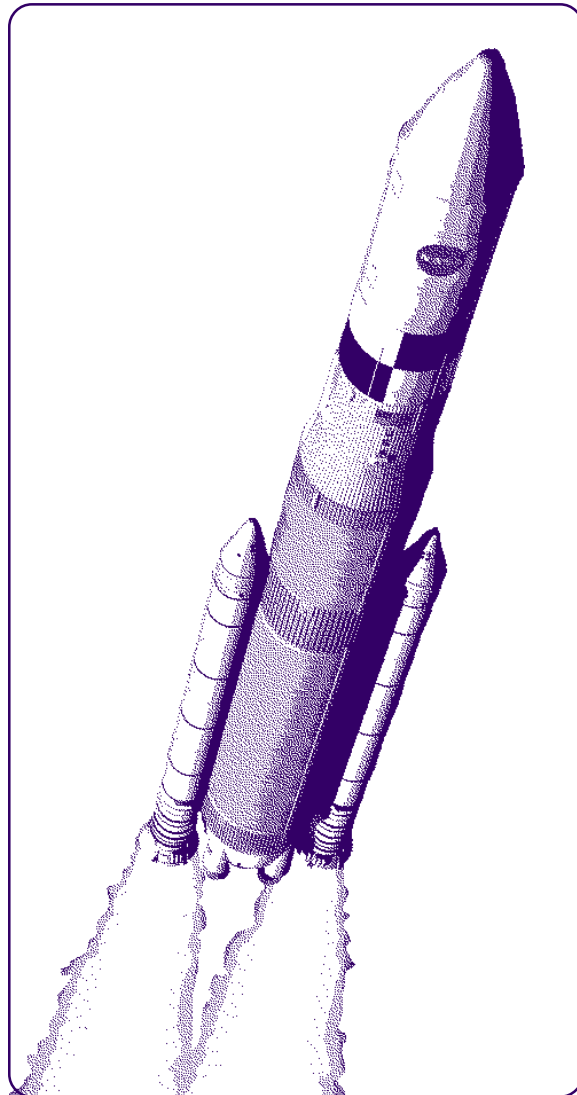
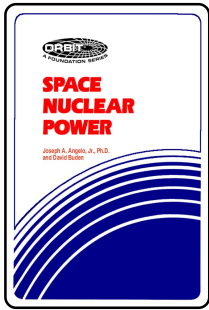


# SPACE TECHNOLOGY



KRIEGER PUBLISHING COMPANY

## Titles of Distinction by Krieger Publishing



### SPACE NUCLEAR POWER

by Joseph A. Angelo, Jr. & David Buden

A comprehensive technical volume which considers the major aspects of space nuclear power and includes concise treatments of radioactivity, radiation interaction with matter, nuclear reactor principles, thermodynamic power conversion systems, and heat transfer and heat rejection systems. Exciting applications of nuclear energy in space are introduced in the context of man's space exploits.

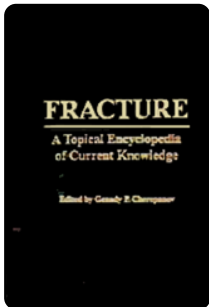
Orig. Ed. 1985 • 304 pp. • ISBN 978-0-89464-000-1 • \$90.25

### THE SPACEFLIGHT/REVOLUTION: A Sociological Study

by William Sims Bainbridge

Spaceflight is a fascinating example of revolutionary technological change. It has transformed our world in radical ways and was itself the result of special social conditions and sequences of events. This book not only tells the surprising story of the spaceflight revolution, but also gives the first sociological analysis of why it started and how it succeeded.

Orig. Ed. 1976, Reprint Ed. 1983 • 304 pp.  
ISBN 978-0-89874-501-6 • \$33.25



### FRACTURE: A Topical Encyclopedia of Current Knowledge

Edited by Genady P. Cherepanov

A team of scholars united for this project in order to provide an almanac of some of the more recent achievements in fracture science and to compile a topical reference book with first-hand information on the methods and ideas in this field. Every section was written by the originator of or one of the top experts in the corresponding area, with emphasis on the most dynamic portion of this fast-growing and challenging science.

Orig. Ed. 1998 • 892 pp. • ISBN 978-0-89464-924-0 • \$208.00

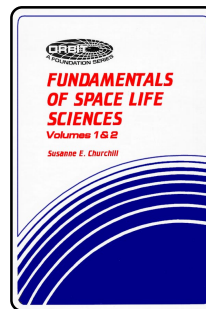
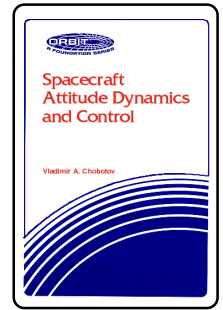
### SPACECRAFT ATTITUDE DYNAMICS AND CONTROL

by Vladimir A. Chobotov

Presented here are the basic concepts, methods, and mathematical developments which are necessary to understand spacecraft attitude dynamics and control. This book is a comprehensive and self-contained treatment with

emphasis on the practical aspects of the subject. It is a "road map" to the field of spacecraft dynamics and control, which contains all essential elements of kinematics, rigid body dynamics, linear control theory, environmental effects, and the theory of the stability of motion, all in a single volume. The book is based on the author's more than forty years of industrial and teaching experience and can be used as a textbook in aerospace engineering courses at either the senior or the first-year graduate school level. The *Spacecraft Attitude Dynamics*, 2008 Reprint with Corrections, Supplement and CD ROM augments the original material published in 1991 by correcting errors and presenting a Supplement that reviews recent trends in dynamics and control of small satellite systems and tethers in space. Also, included is a CD-ROM the objective of which is to provide view points and guidelines for solving selected problems in the text. Spinners and a menu are employed to enhance the learning experience by providing numerical results for ranges of input parameters to selected problems. Moreover, a faculty CD-ROM is also available that presents complete solutions to the problems of interest.

Orig. Ed. 1991, Reprint Ed. 2008 • 161 pp.  
ISBN 978-0-89464-069-0 • \$98.75



### FUNDAMENTALS OF SPACE LIFE SCIENCES - 2 VOL. SET

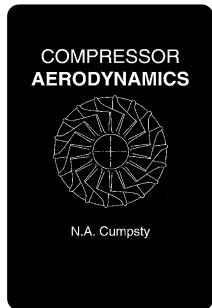
Edited by Susanne E. Churchill

Foreword by Heinz Oser, M.D.

*Fundamentals of Space Life Sciences* is the first comprehensive teaching text to be published in the space life sciences. Designed primarily to support coursework at the advanced undergraduate and graduate levels, this two-volume set is also a state-of-the-art reference text for those desiring a broad overview of the space environment, response of living systems to spaceflight, psychosocial issues of spaceflight, and life support systems. Of particular interest is Section II: Response of Living Systems to Spaceflight. In this section, each chapter is organized to provide both a functional introduction to the physiologic system under consideration and a discussion of how spaceflight affects that system. Unlike previous treatments of the space life sciences, *Fundamentals* has relied primarily on the academic community engaged in space-related research for its material. As noted by Dr. Heinz Oser,

chief life scientist, ESA, in the Foreword, "This book deserves a wide use. I am convinced that it fulfills its intended goal to educate the coming generation appropriately such that it will further life sciences research in space on a well-informed basis."

Orig. Ed. 1997 • 398 pp. • ISBN 978-0-89464-051-3 • \$160.75

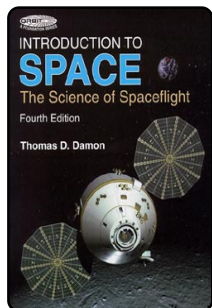


### COMPRESSOR AERODYNAMICS

by *Nicholas A. Cumpsty*

Starting from first principles, this book looks at the aerodynamic behavior of axial and radial compressors. The text starts with general ideas, and then moves through the simple aspects of axial compressors to the more advanced three-dimensional ideas. Radial compressors are treated in two sections: impellers and diffusers. Noise and aeroelasticity are considered in one chapter, and another chapter looks at measurement and computational techniques. The book is unique in the approach and treatment. The emphasis is on physically based understanding, and these ideas and this approach do not age. Considerable effort is taken to explain the cause of observed behavior, rather than to provide methods or recipes to be followed. For the 2004 reprint edition there is a new introduction summarizing major developments since the first publication. This is complemented by a supplementary bibliography of important new papers.

Orig. Ed. 1989, Reprint Ed. 2004 • 546 pp.  
ISBN 978-1-57524-247-7 • \$98.00



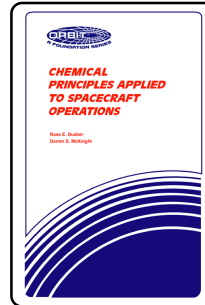
### INTRODUCTION TO SPACE: The Science of Spaceflight, 4th Ed.

by *Thomas D. Damon*

NASA is again reorganizing its resources to accomplish its fluctuating missions. The fourth edition of *Introduction to Space: The Science of Spaceflight* has received a major overhaul to bring to you a readable understanding of how these goals may be achieved. The basics of propulsion, orbital mechanics, the space environment, and satellite operations are updated. New Information is included on the completion of the International Space Station, the next generation of space vehicles, how we can live on the Moon and Mars, and whether or not there is life elsewhere in the universe. The book is now profusely illustrated throughout with 274 illustrations of which 102 are in color. All measure-

ments are presented in both common units and in the international System of Units (SI), commonly called metric units.

4th Ed. 2011 • 316 pp. • ISBN 978-0-89464-068-1 • \$68.25



### CHEMICAL PRINCIPLES APPLIED TO SPACECRAFT OPERATIONS

by *Ross E. Dueber & Darren S. McKnight*  
Foreword by *Raymond O. Rantanen*

The chemical environment of space and its effect upon spacecraft design and materials are examined in this text. The book begins by reviewing the basic principles of chemistry and astrodynamics. These principles are then applied in subsequent chapters covering the near-Earth and interplanetary environment, spacecraft systems and materials, and spacecraft-environment interaction. Topics of current interest include monoatomic oxygen attack, ozone depletion, spacecraft charging, and particulate impact. A unique aspect of this book is that it provides coverage of chemical principles and their applications to spacecraft design and operation in a single text.

Orig. Ed. 1993 • 216 pp. • ISBN 978-0-89464-036-0 • \$75.00

### METHODS OF ORBIT DETERMINATION

by *P.R. Escobal*

An introduction to the techniques of analytical satellite mechanics, booster mechanics, orbit determination, and differential correction. Featuring a great deal of added material, this edition contains a complete and rigorous treatment of two-body mechanics.

Orig. Ed. 1965, Reprint Ed. 1976 • 500 pp.  
ISBN 978-0-88275-319-5 • \$80.75

### TOPICS In ATOMIC COLLISION THEORY

by *Sydney Geltman*

This volume provides a thorough, up-to-date treatment of the application of quantum scattering theory to low-energy atomic collision phenomena. The first unified expository approach to the subject in book form, it includes much new information reflecting the results of recent investigations. The material is divided into three main areas: static field scattering, electron-atom collisions and atom-atom collisions. Within these areas, individual topics are presented in a complete and self-contained manner, with emphasis placed on the understanding of the physics involved and the

calculation of reliable cross sections. Intended primarily for researchers and graduate students in atomic physics, atmospheric physics, and astrophysics, this book will also prove a highly accessible source of information to the chemist interested in atomic scattering.

Orig. Ed. 1969, Reprint Ed. 1997 • 256 pp.  
ISBN 978-1-57524-033-6 • \$46.00



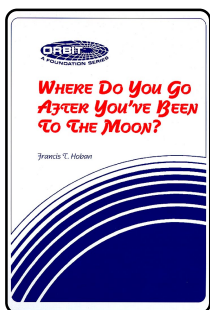
### SPACEFLIGHT IN THE ERA OF AERO-SPACE PLANES

by *Russell J. Hannigan*  
Foreword by *David C. Webb*

This is the first book of its type that deals with the subject of future aero-space plane launchers from the integrated perspective of the political, technical, and economic issues that drive

their development. Discussion also focuses on how such launchers could directly impact the U.S. and other nations' space programs. Many interviews were conducted, particularly with the originators and directors of the current major programs. The NASP, Sanger, HOTOL and Delta Clipper (SSRT) projects are analyzed in detail as specific case studies to illustrate the myriad problems associated with getting any reusable launcher off the ground. Interviews with congressmen and foreign politicians are also included. It is not necessary to be an expert in the technical aspects of aero-space planes to understand the issues in this book.

Orig. Ed. 1994 • 320 pp. • ISBN 978-0-89464-046-9 • \$69.25



### WHERE DO YOU GO AFTER YOU'VE BEEN TO THE MOON? A Case Study of NASA's Pioneer Effort at Change

by *Francis T. Hoban*  
with *William M. Lawbaugh and Edward J. Hoffman*

This is the first book to analyze NASA's post-Apollo attempt at change, and may actually be the first analysis of any large government agency's attempt at change through cost control. It contains an extensive collection of program cost drivers and lessons learned which are pertinent to a broad range of applications. *Where Do You Go After You've Been to the Moon?* should be of interest to anyone involved in organizational and management change; cost identification, mitigation and control; and the impact of culture and bureaucracy on NASA's way of doing business.

Orig. Ed. 1997 • 240 pp. • ISBN 978-0-89464-060-5 • \$45.50



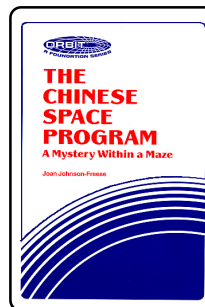
### ARTIFICIAL SPACE DEBRIS

by *Nicholas L. Johnson & Darren S. McKnight*

Over eighty man-made Earth satellites have fragmented since the Transit 4A rocket exploded in 1961. Now, nearly 50 percent of all objects being tracked in near-Earth orbit are debris fragments from these satellite breakups. The

sources of this debris and its future implications on space endeavors are discussed in this book. Emphasis is placed on measurements of fragments and discerning the cause of the many breakups which have been triggered by unknown means. This book examines the technical issues of orbital debris in a comprehensive manner useful to the systems engineer, yet it is still thought provoking to the researching graduate student. An appendix has been added to this edition to provide updates and insights on a number of important technical and policy events that have occurred since the original printing of the book, and some areas requiring more in-depth coverage have been expanded. Errata from the first printing is included, as well as current data on breakups and the cataloged population.

Orig. Ed. 1987, Reissue Ed. 1991 • 142 pp.  
ISBN 0-89464-043-8 • \$61.25



### THE CHINESE SPACE PROGRAM: A Mystery Within a Maze

by *Joan Johnson-Freese*

*The Chinese Space Program: A Mystery Within a Maze* is the first unclassified, comprehensive analysis of Chinese efforts in space. It not only describes the activities the Chinese are engaged in, but does so within the context of Chinese

political, economical, and cultural parameters critical to realistic and pragmatic policy analysis. Projections are then offered from the information provided concerning where China might be going in the future and equally important, what policy actions the United States might take to avoid a confrontational stance with China and to encourage Beijing to build a more stable, cooperative regime.

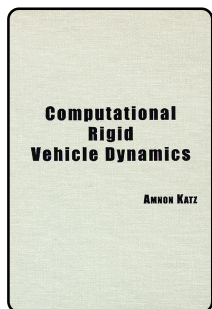
Orig. Ed. 1998 • 150 pp. • ISBN 978-0-89464-062-9 • \$26.25

## PRINCIPLES OF IDEAL-FLUID AERODYNAMICS

by Krishnamurty Karamcheti

This book explains the basic principles and analytical methods underlying the theory of the motion of an ideal fluid (an inviscid incompressible fluid). It describes the role of the theory in describing and predicting the flow associated with the motion of certain bodies of aerodynamic interest, such as wings and bodies of revolution. The book also attempts to describe ideal fluid aerodynamics, although restricted to certain problems, as a branch of theoretical physics.

Orig. Ed. 1966, Reprint Ed. 1980 • 654 pp.  
ISBN 978-0-89874-113-1 • \$92.25



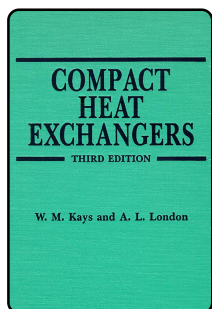
## COMPUTATIONAL RIGID VEHICLE DYNAMICS

by Annon Katz

*Computational Rigid Vehicle Dynamics* is oriented toward computer simulation and applies rigorous and nonlinear dynamic equations, which current desktop computers can easily handle. This work bypasses the laborious process of

linearization and the exhaustive analysis of linearized equations. Linearized analysis is used selectively to build insights and is checked against the full computer simulation. Here is a reference work for practitioners in flight simulation that can be a course text. It provides in-depth coverage of kinematics and dynamics of 6DOF, including some recently published material. The text covers the mathematics and physics of the subject and modeling. Coding issues are treated in appendixes.

Orig. Ed. 1997 • 236 pp. • ISBN 978-1-57524-016-9 • \$43.75



## COMPACT HEAT EXCHANGERS, 3rd Edition

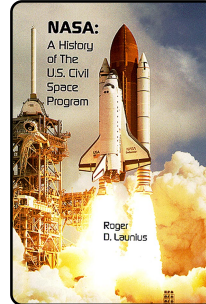
by William M. Kays & A.L. London

*Compact Heat Exchangers* is a compilation of experimental data on the basic heat transfer and flow friction characteristics of "compact" heat exchanger surfaces, i.e., surfaces with the characteristic of large area per unit of volume, used

primarily in gas-flow applications where large surface area is a necessity. The data have a wide application, including space heating, spacecraft heat exchangers, aircraft heat exchangers, and cooling systems of all kinds. Besides the basic experimental heat transfer and flow friction data,

*Compact Heat Exchangers* contains chapters on heat exchanger analysis and design and auxiliary topics.

3rd Ed. 1984, Reprint Ed. 1998 • 352 pp.  
ISBN 978-1-57524-060-2 • \$63.50



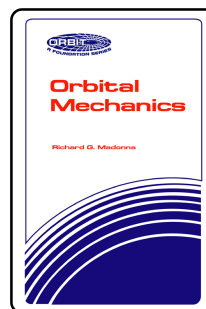
## NASA: A History of the U.S. Civil Space Program

by Roger D. Launius

When future generations review the history of the twentieth century, they will undoubtedly judge humanity's movement into space, with both machines and people, as one of its seminal developments. Even at this juncture, the complex

nature of spaceflight and the activity that it has engendered on the part of many peoples and governments make the U.S. civil space program a significant area of study. People from all avenues of experience and levels of education share an interest in the drama of spaceflight. This book is the most up-to-date synthesis of the American civil space program available. Written by NASA's chief historian, it describes the history of this effort from its earliest origins to the early 1990s and offers a powerful analysis of the space program that merges political, economic, technological, scientific, and foreign affairs into a meaningful whole. It has both a sound historical narrative and a set of key documents which suggest other aspects of the story.

Orig. Ed. 1994, Reprint Ed. 2000 • 310 pp.  
ISBN 978-1-57524-178-4 • \$28.75

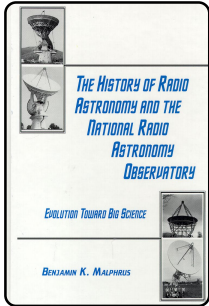


## ORBITAL MECHANICS

by Richard Madonna

Although its aim is to provide the engineer and scientist with a concise treatment of the basic elements of orbital mechanics, this book is also suitable for senior-level undergraduate and graduate courses. The author begins with the physics of the two-body problem, then enters into a discussion of launching satellites into orbit.

Orig. Ed. 1997 • 136 pp. • ISBN 978-0-89464-010-0 • \$68.75



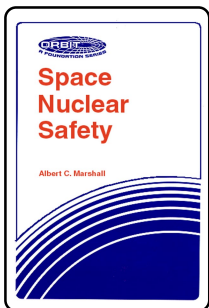
## The HISTORY OF RADIO ASTRONOMY AND THE NATIONAL RADIO ASTRONOMY OBSERVATORY: Evolution Toward Big Science

by Benjamin K. Malphrus

In making the invisible universe visible, radio telescopes allow astronomers to see through our local universe of nearby stars to view a distant universe. Radio

astronomy has provided tremendous insights into the composition, physical characteristics, and evolution of objects in the universe and revealed completely new, unanticipated phenomena. The National Radio Astronomy Observatory (NRAO) has greatly contributed to this scientific revolution. The book traces the story of radio astronomy from its accidental beginnings in the 1930s to the present, describes the development of NRAO instrumentation, and focuses on the considerable contributions made by the scientists using the NRAO instruments. This unique insight into the evolution of a truly modern science is written in a style that anyone with an interest in astronomy can understand and enjoy, and also provides technical information that professionals in astronomy, computer science, and electrical engineering will find useful.

Orig. Ed. 1996 • 210 pp. • ISBN 978-0-89464-841-0 • \$40.25



## SPACE NUCLEAR SAFETY

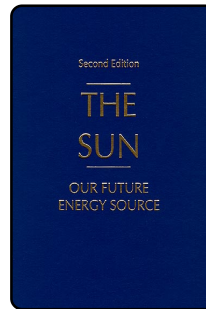
Edited by Albert C. Marshall, F. Eric Haskin, & Veniamin Usov

*Space Nuclear Safety*, the first, and presently, the only book written on the topic of space nuclear safety, is a comprehensive textbook intended for professors and students. The principal authors and contributors are recognized leaders in

their field of expertise. The book is also a convenient reference book for nuclear engineers, aerospace safety specialists, project managers, and government staff. Although *Space Nuclear Safety* is oriented toward nuclear engineers and aerospace safety professionals, the material should be accessible to engineers, scientists, graduate students and upper division undergraduate students without nuclear engineering or aerospace backgrounds. *Space Nuclear Safety* covers both radioisotope power sources and space reactor systems. The chapters address safety principles and safety analysis methods and include discussions of safety issues and scenarios, protection and mitigation methods, and safety testing. Topics include radiation protec-

tion and shielding, propellant fires and explosions, orbital mechanics, atmospheric reentry, impact and analysis, reactor criticality safety, reactor transient analysis, risk/reliability analysis, and consequence analysis. Student exercises are provided that can be solved using a handheld calculator. Although the book focuses on relatively simple safety analysis methods, each chapter provides a brief discussion of computer analysis methods used in space nuclear safety programs.

Orig. Ed. 2008 • 484 pp. • ISBN 978-0-89464-061-2 • \$193.00

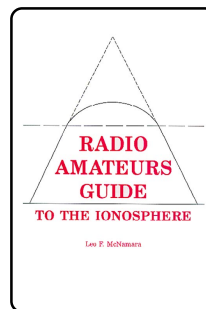


## THE SUN: Our Future Energy Source

by David K. McDaniels

An elementary, nonmathematical introduction to the practical use of solar energy, this text discusses the background of the present energy crisis, the concept of energy, and the ability to meet the crisis with nonrenewable energy sources. The history of solar energy, the nature of the universe, and the formation of the sun are reviewed. Primary solar energy applications - space heating and cooling, and solar electric power generation - are examined. A bibliography is included in each chapter and there are numerous illustrations throughout the text.

2nd Ed. 1984, Reprint Ed. 1991 • 360 pp.  
ISBN 978-0-89464-594-5 • \$51.75

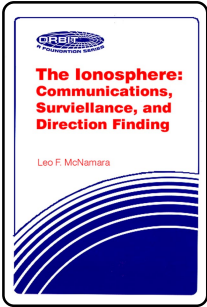


## RADIO AMATEURS GUIDE TO THE IONOSPHERE

by Leo F. McNamara

This guide introduces the reader to the ionosphere, including its formation, complexities and its use for HF communications. It first provides a comprehensive background of the ionosphere and its variations, before addressing the structure of the ionosphere for HF radio propagation under both quiet and disturbed conditions. Some of the problems faced by the HF communicator are then explained in terms of changes in the ionosphere caused by solar-terrestrial interactions. The guide also provides a review of available HF propagation prediction programs, using one of the best to illustrate some of the phenomena which make HF communications such a fascinating and challenging field. This is a very informative text for the serious HF radio operator, written by a scientist with over 20 years experience in ionospheric research.

Orig. Ed. 1994 • 176 pp. • ISBN 978-0-89464-8045 • Paper • \$46.00

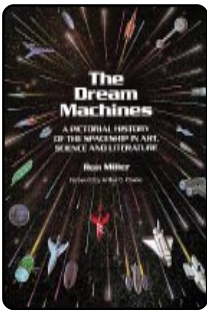


**THE IONOSPHERE: Communications, Surveillance, and Direction Finding**  
by *Leo F. McNamara*

In a simple, reader-friendly style, this introductory text describes the ionosphere and its effects on systems which use it, giving particular emphasis to HF communications as well as including sections on the single station location of

HF transmitters and over-the horizon radar. It is written for those who must understand or operate these systems and for those who just enjoy knowing how things work. A must-read book for the military high-frequency communicator.

Orig. Ed. 1991 • 248 pp. • ISBN 978-0-89464-040-7 • \$61.25



**THE DREAM MACHINES: An Illustrated History of the Spaceship in Art, Science and Literature**

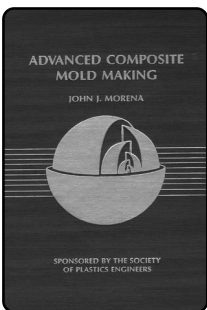
by *Ron Miller*

Foreword by *Arthur C. Clarke*

Unique in the literature of spaceflight, this book is an encyclopedic history of the spaceship from the earliest yearnings for space travel to plans for the distant

future. Covering in unprecedented detail over 2,000 years of spaceship design, the text chronologically documents thousands of events, with illustrations and photos graphically demonstrating the centuries-long evolution of an idea that has changed our world forever. Included are rare photos and illustrations from science fiction films, books, and magazines; unique drawings of Soviet spacecraft; NASA photos never before reproduced; and artwork specially commissioned for this book. The illustrations are reproduced in two colors throughout, with a sixteen-page full-color section, appendixes, bibliography, and index. Winner of the Booklist Editor's Choice 1994 Technology Award.

Orig. Ed. 1993 • 744 pp. • ISBN 978-0-89464-039-1 • \$103.75



**ADVANCED COMPOSITE MOLD MAKING**  
by *John J. Morena*

All the design, design engineering, materials, processes and manufacturing engineering tools needed to produce patterns, molds and tools that yield quality, trouble free advanced-composite structures and components are in this book. The book exceeds all other available

works in scope and new-method coverage. This all-in-one

resource guides you through the manufacture of both nonmetallic and metallic molds and tools used to form, mold or bond small to very large advanced composite parts and assemblies. It provides detailed instructions on how to use each kind of mold-making material and execute each mold-making process. This updated edition contains leading edge state of the art information that takes the reader step by step through the mold design, tooling and molding processes of light RTM, vacuum assisted and low pressure injection including other resin system infusion systems.

Orig. Ed. 1988, Reprint Ed. 2007 • 468 pp.  
ISBN 978-1-57524-123-4 • \$86.50



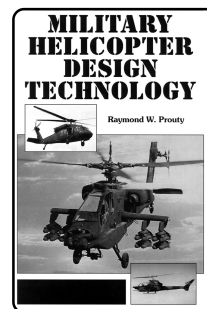
**HELICOPTER PERFORMANCE, STABILITY, AND CONTROL**

by *Raymond W. Prouty*

Provided in this text, for both the student and the practicing helicopter aerodynamicist, is the information necessary to analyze the performance of an existing helicopter or to participate in the design of a new helicopter. This

information includes the derivation of the theory behind the various methods of analysis, appropriate experimental data to correlate and supplement the theory, and charts that permit rapid analysis. A special attempt is made to relate helicopter aerodynamics to airplane aerodynamics for those who are making the transition. The first six chapters are devoted to the various aspects of helicopter performance. Chapters 7, 8, and 9 cover stability and control. The final chapter presents the tradeoff considerations that the engineer must face during the preliminary design phase to ensure both good performance and good flying qualities. In Appendix A, an "Example Helicopter" is defined and is consistently used throughout the book to illustrate, by numerical calculations, the application of the analysis.

Orig. Ed. 1986, Reissue Ed. 2002 • 746 pp.  
ISBN 978-1-57524-209-5 • \$145.00



**MILITARY HELICOPTER DESIGN TECHNOLOGY**

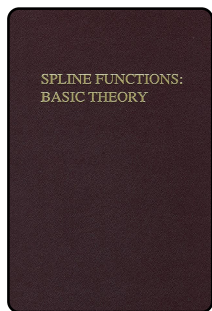
by *Raymond W. Prouty*

The military helicopter has come to prominence since the Second World War as the workhorse of the battlefield – casualty evacuation, angel of mercy and more recently, as a direct fire weapon. The attack helicopter in particular is

challenging the supremacy of the main battle tank. Today's

helicopter technology must be seen against the background of the evolution of helicopter design in the United States and Europe from the 1920s onwards. The author demonstrates with photographs, line drawings and original text, the revolution in design and technology. Considerable time is spent reviewing the various design phases of a helicopter, from conception through to the building and prototype testing stages. Current helicopter design programmes are outlined with emphasis on future programmes and with an assessment of their importance to the industry.

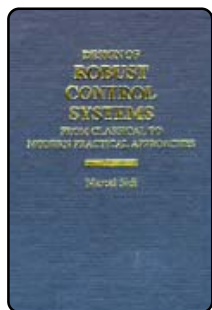
Orig. Ed. 1989, Reprint Ed. 1998 • 148 pp.  
ISBN 978-1-57524-067-1 • \$45.00



**SPLINE FUNCTIONS: Basic Theory**  
by *Larry L. Schumaker*

This book is devoted to the basic theory of spline functions, both in the polynomial case and for more general piecewise structure (including Tchebycheffian and L-Splines). It covers the study of main algebraic, analytic, and approximation-theoretic properties of various spaces of splines (which in their simplest form are just spaces of piecewise polynomials). In Chapters 1 through 3, background and reference material are presented. The heart of the book consists of Chapters 4 through 8, where polynomial splines are treated; Chapters 9 through 11 deal with the theory of generalized splines; and Chapters 12 and 13 are devoted to multidimensional splines.

Orig. Ed. 1981, Reprint Ed. 1993 • 570 pp.  
ISBN 978-0-89464-771-0 • \$103.75

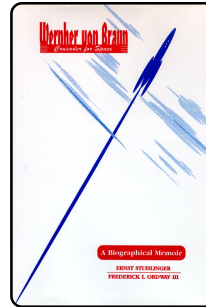


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Orig. Ed. 1994, Reissue Ed. 1996 • 392 pp.  
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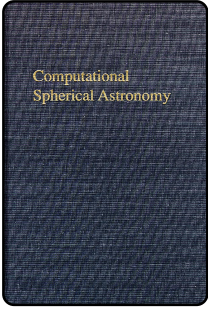
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Foreword by *Edward O. Buckbee*

This book, a companion volume to the biographical memoir, is a unique collection of photographs compiled from von Braun's life, spanning his childhood

through Peenemunde, White Sands, Redstone and NASA-Marshall Space Flight Center to his final years in Washington, D.C.

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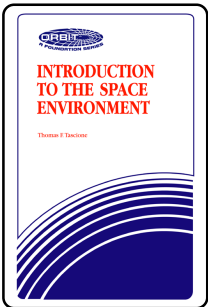


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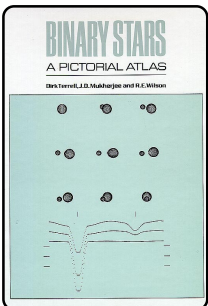


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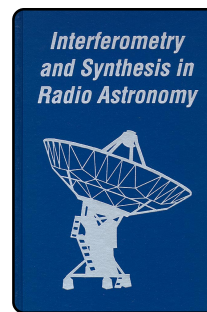
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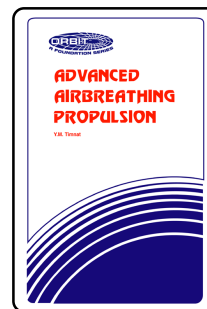


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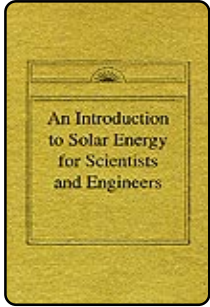
In this book Professor Timnat describes the physical and operating characteristics of a wide range of modern gas turbine engines, giving both their civil and military aviation applications. In addition, ramjets, scramjets, and pulse jets are analyzed, first for ideal conditions, then taking into account real gas effects and losses. Modern aviation applications for a number of airbreathing powerplants are also discussed

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