

## Preface to the English Edition

This book was first published in Japanese in March 2003 as one of the volumes of the “Space Engineering Series” by Corona Publishing, a publisher of science and technology books in Japan. Up to this point, there has been no book published that systematically covers the technology pertaining to scientific ballooning in the same way that this book does. Moreover, the content of the book is intended to cover scientific ballooning being carried out throughout the world, not just within Japan. As a result, many friends have recommended that we publish the book in English and broaden our target readership. Fortunately, we were able to obtain a Grant-in-Aid for Publication of Scientific Research Results from the Japan Society for the Promotion of Science (JSPS), and this has enabled the publication of this book in English to become a reality. The authors hope that this book will contribute to the future development of scientific ballooning worldwide.

We thank Forte, Inc. for its cooperation in translating this book into English. We express our gratitude to Corona Publishing for graciously agreeing to publish this book in English and accommodating our requests in various ways. We are deeply grateful to the JSPS for their support in its publication.

Nobuyuki Yajima (on behalf of all the authors)

Please note that the names of some space organizations have changed recently (see later). In this book, however, the names of organizations and facilities used are those that were correct at the time of the writing the Japanese language edition of this book.

1. In 2003, the Institute of Space and Astronautical Science (ISAS) and the National Aerospace Laboratory were integrated into the Japan Aerospace Exploration Agency (JAXA) and became the Institute of Space and Aeronautical Science (ISAS) and the Institute of Aerospace Technology (IAT) of JAXA, respectively.
2. In 2005, Sulphur Springs Balloon Plant of Raven Industries, Inc., the balloon manufacturing plant of US, changed to the Sulphur Springs Aerospace Balloon Engineering and Manufacturing Facility of Aerostar International (the parent company of Raven Industries).

3. In 2006, the National Scientific Balloon Facility (NSBF) of NASA was renamed as the Columbia Scientific Balloon Facility (CSBF) in remembrance of the Space Shuttle Columbia disaster.

## Preface to Series

A long time has elapsed since the phrase “space age” was first coined. Commencing with the rockets of Tsiolkovsky and Goddard, over 40 years have passed since the launch of the first artificial satellite Sputnik. These days, approximately 100 large rockets for artificial satellites are launched a year, and 1,600 satellites orbit Earth for various missions.

Although the first practical use made of the means of transport (rockets) was space research, space industries subsequently arose, such as satellite communications and remote sensing. Initially, the situation was such that transporting even minimal equipment into space was just barely possible, but now artificial satellites are constantly increasing in size, or alternatively, smaller equipment is being launched at more frequent intervals. In addition, long-duration manned missions have become possible with the Space Shuttle and space stations. Moreover, construction of a space station founded on international cooperation continues. In addition, space tourism and the development of resources on other celestial bodies continue to be discussed as real possibilities. To make these concepts a reality, new reusable space transport vehicles will be necessary, and in addition, the laws and insurance pertaining to space will need to be improved. The realm of space-related activities has suddenly expanded. Perhaps the true space age is only just beginning.

To make such space activities possible, space systems have to be created. Space systems may be described as “systems within systems,” and high levels of complexity and optimization are rigorously pursued. In fact, systems consist of many basic technologies, and the teams that implement them are formed by bringing together graduates of aerospace engineering, electrical engineering, materials engineering, and other such fields. Particularly for mission planners and satellite designers, it is no exaggeration to say that it is essential to have insight into all of these basic technologies. Moreover, the technological fields associated with space activities may be categorized into fundamental technology areas (such as rockets, artificial satellites, space stations, and space measurement and navigation) and areas of practical application (such as satellite communications, remote sensing, and uses of zero-gravity). To make use of these space systems, a broad range of knowledge and technologies is required.

This “Space Engineering Series” consists of separate specialized volumes, and covers these broad-ranging basic technologies. Furthermore, these volumes are written by specialists who are active at the forefront of their fields. In Japan, many instruction manuals and individual books on technology have so far been written, but there has been no plan for providing an overall description of space technology

from these technological and theoretical viewpoints. For that matter, there is almost no precedent to be found anywhere in the world.

Our hope is that those who intend to construct rockets or artificial satellites and launch them into space, those who intend to use satellites for communications, remote sensing, or other applications, those who wish to study space itself, and those who desire to travel into space will consult each volume from their own viewpoint. In addition, we hope that these volumes will prove useful to specialist technologists, system designers, and students who are enthusiastic about these fields.

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