Thesis Title

Candidate Full Name

Thesis to obtain the Master of Science Degree in

Aerospace Engineering

Supervisor(s): Professor Full Name 1 and Professor Full Name 2

Examination Committee

Chairperson:	Professor Full Name
Supervisor:	Professor Full Name 1 (or 2)
Member of the Committee:	Professor Full Name 3

Month and Year

Dedicated to someone special...

Acknowledgments

A few words about the university, financial support, research advisor, dissertation readers, faculty or other professors, lab mates, other friends and family...

Resumo

Inserir o resumo em Português aqui com o máximo de 250 palavras e acompanhado de 4 a 6 palavras-chave...

Palavras-chave: palavra-chave1, palavra-chave2,...

Abstract

Insert your abstract here with a maximum of 250 words, followed by 4 to 6 keywords...

Keywords: keyword1, keyword2,...

Contents

List of Tables

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Nomenclature

Greek symbols

α Angle of attack.

β Angle of side-slip.

κ Thermal conductivity coefficient.

μ Molecular viscosity coefficient.

ρ Density.

Roman symbols

C_D Coefficient of drag.

C_L Coefficient of lift.

C_M Coefficient of moment.

p Pressure.

$\mathbf{u}$ Velocity vector.

u, v, w Velocity Cartesian components.

Subscripts

∞ Free-stream condition.

i, j, k Computational indexes.

n Normal component.

x, y, z Cartesian components.

ref Reference condition.

Superscripts

* Adjoint.

T Transpose.

Glossary

CFD Computational Fluid Dynamics is a branch of fluid mechanics that uses numerical methods and algorithms to solve problems that involve fluid flows.

CSM Computational Structural Mechanics is a branch of structure mechanics that uses numerical methods and algorithms to perform the analysis of structures and its components.

MDO Multi-Disciplinar Optimization is an engineering technique that uses optimization methods to solve design problems incorporating two or more disciplines.

Chapter 1

Introduction

Insert your chapter material here...

1.1 Motivation

Relevance of the subject...

1.2 State-of-the-art

Insert your section material with the appropriate citations. These can be cited in the following way:

Citation mode #1 - Jameson et al. [1998]

Citation mode #2 - Jameson et al. [1998]

Citation mode #3 - [Jameson et al., 1998]

Citation mode #4 - Jameson, Pierce, and Martinelli [1998]

Citation mode #5 - [Jameson, Pierce, and Martinelli, 1998]

Citation mode #6 - Jameson et al. 1998

Citation mode #7 - Jameson et al., 1998

Citation mode #8 - Jameson et al.

Citation mode #9 - 1998

Citation mode #10 - [1998]

Several citations can be made simultaneously as Nocedal and Wright [2006], Marta et al. [2007].

The style can be changed from numerical citation order to authors' last name with option `\usepackage[numbers]{nat` in file `Thesis_Preamble.tex`.

1.2.1 Tables

Insert your subsection material and for instance a few tables...

item 1	item 2
item 3	item 4

Table 1.1: Table caption

Make reference to Table 1.1.

Model	C_L	C_D	C_{My}
Euler	0.083	0.021	-0.110
Navier–Stokes	0.078	0.023	-0.101

Table 1.2: Aerodynamic coefficients.

Here is an example of a table with merging columns:

	Virtual memory [MB]	
	Euler	Navier–Stokes
Wing only	1,000	2,000
Aircraft	5,000	10,000
(ratio)	$5.0\times$	$5.0\times$

Table 1.3: Memory usage comparison (in MB).

1.2.2 Drawings

Insert your subsection material and for instance a few drawings...

The schematic illustrated in Fig. 1.1 can represent some sort of algorithm.

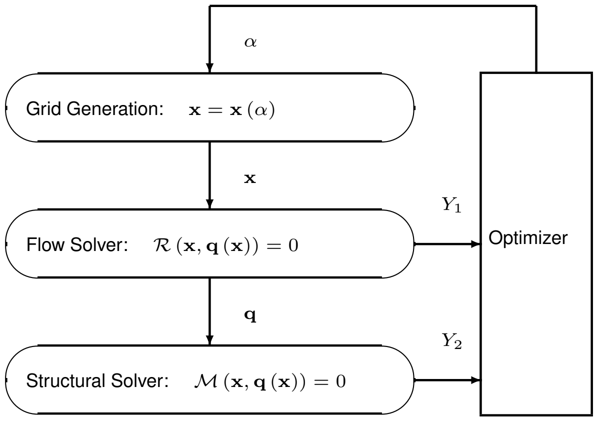

Figure 1.1: Schematic of some algorithm.

Chapter 2

Results

Insert your chapter material here, much like in 1

2.1 Figures

Insert your section material and possibly a few figures...

Figure 2.1: Caption for figure.

Make reference to Figure 2.1.

(a) Airbus A320 (b) Bombardier CRJ200

Figure 2.2: Aircrafts.

By default, the supported file types are *.png,.pdf,.jpg,.mps,.jpeg,.PNG,.PDF,.JPG,.JPEG*.

See http://mactex-wiki.tug.org/wiki/index.php/Graphics_inclusion for adding support to other extensions.

2.2 Equations

Equations can be inserted in different ways.

The simplest way is in a separate line like this

$$\frac{\mathrm{d}q_{ijk}}{\mathrm{d}t} + \mathcal{R}_{ijk}(\mathbf{q}) = 0\,. \tag{2.1}$$

If the equation is to be embedded in the text. One can do it like this $\partial\mathcal{R}/\partial\mathbf{q} = 0$.

It may also be split in different lines like this

$$\begin{aligned} \text{Minimize} \quad & Y(\alpha, \mathbf{q}(\alpha)) \\ \text{w.r.t.} \quad & \alpha\,, \\ \text{subject to} \quad & \mathcal{R}(\alpha, \mathbf{q}(\alpha)) = 0 \\ & C(\alpha, \mathbf{q}(\alpha)) = 0\,. \end{aligned} \tag{2.2}$$

It is also possible to use subequations. Equations 2.3a, 2.3b and 2.3c form the Naver–Stokes equations 2.3.

$$\frac{\partial \rho}{\partial t} + \frac{\partial}{\partial x_j}\left(\rho u_j\right) = 0\,, \tag{2.3a}$$

$$\frac{\partial}{\partial t}\left(\rho u_i\right) + \frac{\partial}{\partial x_j}\left(\rho u_i u_j + p\delta_{ij} - \tau_{ji}\right) = 0, \quad i = 1,2,3\,, \tag{2.3b}$$

$$\frac{\partial}{\partial t}\left(\rho E\right) + \frac{\partial}{\partial x_j}\left(\rho E u_j + p u_j - u_i \tau_{ij} + q_j\right) = 0\,. \tag{2.3c}$$

Chapter 3

Conclusions

Insert your chapter material here...

3.1 Achievements

The major achievements of the present work...

3.2 Future Work

A few ideas for future work...

Bibliography

A. Jameson, N. A. Pierce, and L. Martinelli. Optimum aerodynamic design using the Navier–Stokes equations. In *Theoretical and Computational Fluid Dynamics*, volume 10, pages 213–237. Springer-Verlag GmbH, Jan. 1998.

A. C. Marta, C. A. Mader, J. R. R. A. Martins, E. van der Weide, and J. J. Alonso. A methodology for the development of discrete adjoint solvers using automatic differentiation tools. *International Journal of Computational Fluid Dynamics*, 21(9–10):307–327, Oct. 2007. doi:10.1080/10618560701678647.

J. Nocedal and S. J. Wright. *Numerical optimization*. Springer, 2^{nd} edition, 2006. ISBN:978-0387303031.

Appendix A

Vector calculus

In case an appendix if deemed necessary, the document cannot exceed a total of 100 pages...

Some definitions and vector identities are listed in the section below.

A.1 Vector identities

$$\nabla \times (\nabla \phi) = 0 \tag{A.1}$$

$$\nabla \cdot (\nabla \times \mathbf{u}) = 0 \tag{A.2}$$