SAMPLE

Cosmic Explorers: Living on Mars

Building a Home on the Red Planet

Aira Astralis

Free sample: Introduction & Chapter 1

putrabooks.github.io

Buy the full book:

Carousell carousell.sg/p/cosmic-explorers-living-on-mars-ebook-pdf-1468078435

Ko-fi

Payhip

Contents

Introduction

Chapter 01: The Discovery of Living on Mars

Chapter 02: Understanding Living on Mars

Chapter 03: Key Characteristics of Living on Mars

Chapter 04: The Science Behind Living on Mars

Chapter 05: Observation and Measurement of Living on Mars

Chapter 06: Important Features of Living on Mars

Chapter 07: Living on Mars in Context

Chapter 08: Modern Understanding of Living on Mars

Chapter 09: Research and Exploration of Living on Mars

Chapter 10: Significant Discoveries About Living on Mars

Chapter 11: Challenges and Mysteries of Living on Mars

Chapter 12: Future Directions in Living on Mars Research

Chapter 13: Fun Facts and Trivia About Living on Mars

Chapter 14: Conclusion: The Significance of Living on Mars

Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

The idea of sending humans to Mars has been the subject of aerospace engineering and scientific studies since the late 1940s as part of the broader exploration of Mars. Long-term proposals have included sending settlers and terraforming the planet. Currently, only robotic landers, rovers and a helicopter have been on Mars.

As of 2026, the farthest humans have been beyond Earth is the Moon and its vicinity, with the lunar flights of the Apollo program from 1968 to 1972 and the Artemis II lunar flyby in 2026, both of which were operated by NASA. Conceptual proposals for missions that would involve human spaceflight started in the early 1950s, with planned missions typically expected to take place between 10 and 30 years after they were drafted.

The list of crewed Mars mission plans shows the proposals put forth by multiple organizations and space agencies in this field of space exploration. These plans have varied - from scientific expeditions, in which a small group (between two and eight astronauts) would visit Mars for a period of a few weeks or more, to a continuous presence (e.g. Some have also considered exploring the Martian moons Phobos and Deimos.

By 2020, virtual visits to Mars, using haptic technology, had also been proposed. Meanwhile, uncrewed exploration of Mars has been a goal of national space programs for decades, and was first achieved in 1965 with the Mariner 4 flyby. Human missions to Mars have been part of science fiction since the 1880s, and more broadly, in fiction, Mars is a frequent target of exploration and settlement in books, graphic novels, and films.

In the 1980s, it was suggested that aerobraking at Mars could reduce the mass required for a human Mars mission lifting off from Earth by as much as half.

Each of the successful machines, from Mars 3 and the twin Vikings through the rovers and the small helicopter now flying there, will meet the reader again in the chapters that follow, one at a time.

Chapter 01: The Discovery of Living on Mars

For Earth-Mars trips, the period is every 26 months (2 years, 2 months), so missions are typically planned to coincide with one of these launch periods. Due to the eccentricity of Mars's orbit, the energy needed in the low-energy periods varies on roughly a 15-year cycle with the easiest periods needing only half the energy of the peaks. In the 20th century, a minimum existed in the 1969 and 1971 launch periods and another low in 1986 and 1988, then the cycle repeated.

The last low-energy launch period occurred in 2023. Several types of mission plans have been proposed, including opposition class and conjunction class, or the Crocco flyby. The lowest energy transfer to Mars is a Hohmann transfer orbit, a conjunction class mission which would involve a roughly 9-month travel time from Earth to Mars, about 500 days (16 mo) at Mars to wait for the transfer window to Earth, and a travel time of about 9 months to return to Earth.

This would be a 34-month trip. Shorter Mars mission plans have round-trip flight times of 400 to 450 days, or under 15 months for an opposition-class expedition, but would require significantly higher energy. A fast Mars mission of 245 days (8.0 months) round trip could be possible with on-orbit staging.

In 2014, ballistic capture was proposed, which may reduce fuel cost and provide more flexible launch windows compared to the Hohmann.In the Crocco grand tour, a crewed spacecraft would get a flyby of Mars and Venus in under a year in space. Some flyby mission architectures can also be extended to include a style of Mars landing with a flyby excursion lander spacecraft. Proposed by R.

Titus in 1966, it involved a short-stay lander-ascent vehicle that would separate from a "parent" Earth-Mars transfer craft prior to its flyby of Mars. The Ascent-Descent lander would arrive sooner and either go into orbit around Mars or land, and, depending on the design, offer perhaps 10-30 days before it needed to launch itself back to the main transfer vehicle.

As a result, Mars missions have designed interplanetary spacecraft and landers capable of aerobraking. A number of uncrewed spacecraft have landed on the surface of Mars, while some, such as Beagle2 (2003) and the Schiaparelli EDM (2016), have failed what is considered a difficult landing. Among the successes:

Viking 1 and Viking 2 - 1976

Spirit and Opportunity rovers - 2004

Phoenix lander - 2008

Curiosity rover - 2012

InSight lander - 2018

Tianwen-1 lander and Zhurong rover - 2021

Perseverance rover and Ingenuity helicopter - 2021 When an expedition reaches Mars, braking is required to enter orbit. Two options are available: rockets or aerocapture. Aerocapture at Mars for human missions was studied in the 20th century. In a review of 93 Mars studies, 24 used aerocapture for Mars or Earth return. One of the considerations for using aerocapture on crewed missions is a limit on the maximum force experienced by the astronauts.

The current scientific consensus is that 5 g, or five times Earth's gravity, is the maximum allowable deceleration. Conducting a safe landing requires knowledge of the properties of the atmosphere, first observed by Mariner 4, and a survey of the planet to identify suitable landing sites. Major global surveys were conducted by Mariner 9, Viking 1, and two orbiters, which supported the Viking landers.

Later orbiters, such as Mars Global Surveyor, 2001 Mars Odyssey, Mars

Express, and Mars Reconnaissance Orbiter, have mapped Mars in higher resolution with improved instruments. These later surveys have identified the probable locations of water, a critical resource. Sending humans to Mars will be expensive. In 2010, one estimate was roughly US$500 billion, but the actual costs will likely be more.

Starting in the late 1950s, the early phase of space exploration was conducted as a space race by lone nations, as much to make a political statement as to study the Solar System. This proved to be unsustainable, and the current climate is one of international cooperation, with large projects such as the International Space Station being built and launched by multiple countries.

Critics argue that the immense cost outweighs the immediate benefits of establishing a human presence on Mars and that funds could be better redirected toward other programs, such as robotic exploration. Proponents of human space exploration contend that the symbolism of establishing a presence in space may garner public interest to join the cause and spark global cooperation. There are also claims that a long-term investment in space travel is necessary for humanity's survival.

One factor to reduce the cost of sending humans to Mars may be space

tourism. Growth in that business and technological developments would bring economies of scale and thus a lower cost of human spaceflight. A similar concept can be examined in the history of personal computers: when computers were used only for scientific research, with minor use in big industry, they were big, rare, heavy, and costly.

End of free sample. The full book is available at putrabooks.github.io

ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.