

Safety Design for Space Operations

Interview with Tommaso Sgobba

By Andrea Gini



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 Editor in Chief : T Sgobba
 Elsevier, Apr 2013
 Hardcover, 1072 p.
 ISBN: 9780080969213

The International Association for the Advancement of Space Safety (IAASS) has just published the book "Safety Design for Space Operations" (Elsevier, 2013). The book comes four years after "Safety Design for Space Systems," a university level textbook recently translated into Chinese. With contributions from more than 40 authors, chosen from among the best in their respective fields, the project was coordinated by IAASS President Tommaso Sgobba, and edited by Dr. Firooz Allahdadi, Isabelle Rongier, and Dr. Paul Wilde.

This unique reference brings together essential material on several key topics in operations safety design that were previously only available dispersed over several unrelated textbooks and papers. The book reviews the best design practices relating to space operations, such as the design of spaceport facilities for unmanned and manned missions, and containment design for nuclear powered payloads. It presents advanced analysis methods, such as those used to calculate launch and reentry debris fall-out risk and to select safe trajectories. It covers the implementation of safe operation



The needs posed by commercial infrastructures like Virgin Galactic's SpacePort America in New Mexico require a new generation of safety-aware engineers and managers.

Credits: Virgin Galactic

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procedures, such as rendezvous and docking, collision avoidance maneuvers, and on-orbit space traffic management. Finally, it deals with safety considerations relating to the general public, aviation, and the environment, in addition to ground personnel and asset protection.

Covering launch operations safety relating to manned missions as well as unmanned missions, such as the launch of probes and commercial satellites, "Safety Design for Space Operations" provides a comprehensive reference for engineers and technical managers within aerospace and high technology companies, space agencies, spaceport operators, satellite operators, and consulting firms. Space Safety Magazine met with Sgobba to learn more about this book and its expected impact on the industry.

A Unique Book

The idea behind this book is related to IAASS' belief that advancing space safety requires first of all the improvement of safety education," says Sgobba. "Its purpose is to complement 'Safety

Design for Space Systems,' providing the complete reference set for the establishment of much needed future graduate and postgraduate education programs in space systems safety," he says.

Sgobba explains that space safety engineering is not generally taught in aerospace engineering schools, as it is currently not considered a specialized branch of space systems engineering but rather as a sparse set of issues related to various specialized fields of engineering. "Engineers selected for performing safety related jobs currently receive only some focused on-the-job-training, but no wide specialized education," he adds. "They end up developing their knowledge through internal information exchanges, brain storming, discussions, and short seminars in a sort of master-to-apprentice relationship with senior expert colleagues."

Space safety, as defined by the IAASS, is not only about safety of astronauts and cosmonauts and about space vehicles design: it includes spaceport operations safety, prevention of collisions in space, ground and atmospheric pollution, space debris mitigation and ▶▶



Tommaso Sgobba, IAASS President and Editor-in-Chief of Safety Design for Space Operations, during a 2011 IAASS convention in Washington. – Credits: Andrea Gini

remediation, as well as anything that can ensure the safety of the uninvolved public during launch and reentry. “This is the first and only book to date covering all aspects of safety in space operations,” he says. “It identifies all key technical principles and contributes very much to defining space safety as a specialized branch of systems engineering.”

The Need for Safety Engineering

The ultimate goal of Sgobba and his colleagues is to stimulate the emergence of a new technical profile, the space safety engineer, “to support and execute the design and operations safety certification processes covering all mission phases from launch to on-orbit and reentry or disposal, and to expand the safety engineering knowledge of project teams.”

Sgobba believes that the complexity of space systems design, combined with that of the organizations involved in its realization, demands broader knowledge of the key principles and techniques of safety engineering, and a multidisciplinary awareness of the associated hazards and potential vulnerabilities inherent in the system and its operations. “The difficulty of minimizing the occurrence of design errors is exacerbated by the limited systems safety engineering culture of design teams as a whole,” he says. According to Sgobba, future safety and system engineers must gain a broad understanding of multidisciplinary safety aspects in order to be able to perform integrated analyses and resolve risk issues at the earliest design

stage of a program. Managers and other non-safety engineers involved in space program teams need to gain certain basic knowledge and awareness of space safety engineering.

Safety and International Cooperation

In an era characterized by a competitive industry regulated by market laws, confidentiality concerns, and international regulations limiting technology transfer, Sgobba believes that it is time to reconsider the role of communication and cooperation to ensure the safe development of the sector.

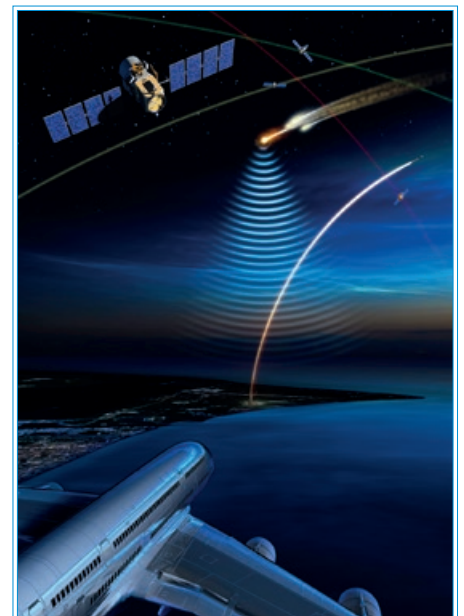
“In the early decades of space missions, the US and USSR tried to protect their leadership in space technologies as a strategic advantage for military, commercial, and foreign policy dominance,” he explains. But human spaceflight programs in China and India, along with the emerging human spaceflight industry, have demonstrated that the time for technological monopolies in space projects is past. “Today, the growing awareness of space threats is pointing towards the need for wider international cooperation in space,” he adds. “The awareness is rising that competition is in the past, while cooperation is the future, in two directions. One is the involvement of all space faring countries in future human planetary exploration programs, like missions to Mars. The other is the unavoidable cooperation to make commercial space activities in the orbital Earth space safe and sustainable.”

The importance of international cooperation is also stressed by Yannick

“Competition is in the past; cooperation is the future,”

d’Escatha, president of the French space agency CNES, who wrote the book’s preface. “The publication of this book is a fine and promising example of the pooling of experience acquired in the safety issues surrounding space operations, of the benefit of public safety and the protection of the environment,” writes d’Escatha in the preface. “I am certain that the relationships and the dynamic created during this project will contribute to future success in international scientific and technical cooperation in the field.”

According to Sgobba and the IAASS, interoperability and safety of space systems is the future. “Technological and foreign-policy dominance will not be assured through ITAR or other isolationistic measures,” he concludes. “Society organizational models, national prosperity, and quality of life improvements will be achieved by pursuing innovation leadership in a world that is getting more and more globalized and interdependent, characterized by a free flow of information. Around the common safety goals it is not only possible, but also necessary to create a new vision of national and international cooperation in space missions.”



Artist’s conception of air and space traffic management. – Credits: Kristhian Mason