

# Contents

<b>1</b>	<b>Why Small Satellites and Why This Book?</b>	<b>1</b>
1.1	Introduction	1
1.2	Understanding the Differences Between Large and Small Satellites	4
1.3	Various Types of Small Satellites and the Rationale(s) for Their Deployment	5
1.4	The Rising Problem of Orbital Debris and Small Satellites	7
1.5	The Concept and Scope of This Book	10
1.6	The Structure of This Book	11
<b>2</b>	<b>The Development of Small Satellite Systems and Technologies</b>	<b>13</b>
2.1	The Evolution of Small Satellites	13
2.2	Small Military and Defense-Related Satellites	14
2.2.1	Rapid Deployment Small Satellites for a Specific and Newly Emergent Theater of Combat or Other Exigent Need	14
2.2.2	Constellations for Mobile Communications or Machine-to-Machine Data Relay	14
2.2.3	Small Satellites for Collection of Data from Ground, Sea, or Other Distributed Sensors	15
2.2.4	Experimental Packages to Test New Technology or Service Delivery Systems	16
2.3	Commercial Constellations	16
2.4	Small Satellites for Educational and Scientific Applications	17
2.5	Small Satellites for Amateur Radio, Emergency, Disaster Relief and Other Social Applications	19
2.6	Start-Up Programs in Various Countries with Fledgling Space Programs	19

<b>3</b>	<b>The Technology of Small Satellites .....</b>	<b>21</b>
3.1	Technology Associated with More Sophisticated and Mission-Driven Small Satellites .....	23
3.1.1	Power Systems for Small Satellites.....	23
3.1.2	Thermal Control.....	26
3.1.3	Ground Surveillance and Communication Characteristics .....	27
3.1.4	Stabilization and Pointing Systems.....	27
3.1.5	Tracking, Telemetry, Command, and Monitoring.....	30
3.2	New Technologies to Protect the Payloads on Small Satellites .....	31
3.2.1	Higher Gain Antennas.....	31
3.2.2	Technical Advances to Consolidate “Small Satellite” Missions and Experiments .....	33
3.2.3	Observability .....	36
3.2.4	Communication and Controllability.....	36
3.2.5	Maneuverability .....	37
3.2.6	Assessing Technology Gains Related to Small Satellite Performance .....	38
3.3	De-orbit Capabilities for Small Satellites .....	39
<b>4</b>	<b>The Global Legal Guidelines Governing Satellite Deployment .....</b>	<b>43</b>
4.1	Introduction.....	43
4.2	Rights of Space Use by Large and Small Satellites.....	44
4.3	National Laws Relating to Usage of Space.....	46
<b>5</b>	<b>Licensing, Registration, and Frequency Use Regulation.....</b>	<b>49</b>
5.1	Launch and Payload Licenses.....	49
5.2	Registration .....	55
5.3	Use of Radio Frequencies .....	57
<b>6</b>	<b>Responsibility, Liability, and Orbital Debris Mitigation Issues .....</b>	<b>61</b>
6.1	Responsibility and Liability Issues .....	61
6.1.1	Liability for Small Satellites as Space Objects .....	62
6.1.2	Liability Under General International Law or National Law.....	64
6.1.3	Risk Management.....	65
6.2	Orbital Debris Mitigation Issues.....	65
<b>7</b>	<b>Technical, Operational, and Regulatory Solutions to Small Satellite Issues .....</b>	<b>67</b>
7.1	Technical and Operational Issues.....	67
7.1.1	Challenges for New Power Systems .....	67
7.1.2	Challenges for New Antenna Systems.....	68
7.1.3	Challenges for New De-orbiting Systems.....	68
7.1.4	Challenges for New Positioning and Pointing Systems.....	68
7.1.5	Challenges for Standardization and Kit Systems.....	69
7.2	Regulatory, Legal, and Liability Issues.....	69
<b>8</b>	<b>Ten Top Things to Know About Small Satellites and Space Debris.....</b>	<b>71</b>

<http://www.springer.com/978-1-4614-9422-5>

Small Satellites and Their Regulation

Jakhu, R.S.; Pelton, J.

2014, XIV, 77 p. 22 illus., 19 illus. in color., Softcover

ISBN: 978-1-4614-9422-5