

北京航空航天大学撰写学位论文规定

Guidelines of Beihang University for Writing Theses/Dissertations

(Revised in September 2010)

A thesis/dissertation is deemed a piece of work to demonstrate the creative outcomes and ideas of the author in his/her scientific research and to apply for a degree.

For a Master's Degree, the thesis should show evidence that the applicant has mastered the basic theory and systematic knowledge in a specific research field and has acquired the capability of conducting research.

For a Doctoral Degree, the dissertation should show evidence that the applicant has demonstrated mastery of a solid basic theory and systematic knowledge in a specific research field, made creative results on his or her scientific research or specialized technology, and acquired the capability of conducting research independently.

"*Guidelines of Beihang University for Writing Theses/Dissertations*" is formulated so as to improve the quality of the dissertation for a postgraduate and standardize its format.

Chapter 1: Basic Requirements and Content of a Thesis/Dissertation

1.1 Basic Requirements

The thesis/dissertation should be accurate, logical, coherent, and convincing.

All concepts in a thesis/dissertation should be clarified accurately. Analysis should be in-depth and comprehensive. Terms and abbreviations should be explained in their first use. All views made in the research should be supported by relevant references and reliable data. All illustrations should be relevant, accurate, comprehensive, and consistent. The used measurement units and drawing norms should comply with the national standards of the People's Republic of China.

1.2 Content

The content should include: background, basis, and significance of the research; a literature and related research overview, research and design program, experimental methods, equipment and results; important calculations, data, diagrams, curves and relevant analysis; necessary appendixes and catalogue of references.

For a cooperative project, the dissertation should focus on his/her own research of the author. It should clearly indicate the achievements jointly made by the author and his/her tutor or other co-workers.

Chapter 2: Main Structure and Binding Order

The thesis/dissertation should consist of 13 parts and be bound in the following order:

- (1) Front Cover (Chinese & English versions)
- (2) Title Page
- (3) Statement of Originality and Authorization Statement for Thesis Use

- (4) Abstract (Chinese)
- (5) Abstract (English)
- (6) Contents
- (7) Lists of Diagrams and Abbreviations/Acronyms/Terms
- (8) Body of Thesis/Dissertation
- (9) References
- (10) Appendixes
- (11) Research or Academic Achievements during Master/PhD Study Period
- (12) Acknowledgements
- (13) Author Profile

Chapter 3: Writing Standard and Printing Styles

3.1 Writing Standard

3.1.1 Language

For international postgraduate students, the thesis/dissertation's content, main body, and acknowledgements and other parts can be written in English, but the front cover, title page, and statement of originality and authorization statement for thesis use should be written in Chinese. The abstract should be written in both Chinese and English.

3.1.2 Paper Size and Printing Style

A4 Paper (210×297mm) of white color should be used. All of the front cover (the Chinese and English versions), the title page, and statement of originality and authorization statement for thesis use should be printed on a single side of paper. All the others should be typed on both sides of paper. If the thesis/dissertation contains fewer than 50 pages, then it should be printed on one side of paper.

3.1.3 Font Style and Size

Thesis/dissertation title: according to the specific regulations

Chapter title: size 16 pt, bold, center, Times New Roman

Section title: size 14 pt, bold, left, Times New Roman

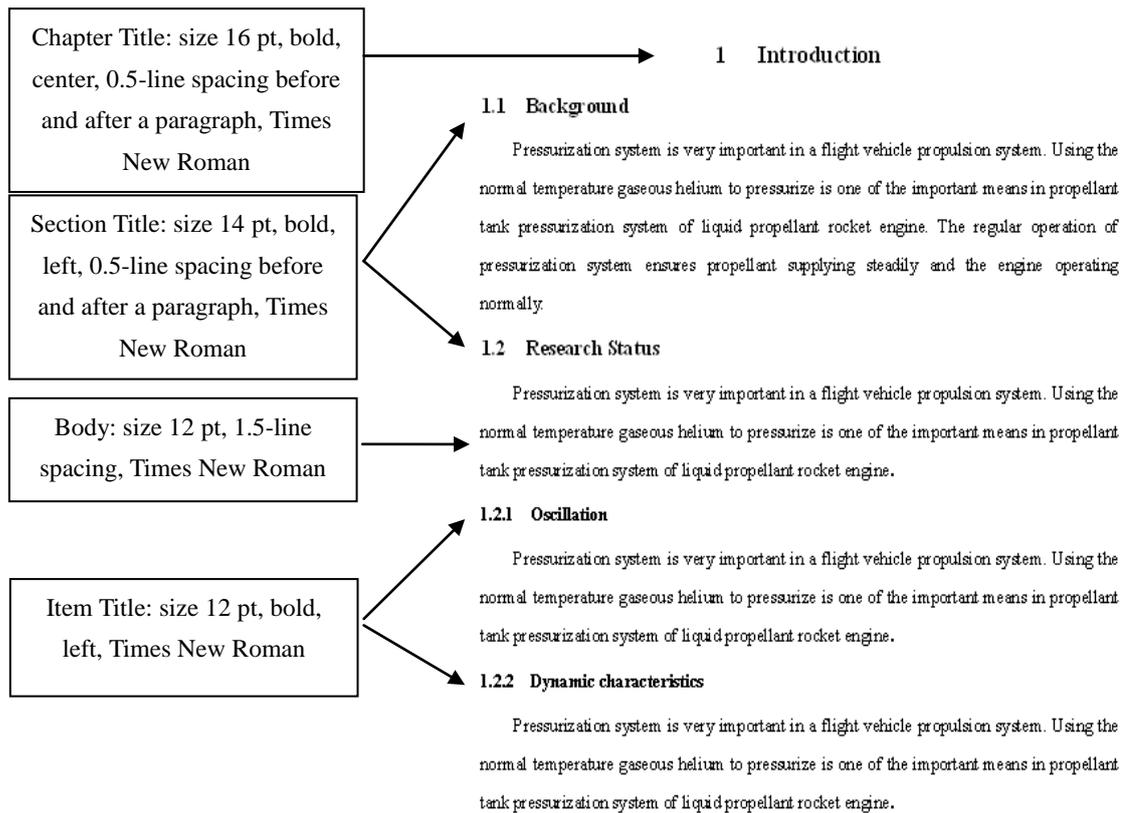
Item title: size 12 pt, bold, left, Times New Roman

Body: size 12 pt, Song typeface

Page number: size 10.5 pt, Song typeface

Number and letter: Times New Roman

Sample:



3.2 Page Layout

3.2.1 Page Margin and Line Spacing

Page margins:

Top margin = 25 mm

Bottom margin = 25 mm

Left margin = 30 mm

Right margin = 20 mm

Line Spacing: Chapter, section, and item titles should be in single spacing. 0.5 line spacing is required before and after a paragraph.

In the body paragraphs, 1.5-line spacing without blank line spacing before or after a paragraph is required.

3.2.2 Header and Footer

Both header and footer must be 15 mm from the edge.

The header should start from the main body of the thesis/dissertation (Introduction or Chapter 1). Odd and even numbered pages should be differently labeled. For odd numbered pages, the header should indicate “BUAA Academic Dissertation/Thesis for Doctoral/ Master’s Degree”. For even numbered pages, the header should indicate the chapter sequence and title, for example, “Chapter 4 Strategic Analysis on Cultivating Chinese Enterprises’ Competitiveness”. The header should be in the font style of 9 pt Song typeface.

3.2.3 Page Numbers

All pages of the thesis/dissertation from the start (introduction, main body, and conclusion) to

finish (acknowledgements and author profile) must be continuously paginated in 10.5 pt Arabic Number, with the page numbers in the center of the footer.

The front cover, statement of originality, and authorization statement for thesis use should not be paginated.

Abstracts, content, lists of diagrams and abbreviation/acronyms/terms are consecutively numbered in small 10.5 pt Roman Number, with the page number in the center of the footer.

3.3 Technical Terms

The full expression of Technical Terms should be clearly indicated in their first use.

Notes should be given when necessary.

3.4 Physical Quantities, Symbols, and Measurement Units

All physical quantities, symbols, and measurement units should comply with the provisions of the “China Statutory Measurement Units” as released and implemented by the People’s Republic of China, and national standard “Quantity and Units” (GB3100-3102).

3.5 Diagrams, Tables, and Annotations

Diagrams and tables should be located below the text of their first reference. If there is not enough room to arrange them on the same page, they should be placed on the following page.

3.5.1 Diagrams

The diagrams should be self-explanatory. All diagrams, regardless of which chapter they are in, should be numbered “Diagram 1, Diagram 2, etc. ...” in sequence from the beginning to the appendix of the thesis/dissertation.

The diagram title should be concise in 10.5 pt, bold Times New Roman. There should be two spaces between the diagram number and title. The number and title of the diagram should be centered below the diagram. The text in diagrams should be in 10.5 pt, Song typeface style.

The graph must be marked with “quantities, normative symbols, and units” in the X-axis and Y-axis. They can be omitted only when their indication is unnecessary. In addition, the symbols and abbreviations of the marked quantities should be consistent with those in the text.

Sample:

Diagram Title: size 10.5 pt, bold,
Times New Roman

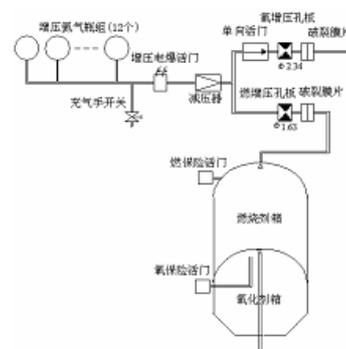


Figure 1 Pressurization System Sketch

3.5.2 Tables

Tables should be self-explanatory. The content and testing items are usually read horizontally from

left to right. The data is read vertically according to its order. All tables, regardless of which chapter they are in, should be numbered “Table 1, Table 2, etc. ...” in sequence from the beginning to the appendix of the thesis/dissertation.

The table title should be concise in 10.5 pt, bold Song typeface style. There should be two spaces between the table number and title. The number and title of the table should be marked in the center above the table. The text in the table should be written in 10.5, pt Song typeface style.

If a table cannot be displayed on one page, it can be displayed continuously with the same layout on the following page. For example:

Table 1: Result of Plan 1 (continued)

The table title and units should be repeated for the continued table.

Sample:

Table Title: size 10.5 pt, bold, Times New Roman	→	Table 1 Parameters			
	No.	Parameter	Unit	Value	Remark
	氮气气瓶				
	1	Pressure	MPa	23	
	2	Temperature	K	288.15	

3.5.3 Annotations

If a diagram or a table needs annotations, the annotations should be written below the diagram or table in the following form: “annotation + Arabic number + colon”. For instance, “Annotation 1:” The text should be written in 10.5 pt, Song typeface style.

3.6 Formulae

Each formula should be ordered and labeled according to chapters. The label should consist of a pair of two numbers or a pair of a letter and a number in parenthesis. The label should be listed on the right side of the line end.

For example, “(3.2)” indicates this is the second formula in Chapter 3; “(B3)” indicates this is the third formula in Appendix B.

3.7 Notes

Notes can be used to explain some terms and situations and should be listed on the bottom of the same page or at the end of the same article. The note signal in the text should be marked as ^[note 1] in Arabic numbers.

Chapter 4: Specific Formats for Each Section of Thesis/Dissertation

4.1 Front Cover

The front cover paper for the thesis/dissertation is supplied at certain printing workshops. The front cover of the thesis/dissertation should be printed with the standard paper and design format. The title of the thesis/dissertation should be accurate and concise, with no more than 25 words. A subtitle can be used if necessary. The specific disciplinary should be clearly indicated. The name of the School should be fully spelled out.

4.2 Superscription Page

The information in the superscription page of the thesis/dissertation should be more detailed than on the front cover page. The additional information in the superscription page should include: research direction under the discipline, the degree applied for, specific dates of enrollment, thesis/dissertation submission, and thesis/dissertation defense. All dates should be written in Arabic numbers.

4.3 Statement of Originality and Authorization Statement for Thesis Use

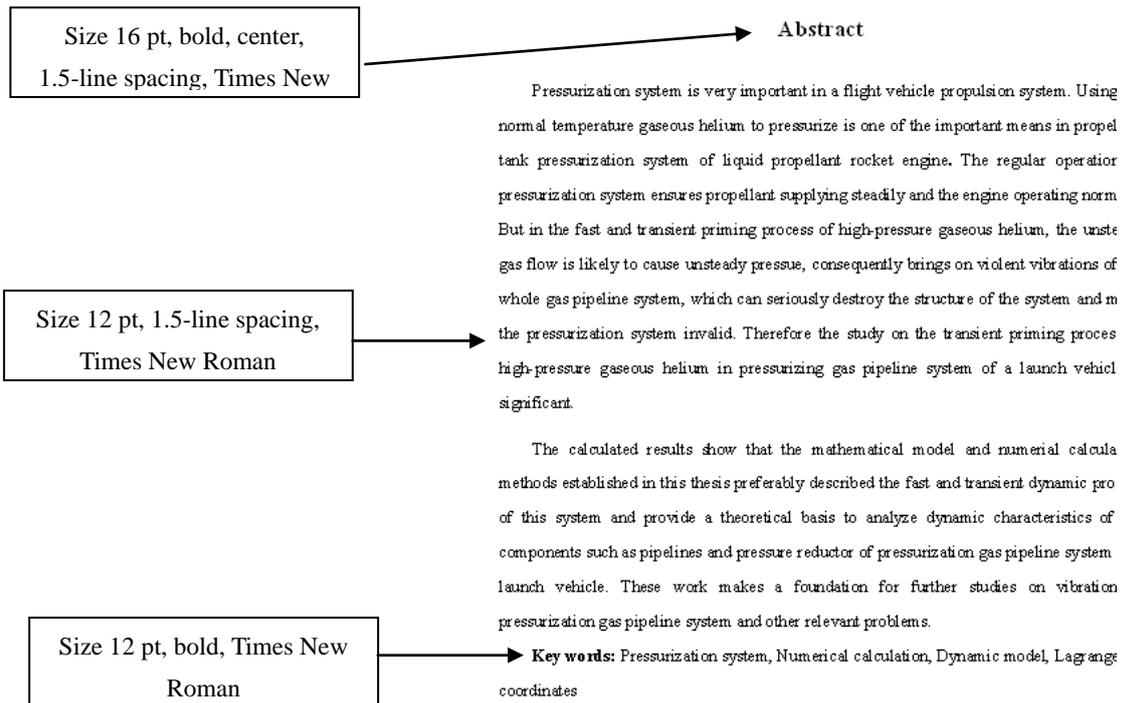
The statement should contain names and signatures of both the author and his/her tutor along with the signature date.

4.4 Abstracts

The abstract should be precise and concise. It should reflect the significance, methodology, and the results or conclusion of the research. The Chinese abstract of the Doctoral dissertation should contain 800-1200 words, while that of the master's thesis should contain about 500 words. The English version of the abstract should be consistent with that of the Chinese version and should be printed in the Times New Roman with the same font size as the Chinese version.

Key words following the abstract should be representative of the research contents of the thesis/dissertation with 3-8 words, separated with comma, but with no punctuation sign after the last.

Sample:



4.5 Contents

It should consist of three ranks: chapter numbers, section titles and item titles. It should include all the parts of the dissertation.

Sample:

Size 18 pt, bold, Times New Roman	→ Contents
Size 12 pt, 1.5-line spacing, Times New Roman	1 Introduction 1 1.1 Background..... 1 1.2 Research Status..... 2 1.2.1 Oscillation..... 2 1.2.2 Dynamic characteristics 2 1.3 Dissertation's Structure..... 2 2 Basic Theory 3 3 Mathematical Model 5 4 Program 7 5 Examples and Results 9 Conclusion 11 References 13 Research Fruits 15
Size 10.5 pt, bold, 1.2-line spacing, Times New Roman	→
Size 12 pt, bold, single spacing, 0.5-line spacing before paragraph, Times New Roman	→

4.6 Lists of Diagrams and Abbreviations/Acronyms/Terms

If the thesis/dissertation contains many diagrams, the diagrams could be listed after the list of content. The list of diagrams should include serial numbers, diagram titles and page numbers. All symbols/ abbreviations/acronyms/terms used in the thesis/dissertation should be appended alphabetically to the list of diagrams.

4.7 Thesis/Dissertation Body

The thesis/dissertation body is composed of the introduction, main body, and conclusion.

4.7.1 Chapter Titles

Each chapter should begin on a new page. Generally, the chapter title should not contain abbreviations and punctuation marks, although in some cases acronyms are allowed. The chapter title should be no more than 15 words. The number of sections or sub-sections depends on their actual needs. The titles should be numbered in Arabic number in Times New Roman style.

4.7.2 Introduction

The introduction is the first chapter of the dissertation, which should describe the purpose, focus, methodology, experiments and corresponding results of the research. The introduction of the Doctoral dissertation should contain no less than 8,000 words, and the Master's thesis no less than 5,000 words.

4.7.3 Main Body

The main body of the thesis/dissertation is the core part of the thesis/dissertation. Generally it contains the methodology, materials, equipment, and conclusion of the research followed by detailed analysis of results. The main body of the doctoral dissertation should contain 60,000 to 100,000 words, and that of the master's thesis 30,000 to 50,000 words.

4.7.4 Conclusion

The conclusion is a summary of the whole thesis/dissertation, but not a simple repetition of previous chapters. It aims to concisely summarize the creative ideas, findings, or significance of the research both accurately and completely. It may put forward some problems to be probed into or make

suggestions for further studies.

If the research cannot reach any conclusion, necessary discussions are still allowable.

4.8 References

All works, which have been used or quoted in the research in one way or otherwise, should be referred here to avoid the plagiarism.

All items in References should be edited, either in Chinese or in English, according to the following formats:

- [1] 毛峡, 丁玉宽. 图像的情感特征分析及其和谐感评价[J]. 电子学报, 2001, 29(12A) : 1923-1927
- [2] Ozgokmen T. M., Johns W. E., Peters H., et al. Turbulent Mixing in the Red Sea Outflow Plume from a High-Resoluting Nonhydrostatic Model [J]. Journal of Physical Oceanography, 2003, V33 (8): 1846-1869
- [3] 刘国钧, 王连成. 图书馆史研究[M] . 北京: 高等教育出版社, 1979: 15-50
- [4] 毛峡. 绘画的音乐表现[A]. 中国人工智能学会 2001 年全国学术年会论文集[C]. 北京: 北京邮电大学出版社, 2001: 739-740
- [5] Xia, Mao, et al. Analysis of Affective Characteristics and Evaluation of Harmonious Feeling of Image Based on 1/f Fluctuation Theory[A] . International Conference on Industrial & Engineering Applications of Artificial Intelligence & Expert Systems (IEA/AIE) [C]. Australia Springer Publishing House, 2002: 17-19
- [6] 张和生. 地质力学系统理论[D]. 太原: 太原理工大学, 1998
- [7] 姜锡洲. 一种温热外敷药制备方案[P] . 中国专利: 881056078, 1983-08-12
- [8] 毛 峡. 情感工学破解‘舒服’之迷[N] . 光明日报, 2000-4-17(B1)
- [9] 冯西桥. 核反应堆压力容器的 LBB 分析[R] . 北京: 清华大学核能技术设计研究院, 1997
- [10] 王明亮. 中国学术期刊标准化数据库系统工程的[EB/OL] ,
<http://www.cajcd.cn/pub/wml.txt/980810-2.html>, 1998-08-16/1998-10-04

Where

Reference Type	Journal	Monograph	Conference Proceeding	A paper	Dissertation	Patent
Acronym	J	M	C	A	D	P
Reference Type	Standard	Newspaper	Report	General		
Acronym	S	N	R	G	Z	

[DB/OL]: Database Online

[DB/MT]: Database on Magnetic Tape

[M/CD]: Monograph on CD-ROM

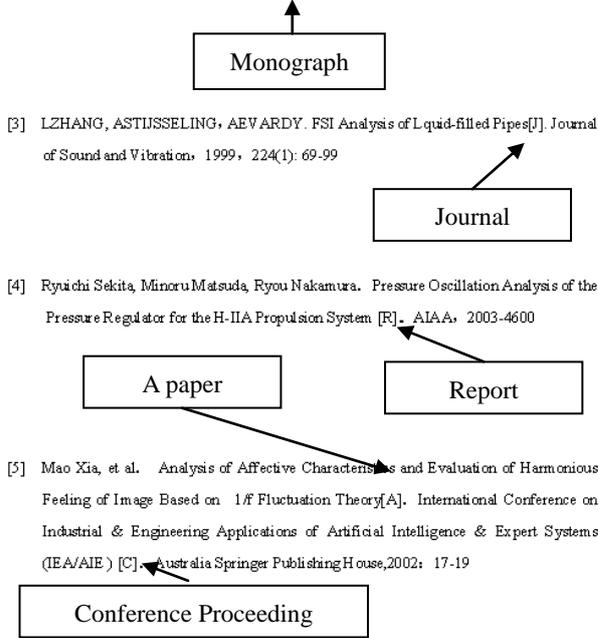
[CP/DK]: Computer Program on Disk

[J/OL]: Serial Online

[EB/OL]: Electronic Bulletin Board Online

Sample:

[2] Cai Yigang. Fluid Pipeline Dynamics[M]. Zhejiang: Zhengjiang University Press, 1990



[3] LZHANG, ASTJUSSELING, AEVARDY. FSI Analysis of Liquid-filled Pipes[J]. Journal of Sound and Vibration, 1999, 224(1): 69-99

[4] Ryuichi Sekita, Minoru Matsuda, Ryou Nakamura. Pressure Oscillation Analysis of the Pressure Regulator for the H-IIA Propulsion System [R]. AIAA, 2003-4600

[5] Mao Xia, et al. Analysis of Affective Characteristics and Evaluation of Harmonious Feeling of Image Based on 1/f Fluctuation Theory[A]. International Conference on Industrial & Engineering Applications of Artificial Intelligence & Expert Systems (IEA/AIE) [C]. Australia Springer Publishing House, 2002: 17-19

References

[1] Ozgolmen T. M., Johns W. E., Peters H., et al. Turbulent Mixing in the Red Sea Outflow Plume from a High-Resolving Nonhydrostatic Model[J]. Journal of Physical Oceanography, 2003, V33(8): 1846-1869

[2] Cai Yigang. Fluid Pipeline Dynamics[M]. Zhejiang: Zhengjiang University Press, 1990

[3] LZHANG, ASTJUSSELING, AEVARDY. FSI Analysis of Liquid-filled Pipes[J]. Journal of Sound and Vibration, 1999, 224(1): 69-99

[4] Ryuichi Sekita, Minoru Matsuda, Ryou Nakamura. Pressure Oscillation Analysis of the Pressure Regulator for the H-IIA Propulsion System [R]. AIAA, 2003-4600

[5] Mao Xia, et al. Analysis of Affective Characteristics and Evaluation of Harmonious Feeling of Image Based on 1/f Fluctuation Theory[A]. International Conference on Industrial & Engineering Applications of Artificial Intelligence & Expert Systems (IEA/AIE) [C]. Australia Springer Publishing House, 2002: 17-19

[6] Perry W. Stout, S. Antony Snell. Multiple On-Off Solenoid Valve Control for a Launch Vehicle Propellant Tank Pressurization System[J]. AIAA, 99-4085: 798-804

[7] Kimberly Holt, Alok Majumdar, Todd Steadman, et al. Numerical Modeling and Test Data Comparison of Propulsion on Test Article Helium Pressurization System[R]. AIAA, 2000-3719

[8] Alok Majumdar, John W. Bailey, Paul Schallhorn, et al. A Generalized Fluid System Simulation Program to Model Flow Distribution in Fluid Networks[R]. AIAA 98-3682

4.9 Appendix

Appendix is supplementary rather than essential to the thesis/dissertation. It should be attached at the end of the thesis/dissertation.

4.10 Research Outcomes

As for a Doctoral dissertation, research outcomes include the academic outcomes made during PhD study period, including the applicant's published papers, registered patents and obtained awards, and the research projects conducted during PhD study period, including the name, source and duration of the project.

As for a Master's Degree thesis, academic outcomes made during master study period only include the applicant's published papers and works, registered patents, and awards.

The writing style is the same as that of References.

4.11 Acknowledgments

In this part, the author is to express his or her gratitude to the tutor and the other persons & organizations that have contributed to the present research work.

4.12 Author Profile

This is required for the Doctoral dissertation only.

It consists of the name, gender, nationality, birth date, birth place, education background, professional interests of the author, and his or her achievements during the PhD period.

4.13 Archiving

The applicant should submit both hard and soft copies (electronic version) of his/her thesis/dissertation in the required format.

The hard copies should be bound in the place as specified by the applicant's school. The applicant must submit four hard copies of the thesis/dissertation to the related office.

The soft copy of the thesis/dissertation (WORD or PDF) should be uploaded to the “thesis/dissertation submission system” at <http://lib.buaa.edu.cn>.

Samples:

Front Cover (Chinese version)	Front Cover (English version)
<p>中图分类号: V475.1 论文编号: 100065Y0415231</p> <p style="text-align: center;">北京航空航天大学 硕士学位论文</p> <p style="text-align: center;">增压气路系统瞬变填充过程数值 计算研究</p> <p>作者姓名 XXX 学科专业 XXXXXXXXXXXX 指导教师 XXXXXXX 培养院系 宇航学院</p>	<p style="text-align: center;">Numerical Analysis of Transient Priming Process in Pressurization Gas Pipeline System</p> <p style="text-align: center;">A Thesis Submitted for the Master's Degree</p> <p style="text-align: center;">Candidate: XXX</p> <p style="text-align: center;">Tutor: XXXXX</p> <p style="text-align: center;">School of Astronautics Beihang University, Beijing, China</p>
Superscription Page	Statement of Originality and Authorization Statement for Thesis Use
<p>中图分类号: V475.1 论文编号: 100065Y0415231</p> <p style="text-align: center;">硕 士 学 位 论 文</p> <p style="text-align: center;">增压气路系统瞬变填充过程数值计算研究</p> <p>作者姓名 XXX 申请学位级别 工学硕士 指导教师姓名 XXX 职 称 教 授 学科专业 XXXXX XXXXX XXXX 研究方向 XXXXX 学习时间自 XXXX 年 X 月 X 日 起至 XXXX 年 X 月 X 日止</p>	<p style="text-align: center;">关于学位论文的独创性声明</p> <p>本人郑重声明: 所呈交的论文是本人在指导教师指导下独立进行研究工作所取得的成果, 论文中有关资料和数据是实事求是的。尽我所知, 除文中已经加以标注和致谢外, 本论文不包含其他人已经发表或撰写的研究成果, 也不包含本人或他人为了获得北京航空航天大学或其它教育机构的学位或学历证书而使用过的材料。与我一同工作的同志对研究所做的任何贡献均已在论文中作出了明确的说明。</p> <p>若有不实之处, 本人愿意承担相关法律责任。</p> <p>学位论文作者签名: _____ 日期: 年 月 日</p> <p style="text-align: center;">学位论文使用授权书</p> <p>本人完全同意北京航空航天大学有权使用本学位论文(包括但不限于其印刷版和电子版), 使用方式包括但不限于: 保留学位论文, 按规定向国家有关部门(机构)送交学位论文, 以学术交流为目的赠送和交换学位论文, 允许学位论文被查阅、借阅和复印, 将学位论文的全部或部分内容编入有关数据库进行检索, 采用影印、缩印或其他复制手段保存学位论文。</p> <p>保密学位论文在解密后的使用授权同上。</p> <p>学位论文作者签名: _____ 日期: 年 月 日 指导教师签名: _____ 日期: 年 月 日</p>

Abstract (Chinese)	Abstract (English)
<p style="text-align: center;">摘 要</p> <p>运载火箭增压输送系统是火箭推进系统的重要组成部分。常温氦气增压是液体火箭发动机推进剂贮箱增压的重要手段之一。增压系统的正常工作保证了推进剂的稳定供应以及发动机的正常运行。但是在高压氦气高速瞬变充气管路的过程中，由于高压高速氦气的非定常流动，极易产生压力的不稳定，作用在管道上，引发管道和各种管路元件的巨大振动，从而对系统产生极强的破坏作用，使增压不能达到预期效果，甚至导致增压系统失效。因此对高压气体与管路振动过程的研究具有重要的意义。</p> <p>本文通过对国内外同行管路系统研究成果的分析，以及对管路系统气体瞬变充气过程建模方法和气体动力学数值计算方法的深入研究和比较，以拉格朗日坐标下的一维非定常气体动力学方程组为基础，针对运载火箭一个典型增压气路系统及其系统组件，建立了典型气路系统高压氦气高速瞬变充气管路的流动过程的数学模型。并利用本论文的模型，采用完全守恒型差分格式数值计算方法，用 FORTRAN 计算机语言编制了数值计算程序对该管路系统的非定常气路过程进行了数值计算，对不同算例的计算结果进行了分析和比较。</p> <p>结果表明，本文建立的数学模型及数值计算方法较好地描述了增压气路系统的瞬变充气过程，为分析运载火箭增压气路系统及其系统中的管路和减压器等组件的动态特性提供了重要的理论参考。为解决运载火箭增压气路系统中出现的管路振动问题，为后续研制过程中解决类似问题打下了基础。</p> <p>关键词：增压系统，数值计算，动力学模型，拉格朗日坐标</p>	<p style="text-align: center;">Abstract</p> <p>Pressurization system is very important in a flight vehicle propulsion system. Using the normal temperature gaseous helium to pressurize is one of the important means in propellant tank pressurization system of liquid propellant rocket engine. The regular operation of pressurization system ensures propellant supplying steadily and the engine operating normally. But in the fast and transient priming process of high-pressure gaseous helium, the unsteady gas flow is likely to cause unsteady pressure, consequently brings on violent vibrations of the whole gas pipeline system, which can seriously destroy the structure of the system and make the pressurization system invalid. Therefore the study on the transient priming process of high-pressure gaseous helium in pressurizing gas pipeline system of a launch vehicle is significant.</p> <p>The calculated results show that the mathematical model and numerical calculation methods established in this thesis preferably described the fast and transient dynamic process of this system and provide a theoretical basis to analyze dynamic characteristics of the components such as pipelines and pressure reductor of pressurization gas pipeline system of a launch vehicle. These work makes a foundation for further studies on vibration of pressurization gas pipeline system and other relevant problems.</p> <p>Key words: Pressurization system, Numerical calculation, Dynamic model, Lagrange coordinates</p>
<p style="text-align: center;">Contents</p>	<p style="text-align: center;">Thesis Body</p>
<p style="text-align: center;">Contents</p> <p>1 Introduction1</p> <p> 1.1 Background1</p> <p> 1.2 Research Status2</p> <p> 1.2.1 Oscillation2</p> <p> 1.2.2 Dynamic characteristics2</p> <p> 1.3 Dissertation's Structure2</p> <p>2 Basic Theory3</p> <p>3 Mathematical Model5</p> <p>4 Program7</p> <p>5 Examples and Results9</p> <p>Conclusion11</p> <p>References13</p> <p>Research Fruits15</p> <p>Acknowledgements16</p>	<p style="text-align: center;">1 Introduction</p> <p>1.1 Background</p> <p>Pressurization system is very important in a flight vehicle propulsion system. Using the normal temperature gaseous helium to pressurize is one of the important means in propellant tank pressurization system of liquid propellant rocket engine. The regular operation of pressurization system ensures propellant supplying steadily and the engine operating normally.</p> <p>1.2 Research Status</p> <p>Pressurization system is very important in a flight vehicle propulsion system. Using the normal temperature gaseous helium to pressurize is one of the important means in propellant tank pressurization system of liquid propellant rocket engine.</p> <p>1.2.1 Oscillation</p> <p>Pressurization system is very important in a flight vehicle propulsion system. Using the normal temperature gaseous helium to pressurize is one of the important means in propellant tank pressurization system of liquid propellant rocket engine.</p> <p>1.2.2 Dynamic characteristics</p> <p>Pressurization system is very important in a flight vehicle propulsion system. Using the normal temperature gaseous helium to pressurize is one of the important means in propellant tank pressurization system of liquid propellant rocket engine.</p>

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