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Title:

Study of coupling of vibration countermeasures applied on airplane structural elements

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1. Structure overview

This section gives an explanation of the items covered in the budget. Indirect costs are taken into account in the wage of the engineer in charge of the study. The budget is divided in three main sections that generate expenses:

- Labor
- Software
- Hardware

The final relation of costs is presented in table 1.1.

Labor	Amount	Amort. period	Price / Unit time	Quantity	Total
Vibration Engineer			50	300 hr	15.000
Software costs					
MSC Nastran+Patran 2010	10.050	12 mo.	838	4 mo.	3.350
MATLAB 2010	2.000	24 mo.	83	4 mo.	333
Hardware Costs					
Working computer	750	24 mo.	31	3 mo.	94
Calculation Hardware	2.000	24 mo.	83	4 mo.	333
					19.110

Table 1.1: Budget table in €

2. Detailed concepts

This section gives a more detailed explanation of the concepts included in the budget.

2.1 Labor

The concept includes the wage of the engineer in charge of the study, as well as the indirect costs associated with the workplace.

The dedication of labor time is detailed in table 2.1.

Concept	Hour no.	Percentage	Cost
Theory research	80	26.67%	4000€
Formulation	100	33.33%	5000€
Programming	120	40.00%.	6000€

Table 2.1: Labor hour dedication

2.2 Software

The software costs include the yearly license price of the commercial programs needed for the simulations and programming, scaled to the timespan in which it has been dedicated to the study.

There are two main commercial software used in the study:

- **MATLAB 2010:** 2000 €for a 2 year period.
- MSC Nastran + MSC Patran 2010: 10050 €for a 1 year period.

2.3 Hardware Costs

It includes the price of the hardware used in the study scaled to the amount of time it has been devoted to it. Hardware has been considered to have a life of 2 years, taking into account the fact that a hardware older than 2 years is not competitive anymore, even if it still functions.

The hardware is divided in two kinds of equipment;

- **Working computer:** Used for programming and visualization of models.
- **Calculation hardware:** Used for simulating and performing calculations requiring a big computation capacity.