Master of Science Thesis

The Main Title Of the Thesis

A Subtitle to Enlighten the Reader

M.Y.N. Ame B.Sc.

My Graduation Date

Faculty of Aerospace Engineering · Delft University of Technology

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For obtaining the degree of Master of Science in Aerospace Engineering at Delft University of Technology

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Faculty of Aerospace Engineering · Delft University of Technology

Delft University Of Technology
Department Of
Design, Integration and Operations of Aircraft and Rotorcraft

The undersigned hereby certify that they have read and recommend to the Faculty of Aerospace Engineering for acceptance a thesis entitled **"The Main Title Of the Thesis"** by **M.Y.N. Ame B.Sc.** in partial fulfillment of the requirements for the degree of **Master of Science**.

Dated: My Graduation Date

Head of department: _____
prof.dr.ir. P.R. Of

Supervisor: _____
dr.ir. D.A.I. Ly Supervisor

Reader: _____
ir. G.U. Est

Reader: _____
ir. Reader Four

Summary

This is the summary of the thesis.

Acknowledgements

I wish to thank the following persons...

Delft, The Netherlands
My Graduation Date

M.Y.N. Ame B.Sc.

Contents

Nomenclature

Latin Symbols

m	Mass	[kg]
$\dot{m}$	Mass flow	[kg/s]
$\bar{x}$	State vector of a dynamical system	[-]

Greek Symbols

α	This is a very long explanation, and without this, it is still too short to show you what I want to show...	[rad]
γ	flight path angle	[rad]
δ	some coefficient to show proper sorting of symbols	[-]
θ	Angle of pitch	[rad]
μ	Friction Coefficient	[-]
ϕ	Flight path angle	[rad]

Subscripts

i	An index, or something...

Superscripts

2	Square me

Abbreviations

PD	Proportional – derivative
PID	Proportional – integral – derivative
P	Proportional

Other Symbols

[ ]	Matrix
¯	Vector quantity
{ }	Column vector

Chapter 1

Introduction

1.1 Before You Start

First of all, install the latex class and the LyX layout file. The following steps assume that you are using Windows Vista or 7 with LyX 2.0 installed.

1. Copy the class file (`dutmsc.cls`) into a folder with the same name into `C:\Users\your_user_name\AppData\Roaming\MiKTeX\2.8\tex\latex`.
2. In a command prompt (type `cmd` in start menu), type `texhash`, or press the Update FNDB button in the GUI. What you will now see it doing is iterating through several folders for new classes, one of which (`C:\Users\your_user_name\AppData\Roaming\MiKTeX\2.8\`) is where we copied the `dutmsc.cls` class file into.
3. Copy the LyX layout file (`dutmsc.layout`) into `c:\program files (x86)\lyx\Resources\layouts`.
4. Within Lyx, hit Tools > Reconfigure, then restart Lyx when asked for.

If you never have worked with LyX before, read the tutorial (Help ▷ Tutorial)

1.2 Thesis information

To change the title, author, etc of the thesis, edit the latex preamble (Document ▷ Settings ▷ LaTeX Preamble.

1.3 Tables

Look at Table 1.1a. Iz nice, no?

It uses two custom commands to add some space just after (bottom) and before (top) a horizontal line, `\B` and `\T` in ERT. Without them, the table would look really bad (see Table 1.1b).

Param	Value	Unit
v_i	11.47	$[\mathrm{m\,s^{-1}}]$
ΩR	212.25	$[\mathrm{m\,s^{-1}}]$
λ_i	0.054	$[-]$

(a) Improved vertical spacing in tables

Param	Value	Unit
v_i	11.47	$[\mathrm{m\,s^{-1}}]$
ΩR	212.25	$[\mathrm{m\,s^{-1}}]$
λ_i	0.054	$[-]$

(b) Default vertical spacing in tables

Table 1.1: Difference between default and improved spacing in tables.

1.4 Shorthand Notations for Sine, Cosine and Tangent

Three commands are available to display sine, cosine and tangent of angles in math mode: $\mathcal{C}_\alpha$, $\mathcal{S}_\beta$, $\mathcal{T}_\gamma$.

1.5 Nomenclature

Adding nomenclature entries differs from the original latex style to minimize ERT.

1.5.1 Categories

There are several categories in the nomenclature. To put your symbol in the right one, add the appropiate letter in the *beginning* of the sort as field:

A latin symbols

G greek symbols

W subscripts

X superscripts

Y acronyms

Z other symbols

1.5.2 Sorting

To sort symbols properly, an additional fourth mandatory argument is added to the Greek, Latin and Other symbols. These add the ability to sort similar symbols (such as $\dot{m}$and

m) in the proper order (m before $\dot{m}$). The way to make sure that the symbol for mass flow appears after the symbol for mass is by adding letters in the sorting field.

For instance, mz comes after mm when sorted, which means that the symbol of mass flow will be put after the symbol for mass.

Something similar can be done for the Greek symbols. If γ (third letter in the Greek alphabet) should appear before δ (fourth letter), add a letter to force proper sorting.

In table 1.2, you can find the sort symbols (index) that I used to make sure that the Greek symbols appear in the correct order in the nomenclature.

Greek Symbol	Command	Index	Greek Symbol	Command	Index
α	\alpha	aa	o	o	oo
β	\beta	bb	Π	\Pi	p
Γ	\Gamma	c	π	\pi	pp
γ	\gamma	cc	ρ	\rho	qq
Δ	\Delta	d	Σ	\Sigma	r
δ	\delta	dd	σ	\sigma	rr
ϵ	\epsilon	ee	τ	\tau	ss
ζ	\zeta	ff	Υ	\Upsilon	t
η	\eta	gg	υ	\upsilon	tt
Θ	\Theta	h	Φ	\Phi	u
θ	\theta	hh	ϕ	\phi	uu
ι	\iota	ii	χ	\chi	vv
κ	\kappa	jj	Ψ	\Psi	w
Λ	\Lambda	k	ψ	\psi	ww
λ	\lambda	kk	ω	\omega	xx
μ	\mu	ll	Ω	\Omega	x
ν	\nu	mm			
Ξ	\Xi	n			
ξ	\xi	nn			

Table 1.2: Sort symbols used to sort all Greek letters

1.5.3 Units

add \nomunit{[unit]} to the end of the description.

1.5.4 examples

The angle of attack α can be calculated from the pitch angle θ and the flight path angle ϕ as follows[1]:

$$\alpha = \theta + \phi \tag{1.1}$$

Same thing for Latin symbols:

$$\bar{x}^2 = \theta_i \tag{1.2}$$

[1]Note that the sign depends on the definition of the angles.

For subscripts and superscripts (as depicted in Eq 1.2), something special is needed. The sub- and superscripts must be added separately. The commands for sub- and superscripts also have only two obligatory arguments, instead of three as is the case with the Latin and Greek symbols.

Acronyms are also part of the nomenclature list.

P, PD, and PID controllers.

At last, there is a possibility for other symbols that do not fit in any of the above categories, such as symbols to denote matrices or vector quantities, such as , and .

1.6 Bibliography/literature

These are some references just for the sake of it. If you want to know more about ground effect models, consult [1]. For an introduction into helicopter aerodynamics, read [2]. And a reference to LAPACK [3].

This thesis uses a bib-file (named biblio.bib), which contains a database of references. To fill it, use a bibtex editor. I suggest you use the Zotero and LyZ add-ons for Firefox.

References

[1] H. Xin. *Development and Validation of a Generalized Ground Effect Model for Lifting Rotors*. Ph.D. Thesis, Georgia Institute of Technology, Georgia, Atlanta, 1999.

[2] J. G. Leishman. *Principles of Helicopter Aerodynamics*. Cambridge Aerospace Series. Cambridge University Press, Cambridge, 2002.

[3] LAPACK – Linear Algebra PACKage. http://www.netlib.org/lapack/, July 2006.

Appendix A

Mathematical Model

A.1 Introduction

This appendix contains the math model of the thesis. It looks as follows:

$$c = \sqrt{a^2 + b^2} \tag{A.1}$$