

## “Spacecraft Thermal Control Technologies”

**By J. Miao (China Academy of Space Technology), Q. Zhong (Institute of Spacecraft System Engineering, China), Q. Zhao (Institute of Spacecraft System Engineering, China) and X. Zhao (Institute of Spacecraft System Engineering, China), Space Science and Technologies Series, Springer Singapore, 2021, 360 pages, ISBN 978-981-15-4983-0, £149.99, €181.89, US\$219.99**

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### **Introduction**

Into my hands came an exciting new book about space. “Spacecraft Thermal Control Technologies” is written by Professor Jianyin Miao, Qi Zhong, Professor Qiwei Zhao and Professor Xin Zhao. All the authors of this book are part of the Institute of Spacecraft System Engineering, China Academy of Space Technology (CAST), Beijing, China. Jianyin Miao is a head scientist of heat pipes at CAST and a Massachusetts Institute of Technology (MIT, USA) visiting professor, and is an academic leader for space thermal control technology at China Aerospace Science. Qi Zhong is a research fellow at CAST and his expertise is in the field of aerospace thermal control. Qiwei Zhao is a professor at CAST with expertise in the field of space thermophysics. Professor Xin Zhao has served as a chief designer of thermal control subsystems. He serves on the professional committee at CAST. He has received several national and ministerial awards for his work in this field. The series editor Peijian Ye, (China Academy of Space Technology, Beijing, China) is a Chinese aerospace engineer. He is a professor at the Beijing University of Aeronautics and Astronautics, China, and is a professor at the Harbin Institute of Technology, China. He is a research fellow and chief engineer at CAST. He is also the Chief Commander and Chief Designer of the Chinese

Lunar Exploration Program. In his honour the inner main-belt asteroid 456677 Yepeijian, discovered by the Purple Mountain Observatory Near-Earth Object Survey Program at the XuYi Station, China, took his name in 2007.

This book is the first of a 10-part series called Space Science and Technologies. In this book you can find high quality data and some new findings in the area of spacecraft. It provides information for better and deeper understanding of China’s space industry.

### **Thermal Control Technologies**

This book consists of seven main chapters: ‘Introduction’, ‘Space Environment’, ‘Design of Spacecraft Thermal Control Subsystem’, ‘Typical Thermal Control Technologies for Spacecraft’, ‘Typical Thermal Control Design Cases of Spacecraft’, ‘Thermal Analysis Technology’ and ‘Spacecraft Thermal Testing’. The first chapter is the ‘Introduction’ written by Qi Zhong. This is the most important chapter because it introduces the subject matter and explains all the key words and basics. Part of the content in this chapter describes the mission of spacecraft thermal control, explains the main technology of thermal control and the main tasks of this field, and also lays out the requirements of this field.

The second chapter of this book is ‘Space Environment’. This chapter was written by Xin Zhao with Yanchao Xiang. In this chapter is information about the environment at the launching phase, Earth orbital thermal environment, thermal environment at re-entry and entry phase. The most interesting parts of this chapter are the

findings about the moon and planetary space environments, with details of the lunar, Mercury, Venus and Mars environments. The third chapter in this book is called 'Design of Spacecraft Thermal Control Subsystem', written by Xin Zhao, the same author as Chapter 2. In this chapter Xin used his experience and shared his knowledge about the ground, orbiting and landing phases. In this chapter are explained the basic principles of thermal control design and the design method of thermal control systems. The fourth chapter in this book is 'Typical Thermal Control Technologies for Spacecraft', written by Jianyin Miao, Weichun Fu and Hongxing Zhang. This chapter is focused mostly on heating and cooling technologies, with the main emphasis on heat transfer technology. Also as a part of this chapter are explanations about temperature measurement and control technology.

### Conclusions

This book is very well written, containing informative details about the subject matter discussed in each chapter. The book is full of mathematical formulae, graphs and pictures. For me as a non-expert in space science, there were some things that required more time and research

of the given matter to fully understand. But this book is definitely worth reading. The days spent reading this book were most interesting and I have learned much new information.

If you are a student in the field, scientist, professor or simply a fanatic for space and the universe this is the book that you need to read. We can be grateful to the people involved for sharing the vast knowledge they have gained in this area of work.



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### The Reviewer



Sara Gligoroska has a Bachelor's degree in Pure and Applied Chemistry from the Faculty of Mathematics and Natural Sciences, Ss. Cyril and Methodius University in Skopje, North Macedonia. She works as a process engineer at Johnson Matthey. She is a space and universe enthusiast who is always interested in learning new things.