Chinese Space Policies : Implications for Asia, South America and Africa

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a. Why cooperation is difficult regarding outer space programs and policies?

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1. Defining the Problem

Answering the Questions:

Unbalanced Multipolarity – a tripolar system (United States, Russia and China) with huge asymmetric capabilities in favor of one potential hegemon (United States) is the least stable system because other great powers have to assume worst case scenarios regarding relative power gains.

The U.S. Grand Strategy of maintaining **Superpower Global Leadership** for as long as possible reinforces the perception of other actors regarding a growing gap between America's declared status quo intentions and its actual behavior.

Although China's Grand Strategy of "**safeguard the interests of sovereignty, security, and developmen**t" (2010) has tried to address international concerns related with the previous "peaceful rise" approach, China's consistent growing economic and military capabilities are perceived by other states as 'mobilizable' latent power in a future measured by decades.

Besides, petroleum, natural resources and other similar logistic requirements to sustain Grand Strategy, combined with growing dependence of cyber and outer space, create for all states a urging sense of insecurity in areas of human activity far removed from conventional military threats.

1. Defining the Problem

Answering the Questions:

The utter economic, scientific, and political importance of the Outer Space for the very "fabric of national interests and the public psyche" (Harding, 2013, p. 05) is expressed by the fact that 41 governments spent altogether more than US$ 80 billion per year in space programs in 2012, and *space enabled networks* are increasingly perceived as a *conditio sine qua non* for development and security.

Great Powers and the interdependency of their strategic decisions and actions shapes the space problem as a security dilemma: each country, trying to maximize its own security, increases everyone else insecurity. Military power is therefore inherent to any Space Program or Policy, whether or not the weaponization of space becomes reality.

Diplomatic efforts regarding the Outer Space from a Great Power perspective are driven by the need to **manage the economic and political costs and timing of a space race, as well as to build legitimacy to one's interests and actions**. They are not a sham or useless, but should be much more modest and verifiable than the proposed draft treaty for the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PPWT).

1. Defining the Problem

Answering the Questions:

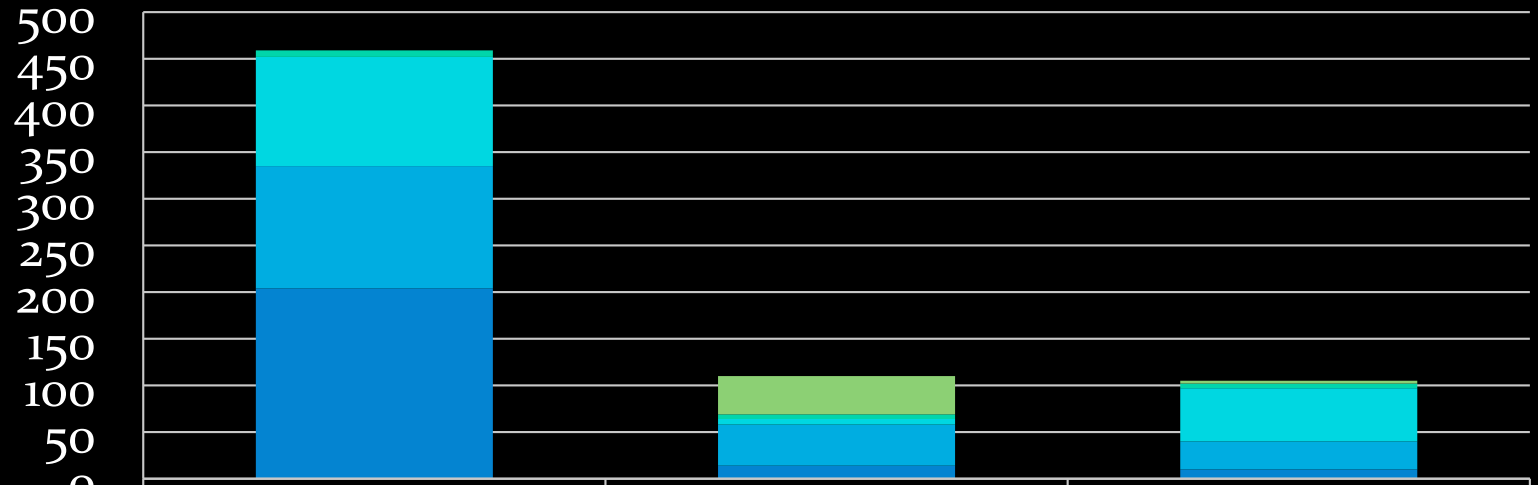
During the Cold War, United States and Soviet Union decided to cooperate due to the environment hazards associated with the potential use of nuclear weapons in space (EMP radiation, high velocity of space debris, etc). From 1963 (Partial Test Ban Treaty), 1967 (Outer Space Treaty), 1972 (ABM Treaty; Convention of International Liability), 1974 (Convention on Registration of Objects), until 2001, space cooperation was an integral part of the *Détente* between USSR (Russia) and USA. MOLTZ (2008).

Nowadays, the risks are higher because ASAT weapons do not necessarily involve breaking the nuclear threshold. The main issue requiring international cooperation is the weaponization of space and the content, rhythm, and intensity of competition between USA and China regarding the command of space. Other issues requiring cooperation are the growing international dependence from "space enabled networks", space traffic control to avoid collisions, asteroid monitoring, deep space exploration, laser communications, as well as radio frequency and geo orbital slot allocations.

According to Chambers (2009), there are 600 state owned satellites planned for launch until 2020. In 2010 the space market worth US$ 276 billion. In 2013, 25 developing countries possess active space programs. Considering the successful Chinese space program, competitive prices, the institutional framework, and room for some technological transfer, many developing countries do consider to cooperate with China.

2. Providing Context

Estimates of Space Assets, 2011

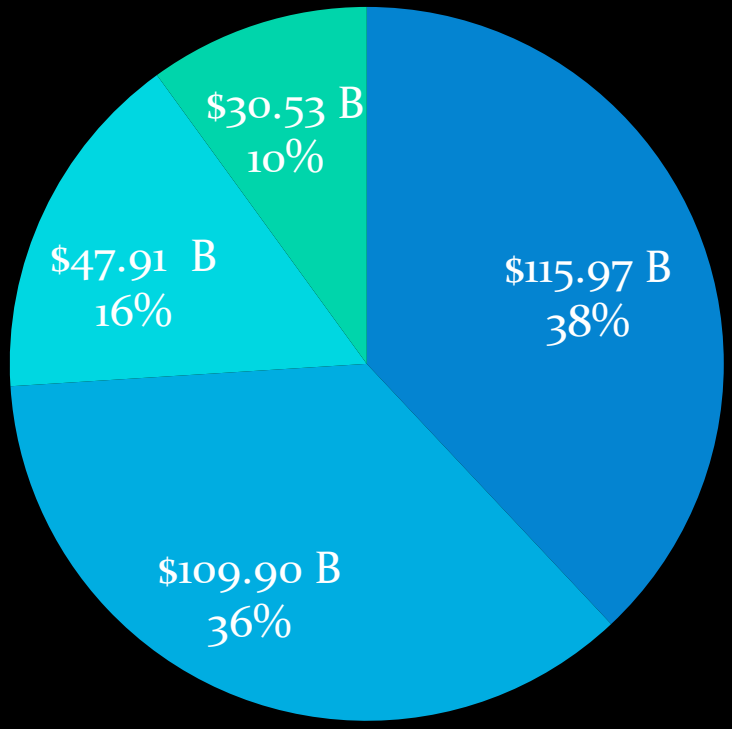


	United States	Russia	China
Mixed		41	3
Civil	7	5	5
Government	117	6	57
Military	131	44	30
Commercial	204	14	10

Source: UCS Satellite Database., 2011.

2. Providing Context

Global Space Activity



Source: The Space Report, 2013.

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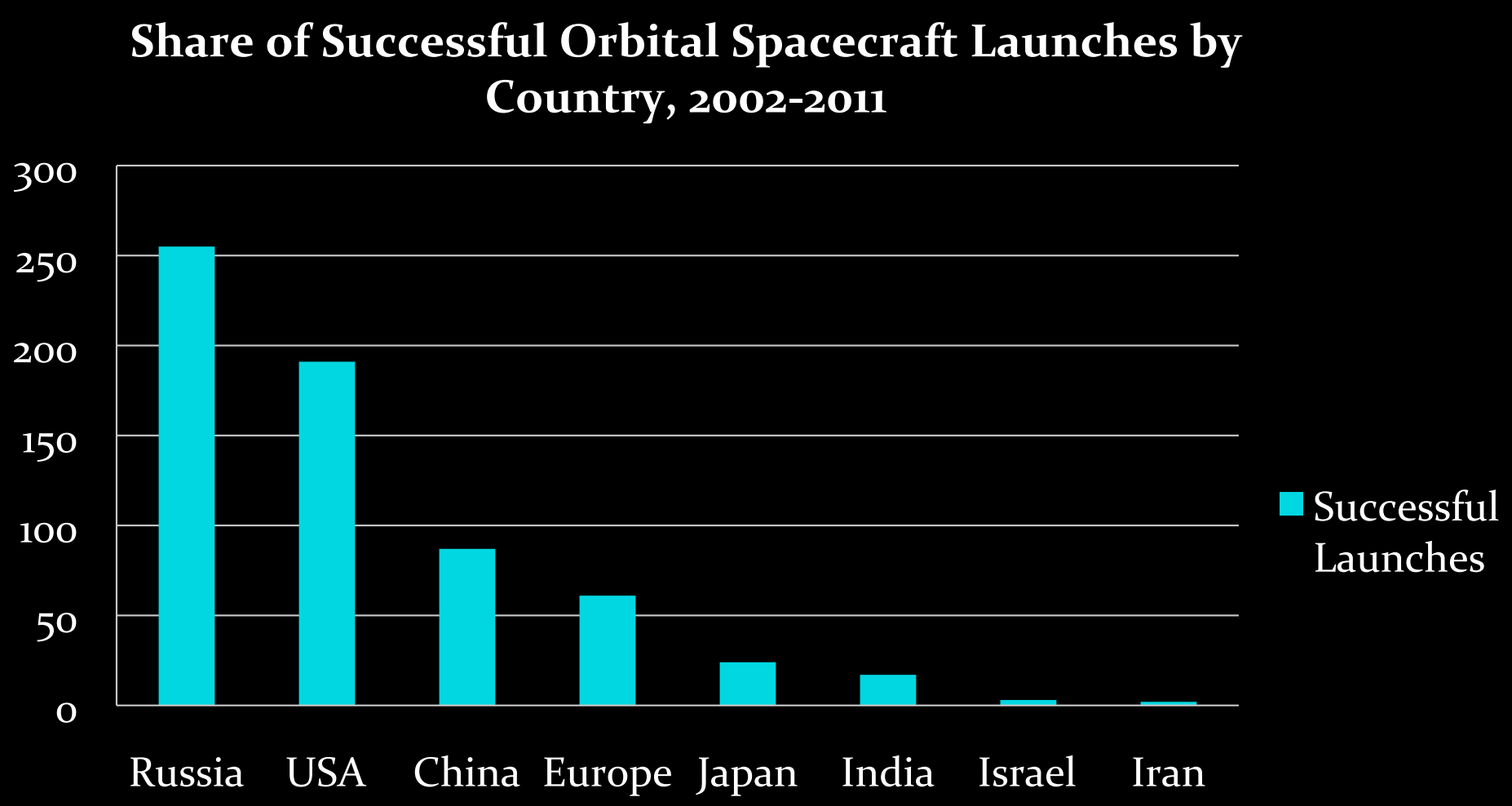

Source: Futron Corporation, 2012.

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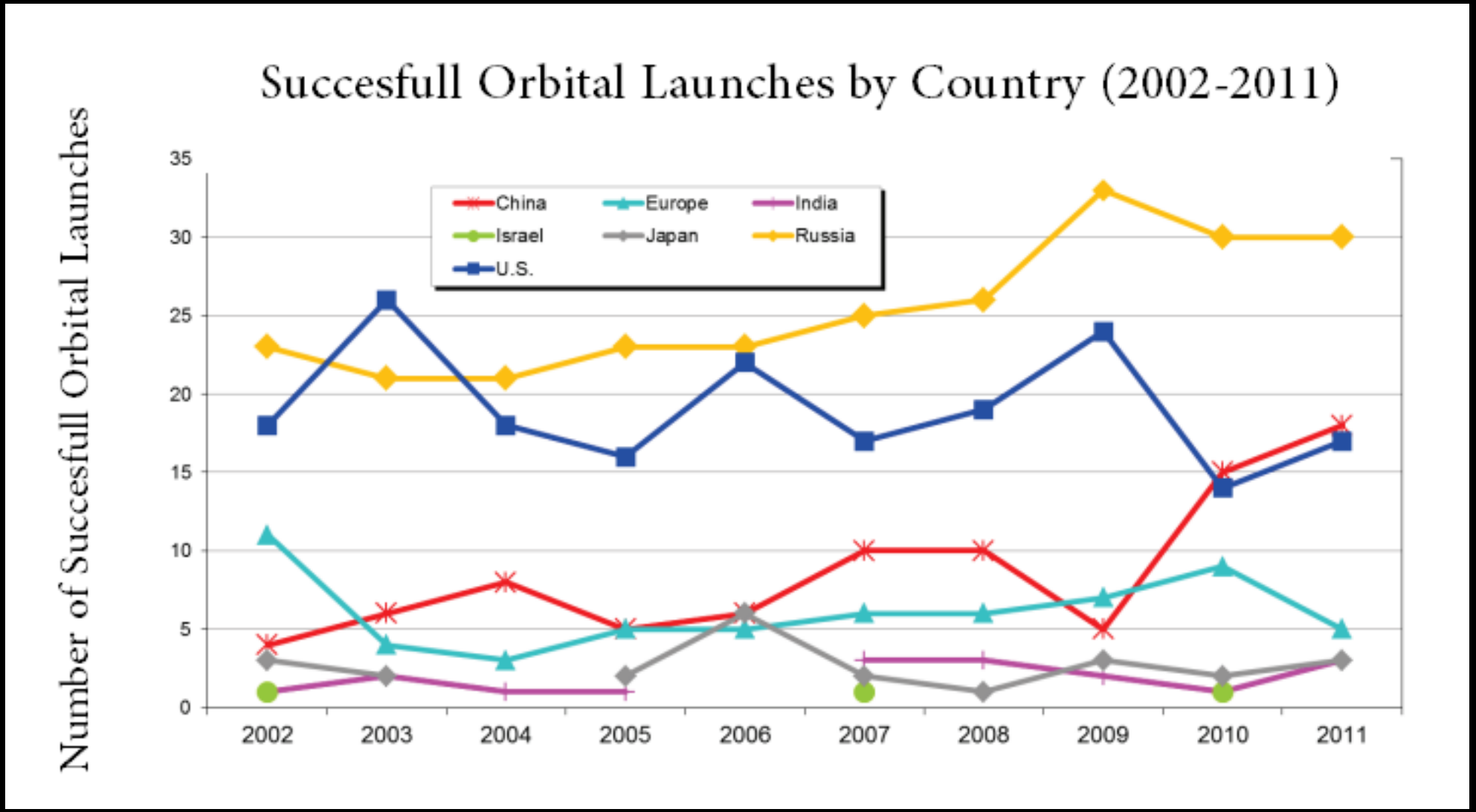
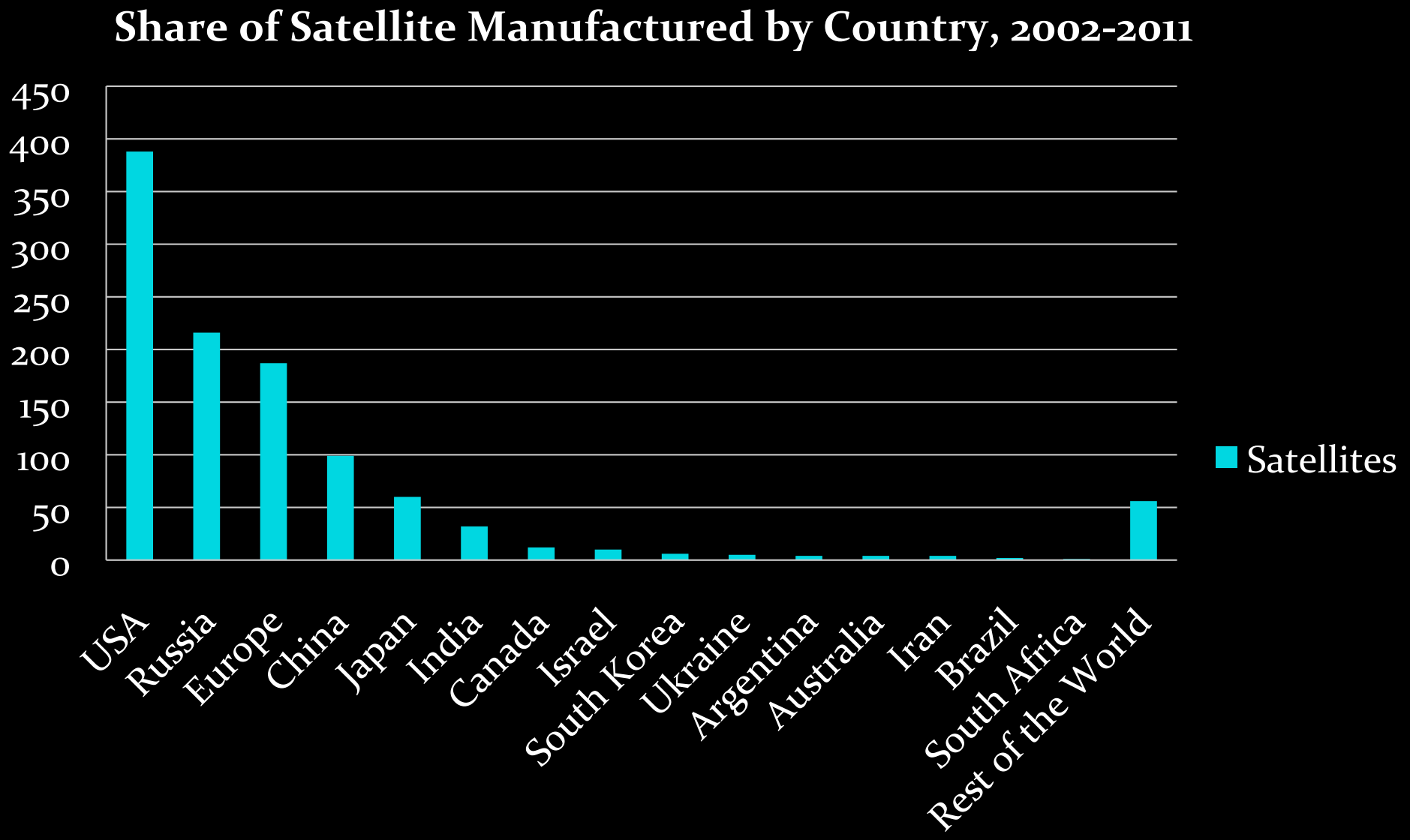


Source: Futron Corporation, 2012.

2. Providing Context



Source: Futron Corporation, 2012.

2. Providing Context

Government Space Budgets, 2012

Country/Agency	Budget (U.S. Dollars)
United States	$47.911 B
European Space Agency (ESA)	$5.091 B
Russia	$4.636 B
Japan	$3.373 B
China	$3.090 B
India	$1.210 B
France*	$1.058 B
European Union*	$0.190 B
Germany*	$0.743 B
EUMETSAT*	$0.325 B
Brazil	$0.219 B
Canada*	$0.318 B
Israel	$0.013 B
Italy*	$0.317 B
South Korea	$0.191 B
United Kingdom*	$0.049 B
Non-U.S. Military Space	$8.732 B
Total	$77.463 B

*Excludes ESA spending
Defense spending for all non-U.S. countries is included in “Non-U.S. Miliitary Space”

Source: The Space Report, 2013.

3. China's Space Program

- China's space program began in 1956 in a very unfavorable security environment. At that time, mainland China was isolated by the international community and faced military threats from both the USA and the former Soviet Union (after the sino-soviet split).

- Even today the technological gap between the U.S. and China in terms of missiles, satellites, command and control systems, or the ability to integrate space capabilities for military purposes is huge, measured in decades.

- Nonetheless, the national government and the PLA take very seriously the role of space in China's grand strategy. The current disadvantage in conventional power demands China to seek asymmetric capacities in order to deter any kind of external initiatives against its growth and sovereign integrity (Taiwan).

- China's space program is distinguished because of its perseverance and completeness, including launching sites (Jiuquan, Xichang, and Taiyuan), rockets (Long March and Changzheng), various types of satellites, ground stations (TT&C), spacecraft (Shenzhou), space station (Tiangong), manned flights and deep space robotic exploration (HARVEY, 2013).

- China's space cooperation goes beyond expert training and satellite construction. However, since those are consequential for the developing countries, in this section more information will be provided regarding selected satellite projects like remote sensing/imaging, navigation (Beidou and Compass), communication, data relay, and micro and nano satellites.

3. China's Space Program

China's Space Budget			
Year	Civil Space Budget (US$)	National Budget (US$)	Space as a % of Budget
2009	$1,792,920,000	$642,325,000,000	0,28%
2010	$2,240,000,000	$764,850,000,000	0,29%
2011	$3,080,000,000	$840,970,000,000	0,37%

Source: Futron Corporation, 2012.

3.1. - Remote Sensing / Imaging Satellites

- Remote sensing technologies are an important element for building military reconnaissance and surveillance superiority, and China has identified them as a crucial area for the development of space capabilities.

- Since April 2006, China has launched a number of reconnaissance satellites known as Yaogan Weixing (遥感卫星), or “Remote Sensing Satellite” in its English translation.

3.1 - Remote Sensing / Imaging Satellites

Public Name	Military Designation	Contractor	Launch Date	Launch Cetre	Launch Vehicle	Orbit	Type
Yaogan Weixing 1	JianBing 5-1	SAST	27 Apr 06	Taiyuan	CZ-4B	SSO	SAR radar imaging
Yaogan Weixing 2	JianBing 6-1	CAST	25 May 07	Jiuquan	CZ-2D	SSO	Electro-optical
Yaogan Weixing 3	JianBing 5-2	SAST	12 Nov 07	Taiyuan	CZ-4C	SSO	SAR radar imaging
Yaogan Weixing 4	JianBing 6-2	CAST	1 Dec 08	Jiuquan	CZ-2D	SSO	Electro-optical
Yaogan Weixing 5	JianBing ?	CAST	15 Dec 08	Taiyuan	CZ-4B	SSO	Electro-optical
Yaogan Weixing 6	JianBing ?	SAST	22 Apr 09	Taiyuan	CZ-2C	SSO	SAR radar imaging
Yaogan Weixing 7	JianBing ?	CAST	9 Dec 09	Jiuquan	CZ-2D	SSO	Electro-optical
Yaogan Weixing 8	JianBing ?	SAST	16 Dec 09	Taiyuan	CZ-4C	SSO	SAR radar imaging
Yaogan Weixing 9	JianBing ?	CAST	5 Mar 10	Jiuquan	CZ-4C	SSO	Electro-optical
Yaogan Weixing 10	JianBing ?	SAST	10 Aug 10	Taiyuan	CZ-4C	Polar	Electro-optical
Yaogan Weixing 11	JianBing ?	CAST	22 Sep 10	Jiuquan	CZ-2D	LEO	Electro-optical
Yaogan Weixing 12	JianBing ?	CAST	9 Nov 11	Jiuquan	CZ-4B	SSO	Electro-optical
Yaogan Weixing 13	JianBing ?	SAST	30 Nov 11	Taiyuan	CZ-2C	Polar	SAR radar imaging
Yaogan Weixing 14	JianBing ?	CAST	10 May 12	Taiyuan	CZ-4B	LEO	Electro-optical
Yaogan Weixing 15	JianBing ?	SAST	29 May 12	Taiyuan	CZ-4C	SSO	Electro-optical
Gaofen 1	-	CAST	26 Apr 13	Jiuquan	CZ-2D	SSO	High-Resolution (1~2 metres)

Source: SinoDefence, 2013.

3.2 - Navigation Satellites

- Compass Navigation Satellite System (CNSS) or Beidou 2.
- CNSS satellites are based on the DongFangHong 3 (DFH-3) satellite bus, with a designed life span of eight years.
- The CNSS will provide two types of services: a free service for civilian users with positioning accuracy of within 10 meters, velocity accuracy of within 0.2 m/s and timing accuracy of within 50 nanoseconds; as well as a licensed service with higher accuracy for authorized and military users only.
- The completed system for a global coverage will comprise 25~35 satellites;
- Beijing plans to have a full network to provide global positioning for military and civilian users by 2015-2020.
- China is pursuing both domestic and foreign co-operative programs to ensure that it maintains access to navigation satellite signals to guide military platforms and weapons.
- Also as a multilateral initiative, on 18 September 2003 China and EU officials signed an agreement whereby China would become an active participant in the Galileo navigation satellite program.

3.2 - Navigation Satellites

	CHINA	EUROPE	INDIA	JAPAN	RUSSIA	UNITED STATES
Positioning, Navigation, and Timing Systems						
System Name(s)	Compass BeiDou	Galileo	Indian Regional Navigation Satellite System (IRNSS)	Quase-Zenith Satellite System (QZSS)	Global Navigation Satellite System (GLONASS)	Global Positioning System (GPS)
Minimum Constellation	30	30	7	3	21 (plus 3 in-orbit spares)	24
Current Constellation	5	2	0	0	19	
Operational Date	2012 2015-20	2014	TBD	2013	1995 2012[1]	1995 2014[2]
Coverage	Asia-Pacific Global	Global	India + Regional	Japan	Global	Global
Consumer Equipment		Planned		Planned	Available	Available
Augmentation Systems						
System Name(s)	-	European Geostationary Navigation Overlay Service (EGNOS)	GPS-Aided Geo Augmented Navigation (GAGAN)	Multi-functional Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS)[3]	System of Differential Correction and Monitoring (SDCM)	Wide Area Augmentation System (WAAS)/ Local Area Augmentation System (LAAS)
Minimum Constellation	-	3	3	2	2	2
Current Constellation	-	3		2	0	2
Operational Date	-	2009	2011	2006	TBD	2003 2001-2030
Coverage	-	Europe	Regional	Asia/Oceania	Russia	North America

[1] Expected reconstitution date as the system is replenished after a period of degradation
[2] GPS III launches are scheduled to begin is 2014.
[3] MSAS also provides meteorological services in addition to PNT.

Source: Inside GNSS Magazine, updated in December 2009

3.2 - Navigation Satellites

- **Compass/Beidou Navigation Satellites**

Satellite	Launch Date	Launch Centre	Launch Vehicle	Orbit
Compass - M1	14 Apr 2007	Xichang	CZ-3A	MEO
Compass - G1	15 Apr 2009	Xichang	CZ-3C	GEO
Compass - G2	17 Jan 2010	Xichang	CZ-3C	GEO
Compass - G3	2 Jun 2010	Xichang	CZ-3C	GEO
Compass – G4	31 Oct 2010	Xichang	CZ-3C	GEO
Compass – G5	31 Set 2010	Xichang	CZ-3C	GEO
Compass – G7	17 Dec 2010	Xichang	CZ-3C	GEO
Compass-IGSO3	10 Apr 2011	Xichang	CZ-3A	GSO
Compass-IGSO4	27 Jun 2011	Xichang	CZ-3A	GSO
Compass-I5	02 Dec 2011	Xichang	CZ-3A	GSO
Compass-G5	25 Feb 2012	Xichang	CZ-3C	GSO
Compass-M3	30 Apr 2012	Xichang	CZ-3B	MEO
Compass-M4	30 Apr 2012	Xichang	CZ-3B	MEO
Compass-M5	19 Set 2012	Xichang	CZ-3B	MEO
Compass-M6	19 Set 2012	Xichang	CZ-3B	MEO
Compass-G2R	25 Oct 2012	Xichang	CZ-3C	GEO

Source: SinoDefence and UCS Satellite Database, 2013.

3.3 - Communication Satellites

- The PLA has direct control over two ZHONGXING-20 communication satellites, launched in 2003 and November 2010.

- In addition the PLA has regular access to many of the 14 or so foreign-made satellites launched by China and owned by Chinese government related entities.

- Communication satellites, albeit in smaller numbers compared to U.S. current assets, are allowing more and better information sharing among the PLA divisions.

3.3 - Communication Satellites

- **Apstar**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
APStar 7	31 Mar 2012	Xichang	CZ-3B	GEO		
Apstar 6B	2009?	-	-	-	-	DFH-4, to be launched in late 2008, 28 C-band and 16 Ku-band transponders
Apstar 6	12 Apr 05	Xichang	CZ-3B	GEO 134.0°E	Yes	Alcatel Alenia Space: Spacebus 4000C2
Apstar 5	29 June 04	Odyssey	Zenit 3SL	GEO 138.0°E	Yes	Space Systems/Loral LS-1300 platform

Source: SinoDefence, 2012.

- **AsiaSat**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
AsiaSat 5	2009	Baikonur Cosmodrome	Breeze M	GEO 100.5°E	Yes	-

Source: SinoDefence, 2009.

3.3 - Communication Satellites

- **SinoSat**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
SinoSat 4	-	-	-	GEO 92.2°E	-	DFH-4, to be launched in late 2008 to replace the failed SinoSat 2
SinoSat 3B	-	-	-	GEO 125°E	-	DFH-4, backup for the SinoSat 3, to be launched in 2008, C-band
SinoSat 3	1 June 07	Xichang	CZ-3A	GEO 125°E	Yes	DFH-3, 10 C-band transponders
SinoSat 2	28 Oct 06	Xichang	CZ-3B	-	No	DFH-4, 22 Ku-band transponders, unusable as the solar panel failed to deploy
SinoSat 1	18 July 98	Xichang	CZ-3B	GEO 110.5°E	Yes	Alcatel Alenia Space Spacebus 3000, to be retired in 2007

Source: SinoDefence, 2009.

- **ChinaStar**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
ChinaStar 1	30 May 98	Xichang	CZ-3B	GEO 87°E	Yes	Astra Space AS2100

Source: SinoDefence, 2009.

- **ChinaSat**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
ChinaSat 9	9 June 08	Xichang	CZ-3B	GEO 92.2°E	Yes	-
ChinaSat 6B	5 July 07	Xichang	CZ-3B	GEO 115.5°E	Yes	Replace ChinaSat-6

Source: SinoDefence, 2009.

3.3 - Communication Satellites

- **Military Communications Satellites**

Satellite	Launch Date	Launch Site	Launch Vehicle	Orbit	In use	Note
Chinasat 2A (Shentong 2)	26 May 12	Xichang	CZ-3B/E	-	Yes	-
ChinaSat 20A (Shentong 1 No.2)	25 Nov 11	Xichang	CZ-3A	GEO 103°E	Yes	Replace Chinasat 20 launched in 2003
ChinaSat 1	19 Sep 11	Xichang	CZ-3A	GEO 129.82°E	Yes	Fenghuo-2 (military name) second-generation tactical military COMSAT
ChinaSat 22A	12 Sept 06	Xichang	CZ-3A	GEO 98°E	Yes	FengHuo 1 No. 2 tactical COMSAT
ChinaSat 20 (Shentong 1 No.1)	14 Nov 03	Xichang	CZ-3A	GEO 98°E	No	Shenyong 1 strategic COMSAT based on DFH-3
ChinaSat 22	25 Jan 00	Xichang	CZ-3A	GEO 103°E	No	FengHuo 1 tactical COMSAT for the PLA, based on DFH-3, replaced by ChinaSat 22A in 2006

3.4 - Data Relay System

- In April 2008, China launched its first data-relay satellite, the TianLian-1 (TL-1).
- The TianLian 1 (TL-1) data relay satellite system has been developed by the China Academy of Space Technology (CAST).
- The TL-1 is designed to support near-real-time communications between orbiting spacecraft and the ground control. The system will complement the existing ground-based space tracking and telemetry stations and ships to support future space projects of the PRC.
- In 2012, it was launched the third satellites, Tianlian-1 No.3 of the series, which points to a possible success of the results brought by the payload.

3.4 – Data Relay System

- **Tianlian Data Relay Satellite Series**

Satellite	Launch Date	Launch Site	Launch Vehicle	Contractor	Orbit	In use
Tianlian 1 No.1	25 Apr 08	Xichang	CZ-3C	CAST	GEO 77°E	Yes
Tianlian 1 No.2	11 Jul 11	Xichang	CZ-3C	CAST	GEO 177°E	Yes
Tianlian 1 No.3	25 Jul 12	Xichang	CZ-3C	CAST	-	Yes

Source: SinoDefence, 2013.

3.5. Micro and Nano Satellites

- China is developing micro-satellites (weighing less than 100 kg) for remote sensing, as well as networks of imagery and radar satellites. This could enable rapid reconstitution or expansion of China's satellite force in the event of any disruption in coverage.

- These increasingly sophisticated micro-satellites also have the potential to permit the use of satellite constellations to increase survivability, decrease cost, and increase reliability, particularly of communications missions. However, successfully using microsatellites as a replacement for larger military platforms still requires a high degree of technological sophistication.

3.5. Micro and Nano Satellites

- In 1998, Tsinghua University formed a cooperative research program with a company formed by the University of Surrey, a leading microsatellites research facility, under a “know-how transfer and training” agreement.

- China launched its first 50 kg TSINGHUA-1 micro-satellite in 2000. This was the direct result of a 1998 co-development programme between Tsinghua University and Britain's Surrey Space Systems. Then, on 18 April 2004, China launched its first nano-satellite, the 55 lb NAXING, or NS-1.

3.5. Micro and Nano Satellites

Satellite	Launch Year	Launch Site	Launch Vehicle	Mass	Note
Tianxun 1	2011	Taiyuan	CZ-4B (piggyback)	50 kg	Experimental Earth-observation microsatellite
Xiwang 1	2009	Taiyuan	CZ-4C (piggyback)	61 kg	Designed to support armature radio (ham radio) communications. It also carried a CMOS camera for Earth observation and microgravity experiment package.
Nanxing - NS-1	2004	Xichang	-	-	Nanosatellite
Tsinghua-1	2000	Xichang	-	50 kg	Microsatellite

Source: SinoDefense, 2013.

4. Multilateral Initiatives

Global Context

- United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS)

Regional Context

- Asian-Pacific Space Cooperation Organization (APSCO)

4.1 - UNCOPUOS

- China has been a strong proponent of an arms control regime in space and has argued for the peaceful use of outer space in the ***United Nations Conference on Disarmament and at the Prevention of an Arms Race in Outer Space*** dialogue.

- Reaffirming the guidelines expressed in the 2006 China's White paper on Space Activities, the Chinese representative in the UNCOPOUS, supported by Russia and other 35 countries came up with the draft resolution A/C.1/62/L.34, which resulted in the "Resolution Adopted by the General Assembly: 62/20. Prevention of an Arms Race in Outer Space."

- As the military options are not very attractive for China these days, and the U.S. owns a respectful advantage regarding space assets and technology know-how, China's strategic choice, at this moment, lays on diplomacy. Through the U.N. framework, China intends to constrain the increasing of American space power.

4.2 - APSCO

- China took steps to take a leading role in regional space cooperation during the Tenth Five-year Plan.
- In October 2005, **China, Bangladesh, Indonesia, Iran, Mongolia, Pakistan, Peru, and Thailand** endorsed the Asia-Pacific Space Cooperation Organization convention to promote multilateral cooperation in space science, technology, and applications.
- On 16 December 2008, the Inauguration Ceremony of APSCO (http://www.apsco.int) was held in Beijing, where its headquarters is located. Besides delegates from all Signatory States, now including Turkey, representatives from Argentina, Malaysia, the Philippines, Russia and Sri Lanka also attended the Ceremony.
- Dr. Zhang Wei, nominated by the Chinese Government, was chosen as the Secretary-General of APSCO for an initial period of five years.

4.2 - APSCO

- APSCO aims to foster multilateral cooperation in the application of space technology amongst its members. The first initiatives on this matter came along with the Cooperation in Small Multi-Mission Satellites Project.

- As for 2010, the organization had defined 10 projects on designing, building and launching light satellites, middle class satellites weighing 500-600 kg, research satellites, remote-sensing and telecommunications satellites with member states.

- China is also using the whole framework that comes up from the APSCO to strengthen its ties with countries significant to the balance of power in the Asian-Pacific region, from Turkey and Iran to Indonesia.

5. Regional Implications

- Space power is increasingly important for all states and societies, and no fewer than 25 developing states possess space programs (HARDING, 2013)
- China's space cooperation policies are guided by political, commercial, scientific, and strategic goals. These partnerships may constitute a challenge to the United States and enhance China's "soft power" among key American allies and even in some regions traditionally dominated by U.S. influence (Latin America and Africa). (CHAMBERS, 2009).
- In the case of Brazil there is prior space cooperation with China since 1988, both in launch services as well as meteorological and imaging satellite development (CBERS).
- South Africa fully re-entered the international space politics arena in 2009, after the establishment of its ambitious new National Space Policy. Although Russia plays an important role in the South Africa space program, the Chinese politics towards Africa, as well as its demonstrations of capable space cooperation with Nigeria, could also help China to be a more active partner for South Africa.

5. Regional Implications

Strategic Partnerships:

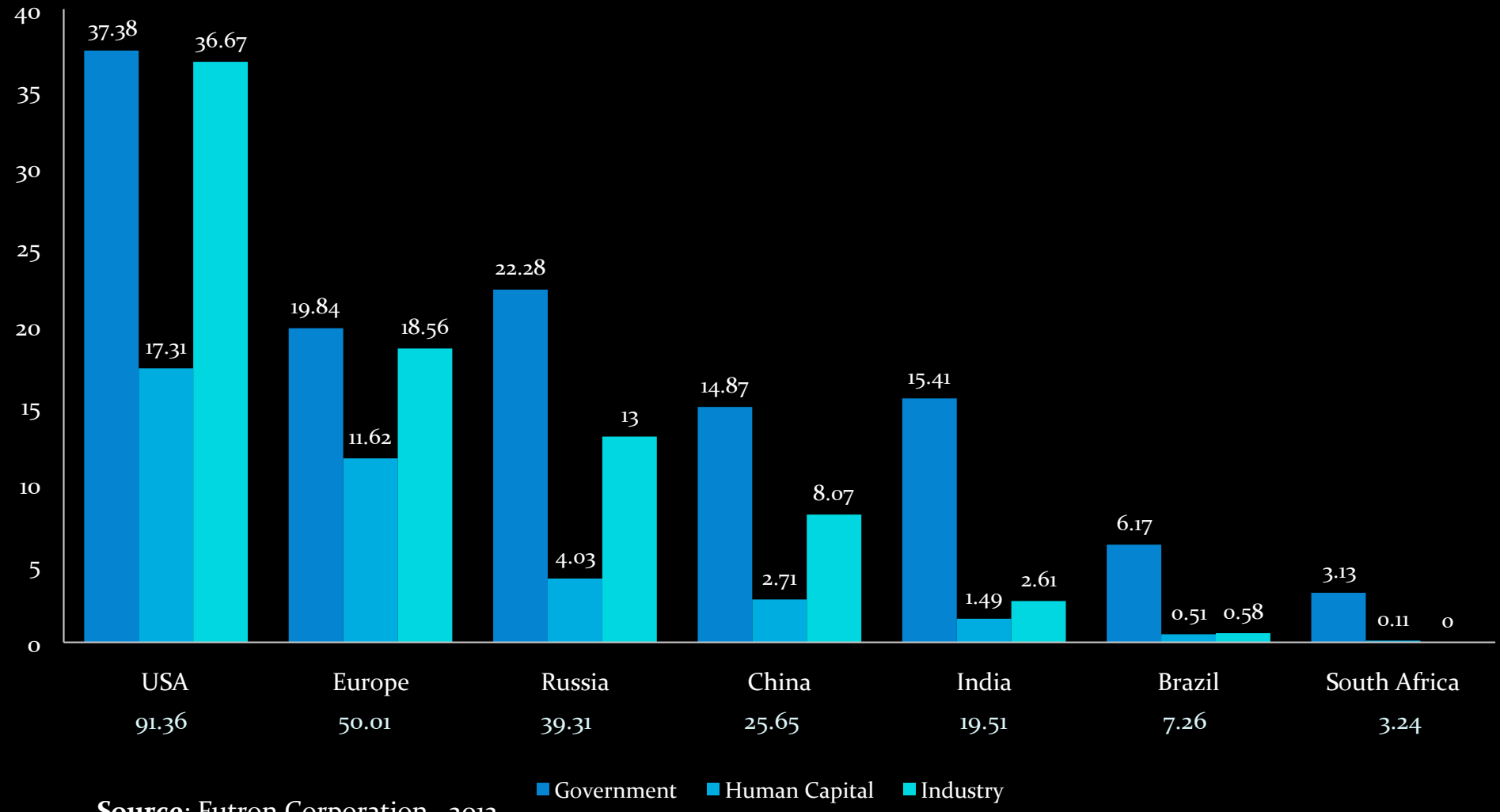
- For China, "strategic partnership" (*zhanlue huoban guanxi* 战略伙伴关系) is:

"*not treated as quasi-military alliances, which involve extensive security and military cooperation, as implied by the term "strategic." Rather, in the Chinese foreign policy lexicon, a partnership is strategic for two reasons: (1) It is* ***comprehensive****, including all aspects of bilateral relations (e.g., economic, cultural, political, and security), and (2) both countries agree to make a* ***long-term commitmen****t to bilateral relations, in which bilateral problems are evaluated in that context and, importantly, occasional tensions do not derail them*." (MEDEIROS, 2009:82)

"*It uses them as mechanisms to expand economic opportunities (especially to gain preferential access to nations' markets, investment, and natural resources), to stabilize and shape China's regional security environment, to reduce external constraints on China, and to bolster its international reputation as a responsible major power*." (MEDEIROS, 2009:86)

5. Regional Implications

Space Competitive Index



Source: Futron Corporation, 2012

5. Regional Implications

China - Asia

COUNTRY	SATELLITE	TYPE	LAUNCH DATE
Bangladesh	?	ComSat	2013?
Maldives	?	ComSat	?
Pakistan	PakSat 1R	ComSat	2011
Sri Lanka	?	ComSat	2012

5. Regional Implications

China-South America

COUNTRY	SATELLITE	TYPE	LAUNCH DATE
Argentina	CubeBug 1 satellite	Tecnology demonstration payload	26 Apr 2013
Bolivia	Túpac Katari	Communications Satellite	Dec/2013
Brazil	CBERS 1	Earth Observation	Oct/1999
	CBERS 2	Earth Observation	Oct/2003
	CBERS 2B	Earth Observation	Sep/2007
	CBERS 3	Earth Observation	Oct/2013
	CBERS 4	Earth Observation	Oct/2015
Ecuador	CubeSat - NEE-01 PEGASUS	Nanosatellite	26 Apr 2013
Venezuela	Venesat-1(Simon Bolivar)	Communications Satellite	29 Oct 2008
	Miranda	Earth Observation	29 Sep 2012

5. Regional Implications

China - Africa

COUNTRY	SATELLITE	TYPE	LAUNCH DATE
Nigeria	NigcComSat 1R	ComSat	13 May 2007 (failed)
	Nigeriasat 2	ComSat	Dec/2011
Egypt	Egypt Sat 2	ComSat	2014

5.1 – Brazil: from CBERS to what?

1. Brazil and China signed in 1988 a partnership agreement between INPE (The Brazilian National Space Research Institute) and CAST (Chinese Academy of Space Technology) for the development of two advanced remote sensing satellites, named CBERS Program (China-Brazil Earth Resources Satellite)
2. Brazil and China invested more than US$ 300 millions (30% Brazilian and 70% Chinese) in the first two satellites.
3. Thanks to CBERS program, Brazil acquired the capacity of operating large satellites of a complexity. Moreover, there are plans to launch the CBERS-3 from China and the CBERS-4 from the Alcantara Launch Center in Maranhão, Brazil.

5.1 – Brazil: from CBERS to what?

4. The initial CBERS development have not troubled United States because the satellites were unsophisticated. At the time, China relied on the Fanhui Shi Weixing imagery satellites, which used film capsules with lower resolution images and had to be de-orbited from space.
5. This attitude changed somewhat in November 2002, when China and Brazil announced their follow-on agreement to produce CBERS-3 and -4 (funded in a 50%-50% basis), with improved image resolution.
6. Due to technological, political, as well as financial problems, the Brazilian space program has now reached a crossroad. International cooperation needs consistency and endurance.

5.1 – Brazil: from CBERS to what?

7. That's why China and Brazil have agreed to start sharing the images from CBERS with other nations.
8. Through the installation of ground bases in different countries, China and Brazil plan to expand the commercial and technical reach of their partnership.
9. Three countries have already signed agreements: South Africa (CSIR), Spain (INTA), and Egypt (NARSS).
10. Gabon and Kenya are also working to set up a CBERS ground station.
11. It was agreed that China would work with CSIR (South Africa) and Brazil would operate in Maspalomas, Canary Islands, Spain.

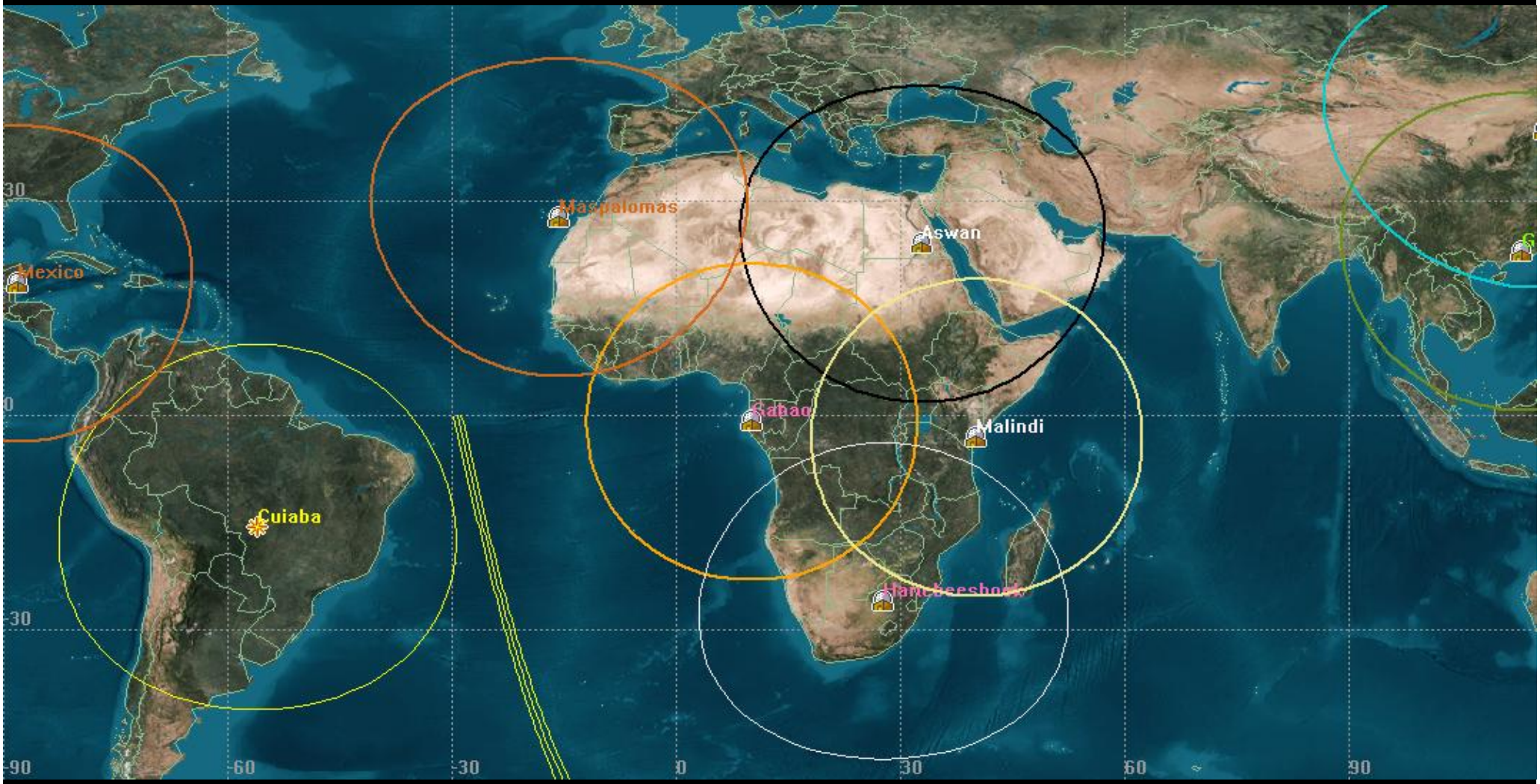
5.1 – Brazil: from CBERS to what?

Mission	Launch Date	Lifetime	Applications	Orbit Details
CBERS-1	Oct/1999	4 years	Earth resources, environmental monitoring, land surface	Type: Sun-synchronous Altitude: 778 km Period: 100.26 mins Repeat cycle: 26 days
CBERS-2	Oct/2003	5 years	Earth resources, environmental monitoring, land surface	Type: Sun-synchronous Altitude: 778 km Period: 100.26 mins Repeat cycle: 26 days
CBERS-2B	Sep/2007	3 years	Earth resources, environmental monitoring, land surface	Type: Sun-synchronous Altitude: 778 km Period: 100.26 mins Repeat cycle: 26 days
CBERS-3	Oct/2013	3 years	Earth resources, environmental monitoring, land surface	Type: Sun-synchronous Altitude: 778 km Period: 100.26 mins Repeat cycle: 26 days
CBERS-4	Oct/2015	3 years	Earth resources, environmental monitoring, land surface	Type: Sun-synchronous Altitude: 778 km Period: 100.26 mins Repeat cycle: 26 days

Source: CEOS (Committee on Earth Observation Satellites)

5.1 – Brazil: from CBERS to what?

CBERS for Africa Initiative



Source: INPE (Brazilian National Institute for Space Research), 2009.

5.2 - South Africa: the new frontier

- As China increases its economic footprint in Africa, it would be a reasonable path to be followed by the Chinese space institutions to engage in cooperation with the South Africa Space program.
- China is already interested in the Africa's space related market. In 2004, for instance, China beat 21 other bidders in 2004 for the $311m contract to build and launch (using a Long March 3-B rocket) the Nigerian Communication Satellite NIGCOMSAT-1, providing broadcasting, phone and broadband internet services for Africa. Even after the lost of this satellite in 2008, China got the contract for its replacement, orbited in December of 2011.

5.2 - South Africa: the new frontier

- South Africa's most important international partner is currently Russia, but China's growing presence in Africa is also reflected in recent scientific and industrial agreements with South Africa.
- Leadership in space is one of requirements for greater international status, and South Africa is well aware of that since its engagement with the UNCOPOUS in 2003, as well as with the Regional African Satellite Communications Organization (RASCOM).

6. Conclusions

1. China's **grand strategy**, in short, aims to increase the country's international clout without triggering a counterbalancing reaction.

2. China's **space program** is intended to situate China as a modernizing nation committed to the peaceful uses of space. Of course China's space cooperation serves its interests.

3. China's leaders also understand that the Command of Space (in a Clausewitzian / Corbettian sense) is paramount for achieving greater **national security. T**hey are strategically committed to a far reaching unmanned and manned planetary exploration program and wider international space technical co-operation.

6. Conclusions

4. In the global multilateral arena, China's space diplomacy aims to postpone a Space Race as long as possible. Regionally, APSCO is a newly established body with huge potential expressed by the ten new satellites Iran will build with APSCO.
5. Finally, in the regional and bilateral cooperation, China intends to compete with U.S., Russia, and Europe for the "uncharted space markets" of Asia, South America, and Africa.
6. While avoiding renewed political and technical dependency remains an imperative, **regional powers** like Brazil and South Africa can benefit from cooperating with the Chinese space program. This should be done without prejudice and with no harm to the well established cooperation with United States.

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