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Master's Degree in Aeronautical Engineering

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Numerical Resolution of Fluid Dynamics and Heat and Mass Transfer problems
Application to Combustion processes

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Budget

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1. Introduction

This document presents an economic study considering the cost of this project. The aim of this is to provide a guide of the expenditures a person would find if he/she wanted to develop the simulations and programming exposed in the study, or perform a similar project to the one presented, as well as an extension to it.

Since the developed work is a study that can be developed with accessible resources, not a project, the exhaustivity and extension of this document is limited as it is not necessary to develop deeper analyses on this issue.

2. Cost breakdown

First expenditures come from the amount of energy destined to computational part of the project. The PC has been used for a total of 300 hours on this study. This gives a total of 151.2 kWh of energy consumed (see report). According to EDF taxes, the cost of electricity is of 15.87 cts/kWh, and considering the amount of energy used plus a safety margin, the total energy cost is assumed to be around 25.00 €. The reason why this part of the budget is so low is due to the low consumption of a laptop such as the one used for the study.

Regarding the software, there are many open-source C++ programming environments (the one used was Dev C++). However, the programming language of MATLAB, which has been used for the post-processing, has a license that has to be purchased. The cost of an annual license is of 800.00 €, and it must also be taken into account in the budget of the project.

Additionally, the elaboration of the proper documentation in printed format accounts for approximately 30.00 €.

Finally, all the hours worked on this project must also have its correspondent remuneration. For the case of this study, different hour costs have been established, differentiating between stages A, G and H and the other ones. This distinction is done since the most demanding work is done in the stages devoted to program development and simulations. On the following table is summarized the costs of each phase.

ITEM	TIME SPENT (H)	COST/HOUR	TOTAL COST
PHASE A	10	25.00 €	**250.00 €**
PHASE B	100	30.00 €	**3,000.00 €**
PHASE C	70	30.00 €	**2,100.00 €**
PHASE D	100	30.00 €	**3,000.00 €**
PHASE E	60	30.00 €	**1,800.00 €**
PHASE F	80	30.00 €	**2,400.00 €**
PHASE G	40	25.00 €	**1,000.00 €**
PHASE H	20	25.00 €	**500.00 €**
TOTAL	**300**	-	**14,050.00 €**

Table 1. Human costs of the study.

Taking into consideration all the previous expenditures, the total budget of this project is displayed below.

EXPENDITURE	TOTAL COST
LICENSES	500.00 €
ENERGY	25.00 €
HUMAN COSTS	14,050.00 €
DOCUMENTATION COSTS	30.00 €
TOTAL	**14,605.00 €**

Table 2. Total budget of the study.

Thus, the budget of the study of the numerical resolution of Fluid Dynamics and Heat and Mass Transfer problems applied to Combustion processes is of approximately 14,600.00 €.