Falcon 9 Launch Vehicle Payload User S Guide

This book provides answers to the questions of why human-kind should go into space, and on the relative roles of governments and markets in the evolution of the space economy. It adopts an interdisciplinary approach to answer those questions. Science and technology define the boundaries of what is possible. The realization of the possible depends on economic, institutional, and political factors. The book thus draws from many different academic areas such as physical science, astronomy, astronautics, political science, economics, sociology, cultural studies, and history. In the literature, the space economy has been analyzed using different approaches from science and technology to the effects of public expenditures on economic growth and to medium term effects on productivity and growth. This book brings all these aspects together following the evolutionary theory of economic change. It studies processes that transform the economy through the interactions among diverse economic agents, governments, and the extra-systemic environment in which governments operate. Its historical part helps to better understand motivations and constraints - technical, political, and economical - that shaped the growth of the space economy. In the medium term, global issues - such as population changes, critical or limited natural resources, and environmental damages – and technological innovations are the main drivers for the evolution of the space economy beyond Earth orbit. In universities, this

book can be used: as a reference by historians of astronautics; for researchers in the field of astronautics, international political economy, and legal issues related to the space economy. In think tanks and public institutions, both national and international, this book provides an input to the ongoing debate on the collaboration among space agencies and the role of private companies in the development of the space economy. Finally, this book will help the educated general public to orient himself in the forest of stimuli, news, and solicitations to which he is daily subjected by the media, television and radio, and to react in less passive ways to those stimuli.

An optimistic look at space travel not only showcases the groundbreaking technology of today but also speculates on what lies beyond today's hardware, in a book that looks at both governmental and commercial strategies for space exploration and where in the universe they may lead humans in the future.

Written by a former Aerodynamics Officer on the space shuttle program, this book provides a complete overview of the “new” U. S. space program, which has changed considerably over the past 50 years.The future of space exploration has become increasingly dependent on other countries and private enterprise. Can private enterprise fill NASA's shoes and provide the same expertise, safety measures and lessons learned? In order to tell this story, it is important to understand the politics of space as well as the dangers, why it is so difficult to explore and utilize the resources of space. Some past and recent triumphs and failures will be discussed, pointing the way

to a successful space policy that includes taking risks but also learning how to mitigate them.

Blast off with SpaceX, the company that builds and launches rockets and spacecraft. Up-to-date information and fact-filled sidebars help readers explore the world's most exciting space-travel company while learning about related STEM topics.

Young addresses the impressive expansion across existing and developing commercial space business markets, with multiple private companies competing in the payload launch services sector. The author pinpoints the new markets, technologies, and players in the industry, as well as highlighting the overall reasons why it is important for us to develop space. NASA now relies on commercial partners to supply cargo and crew spacecraft and services to and from the International Space Station. The sizes of satellites are diminishing and their capabilities expanding, while costs to orbit are decreasing. Suborbital space tourism holds the potential of new industries and jobs. Commercial space exploration of the Moon and the planets also holds promise. All this activity is a catalyst for anyone interested in joining the developing space industry, from students and researchers to engineers and entrepreneurs. As more and more satellites and rockets are launched and the business of space is expanding at a significant pace, it is increasingly important for scientists and engineers of many disciplines to understand how the business evolved and where it is continuing to develop. The growing field is fully explored in this concise overview to the players in this changing

landscape.

This book explores the once popular idea of 'Flexible Path' in terms of Mars, a strategy that would focus on a manned orbital mission to Mars's moons rather than the more risky, expensive and time-consuming trip to land humans on the Martian surface. While currently still not the most popular idea, this mission would take advantage of the operational, scientific and engineering lessons to be learned from going to Mars's moons first. Unlike a trip to the planet's surface, an orbital mission avoids the dangers of the deep gravity well of Mars and a very long stay on the surface. This is analogous to Apollo 8 and 10, which preceded the landing on the Moon of Apollo 11. Furthermore, a Mars orbital mission could be achieved at least five years, possibly 10 before a landing mission. Nor would an orbital mission require all of the extra vehicles, equipment and supplies needed for a landing and a stay on the planet for over a year. The cost difference between the two types of missions is in the order of tens of billions of dollars. An orbital mission to Deimos and Phobos would provide an early opportunity to acquire scientific knowledge of the moons and Mars as well, since some of the regolith is presumed to be soil ejected from Mars. It may also offer the opportunity to deploy scientific instruments on the moons which would aid subsequent missions. It would provide early operational experience in the Mars environment without the risk of a landing. The author convincingly argues this experience would enhance the probability of a safe and successful Mars landing by NASA at a later date, and lays out

the best way to approach an orbital mission in great detail. Combining path-breaking science with achievable goals on a fast timetable, this approach is the best of both worlds--and our best path to reaching Mars safely in the future.

On June 15, 2011, the Air Force Space Command established a new vision, mission, and set of goals to ensure continued U.S. dominance in space and cyberspace mission areas. Subsequently, and in coordination with the Air Force Research Laboratory, the Space and Missile Systems Center, and the 14th and 24th Air Forces, the Air Force Space Command identified four long-term science and technology (S&T) challenges critical to meeting these goals. One of these challenges is to provide full-spectrum launch capability at dramatically lower cost, and a reusable booster system (RBS) has been proposed as an approach to meet this challenge. The Air Force Space Command asked the Aeronautics and Space Engineering Board of the National Research Council to conduct an independent review and assessment of the RBS concept prior to considering a continuation of RBS-related activities within the Air Force Research Laboratory portfolio and before initiating a more extensive RBS development program. The committee for the Reusable Booster System: Review and Assessment was formed in response to that request and charged with reviewing and assessing the criteria and assumptions used in the current RBS plans, the cost model methodologies used to fame [frame?] the RBS business case, and the technical maturity and development plans of key elements critical to RBS implementation. The committee consisted of

experts not connected with current RBS activities who have significant expertise in launch vehicle design and operation, research and technology development and implementation, space system operations, and cost analysis. The committee solicited and received input on the Air Force launch requirements, the baseline RBS concept, cost models and assessment, and technology readiness. The committee also received input from industry associated with RBS concept, industry independent of the RBS concept, and propulsion system providers which is summarized in Reusable Booster System: Review and Assessment.

The Yearbook on Space Policy, edited by the European Space Policy Institute (ESPI), is the reference publication analysing space policy developments. Each year it presents issues and trends in space policy and the space sector as a whole. Its scope is global and its perspective is European. The Yearbook also links space policy with other policy areas. It highlights specific events and issues, and provides useful insights, data and information on space activities. The first part of the Yearbook sets out a comprehensive overview of the economic, political, technological and institutional trends that have affected space activities. The second part of the Yearbook offers a more analytical perspective on the yearly ESPI theme and consists of external contributions written by professionals with diverse backgrounds and areas of expertise. The third part of the Yearbook

carries forward the character of the Yearbook as an archive of space activities. The Yearbook is designed for government decision-makers and agencies, industry professionals, as well as the service sectors, researchers and scientists and the interested public.

Please note that the content of this book primarily consists of articles available from Wikipedia or other free sources online. Pages: 19. Chapters: Antrix Corporation, Arianespace, China Aerospace Science and Technology Corporation, COSMOS International, Eurockot Launch Services, International Launch Services, ISC Kosmotras, Khartron, Land Launch, Orbital Sciences Corporation, Sea Launch, SpaceX, Starsem, United Launch Alliance. Excerpt: Space Exploration Technologies Corporation, or SpaceX, is an American space transport company headquartered in Hawthorne, California. It was founded in 2002 by former PayPal entrepreneur Elon Musk. It has developed the Falcon 1 and Falcon 9 launch vehicles, both of which were designed from conception to eventually become reusable. SpaceX also developed the Dragon spacecraft to be flown into orbit by the Falcon 9 launch vehicle, initially transporting cargo and later planned to carry humans. On 25 May 2012, SpaceX made history as the world's first privately held company to send a cargo payload, carried on the Dragon spacecraft, to the International Space Station. In order to control quality

and costs, SpaceX designs, tests and fabricates the majority of its components in-house, including the Merlin, Kestrel, and Draco rocket engines used on the Falcon launch vehicles and the Dragon spacecraft. In 2006, NASA awarded the company a Commercial Orbital Transportation Services (COTS) contract to design and demonstrate a launch system to resupply cargo to the International Space Station (ISS). On 9 December 2010, the launch of the COTS Demo Flight 1 mission, SpaceX became the first privately funded company to successfully launch, orbit and recover a spacecraft. On 22 May 2012, SpaceX's Falcon 9 rocket carried the unmanned Dragon capsule into space, marking the first time a private company has sent a spacecraft to the space station. The unmanned, cone-shaped capsule became the first privately built and operated vehicle to ever dock...

Presents an historical survey of unmanned space travel, examines its scientific and practical applications, profiles notable missions, and speculates about the future of unmanned space missions.

Reinventing Space is the largest global conference and exhibition for one of the space industry’s fastest growing sectors. Over its 82-year history, the British Interplanetary Society has acted as a forum for new and innovative ideas and developments in astronautics, low-cost access and utilization of space. These

conference proceedings reflect the work done at the 13th Reinventing Space Conference, the second biggest space event in the UK during 2015. The global economic climate is creating demand to reduce expenditure, leading to new challenges and opportunities in the world's space industry. The need to create more responsive systems and launchers that are capable of delivering to space quickly, cheaply and reliably has never been more vital. This collection from RIspace brings together industry, agency, government, financiers, academia and end users. It focuses on the commercialization of space and addresses a range of topics including low-cost launch opportunities, the rebirth of constellations, beyond LEO activities and novel technologies. These papers encourage and promote forward-thinking ideas and concepts for the future exploration and utilization of space. The proceedings address: • New ways of doing business in space – how do we make money on affordable and responsive space missions? • Tactical space systems – how do we best serve the needs of defense missions; civilian missions; the needs of emergency responders? • Interplanetary missions – can we use new technology to explore the Solar System at dramatically lower cost? • What are the methods, processes, and technologies that we can use to make major reductions in the cost of space missions? • New application areas for low-cost space systems – which ones can take advantage of newer, much

lower-cost systems? • How do we educate and motivate the coming generation, without whom there won't be a space industry?

In recent decades, the number of satellites being built and launched into Earth's orbit has grown immensely, alongside the field of space engineering itself. This book offers an in-depth guide to engineers and professionals seeking to understand the technologies behind Low Earth Orbit satellites. With access to special spreadsheets that provide the key equations and relationships needed for mastering spacecraft design, this book gives the growing crop of space engineers and professionals the tools and resources they need to prepare their own LEO satellite designs, which is especially useful for designers of small satellites such as those launched by universities. Each chapter breaks down the various mathematics and principles underlying current spacecraft software and hardware designs.

This book covers the possible manned mission to Mars first discussed in the 1950s and still a topic of much debate, addressing historic and future plans to visit the Red Planet. Considering the environmental dangers and the engineering and design needed for a successful trip, it covers every aspect of a possible mission and outpost. The chapters explain the motivations behind the plan to go to Mars, as well as the physical factors that astronauts on manned missions will

face on Mars and in transit. The author provides a comprehensive exposure to the infrastructure needs on Mars itself, covering an array of facilities including power sources, as well as addressing earth-based communication networks that will be necessary. Mechanisms for return to Earth are also addressed. As the reality of a manned Mars voyage becomes more concrete, the details are still largely up in the air. This book presents an overview of proposed approaches past, present, and future, both from NASA and, increasingly, from other space agencies and private companies. It clearly displays the challenges and the ingenious solutions involved in reaching Mars with human explorers.

A major non-technical challenge of space activities is ensuring productive cooperation, communication, and understanding between the engineers who design the mission and the space lawyers who cover its relevant legal aspects. Though both groups usually attain some level of understanding, it is only achieved after many years of experience in the space industry and through repeated contact with topics relevant to their projects. A basic understanding of the most important legal and technical aspects acquired earlier in their careers can facilitate better cooperation and more efficient development of space projects. Promoting Productive Cooperation Between Space Lawyers and Engineers is a pivotal reference source that provides vital insights into basic legal

and technical topics and challenges that occur while planning and conducting typical space activities. The book uses high-profile space missions as examples and highlights the major technical aspects of these missions and the legal issues applied to these missions. While highlighting topics such as planetary settlements, policy perspectives, and suborbital spaceflight, this publication is ideally designed for lawyers, engineers, academicians, students, and professionals.

Based on years of research conducted at the NASA Jet Propulsion Laboratory, Low-Energy Lunar Trajectory Design provides high-level information to mission managers and detailed information to mission designers about low-energy transfers between Earth and the moon. The book answers high-level questions about the availability and performance of such transfers in any given month and year. Low-energy lunar transfers are compared with various other types of transfers, and placed within the context of historical missions. Using this book, designers may reconstruct any transfer described therein, as well as design similar transfers with particular design parameters. An Appendix, “Locating the Lagrange Points,” and a useful list of terms and constants completes this technical reference. Surveys thousands of possible trajectories that may be used to transfer spacecraft between Earth and the moon, including transfers to lunar libration orbits, low lunar orbits, and the lunar surface Provides information about the methods, models, and tools used to design low-energy lunar transfers Includes discussion about the variations of these transfers from one month to the next, and the important operational aspects of implementing a low-energy lunar transfer Additional

discussions address navigation, station-keeping, and spacecraft systems issues
Orbital 2100 is a science fiction setting for Cepheus Engine and other Classic 2D6 SF RPGs. It has realistic (TL 9) feel that is set within our own solar system. The Earth is locked in a Cold War with the people of Luna. Both face off, 400,000 km apart, threatening mutual annihilation whilst they compete to colonise the moons of Jupiter and Saturn. Older colonies such as Mars and Mercury are independent and caught up in this struggle for solar system supremacy. Spacecraft use nuclear thermal rockets and create gravity by spinning pods or centrifuges, this is spaceflight as envisaged today! In keeping with the near-future and hard-science fiction themes, role-playing campaigns focus on real people doing real jobs. The game has rules, technology and advice to allow scenarios based around deep space haulage, asteroid mining, salvage, rescue and exploration. Colour cover, with B&W interior. Claim a free copy of the full colour PDF by contacting Zozer: https: //www.paulelliottbooks.com/contact.html
More than four decades have passed since a human first set foot on the Moon. Great strides have been made in our understanding of what is required to support an enduring human presence in space, as evidenced by progressively more advanced orbiting human outposts, culminating in the current International Space Station (ISS). However, of the more than 500 humans who have so far ventured into space, most have gone only as far as near-Earth orbit, and none have traveled beyond the orbit of the Moon. Achieving humans' further progress into the solar system had proved far more difficult than imagined in the heady days of the Apollo missions, but the potential rewards remain substantial. During its more than 50-year history, NASA's success in human space exploration has depended on the agency's ability to effectively address a wide range of biomedical, engineering, physical science, and related

obstacles--an achievement made possible by NASA's strong and productive commitments to life and physical sciences research for human space exploration, and by its use of human space exploration infrastructures for scientific discovery. The Committee for the Decadal Survey of Biological and Physical Sciences acknowledges the many achievements of NASA, which are all the more remarkable given budgetary challenges and changing directions within the agency. In the past decade, however, a consequence of those challenges has been a life and physical sciences research program that was dramatically reduced in both scale and scope, with the result that the agency is poorly positioned to take full advantage of the scientific opportunities offered by the now fully equipped and staffed ISS laboratory, or to effectively pursue the scientific research needed to support the development of advanced human exploration capabilities. Although its review has left it deeply concerned about the current state of NASA's life and physical sciences research, the Committee for the Decadal Survey on Biological and Physical Sciences in Space is nevertheless convinced that a focused science and engineering program can achieve successes that will bring the space community, the U.S. public, and policymakers to an understanding that we are ready for the next significant phase of human space exploration. The goal of this report is to lay out steps and develop a forward-looking portfolio of research that will provide the basis for recapturing the excitement and value of human spaceflight--thereby enabling the U.S. space program to deliver on new exploration initiatives that serve the nation, excite the public, and place the United States again at the forefront of space exploration for the global good.

Reusable rockets are rockets that can be launched, recovered, and launched again. Reusable rockets are already in use, and they have been used to supply the International Space Station.

Reusing rockets will help bring costs down and open access to space for many more people. Includes glossary, websites, and bibliography for further reading.

This new resource presents the emerging role of Low Earth Orbit (LEO), Medium Earth Orbit (MEO), and Geostationary satellites (GSO) as a delivery option for backhaul and wide area rural and urban mobile broadband and fixed access. The book offers insight into recently established Non Terrestrial Network standards. Readers learn which bands will need to be supported in next generation 5G and satellite devices and networks and how the bands will be characterized. Channel spacing, guard bands, FDD or TDD, out of band emission limits, and in band performance requirements are discussed. The book discusses what interference issues will arise from new band allocations including co-shared allocations and how interference will be mitigated in and between next generation terrestrial and satellite 5G networks. Readers learn how modulation choices will affect co-existence issues. The book discusses the design, performance, cost, and test implications of integrating next generation satellite physical and MAC layers with Release 16 and 17 5G standards and explores how these emerging spectrum and standards map on to IOT and MTC use cases in specific vertical markets. Readers learn how new active and passive antennas in the K bands and V and W band (E band) impact the satellite link budget and satellite delivery cost economics.

This book gives you knowledge about the Falcon Launch Vehicle Payload. Falcon 9 is a partially reusable two-stage-to-orbit medium-lift launch vehicle designed and manufactured by SpaceX in the United States. It is powered by Merlin engines, also developed by SpaceX, burning cryogenic liquid oxygen and rocket-grade kerosene (RP-1) as propellants. Its name is derived from the Millennium Falcon and the nine engines of the rocket's first stage.

This brief presents a concise description of the existing spaceport market, the technologies being tested and developed at them, and the private companies that are making them possible. While NASA has its own plan for the future of space exploration, one that includes a new shuttle, an interplanetary spacecraft, and astronauts going to Mars, many people believe that the real future of space exploration is currently centered around dozens of commercial spaceports, financed by entrepreneurs inspired not only by profit but by the dream of creating a new space age, one not limited by bureaucracies or by budget allocations. Commercial spaceports in Florida, Texas, Oklahoma, Virginia and Alaska, as well as in countries like Curaçao and Sweden, are becoming home to dozens of private aerospace companies and provide a place where cutting-edge technology can be developed, tested and launched into space. Based on original interviews with principles at the various companies involved and on-site observations at the Mojave Air and Space Port, the author traces the early days of the spaceport movement and outlines what lies ahead.

The book describes the basic concepts of spaceflight operations, for both, human and unmanned missions. The basic subsystems of a space vehicle are explained in dedicated chapters, the relationship of spacecraft design and the very unique space environment are laid out. Flight dynamics are taught as well as ground segment requirements. Mission operations are divided into preparation including management aspects, execution and planning. Deep space missions and space robotic operations are included as special cases. The book is based on a course

held at the German Space Operation Center (GSOC).
Look at Falcon 9 now. There has never been a Falcon 9 Guide like this. It contains 103 answers, much more than you can imagine; comprehensive answers and extensive details and references, with insights that have never before been offered in print. Get the information you need--fast! This all-embracing guide offers a thorough view of key knowledge and detailed insight. This Guide introduces what you want to know about Falcon 9. A quick look inside of some of the subjects covered: Falcon 9 - Launcher versions, Falcon 9 second-stage - Launcher versions, Falcon 9 - Funding, Falcon 9 v1.1 - Second stage, Falcon 9 second-stage - Launch history, Falcon 9 Air, Falcon 9 - Launch history, Falcon 9 v1.1 - Production and testing history, Reusable Falcon 9, SpaceX Rocket Development and Test Facility - Falcon 9, Falcon 9-R, Falcon 9 - Reliability, Falcon 9 - Falcon 9 v1.1, Falcon 9 second-stage - Payload fairing, Falcon 9 - Post-mission high-altitude launch vehicle testing of Falcon 9 v1.1 boosters, Falcon 9 second-stage - Reusability, List of Falcon 9 launches, SpaceX reusable launch system development program - Falcon 9 booster post-mission, controlled-descent tests, Falcon 9 - Falcon 9-R, Falcon 9 - Launch sites, Falcon 9 Flight 6 - History, Falcon 9 v1.1 - Control, List of Falcon 9 missions - COTS Demo Flight 2, Reusable Falcon 9 - Falcon 9 booster post-mission, controlled-

descent tests, Reusable Falcon 9 - Economic issues, Falcon 9 - Secondary payload services, Falcon 9 v1.1 - Other launcher versions, Falcon 9 v1.0, Falcon 9 Flight 1 - Orbit, Falcon 9 v1.0 - Second stage, Falcon 9 Flight 10 - History, Falcon 9 - Reusability, Falcon 9 v1.1 - Post-mission high-altitude launch vehicle testing of Falcon 9 v1.1 boosters, Falcon 9 second-stage - Production and testing history, and much more...

In the final book in the digital “BANK” series, Brett King tackles the topic of whether banks have a future at all in the emerging, technology embedded world of the 21st century. In 30-50 years when cash is gone, cards are gone and all vestiges of the traditional banking system have been re-engineered in real-time, what exactly will a bank look like? How will we reimagine a bank account, identity, value, assets, investments? hen stepping back from this vision of the future, King and his cadre of ‘disruptors’ and Fintech mafia chronicle the foundations of this new banking ecosystem today. From selfie-pay in China, blockchain in Africa, self-driving cars with their own bank accounts and augmented reality tech that informs the future design of banking systems, this proves once and for all that we’re not in Wall Street anymore Toto. Bank 4.0 is what banking will become.

For several decades it has been widely accepted that human space exploration is

the exclusive domain of government agencies. The cost of performing such missions, estimated in multiple reports to amount to hundreds of billions dollars over decades, was far beyond what private entities could afford. That arrangement seems to be changing. Buoyed by the success of its program to develop commercial cargo capabilities to support the International Space Station, NASA is becoming increasingly open to working with the private sector in its human space exploration plans. The new private-public partnership will make 'planet hopping' feasible. This book analyses the move towards planet hopping, which sees human outposts moving across the planetary dimensions, from the Moon to Near-Earth Asteroids and Mars. It critically assesses the intention to exploit space resources and how successful these missions will be for humanity. This insightful and accessible book will be of great interest to scholars and students of space policy and politics, international studies, and science and technology studies.

The objective of this study centralized on the analysis of a kinetic bombardment long-rod penetrator system and its evident processes, ramifications, and applications. Applications spanned three broad operational intentions; deep bunker breach, intercontinental strike capability, and preeminence over terrestrial forces without matched investment. The ambition of a viable Kinetic

Bombardment Orbital Mechanism (KBOM), is for the cost in its entirety from being put into orbit, to maintenance, and ejecting payloads, to be less than or equal to the same amount of marginal effort required to build, maintain, and launch the required number of ICBMs to complete a given set of tactical objectives. Eleven potential Kinetic Bombardment Rod (KBR) configurations were initially developed varying between two forms; standard tungsten carbide rods and tungsten carbide rods equipped with thermobaric warheads. Through an Analysis of Alternatives (AoA) down select process, a final standard tungsten carbide rod composition was selected for use as a case example for further investigation. It is concluded that as policies are shaped to allow less restricted military activity in space, kinetic bombardment systems will be acquired in response to distinct international events or threats. Peer nations seeking to match U.S. general terrestrial forces without matching U.S. investment may also look to acquire orbital defense satellites. In regards to nations such as the United States that already own weapons effective against all classes of targets, kinetic bombardment systems will only become viable prospects once launch costs decline with the development of reusable launch vehicles. This study makes the beginning but surely not the whole case, for the long pursued concept of orbital defense satellites as the obstacles that once stood in the way recede. While it

does not however suggest or constitute the immediate development of such a project, it perhaps constitutes its future consideration.

This book examines the U.S. space program's triumphs and failures in order to assess what constitutes a successful space policy. Using NASA and the space industry's complex history as a guide, it draws global lessons about space missions and the trends we can expect from different nations in the next decade and beyond. Space exploration has become increasingly dependent on cooperation between countries as well as the involvement of private enterprise. This book thus addresses issues such as: Given their tenuous history, can rival countries work together? Can private enterprise fill NASA's shoes and provide the same expertise and safety standards? Written by a former NASA Aerodynamics Officer at Houston Mission Control working on the Space Shuttle program, the second edition of this book provides updated information on U.S. space policy, including the new strategy to return to the Moon prior to traveling to Mars. Additionally, it takes a look at the formation of the Space Force as a military unit, as well as the latest developments in private industry. Overall, it is a thought-provoking resource for both space industry professionals and space enthusiasts.

This book examines emerging defense technologies such as directed energy

weapons, nanotech devices, and bioscience applications that have the potential to dominate international relations in the future, just as nuclear weapons and space infrastructure-assisted conventional weapons do now.

This book describes the future of the Artemis Lunar Program from the years 2017 to about 2030. Despite the uncertainty of the times and the present state of space exploration, it is likely that what is presented in this book will actually happen, to one degree or another. As history has taught us, predictions are often difficult, but one can see enough into the future to be somewhat accurate. As the Bible says, “Wesee thru the glass, but darkly.” All of the elements of the proposed program are described from several perspectives: NASA’s, the commercial space industry and our International partners. Also included are descriptions of the many vehicles, habitats, landers, payloads and experiments. The book tells the story of the buildup of a very small space station in a strange new lunar orbit and the descent of payloads and humans, including the first women and next man, to the lunar surface with the intent to evolve a sustained presence over time.

This first account of commercial spaceflight’s most successful venture describes the extraordinary feats of engineering and human achievement that have placed SpaceX at the forefront of the launch industry and made it the most likely

candidate for transporting humans to Mars. Since its inception in 2002, SpaceX has sought to change the space launch paradigm by developing a family of launch vehicles that will ultimately reduce the cost and increase the reliability of space access tenfold. Coupled with the newly emerging market for governmental, private, and commercial space transport, this new model will re-ignite humanity's efforts to explore and develop space. Formed in 2002 by Elon Musk, the founder of PayPal and the Zip2 Corporation, SpaceX has already developed two state-of-the-art new launch vehicles, established an impressive launch manifest, and been awarded COTS funding by NASA to demonstrate delivery and return of cargo to the ISS. This book describes how simplicity, low-cost, and reliability can go hand in hand, as promoted in the philosophy of SpaceX. It explains how, by eliminating the traditional layers of internal management and external sub-contractors and keeping the vast majority of manufacturing in house, SpaceX reduces its costs while accelerating decision making and delivery, controls quality, and ensures constant liaison between the design and manufacturing teams.

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