



UNIVERSITAT POLITÈCNICA DE CATALUNYA

BARCELONATECH

Escola Tècnica Superior d'Enginyeries  
Industrial i Aeronàutica de Terrassa

Titulació:

**Grau en Enginyeria en Tecnologies Aeroespacials**

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Títol TFG:

**Study of a feasible solution for a specific mission with unmanned aerial vehicles(UAV/RPAS)**

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**Aitor Martín Sierra**

Convocatòria de lliurament del TFG: **Juny 2016**

Contingut d'aquest volum: **BUDGET**



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# **Study of a feasible solution for a specific mission with unmanned aerial vehicles(UAV/RPAS)**

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Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de

Terrassa

ESEIAAT

**Grau en Enginyeria en Tecnologies Aeroespacials**

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Director del TFG: Aitor Martín Sierra

**Juny 2016**



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## List of Abbreviations

**CFRP:** Carbon Fibre Reinforced Polymer

**GFRP:** Glass Fibre Reinforced Polymer

**MAN:** Manufacturing

**RDTE:** Research, development, test and evaluation cost

**UAS:** Unmanned Aerial System

**UAV:** Unmanned Aerial Vehicle



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## 1. Introduction

This document includes the budget of the solution proposed in the study that has been calculated taking into account the following costs:

- Research, development, test and evaluation cost
- Manufacturing cost

Finally, the cost of the raw materials has been tabulated.



## 2. Budget

### 2.1. Research, development, test and evaluation cost

Table 1: Research, development, test and evaluation cost

<b>RESEARCH, DEVELOPMENT, TEST AND EVALUATION COST</b>	
<b>Engineering cost</b>	
Pre-design phase	
Hours worked	300 h
Price per hour	15 €/h
<b>Total</b>	<b>4 500 €</b>
Design phase	
Number of engineers	2
Salary	42 000 €/year
Time	2 years
<b>Total</b>	<b>168 000 €</b>
<b>TOTAL</b>	<b>172 500 €</b>
<b>Development support and testing cost</b>	
Development support and testing cost	2 085 €
<b>TOTAL</b>	<b>2 085 €</b>
<b>Flight test cost</b>	
Flight test cost	18 876 €
<b>TOTAL</b>	<b>18 876 €</b>
<b>Research, development, test and evaluation cost profit</b>	
Research, development, test and evaluation cost profit	24 182.60 €
<b>TOTAL</b>	<b>24 182.60 €</b>
<b>Financial</b>	
Financial	24 182.60 €



<b>TOTAL</b>	<b>24 182.60 €</b>
<b>TOTAL RDTE COST</b>	<b>241 826 €</b>

## 2.2. Manufacturing cost

Table 2: Manufacturing cost

<b>MANUFACTURING COST</b>	
Engineering and design cost	51 750 €
Production cost	1 255 800 €
Financial cost	141 950 €
<b>TOTAL MAN. COST</b>	<b>1 419 500 €</b>

## 2.3. Total budget

$$\text{Total budget} = C_{RDTE} + C_{MAN} = 1 661 326 €$$

The total budget includes the manufacturing costs of all the UAV produced in the considered life of the product, that has been fixed to 200 units. Therefore, the calculation of the price of the UAV has been made:

$$\text{Price} = \frac{C_{RDTE} + C_{MAN}}{200} = \frac{241 826 + 1 419 500}{200} = 8 307 €$$

It has to be noted that the price corresponds only for the UAV. The payload and the ground control station are products manufactured by other companies.



### 3. Raw materials cost

The cost of the raw materials of the UAV proposed in the study have been tabulated.

**Table 3: Raw materials cost for the solution proposed**

Item	Price
<b>UAV</b>	
Propulsion system	
RCV engine	500 €
Propeller	29 €
Fuel tank	1200 €
Raw materials	
Balsa wood	$15,625 \frac{\text{€}}{\text{kg}} \cdot 2 \text{ kg} = 31,3 \text{ €}$
GFRP	$3,44 \frac{\text{€}}{\text{kg}} \cdot 4,5 \text{ kg} = 15,5 \text{ €}$
CFRP	$97 \frac{\text{€}}{\text{kg}} \cdot 3,5 \text{ kg} = 339,5 \text{ €}$
Flight Control System and Communication System	
Autopilot (Lisa/S)	385 €
XBee modem	28 €
Power supply	
On board generator system	120 €
<b>UAV platform</b>	<b>2 639 €</b>
<b>Payload</b>	
Payload camera	26 300 €
<b>UAV with payload</b>	<b>28 939 €</b>
<b>Ground Control Station</b>	



Ground Control Station	3 000 €
<b>TOTAL GCS</b>	<b>3 000 €</b>
<b>TOTAL UAS</b>	<b>31 939 €</b>
<b>TOTAL UAS without payload</b>	<b>5 589 €</b>
<b>Extra equipment</b>	
Pneumatic catapult	20 950 €
Landing gear	910 €