Quicktake

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Key Trends in the Global Space Industry

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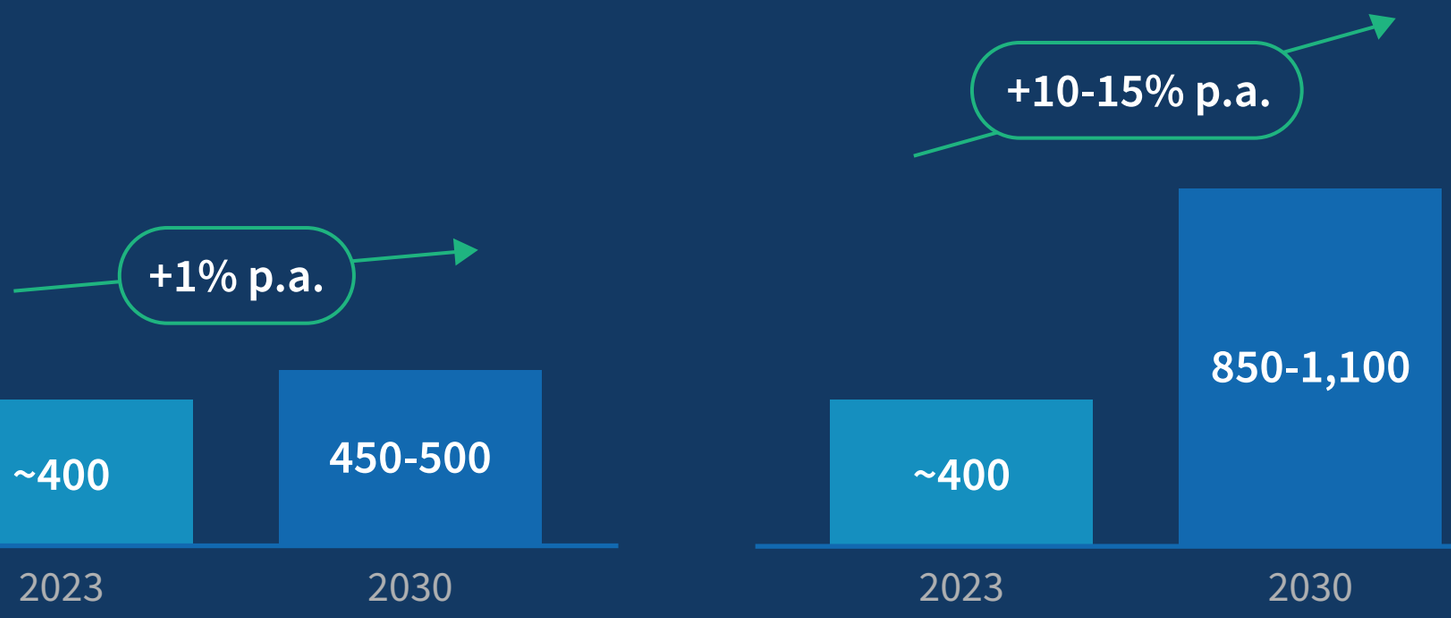
There are differing perspectives on the future of the space market: the Minimalist, and the Maximalist

VIEW	MINIMALIST	MAXIMALIST
Outlook (2023-2030)	**Size of the global space economy value pools[1]** ($ Billions, 2023-2030)	
Belief basis	— Drying up of government financing — Short-term investor focus (i.e., not willing to bet beyond 3-5 years) — Technical challenges to achieve greater scalability/lower costs across value chain	— Growing geopolitical prominence of space exploration and sovereignty — Use case proliferation of AI, IoT applications and direct-to-device technologies — Increasing economies of scale and technical break-throughs



[1] Includes government spend on space exploration, defence, and other programs as well as revenues from private companies including upstream and downstream

Source: Industry reports, Expert Interviews, FTI Delta Analysis

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We expect developments across the following trends, creating new opportunities across the value chain

1

NGSO proliferation

2

Direct-to-device renaissance

3

Streamlined satellite manufacturing methods

4

Public-private partnerships

5

Reusable, flexible and democratized launch services

6

IoT/AI use case proliferation

7

Space debris risks and opportunities

8

Growth and commercialization of space exploration

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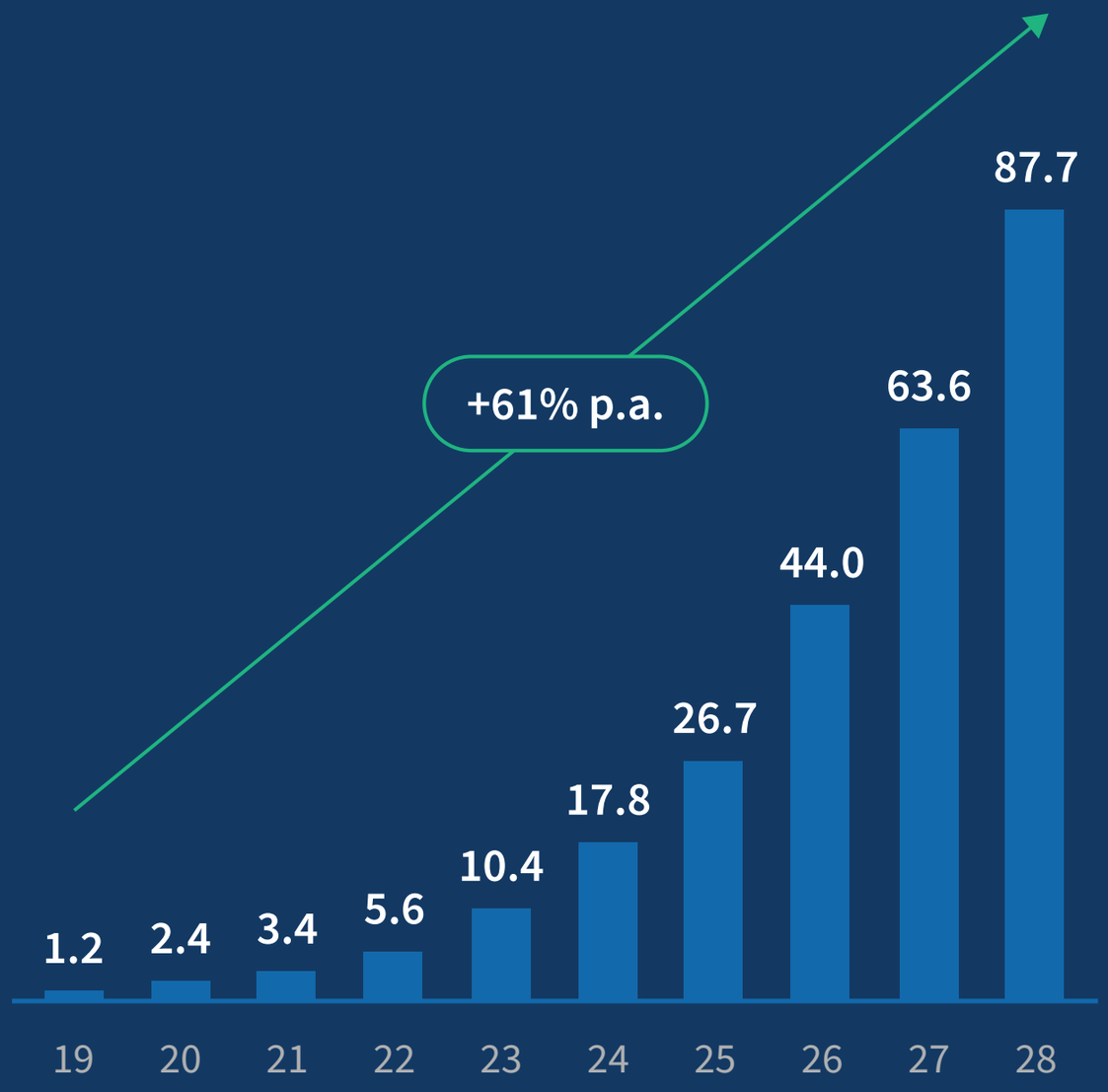
1 NGSO proliferation

NGSO (LEO & MEO) broadband satellites are being deployed at massive scale

INCREASED DEMAND FOR BANDWIDTH...

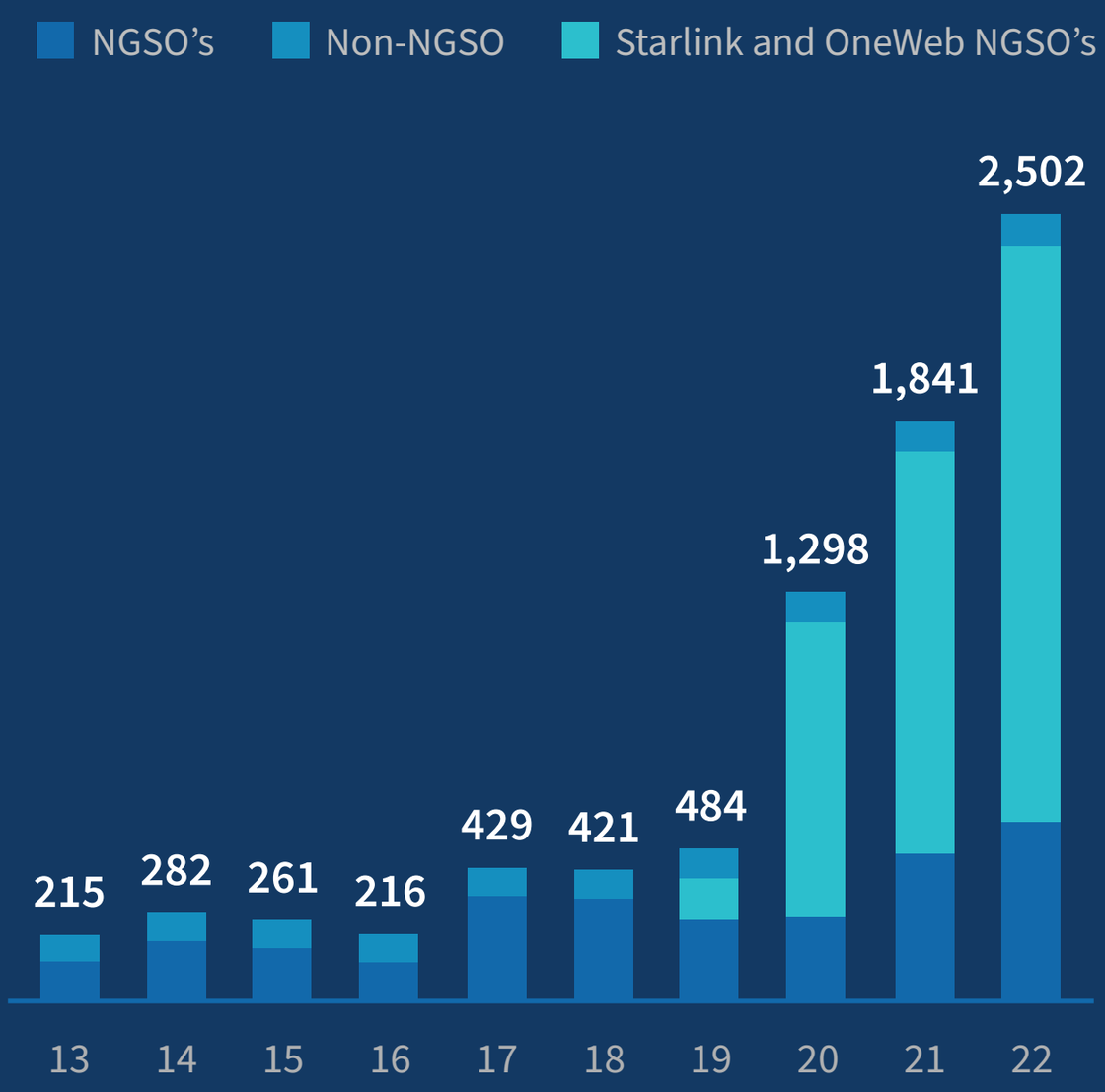
Demand for satellite services
(2019–2028, Tbps)



The demand of satellite bandwidth continues to increase as companies like SpaceX's Starlink grow their satellite internet subscriber base

...HAS PROMOTED NGSO PROLIFERATION

Satellites launched,
2013–2022[1]



The share of NGSO satellites significantly climbed in the past decade, from 61% in 2013 to 96% in 2022

NGSO: Non-geospatial orbit; LEO: Low-earth orbit; MEO: Medium-earth orbit;
[1] SmallSats (<600 kg) considered NGSO;
Sources: BryceTech, press clippings, FTI Delta analysis; Examples non-exhaustive.

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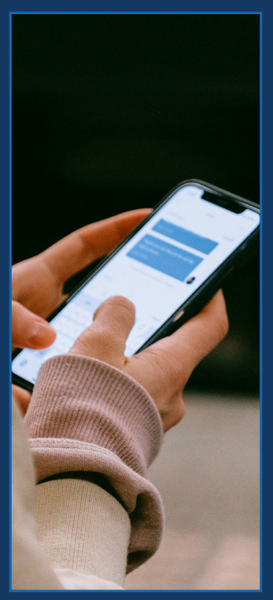
Direct-to-device connectivity has moved out of the theoretical and is available in the market

RECENT MARKET INTEREST

Satellite Quantity & Spectrum Demand

LOW — HIGH

Emergency SOS, narrow-band IoT



Voice & text

Basic broadband

High-speed broadband

Current market focus is basic SOS and emergency services, with an approximate annual total addressable market ranging from ~$2B to potentially surpassing $10B, contingent upon technological advancements

EXAMPLES OF DIRECT-TO-DEVICE PARTNERSHIPS

Solution Provider	Key Partners	
Starlink	T Mobile, KDDI	*Status: Satellites launched in January 2024*
OneWeb	AT&T, Orange, Airtel	*Status: To be determined*
AST Space Mobile	AT&T, Vodafone	*Status: Expected to launch in 1H2024*
Globalstar	Apple	*Status: Operational*
eSAT Global	Yahsat	*Status: Expected to launch in 1H24*

Sources: Quality Space Report, Space News, TM Forum, press clippings, FTI Delta analysis; Examples non-exhaustive.

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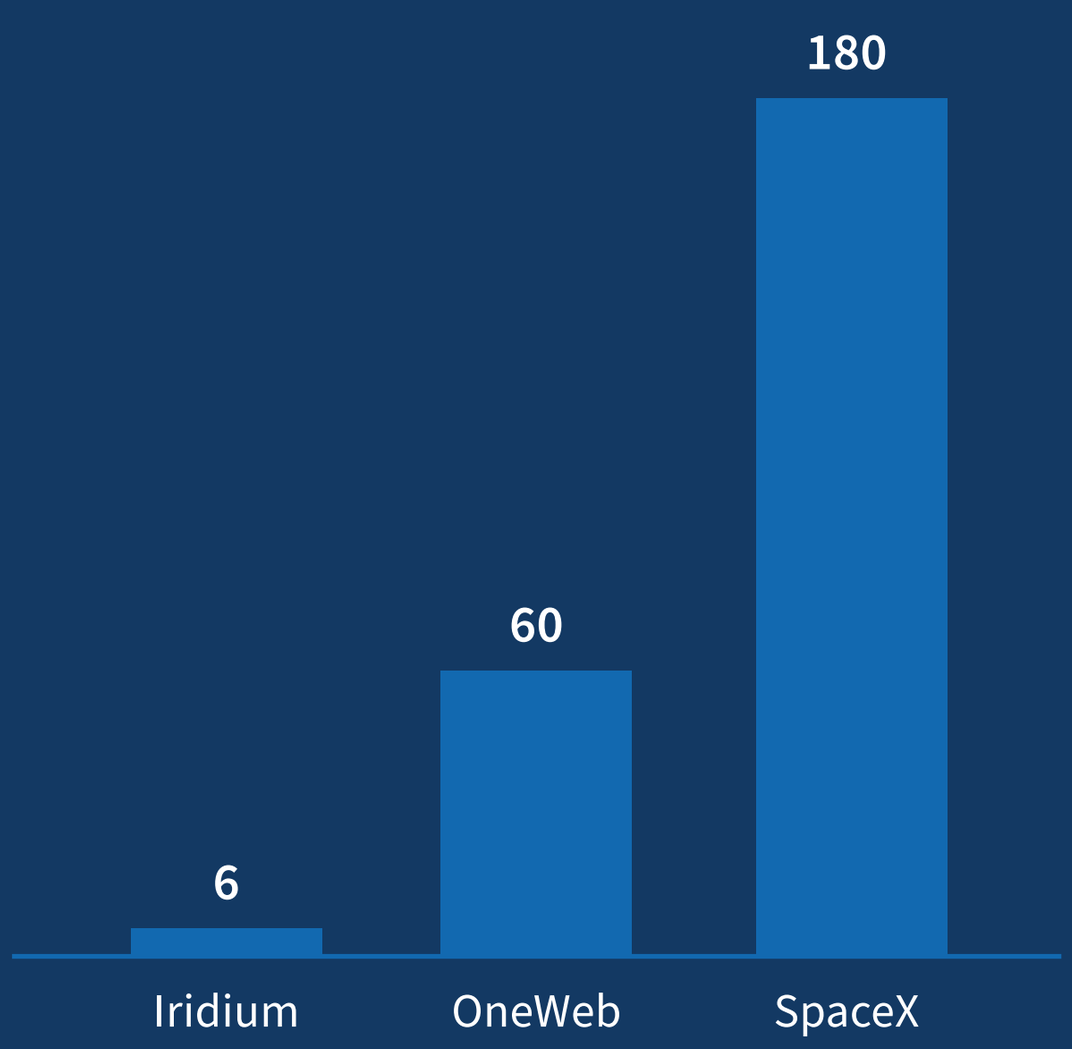
Manufacturing best practices from other industries enabling mass-produced constellations

Monthly satellite production rate

(Satellites/month in 2023)



Some players have invested in streamlining satellite manufacturing to increase production rates

Satellite Production Changes

Design

- Big satellites, complex projects
- Small and simplified satellites, easier to assemble and troubleshoot

Assembly

- Unique assembly designed to satellite; satellite stays in place, factory adjusts to it
- Standardization of production; satellite moves across different workstations
- Additive manufacturing

Testing

- Meticulous testing to ensure everything is perfect before launch
- Automated testing, providing feedback to improve next batch

Sources: Press clippings, FTI Delta analysis; Examples non-exhaustive.

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4 Public-private partnerships

Partnerships between public and private entities are a viable solution to accelerate public space agendas while boosting commercial space economies

PUBLIC-PRIVATE PARTNERSHIPS (P3s) OVERVIEW

Public entity perspective - Benefits of P3

- Shared cost with private sector
- Latest technological innovations incorporated from private companies
- Keeps domestic players financially stable
- Shared risk

Private entity perspective - Benefits of P3

- Access to government resources, including funding, facilities and regulatory support
- Shared risk

NOTABLE EXAMPLES

NASA - SpaceX

- NASA's first-ever investment in a private space company was in 2006 with SpaceX for $400M
- A report by NASA indicated that over $1B savings had been achieved from working with private companies

ISRO

- Indian space agency ISRO announced mid-2023 that its space research will be more accessible for commercial businesses
- Mutually beneficial partnerships also formed with private players — in Jan. 2024, ISRO launched communication satellites facilitated by SpaceX

Sources: Reuters, press research, expert interviews, FTI Delta analysis; Examples non-exhaustive.

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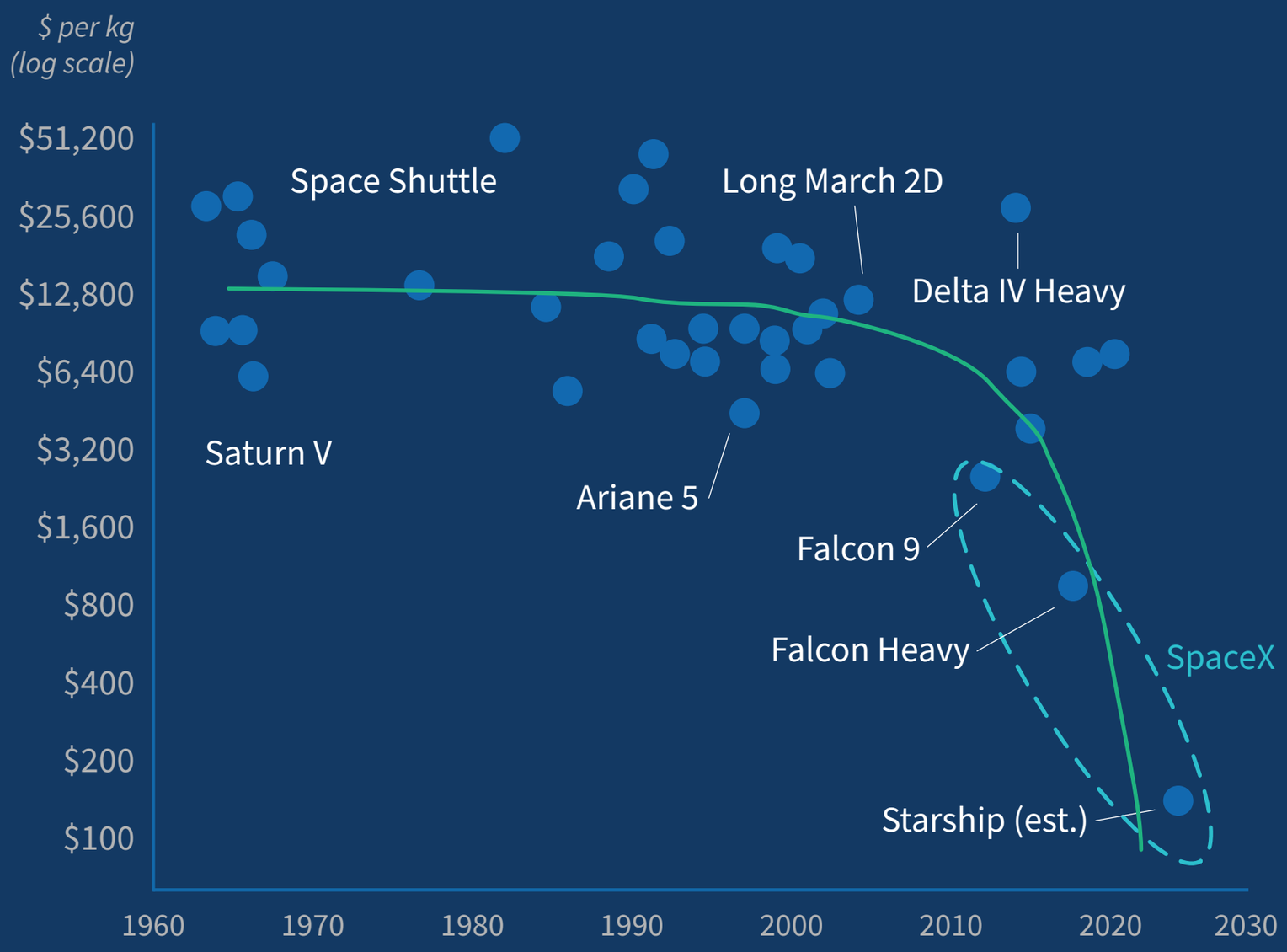
Launch services are leveraging innovative methods to reduce cost and add flexibility

Spacecraft reusability and cost impact

Falling launch costs to orbit: Cost per kilogram



- Starship is SpaceX's latest spacecraft, designed to supersede older spacecraft as the largest and most powerful rocket ever, supporting a crew of up to 100 people on board.
- The aircraft successfully recorded its longest test flight and reached orbit during its March 2024 launch.

COMPANY EXAMPLE

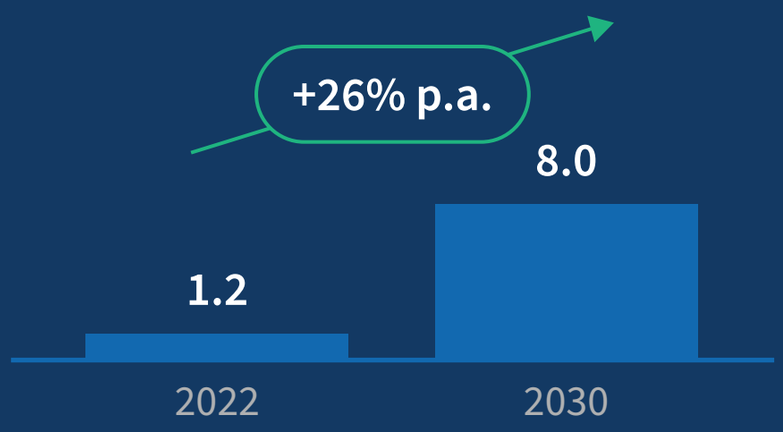
SpaceX has pioneered landing used rockets, successfully doing so in 2015 and eventually reusing them in 2017. The company also became successful in recapturing a rocket component previously thought impossible to reuse, saving $6M per component. SpaceX has carried out multiple rideshare missions to appeal to both constellation-builders and small actors (start-ups, universities, governments).

Sources: Press clippings, CSIS Aerospace Security Project, PayloadResearch estimates.

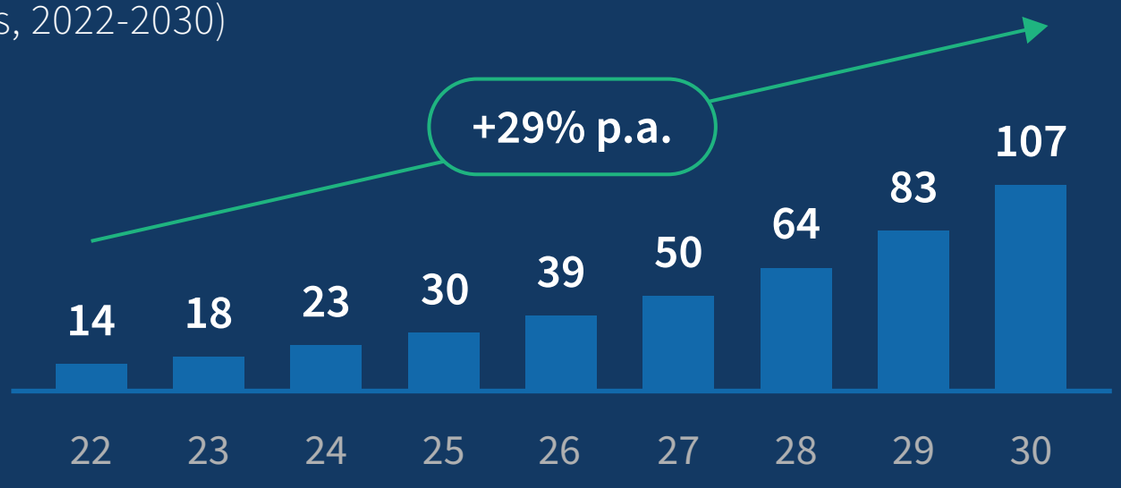
IoT/AI use cases are already becoming widespread around the world, with further potential on the horizon as new industries develop

TREND

Global Satellite IoT Market
($ Billions, 2022-2030)



Global IoT connected devices
(# Billions, 2022-2030)



The global satellite IoT market is expected to grow at a CAGR of 26% over the next decade, driven by the expected number of connected IoT devices growing at 29%

KEY EXAMPLES

Hiber - Shell

- Hiber, an end-to-end IoT solution startup, has an agreement with Shell to provide well integrity monitoring globally using LEO satellites

Inmarsat, Zamil Group

- Inmarsat's satellite IoT-supported solutions Fleet Connect and Fleet Data are being used by Saudi-based offshore firm Zamil to uncover important insights into vessels

Sources: LinkedIn, PR Newswire, Yahoo Finance, The Insight Partners, Reuters, GPS World, market research, FTI Delta analysis; Examples non-exhaustive.

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While orbital debris poses a potential risk to the progress of the space economy, new start-ups are actively transforming it into an opportunity

TREND

Tonnes of debris and number of satellites in LEO
(#, IBIS World Report)

6,300	60,000
Tonnes of debris in LEO	Satellites predicted in LEO in 2030

LEO orbital environment at risk of becoming unstable without removal of debris

Debris types

Natural	Artificial
(e.g., asteroids, space dust)	(e.g., decommissioned space assets, launch equipment, fragmented objects)

KEY EXAMPLES

ClearSpace today

— Founded in 2018, ClearSpace was designed by the ESA to lead the first mission to remove debris from orbit in 2025

Starfish Space

— Starfish Space is attempting the first-ever commercial docking with another satellite in LEO in order to service satellites in-orbit after a potential collision or issue

TransAstra

— In 2023, contracted by NASA to explore cleaning up space debris with “capture bag” called FlyTrap

— In Jan. 2024, awarded contract by United States Department of Defense to further develop FlyTrap

Sources: World Economic Forum, GHGSat, FTI Delta analysis; Examples non-exhaustive.

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Commercialization of space exploration remains distant but may begin to make inroads in the next years

TOURISM

Blue Origin

With its first successful tourist mission in 2021, Blue Origin is at the forefront of space tourism

OUTER-SPACE EXPLORATION

USA (Artemis program)

- Set up robotic and moon exploration programs led by NASA to run from 2022 to 2029
- By 2030, a lunar base will be established to support missions of up to 2 months

United Arab Emirates

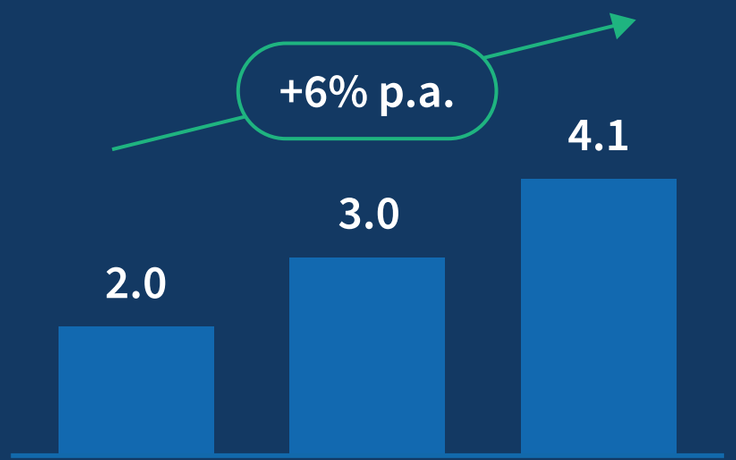
- Establishment of the first habitable human settlement on Mars by 2117
- 100-year plan focused on developing capabilities in space science and tech, research, AI, robotics

China

- Building of scientific experiment on the lunar surface to occur in 3 phases from 2021 through 2036
- By 2036, a lunar base will be established to support scientific research and space exploration

SPACE MINING

Global space mining market size[1]
($ Billions, 2024-2037)



Astro Forge

Following the launch of its first mission in 2024, AstroForge will be deploying a spacecraft in 2024 to observe a target asteroid, making significant strides in space mining

[1] Driven by space mining missions and increased governmental support for space mining.
Sources: Afar, Blue Origin, AstroForge, Wired, news clippings, market research, company websites, FTI Delta analysis; Examples non-exhaustive.

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