
Space Propulsion Analysis And Design Ronald Humble

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Thermal and Structural Electronic

Packaging Analysis for Space and Extreme Environments Learning Solutions

Develop a fundamental understanding of heat transfer analysis techniques as applied to earth based spacecraft with this practical guide. Written in a tutorial style, this essential text provides a how-to manual tailored for those who wish to understand and develop spacecraft thermal analyses. Providing an overview of basic heat transfer analysis fundamentals such as thermal circuits, limiting resistance, MLI, environmental thermal sources and sinks, as well as contemporary space based thermal technologies, and the distinctions between design considerations inherent to room temperature and cryogenic temperature applications, this is the

perfect tool for graduate students, professionals and academic researchers. Fundamentals of Rocket Propulsion

McGraw-Hill College

With growing interest in space activity and numerous new launchers in development, this book is a timely, comprehensive survey of important concepts and applications. It enhances understanding and provides exposure to practical aspects of design, manufacturing, testing, and engineering associated with these topics.

Modern Engineering for Design of Liquid-Propellant Rocket Engines Springer

The purpose of this book is to discuss, at the graduate level, the methods of performance prediction for chemical rocket propulsion. A pedagogical presentation of such methods has been

unavailable thus far and this text, based upon lectures, fills this gap. The first part contains the energy-minimization to calculate the propellant-combustion composition and the subsequent computation of rocket performance. While incremental analysis is for high performance solid motors, equilibrium-pressure analysis is for low performance ones. Both are detailed in the book's second part for the prediction of ignition and tail-off transients, and equilibrium operation. Computer codes, adopting the incremental analysis along with erosive burning effect, are included. The material is encouraged to be used and presented at lectures. Senior undergraduate and graduate students in universities, as well as practicing engineers and scientists in rocket

industries, form the readership.

Design of Rockets and Space Launch Vehicles Butterworth-Heinemann

Aerospace propulsion devices embody some of the most advanced technologies, ranging from materials, fluid control, and heat transfer and combustion. In order to maximize the performance, sophisticated testing and computer simulation tools are developed and used. Aerospace Propulsion comprehensively covers the mechanics and thermal-fluid aspects of aerospace propulsion, starting from the fundamental principles, and covering applications to gas-turbine and space propulsion (rocket) systems. It presents modern analytical methods using MATLAB and other advanced software and includes essential elements of both gas-turbine and rocket propulsion

systems. Gas turbine coverage includes thermodynamic analysis, turbine components, diffusers, compressors, turbines, nozzles, compressor-turbine matching, combustors and afterburners. Rocket coverage includes chemical rockets, electrical rockets, nuclear and solar sail. Key features: Both gas-turbine and rocket propulsion covered in a single volume. Presents modern analytical methods and examples. Combines fundamentals and applications, including space applications. Accompanied by a website containing MATLAB examples, problem sets and solutions. Aerospace Propulsion is a comprehensive textbook for senior undergraduate, graduate and aerospace propulsion courses, and is also an excellent reference for researchers and

practicing engineers working in this area.

Aerospace Propulsion Systems

Courier Corporation

The book addresses the overall integrated design aspects of a space transportation system involving several disciplines like propulsion, vehicle structures, aerodynamics, flight mechanics, navigation, guidance and control systems, stage auxiliary systems, thermal systems etc. and discusses the system approach for design, trade off analysis, system life cycle considerations, important aspects in mission management, the risk assessment, etc. There are several books authored to describe the design aspects of various areas, viz., propulsion, aerodynamics, structures, control, etc., but there is no book which presents

space transportation system (STS) design in an integrated manner. This book attempts to fill this gap by addressing systems approach for STS design, highlighting the integrated design aspects, interactions between various subsystems and interdependencies. The main focus is towards the complex integrated design to arrive at an optimum, robust and cost effective space transportation system. The orbital mechanics of satellites including different coordinate frames, orbital perturbations and orbital transfers are explained. For launching the satellites to meet specific mission requirements, viz., payload/orbit, design considerations, giving step by step procedure are briefed. The selection methodology for launch vehicle

configuration, its optimum staging and the factors which influence the vehicle performance are summarized. The influence of external, internal and dynamic operating environments experienced by the vehicle subsystems and the remedial measures needed are highlighted. The mission design strategies and their influence on the vehicle design process are elaborated. The various critical aspects of STS subsystems like flight mechanics, propulsion, structures and materials, thermal systems, stage auxiliary systems, navigation, guidance and control and the interdependencies and interactions between them are covered. The design guidelines, complexity of the flight environment and the reentry dynamics for the reentry missions are

included. The book is not targeted as a design tool for any particular discipline or subsystem. Some of the design related equations or expressions are not attempted to derive from the first principle as this is beyond the scope of this book. However, the important analytical expressions, graphs and sketches which are essential to provide in-depth understanding for the design process as well as to understand the interactions between different subsystems are appropriately included.

Control System Design Elsevier Liquid Acquisition Devices for Advanced In-Space Cryogenic Propulsion Systems discusses the importance of reliable cryogenic systems, a pivotal part of everything from engine propulsion to fuel deposits. As some of the most

efficient systems involve advanced cryogenic fluid management systems that present challenging issues, the book tackles issues such as the difficulty in obtaining data, the lack of quality data and models, and the complexity in trying to model these systems. The book presents models and experimental data based on rare and hard-to-obtain cryogenic data. Through clear descriptions of practical data and models, readers will explore the development of robust and flexible liquid acquisition devices (LAD) through component-level and full-scale ground experiments, as well as analytical tools. This book presents new and rare experimental data, as well as analytical models, in a fundamental area to the aerospace and space-flight communities.

With this data, the reader can consider new and improved ways to design, analyze, and build expensive flight systems. Presents a definitive reference for design ideas, analysis tools, and performance data on cryogenic liquid acquisition devices Provides historical perspectives to present fundamental design models and performance data, which are applied to two practical examples throughout the book Describes a series of models to optimize liquid acquisition device performance, which are confirmed through a variety of parametric component level tests Includes video clips of experiments on a companion website

Rocket Propulsion Springer Nature
Aerospace Propulsion Systems is a
unique book focusing on each type of

propulsion system commonly used in aerospace vehicles today: rockets, piston aero engines, gas turbine engines, ramjets, and scramjets. Dr. Thomas A. Ward introduces each system in detail, imparting an understanding of basic engineering principles, describing key functionality mechanisms used in past and modern designs, and provides guidelines for student design projects. With a balance of theory, fundamental performance analysis, and design, the book is specifically targeted to students or professionals who are new to the field and is arranged in an intuitive, systematic format to enhance learning. Covers all engine types, including piston aero engines Design principles presented in historical order for progressive understanding Focuses on

major elements to avoid overwhelming or confusing readers Presents example systems from the US, the UK, Germany, Russia, Europe, China, Japan, and India Richly illustrated with detailed photographs Cartoon panels present the subject in an interesting, easy-to-understand way Contains carefully constructed problems (with a solution manual available to the educator) Lecture slides and additional problem sets for instructor use Advanced undergraduate students, graduate students and engineering professionals new to the area of propulsion will find *Aerospace Propulsion Systems* a highly accessible guide to grasping the key essentials. Field experts will also find that the book is a very useful resource for explaining propulsion issues or

technology to engineers, technicians, businessmen, or policy makers. Post-graduates involved in multi-disciplinary research or anybody interested in learning more about spacecraft, aircraft, or engineering would find this book to be a helpful reference. Lecture materials for instructors available at www.wiley.com/go/wardaero

Rocket and Spacecraft Propulsion

Springer Nature

Spacecraft Structures and Mechanisms describes the integral process of developing cost-effective, reliable structures and mechanical products for space programs. Processes are defined, methods are described and examples are given. It has been written by 24 engineers in the space industry, who cover the themes of (1) ensuring a

successful mission, and (2) reducing total cost through good designs and intelligent risk management. Topics include: Introduction and requirements (development process, requirements documentation, requirements definition, space mission environments); Analysis (statics, dynamics and load analysis, fatigue and fracture mechanics, mechanics of materials, strength analysis, heat transfer and thermal effects); Verification and quality assurance (verification planning, structural, mechanical and environmental testing, quality assurance and configuration control, compliance documentation, structural reliability analysis, verification criteria - factors of safety, margins of safety, fracture control, test options); Design (spacecraft

configuration development, finite element analysis, mechanism development, designing for producibility, structural design, materials, designing to control loads, load cycles, sensitivity analysis); Final verification (model correlation, risk management, launch readiness reviews). For system engineers, mechanical designers, stress analysts, dynamics and load analysts, technical leads, program managers.

LSC Space Propulsion Analysis and Design with Website CRC Press

The present impetus to drive down the overall cost of space missions is leading to ever-increasing demands for more efficient design techniques over a wide range of interplanetary missions, and the methods now being utilised to do this are described in this timely and

authoritative work.

Introduction to Spacecraft Thermal Design Springer Science & Business Media

This book offers readers essential insights into system design for deep space probes and describes key aspects such as system design, orbit design, telecommunication, GNC, thermal control, propulsion, aerobraking and scientific payload. Each chapter includes the basic principles, requirements analysis, procedures, equations and diagrams, as well as practical examples that will help readers to understand the research on each technology and the major concerns when it comes to developing deep space probes. An excellent reference resource for researchers and engineers interested in

deep space exploration, it can also serve as a textbook for university students and those at institutes involved in aerospace.

Space Mission Analysis and Design
Springer Science & Business Media

The only comprehensive text available on space propulsion for students and professionals in astronautics.

The Design and Engineering of Curiosity
Cambridge University Press

This book gives an in-depth analysis of the physical phenomena of thrust production by laser radiation, as well as laser propulsion engines, and laser-propelled vehicles. It brings together into a unified context accumulated up-to-date information on laser propulsion research, considering propulsion phenomena, laser propulsion techniques, design of vehicles with laser propulsion

engines, and high-power laser systems to provide movement for space vehicles. In particular, the reader will find detailed coverage of: designs of laser propulsion engines, operating as both air-breathing and ramjet engines to launch vehicles into LEOs; Assembly of vehicles whereby laser power from a remote laser is collected and directed into a propulsion engine; and, the laser-adaptive systems that control a laser beam to propel vehicles into orbits by delivering laser power through the Earth's atmosphere. This book is essential reading for researchers and professionals involved in laser propulsion.

A Review of United States Air Force and Department of Defense Aerospace Propulsion Needs Wiley

A modern pedagogical treatment of the

latest industry trends in rocket propulsion, developed from the authors' extensive experience in both industry and academia. Students are guided along a step-by-step journey through modern rocket propulsion, beginning with the historical context and an introduction to top-level performance measures, and progressing on to in-depth discussions of the chemical aspects of fluid flow combustion thermochemistry and chemical equilibrium, solid, liquid, and hybrid rocket propellants, mission requirements, and an overview of electric propulsion. With a wealth of homework problems (and a solutions manual for instructors online), real-life case studies and examples throughout, and an appendix detailing key numerical

methods and links to additional online resources, this is a must-have guide for senior and first year graduate students looking to gain a thorough understanding of the topic along with practical tools that can be applied in industry.

Chemical Rockets AIAA

Annotation This text discusses the conceptual stages of mission design, systems engineering, and orbital mechanics, providing a basis for understanding the design process for different components and functions of a spacecraft. Coverage includes propulsion and power systems, structures, attitude control, thermal control, command and data systems, and telecommunications. Worked examples and exercises are included, in addition to appendices on

acronyms and abbreviations and spacecraft design data. The book can be used for self-study or for a course in spacecraft design. Brown directed the team that produced the Magellan spacecraft, and has taught spacecraft design at the University of Colorado. Annotation c. Book News, Inc., Portland, OR (booknews.com).

Spacecraft Systems Engineering

McGraw-Hill College

Annotation "Design Methodologies for Space Transportation Systems is a sequel to the author's earlier text, "Space Transportation: A Systems Approach to Analysis and Design. Both texts represent the most comprehensive exposition of the existing knowledge and practice in the design and project management of space transportation

systems, and they reflect a wealth of experience by the author with the design and management of space systems. The text discusses new conceptual changes in the design philosophy away from multistage expendable vehicles to winged, reusable launch vehicles and presents an overview of the systems engineering and vehicle design process as well as systems trades and analysis. Individual chapters are devoted to specific disciplines such as aerodynamics, aerothermal analysis, structures, materials, propulsion, flight mechanics and trajectories, avionics and computers, and control systems. The final chapters deal with human factors, payload, launch and mission operations, safety, and mission assurance. The two texts by the author provide a valuable

source of information for the space transportation community of designers, operators, and managers. A companion CD-ROM succinctly packages some oversized figures and tables, resources for systems engineering and launch ranges, and a compendium of software programs. The computer programs include the USAF AIRPLANE AND MISSILE DATCOM CODES (with extensive documentation); COSTMODL for software costing; OPGUID launch vehicle trajectory generator; SUPERFLO-a series of 11 programs intended for solving compressible flow problems in ducts and pipes found in industrial facilities; and a wealth of Microsoft Excel spreadsheet programs covering the disciplines of statistics, vehicle trajectories, propulsion performance, math utilities,

High Power Laser Propulsion John Wiley & Sons

Geared toward advanced undergraduates and graduate students, this text develops the concepts of electrical acceleration of gases for propulsion, from primary physical principles to realistic space thruster designs. 1968 edition.

Rocket Propulsion Elements National Academies Press

With the second edition of Space Mission Analysis and Design, two changes have been introduced in the Space Technology Library. Foremost among these is the introduction of the Space Technology Series as a part of the Space Technology Library. Dr. Wiley Larson of the US Air Force Academy and University of Colorado, Colorado Springs, will serve

as Managing Editor for the Space Technology Series. This series is a cooperative effort of the Department of Defense, National Aeronautics and Space Administration, Department of Energy, and European Space Agency, coordinated by the US Air Force Academy. The sponsors intend to bring a number of books into the series to improve the literature base in the fundamentals of space technology, beginning with the current volume. Books which are not a part of the Space Technology Series, but which also represent a substantial contribution to the space technology literature, will still be published in the Space Technology Library. As always, we welcome suggestions and contributions from the aerospace community.

Aerothermodynamics of Gas Turbine

and Rocket Propulsion Cambridge University Press

Have you ever wondered how NASA designs, builds, and tests spacecrafts and hardware for space? How is it that wildly successful programs such as the Mars Exploration Rovers could produce a rover that lasted over ten times the expected prime mission duration? Or build a spacecraft designed to visit two orbiting destinations and last over 10 years when the fuel ran out? This book was written by NASA/JPL engineers with experience across multiple projects, including the Mars rovers, Mars helicopter, and Dawn ion propulsion spacecraft in addition to many more missions and technology demonstration programs. It provides useful and practical approaches to solving the most

complex thermal-structural problems ever attempted for design spacecraft to survive the severe cold of deep space, as well as the unforgiving temperature swings on the surface of Mars. This is done without losing sight of the fundamental and classical theories of thermodynamics and structural mechanics that paved the way to more pragmatic and applied methods such finite element analysis and Monte Carlo ray tracing, for example. Features: Includes case studies from NASA's Jet Propulsion Laboratory, which prides itself in robotic exploration of the solar system, as well as flying the first cubeSAT to Mars. Enables spacecraft designer engineers to create a design that is structurally and thermally sound, and reliable, in the quickest time

afforded. Examines innovative low-cost thermal and power systems. Explains how to design to survive rocket launch, the surfaces of Mars and Venus. Suitable for practicing professionals as well as upper-level students in the areas of aerospace, mechanical, thermal, electrical, and systems engineering, Thermal and Structural Electronic Packaging Analysis for Space and Extreme Environments provides cutting-edge information on how to design, and analyze, and test in the fast-paced and low-cost small satellite environment and learn techniques to reduce the design and test cycles without compromising reliability. It serves both as a reference and a training manual for designing satellites to withstand the structural and thermal challenges of extreme

environments in outer space.

Technologies for Deep Space Exploration
Springer Nature

Throughout most of the twentieth century, electric propulsion was considered the technology of the future. Now, the future has arrived. This important new book explains the fundamentals of electric propulsion for spacecraft and describes in detail the physics and characteristics of the two major electric thrusters in use today, ion and Hall thrusters. The authors provide an introduction to plasma physics in order to allow readers to understand the models and derivations used in determining electric thruster performance. They then go on to present detailed explanations of: Thruster principles Ion thruster plasma generators

and accelerator grids Hollow cathodes
Hall thrusters Ion and Hall thruster
plumes Flight ion and Hall thrusters
Based largely on research and
development performed at the Jet
Propulsion Laboratory (JPL) and
complemented with scores of tables,
figures, homework problems, and
references, Fundamentals of Electric
Propulsion: Ion and Hall Thrusters is an
indispensable textbook for advanced
undergraduate and graduate students
who are preparing to enter the
aerospace industry. It also serves as an
equally valuable resource for
professional engineers already at work in
the field.

Space Propulsion Analysis and Design

CRC Press

Following on from the hugely successful

previous editions, the third edition of
Spacecraft Systems Engineering
incorporates the most recent
technological advances in spacecraft and
satellite engineering. With emphasis on
recent developments in space activities,
this new edition has been completely
revised. Every chapter has been updated
and rewritten by an expert engineer in
the field, with emphasis on the bus
rather than the payload. Encompassing
the fundamentals of spacecraft
engineering, the book begins with front-
end system-level issues, such as
environment, mission analysis and
system engineering, and progresses to a
detailed examination of subsystem
elements which represent the core of
spacecraft design - mechanical,
electrical, propulsion, thermal, control

etc. This quantitative treatment is supplemented by an appreciation of the interactions between the elements, which deeply influence the process of spacecraft systems design. In particular the revised text includes * A new chapter on small satellites engineering and applications which has been contributed by two internationally-recognised experts, with insights into small satellite systems engineering. * Additions to the mission analysis

chapter, treating issues of aeromanoeuvring, constellation design and small body missions. In summary, this is an outstanding textbook for aerospace engineering and design students, and offers essential reading for spacecraft engineers, designers and research scientists. The comprehensive approach provides an invaluable resource to spacecraft manufacturers and agencies across the world.