International Space Security Setting: An Introduction

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Peter L. Hays

Contents

Abstract

This chapter provides an introduction to Part 1 of the second edition of the *Handbook of Space Security* by overviewing major issues and themes that frame discourse about space security. This part contains 17 chapters that include foundational discussions about definitional, governance, theoretical, legal, deterrence, and resilience themes for space security as well as more focused discussions about cooperation, strategic competition, export controls, critical infrastructure, cyber threats, safety, traffic management, and the sustainability of space resources. Together, these themes and issues provide a comprehensive setting for refining and advancing our dialogue about international space security.

Foundational Themes

Defining and scoping space security has been and still probably is the single most important issue for any dialogue about this topic. While some decades ago most distinctions between military and civilian uses of space were rather clear, there was always an area in between called "dual-use." The latter has been ever expanding under the label of "security" and it has thereby been diminishing exclusively military and civilian purposes to just small remnants. One can think of the challenges that arise in the fields of environmental security, cybersecurity, food security, water

P. L. Hays (✉)
Space Policy Institute, George Washington University, Washington, DC, USA
e-mail: hayspl@gwu.edu

security, and other areas. Tackling the security issues in these domains requires analysts to take into consideration all dual-use elements that serve both civilian and military uses. It then becomes clear that we must speak of a new paradigm for the use of space; a paradigm that blurs the traditional divide between civilian and military uses. Accordingly, the chapter by Ntorina Antoni explains how the definitional approach used across the chapters of this book can be stated as: "Space security" is the aggregate of all technical, regulatory and political means that aims to achieve unhindered access and use of outer space from any interference as well as aims to use space for achieving security on Earth. This adds to an already existing abundance of definitions for space security. Since it is not likely a consensus can be reached, the definition for the *Handbook of Space Security* maintains the practice of attempting to narrow general applicability and tailor definitions to specific uses. This definition serves as a frame for the focus and the structure of the Handbook.

Governance and theoretical perspectives form other foundational aspects of space security. Effective governance is needed for humanity to derive more benefits from space; space governance also seeks to ensure space is used in stable and sustainable ways. The challenges to international space governance in ensuring space as a safer and more secure environment are enormous. These include the increasing number of actors, growing commercialization, expanding military space programs, the proliferation of anti-satellite weapons, and lack of consensus among states on the need for and realization of a conclusive and universally negotiated treaty to prohibit an arms race in space. Ahmad Khan and Sufian Ullah indicate that any model for space governance should aim to reconcile the inherent competitive tendencies among states by incentivizing further cooperation. The idea of effective global space governance should seek to maximize the prospects for peaceful exploitation of space as *a global commons* by encouraging responsible behavior of states. My chapter asserts that spacepower theory can describe, explain, and predict how individuals, groups, and states can best derive utility, balance investments, and reduce risks in their interactions with the cosmos. Such foundational theory should be more fully developed and become a source for critical insights on finding better ways to generate wealth in space, making trade-offs between space investments and other important goals, reordering terrestrial security dynamics as space becomes increasingly militarized and potentially weaponized, and seizing exploration and survival opportunities that only space can provide.

Chapters exploring the laws of war for space and the role of space in deterrence complete the foundational part of Part 1. Steven Freeland and Elise Gruttner explain how the regulation of space is embedded in international law and explicate the major themes of the 1967 Outer Space Treaty (OST), the main source of space law. As technology advances, space has been increasingly used during the course of armed conflict, notwithstanding the "peaceful purposes" provisions of the OST. Reconciling these seemingly incompatible concepts and developments is difficult and requires an understanding of how and to what extent the international law principles of *jus in bello* – body of legal norms that regulate the conduct of participants in armed conflict – as well as international humanitarian law, apply to the conduct of these activities. Freeland describes how the rising number of "dual-use" satellites

further complicates matters and asserts that there is a growing need to reach consensus on additional legal regulation for armed conflict that may involve use of space capabilities. Stacey Henderson's chapter about Arms Control stresses that the current international law regime applicable to outer space does not prohibit the placement or use of all weapons in outer space, prohibiting only nuclear weapons and weapons of mass destruction, and is not capable of preventing a conventional arms race in outer space.

John Klein and Nickolas Boensch assert that even though deterrence has a legitimate role in future space strategy, it is not the panacea for preventing conflict. History shows that deterrence will at times fail due to miscalculation, uncertainty, or chance. They conclude that the enduring nature of war and strategy (and therefore deterrence) as well as the evolving character of war, indicate that the implementation of space deterrence should also be expected to change. This change is currently reflected by the growth of the commercial space sector (particularly in the United States, Europe, China, and Japan) – whether in reusable or responsive launch vehicles or mega-constellations of Earth imaging and communications satellites. In view of the increasing complexity of the space environment, resilience has emerged as a pervasive concept in contemporary space security. Regina Peldszus analyzes resilience from two distinct but complementary approaches: mission assurance and deterrence as well as high reliability and resilience engineering. Drawing on contemporary thinking from civilian and military perspectives, resilience is addressed as a distinct yet malleable notion at the intersection of space security and safety. She concludes that resilience is likely to continue as a key concept in space policy and systems planning. Straddling the fields of space security and reliability, it may inform, enrich, or even galvanize the more traditional security and safety management disciplines.

International Space Security Focus Areas

Maintaining the ability of this domain to support safe, sustainable, and secure access and use for all – the essence of space security – requires cooperation. Jessica West explains that although cooperation is embedded as a core value within the institutions and laws that govern outer space, new uses and users of outer space are changing the dynamics of space security cooperation. This means that while cooperation can enhance security in space for those involved, it may come at cost to the long-term security of space by increasing strategic rivalry and facilitating the escalation of conflict into outer space. Jana Robinson and co-authors address the China's and Russia's global space footprint in the economic and financial (E&F) domain. They describe how the pace and nature of these international space partnerships concluded by China and Russia present a strategic and competitive challenge for Europe, the U.S., and other allies, including the development of global space governance, as well as markets based on transparency, good governance, and disclosure. The authors assert that the more subtle strategy deployed in the developed, democratic countries, to gain influence is conducted on an incremental basis, while the other approach, described as

"space sector capture," mostly involves developing countries and consists of offering package deals of capabilities, services, and financing, creating sole-source supplier relationship and long-term dependencies.

Ulrike Bohlmann and Gina Petrovici explain how the Cold War drove both innovation in space technology and imposition of controls on the export of these technologies. Balancing national security and commercial interests has been and remains difficult due to the Janus-faced, "dual-use" nature of space technology, serving scientific and commercial interests on the one hand and strategic, defense-related objectives on the other. Export restrictions play a significant role within the sovereignty of a state, assert Annamaria Nassisi and Isabella Patatti, and therefore keeping the technological edge is perceived as a form of dominant power. As the demand for space-based security is very high, major spacepowers are inclined to protect critical technology, rather than exporting it. Alexandru Georgescu highlights that space systems are a key enabler for a wide variety of applications which have become critical to the functioning of modern societies. He uses the Critical Infra-structure Protection framework to argue that space systems may constitute a new form of Critical Infrastructure, dubbed Critical Space Infrastructure, and traces the positive impact that such a perspective may have on space security governance.

With regard to cybersecurity, Stefano Zatti asserts that the security measures implemented in space-based systems may turn out to be insufficient to guarantee information assurance against possible cyberattacks. Accordingly, security-specific aspects of the European Space Agency's (ESA) space missions, along with specific cyber threats and possible countermeasures are addressed. Space safety is necessary for the sustainable development of space yet, as Joe Pelton and his coauthors describe, safety considerations are too often an afterthought for space security issues. Without improved space safety practices and standards from launch, to on-orbit operations, to reentry, billions of dollars of space assets, many astronaut lives, and even people on Earth could all be increasingly in peril. A related topic of growing importance is the concept of space traffic management. William Ailor's chapter begins by providing an overview of the evolution of the near-Earth space environ-ment, discussing the current situation, and projecting how the addition of large constellations of satellites to low-Earth orbit (LEO) will affect that environment. Just as the growth in air travel led to air traffic management, assuring that future space systems will have minimal interference to their operations requires a system to warn operators of potential collisions and other hazards: a space traffic management system.

Space sustainability is a concept that has emerged within the past 15 years to refer to a set of concerns relating to outer space as an environment for carrying out space activities safely and without interference, as well as to concerns about ensuring continuity of the benefits derived on Earth from the conduct of such space activities. Peter Martinez, as a long-time international space policy expert, is in an ideal position to review the role of the various relevant United Nations (UN) entities in ensuring space sustainability and provide a detailed review of the Working Group on the Long-Term Sustainability of Outer Space Activities within the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of

Outer Space (UN COPUOS). In addition, his chapter discusses the relationship of the work in UN COPUOS with related work being done in the Conference on Disarmament, the UN Group of Governmental Experts (GGE) on Transparency- and Confidence-Building Measures (TCBMs) in Outer Space Activities, and the initiative by the European Union to propose a draft international Code of Conduct for outer space activities. Finally, George Kyriakopoulos addresses space security as part of the overall international security, the maintenance of which constitutes the fundamental purpose of the UN Charter. In particular, he asserts that preserving security with respect to the celestial bodies requires the activation of mechanisms able to guarantee that the existing *status quo* will not be compromised by the placement of offensive weapons on them or potential conflict over the exploitation of space resources.

Conclusions

This overview of Part 1 of the second edition of the *Handbook of Space Security* provides a comprehensive introduction to major issues and themes that shape humanity's dialogue about space security. The 17 chapters in Part 1 include foundational discussions about definitional, governance, theoretical, legal, deterrence, and resilience themes for space security as well as more focused discussions about cooperation, strategic competition, export controls, critical infrastructure, cyber threats, safety, traffic management, and sustainability. These chapters provide a comprehensive foundation for the more detailed and focused discussions of space security themes and issues in the remainder of the *Handbook of Space Security*.