

I. IDENTIFICATION DATA

Thesis name:	Study of launcher recovery systems
Author's name:	Mauro Eusebio Rojas Sigala
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Control Engineering
Thesis supervisor:	Dr. Élcio Jeronimo de Oliveira
Supervisor's department:	doc. Kristian Hengster-Movric, Ph.D.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
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Evaluation of thesis difficulty of assignment.

This thesis deals with the analysis and proposal of a stage recovery system for small launchers. This problem presents a high level of difficulty that demands a multidisciplinary capability in space systems. For instance, only few years ago it was demonstrated a cost effective project by the company Space X. In this way, a complete solution of this problem is out of the range of a unique master thesis. However, a general analysis with a reasonable approximation can take place in a master thesis as done by the author.

Satisfaction of assignment	fulfilled with minor objections
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Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.

A control project, even a simple one, for the reentry stage is not developed in this thesis, being left for a future research. A good control project will impact in the final sizing and payload capability of the launcher, as well as in the final cost of this sort of project. However, considering the short time to develop this master thesis, it should be taken into account the relative complexity of this topic which demands time to be developed properly.

Activity and independence when creating final thesis	A - excellent.
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Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.

After some meetings receiving the general background to guide his research, the student worked independently by developing his own computational codes, as well as the whole research by analyzing and comparing the theory and data available in the current literature.

Technical level	A - excellent.
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Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

As addressed before, to develop this specific topic demands a very good understanding and application of a multitude of skills in the space area, as well as time. In the specific case of this thesis, considering the short time, the work covered most of the key areas demanded to achieve an acceptable preliminary design/result.

Formal and language level, scope of thesis	B - very good.
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Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

In general, the thesis is well structured and written in a clear and sequential way, which make easy its understanding. The theoretical/mathematical development, references and codes used are clear and follow the formal scientific language. However, a review/correction in some graphics need to be done.

Selection of sources, citation correctness	B - very good.
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Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished.



SUPERVISOR'S OPINION OF FINAL THESIS

from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.

During the regular meetings to follow up the thesis progress, it was clear the use of good references and the care, by the student, with the use of some "not well informed" parameter. However, in the Reference List a publication appears twice with different heading.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

Please insert your commentary (voluntary evaluation).

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation.

I evaluate handed thesis with classification grade **B - very good**.

Date: 30.8.2020

Signature:

I. IDENTIFICATION DATA

Thesis title:	Study of launcher recovery systems
Author's name:	Rojas Sigala Mauro Eusebio
Type of thesis :	master
Faculty/Institute/	Czech Technical University in Prague
Department:	Faculty of Electrical Engineering (FEE) Department of Control Engineering & Lulea University of Technology Department of Computer Science, Electrical and Space Engineering (SRT)
Thesis reviewer:	Mgr. Jaroslav Kousal, Ph.D.
Reviewer's department:	Czech Technical University in Prague Faculty of Mechanical Engineering (FME) Department of Aerospace Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment <i>How demanding was the assigned project?</i>	challenging
The assignment had several parts. Both the development (design) of the draft of the prototype propulsion and the study of the impact of the developed recovery concept on the space sector are broad topics already.	
Fulfilment of assignment <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	fulfilled with minor objections
The assignment was generally fulfilled, however, the "impact on the space sector" is mostly "between the lines".	
Methodology <i>Comment on the correctness of the approach and/or the solution methods.</i>	correct
The methodology in terms of the theoretical background is mostly correct.	
Technical level <i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	C - good.
Most of the calculations are sound in the detail, but the overall picture is kind of hazy. For example, on various places in the work, the scaling of the subsystems are taken as directly proportional to the total mass of the system (the rocket launcher). This is a very crude estimation, since the 1D/2D/3D scaling laws play a significant role both in terms of physics and technology. Another point is that the propulsion system is designed carefully in terms of dimensions, but not in the terms of mass. Also, in the section 3.3 it seems that the Stage 1 is initially designed with thrust/weight ratio below 1.	
Formal and language level, scope of thesis <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	C - good.
The thesis is generally readable, but the amount of various language mistakes and errors (including sentences cut in half) sometimes hamper the comprehension of the text. It seems that the author did not read the final text in full. There are also some formal issues (missing page numbering, figures not referenced in the text etc.).	
Selection of sources, citation correctness	B - very good.

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The set of sources seems to generally cover the topics treated in the work. However, sometimes it is not clear what is the actual author's work (e.g. in the MATLAB codes).

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

The thesis had to deal with a challenging topic and the author had to work with a multi-layered problem. The very core of the work seems to be sound, but it seems that a full treatment of this topic would need some more time to refine.

During the presentation/defense I suggest the following questions to be answered:

- 1) On various places of the work a linear scaling of subsystem mass with total system mass is assumed. Which of these assumptions lead to overestimation and which ones to underestimation of the subsystem mass?
- 2) What would be the estimated mass of the propulsion system (in the final iteration)?

The grade that I award for the thesis is **C - good**.

Date: 28.8.2020

Signature: