Managing the Challenges from New Actors in Space

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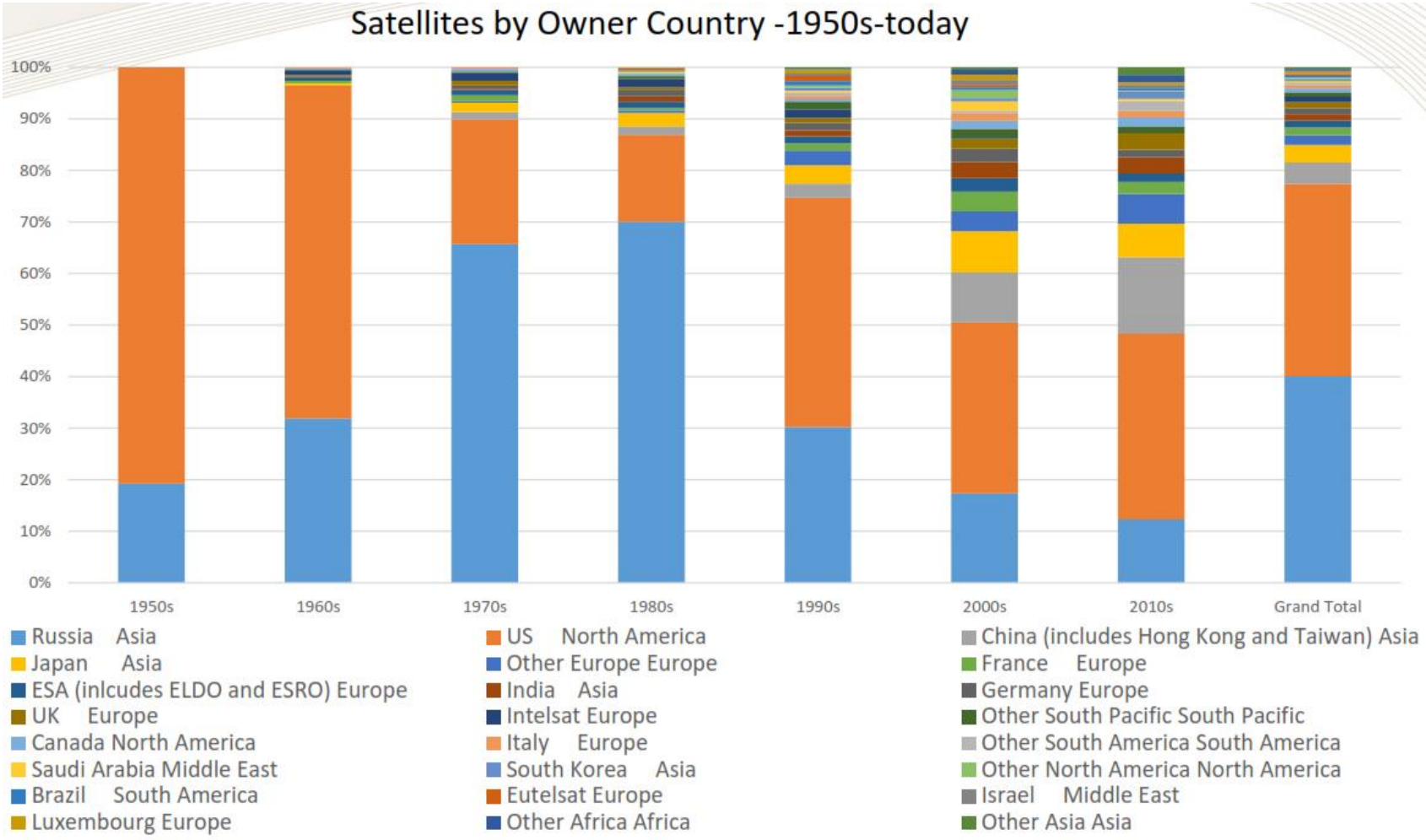
Promoting Cooperative Solutions for Space Sustainability

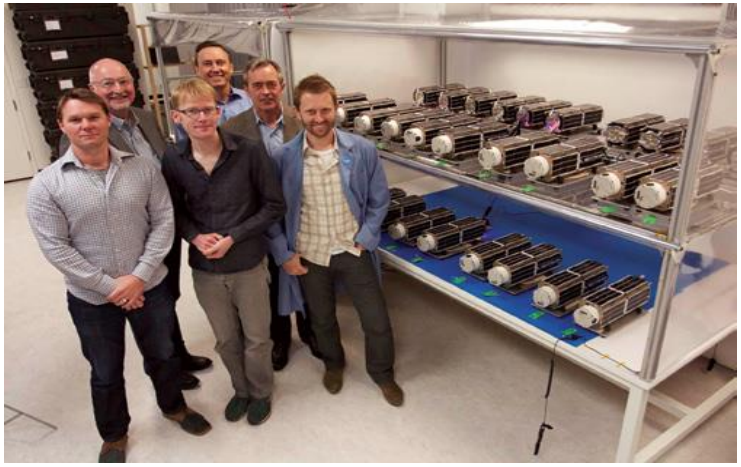
Space is becoming more international



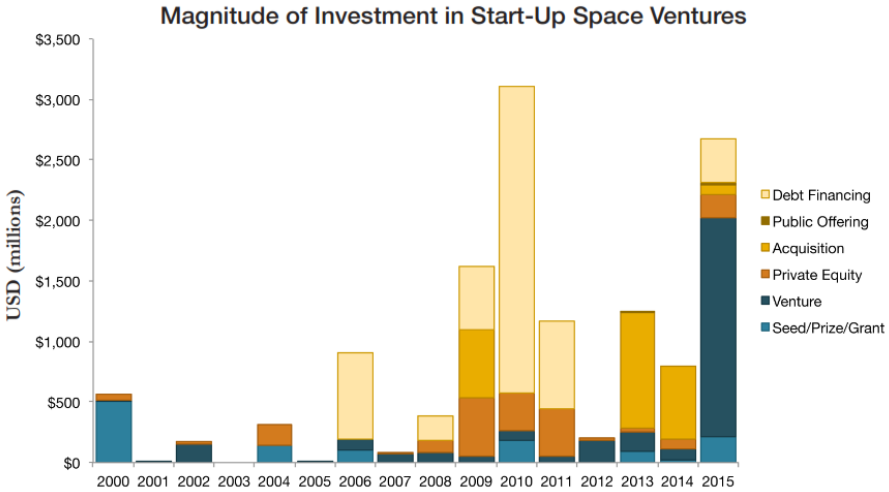
Adapted from IDA Global Trends in Civil and Commercial Space Study

Surge in commercial remote sensing

Company	Sector	Projected # of satellites	Mass (kg)	Altitude (km)	First Launch
SkyBox Imaging	Imagery	12-24	120	800	2013
Planet	Imagery	100	3	550	2013
Spire Global	Weather/ Maritime Domain Awareness	50	3	800	2014
OmniEarth	Remote Sensing	15-18	110	800	2018
NorStar	Imagery	40	?	800	?



Planet founders pose with a flock of Doves. Image credit: SatMagazine



Source: Tauri Group (2015)

Megaconstellations are coming

Company	# of Satellites	Orbit	Space-to-Earth	Earth-to-Space
OneWeb	720	1200 km	10.7-12.7 GHz	14.0-14.5 GHz
Boeing	2,956	1200 km	?	?
SpaceX	4,425	1100-1300 km	10.7-12.7 GHz	14.0-14.5 GHz

SpaceX System Constellation

Parameter	Initial Deployment (1,600 satellites)	Final Deployment (2,825 satellites)			
Orbital Planes	32	32	8	5	6
Satellites per Plane	50	50	50	75	75
Altitude	1,150 km	1,110 km	1,130 km	1,275 km	1,325 km
Inclination	53°	53.8°	74°	81°	70°

Source: SpaceX FCC Filing (2016)

Best practices for smallsats and SSA

- SWF side event at 2016 SmallSat Conference in Utah
  - Best practices for smallsat orbit determination and conjunction assessment
  - Space Data Association, JSpOC, and Planet

- 2016 AMOS SSA Conference in Maui
  - SWF-organized panel discussion on challenges of smallsats
  - SWF side event to discuss steps SSA operators and smallsat operators take to improve tracking, identification, and conjunction assessment

SWF Handbook for New Actors in Space

- **Proposal:** Create a publication that provides an overview fundamental principles, laws, norms, and best practices for safe, predictable, and responsible activities in space

- **Two specific audiences:**
  - Countries developing space programs and/or having to oversee and regulate their first satellites
  - Universities and start-up companies that are developing/operating satellites

Content (1)

- **Chapter 1: The International Framework for Space Activities**
  - Freedom and Responsibility
  - Registration of Space Objects
  - International Frequency Management
  - Remote Sensing
  - International Standards
  - International Export Control
  - International Liability
  - Dispute Settlement
  - Environmental Issues
  - Advanced Issues

Content (2)

- **Chapter 2: National Space Policy and Administration**
  - Public Policy
  - Public Administration and National Oversight
  - Case Study: Remote Sensing Policy and Administration

- **Chapter 3: Responsible Space Operations**
  - Pre-launch
  - Launch
  - On-orbit
  - End-of-life

Next steps

- The Handbook will be published in the 1st Quarter of 2017
- Electronic copies will be available through the SWF website, free of charge: www.swfound.org
- Printed copies will also be available
- SWF plans to curate an electronic library of resources to accompany the Handbook

Dialogue on satellite operator norms

- In 2017, SWF will be starting a new project aimed at promoting norms of behavior among commercial satellite operators

- SWF will organize workshops in US and internationally
  - Industry-led dialogue on principles of safe and responsible satellite operations
  - Borrow concepts from Corporate Social Responsibility (CSR)

- Focus areas
  - Rendezvous and proximity operations
  - Space traffic management
  - Conjunction assessment

Thank You

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