

Space, Security, & Economics

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Space Economy

- The narrow definition:
 - Governments, launch industry, commercial satellites; entrepreneurial activities (about \$100 billion per year)
- A bit more expansive:
 - Equipment: ground stations, receivers, satellite dishes, etc. (about \$80 billion per year)
- Larger yet:
 - Secondary products and services (value added weather and remote sensing, spin-off industries and technologies, etc.)
- Most encompassing:
 - Space goods and services as a “backbone” infrastructure that, if we didn’t have it, many essential capabilities would not function.

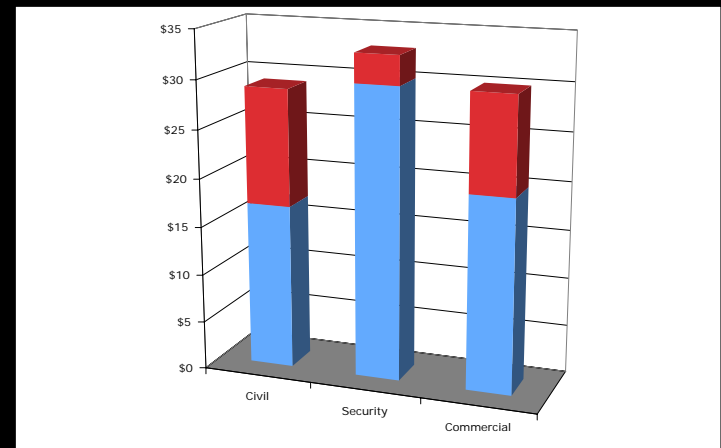
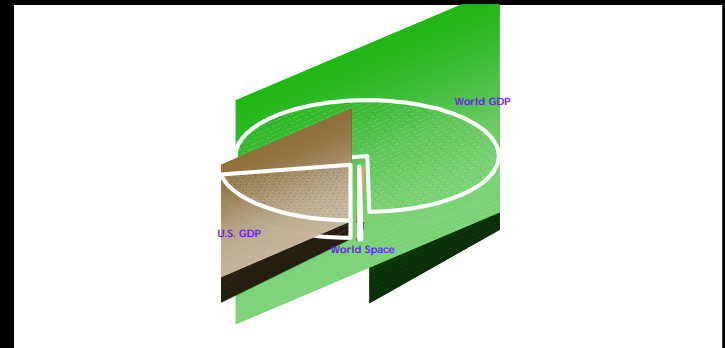
Space Economic Indicators

- Accurate statistics are not available
 - No agreement on definitions
 - Classified programs (security space)
 - Proprietary commercial data
 - Numerous technical problems ranging from international comparisons to NAICS categories
- Need for a uniform system of space accounts
- Need for good time series and “leading” indicators based on trends in critical areas

How Big is the Space Industry?

Where does space fit in the Economy?

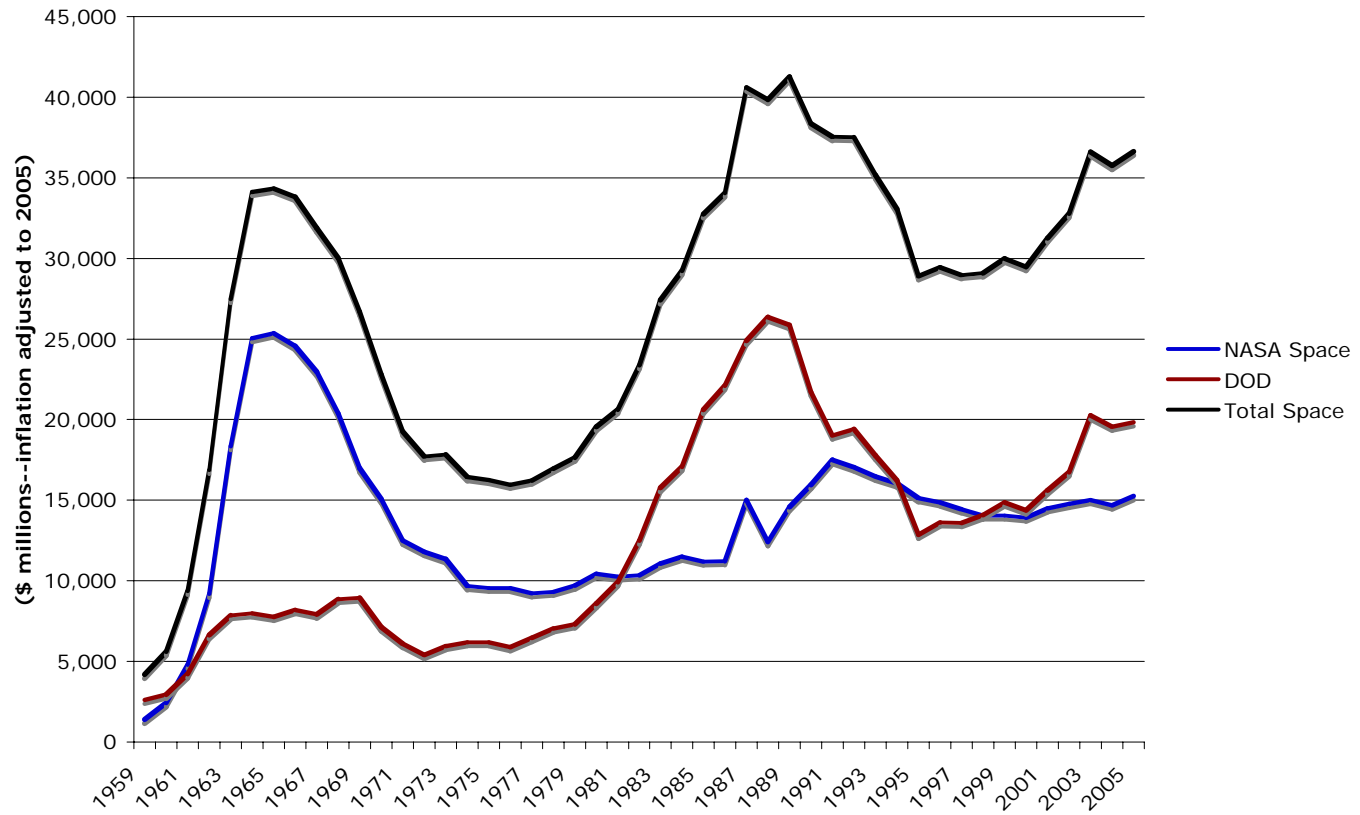
- It depends on what we include
 - The World Economy: over \$45 trillion
 - The U.S. Economy: over \$13 trillion
 - Space Economy
 - Civil Governments ≈ \$28 billion
 - Security ≈ \$33 billion
 - Commercial ≈ \$30 billion
 - The World Space Sector ≈ \$180 billion (but includes consumer receivers)
- Exxon-Mobil, in comparison, had sales of nearly \$400 billion in 2006



U.S. Space Government Budget

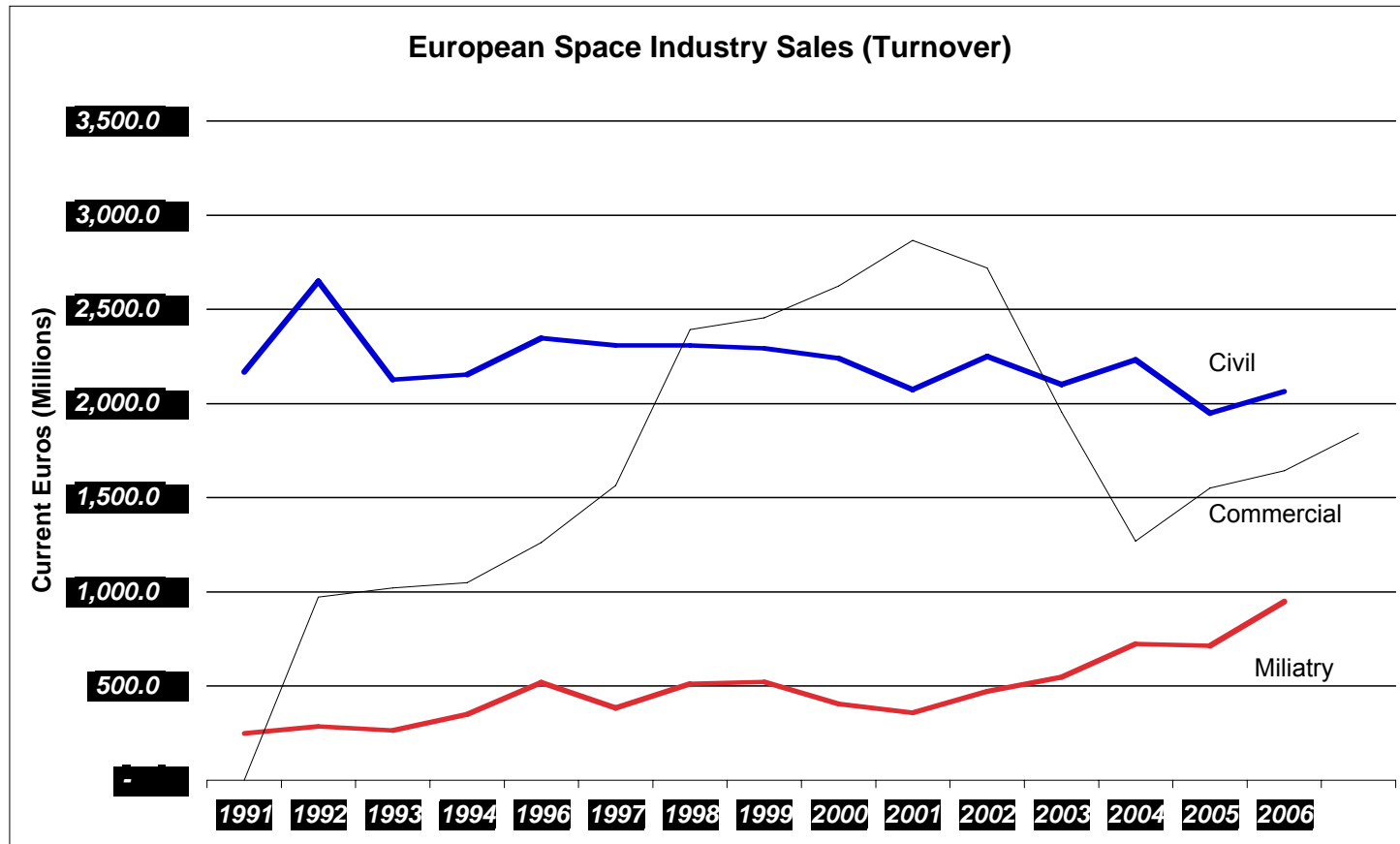
(Source: President's Report on Aeronautics and Space, 2005)

U.S. Space Expenditures

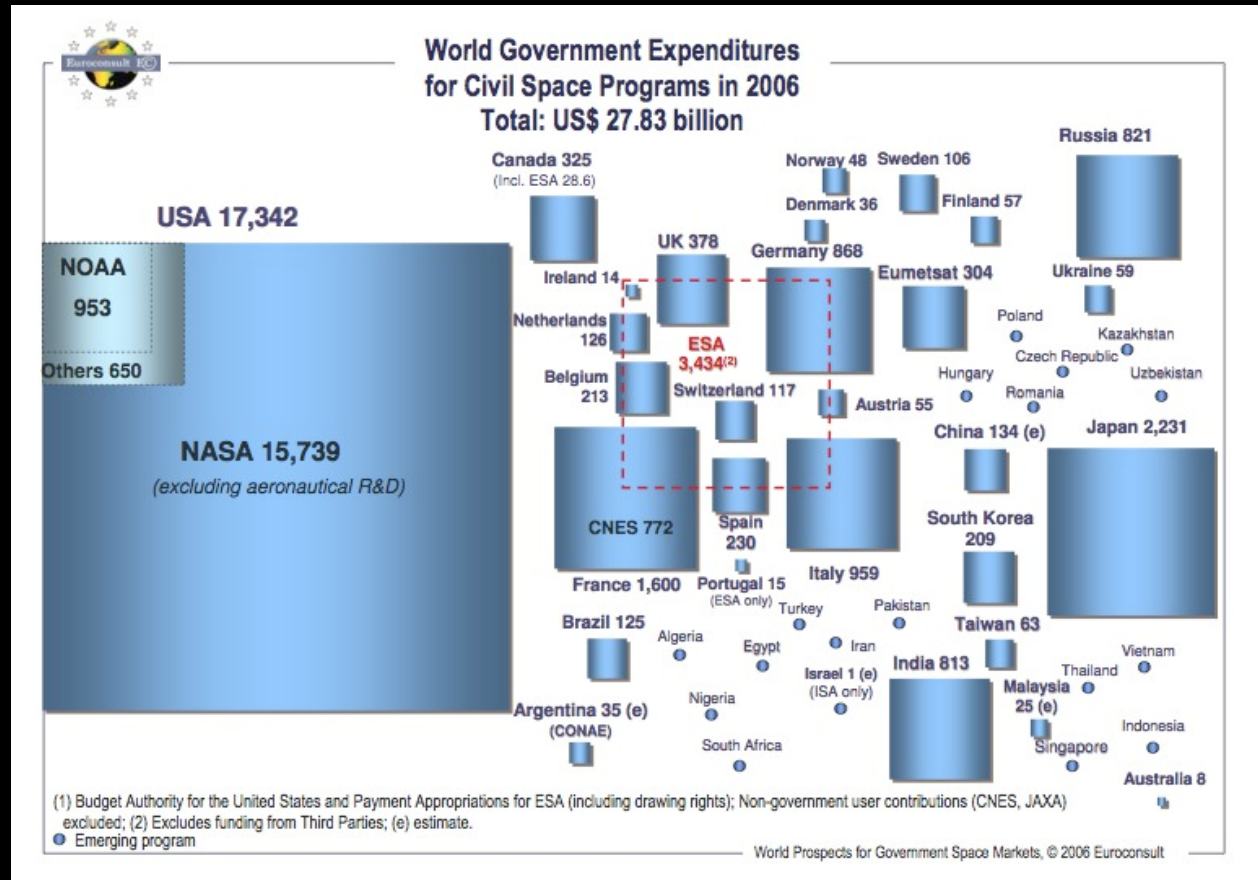


European Space Expenditures

(Source: Eurospace)



World Space Expenditures



Note that China is grossly underestimated

So, if the space sector is
so small, why does space
get so much attention?

Space then and Space now

- 1980: ESA Conf. in Strasbourg on Economics
 - Spin-offs and voice telecommunications
- Today, the difference is enormous
 - Space as R&D and basic telecom environment
 - Space as a key backbone in the economic infrastructure of the U.S. and World
 - Examples of what DID NOT exist in 1980:



Cell Links

Cell Phones

Space Maps

ATM's (v-sats)

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.



COMMERCIAL
SPACE
SERVICES
NOT PRESENT
IN 1980



DBS



Public Perception of Space

- Astronauts
- Shuttle and launch vehicles that have mediocre performance success
- Consumer products
 - Knowledge that they are at least partially space-based
 - When services are delivered, public really doesn't care how they are delivered--a phone call is a phone call
 - Public is relatively ignorant of the cost and contributions of space R&D and investments
- Cold War technology and mentality
- Same thinking often permeates government policy toward space and commercial space

Space is for Rocket Scientists

- Too abstract, complex, and removed from perception of everyday life
- Message is difficult to communicate
- In fact, NASA may be its own worst enemy
 - Because of focus on human space flight
- What happens if we turn off all satellite services for 24 hours?
 - A true measure of their importance

Space Assets are Fragile

- All space assets are very vulnerable and there is
 - No quick backup or alternative
- Not only could we lose this backbone, but
- Would we be back in the 1950s or even worse off?
- War and aggression are not the only ways they are vulnerable--natural disruptions in space happen all the time
 - Space weather (geomagnetic storms from the sun)
 - Asteroids, comets, and other natural “debris”
- Operational orbital debris is also a serious problem

Economics and Space Security

Economic Dominance of Space

- A major theme of U.S. policy (leadership, superiority)
- Economic and commercial power:
 - Monopoly
 - Dominant competitive position
 - Large market share; ability to set worldwide standards
- But, it must be assumed that a stable space environment can be enforced.
 - International organizations, regulations, agreements
 - A very powerful nation(s) enforcing rules

The Changing International Space Environment: 1960 to 2007

- Globalization of networks (industrial, financial, information)
- Technological capabilities have spread to many nations
- “Privatization” -- Governments as one of many purchasers
- Worldwide consolidation of space firms
- Growing regulatory environment--national interests
 - For security, and non-proliferation purposes
 - For safety, environmental, and economic protection

Globalization

- Different types of globalization
 - Geopolitical
 - Multinational corporations, financial markets
 - Information and networks



- Globalization is not inevitable
 - Has progressed unevenly and with setbacks

Globalization and Space: The Supply Side of the Equation

- Dual-use space capabilities have:
 - Created worldwide instant communications
 - Enabled images of large areas as well as high-resolution images for location-specific purposes
- All of which lead to a reinforcing pattern of greater globalization
 - Better and faster communications, and
 - Expanded potential markets
- Space activities require very high up-front investments, the larger the market potential, the better the profit opportunity

Globalization and Space: The Demand Side of the Equation

- Raises consumer expectations of the availability of new goods and services
 - Enables demand for space products to increase
- Which, with open borders and markets, encourages commercial space investments, and
- Feeds back on the supply side to scale economies and possibly decreasing prices

Trends in Government Policy

(Eisenhower to Present: 1957 to 2007)

- Early policies reflect Cold War era: security, U.S. leadership in technology race
- No commercial policy; mainly references to economic growth and spin-offs
- Serious encouragement of commercial space began in Carter Administration--greatly enhanced in Reagan Administration Space Policies
- By Clinton Administration, commercial space policy was many pages long
- Basic approach to U.S. leadership and dominance in space has not changed over time

Other Government Space Regulatory and Policy Actions

- Deregulation as a government philosophy--stimulate commercial competitiveness
- GPS in mid-90s; led to policy to guarantee free signal and turn selective availability off
- Export controls--major tightening in 1999
- DOD effort to stimulate industry consolidation
- Growth of government deficit and change in priorities
- Efforts to commercialize and privatize space assets

International Space

- Growth of foreign capabilities and commercial space endeavors
 - Europe: Ariane, Spotimage, Galileo
 - Russia: Commercial launch vehicles; Glonass
 - China: Human Space, launch vehicles
 - Others: Japan, India
 - Emergence of developing world in space
- Consolidation to compete with U.S.
 - Corporate
 - Regional agreements

U.S. Policies That Backfired

(from the perspective of economic dominance)

- Examples of unintended foreign commercial incentives resulting from U.S. policies
 - Symphonie (U.S. refusal to launch operational telecommunications satellite)
 - One factor which stimulated a commercial Ariane
 - Shuttle decision (no R&D for ELVs)
 - Again, stimulated Ariane to be optimized for geosynchronous telecommunications orbits
 - Export controls
 - Stimulated “ITAR-free” product lines abroad, particularly for the manufacturing of communications satellites

International Space

- Foreign capabilities today have become essential for some U.S. missions
 - Soyuz as launching system for ISS
 - Joint dependence on weather satellites
 - Purchase of remote sensing imagery
 - Available bandwidth for telecommunications
 - Ground receiving equipment for GPS

Polycymaking in the U.S. is Complex

- Space policy, in order to be effective, must be coordinated with other policies; a very difficult process, particularly in the commercial arena

Priorities

- Security policy trumps commercial space policy
 - Security policy trumps government economic policy
 - Government economic policy trumps commercial space policy
- therefore,
- Commercial space policy **will not be the driver** of spacepower in the U.S.
- and,
- Commercial space policy can easily be **undermined** by these other policies
- and,
- Most other nations are very explicit that economic policy is a **major** part of space policy

Summary

- Economic/business factors
 - Profit motive--investment only with sufficient ROI
 - ROI can include government revenues
 - If global market opportunity is denied, fewer purely commercial investments
 - If increased risk of loss of assets from *either* domestic or foreign security initiatives, fewer commercial investments will occur.
- Important questions:
 - Do national objectives require space business investment?
 - Are foreign commercial space assets essential to domestic security?
- Clear answer is yes!

Summary

- Economic dominance of U.S. in space, once lost is unlikely to be easily or quickly recovered
- Limited options for the future
 - **Treat commercial space as “just another commodity”**
 - Ignores the dual-use nature of most space applications
 - **Dominance and control through military actions**
 - Will encourage counter measures by others with uncertain outcomes and increase commercial risk factors
 - **Stimulate renewed economic competitiveness in U.S.**
 - May not be consistent with export restrictions and other U.S. policies related to free trade and competitiveness

Is There A Solution?

Space Leadership Through Commercial Strength

- Find ways to keep U.S. technological leadership in space
 - Encourage R&D in areas likely to advance commercial space
 - An “offence” rather than a “defense” for future commercial products
 - Produce the best products to encourage worldwide purchase of U.S. goods and services
 - Leadership and spacepower through market dominance
 - Eliminate regulatory disincentives without jeopardizing security or public safety