A wide-angle photograph of a sunset over the ocean. The sky is filled with soft, colorful clouds in shades of orange, pink, and purple, transitioning to a deep blue at the top. The horizon line is clearly visible, separating the dark blue sea from the vibrant sky.

Nurturing the development of space technology: a international comparison

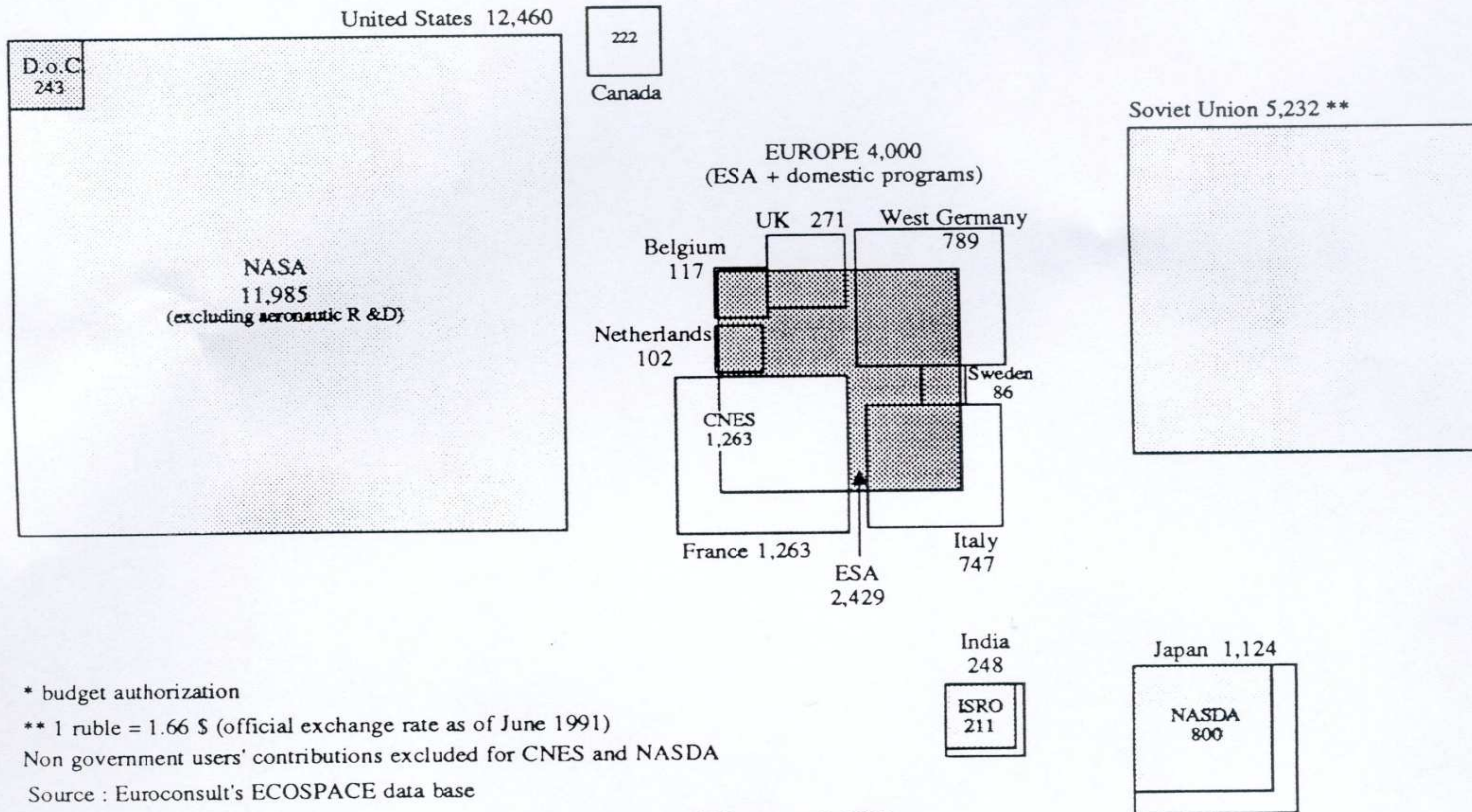
Industry Symposium of the Scientific and Technical Subcommittee of the OOSA

February 8, 2010 - United Nations Office, Vienna

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Public expenditures for civilian space in the world: the past (20 years ago)

1990 Civil Budgets for Space* Throughout the World (USD in millions)



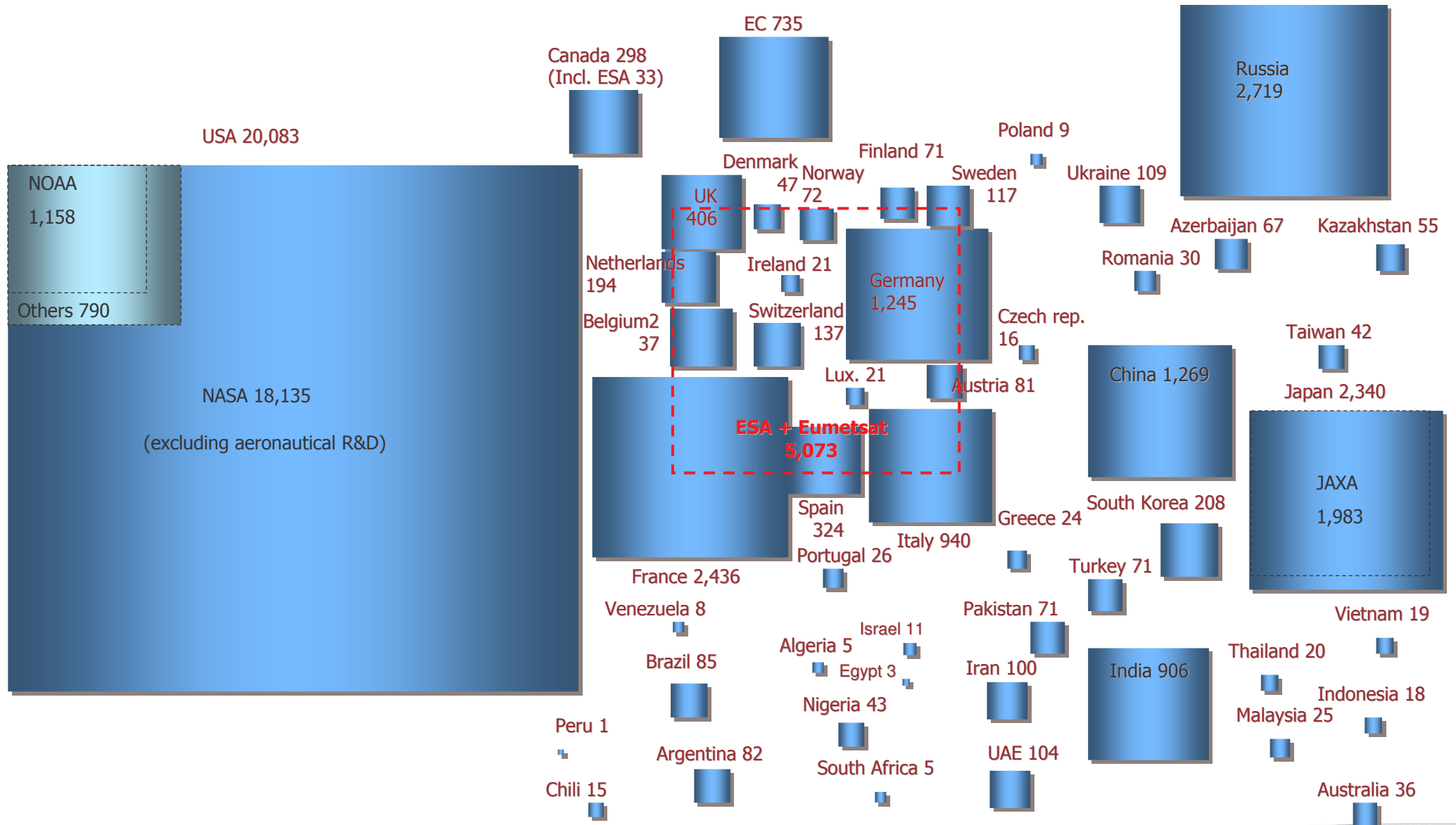
* budget authorization

** 1 ruble = 1.66 \$ (official exchange rate as of June 1991)

Non government users' contributions excluded for CNES and NASDA

Source : Euroconsult's ECOSPACE data base

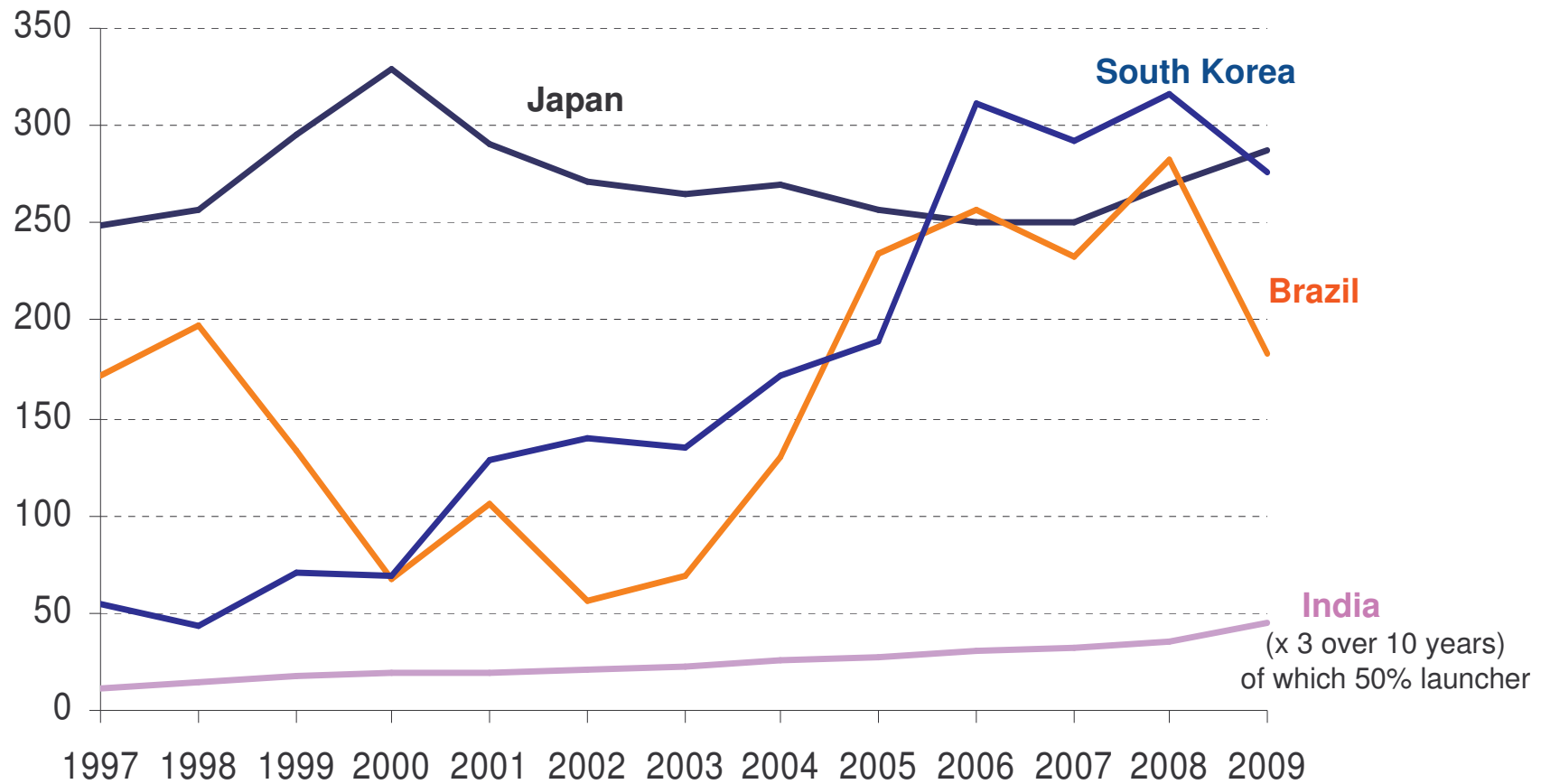
.. And today, a total of \$36 billion in 2009



Note: Budgets indicated for European countries include their contributions to ESA and Eumetsat

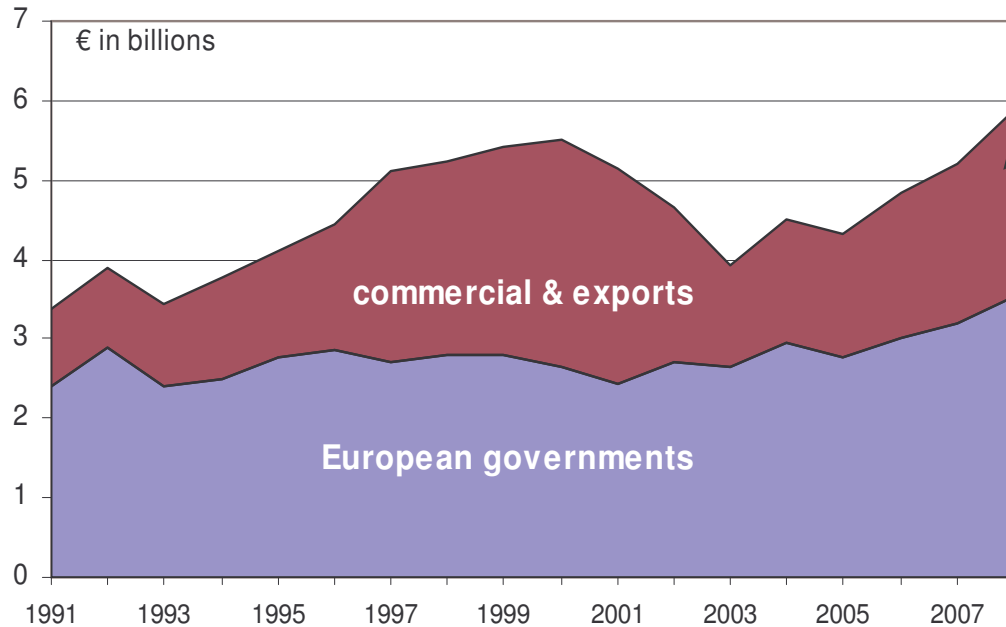
Growth in public expenditures for space in the « new space countries »

Local currencies in billions or millions



Growth of space industry conditional to government expenditures for space: the case of Europe

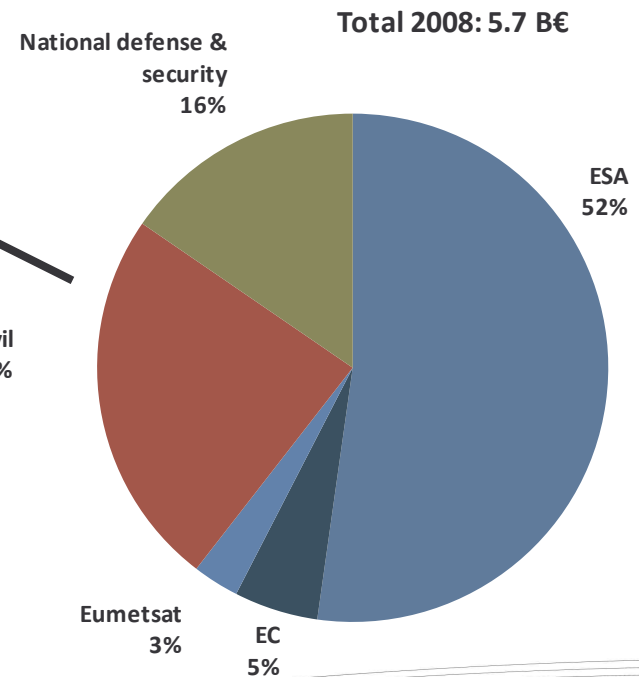
Sales of the European space industry



Data source: ASD-Eurospace

Mainly GEO comsat manufactured by Astrium and TAS and launch of GEO comsat by Ariane 5

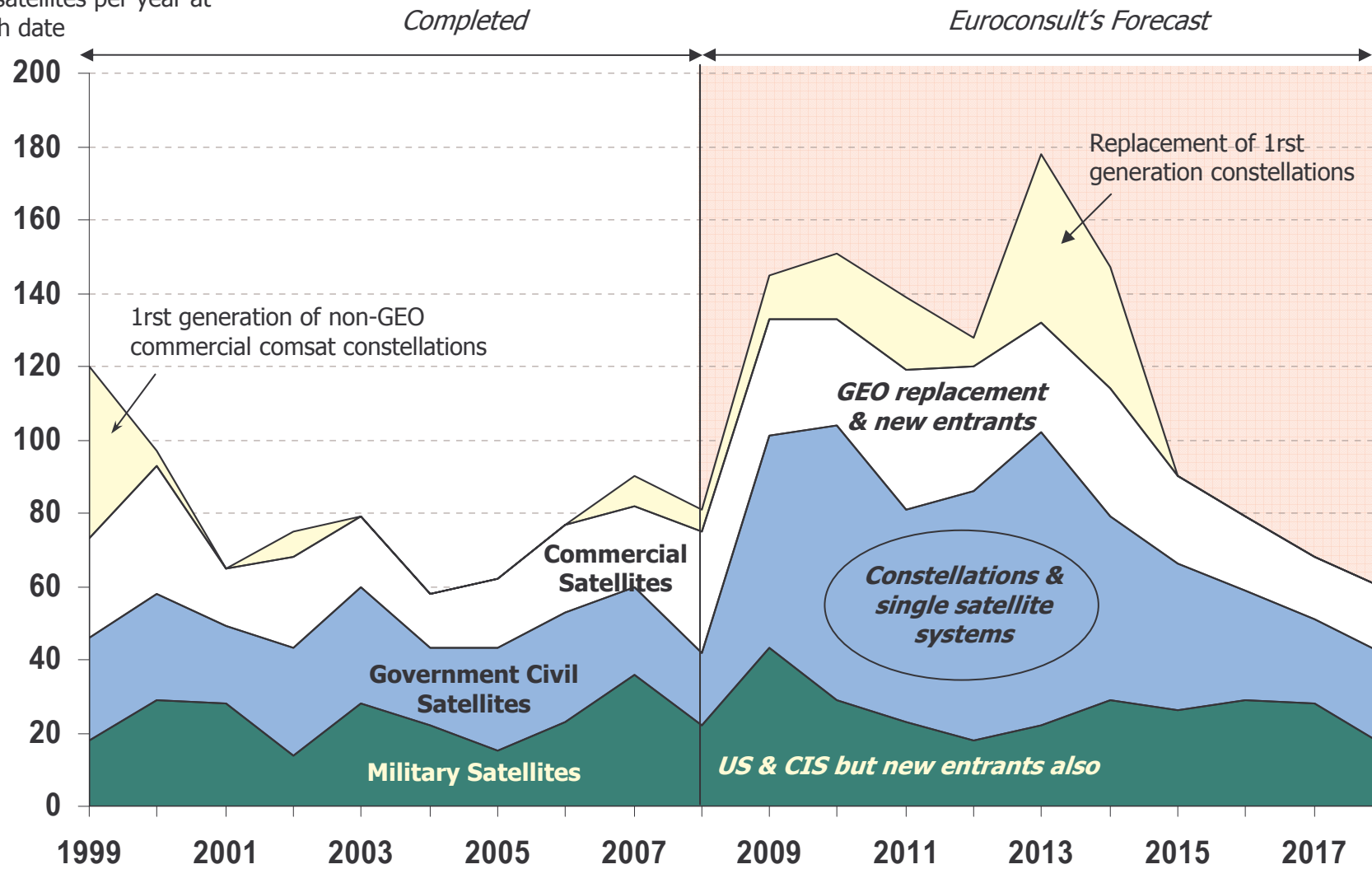
European government expenditures for space in 2008



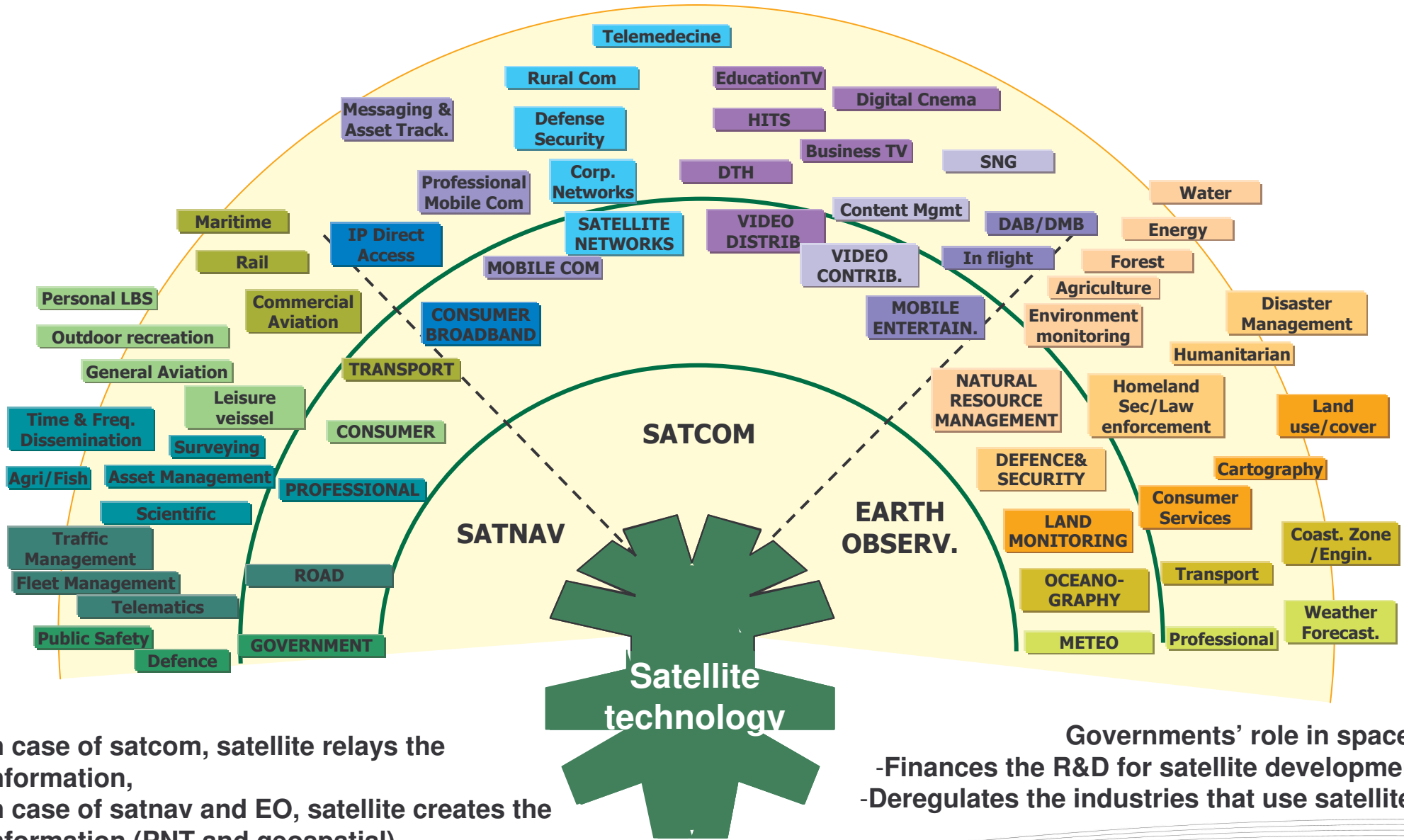
About two-thirds of the civilian and military expenditures of European governments (for satellite and launch vehicle development and production) go to the European space industry

Growth in satellite manufacturing & launch demand driven by the governments

of satellites per year at launch date



Satellite technology at the origin of numerous services for the citizens



In case of satcom, satellite relays the information,
 in case of satnav and EO, satellite creates the information (PNT and geospatial)

Governments' role in space :
 -Finances the R&D for satellite development
 -Deregulates the industries that use satellites

Governments' interest for space is enlarging and diversifying

Government expenditures for civilian space remain concentrated with 6 countries/region (USA, Europe, Russia, China, Japan and India) responsible for 90% of the world expenditures in 2009

But more countries show an interest for the applications provided by satellite systems

- ✓ Looking to benefit from satellite applications for socio-economic development: EO, satcom, satnav, metsat
- ✓ Signing industrial and/or institutional agreements for the acquisition of local engineering and technical capabilities:
 - Algeria: Alsat with SSTL and EADS Astrium for EO
 - Thailand: Theos with EADS Astrium for EO
 - Vietnam: Vinasat with Lockheed Martin for satcom
 - Chile: SSOT with EADS Astrium for EO
 - Nigeria: Nigcomsat with CGWIC for satcom, Nigeriasat with SSTL for EO
 - etc.

This interest generally materializes with the creation of a space agency or a dedicated organisation to manage national space effort

- ✓ Algeria, Chile, Malaysia, Nigeria, Vietnam, Turkey, South Africa...

New international leaders emerge

- ✓ China and India become autonomous for government programs in their countries with domestically-developed satellite manufacturing and launch capabilities made available to third parties



Satellite applications for direct socio-economic benefits

Satellite Communications

- ✓ Provides multiple benefits for the population: Remote communications, Telemedicine, Teleducation
- ✓ May take several forms
 - ✓ Access to foreign satcom capacity (from commercial satellite operators)
 - ✓ Acquisition of a domsat system from foreign suppliers (e.g. Vinasat, Nigcomsat)
 - ✓ Development of indigenous capabilities (Insat, DFH)
- ✓ Enables also countries to make return on investment by selling satellite capacity to 3rd parties

Earth Observation

- ✓ Entry point to develop a space program: dual objective of developing technical know-how and of acquiring an autonomous observation capability (collection and processing of imagery)
- ✓ 65 satellites anticipated in countries outside the "big 6" in the next 10 years (a fourfold increase over the past 10 years)
- ✓ Imagery collected by national satellite systems (India, China, Brazil, Taiwan, South Korea) provided to other countries commercially or in-kind

Space Science & Exploration

- ✓ Small scaled science missions often used as a driver for cooperation and access to technology
- ✓ Larger programs (Moon, Mars, Deep space...) requires high/long term funding, thus affordable only to a limited number of countries
- ✓ Countries show interest for science/exploration: India (Chandrayan), China (Shenzou)

About 30 companies/organizations in the world are in position to assemble, integrate and test (AIT) satellites

	GEO and non-GEO satellites	Non-GEO satellites
Satellite manufacturers competing domestically & internationally	Space Systems/Loral - SSL (USA) Boeing Satellite Systems – BSS (USA) Lockheed Martin – LM (USA) Orbital Sciences Corp. – OSC (USA) EADS Astrium Satellites (Europe) Thales Alenia Space - TAS (Europe) Mitsubishi Electric – Melco (Japan) China Academy of Space Tech. (China) ISS-Reshetnev (Russia)	SSTL (UK) Satrec Initiative (South Korea)
Satellite manufacturers competing domestically (mainly or exclusively)	Northrop Grumman (USA) OHB System (Europe) Energia (Russia) Krunichev (Russia) NTSpace (Japan) Israel Aircraft Industry - IAI (Israel) ISRO (India)	General Dynamics (USA) Ball Aerospace (USA) ATK (USA) Comtech Aero (USA) Sierra Nevada(USA) MDA (Canada) Magellan Aerospace (Canada) Comdev (Canada) Yuzhnoe (Ukraine) ASTB (Malaysia) INPE (Brazil) Invap (Argentina) SunSpace (South Africa)



From import needs to export capabilities: three different country cases for GEO comsat

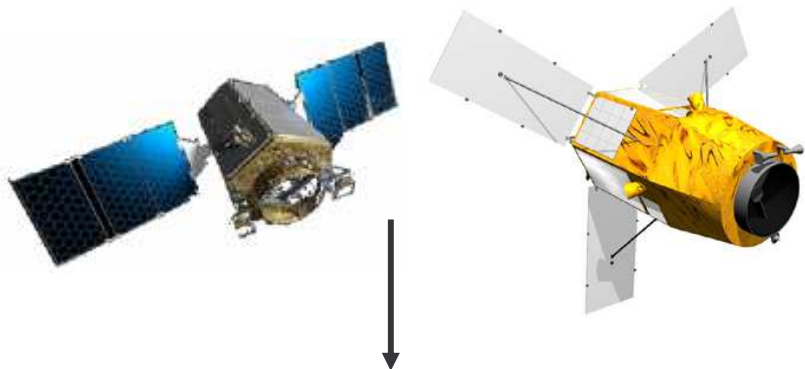
	China	Russia	India
Local company	CAST (DFH bus)	ISS-Reshetnev (Express bus) Krunichev (Yakta bus) Energia (Yamal bus)	ISRO (Insat bus)
Comsat IMPORT	Chinastar 1 (LM) Chinasat 7 (BSS) Sinosat 1 (DASA) Chinasat 6B (TAS) Chinasat 9 (TAS)	13 payloads from TAS for ISS Spacebus of TAS for Express 4K of ISS Eurostar of Astrium for Krunichev for Express AM4 2 Yamal 400 from TAS	Not anymore (the Insat 3 generation was 90% Indian)
Comsat EXPORT	Nigcomsat (Nigeria) Venesat (Venezuela) Paksat (Pakistan)	Kazsat (Kazakhstan) Angola ?	Insat bus & AIT for 2 Astrium satellites (Hylas 1, W2M)



From import to export: the case of Earth observation in South Korea

Kompsat

Satellite bus & launch Kompsat 1 (1999)= USA
Bus and launch Kompsat 2 (2006)= Europe
HR optical instrument Kompsat 3 = Europe
Radar instrument Kompsat 5 = Europe
Kompsat 3 launch = Japon (H2A)



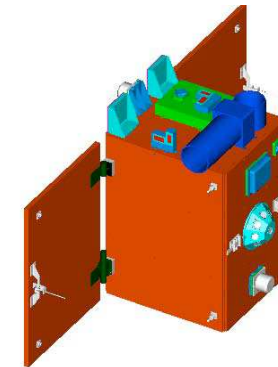
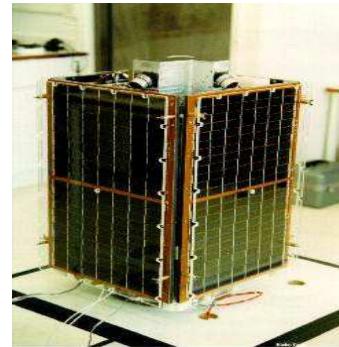
Spot Image distributes the imagery of Kompsat-2 (1m PAN resolution)



From Kitsat to STSat

Initial learning with SSTL (Kitsat 1=50 kg in 1992)
STSat 1 (Kitsat 4, 100 kg) developed by SaTRec and launched by the national KSLV in 2009 (failed)
SaTRECi, created in 1999, exports small satellites to countries with no engineering capabilities yet (Dubaisat, Razaksat for Malaysia, Singapore)

Kitsat 1

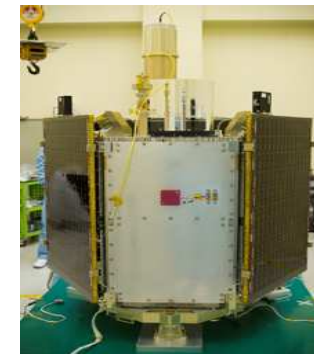


STSat 1 on KSLV in 2009

Razaksat launched by Falcon 1 in 2009



Dubaisat launched by Dnper in 2009



Access to space is a different story than satellite applications

- ✓ Huge level of investment that makes launcher development under the realm of only a few countries
- ✓ Key drivers for the indigenous development of a launch capability: independent access to space, strategic consideration
- ✓ 6 countries/region have domestic geostationary launch capability (USA, Europe, Russia, China, India and Japan). Only three additional have or develop a non-GTO capability (Israel, Brazil, South Korea)
- ✓ Access to foreign technology to start LV development: Japan from USA (from N1 to H1, now over), India and South Korea from Russia (1st stage of KSLV, cryogenic stage of GSLV), Brazil from Ukraine
- ✓ The multiplication of EO satellite projects in countries with no launch capability benefits to low cost launch service providers: e.g. PSLV from India; Russian converted missiles such as Dnepr; Falcon from SpaceX, a US private company

	Large ELVs	Small ELVs	Converted missiles	Air launched systems
Operational systems	Delta 2 Zenit 2 Soyuz	Taurus 1 PSLV Falcon 1	Minotaur 1 Cosmos Dnepr Start Rockot	Pegasus
Systems in development	Taurus 2	Falcon 1 ^e Vega KSLV VLS	Minotaur 4	Air Launch



Nurturing the development of space technology

A challenge....

- ✓ For newcomers countries: high tech and complex sector, long term programs and return of investment, need to identify requirements and priorities...
- ✓ Find the right balance of investment between national autonomy and operational requirements (extreme case is launch vehicle)
- ✓ Governments are at the same time financing the R&D effort for satellite systems and using the capabilities of satellite systems
- ✓ For established players: more difficult to follow the sector, multiplication of bilateral programs, need for coordination between initiatives

.... and an opportunity

- ✓ Opens new partnerships at industry and institutional levels: e.g. DMC
- ✓ Brings new capabilities and competencies internationally
- ✓ Develops national engineering and technical capabilities at two levels: production of the satellite systems and usage of the satellite systems in different areas of the future (ICT, scientific research, homeland security, ..)



About Euroconsult

Established in 1983, Euroconsult has become a world reference for analysis and consulting in space markets, industries and policies. The company provide service at each level of the value chain, from the space industry upstream that manufactures and launches the satellites to the providers of satellite services downstream. The company's objective is to provide support to strategic decision making in the space area to governments and private players. It is independently owned and operated.

Euroconsult has a records of 500 customers in 40 countries, of which 300 active each year

Three main lines of services of the company:

Research reports: A permanent team of experts continuously analyze key trends for both satellite applications and the satellite industry, notably through the publication of recurring Research reports such as *Government Space Programs*, and *Satellite to be Built & Launched in the next 10 years*

Consulting: Euroconsult has conducted over 450 consulting missions in the satellite sector over the last 20 years for clients located in more than 40 countries. Missions include independent assessment & due diligence for the public & private sectors; Assist private and public organizations in their decision-making process; Market analysis for satellite products and services

World Summit & customized training: the *World Satellite Business Week* has become the annual meeting place for senior executives from the international satellite industry and financial community to benchmark, do business and network with their partners, existing and prospective clients. The event gathers each year in Paris 450 senior executives from over 175 companies