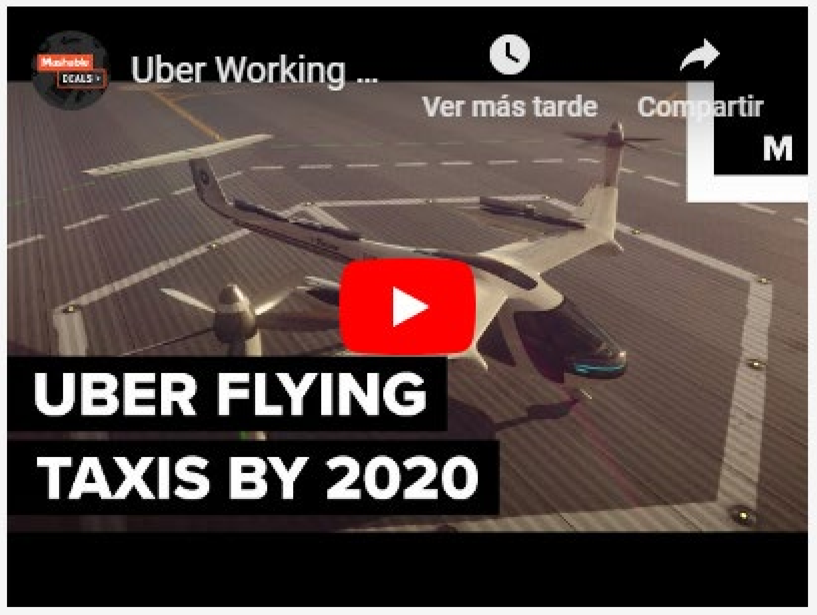
Drones capable of submerging: https://youtu.be/FC9EJhs0pc0

Athletic capabilities of drones: https://youtu.be/w2itwFJCgFQ

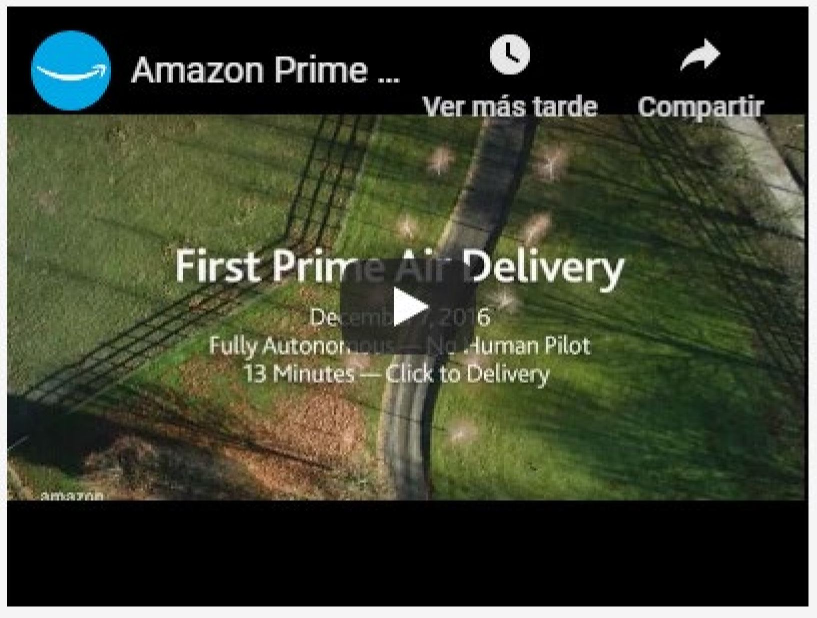
1.4.3.1 PLAYFUL USES.

EVOLUTION OF MAN

1.4.4 EXAMPLES OF DEVELOPMENTS:


Mashable DEALS
Uber Working ...
Ver más tarde
Compartir
M
UBER FLYING
TAXIS BY 2020

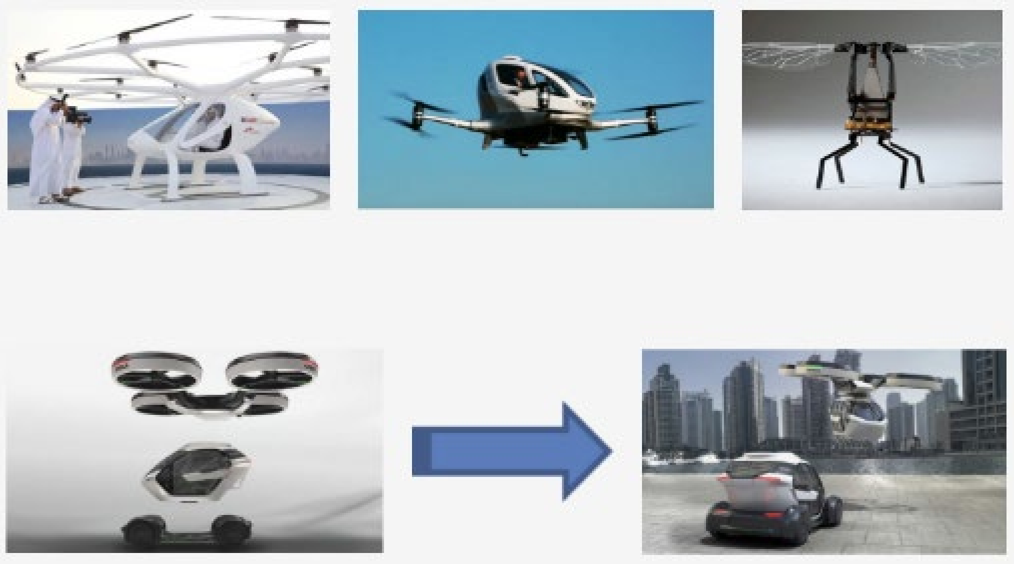
https://youtu.be/E7ZHEoefQxo


Amazon Prime ...
Ver más tarde
Compartir
First Prime Air Delivery
Fully Autonomous — No Human Pilot
13 Minutes — Click to Delivery
amazon

https://youtu.be/vNySOrI2Ny8

15 Coolest Ma...
Ver más tarde
Compartir

https://youtu.be/1juc7_7gnB0



Several examples of future UAV robot prototypes for people or for other uses. The Age of Drones is projected for next years.

1.4.5 PRESENTATIONS IN MAJOR EVENTS.

Winter Olympics Opening Ceremony, 1.218 drones in Pyeongchang Games:

https://youtu.be/01AMaaoILCM

1.4.6 DRONE COMPETITIONS.

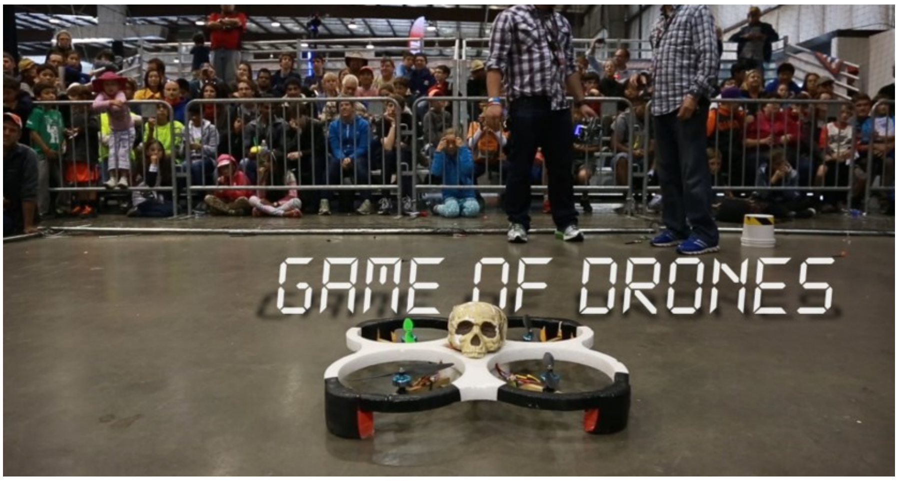
Drone racing:

START
FINISH

GoPro Awards:...
Ver más tarde
Compartir
RACE TIME
LAP TIME
BEST
SCORE
POS
LAP
22

https://youtu.be/lMyCMinOBYw

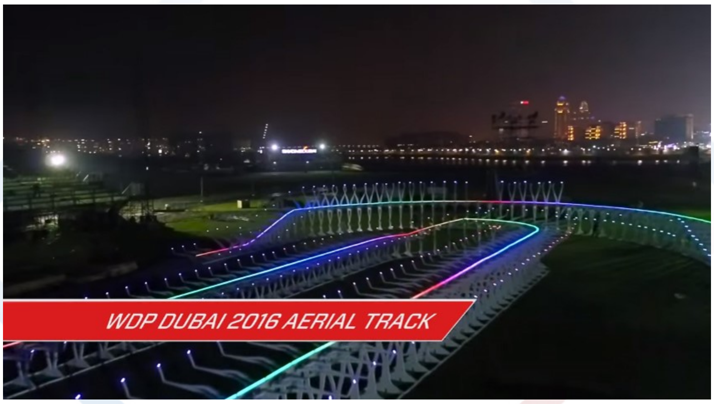
Drones fight:

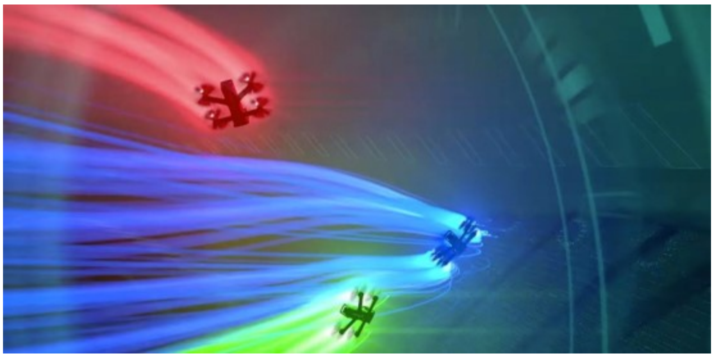

GAME OF DRONES

https://youtu.be/jFiYqVKFJ0U

World Drone Prix in Dubai:

It was the first drone race with 1 million dollars in prizes (March 2016).


WDP DUBAI 2016 AERIAL TRACK



Bloomberg
Go Inside the ...
Ver más tarde
Compartir
Bloomberg Business

https://youtu.be/pZ0viMxYDA4

World Drone Pr...
Ver más tarde
Compartir
TV FEED

https://youtu.be/gIM4zKvsTIQ

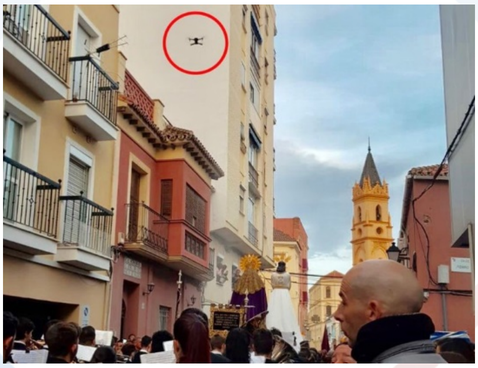
2 EDUCATION IN THE USE OF DRONES

Education in a crucial sector

The drones are giving new ideas for educational innovation. The goal is to inspire and give confidence to students to acquire new skills (STEM), necessary for the new digital era. In following sections of Drone It Yourself! Guide, you can find more about drones.

You have to educate in safety:

They denounce a woman for flying a drone over a procession during Holy Week (2018) In Spain.



The fine can reach 225,000 euros (in the most serious cases) and 45,000 in the mild cases according to the regulations of the State Agency for Air Safety.

Other cases of violation of the rules of the State Aviation Safety Agency with a drone:

FAA Violation. ...
Ver más tarde
Compartir

Violation flying a drone in Las Vegas (USA): https://youtu.be/KqbPf-mEf9Q

EXCLUSIVE: Dr...
Ver más tarde
Compartir

Simulation about drone and a plane: https://youtu.be/THCDsZLkOTk