

How Big is the Space Economy?

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Advisory Committee on Commercial Remote Sensing (ACCRES)
Meeting

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Motivation

- Estimates of size of space economy in recent years have been \$360-\$384 billion
 - Several investment banks have projected a multi-trillion dollar space economy by the 2040s
 - Current numbers, their growth rates, and emerging markets are driving government policies and private sector investment
- Science and Technology Policy Institute (STPI) examined underlying methodologies and assumptions



CHALLENGES WITH CURRENT METHODOLOGIES



Challenges with Current Approaches

- Value of goods and services sold sometimes added to goods and services purchased (i.e., double-counted)
 - Overstates size of the space economy by \$8-\$20 billion
- Include services generated on the ground
 - Example: Royalties, marketing expenses included in value of direct broadcast TV
 - Overstates size of the space economy by roughly \$80 billion
- Include costs and revenues that could be considered unrelated to space
 - Ascribed value of navigation equipment includes full cost of system; not just receivers of signals from space
 - Example: Value of trucking fleet management systems include entire service package
 - Include derivative products or services produced terrestrially
 - Example: cell phone data used for location services
 - Adds roughly \$70 billion

2013 Estimates (billions of dollars)

Category	SIA	Space Foundation	STPI
Government space budgets	---	\$74.1	\$76.3
Satellite services	\$118.6	\$122.6	\$37.4
Space support industry	\$55.5	\$109.6	\$42.0
Other	\$124.5	---	---
Subtotal	\$298.9	\$306.3	\$155.7
Space supplier industry	\$21.1	\$7.9	---
Total	\$320	\$314.2	

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Subtotal	\$298.9	\$306.3	\$155.7
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Total	\$320	\$314.2	\$155.7
Difference with STPI	\$164	\$158.5	



CHALLENGES WITH CURRENT PROJECTIONS



Projections of the Size of the Space Economy by the 2040s

UBS	\$926 billion
Goldman Sachs	\$1 trillion
US Chamber of Commerce	\$1.5 trillion
Morgan Stanley	\$600 billion - \$1.75 trillion
Bank of America (Merrill Lynch)	\$2.7 trillion

*Growth of ~5-11% compounded for 20 years,
starting with today's estimates*

“the next development phase [of space] will be decidedly different, potentially shifting into new product development, additive manufacturing in low-Earth orbit, and new activities like space mining.”

US Chamber of Commerce 2018

Projections Include Current and New Lines of Business

- Space-based connectivity for humans and machines and component hardware
- Downstream services (“second order impacts”) based on global Internet connectivity
 - Data analytics using space-based info
 - Social media, e-commerce
- Space tourism
- Point-to-point hypersonic travel
- Space mining
- Space manufacturing

Growth Inconsistent with Many Current Trends

- Growth of satellite industry has slowed to 3% in recent years
 - Revenues from satellite TV fell almost 3% in 2018
- Satellite broadband currently produces \$2.5 billion in revenue
 - Will satellite broadband revenues increase to more than \$300 billion by 2040?
- Earth observation revenues decreased from 2017 to 2018
- Government budgetary expenditures on space almost half of final demand for goods and services from space
 - Globally government expenditures growing slowly



Inclusion of Unproven Markets

- Mining asteroids for use on Earth uneconomic
- Propellant produced in space will remain more expensive than Earth-based propellant for several decades
- Space tourism remains expensive; demand unproven
- Cost of rockets replacing jets high
 - Supersonic passenger aircraft did not pan out

Long-term forecasts of new technologies prone to large errors – AT&T projection for number of cell phones in 2000 was lower by over two orders of magnitude

Core Challenges with Projections

- Compare apples to oranges
 - Dennis Tito orbital flight to the International Space Station (400 km) for \$20 million not the same as a sub-orbital hop to 80 km for \$250,000
 - Energy expenditure to ISS 50 times greater than sub-orbital flight
- Sometimes misunderstand technologies
 - Space Shuttle (Ferrari); Falcon 9 (Ford Focus); and Rocket Labs (Lyft Scooter) not interchangeable
 - Costs have not come down proportionately for *same* capability
- Do not differentiate between final and derived demand
 - Growth of revenues from the sale of intermediate products limited by final demand, which is: (1) Government civil and military space programs (2) Household and business demand for satellite services



How Should the Scope of the Space Economy be Defined?

- Only include the value of goods and services from space or used to support activities in space? *Difference between size of the space economy and impact of the space economy*
- Projections include a range of scenarios, and are peer reviewed?

Is there value to a community discussion on methods and estimates of the size of the space economy? Given policy and regulations depend partially on size, what is the role of the Federal government and advisory bodies like ACCRES?



BACKUP SLIDES

CAPABILITIES & SERVICES

SpaceX offers competitive pricing for its Falcon 9 and Falcon Heavy launch services. Modest discounts are available, for contractually committed, multi-launch purchases. SpaceX can also offer crew transportation services to commercial customers seeking to transport astronauts to alternate LEO destinations.

PRICE	FALCON 9	FALCON HEAVY
STANDARD PAYMENT PLAN (2018 LAUNCH)	\$62M Up to 5.5 mT to GTO	\$90M Up to 8.0 mT to GTO
DESTINATION	PERFORMANCE*	PERFORMANCE*
LOW EARTH ORBIT (LEO)	22,800 kg 50,265 lbs	63,800 kg 140,660 lbs
GEOSYNCHRONOUS TRANSFER ORBIT (GTO)	8,300 kg 18,300 lbs	26,700 kg 58,860 lbs
PAYLOAD TO MARS	4,020 kg 8,860 lbs	16,800 kg 37,040 lbs

*Performance represents max capability on fully expendable vehicle.

Inclination: LEO = 28.5°, GTO = 27°

Tickets to Mars Will Eventually Cost Less Than \$500,000, Elon Musk Says

By Mike Wall February 13, 2019 Spaceflight



<https://www.space.com/elon-musk-spacex-mars-mission-price.html>

<https://www.spacex.com/about/capabilities>