SIA
SATELLITE INDUSTRY ASSOCIATION

2015

State of the Satellite Industry Report

Prepared by:

THE TAURI GROUP

September 2015

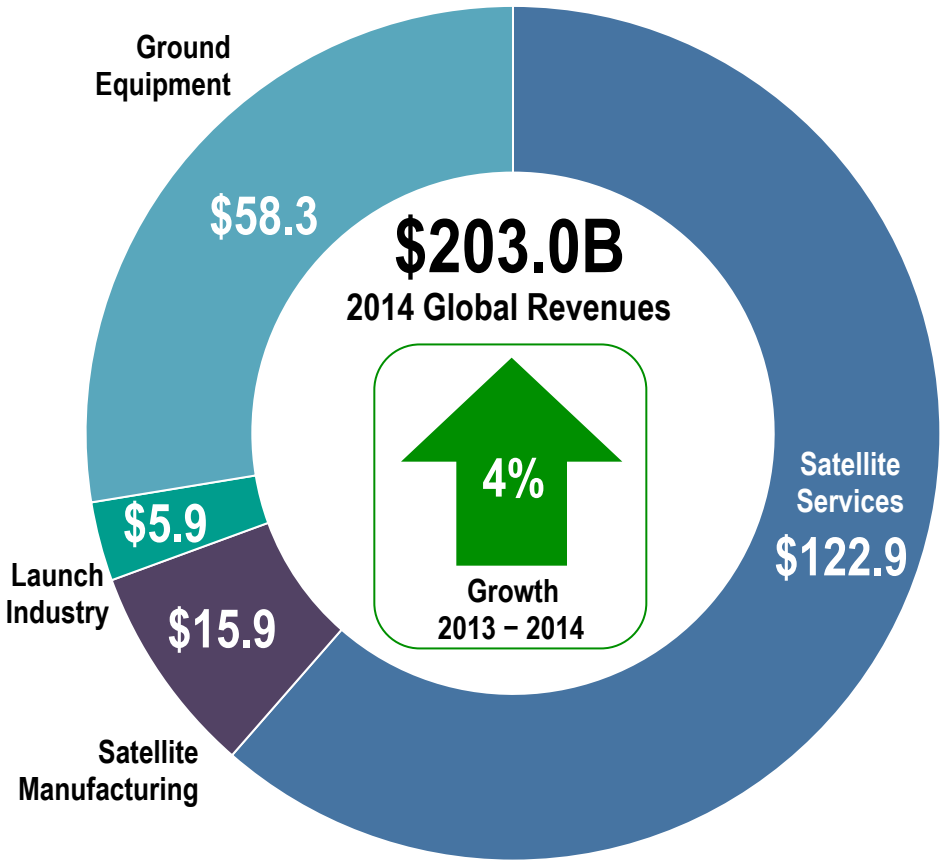
Satellite Industry Association:
20 Years as the Voice of the U.S. Satellite Industry

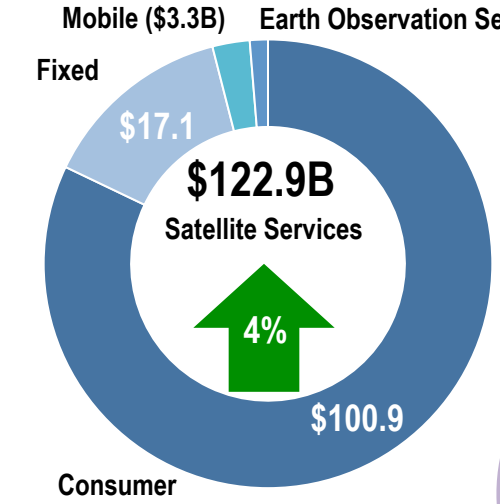
SIA Member Companies

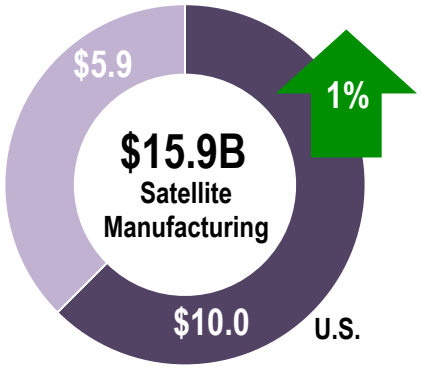
Study Overview

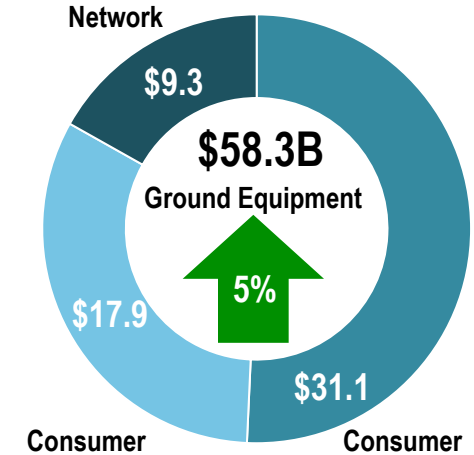
- SIA's 18th annual study of satellite industry data
- Performed by The Tauri Group
- Reports on 2014 activity derived from unique data sets, including proprietary surveys, in-depth public information, and independent analysis
- All data are global, unless otherwise noted
- Prior year revenues are not adjusted for inflation

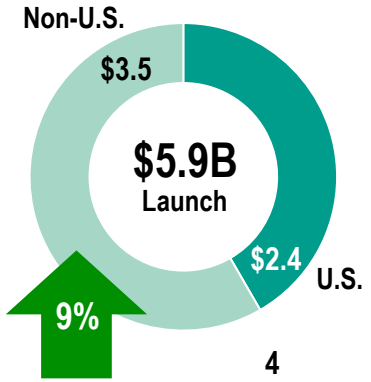
2014 Satellite Industry Indicators Summary











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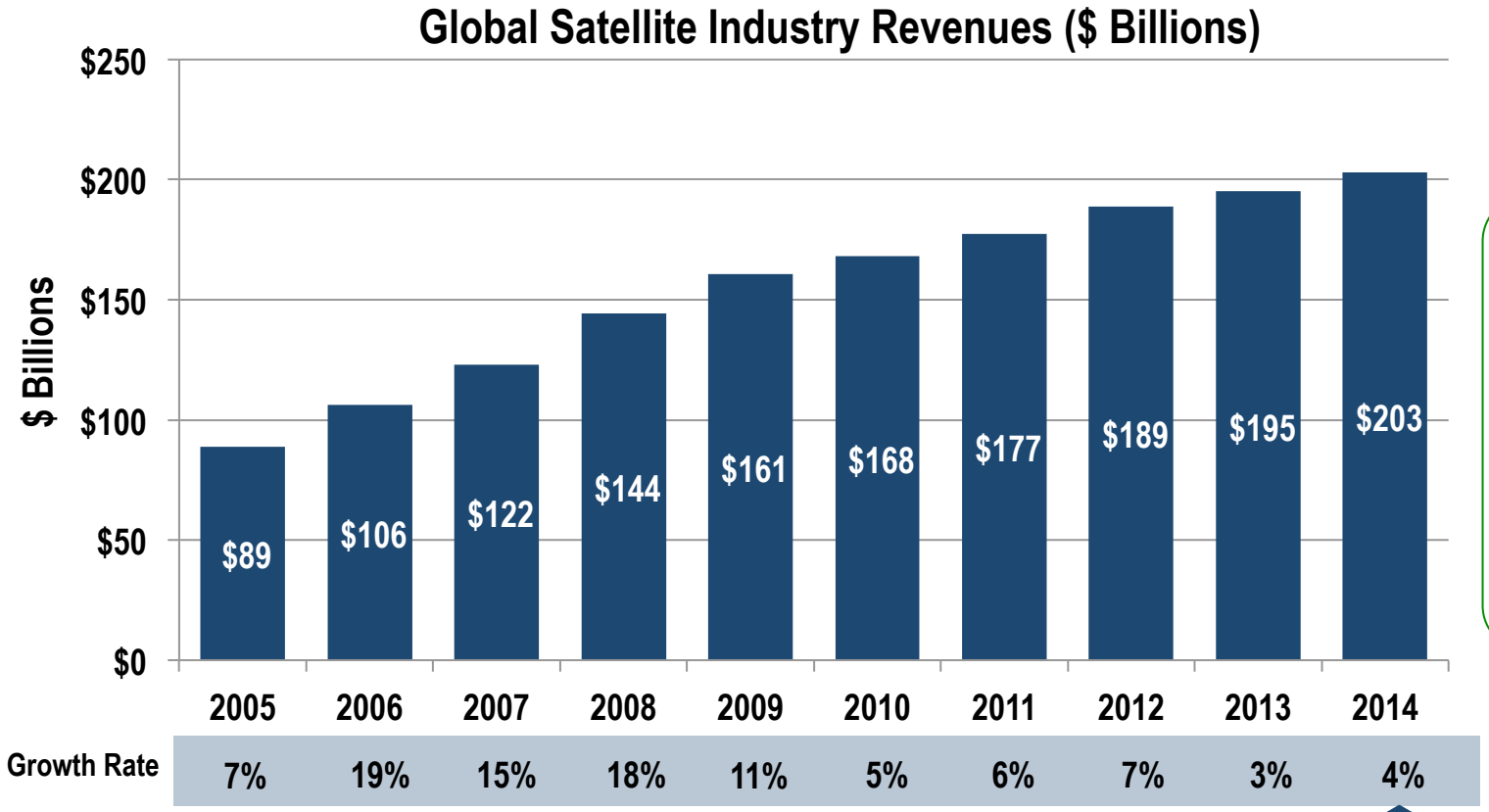
Global Satellite Industry Revenues



2.3X

Ten-Year Global Industry Growth

Global satellite industry grew 4% in 2014, slightly above worldwide economic growth (2.6%) and U.S. growth (2.4%)

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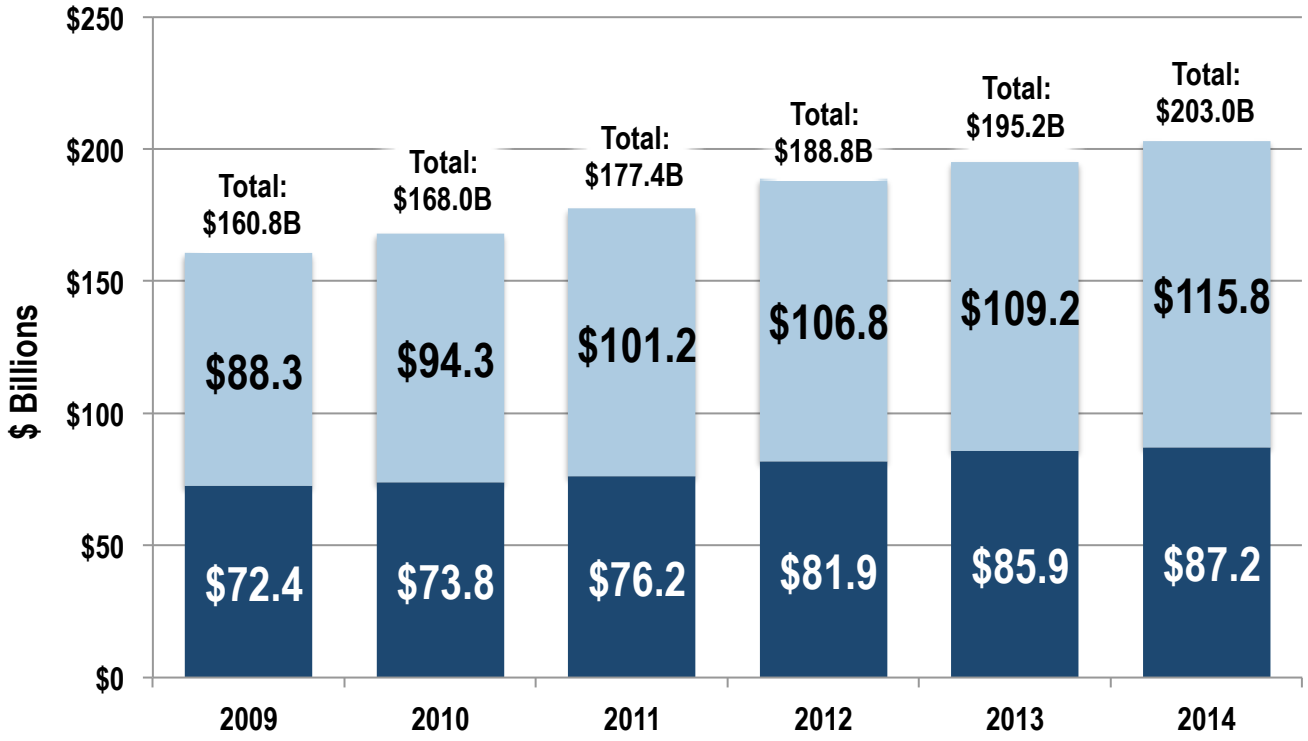
U.S. Portion of Global Satellite Industry Revenues

Average yearly U.S. market share

43%

of global industry



	2009	2010	2011	2012	2013	2014
Growth Rate	11%	4%	6%	6%	3%	4%
U.S. Growth	12%	2%	3%	7%	5%	2%
Non-U.S. Growth	11%	7%	7%	6%	2%	6%

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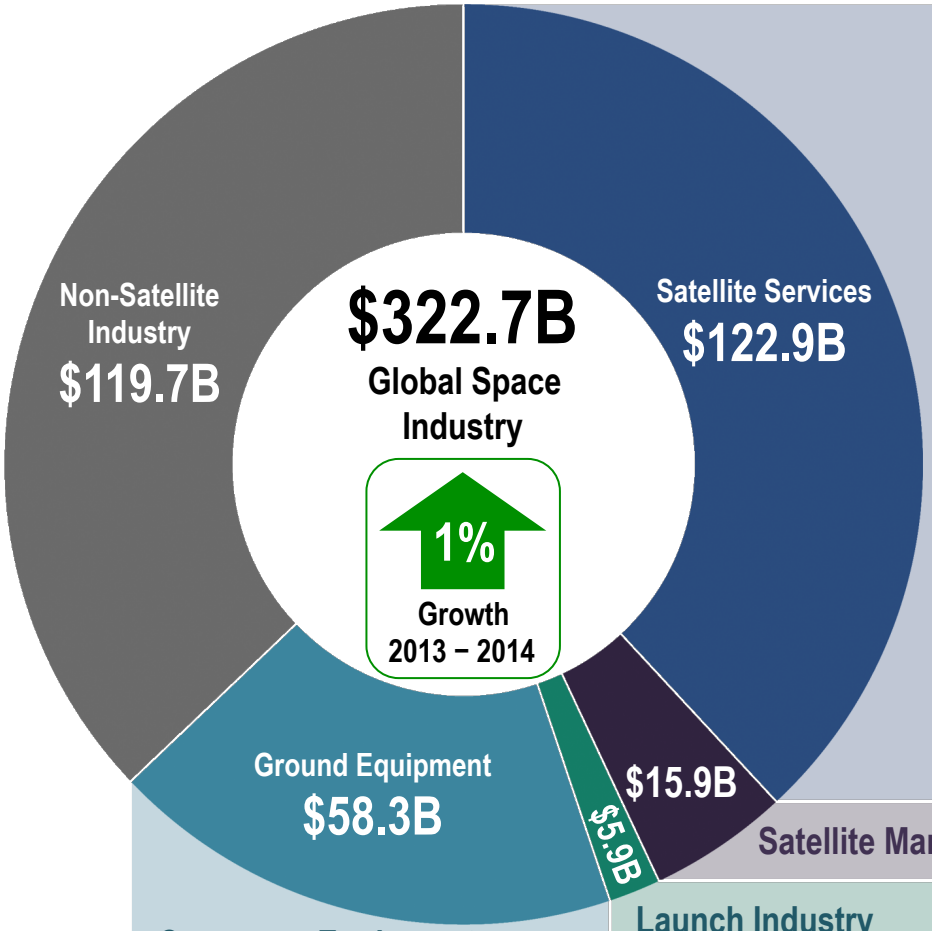
The Satellite Industry in Context



Telecommunications
- Television
- Telephone
- Broadband
- Aviation
- Maritime
- Road and Rail

Earth Observation
- Agriculture
- Change Detection
- Disaster Mitigation
- Meteorology
- Resources

Science
- Earth Science
- Space Science

National Security

Core of the Space Industrial Base

Consumer Equipment
- Sat TV, radio, and broadband equipment
- GNSS stand-alone units & in-vehicle systems

Network Equipment
- Gateways
- NOCs
- VSATs
- SNG equipment

$203B
Satellite Industry (63% of Space Industry)

4%
Growth 2013 – 2014

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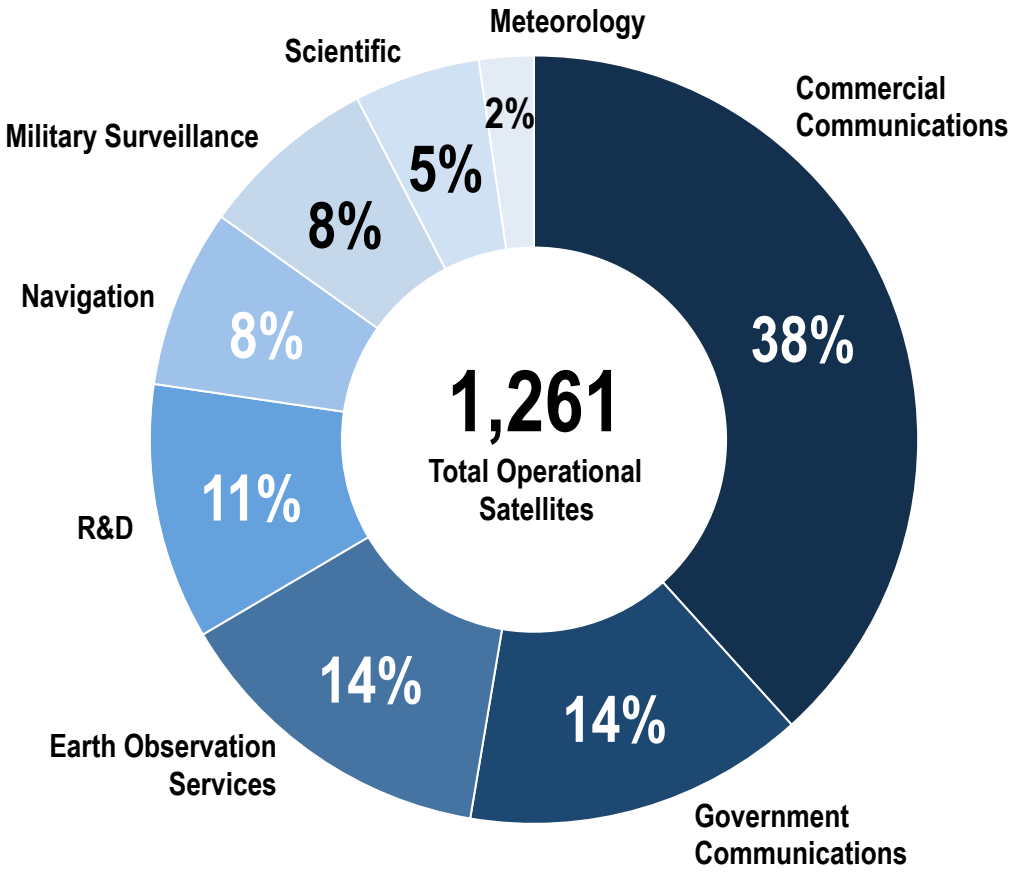
Notes: Network operations centers (NOCs), satellite news gathering (SNG), very small aperture terminal (VSAT) equipment, global navigation satellite systems (GNSS)

The Satellite Network in Context

Operational Satellites by Function
(as of December 31, 2014)



- 1,261 operating satellites as of year-end 2014
  - » >50% are communications satellites
  - » 38% are commercial communications satellites
- 57 countries operate at least one satellite (some as part of regional consortia)

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Source: The Tauri Group. Note: "Earth Observation Services" is new label for what was formerly referred to as "Remote Sensing" (this is a definitional change only)

Top-Level Global Satellite Industry Findings

- Satellite industry revenue was $203 billion in 2014
- Overall industry growth of 4% worldwide
- All four satellite industry segments posted growth

4%

Satellite services, the largest segment, revenues grew by 4%

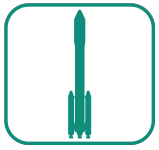
Consumer services continues to be a key driver for the overall satellite industry

1%

Satellite manufacturing revenues grew by 1%

Slower growth than in 2013, due to a smaller number of expensive commercial GEO and government satellites launched in 2014, partially offset by an increase in the total number of satellites launched

9%



Launch industry revenues grew by 9%

Higher number of European and U.S. launches of commercial satellites than prior year

5%

Ground equipment revenues grew by 5%

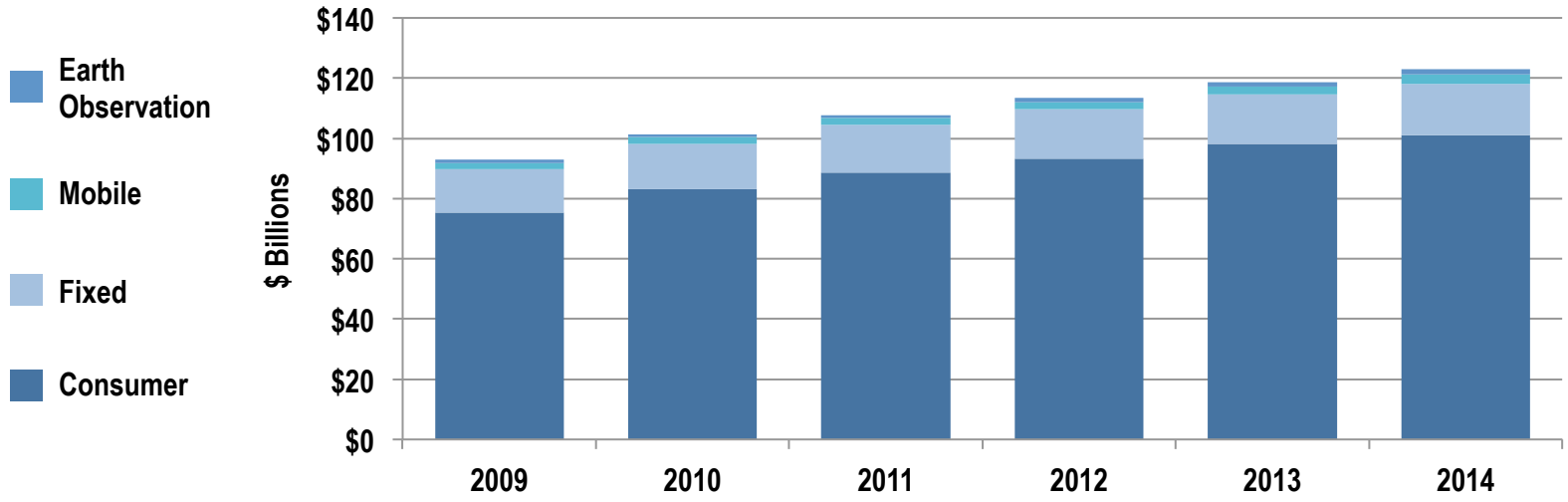
Growth in consumer and network equipment, and consumer GNSS remaining flat

Satellite Industry Segments

Satellite Services

- Consumer Services
  - » Satellite Television
  - » Satellite Radio
  - » Satellite Broadband
- Fixed Satellite Services
  - » Transponder Agreements
  - » Managed Network Services (including spaceflight management services)
- Mobile Satellite Services
  - » Mobile Data
  - » Mobile Voice
- Earth Observation Services

Global Satellite Services Revenue



4%

2013 – 2014 Global Growth

	2009	2010	2011	2012	2013	2014
Growth Rate	10%	9%	6%	5%	5%	4%
Total	**$92.8**	**$101.3**	**$107.8**	**$113.5**	**$118.6**	**$122.9**
Consumer	$75.3	$83.1	$88.6	$93.3	$98.1	$100.9
Satellite TV (DBS/DTH)	$71.8	$79.1	$84.4	$88.4	$92.6	$95.0
Satellite Radio (DARS)	$2.5	$2.8	$3.0	$3.4	$3.8	$4.2
Satellite Broadband (3)	$1.0	$1.2	$1.2	$1.5	$1.7	$1.8
Fixed	$14.4	$15.0	$15.7	$16.4	$16.4	$17.1
Transponder Agreements (1)	$11.0	$11.1	$11.4	$11.8	$11.8	$12.3
Managed Services (2)	$3.4	$3.9	$4.3	$4.6	$4.6	$4.8
Mobile	$2.2	$2.3	$2.4	$2.4	$2.6	$3.3
Voice	$0.7	$0.7	$0.7	$0.7	$0.8	$0.9
Data	$1.5	$1.6	$1.7	$1.8	$1.8	$2.3
Earth Observation	$1.0	$1.0	$1.1	$1.3	$1.5	$1.6

The U.S. share of satellite services revenue in 2014 was

41%

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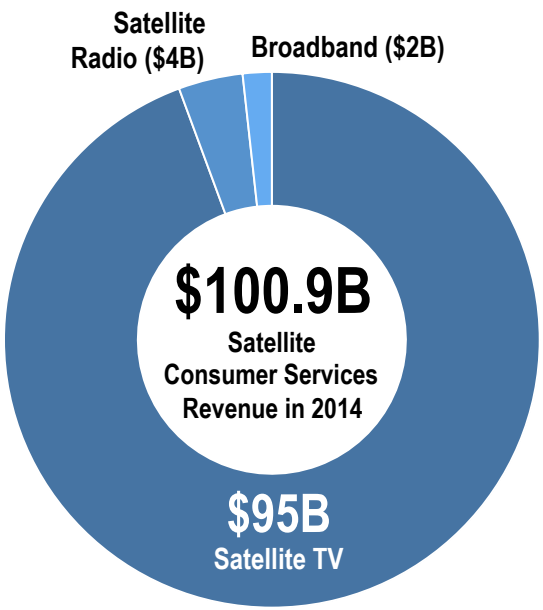
Notes: Numbers may not sum exactly due to rounding. (1) Includes capacity for DTH satellite TV platforms. (2) Includes VSAT networks. (3) Improved 2014 data results in understatement of broadband growth rate from 2013.

Satellite Services Findings: Consumer Services Highlights

The consumer services segment, consisting of satellite television, radio, and broadband, grew by 3% and was the largest contributor to overall satellite services revenues

Satellite TV Services

- Satellite TV services (DBS/DTH) account for 77% of all satellite services revenues, and 94% of consumer revenues
- About 230 million satellite TV subscribers worldwide, driven by growth in emerging markets
- 42% of global revenues attributed to U.S.
- More HD channels added, driving premium service revenues up
  - » First commercial 4K Ultra HD (UHD) channel launched in U.S. in late 2014
- More UHD channels to be launched in 2015, live broadcasts seen as main driver
- Compression technologies continue to improve; near-term possibility of 2.5 times bandwidth savings



Satellite Radio

- Satellite radio (DARS) revenues grew by 10% in 2014
- Satellite radio subscribers grew 7% in 2014 to 27.3 million
- Primarily U.S. customer base

Satellite Broadband

- Over 1.6 million subscribers, mostly in the U.S.
- Revenue grew slightly faster than subscribership

Satellite Services Findings

- Fixed satellite services grew by 4%
  - » Revenues for transponder agreements grew 4% compared to no growth in 2013
  - » Revenues for managed services grew 4% compared to no growth in 2013
- Mobile satellite services grew 25%
  - » Mobile satellite voice revenues grew 19%, compared to 11% in 2013
  - » Mobile satellite data revenues grew 27%, compared to 5% in 2013
    - ○ Data services for aviation major contributor to mobile satellite data growth
- Earth observation services revenues grew 9%
  - » Continued growth by established satellite remote sensing companies, with government sales driving demand
  - » New entrants continued to raise capital, develop satellites, and deploy initial constellations

Case Study: Consumer Broadband Over Satellite

- **Keys to success for today's satellite broadband**:
- **Comparable to terrestrial**
  - » Comparable to cable and fiber in terms of speed and price
  - » Available nationwide, not just in select areas
- **Maturation** and combining of advanced technologies (frequency reuse, spot beams, and on-board processing) defined new, high throughput satellites (HTS)
- **Substantial reduction in cost** per unit of throughput
- **Growing demand** and customer confidence due to high data rates and reliable service
  - » Satellite broadband operator ranked first in peak period download speeds among 14 terrestrial and satellite broadband providers in the FCC 2013 and 2014 reports "Measuring Broadband America"

1990s

- Large constellations proposed, all canceled
- Expensive technology
- Cost-effective terrestrial competition

2000s

- Smaller regional systems proposed and deployed
  - » Wildblue
  - » Spaceway
- Technical success, test bed for new technologies, bandwidth cost reduction
- Acquisitions by established players

Present

- Five major systems today and expanding:
  - » Eutelsat Tooway, HughesNet, ViaSat Exede, Inmarsat Global Xpress, O3b
- Four providers affiliated with established satellite operators (DTH, FSS, or MSS)
- 50% revenue growth over 5 years
- Subscribers grew 14% annually, tracking the revenue growth

Case Study: Earth Observation Services

- For many years, global Earth observation services were offered by small number of operators
  - » Typically founded and financed by space industry
  - » Objective to provide high resolution imagery
  - » Medium to large satellites with advanced, custom-designed payloads
  - » Governments as primary customers
  - » Increasing satellite sophistication: on-board data processing and optical communications for downlink
- New competitors have recently emerged
  - » Typically founded and financed by IT/analytics/tech sector
  - » Objective to provide real-time or near-real time imagery using the Internet
  - » Smaller satellites, with lower costs of manufacture, launch, and operation
  - » Customer base is developing
  - » Sophisticated data analytics on the ground
- Commercial satellite meteorology on the horizon
  - » Three companies seeking to provide weather data using LEO satellite-based radio occultation (measuring response of satellite signals traveling through atmosphere)
  - » Two companies seeking to provide weather data using imagery

Notes: Multispectral capability provides spectrum for an entire image. Hyperspectral capability adds an additional layer of information by providing spectrum data for each pixel in an image. List of operators is not comprehensive. The status of Dauria-Elecnor Perseus system is unclear following financial restructuring of Dauria and purchase of Elecnor Deimos by Urthecast.

Operational
Planned

	High Resolution (<1m)	High revisit time (<1dy)	Panchromatic (B&W)	Multispectral	Near Infrared/Infrared	Hyperspectral	Radar	Radio Occultation	Video	Meteorological Focus	Small Sat (<200kg)
Airbus D&S	●	●	●	●	●		●				
BlackBridge		●		●	●						●
DigitalGlobe	●	●	●	●	●						
DMCii		●		●	●						
ImageSat	●		●	●	●						
MDA		●					●				
Planet Labs		●	●	●	●						●
Skybox	●	●	●	●	●				●		●
Spire Global		●						●		●	●
Aquila Space		●			●	●	●				●
BlackSky Global	●	●		●					●		●
GeoOptics		●						●		●	●
HySpecIQ	●					●					
NorStar		●	●	●	●					●	●
OmniEarth		●	●	●	●						●
PlanetiQ		●						●		●	●
Tempus Global		GEO	●		●	●				●	
Urthecast	●	●		●			●		●		●

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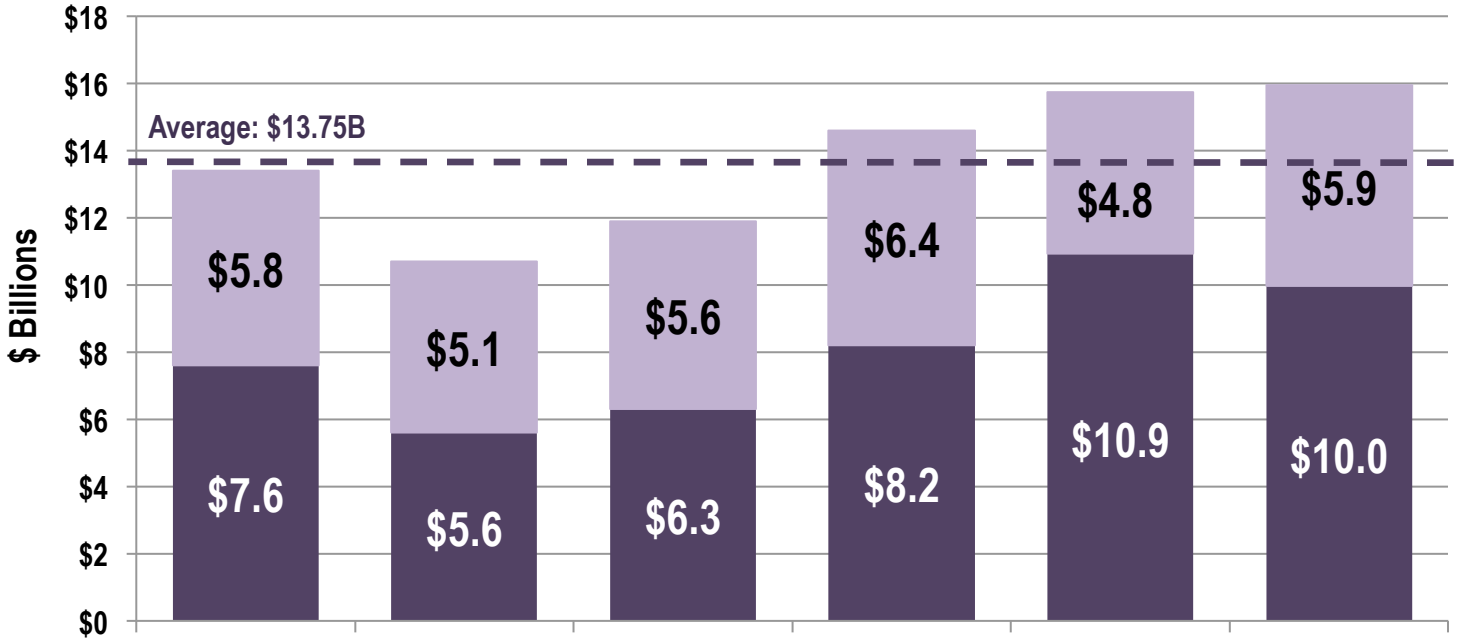
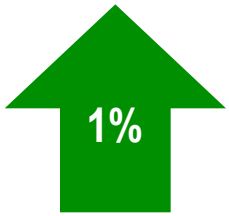
Satellite Industry Segments

Satellite Manufacturing

Satellite Manufacturing Revenues



	2009	2010	2011	2012	2013	2014
Total	$13.4	$10.7	$11.9	$14.6	$15.7	$15.9
Growth Rate	29%	-20%	10%	23%	8%	1%



2013 – 2014 Global Growth

Non-U.S.

United States

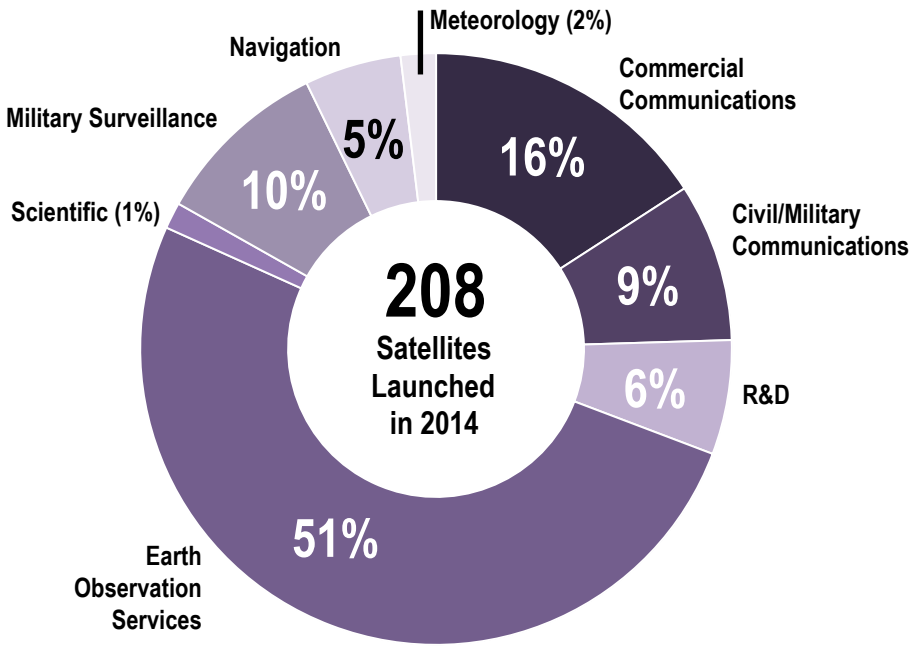
- Worldwide 2014 revenues totaled $15.9 billion
- U.S. share of global revenues was 63%, a decrease from 69% in 2013

NOTE: Satellite manufacturing revenues are recorded in the year the launch was conducted.

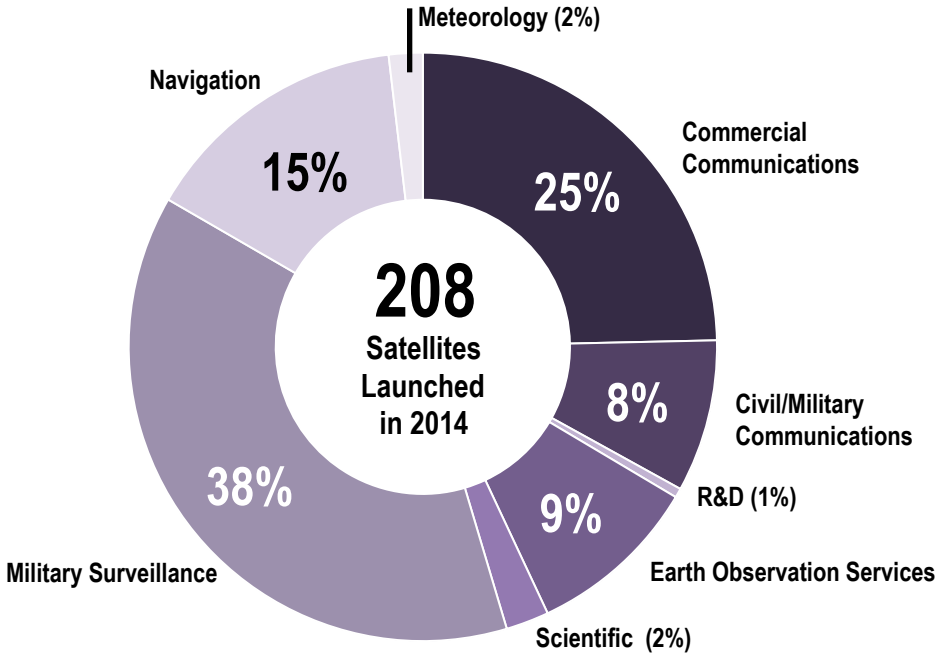
Satellite Manufacturing Findings

- 208 satellites launched in 2014, almost double the 107 launched in 2013
- 130 CubeSats launched represented 63% of total
- Most CubeSats were used for Earth observation

- Communications satellites represented 33% of total revenues generated
- Military surveillance satellites accounted for 38% of total revenues generated in 2014, compared to 30% in 2013
- CubeSats represented less than 1% of total value



Number of Spacecraft Launched by Mission Type (2014)



Value of Spacecraft Launched by Mission Type (2014)

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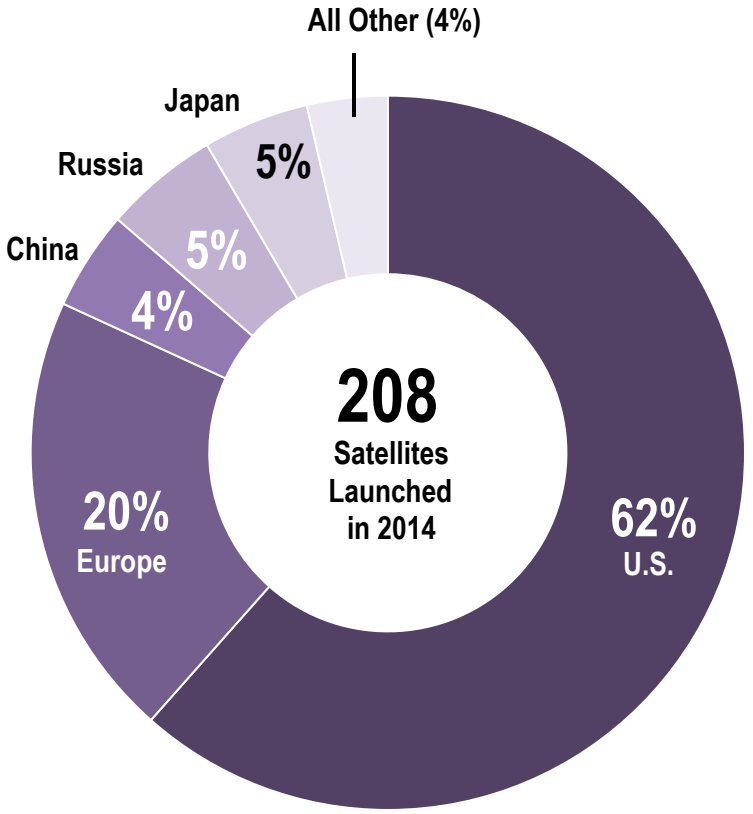
Note: Does not include satellites built by governments or universities. Data based on unclassified sources.

U.S. Satellite Manufacturing Findings

- U.S. satellite manufacturing revenues decreased 9%, with revenues from both government and commercial sectors proportionally lower
- 75% of U.S. satellite manufacturing revenues were from U.S. government contracts
- Discounting CubeSats, U.S. firms built 29% of the satellites launched in 2014 and earned 62% of the revenues
  - » Including CubeSats, U.S. firms built about 62% of the satellites launched in 2014 and earned 63% of global satellite manufacturing revenues
  - » 99 of the 130 U.S.-built satellites launched in 2014 were CubeSats



Value of Spacecraft Launched by Country/Region of Manufacturer (2014)

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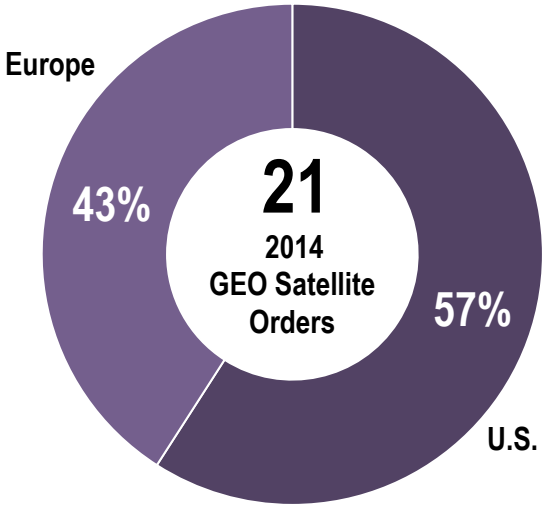
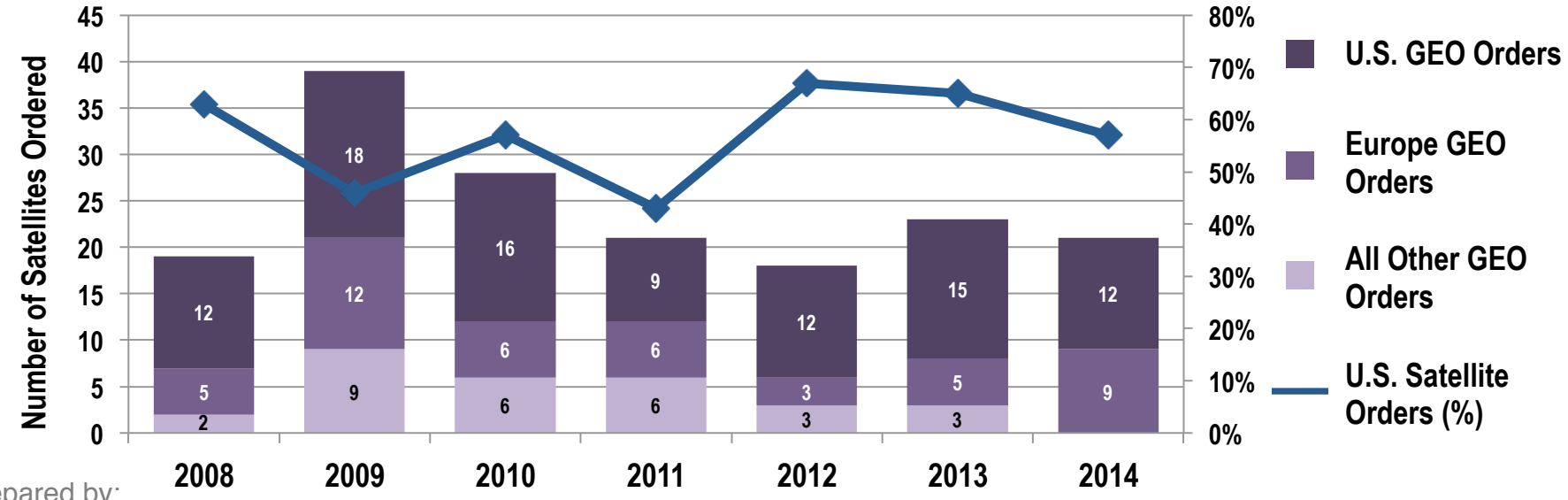
Note: Does not include satellites built by governments or universities. Data based on unclassified sources.

Future Indicator: Commercial Satellite Manufacturing Orders



- Orders for 21 commercial GEO satellites were announced in 2014
- 12 orders were won by U.S. manufacturers
- 57% share of orders won by U.S. firms is a decline from 65% in 2013



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Case Study: Very Small Satellites

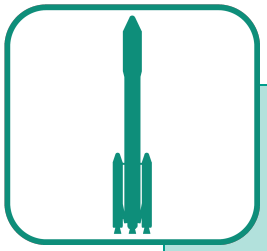
- Continued and growing interest in inexpensive very small satellites
- CubeSats are an established "kit" form of very small satellite in use for academic, government, and, increasingly, commercial purposes
  - » 130 CubeSats were launched in 2014, up from 91 in 2013, with 84 sent into orbit via ISS (28 CubeSats lost in Antares failure in October)
  - » 101 commercial CubeSats launched in 2014 for Earth observation services and communications, up from 8 in 2013. The vast majority (93) are built and operated by Planet Labs
  - » Total expenditure to build all CubeSats since 2005 estimated at less than $100M
  - » Growing concern regarding collisions with CubeSats – NASA first major operator to say it has moved satellites to avoid CubeSats
- Commercial constellations using customized very small satellites (under 200 kg) are in development
  - » Skybox: High resolution, multispectral sensors, up to 24 sats planned, 2 launched to date
  - » OneWeb: Telecommunications, function more as nodes compared to traditional comsats, 100s of satellites planned, zero launched to date

Number of CubeSats Launched by Year (2005-2014)

What is a CubeSat?

- A CubeSat is a cube-shaped satellite bus measuring 10cm on a side, with a mass of 1-2 kilograms
- Can be stacked together (2U, 3U, 6U) depending on mission
- Costs
  - » **Low Cost:** Basic 1U CubeSat bus kits can be purchased for $10,000; with payload development it will cost roughly $100,000 per unit
  - » **Moderate Cost:** Boeing-built CubeSat platforms for NRO are expected to cost no more than $250,000
  - » **Higher Cost:** NASA expects that CubeSats used for planetary science missions may cost $3-$10 million

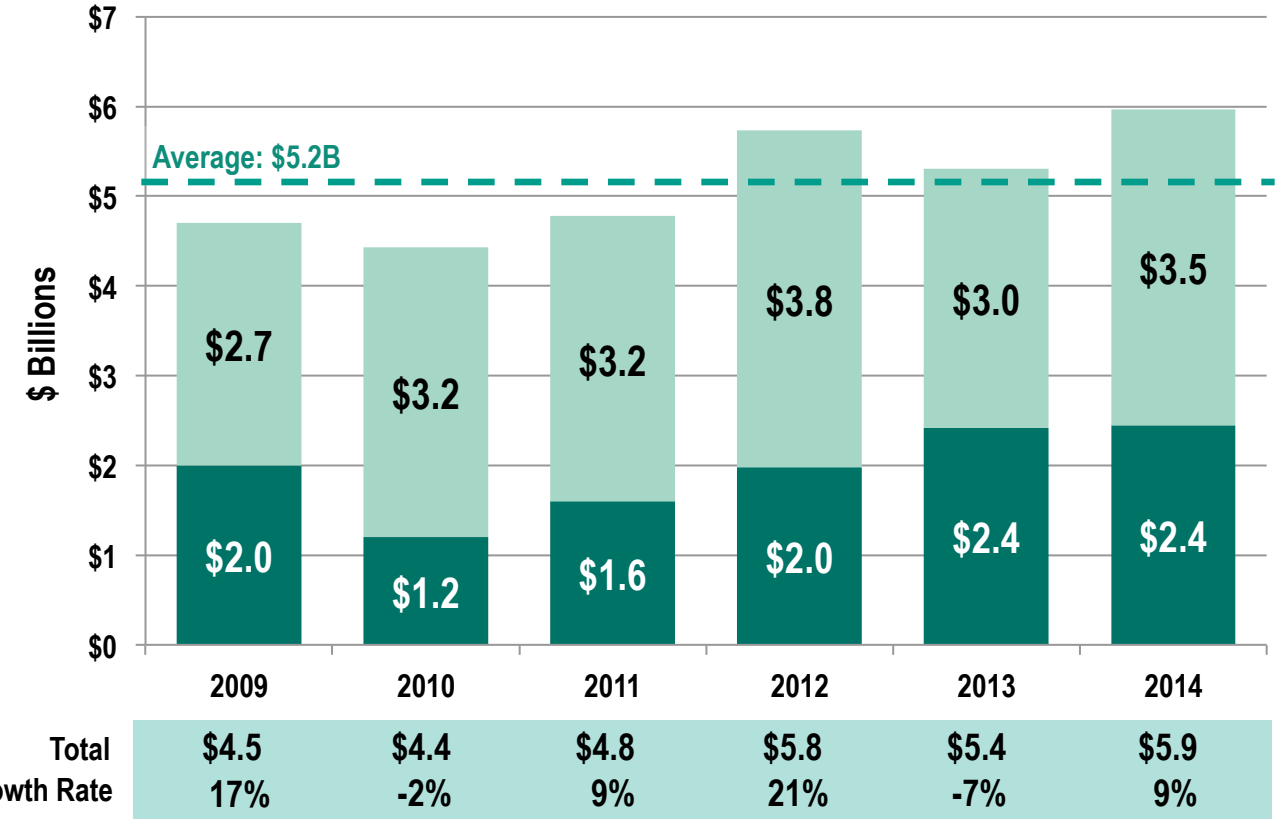
Satellite Industry Segments



Launch Industry

- Launch Services
- Launch Vehicles

Satellite Launch Industry Revenues



	2009	2010	2011	2012	2013	2014
Total	$4.5	$4.4	$4.8	$5.8	$5.4	$5.9
Growth Rate	17%	-2%	9%	21%	-7%	9%

Non-U.S.

United States

- $5.9B global revenues in 2014 from commercially-procured satellite launches
- U.S. share of global launch revenues decreased from 45% in 2013 to 41% in 2014

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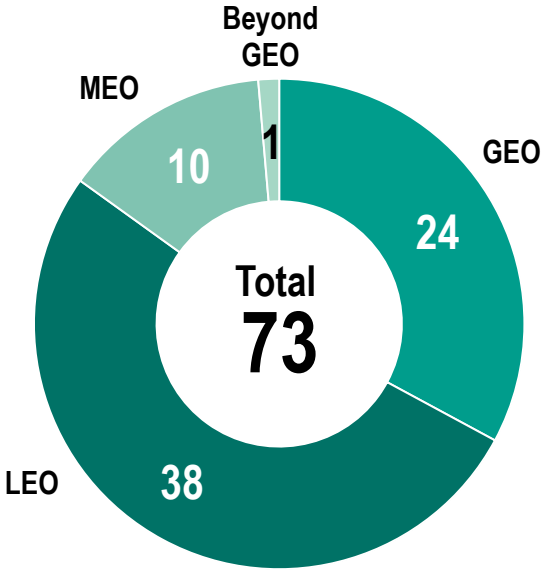
Note: Launch industry revenues are recorded in the year the launch was conducted.

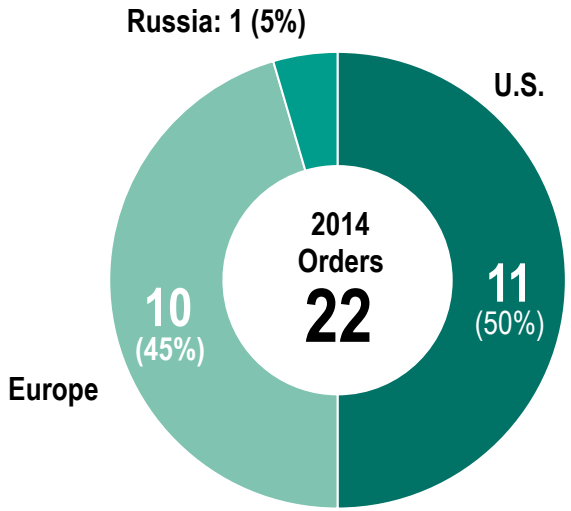
Satellite Launch Industry Findings

- The number of commercially-procured launches conducted worldwide in 2014 (73) was up from 2013 (62)
- Revenues increased by about 9% globally in 2014, compared with a 7% decrease in 2013. The higher revenues stemmed from more European and U.S. launches of commercial satellites, including:
  - » 10 Arianespace launches in 2014 versus 6 in 2013
  - » 5 launches by U.S. providers Lockheed Martin and SpaceX, versus 2 in 2013
  - » 4 launches by MHI Launch Services (Japan), versus 1 in 2013
- Government customers worldwide remained the launch revenue driver, at 72% of commercially-procured satellite launch revenues, slightly higher than in 2013 (70%)
- By country, the U.S. had the largest share of commercially-procured launch revenues (41%), with 34% of global revenues coming from launching U.S. government satellites

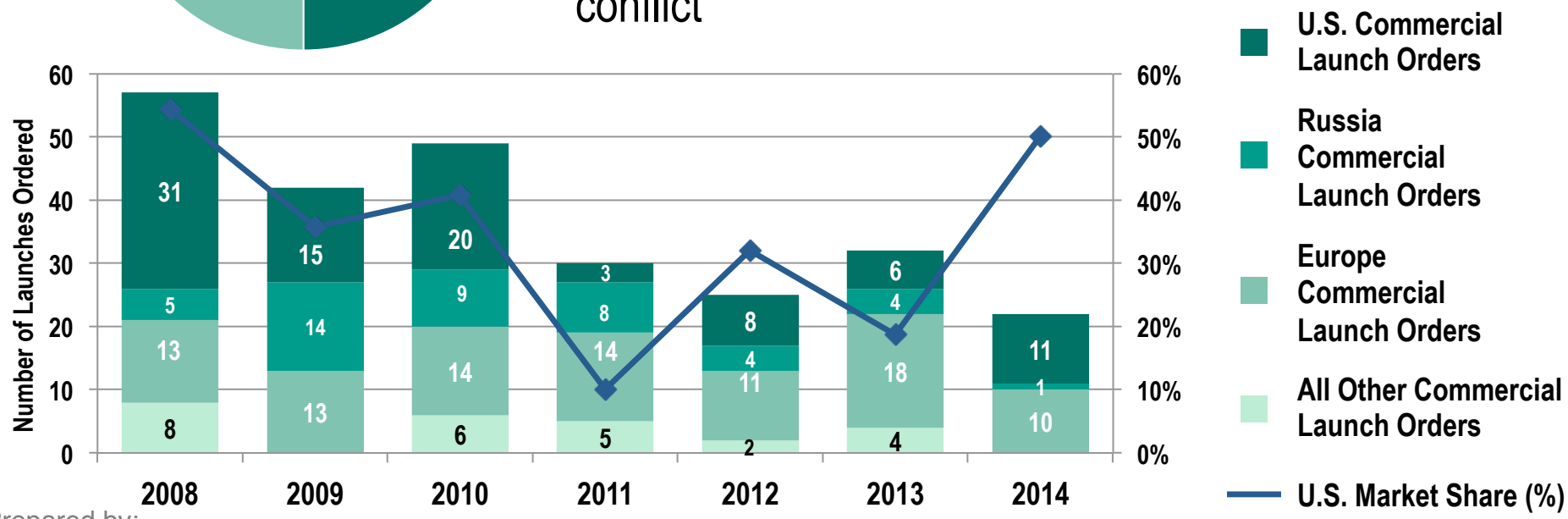


2014 Commercially-Procured Satellite Launches by Orbit

Future Indicator: Commercial Satellite Launch Orders



- Orders to launch 22 satellites were placed in 2014, down from 32 in 2013
- 11 (50%) satellite launch orders were won by U.S. companies, up 83% from 2013
- Russian launch providers experienced a dramatic drop in orders due to reliability issues and Ukraine conflict



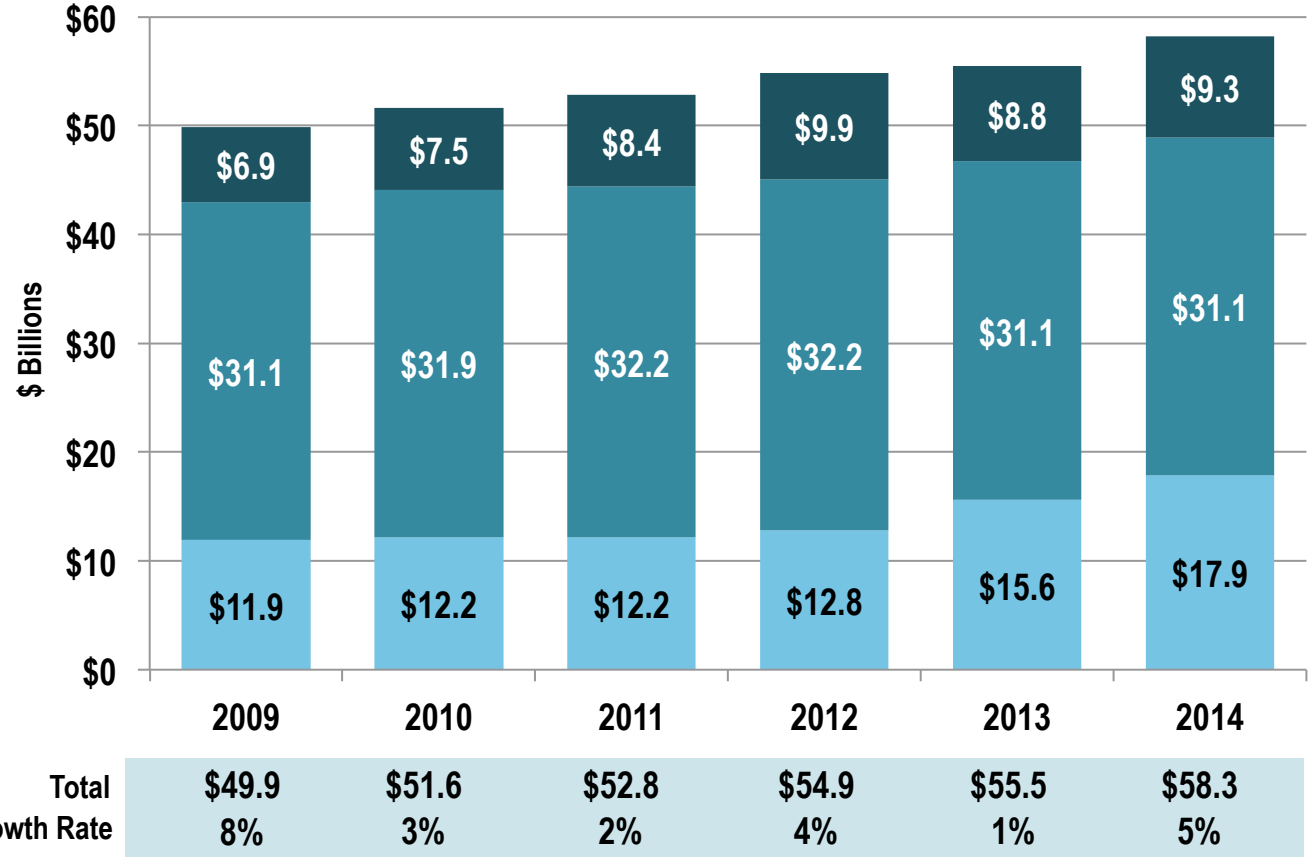
NOTE: A single launch contract may cover the launch of more than one satellite (each described as an "order").

Satellite Industry Segments

Ground Equipment

- Network Equipment
  - » Gateways
  - » Control stations
  - » Very Small Aperture Terminals (VSATs)
- Consumer Equipment
  - » Satellite TV dishes
  - » Satellite radio equipment
  - » Satellite broadband dishes
  - » Satellite phones and mobile satellite terminals
  - » Satellite navigation stand-alone hardware

Global Satellite Ground Equipment Revenues



	2009	2010	2011	2012	2013	2014
Total	$49.9	$51.6	$52.8	$54.9	$55.5	$58.3
Growth Rate	8%	3%	2%	4%	1%	5%

5%

2013 – 2014 Global Growth

The U.S. share of ground equipment revenue in 2013 was

41%

Network Equipment — gateways, network operations centers (NOCs), satellite news gathering (SNG) equipment, flyaway antennas, very small aperture terminal (VSAT) equipment

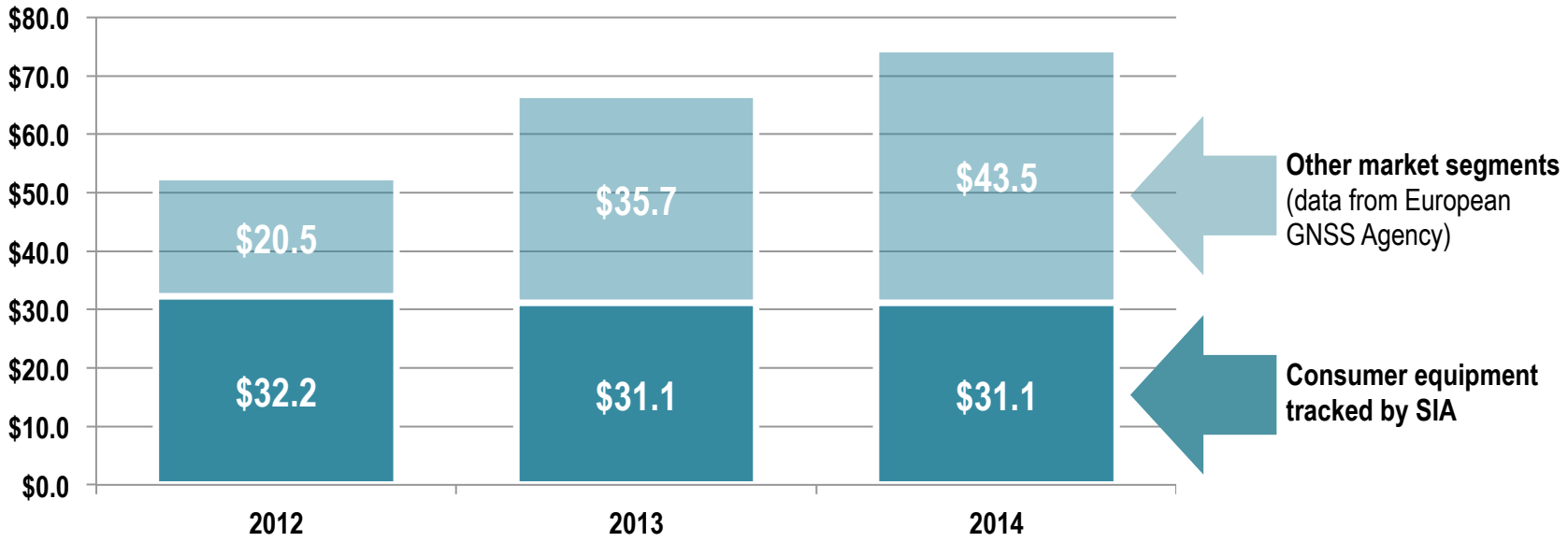
Consumer Equipment — Non-GNSS: satellite TV, radio, and broadband equipment, mobile satellite terminals. GNSS: stand-alone satellite navigation devices and in-vehicle services. Excludes chipsets in devices (e.g., smartphones) whose primary use is not satellite navigation

Ground Equipment Findings

- Total satellite ground equipment revenues increased 5% in 2014
- Network equipment revenues increased 6%
- Consumer equipment for satellite navigation (or GNSS, for global navigation satellite system) represents about 53% of overall ground equipment revenue, down from 57% in 2013
  - » Revenue stayed flat, reflecting further migration away from stand-alone devices toward embedded chipsets
  - » See case study on following page
- Consumer equipment for satellite TV, radio, broadband, and mobile satellite terminals (non-GNSS) revenues grew 15% with more terminals in service across all segments in 2014

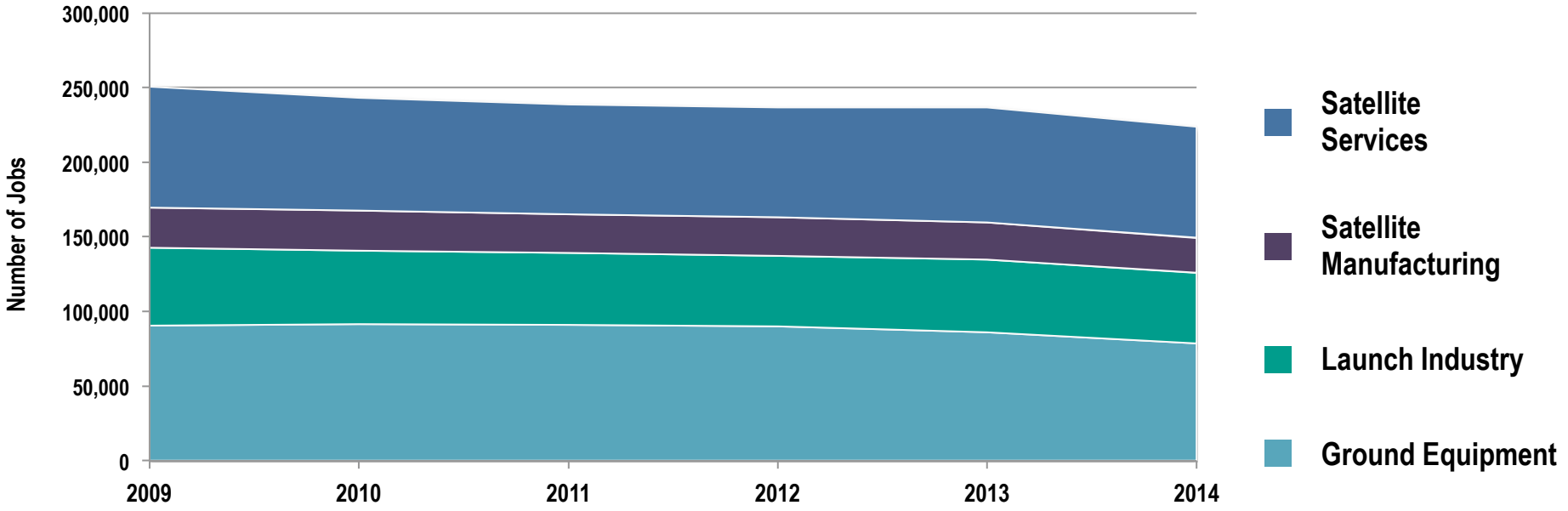
Case Study: Market for Satellite Navigation

- GNSS market includes
  - » Consumer equipment tracked by SIA: stand-alone units and in-vehicle systems
  - » Other market segments: chipsets supporting location-based services in mobile devices; traffic information systems; GNSS avionics in aircraft, maritime, surveying, and rail (not included in SIA indicators)
- Chart below shows SIA data combined with data on other GNSS market segments
  - » Consumer equipment revenue is flat; other market segments show growth
  - » Data source for other market segments: European Global Navigation Satellite Systems Agency, which recently began tracking global GNSS market segments in detail



2014 U.S. Employment Estimates (Private Sector Employment Only)

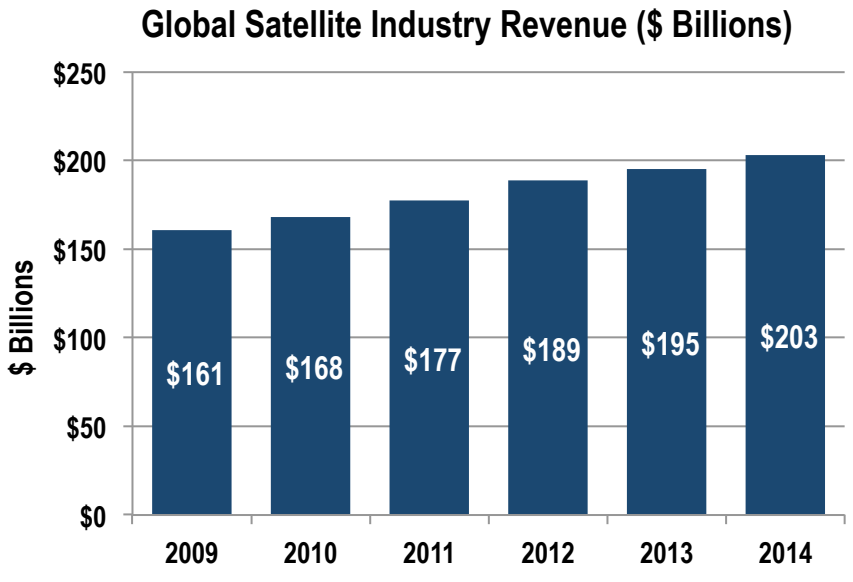
- In 2014, satellite industry employment in the U.S. decreased by 13,289 jobs (-6%)
- Four of the satellite industry segments lost jobs as of 2014 (compared to 2013)
  - » Satellite Services employment decreased by 3,060 jobs, or -4% (2013: +5%)
  - » Satellite Manufacturing employment decreased by 1,508 jobs, or -6% (2013: -4%)
  - » Launch Industry employment decreased by 1,071 jobs, or -2% (2013: +2%)
  - » Ground Equipment employment decreased by 7,650 jobs, or -9% (2013: -4%)



Source: U.S. Bureau of Labor Statistics (BLS).

Summary: Top-Level Global Satellite Industry Findings

- Satellite industry revenue was $203 billion in 2014
  - » Growth of 4% worldwide in 2014
  - » Increase from 3% growth rate in 2013



4%
2013 – 2014 Global Growth

- All satellite industry segments surveyed posted growth in 2014
  - » **Satellite services**, the largest segment, grew by 4% - consumer services continues to be a key driver for the overall satellite industry
  - » **Satellite manufacturing** revenues grew by 1%, slower growth than 2013, due to smaller number of expensive commercial GEO and government satellites launched in 2014, partially offset by increase in total number of satellites launched
  - » **Launch industry** revenues grew by 9% in 2014, reflecting higher number of European and U.S. launches of commercial satellites
  - » **Ground equipment** revenues increased 5% in 2014, with growth in consumer and network equipment, and consumer GNSS remaining flat

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