

# Foreword

The chapters of this book all revolve around the challenges of establishing humanity's permanent presence on other planets, notably on the Moon. The opinions about the whole topic are divided, some say this is a futile attempt and the resources should be focused on more urgent matters, and spent here on Earth. For those against the investment in space exploration and space activities, education, health care, food production and green energy all seems a better investment. And they are right, these topics are all very important and the challenges awaiting us in the coming years are indeed formidable. They also highlight the many obstacles: distance, radiation, psychological effects, lack of materials, decreased gravity, low return on investment, etc. Many of those are still unsolved problems at our current technological level.

These obstacles do not mean, however, that it is pointless to deal with them. On the contrary, if we believe that space exploration and human missions are beneficial for humanity, obstacles must be overcome. Supporters of further expansion of space activities emphasise the benefits derived from space activity which has an immense GDP multiplier effect<sup>1</sup> and has an overall positive effect on life on Earth, and there is reason to believe that human missions on other planets will have the same effect in the long run. Beyond the sake of development, space powers seem to invest in Moon programs also due to geopolitical tensions, leading to a new space race.

Whether the Reader supports or not investing in projects enabling humanity to create permanent stations on other planets, we all must agree that the competition has already begun and scientific research stations might be a reality on the Moon in the next decade. Our prior aim was to offer a broad spectrum of topics related to the next chapter of human space flight.

The title of the book is purposefully provocative. We are aware of the debate and controversy surrounding such terms as “space colony” and “colonisation”.

<sup>1</sup> European Space Policy Institute (2023): *More than a Space Programme. The Value of Space Exploration to Empower the Future of Europe*. 1.

It is with purpose that we use the word colony as an anti-goal since we hope that history does not repeat itself and space powers will have the wisdom to avoid hostility, self-centred exploitation of resources and will conduct their activity in the spirit of Article I of the Outer Space Treaty which states: “The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”

As I mentioned, permanent human presence on the Moon and later on Mars is not science fiction any more but a subject of spacefaring nations’ strategy. Even if many obstacles must be overcome yet and we do not have answers to many questions, it is interesting to conceptualise different future possibilities and raise awareness of certain issues. The condition for such thought experiments is that it has to be rooted in real science. Part of the chapters therefore describe the current situation and offer solutions, questions and possible pathways of thinking about these problems.

Mars and Moon are both mentioned in the chapters, in some instances focus shifts between the two, or is mostly centred on one particular celestial body. The order of the chapters does not reflect a hierarchy of importance. All the topics and challenges discussed are crucial and need to be solved sooner or later to establish and maintain a permanent colony of humanity on another planet. Consequently, the chapters can be read in varying order, the current sequence is only a suggestion.

Space weather is important at every stage of the journey. It will influence the equipment and the living beings on board the spacecraft or living on the colonies. Both will spend considerable time outside Earth’s protective magnetic field and therefore adequate protection is a must.

The medical and psychological chapters cover the difficulties of survival in inhospitable and dangerous environments while maintaining optimal performance and avoiding severe, long-term, permanent damage to their body and psyche. To guarantee the safety and the performance of the crew, more medical and psychological research is indispensable. The results will shape

both the equipment development they will need and the selection process and training of the crew.

Humans arriving on another planet will need shelter, energy, different kinds of resources, equipment, vehicles and a reliable communication network. Without these, humans could only visit for a short time and would need to leave just like the crew of the Apollo mission. Some of these can be delivered, provided and built in advance via previous missions or robots. Weight, reliability and autonomous operation capability could be a crucial factor. Engineers, software developers, architects and other STEM experts must take all factors imaginable into consideration and build resilient systems with backup options. The task is enormous and requires a lot of funding, long-term design thinking, testing and building the equipment.

It is also a fascinating question how these settlements might influence geopolitics, with special emphasis on security and defence policy. How could the cislunar area contribute to the space industry? How can the current international legal framework assure legal certainty, security and peace, as well as the balance between competing economic interests?

As the distances between Earth and the chosen planet increase, so do the problems. As a final note in our book, we have two chapters focusing on Mars with its specific conditions and unique challenges. Travelling to Mars and making sure the crews can operate for a longer time before they can return will require even more effort than going to the Moon. The guidelines and lessons learned in previous more general chapters will also be valid for Mars with tailor-made modifications for that specific planet.

All in all, our book tries to explore the topic in an interdisciplinary way, fully aware that for the time being there are more questions than answers. I sincerely hope that the reader will also find it interesting and thought-provoking and that we will have the chance to see their confirmation or refutation in the coming decades.

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