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Liquid Hydrogen As a Propulsion Fuel, 1945-1959 Jun 08 2021 In 1957, when Russia launched the first satellite, the ability of the United States to respond depended on one small launch vehicle still under development, Vanguard, and modifications to ballistic missiles. The subsequent space race featured a rapid buildup of launch vehicle capability in this country during the 1960s, culminating with the giant Saturn V which launched the Apollo lunar expeditions beginning in 1968. A significant part of the increased launch capability resulted from technical decisions made in 1958 and 1959 to use liquid hydrogen in the upper stages of the Centaur and Saturn vehicles-and that story is not well known. The decision to use liquid hydrogen in developing the nation's largest launch vehicle was particularly bold, for many experienced engineers doubted the advisability of using a highly hazardous fuel associated with the Hindenburg disaster of 1937, a gas difficult to liquefy, a liquid so cold-close to absolute zero-that storage and handling are difficult, and so light-1/14 the density of water-that large tank volumes are required, with attendant problems of vehicle mass and drag. Hydrogen had been considered in astronautics and aeronautics several times before; but in each case, as the problems became better known, the attempt was abandoned, What was different in this case? Why was there so much confidence about hydrogen within the young space agency to warrant risking the success of the nation's manned spaceflight program? The decision, of course, turned out to be the right one. Subsequent advancements in the technologies of liquefying, storing, transporting, and using large quantities of liquid hydrogen made it just another flammable liquid that could be handled and used safely with reasonable caution. The key role that liquid hydrogen played in the success of the Centaur and Saturn launch vehicles has long interested the author. As a participant in research on hydrogen for rockets in the 1950s and a proponent for its use, the author understood the potential as well as the risks and in recent years wanted to investigate more fully the circumstances leading to the 1958 and 1959 decisions. In digging into the background for the decisions and the status of hydrogen technology that influenced those decisions, the question arose: how far back to investigate? The flammability of gaseous hydrogen has been known for centuries; its large heat content was measured in the 18th century; and it was liquefied by Dewar in 1898. Five years later, Tsiolkovskiy, the Russian rocket pioneer, proposed its use in a space rocket, as did Goddard in 1910. In the 1920s, Oberth correctly assessed the advantage of using hydrogen in the upper stages of space vehicles. None of these rocket pioneers experimented with hydrogen; other fuels appeared more attractive in the face of hydrogen's disadvantages, particularly its low density. One German experimenter, Walter Theil, tried to use liquid hydrogen in a small rocket engine a few years before World War II, but numerous leaks and higher priority tasks ended the experiments. The first systematic investigations of liquid hydrogen to propel aircraft and rockets began in the United States in 1945 and although earlier developments undoubtedly had an influence, where the author chose to start this book at that point. In describing the history of rocket technology, it is easy for an engineer-author to become immersed in the technical aspects that may be of little interest to some readers. The author tried to minimize mathematics, technical language, and other specialized details, but some are unavoidable if propulsion research is to be presented fairly and accurately. Adding to this problem has been the conversion of many familiar English units into the metric system. Those accustomed to thinking of rocket performance in terms of specific impulse will not find it here; instead, they will have to settle for its equivalent, exhaust velocity.

A High-performance 250-pound-thrust Rocket Engine Utilizing Coaxial-flow Injection of JP-4 Fuel and Liquid Oxygen May 20 2022

Liquid Hydrogen as a Propulsion Fuel, 1945-1959 Aug 11 2021

Physical Therapy Rocket Fuel Jul 30 2020 ARE YOU JUST SURVIVING? Physical Therapy ROCKET FUEL will help you systematically grow and expand your practice in ways that not only work, but that are easy to implement: 14 high-velocity marketing ideas to propel your practice

from survival to success.

Leave the Grind Behind Aug 23 2022 Get the bestselling book that shows you how to make more money, build your legacy, and quit your job. "Move over Tim Ferriss, there's a refreshed approach to unshackling yourself from the grueling busy-work of the grind." - Matthew Hart - Author and CTO Arise Virtual Solutions Leave The Grind Behind is for anyone who has built a good career, is comfortable, yet has an itch-a realization-that there is more to life. This book is dedicated to all those ready to forge their own path, get more out of life, and burn their imprint on the world. You want more money, more freedom, and to build your own legacy. Perhaps you want to carve a future by leveraging your talents to freelance, consult, or become an entrepreneur. Leave The Grind Behind is packed with actions, habits, and tools that will enable your success and explode your results. It will help you build the legacy you envisioned yourself leaving. You will develop a plan for leaving the grind behind, execute, and do so with minimal risk. Time is your most valuable asset. Spending the majority of it working for someone else's dream won't let you achieve the life you want. You'll end up as just another cog in the daily grind, working for an upper-middle class salary with no end in sight. Your own dreams are fading... but you're not ready to go down without a fight. If this sounds like you, you're ready for more in life than just a job. You're ready to venture into a realm that will be more rewarding and more exciting. You're ready for something that will make you a fortune. Leave The Grind Behind is for you if you want to... Quit your day job and follow your passions to become a consultant, a freelancer, or an entrepreneur. Be a rock star at the job you already have, opening your career wide. Identify your personal and professional goals, then design your life around them. Reduce the risk of doing something big. Create new revenue streams while working your current job. Purchase investment properties. Complete that passion project on the side. Write a book. Provide for yourself and your family without compromise. Live a life directed by you rather than someone else. Enjoy freedom and the best things life has to offer. Leave a legacy. Leave The Grind Behind will inspire you to leave the daily grind and start a life in which you drive the results. A life in which you: Earn money via multiple channels. Are in control of your time. Do things you enjoy. Leave a legacy that makes you proud. It can be a daunting proposition to completely kick your job and spend as much time as you want on projects that excite you. If you're not quite ready to go all in, this book will give you plenty of guidance and inspiration to get you started. To start an excellent, scalable business, you're probably looking at a couple of years of tremendously hard work with little return and no guarantee. If you already have a solid job, a mortgage, and a family to support, you know that immediately jumping into the deep end is just too risky. But, that doesn't need to stop you. There is no shortage of self-help, personal development, and get-rich books on the market. And that's great. Life is a journey, and we all need fresh sources of inspiration and ideas to keep ourselves motivated and challenged. This book provides that for you. But it can do something more. Many books come from authors who've had one particularly large success. Leave the Grind Behind provides a more generally accessible path. You won't necessarily learn how to be a one time success, but rather to consistently find one success after the next. You'll get the tools to achieve repeated excellence.

History of Liquid Propellant Rocket Engines Dec 27 2022 Liquid propellant rocket engines have propelled all the manned space flights, all the space vehicles flying to the planets or deep space, virtually all satellites, and the majority of medium range or intercontinental range ballistic missiles.

Advances in Hybrid Rocket Technology and Related Analysis Methodologies Jan 16 2022 The book is an amazing collection of technical papers dealing with hybrid rockets. Once perceived as a niche technology, for about a decade, hybrid rockets have enjoyed renewed interest from both the propulsion technical community and industry. Hybrid motors can be used in practically all applications where a rocket is employed, but there are certain cases where they present a superior fit, such as sounding rockets, tactical missile systems, launch boosters and the emerging field of commercial space transportation. The novel space tourism business, indeed, will benefit from their safety and lower recurrent development costs. The subjects addressed in the book include the cutting edge technology employed to push forward this relatively new propulsion concept, spanning systems to improve fuel regression rate, control of the mixture ratio to optimize performance, computational fluid dynamics applied to the simulation of the internal ballistics, and some other novel system applications.

The Conversion of Liquid Rocket Fuels, Risk Assessment, Technology and Treatment Options for the Conversion of Abandoned Liquid Ballistic Missile Propellants (Fuels and Oxidizers) in Azerbaijan Apr 06 2021 Prof. Dr. -Ing. Wolfgang Spyra Brandenburg University of Technology in Cottbus, Germany The demilitarization and conversion of military properties wor- wide has been a topic of growing importance since the end of the Cold War. The slowing of the arms race brought on by weapons treaties and relaxed tensions between NATO and Warsaw Pact nations caused sto- piles of conventional weapons to become superfluous. The need to process and dispose of such weapons began more quickly in NATO countries. This demilitarization process began shortly after the reunification of Germany and was largely completed by the mid to late 1990's. The remaining process, no small task in itself, of converting lands formerly used by the military into safe and environmentally acceptable landscapes may continue for decades to come. Due to a lack of resources and technology, the process of demilitarization in the former Warsaw Pact countries has launched more slowly. In 2002 both Georgia and Moldova finished projects which destroyed their stocks of liquid ballistic missile components. Both these projects were carried out through the cooperative support of trans-national organizations, private contractors, and research institutions. The Republic of Azerbaijan now finds itself at the beginning of its demilitarization process. Stored at the country's military depots are over 2000 tons of missile fuels, oxidizer, and chemical additives. This hazardous waste is kept in tanks intended only for temporary transport and storage.

Rockets and Other Spacecraft Jun 20 2022 Looks at rockets, lunar modules, shuttles, satellites, and probes, in terms of basic space travel theory, gravity, drag, sources of power, design, and steering.

Solid Propellant Rocket Research Jan 04 2021 Solid Propellant Rocket Research

Space Rockets Dec 23 2019 Join Cogz the Robot Dog and discover all about how space machines work, in this bright and fun STEM title. Cogz and his mice sidekicks, Nutty and Bolt, guide the reader through the workings of a rocket, looking closely at all the different parts and discovering information about real space missions and the spacecraft involved, including the Mars Rover and Apollo missions. Covering key STEM themes of engineering, physics, and inventions, and with a fun quiz to test young readers' knowledge, this book will get kids engaged and hands-on with learning. Perfect for vehicle-mad pre-schoolers, the Clever Cogz series lets young readers discover different vehicles, from space rockets to racing cars. Bite-sized text and colorful, informative illustrations introduce the transport topics in a simple, engaging way for young readers with a passion for machines.

Rocket Propulsion Elements Feb 14 2022

Thermofluiddynamics of Optimized Rocket Propulsions Dec 15 2021 This study has two declared aims: it presents the theoretical basis for a provably ideal comparative process for relaxing flows (ICP) and jus tifies its application to jet and, in particular, rocket engines. This will be treated in two parts. Part I offers a status quo report on current calculation methods, and compiles and explains briefly the most important data on selected pro minent rocket engines. Starting from the phenomenology of the dynamical and physico-chemical conversion processes in the fuel-oxidizer fluid mixture and in the burned gases, the ideal thermodynamic comparative process is then derived - as a defined sequential change of states in the system. In order to render this comparative process readily under standable, it is first applied to an appropriate model gas using alge braic equations for all relevant parameters. This model gas undergoes energy conversion processes without forfeiting the simplicity of pre sentation typical of classical gas dynamics. Above all, examination of this model offers proof that it is generally impermissible to use, as is done in practice, the familiar isentropic equation for flow changes of state continuously propagated in flow tube theory. Elementary calculations immediately indicate essential attributes which are also typical for relaxing, multicomponent, one-phase systems, such as the significant 'pressure drop phenomenon' or the establishment of the steady mass flow rate as an 'eigenvalue' of the comparative pro cess. Their relevance to the RE theory is stressed.

Traction Jul 22 2022 OVER 1 MILLION COPIES SOLD! Do you have a grip on your business, or does your business have a grip on you? All entrepreneurs and business leaders face similar frustrations—personnel conflict, profit woes, and inadequate growth. Decisions never seem to get made, or, once made, fail to be properly implemented. But there is a solution. It's not complicated

or theoretical.The Entrepreneurial Operating System® is a practical method for achieving the business success you have always envisioned. More than 80,000 companies have discovered what EOS can do. In Traction, you'll learn the secrets of strengthening the six key components of your business. You'll discover simple yet powerful ways to run your company that will give you and your leadership team more focus, more growth, and more enjoyment. Successful companies are applying Traction every day to run profitable, frustration-free businesses—and you can too. For an illustrative, real-world lesson on how to apply Traction to your business, check out its companion book, Get A Grip.

Rocket Propellant Technology Jan 28 2023 Rocket Propulsion has come of age. Although its potentialities and capabilities in many areas have been recognized for centuries, it is only in recent years that scientists have had the materials and the manufacturing techniques at their command so they could control and direct the tremendous forces available. Space exploration and manned flights by astronauts have brought the science of rocketry to the attention of the general public. It has also stimulated the interest of students at all level

Boron-Based Fuel-Rich Propellant Oct 01 2020 Boron-Based Fuel-Rich Solid Rocket Propellant Technology is a professional book that systematically introduces the latest research progress for boron-based fuel-rich solid propellants. It covers surface modifications, coating and agglomerating techniques, granulation, and characterization of amorphous boron powders, and its application to fuel-rich solid rocket propellants. Technologies for controlling the processing methods and combustion performance of fuel-rich propellants are examined, and the book concludes with a summary of the research progress in boron-based fuel-rich solid propellants and a look forward to the foreseeable development trends of military applications.

Rocket Fuel for Dreamers Feb 23 2020 A great poetry book that everyone should read.

Liquid Hydrogen May 27 2020 to the German Edition This book is based on published material, oral presentations and lecture courses, as well as the author's personal research in the specific field of space technology and in the general areas of energy storage and transfer, and cryogenics. The science and technology of liquid hydrogen-once essential prere quisites for the rapid development of space technology-are now also proving to be more and more important for the energy production of the future. Hydrogen as an energy carrier can generally mediate the existing disparity between nuclear energy and regenerative energy, both of which are indispensable for the future. Hydrogen, as a secondary energy carrier, can be produced from these primary energy sources with minimal environmental impact and without the detrimental, long-term pollution effects of current fossil fuel technology. Hydrogen, therefore, represents the ultimate in energy technology. The initial, large-scale application of hydrogen as a secondary energy was as a high-energy rocket propellant. The procedures for its large scale liquefaction, storage and employment were generally developed in the U.S. Currently in Europe similar activities are being conducted only in France. The effort in West Germany involves testing hydrogen-oxygen and hydrogen-fluorine rocket engines, studying also the physical and technical characteristics of slush hydrogen-mixture of the solid and liquid phase-and is concentrating currently on R&D applications of liquid hydrogen as an alternate fuel. Similar activities are also being conducted in Japan and Canada.

Theoretical Performance of Diborane as a Rocket Fuel Feb 02 2021

Rockets Oct 13 2021

Solid Rocket Propulsion Technology Oct 25 2022 This book, a translation of the French title Technologie des Propergols Solides, offers otherwise unavailable information on the subject of solid propellants and their use in rocket propulsion. The fundamentals of rocket propulsion are developed in chapter one and detailed descriptions of concepts are covered in the following chapters. Specific design methods and the theoretical physics underlying them are presented, and finally the industrial production of the propellant itself is explained. The material used in the book has been collected from different countries, as the development of this field has occurred separately due to the classified nature of the subject. Thus the reader not only has an overall picture of solid rocket propulsion technology but a comprehensive view of its different developmental permutations worldwide.

Modern Engineering for Design of Liquid-Propellant Rocket Engines Nov 25 2022

Chemical Rockets, and Flame and Explosives Technology Mar 18 2022

Principles of Nuclear Rocket Propulsion Sep 23 2022 Principles of Nuclear Rocket Propulsion,

Second Edition continues to put the technical and theoretical aspects of nuclear rocket propulsion into a clear and unified presentation, providing an understanding of the physical principles underlying the design and operation of nuclear fission-based rocket engines. This new edition expands on existing material and adds new topics, such as antimatter propulsion, nuclear rocket startup, new fuel forms, reactor stability, and new advanced reactor concepts. This new edition is for aerospace and nuclear engineers and advanced students interested in nuclear rocket propulsion. Provides an understanding of the physical principles underlying the design and operation of nuclear fission-based rocket engines Includes a number of example problems to illustrate the concepts being presented Contains an electronic version with interactive calculators and rotatable 3D figures to demonstrate the physical concepts being presented Features an instructor website that provides detailed solutions to all chapter review questions

Liquid Rocket Metal Tanks and Tank Components Jun 28 2020

Rockets : an educator's guide with activities in science, mathematics, and technology. Mar 06 2021

Rocket Fuel Jul 10 2021 The author gives the reader delicious, creative, and convenient real-food recipes to power his or her everyday exercise and weekend adventures.

Rocket Fuel Apr 30 2023 Discover the vital relationship that will take your company from "What's next?" to "We have liftoff!" Visionaries have groundbreaking ideas. Integrators make those ideas a reality. This explosive combination is the key to getting everything you want out of your business. It worked for Disney. It worked for McDonald's. It worked for Ford. It can work for you. From the author of the bestselling Traction, Rocket Fuel details the integral roles of the Visionary and Integrator and explains how an effective relationship between the two can help your business thrive. Offering advice to help Visionary-minded and Integrator-minded individuals find one another, Rocket Fuel also features assessments so you're able to determine whether you're a Visionary or an Integrator. Without an Integrator, a Visionary is far less likely to succeed long-term ,and realize the company's ultimate goals—likewise, with no Visionary, an Integrator can't rise to his or her full potential. When these two people come together to share their natural talents and innate skill sets, it's like rocket fuel—they have the power to reach new heights for virtually any company or organization.

Ignition! Mar 30 2023 This newly reissued debut book in the Rutgers University Press Classics Imprint is the story of the search for a rocket propellant which could be trusted to take man into space. This search was a hazardous enterprise carried out by rival labs who worked against the known laws of nature, with no guarantee of success or safety. Acclaimed scientist and sci-fi author John Drury Clark writes with irreverent and eyewitness immediacy about the development of the explosive fuels strong enough to negate the relentless restraints of gravity. The resulting volume is as much a memoir as a work of history, sharing a behind-the-scenes view of an enterprise which eventually took men to the moon, missiles to the planets, and satellites to outer space. A classic work in the history of science, and described as “a good book on rocket stuff…that’s a really fun one” by SpaceX founder Elon Musk, readers will want to get their hands on this influential classic, available for the first time in decades.

Rocket Fuel for the Soul Jan 22 2020 I created this little book with love. I combined digital art with inspiring words to bring a little more beauty into your world.

Fundamentals of Rocket Propulsion Feb 26 2023 The book follows a unified approach to present the basic principles of rocket propulsion in concise and lucid form. This textbook comprises of ten chapters ranging from brief introduction and elements of rocket propulsion, aerothermodynamics to solid, liquid and hybrid propellant rocket engines with chapter on electrical propulsion. Worked out examples are also provided at the end of chapter for understanding uncertainty analysis. This book is designed and developed as an introductory text on the fundamental aspects of rocket propulsion for both undergraduate and graduate students. It is also aimed towards practicing engineers in the field of space engineering. This comprehensive guide also provides adequate problems for audience to understand intricate aspects of rocket propulsion enabling them to design and develop rocket engines for peaceful purposes.

Rocket Fuel for Dreamers Nov 01 2020

The Chemistry and Technology of Solid Rocket Propellants (A Treatise on Solid Propellants) Apr 18 2022 The book is a treatise on solid propellants in nine chapters, covering the history,

chemistry, energetics, processing and characterization aspects of composite solid propellants, internal ballistics, advanced solid propellants, safety, quality and reliability and homogenous or double base propellants. The book also traces the evolution of solid propellant technology in ISRO for launch vehicles and sounding rockets. There is a detailed table of contents, expanded index, glossary, exhaustive references and questions in each chapter. It can be used as a textbook for science and engineering students, as a reference book for researchers and as a companion to scientists and engineers working in the research, development and production areas of solid propellants.

Nanomaterials in Rocket Propulsion Systems May 08 2021 Nanomaterials in Rocket Propulsion Systems covers the fundamentals of nanomaterials and examines a wide range of innovative applications, presenting the current state-of-the-art in the field. Opening with a chapter on nano-sized energetic materials, the book examines metal nanoparticles-based fuels, ballistic modifiers, stabilizers and catalysts as the components of rocket propellants. Hydrogen storage materials for rocket propulsion based on nanotubes are then discussed, as are nano-porous materials and metal organic frameworks, nano-gelled propellants, nano-composite ablators and ceramic nano-composites. Other applications examined include high thermal conductivity metallic nano-composite nozzle liners, nano-emitters for Coulomb propulsion of space-crafts, and highly thermostable nano-ceramics for rocket motors. The book finishes with coverage of combustion of nano-sized rocket fuels, nano-particles and their combustion in micro- and nano-electromechanical systems (MEMS/NEMS), plasma propulsion and nano-scale physics. Users will find this to be a valuable resource for academic and government institutions, professionals, new researchers and graduate students working in the application of nanomaterials in the aerospace industry. Provides a detailed overview of different types of nanomaterials used in rocket propulsion, highlighting different situations in which different materials are used Demonstrates the use of new nanomaterial concepts, allowing for an increase in payload capacity or a decrease in launch mass Explores a range of applications using metal nanopowders, presenting a panorama on cutting-edge, technological developments

Theoretical Performance of JP-4 Fuel and Liquid Oxygen as a Rocket Propellant Aug 30 2020 Theoretical rocket performance for frozen composition during expansion was calculated for the propellant combination JP-4 fuel and liquid oxygen at two chamber pressures and several pressure ratios and oxidant-fuel ratios.

Liquid Rocket Engine Combustion Instability Mar 25 2020 Annotation Since the invention of the V-2 rocket during World War II, combustion instabilities have been recognized as one of the most difficult problems in the development of liquid propellant rocket engines. This book is the first published in the United States on the subject since NASA's Liquid Rocket Combustion Instability (NASA SP-194) in 1972. In this book, experts cover four major subject areas: engine phenomenology and case studies, fundamental mechanisms of combustion instability, combustion instability analysis, and engine and component testing. Especially noteworthy is the inclusion of technical information from Russia and China--a first.

An Experimental Investigation of Chemical Reaction Between Propellant Tank Material and Rocket Fuels Or Oxidizers when Impacted by Small High-velocity Projectiles Nov 13 2021

Progress in Astronautics and Aeronautics Apr 26 2020

Liquid Rocket and Propellants Dec 03 2020 Liquid Rocket and Propellants

Insanely Gifted Sep 11 2021 It's time to unleash your genius From infancy we are taught to edit ourselves, trimming out the darker, weirder, less acceptable parts in order to please others. But this addiction to approval is holding us back. What if we dare to be our real selves, honestly and fully? Insanely Gifted is full of techniques and games to transform our thinking and turn our inner demons into allies. Jamie Catto, creative force behind Faithless and 1 Giant Leap, and leader of personal development workshops for more than a decade, teaches us to better know our deepest instincts - and unlock our true power.

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