Space-Based Technologies and Commercialized Development: Economic Implications and Benefits

Stella Tkatchova, RHEA System S.A., Belgium



ENGINEERING SCIENCE REFERENCE

Hershey · New York

Table of Contents

.

ъ

4

Chapter 1

Commercial Transportation Services	1
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	1
NASA Funding for 2011	2
NASA COTS Program	8
Space Mission Requirements and Concept Definition	
Brighter Space Exploration Trends	21
Gloomier Space Exploration Trends	23
Discussion	24
Conclusion	
References	
Endnotes	29

Chapter 2	
Moon and Mars Space Exploration Concepts	
Stella Tkatchova, RHEA System S.A., Belgium	
Todome Kazuhide, Japan Manned Space Systems, Japan	
Introduction	
Apollo Mission Benefits	
ESA Strategic Exploration Plan	
Russia's Historic Concepts for Mars Exploration	
Japanese Moon and Mars Programs	
Chinese Lunar Programs	
Indian Lunar Space Missions	
Global Space Exploration Strategy	
Challenges in Front of Long-Term Human Space-Flight Activities	
Expected Benefits from the STG 1969 and the US Vision for Space	
Exploration	
Mission Benefits from the European Space Exploration Vision	49
Mission Benefits from the Russian Space Exploration Vision	50
Reasons Behind Benefits Definition	
Discussion	
Conclusion	
References	
Endnotes	
	8
Chapter 3	
Space Station Commercialisation	

Space Station Commerciansation	
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	59
Commercialisation, Technology Diffusion and Disruptive Technologies	60
US Russian Cooperation and Pre-Historic Days of Space Station	
Commercialisation	61
Early Days of Commercialisation	62
Space Station Commercialisation Problems	
Space Station Lessons Learned	70
Benefits from Space Station Commercialisation	72
Discussion	75
Conclusion	76
References	77
Endnotes	79

. **.** ~

Chapter 4	
Space Industry Market Trends	
Pierre Lionnet, EUROSPACE, France	
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	
Snace Industry Stakeholders	82
Space Industry Activities	
Telecommunications	
Navigation	
Navigation Launchers	
Earth Observation	
Lunar and Mars Space Exploration	
Russia Space Strategy	
Space Exploration Europe	
Space Exploration Japan	
Discussion	
Conclusion	
References	
Endnotes	
· · · · · · · · · · · · · · · · · · ·	
	•

Chapter 5

Emerging Markets and Space Applications	
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	
Future Market Evolution	
Market Segmentation Challenges	
Future Products and Services Classification	
Discussion	
Conclusion	
References	
Endnotes	

Chapter 6

Competitiveness of Space Industry	
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	
Competitiveness in Space Industry	
Space Industry Organisation	
Global Space Market Competitiveness	
Collaborations	
Discussion	
Conclusion	
References	
Endnotes	

Chapter 7	
Space Tourism	164
Michel van Pelt, European Space Agency (ESA), The Netherlands	
Introduction	164
History of Orbital Space Tourism	165
The Price of Access to Orbit	167
Suborbital	173
Spaceports	174
Gradual Development	175
Conclusion	176
References	176

Chapter 8

Space Economics and Benefits	178
Stella Tkatchova, RHEA System S.A., Belgium	
Introduction	<u>.</u>
Space Economics	
Space Budgets per GDP	
Space Employment	× .
Space Product Exports and Exchange Rate Fluctuations	
Economic Impact Measurement	
Discussion	
Conclusion	
References	
Endnotes	

•

Chapter 9

An Analysis of Two Space Business Opportunities	206
Vladimir Atanasov, College of William and Mary, USA	
Gianluigi Baldesi, European Space Agency (ESA), The Netherlands	
Introduction	206
Analysis of an Immediate Investment Opportunity: Space Debris Mitigation and Removal	208
An Analysis of a Long-Term Investment Opportunity: Space Solar	
Power	230
Financing Sources and Mechanisms	243
Conclusion	248
References	249

Glossary		
About the Contributors	•••••	
Index	•••••••••••••••••••••••••••••••••••••••	