SPACE EXPLORATION IN THE SPACE ECONOMY

SYMPOSIUM TO STRENGTHEN THE PARTNERSHIP WITH INDUSTRY
THE ROLE OF INDUSTRY IN SPACE EXPLORATION

United Nations, Vienna
Feb. 15 2016

By Steve Bochinger, COO
SPACE EXPENDITURES IN A TRANSITION PHASE

WORLD GOVERNMENT SPACE EXPENDITURES

US$ billion


CIVIL AND DEFENSE

US$ billion


Civil

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

- United States 12,460
- Canada 222
- NASA 11,985 (excluding aeronautic R&D)
- Europe 4,000 (ESA + domestic programs)
  - UK 271
  - West Germany 789
  - Belgium 117
  - Netherlands 102
- France 1,263
- Italy 747
- Sweden 66
- Soviet Union 5,232 **
- India 248
- Japan 1,124
- ISRO 211
- NASA 800

* 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

© Euroconsult 1991
WORLD GOVERNMENT EXPENDITURES FOR CIVIL SPACE PROGRAMS (2014) * TOTAL $42.4 BILLION

United States 19,187
United Kingdom 2,507
France 2,441
Germany 1,895
Italy 787
Europe 9,796
Russia 4,394
Canada 325

Budgets indicated for European countries include their contributions to ESA and Eumetsat; the total for Europe includes ESA, Eumetsat, the EU and the national budgets of the ESA Member States.

* Includes only budgets over $10 Million
<table>
<thead>
<tr>
<th>Year</th>
<th># Countries with Space Program</th>
<th>Top 3 As of World</th>
<th># GOV SATs Launched</th>
<th># of SAT in Operation from Emerging Progs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>15</td>
<td>USA/URSS/ESA 95%</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>2005</td>
<td>30</td>
<td>USA/ESA/JAPAN 80%</td>
<td>50</td>
<td>39</td>
</tr>
<tr>
<td>2015</td>
<td>60</td>
<td>USA/RUSSIA/CHINA 70%</td>
<td>86</td>
<td>87</td>
</tr>
<tr>
<td>2025</td>
<td>80</td>
<td>USA/RUSSIA/CHINA 70%</td>
<td>76</td>
<td>155</td>
</tr>
</tbody>
</table>
SPACE EXPLORATION & MANNED SPACEFLIGHT IN GOVERNMENT PROGRAMS

WORLD GOV SPENDING FOR SPACE

2006-2015

$65.9B AVERAGE/Y

Manned spaceflight 17%
Space science & exploration 8%
Other 75%

COUNTRIES INVESTING IN APPLICATIONS

<table>
<thead>
<tr>
<th>Application</th>
<th>2004</th>
<th>2013</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>EO</td>
<td>28</td>
<td>55</td>
<td>62</td>
</tr>
<tr>
<td>Satcom</td>
<td>20</td>
<td>48</td>
<td>61</td>
</tr>
<tr>
<td>Science &amp; exploration</td>
<td>18</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Launchers</td>
<td>11</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Security</td>
<td>4</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Satnav</td>
<td>6</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Manned Spaceflight</td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

$65.9B AVERAGE/Y
GROWING INTEREST FOR SPACE EXPLORATION

SPACE SCIENCE AND EXPLORATION SPENDING BY REGION

CONCENTRATION OF SPENDING

US$ billion

USA
Russia
ESA
China
Japan
Others

GROWING INTEREST FOR SPACE EXPLORATION
MANNED SPACEFLIGHT REMAINS AFFORDABLE FOR A FEW

Tough financial context in historical countries impacts funding and program affordability

Look for cooperation: international and commercial solutions
COMMERCIAL REVENUES RELY SO FAR ON SATELLITE MARKETS

The commercial satellite value chain

**IN SPACE**
- ~30 COMPANIES
  - $4.7B
  - 5Y CAGR: +8.7%
  - EBITDA: <10%
- ~10 COMPANIES
  - $2.2B
  - CAGR: +8.2%
  - EBITDA: <10%
- ~50 COMPANIES
  - $14.6B
  - 5Y CAGR: +4.1%
  - EBITDA: 50-80%

**ON EARTH**
- ~5,000 COMPANIES
  - $209B
  - 5Y CAGR: 13%
  - EBITDA 5-30%

**KEY FIGURES**
- SATNAV: 36%
- SATCOM: 62%
- EO: 2%
- 12% last 5 year CAGR
- $230 BILLION cumulated turnover
- 9% IN SPACE
- 91% ON EARTH

**KEY TRENDS**
- MATURITY TRANSITION
- CONVERGENCE INNOVATIONS
- NEW PLAYERS
- NEW MARKETS
- PARTNERSHIPS
- CONSOLIDATION
- PRICE PRESSURE
- CONSTELLATIONS

*Not eliminating double-counting of revenues within the industry's supply chain.*
A NEW ECOSYSTEM FOR PRIVATE ENTERPRISE

Made in Space
Shackleton Energy

In-space operation
Planetary Ressources
Deep Space Industries

Human spaceflight
Bigelow Aerospace
Paragon Space Dev.
Golden Spike
Inspiration Mars
Mars Foundation

Access to space
SpaceX
Blue Origin
Generation Orbit
Stratolaunch Systems
RocketLab
Firefly
Swiss Space Systems
Reaction Engines
Virgin Galactic
XCOR Aerospace
Scaled Composites

Suborbital: techno. test & tourism
Final Frontier Design
Masten Space System
ZeroGravity
Up Aerospace
Zero2Infinity
Copenhagen Suborbital

Urthecast
ISS utilization
NanoRacks

Science and others
B612 Foundation
Digital Solid State
Moon Express
Exolance
TimeCapsule2Mars

ISS utilization
SOME CONDITIONS FOR MARKET DEVELOPMENT

SUSTAINED FUNDING SUPPORT

INTERNATIONAL COORDINATION & COOPERATION

PROGRAM COHERENCE

PRIVATE SECTOR FINANCING

DOWNSTREAM ACTIVITIES

DIVERSIFICATION OF PLAYERS

RISK MITIGATION

CUT COST

OPEN TO NON SPACE SECTORS

WHERE IS THE ROI?
THANK YOU

www.euroconsult-ec.com

HEADQUARTER| FRANCE
86 Boulevard de Sebastopol
75003 Paris
Tel: +33 (1) 49 23 75 30

U.S.A.
2816 N Street NW
Washington, D.C. 20007
Tel: +1 (202) 223-1016

CANADA
465 Rue McGill, Suite 1103
Montreal (QC) H2Y 2H1
Tel: +1 (514)750-9698

JAPAN
1-5-212, Iwaicho, Hodogaya
Yokohama, 240-0023
Tel: +81 80 2052 1348

STEVE BOCHINGER
COO
+33 1 43 26 75 29
+33 6 47 80 60 86
Bochinger@euroconsult-ec.com
WHO WE ARE

• Leading global consulting firm specializing in supporting decision making in the space, communication and Earth observation sectors

• Privately-owned, fully independent firm
A GLOBAL PRESENCE AND SERVICE CAPABILITY

- Close to **600** customers in over **50** countries
- We participate in over **30** international events each year
- Missions conducted in all world regions on a yearly basis
- Multi-cultural team of over 30 full-time experts
- Offices in 4 countries: France (Hq), the U.S., Canada and Japan
- International network of senior affiliate consultants

COUNTRIES WITH CUSTOMERS FOR EUROCONSULT SERVICES (2010-2015)
END-TO-END CAPABILITY IN THE SPACE SECTOR

• Independence
  Independent assessment & decision-making assistance to institutional, industrial & financial organizations

• Experience
  We have completed 500+ consulting missions in the space sector

• Trusted business partner
  The majority of our clients are returning customers

• Large service offering
  As a one-stop-shop firm, we cover the full spectrum of our clients’ requirements