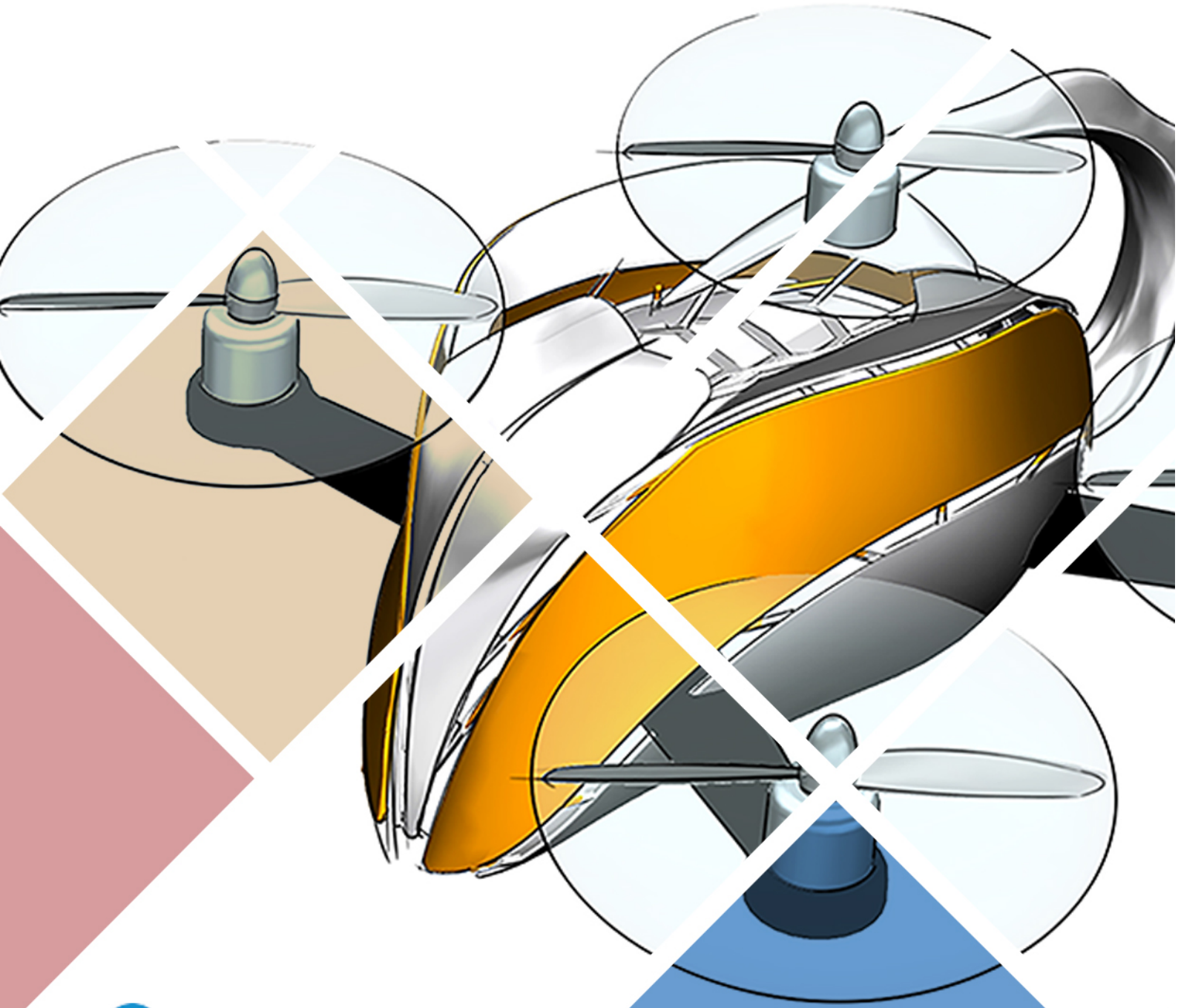


DRONE TEAM

Drone It Yourself!

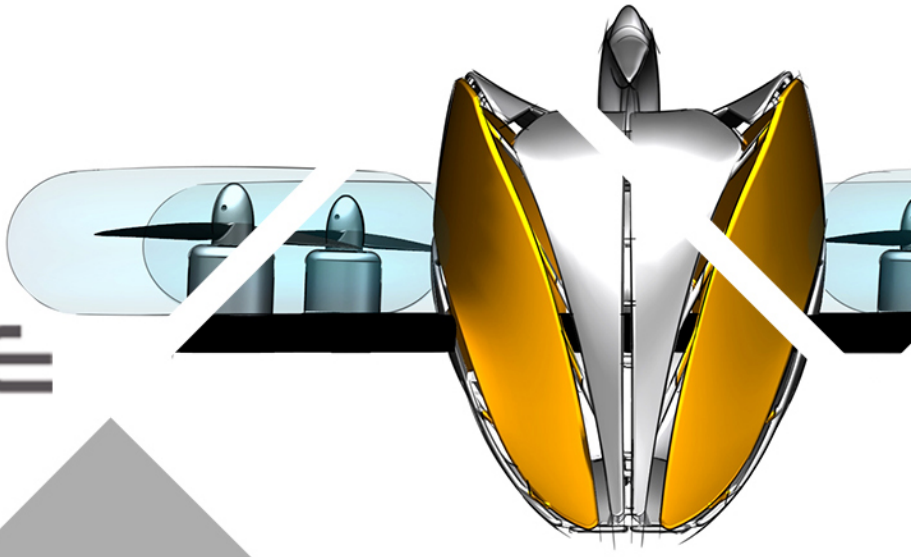
MAKING AND DESIGNING A TOY DRONE THROUGH MULTIDISCIPLINARY COLLABORATIVE WORK

Project no. 2015-1-ES01-KA202-015925

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

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.

GLOSSARY

2015-1-ES01-KA202-015925

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

Index

A 4
Accelerometer 4
Aerial Photography 4
AGL 4
Altitude Hold function 4
ARF 4
Autonomous Flight 4
Autopilot 4
Axis 4
B 4
Balanced Battery Charger 4
Barometric Pressure Sensor 5
Bind 5
BNF 5
Brushless Motor 5
Build 5
BVLOS 5
C 5
Camera gimbal 5
Commercial Flight 5
Controller 5
D 6
Drone 6
E 6
Electronic Speed Control 6
F 6
FAA 6
Firmware 6
First Person View 6
Flight Control System 6
Fly Away 6
Fly-Away Protection System 6

FPV 7
G 7
Gimbal 7
GoPro 7
GPS 7
Ground Control Station 7
Gyroscope 7
H 7
Headless Mode 7
Hexicopter 7
Hobby Grade 8
I 8
IMU 8
Inertial Navigation System 8
IOC 8
L 8
Line of Sight 8
LiPo 8
Lithium Polymer battery 8
M 8
Mobius Camera 8
Mod: modification 9
Multi-rotor copters 9
Multicopter 9
N 9
NAZA 9
No Fly Zone 9
O 9
Octocopter 9
OSD 9
P 9
Payload 9
Pitch 9
Power Distribution Board 10

Pre Flight Planning 10
Q 10
Quadcopter 10
R 10
R/C 10
Radio Controller 10
RC 10
Roll 10
RTF 10
S 10
Sense And Avoid 10
Servo 11
sUAS 11
T 11
Throttle 11
Toy grade 11
TX 11
U 11
UAV 11
Ultrasonic sensor 11
V 11
Visual line of sight 11
Visual Observer 12
VLOS 12
W 12
Waypoint 12
WiFi FPV 12
Y 12
YAW 12

A

Accelerometer

A device that measures the acceleration forces in a certain direction and helpful in maintaining the Drones orientation. These devices are used to stabilize quadcopters.

Aerial Photography

The hobby of capturing images and video while in the air with a camera mounted to your drone.

AGL

Altitude above ground level.

Altitude Hold function

Allows pilot to focus on the camera while the drone hovers steadily in air by itself at a set height. An on-board barometer is needed to allow Altitude Hold.

ARF

Almost ready to fly. This is used to describe a Quadcopter or a Drone that you are purchasing and what comes with it. ARF units will many times come without the transmitter, and they may require some assembly.

Autonomous Flight

There are some UAVs that are managed by internal programming that have instructions on where to fly as guided by an on-board GPS system. This is in opposition to steering mechanisms that are operated by radio control from the ground.

Autopilot

A capability of a drone to conduct a flight without real-time human control. For example, following pre-set GPS coordinates.

Axis

One plane of potential flight. Most quadcopters have at least 4 axis controls, with 6+ being preferred.

B

Balanced Battery Charger

This is a charger or an internal system for LiPo batteries (or different chemistries) which uses smart technology to charge multiple cells properly that are located within the battery and balances them.

Barometric Pressure Sensor

This device used barometric readings to determine the altitude of the aircraft. It can help drones to be able to calculate their height above the ground, along with using combinations of other sensors. (Enables Altitude Hold feature).

Bind

This is the process of making the controller (Transmitter) communicate with the quadcopter or the drone.

BNF

Bind N Fly. The unit is ready to bind to your transmitter and fly.

Brushless Motor

These motors have permanent magnets that rotate around a fixed armature, which eliminates any problems that could be associated with connecting current regarding a moving part. The brushless motors are much more efficient and hardy than brushed motors.

Build

A unit that is built at home as opposed to one that is store bought.

BVLOS

Beyond visual line of sight.

C

Camera gimbal

This is actually the holder of the camera used on drones. It can tilt and swerve, thanks to the servos that power it. The gimbal is strong enough to support even large DSLR cameras.

Commercial Flight

Flying a drone for money-making purposes. This is currently restricted by FAA regulations unless you apply for and receive an exemption.

Controller

The handheld device that is used by the drone pilot that is used to control the drone and the quadcopter. Controllers are also called transmitters. Here is a picture of a higher end controller.

D

Drone

An unmanned aircraft or ship guided by remote control or on-board computers.

E

Electronic Speed Control

ESC. The device for controlling an electric aircraft's motor. It is the connection between the RC receiver and main battery. It usually includes a Battery Elimination Circuit (BEC), which provides the power for the on-board electronics like an autopilot and the RC system.

F

FAA

Federal Aviation Administration a United States Department of Transportation Agency, with the authority to regulate and oversee all aspects of American civil aviation.

Firmware

The sketch or software loaded into the microprocessor based products' non-volatile memory. The reason it is referred to as firmware is because it remains in non-volatile memory state even when power is removed. Therefore, it is non-volatile. In the autopilots case, it is an application (App for smart phone users) or program that determines how and what the auto pilot does.

First Person View

Also known as FPV, a system in which the drone operator views the camera footage from the drone in real-time. The video stream is either viewed through a pair of special goggles, or to a device like a tablet or smartphone.

Flight Control System

This is a network of controls that is interconnected and allows the pilot to fly the quadcopter or any other multi-rotor airborne vehicle.

Fly Away

Unintended flight outside of operational boundaries (altitude/airspeed/lateral) as the result of a failure of the control element or on-board systems, or both.

Fly-Away Protection System

A system that will return the UAV safely to the surface, or keep it within the intended operational area, when the link between the pilot and the UAV is lost.

FPV

Acronym for "First Person View.” This is also known as "Remote Person View” (RPV). The FPV is situated on a camera (such as GoPro) and is mounted on the Quadcopter which allows the operator view exactly what the aerial vehicle is viewing in real time.

G

Gimbal

This is a specialized mount for a camera, giving it the ability to swerve and tilt by utilizing servos. This gives the camera the capability of staying in one position, regardless of the movement of the drone. This allows for a very smooth and stabilized looking image.

GoPro

Top name in high-definition camcorders, often used in extreme-action video photography. It is an HD-quality, waterproof video recording device that is compact, lightweight, rugged. With attachments they can be wearable or mounted on vehicles.

GPS

Global Positioning System that is used to track the position of an object in relation to the global spatial plane, track movement, or cause an airborne vehicle such as a quadcopter to hold position, such as the advanced Dji Phantom.

Ground Control Station

GCS. This software runs on the ground on a computer. It receives telemetry information via an airborne UAV. It displays its status and progress. This frequently include sensor and video data. It also can be used for transmitting in-flight commands up to the UAV in the air.

Gyroscope

A gyroscope or gyro, measures the rate of rotation of the UAV and helps keep the craft balanced correctly with respect to yaw, pitch and roll. Helps to maintain the orientation of the quadcopter while in flight. In most cases, quadcopters use a triple-axis gyroscope.

H

Headless Mode

Regardless of the orientation of the craft, the way the front of the craft is pointed, it will follow your stick movements.

Hexicopter

A multi-rotor aircraft having six rotors in which the beauty and advantage of the hexicopter is that it can lose any single engine and still maintain control to land.

Hobby Grade

Better than toy grade, these quads can offer a good reliability and operation at a reasonable price tag. The Syma X8G, JJRC H25G and Parrot AR. Drone 2.0 are a few examples of hobby grade quads.

I

IMU

The Inertial Measurement Unit is a controller which combines an accelerometer and a gyro, with the purpose of helping with the orientation and stabilization of a quad.

Inertial Navigation System

INS. This is a means of calculating position that is based on the initial GPS reading. This is followed by speed and motion sensor readings that use dead reckoning. This is useful when the GPS has lost its signal temporarily or is not available.

IOC

Intelligent Orientation Control - Usually, the forward direction of a flying multi-rotor is the same as the nose direction. By using Intelligent Orientation Control (IOC), wherever the nose points, the forward direction has nothing to do with nose direction.

L

Line of Sight

Also known as LOS, refers to being able to see your drone from your operating position with your naked eye. Your drone should always be within your line of sight.

LiPo

Short for Lithium Polymer, LiPo is the type of battery favoured by most drone manufacturers due to its low weight and maximized charge capacity and power. Although LiPos are safe, be aware overcharging the battery or breaking the flexible polymer case could result in fire.

Lithium Polymer battery

LiPo or LiPoly. The Lithium Ion battery (Li Ion) is a variant. Lighter weight and more power is offered by this battery chemistry compared to NiCad and NiMh batteries.

M

Mobius Camera

Popular lightweight camera model which can shoot video in HD and take intervalometer photos. It was developed mainly to be used with RC drones.

Mod: modification

Drone addicts modify their machines to integrate new functions or cool features. These changes are usually called mods.

Multi-rotor copters

Are referred to by many names, which include: Drone, Quadcopter, Quadricopter or Quadrocopter.

Multicopter

A generic name for a drone with multiple propellers. Aerial drone with multiple horizontal propellers, also known as rotors. Depending on the number of rotors, we can have tricopters, quadcopters, hexacopters, octocopters and so on.

N

NAZA

Is a flight controller that is used on the DJI Phantom Drones and it contains the main control chip, an accelerometer, a gyroscope, and a barometric altimeter.

No Fly Zone

Areas where flying a drone is restricted by government regulations. Areas where a drone could interfere with an airplane or record sensitive information make up most of these areas.

O

Octocopter

A drone with 8 horizontal propellers or rotors.

OSD

Abbreviation for "On Screen Display".

P

Payload

The amount of additional weight a drone is able to lift in addition to its own weight and batteries. If you attach a camera and gimbal to your drone, the combined weight is the payload.

Pitch

A measure which describes the flight angle along one axis, usually measured from level in case of aerial vehicles.

Power Distribution Board

Is the PDB and is a board that is used on the multicopters to help distribute the power to each of the motors to provide proper stabilization of the unit.

Pre Flight Planning

The activities conducted by the pilot and flight crew prior to take-off to ensure that the flight will be conducted safely and in accordance with all applicable standards and regulations. The activity includes, but is not limited to, such things as checking weather, route of flight, airspace, equipment configuration, support personnel, terrain and communications requirements.

Q

Quadcopter

UAV that typically has 4 propellers, situated in a square formation for smooth and precise flight.

R

R/C

Synonym for Radio Controlled.

Radio Controller

Wireless handheld device used to control flight of the drone.

RC

Shorter way of writing "Radio Controlled - it refers to control of a drone via radio waves.

Roll

Roll is the side to side tilt of the drone.

RTF

Ready to Fly - This means the drone is sold with everything needed in the pack. All you need to do is put it together, add batteries and you are ready to use it. It is possible you may need to buy the batteries separately. This fact is usually mentioned on the box.

S

Sense And Avoid

The capability of a UAS to remain well clear from and avoid collisions with other airborne traffic. Sense and Avoid provides the functions of self-separation and collision avoidance.

Servo

A shorter name for servomotor or servomechanism. Aerial vehicles use servomotors for various functions such as pan cameras and wing flaps adjustments which can be controlled from the ground.

sUAS

Is short for - small Unmanned Aircraft System.

T

Throttle

Control that influences the RPM or the speed of electric motors.

Toy grade

The basic level of quadcopters, usually priced under $100, using relatively cheap components. Not very reliable, toy grade quads can still offer a wide variety of functions. They can be an excellent way to start for beginners, as they can still provide a lot of fun, despite the lack of reliability. when you are ready, you can move on to a hobby grade machine or even or more advanced ones, but you have to be ready to pay a higher price.

TX

Short for transmitter or transmit.

U

UAV

Unmanned Aerial Vehicle. A device that can propel itself through the air without a pilot on-board. Drones and quadcopters are UAVs.

Ultrasonic sensor

A sensor that uses the ultra sound wavelength to communicate with a transmitter. In aerial vehicles, ultrasonic sensors are used for calculating the distance to the ground by bouncing sound waves back and forth. They don't work further than a few meters from the ground.

V

Visual line of sight

Is the term that is going to control how the pilot can see the aircraft from the ground without the use of artificial vision.

Visual Observer

A crew member who assists the UAS pilot in the duties associated with collision avoidance. This includes, but is not limited to, avoidance of other traffic, airborne objects, clouds, obstructions, and terrain. Most associated with FPV flying.

VLOS

Abbreviation for Visual Line of Sight.

W

Waypoint

A set of coordinates which define a point in space. Waypoints are useful in designing various autonomous missions for quadcopters. Mapping out would be impossible without a possibility to define these physical locations.

WiFi FPV

Mostly found on cheaper drones, usually performed by a downloaded APP. which you connect to in order to fetch the live feed. The signal is compatible with most Android/iOS smartphones and tablets.

Y

YAW

The describes the quadcopter rotation around its centre axis on a level plane.