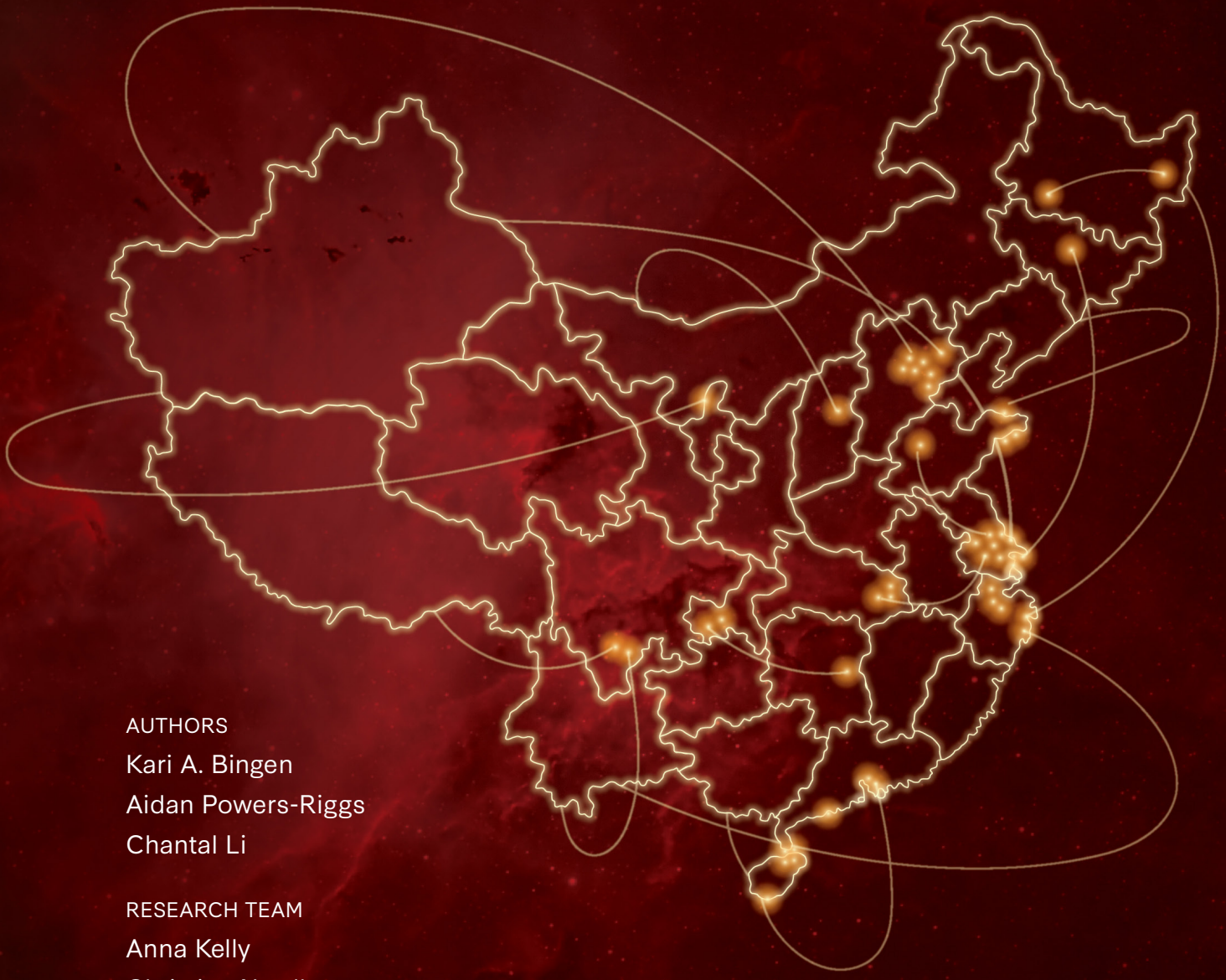
JULY 2026

BLURRED ORBITS

Inside China's Commercial Space Expansion



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A Report of the CSIS Aerospace Security Project

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Contents

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The analysis and conclusions contained in this report are solely those of the authors, and any errors or omissions remain the exclusive responsibility of the authors.

This report is made possible by general support to CSIS.

Abbreviations

ADS-B	Automatic Dependent Surveillance–Broadcast
AIS/VDES	Automatic Identification System / VHF Data Exchange System
AIT	Assembly, integration, and testing
AM	Additive manufacturing
BRI	Belt and Road Initiative
CALT	China Academy of Launch Vehicle Technology
CAS	Chinese Academy of Sciences
CASC	China Aerospace Science and Technology Corporation
CASIC	China Aerospace Science and Industry Corporation
CAST	China Academy of Space Technology
CCP	Chinese Communist Party
CETC	China Electronics Technology Group Corporation
CGSTL	Chang Guang Satellite Technology
China SatNet	China Satellite Network Group Co., Ltd.
CMA	China Meteorological Association
CMC	Central Military Commission
CNSA	China National Space Administration
EO	Electro-optical
EV	Electric Vehicle
GEO	Geosynchronous Earth orbit
GNSS	Global navigation satellite system
IAMCAS	Innovation Academy for Microsatellites of the Chinese Academy of Sciences
IoT	Internet of Things

ISAM	In-space servicing, assembly, and manufacturing
ITU	International Telecommunication Union
Kerolox	Kerosene and liquid oxygen
LEO	Low Earth orbit
LOX	Liquid oxygen
LWIR	Long-wave infrared
MCF	Military-civil fusion
MEO	Medium Earth orbit
MWIR	Mid-wave infrared
PLA	People's Liberation Army
PNT	Position, navigation, and timing
PRC	People's Republic of China
R&D	Research and development
RMB	Renminbi
SAR	Synthetic aperture radar
SAST	Shanghai Academy of Spaceflight Technology
SASTIND	State Administration of Science, Technology, and Industry for National Defense
SATCOM	Satellite communications
SLV	Space launch vehicle
SOE	State-owned enterprise
SSST	Shanghai Spacecom Satellite Technology
SWIR	Short-wave infrared
VTVL	Vertical takeoff and vertical landing

Executive Summary

To understand the degree to which China is infusing space into its national psyche and society, one need only to look at the country's 2024 New Year's Eve celebrations and the image Beijing projected to the world. As the ball dropped in New York's Times Square and fireworks lit up Sydney Harbor, Chinese dancers performed before a colossal backdrop of taikonauts holding Chinese flags—broadcasting a forward-looking vision of technological ambition and national pride framed firmly within the tenets of the Chinese Communist Party (CCP).[1]

This space vision has been years in the making. In 2013, President Xi Jinping articulated a "space dream . . . to make China stronger." Since then, Beijing has increasingly treated space as a strategic industry tied to economic growth, technological self-sufficiency, military modernization, and geopolitical influence.[2] While the People's Liberation Army (PLA) military space developments and China's human spaceflight ambitions have drawn much of the spotlight, less attention has been directed toward the rapid expansion of the country's commercial space activities.

China's commercial space ambitions are a key but underappreciated driver of its broader global space pursuits.

Figure 1: Performers at a 2024 New Year's Eve Countdown Event in Beijing

Source: Ng Han Guan/Associated Press.

China's commercial space ambitions are a key but underappreciated driver of its broader global space pursuits. Beijing views its expanding commercial space ecosystem—its constellation of startups and venture-backed firms—as instruments of national power, expected to contribute to national strategic objectives, including PLA modernization. These activities are opening a new front in strategic competition that will challenge the United States across economic, technological, military, and diplomatic dimensions. As the U.S. Intelligence Community concluded in 2024, "China's commercial space sector is growing quickly and is on pace to become a major global competitor by 2030."[3]

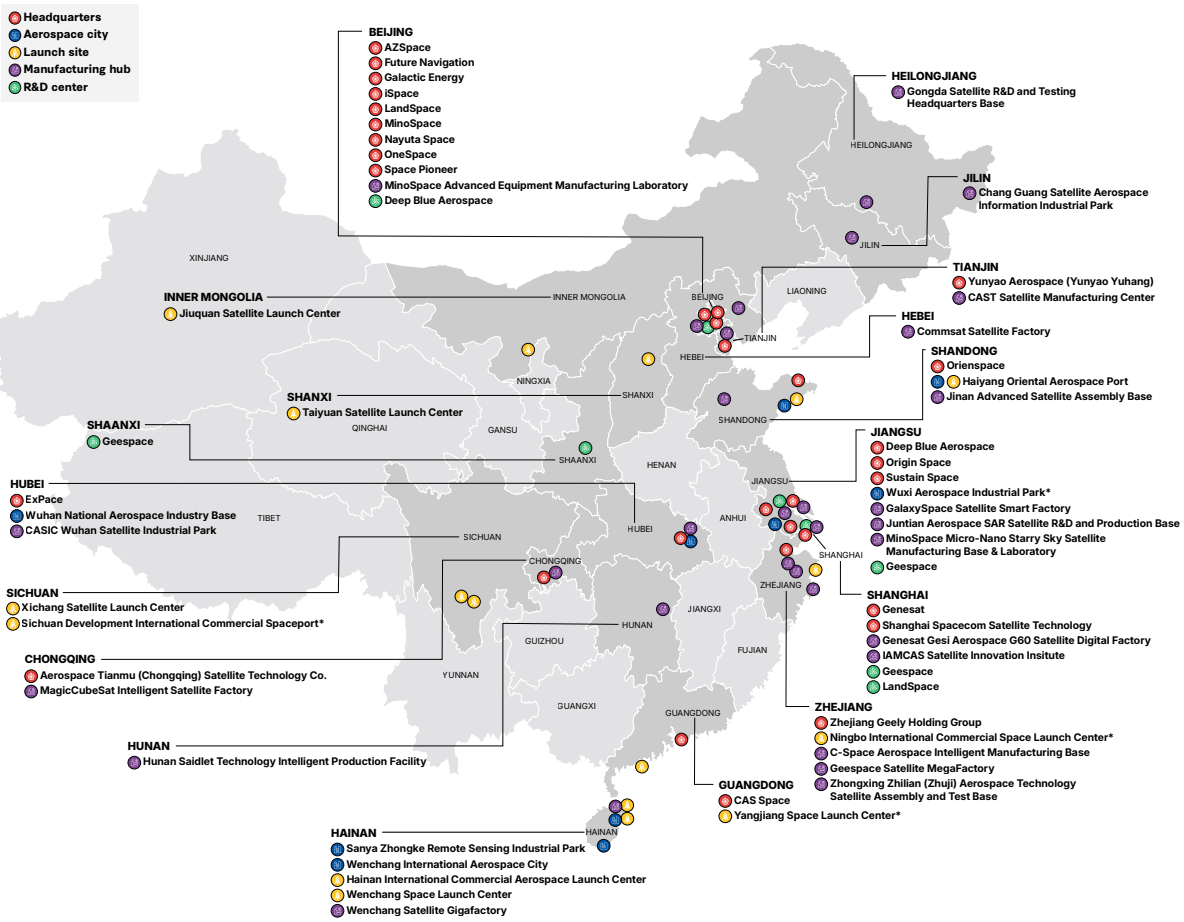
China's progress in its commercial space sector and manufacturing base is stunning—in both scale and speed. U.S. policymakers must understand these dynamics now, before the United States finds itself outpaced in sheer industrial capacity and output. Otherwise, commercial space could follow the trajectory of sectors such as 5G telecommunications, shipbuilding, and drones, where China has leveraged scale, state support, and industrial policy to build industrial advantages with significant economic and national security implications.

An Expanding Commercial Footprint and Industrial Base

Since Beijing opened portions of its space industry to private investment in 2014, China's commercial space ecosystem has expanded from fewer than a dozen firms to some 600 today. These companies span space launch, satellite communications (SATCOM), remote sensing, navigation, weather, and emerging areas such as in-space servicing and commercial human spaceflight.

Although many are described as private enterprises—not fully state owned or operated, receiving private or mixed capital, and offering products or services on the open market—in practice they operate within a distinctly Chinese model in which commercial activity remains closely aligned with state priorities. National ministries and provincial governments have incorporated commercial space into development plans, supporting the growth of aerospace cities, technology hubs, research centers, and manufacturing facilities across the country.

Figure 2: China's Commercial Space Footprint



Note: *In development.

Source: CSIS Aerospace Security Project.

Commercial launch and satellite broadband have emerged as the clearest examples of Beijing's ambitions. No less than 10 launch startups have entered the market since 2014 to challenge and complement the state-run Long March rocket monopoly. The state-backed low Earth orbit (LEO) broadband constellation Guowang and commercial systems such as Thousand Sails seek to deploy more than 10,000 satellites each in direct competition with SpaceX's Starlink, with each also providing both economic and military utility. Other areas of commercial growth include space-based remote sensing, where close state ties are enabling the development of systems that rival—and in some cases exceed—the capabilities of U.S. commercial competitors. Chinese firms

are also expanding into navigation and weather services, in-space servicing, and commercial human spaceflight.

China is simultaneously building the manufacturing base needed to support this growth, including satellite "gigafactories" and "smart factories." The authors assess that China is currently capable of producing approximately 4,100–5,000 satellites per year, mostly small satellites in the 100–500 kg range, across 17 major production facilities, with additional factories under construction (see Table 1).[4] One Chinese trade blog estimates that, as of April 2026, there is a current nationwide production capacity of 4,050 satellites per year across 36 factories, and an additional capacity of 3,310 per year being added, with 16 facilities under construction and 3 planned (bringing total planned capacity to 7,360 satellites per year).[5]

Table 1: Summary of Satellite Manufacturing Factories and Production Capacity

Company / Factory	City / Municipality	Production Capacity (annual estimated)
Wenchang Satellite Gigafactory	Wenchang	1,000
Genesat Gesi Aerospace G60 Satellite Digital Factory	Shanghai	300–600
Geespace Satellite MegaFactory	Taizhou	500
GalaxySpace Satellite Smart Factory	Nantong	300
IAMCAS Satellite Innovation Institute*	Shanghai	300
CASIC Wuhan Satellite Industrial Park*	Wuhan	240
CAST Satellite Manufacturing Center*	Tianjin	240
C-Space Aerospace Intelligent Manufacturing Base	Zhuji	200–500
Zhongxing Zhilian Aerospace Technology Satellite	Hangzhou	200
Chang Guang Satellite Aerospace Information Industrial Park	Changchun	100–200
Gongda Satellite R&D and Testing Headquarters Base	Harbin	180
MinoSpace Micro-Nano Starry Sky Satellite Base, MinoSpace Advanced Equipment Manufacturing Laboratory	Wuxi, Beijing	150
Hunan Saidlet Technology Intelligent Production Facility	Zhuzhou	150
MagicCubeSat Intelligent Satellite Manufacturing Center	Chongqing	100
Commsat Satellite Factory	Tangshan	100
Jinan Advanced Satellite Assembly Base	Jinan	20–100
Juntian Aerospace SAR Satellite R&D and Production Base	Wuxi	100
	Total	**4,180–4,960**

Note: *Includes state-owned enterprises (SOEs).

Source: CSIS Aerospace Security Project.

These modern, largely "greenfield" factories that have emerged across the country are sized for producing hundreds to thousands of satellites per year. They employ cutting-edge manufacturing techniques such as digital twin design, robotic assembly, and automotive-style pulsed production methods to enable industrial-scale satellite production.

This growth is being underwritten by a blend of private capital, state-owned enterprises (SOEs), and government funding. That investment model is paired with a deliberate effort to adapt successful U.S. commercial practices. Venture capital managers with Western experience are openly drawing on U.S. business models and innovation incubators. SpaceX has become both a benchmark and catalyst for China's launch startups and satellite broadband ventures, with entrepreneurs emulating the Falcon 9 and Starlink playbook through reusable launch, mass satellite production, vertically integrated operations, and low-cost deployment at scale, all with the hopes of gaining a similar level of success.

Despite this breadth of activity and enthusiasm, China's commercial space sector also faces considerable technical, structural, and market headwinds. Chinese firms continue to confront the complexities of launch development and operations; notably, no commercial launch company has yet successfully recovered and reused a rocket. As companies move into large-scale satellite manufacturing and deployment, some—including Thousand Sails—have experienced delays, on-orbit failures, and quality issues. Beyond these technical hurdles, the rapid expansion of launch firms, satellite manufacturers, and industrial parks also raises risks of fragmentation and overcapacity. The industry remains heavily dependent on state financing and administrative direction, with many firms continuing to struggle with profitability and limited commercial demand outside China. Yet these weaknesses are unlikely to impede China's broader trajectory.

Strategic Implications

The scale and speed of this buildup carry significant implications for U.S. economic and national security interests. China has repeatedly used state-backed industrial policy to establish dominant positions in strategically important industries such as shipbuilding, 5G telecommunications, critical minerals, and green technology manufacturing—often before the United States can mount an effective response. Beijing appears willing to tolerate inefficiency, duplication, and excess capacity if doing so advances long-term strategic objectives. Commercial space increasingly reflects that same industrial model.

China is leveraging its commercial space advancements to construct a broader global information and communications architecture that could reshape digital infrastructure and influence worldwide. Through the Belt and Road Initiative (BRI) and related efforts such as the Space Silk Road, Chinese firms are exporting bundled communications, navigation, remote sensing, and digital infrastructure services—often supported by subsidized pricing, state financing, and turnkey implementation packages—to developing countries across Africa, Latin America, Southeast Asia, and beyond.

Although China still faces constraints in profitability, launch maturity, and international trust, the broader trajectory is clear: Beijing is positioning itself to become a dominant global space power.

Broadband constellations such as Guowang and Thousand Sails are intended not only to compete with SpaceX's Starlink, but also to establish alternative communications ecosystems increasingly outside Western standards and governance frameworks. Although China still faces constraints in profitability, launch maturity, and international trust, the broader trajectory is clear: Beijing is positioning itself to become a dominant global space power capable of shaping the infrastructure, standards, and information flows that underpin economic and geopolitical competition in the decades ahead.

The United States still leads in innovation and scientific excellence. But China's system, for all its constraints, is engineered for speed, scale, and cohesion. Prevailing measures of space power—such as launch totals and satellite counts—are often lagging indicators and may fail to capture the industrial foundations now being built across China. The facilities, industrial clusters, financing patterns, and manufacturing capacity examined in this report provide early indicators of Beijing's long-term trajectory. If current trends continue, China could narrow the gap with the United States not because it invents more, but because it follows fast and builds faster: marshaling its industrial base, capital, and political system behind a single vision to become the world's leading space power.

Authors' Notes

Drawing on independent research and publicly accessible sources of information, this report offers a comprehensive narrative of China's commercial space developments and their strategic implications. The report captures:

- China's national and subnational policies, implementation plans, and investment trends shaping its commercial space activities;
- China's key companies and sectoral trends in launch, SATCOM, remote sensing, global navigation satellite systems, and other areas;
- China's space industrial base and manufacturing landscape; and
- China's growing commercial presence in global space markets, particularly through the BRI.

Given the opacity surrounding China's space activities and the Chinese state more broadly, this report is neither exhaustive nor policy prescriptive. Instead, it seeks to illuminate the scale, trajectory, and strategic implications of China's commercial space expansion for U.S. economic and national security interests.

Information in the report is current as of April 30, 2026, with some datasets current as of December 31, 2025. All translations are the authors' own, unless otherwise noted. The currency conversion rate used is USD 1 = RMB 7.2.[6]

To preserve access to source material, as China has a history of deleting or altering webpages, details for select online sources have been redacted in several footnotes and are denoted as "details redacted to protect source material." Complete source information is available from the authors upon request.

1

China's Evolving Approach to Space Power

"To explore the vast cosmos, develop the space industry and build China into a space power is our eternal dream."

- Xi Jinping, "China's Space Program: A 2021 Perspective"[7]

The People's Republic of China (PRC) is on an unrelenting mission to become a global space power second to none. Its leaders have long viewed space as a crucial domain for military, economic, and technological power, but President Xi Jinping has personally elevated it as an essential component of his vision for "national rejuvenation."[8] Xi has consistently linked the development of a robust space ecosystem to his broader ambitions for China to reclaim what he describes as its rightful place as a global leader in science, technology, and great power influence.

Chinese leaders also frame their space ambitions in terms of competition with the United States. Official statements regularly contrast China's progress with that of "leading space powers," a euphemism that points above all to the United States. Beijing's push to develop commercial space missions reflects not only national aspirations but also a determination to close the gap with U.S. technologies and to contest U.S. dominance in strategic industries. In Chinese discourse, becoming a global space power is inseparable from matching or surpassing the United States across the full spectrum of civil, commercial, and military space capabilities.

China's Strategic Objectives in Space

Official statements and planning documents make clear that Beijing views space as an indispensable domain for advancing its long-term national interests. In its most recent government white paper outlining the state's approach to space, "China's Space Program: A 2021 Perspective," central authorities frame the mission of the country's space program in expansive terms: to deepen humanity's understanding of the cosmos, to facilitate international consensus on peaceful use, to meet the demands of economic and technological development, to strengthen national security, and to elevate the "scientific and cultural level" of the Chinese people.[9]

Notably, these objectives have both pragmatic and ideological dimensions. On a practical level, they recognize space technologies as critical enablers of economic development and national security in a digitized global economy. They also highlight the symbolic importance of space as a mark of prestige and legitimacy for the CCP. Ultimately, they closely reflect the core priorities of the CCP more broadly in four key areas: delivering economic growth and public services, building a cutting-edge military, showcasing the party's competence and prestige on the world stage, and stimulating a strong domestic interest in its space technology ambitions.[10]

In Chinese discourse, becoming a global space power is inseparable from matching or surpassing the United States across the full spectrum of civil, commercial, and military space capabilities.

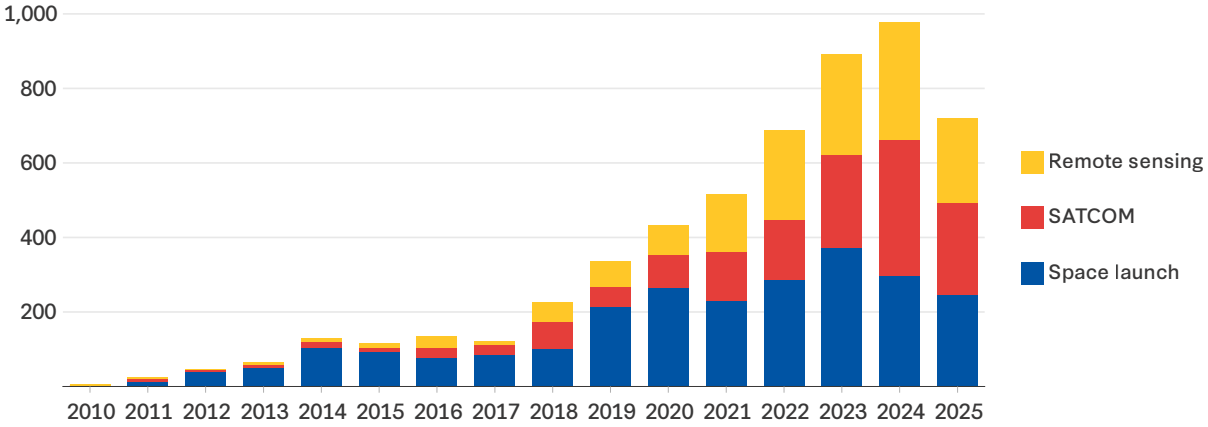
SPACE AS A NEW ECONOMIC ENGINE

As China navigates a challenging, high-stakes transition from an investment- and debt-driven growth model to one led by advanced technologies and higher-value industries, its leaders have explicitly positioned space as a pillar of what policymakers call "new quality productive forces" (新质生产力). This concept, first introduced by Xi in 2023, refers to industries that can generate sustained, innovation-driven growth rather than relying on traditional inputs such as labor or capital.[11] The global space economy, which is projected to reach $1.8 trillion in value by 2035, according to estimates by the World Economic Forum, provides an attractive opportunity to drive this high-value industrial transition.[12]

Chinese economic planners increasingly view the emerging space economy as a catalyst for future growth. In the 2024 edition of the State Council's Government Work Report—among the country's most important annual policy planning documents—Premier Li Qiang called on the government to "foster new growth engines in fields such as biomanufacturing, commercial spaceflight, and the low-altitude economy."[13] In the next year's edition, Li pointed to the growth of the country's commercial space sector as evidence of "innovation-driven development" and pledged to continue to promote its "safe and sound development."[14]

Chinese firms and state entities have responded accordingly. Over the past seven years, patent filings for space-related technologies have risen sharply. Across a dataset of 48 state-owned and private aerospace entities, filings related to space launch, satellite communications (SATCOM), and remote sensing technologies have increased substantially (see Figure 3).[15]

Figure 3: Globally Published Chinese Space-Related Patent Filings



Note: This dataset presents families of patent filings as the unit of measurement for individual inventions as multiple filings often occur across multiple jurisdictions for the same invention. The decline in globally published space-related technology patents in 2025 should not be interpreted as waning Chinese interest in these technologies. Publicly available patent data often lags actual filings. The dataset is current as of February 2026.

Source: Strider Technologies.

In the area of space launch, the top 10 patent-filing entities account for approximately 2,340 patents filed since 2010. The largest share, 27 percent, belongs to the China Academy of Launch Vehicle Technology (CALT), the state's largest research and production center for rocket and missile systems. The remaining nine top filers are all commercial launch startups, underscoring the growing role of private firms in China's launch ecosystem. These companies are discussed in greater detail in Chapter 3.

A similar pattern is visible in the SATCOM sector. The top patent filer is the China Academy of Space Technology (CAST), one of the state's leading satellite developers and manufacturers. Among the top 10 SATCOM patent filers—together accounting for roughly 1,280 patents—the largest share (53 percent) come from SOEs, followed by private firms (36 percent) and state research institutions (11 percent). These firms are examined further in Chapter 4.

Patent trends offer a window into the trajectory of emerging space technologies. In the United States, patent applications are "an indicator of commercial potential."[16] Similarly, Beijing views patents, or high-value intellectual property (IP), as a "key indicator of a country's innovation performance."[17]

In Chinese-language discourse, space is not only discussed as a promising high-value emerging industry but also viewed as an enabler of growth in other sectors. Chinese analysts point to the emergence of a "low Earth orbit economy" (低轨经济) as an economic base for new industries,

such as satellite internet, space tourism, advanced agriculture, in-space manufacturing, and clean energy.[18] As one Chinese Academy of Sciences (CAS) researcher explained, "If you want to get rich, you must first build roads, and the same is true in space. . . . Once this highway is built, there may be more demand for mass production of various satellites such as remote sensing observation, scientific research, and navigation services."[19]

Importantly, elevating space as a "new quality productive force" is also central to Xi's drive to achieve technological self-sufficiency. Chinese sources emphasize that building an "autonomous and controllable" (自主可控) high-tech ecosystem is key to reducing reliance on Western technologies and limiting exposure to supply chain chokepoints.[20] Developing a domestic space industry is thus cast as both an engine of growth and a cornerstone of China's broader strategy to secure its economic resilience in an era of intensifying global competition.

SPACE AS THE "STRATEGIC HIGH GROUND"

Beyond commercial applications, China also views space as a critical domain for military competition. While China's diplomatic position papers advocate for the use of space for "peaceful purposes" and oppose "any attempt to turn outer space into a weapon or battlefield or launch an arms race in outer space," the PLA clearly regards space control as essential for modern warfare.[21]

In the 2020 edition of the influential *Science of Military Strategy*, an authoritative textbook published by China's National Defense University, space is referred to as the "new commanding heights of military competition."[22] PLA publications similarly cast the space domain as a "strategic high ground" due to its decisive role in providing information dominance, enabling precision strikes, and gaining the initiative in modern joint operations.[23] Critically, space operations are central to the PLA's vision of "intelligentized warfare" (智能化战争), a concept defined by the integration of AI, big data analytics, and autonomous systems into command, control, and decisionmaking.[24]

In 2015, the PLA implemented organizational reforms to create the Strategic Support Force (SSF) which consolidated "space, cyber, and electronic warfare capabilities" into a centralized command structure.[25] This move came four years before the United States established its own Space Force. The SSF was dissolved in 2024 and replaced by three new "arms" (兵种), including the PLA Aerospace Force, that reports directly to the Central Military Commission (CMC).[26] So many organizational reforms in a short timespan reflect the PLA's prioritization of space as a critical domain, and may also signal dissatisfaction among Beijing's top-level leadership with the pace and direction of military development under previous structures.

China's military transformation is increasingly driven by military-civil fusion (MCF), now a defining feature of the country's aerospace development strategy. As discussed later, MCF seeks to harness commercial innovation and technology for military applications while simultaneously using the military system to spur local and national economic development.

Against this backdrop, it is no surprise that Chinese analysts are increasingly attentive to U.S. initiatives to integrate commercial space assets with civil and military systems, such as the Defense Innovation Unit's hybrid space architecture project. PLA-affiliated researchers are particularly

concerned about the role of proliferated LEO constellations such as Starlink in supporting U.S. military space operations. Chinese analysts have described Starlink as a "force multiplier" (力量倍增器) for U.S. military operations, giving the United States a decisive edge in command and communications, and have argued that the cooperation model between the U.S. military and SpaceX is "worth serious study and emulation" (值得认真借鉴).[27]

These assessments reinforce the conclusion that to compete effectively with the United States, China must build its own LEO broadband network with dual military and civilian functionality, but also cultivate a broader dual-use ecosystem of state and private space capabilities.

SPACE AS A SOURCE OF NATIONAL PRESTIGE

China's investments in human spaceflight and space science serve not only scientific and technological goals but also its broader pursuit of national prestige. Beijing views visible, high-profile achievements in space as a means of demonstrating the capability, confidence, and modernity of the CCP. The China-led International Lunar Research Station epitomizes this ambition. Planned for completion in stages between 2035 and 2050, the project seeks to establish a permanent scientific outpost at the Moon's south pole and expand into a broader lunar network.[28] By positioning itself as the anchor of a multilateral venture that includes Russia and other partners from Asia, Africa, Eastern Europe, and Latin America, China is laying its claim to leadership in space science beyond traditional Western coalitions.[29]

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In addition to the planned research station, China has developed a long-term planetary road map for deep space exploration and scientific advancement.[30] Planned missions include the Tianwen-3 Mars sample return (2028), Tianwen-4 Jupiter and Callisto orbiter (2029), Habitable Environments Simulator (2030), Venus atmospheric sampler return (2033), Mars Science Station (2038), and Neptune orbiter mission (2039). In 2024, China became the first country to return samples from the far side of the Moon—an achievement that drew global attention and domestic celebration.[31] Importantly, it reinforced China's image as a peer competitor to the United States in the highly visible and politically resonant domain of space exploration.

SPACE AND THE NATIONAL PSYCHE

Beyond national prestige, space is also being woven into the national psyche, society, and culture. China's ascent as a global space power also carries the attendant effects of capturing imagination, recruiting technical talent, and attracting capital. In 2016, Beijing designated April 24 as "Space Day" to commemorate China's achievements in space exploration.[32] National branding is taking root, with examples of regions such as "Rocket Street" (火箭街) and "Satellite Valley" (星谷) aiming to be Silicon Valley-like hubs for aerospace industry and innovation.[33]

Figure 4: Rendering of the Wuxi Aerospace Park

Source: liangxifabu/GoWuXi, June 17, 2024, https://www.gowuxi.com/2024-06/17/c_996501.htm.

Chinese filmmakers are producing space films and documentaries, as seen through the rise of space sci-fi films in China. The 2019 film *The Wandering Earth* was billed as a "breakthrough" for Chinese sci-fi, and the 2025 documentary *SHENZHOU 13* (or *Blue Planet Outside the Window*, in English) received positive reviews for taikonauts' "tremendous cultural creativity and personal charisma."[34] Space tourism and even space-themed amusement parks are also emergent.[35] Wenchang International Aerospace City on Hainan Island aspires to be the "capital of aerospace tourism," especially during space launches, similar to Cape Canaveral, Florida.[36] One journalist noted that in the past two years, "the number of hotels has gone from five to more than 50" and "room rates at the Hilton Wenchang can be seven times higher when there's a launch."[37]

The Rise of "Commercial" Space

China's rapidly growing commercial space sector has quickly become a major component of its space program, signaling an emerging shift from a fully state-run model toward a more diversified and market-oriented ecosystem. In this report, "commercial space" refers to firms that are not fully government owned or operated, receive private or mixed capital, and offer products or services on the domestic or international market. In practice, however, this distinction is difficult to draw in China. Many companies classified as "commercial" maintain close institutional, financial, or personnel ties to the state. As a result, China's commercial space industry can be best understood as a hybrid model that is market-oriented and market-driven but still deeply embedded within the state's strategic and bureaucratic architecture.

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For most of its existence, China's space industry was controlled by government agencies and large military-affiliated SOEs such as the China Aerospace Science and Technology Corporation (CASC) and the China Aerospace Science and Industry Corporation (CASIC). The system was modeled after the Soviet Union's space sector, with a centralized structure that kept space activity under strict state control and treated it as an extension of the defense establishment. This structure delivered important achievements, including the launch of China's first satellite in 1970, its BeiDou position, navigation, and timing system, and the steady progress of its crewed Shenzhou program, but it constrained innovation and left little room for smaller players.

China opened the door to a hybrid model in the late 1980s. In 1987, a French entity contracted with the PRC to host a scientific payload on a PLA reconnaissance satellite that was launched atop a Long March 2C rocket. In 1990, the first U.S.-manufactured satellite, a Hughes communications satellite, Asiasat, was launched on a Long March 3 rocket operated by the state-owned China Great Wall Industry Corporation. A total of 27 U.S.-manufactured satellites were launched on Chinese Long March rockets in the 1990s, and deals were made for the PRC to launch Iridium and Globalstar communications satellites. However, all this came to a halt in 1998 after it was discovered that China was conducting a widespread espionage campaign to steal U.S. nuclear warhead designs and missile technology and using U.S. space companies to gain technology insights to improve its missile capabilities, as documented in the 1999 U.S. congressional report known as the Cox Commission.[38] Stringent U.S. controls on the export of space technology and know-how to China followed, and a promising commercial market for Chinese space launches dried up.

By the mid-2000s, the limits of China's approach were becoming clear as technological advances started reshaping the space industry and its economics, even as U.S.-led export controls prevented these technologies from reaching China. In the United States, new firms such as SpaceX and Blue Origin demonstrated that private companies could compete with or even surpass traditional government programs. In subsequent years, SpaceX's ability to reduce launch costs, secure NASA contracts, and make progress on the Starlink mega-constellation became a frequent point of study in Chinese technical and policy commentary.

In 2014, China opened the floodgates for commercial investment when the State Council issued Document 60, "Guiding Opinions on Innovating Investment and Financing Mechanisms in Key Areas and Encouraging Social Investment."[39] The document called on the government to "encourage private capital to participate in the development of national civil space infrastructure," relaxing legal restrictions and opening the door for a new generation of commercial firms.

The next year, Beijing issued the National Medium- to Long-Term Civilian Space Infrastructure Development Plan (2015–2025), which set priorities for building China's civilian space

"backbone."[40] The plan called for an autonomous, reliable, and continuous national space infrastructure encompassing satellite systems, ground networks, and data applications. It emphasized reducing dependence on foreign systems while promoting diversified investment and commercial participation, signaling a shift from purely state-funded projects toward a more market-oriented model.

Table 2: China's Evolving Approach to Commercial Space

Edition	Key Quote
China's Space Activities in 2000	"The state encourages scientific research institutions, industrial enterprises, **commercial enterprises**, and universities, guided by national space policies, to leverage their respective strengths and actively participate in space activities."[41]
China's Space Activities in 2006	"Actively **promote the commercialization** of satellite communications and broadcasting, and expand the industrial scale of communications and broadcasting satellites and their applications."[42]
China's Space Activities in 2011	"China plans to . . . **further commercialize** satellite communication, and **expand the industrial scale** of the application of communications and broadcasting satellites."[43]
China's Space Activities in 2016	"**Nongovernmental capital** and other social sectors are **encouraged to participate** in space-related activities, including scientific research and production, space infrastructure, space information products and services, and use of satellites to **increase the level of commercialization** of the space industry."[44]
China's Space Program: A 2021 Perspective	"China will . . . **promote the opening and sharing** of major scientific research facilities and equipment **to commercial space companies, support commercial space companies** in participating in the development of major space projects, and **establish a negative list system for market access** for space activities to ensure orderly entry and exit and fair competition for commercial space companies."[45]

Note: Authors' translation; emphasis added.

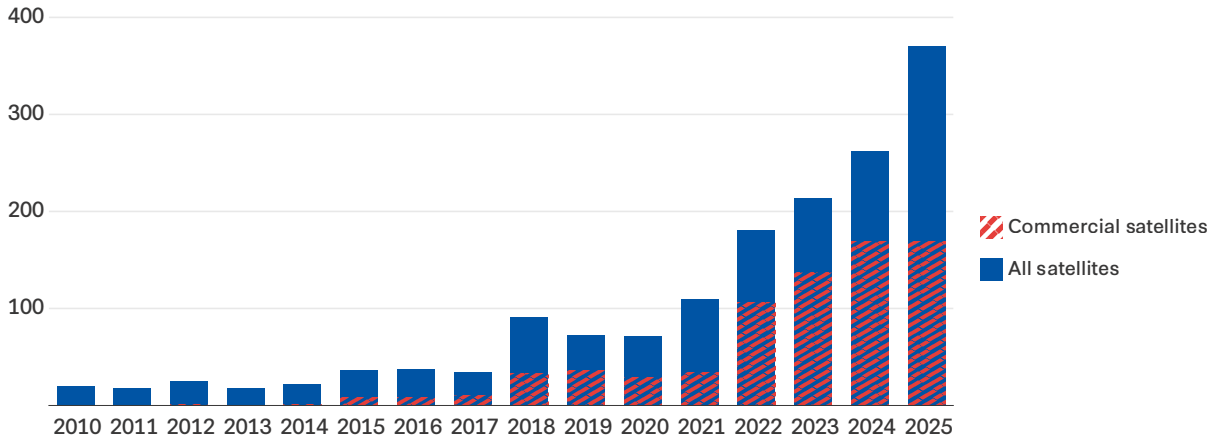
Source: State Council Information Office of the People's Republic of China.

China's evolving approach to commercial space can be traced through its official space policy white papers, released every five years since 2000. The first edition allowed commercial firms and universities to contribute to the sector, but only under state guidance. By 2016, a shift toward commercialization was clear, as the state was directed to actively encourage private investment and competition to accelerate growth. The most recent edition, from 2021, strengthened that trend, focusing the state on an "enabling role" for the market by building mechanisms to facilitate fair competition and boost regulatory transparency.

With the door opening to private sector participation, the number of commercial space firms operating in China has exploded, from under a dozen in 2014 to over 600 by 2025.[46] Many of the early entrants, such as Chang Guang Satellite Technology (CGSTL), LandSpace, and iSpace, were

led by established figures in China's state-run space ecosystem who brought deep engineering knowledge, financial access, and political connections to their new businesses.[47] Investment in China's commercial space sector—while initially modest—has grown rapidly in the ensuing years, swelling tenfold from $340 million in 2015 to over $3.8 billion in 2025, according to recent estimates by Orbital Gateway Consulting.[48] Those same estimates show that satellite manufacturers led the way for the first time in 2025, raising more than $1.4 billion in capital.[49] The share of commercial satellites in China's total satellites launched per year has risen steadily, reflecting the growing scale and maturity of the country's private space sector (see Figure 5). While the total number of U.S. satellites launched per year far exceeds China's totals, the numbers are much closer in recent years when Starlink is removed from the dataset. See the appendix for annualized data on Chinese, U.S., and rest of world satellite launches.

Figure 5: Chinese Satellites Launched per Year, Total vs. Commercial



Source: Dataset from Todd Harrison, "Global Space Data Navigator," American Enterprise Institute, accessed January 17, 2026, https://spacedata.aei.org/.

In November 2025, the China National Space Administration (CNSA) released its Action Plan for Promoting High-Quality and Safe Development of Commercial Space (2025–2027) and soon after established a dedicated commercial space department to implement it.[50] Together, these steps formalized Beijing's intent to foster a commercial space sector integral to achieving its strategic objectives in space. The plan lays out a wide set of tasks focused on accelerating technological development, expanding access to state-owned infrastructure, strengthening government procurement of commercial services, and tightening regulatory and safety oversight.

Notably, the plan frames commercial activity as an explicit complement to state-led efforts. It encourages commercial entities to "actively participate" in the advancement of "civil aerospace engineering projects and major national projects," and presses them toward more advanced technology areas, including reusable launch systems, on-orbit servicing, and new space-based manufacturing capabilities. This reflects an effort to align commercial innovation and investment

with broader national priorities and to accelerate the adoption of new technologies across both civilian and state missions.

HARNESSING THE INDUSTRIAL POLICY PLAYBOOK

China's approach to developing its commercial space industry mirrors an industrial playbook that has proven remarkably successful in other sectors. Chinese firms have achieved global dominance over a growing list of strategic industries, including solar energy, 5G telecommunications, electric vehicles (EV), and shipbuilding, using a broadly similar model.[51] In each case, Beijing used a blend of central directives, local-level competition, industrial subsidies, and selective market liberalization to accelerate innovation and capture global market share. This approach is now being applied to space.

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The playbook begins with central policy direction set through initiatives such as Made in China 2025—in which aerospace was denoted as one of 10 priority technology sectors—and successive five-year plans that outline high-level economic priorities and set performance benchmarks.[52] Provincial and municipal governments then compete to implement these priorities by attracting investment and nurturing firms through subsidies, tax incentives, dedicated infrastructure, and other regulatory support. As industries mature, central authorities guide consolidation, promote standardization, and channel financial support to leading firms positioned to compete globally. The process has proven effective in enabling Chinese companies to achieve economies of scale, move up the technological ladder, and push out global competitors in other high-value industries.

As later sections of this report will explore in depth, a similar pattern is now emerging in the space sector, centered on industrial clustering and ecosystem building. Local governments have established specialized aerospace zones focused on different segments of the industry—such as satellite internet in Shanghai, remote sensing in Changchun, and space launch and rocket technology in Guangdong and Shaanxi provinces. These clusters bring together startups, universities, and suppliers within shared innovation parks, providing firms ready access to technologies, test infrastructure, scaled production, and additional expertise. Often, they arise around established SOEs, which serve as epicenters of technological innovation, talent, and local government financing. The result is a multilevel system in which experimentation and policy support at the local and provincial level feeds into a fiercely competitive national market, enabling China's commercial space ecosystem to evolve quickly while remaining aligned with national industrial goals.

China's commercial space sector is now in a transition phase, shifting from rapid expansion toward early stages of maturity. Chinese analysts characterize the industry as having evolved

beyond its startup phase into a period of accelerated growth marked by regional clustering and a fast-developing yet uneven supply chain.[53] The next stage, envisioned for the 15th Five-Year Plan period (2026–2030), will likely focus on reaching new technological breakthroughs, strengthening foundational supply chains, improving quality standards, and achieving a more stable balance between government coordination and market-driven growth.[54]

MILITARY-CIVIL FUSION

The concept of military-civil fusion (MCF) (军民融合) has become a defining feature of China's approach to aerospace development. Elevated by Xi Jinping to a national strategy in 2017, MCF seeks to "build an integrated national strategic system and capability" by aligning economic development and national security strategies under centralized party-state direction.[55] In the space sector, where technologies such as launch vehicles, satellite communications, propulsion systems, and remote sensing have significant dual-use applications, the strategy is intended to ensure that commercial innovation simultaneously advances military modernization, industrial capacity, and strategic autonomy.

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Institutionally, this integration operates through overlapping party and state organizations, dedicated financing vehicles, and provincial implementation programs. The CCP's Central Commission for Integrated Military and Civilian Development, chaired by Xi Jinping, provides top-level direction, while the State Administration of Science, Technology, and Industry for National Defense (SASTIND) oversees civilian-defense integration. Provincial governments also implement local integration projects that link commercial clusters with military needs, often through dedicated MCF funding vehicles and co-funded research centers.

These mechanisms extend directly into the financing and ownership structures of China's commercial space sector. National-level MCF funds, along with provincial vehicles in places such as Sichuan and Shaanxi, have been invested in private satellite manufacturers and launch providers. Launch startups CAS Space and ExPace, for example, count the National Military-Civilian Integration Industry Investment Fund (国家军民融合产业投资基金有限责任公司) among their investors. ExPace is majority owned by China Sanjiang Space Group, itself a CASIC subsidiary focused on missile and rocket development for the PLA.[56]

While stimulating local industries and economies, these mechanisms also ensure that commercially viable technologies contribute to national defense readiness and supply chain resilience. Commercially focused firms such as GalaxySpace, ExPace, and CGSTL have participated in projects with clear military applications, including secure communications networks, small-lift launch services, and Earth observation data collection. Many of China's leading commercial space companies, including LandSpace, Deep Blue Aerospace, and ExPace are also registered as PLA defense industry suppliers.[57]

Chinese commercial space firms themselves increasingly frame their activities in strategic terms, knowing their systems contribute to military modernization. As one startup executive explained in 2018, "If commercial rockets succeed and prosper, then the military can pit commercial rockets against state-owned rockets to extract the best value, which is good for the military."[58]

Chinese analysts frequently point to SpaceX and Starlink as evidence of the strategic advantages created by close integration between commercial and military entities. Chinese commentators argue that Starlink's scale, resilience, and decentralized architecture provide the United States with a decisive edge in command and communications by blurring the line between civilian and military space infrastructure—a model many analysts suggest the PLA should emulate.[59] This view has reinforced plans for China to build its own LEO broadband networks with dual military and civilian functionality. Ongoing initiatives such as the Guowang (国网) and Thousand Sails satellite constellations, along with projects led by CASC and CASIC subsidiaries, are explicitly framed in these terms.[60]

2

China's Subnational Space Industrial Policies

China's space industrial policy operates through a multilevel governance system in which national and subnational authorities play distinct but mutually reinforcing roles. As previously discussed, national-level policy provides an overarching blueprint for the country's ambitions in space, defining strategic priorities such as self-reliance in core technologies, the integration of civilian and military capabilities, and the development of globally competitive aerospace firms.[61]

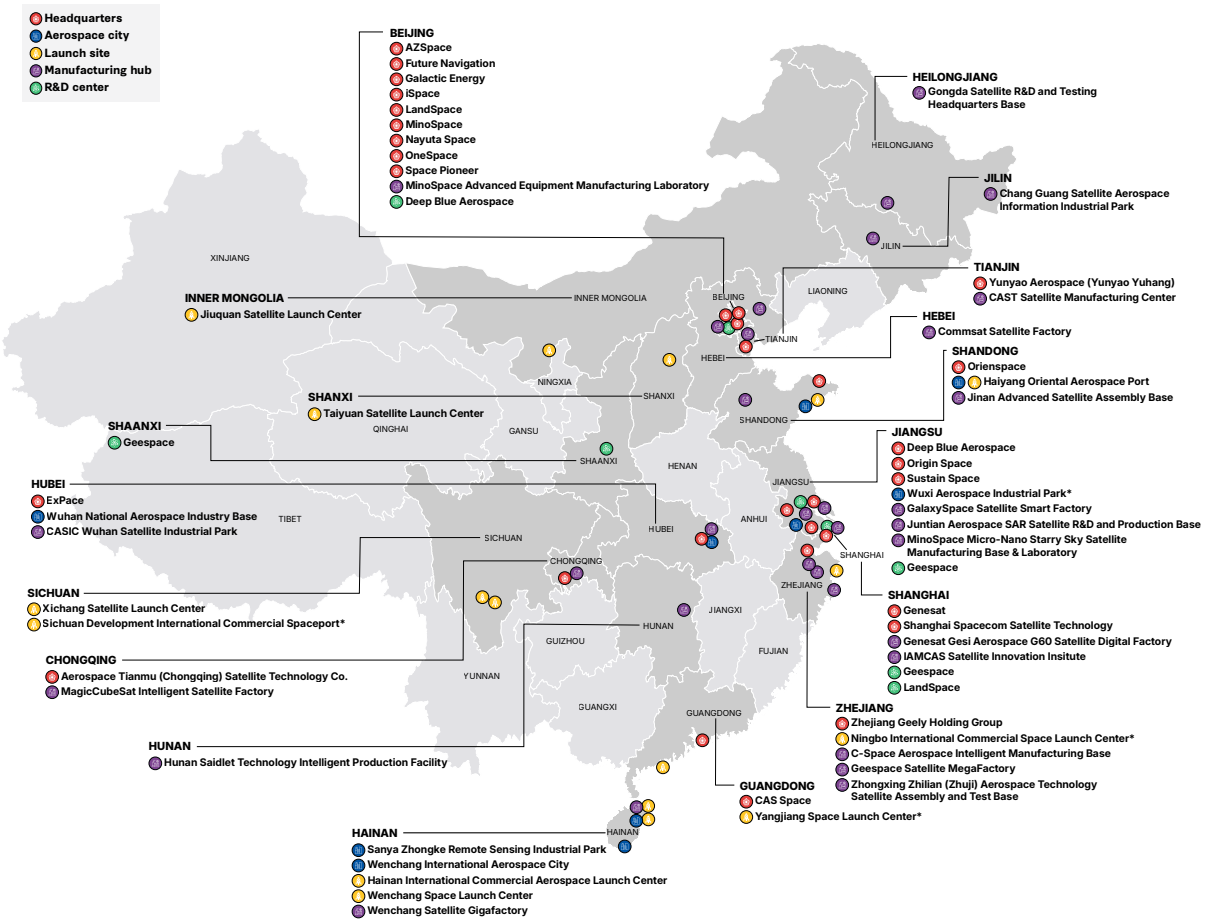
Yet, to understand how these ambitions are realized in practice, it is necessary to look below the national level. While central authorities provide broad strategic direction, China's industrial policy is executed primarily at lower levels of governance, from provinces and municipalities to cities and districts. This process can be directly observed through provincial- and local-level action plans, policy documents, and investments, which provide a more in-depth look at the space industry clusters fostering growth in China's commercial space ecosystem.

Billions of yuan are being plowed into the development of large-scale aerospace cities, industrial space parks, and expanded launch sites.

At the subnational level, billions of yuan are being plowed into the development of large-scale aerospace cities, industrial space parks, and expanded launch sites. These include Wenchang

International Aerospace City on Hainan Island and Haiyang Oriental Aerospace Port in Shandong Province. China's expanding commercial space footprint is reflected in Figure 6, while a few key examples of these action plans for space growth are discussed below.

Figure 6: China's Commercial Space Footprint



Note: See Figure A-3, page 91, for an expanded view of this map.

*In development

Source: CSIS Aerospace Security Project.

BEIJING (北京)

Beijing is China's leading space industrial cluster, with over 300 commercial space firms and over half of the sector's unicorns and top performers.[62] Beijing's space ambitions are captured in its Action Plan to Expedite Innovative Development of Commercial Aerospace Industry (2024-2028), with further activities captured at the district level.[63] The action plan is centered around four principles: servicing larger national goals, leading in innovation within the commercial space sector, ensuring the growth of the aerospace industry is driven by current societal needs, and pioneering policy and management reforms to enable innovative commercial spaceflight development.[64]

By 2028, Beijing plans to make advancements in reusable rocket technologies, accelerate the development of low-cost satellite constellations, increase the applicability of space products to support the aerospace economy, stimulate industrial innovation, build a solid industrial foundation, increase efficiency within the sector, and cooperate with international partners to further the reach of its commercial sector.[65]

This plan splits the municipality into regional spheres of industrial specialization, with the south focused on rocket construction and the north on satellites—dubbed "South Rocket, North Satellite" (南箭北星).[66] Beijing's "Rocket Street" (火箭大街) is located in the city's Daxing District to the south, in proximity to the China Rocket Company (中国长征火箭有限公司), a subsidiary of CALT, allowing for closer integration between SOEs and commercial firms.[67] Announced in 2024, Rocket Street is planned as a specialized industrial park for research and development (R&D) and launch services for rockets in the district's Yizhuang economic-technological development zone (or "Beijing E-Town").[68] The district aims to establish an industrial cluster of "high-end manufacturing" facilities for "satellite R&D, constellation operations" and to incubate companies developing "innovative applications" that "utiliz[e] aerospace information."[69] A February 2025 conference on "commercial space industry high-quality development," themed "together, building dreams in space," cited the development of the Yizhuang commercial aerospace industry as key to the district's economic success.[70] The conference proceedings touted eight new laboratories within the district, focused on reusable space transportation systems, propulsion technology, satellite internet applications, and satellite networking and control.[71]

To the north, the Haidian District is creating "Satellite Valley" (星谷), a Silicon Valley–like innovation hub largely clustered around CAST's headquarters, allowing for similar SOE-commercial coordination in satellite manufacturing as in the south. The project was launched by the Zhongguancun Science City (中关村科技城) and is home to the headquarters of aerospace companies such as Aotian Technology, a specialist in satellite electric propulsion systems.[72] The Haidian District Action Plan for 2024–2028 outlines a vision to be a leading aerospace and innovation center and to expand development of the commercial space industry.[73] Other districts across Beijing are also reportedly positioning themselves as leaders in specific areas, including the Chaoyang District, which aims to advance "communication, navigation, and remote sensing applications" and the Fengtai District, which is focused on commercializing aerospace science and technology advancements.[74]

SHANGHAI (上海)

The General Office of the Shanghai Municipal People's Government published the Action Plan to Promote Commercial Space Development and Create a Space Information Industry Highland (2023–2025) in November 2023.[75] It called for greater manufacturing across the space value chain, including for rockets and satellites, ground stations and terminals, and industrial capacity for "an annual output of 50 commercial rockets and 600 commercial satellites by 2025."[76] A follow-on document issued by Shanghai's Municipal Commission of Economy and Information Technology in April 2025 quietly extended the timeline for these targets to 2027 while simultaneously raising them to an annual rocket assembly capacity of 100 and satellite manufacturing capacity of 1,000.[77]

Of note, in January 2025, Chinese People's Political Consultative Conference members called for an acceleration of the international development of Shanghai's space industry, perhaps an indicator that progress had not been made on the anticipated timelines.[78]

GUANGDONG (广东)

In Guangdong Province, the Action Plan for Promoting the High-Quality Development of Commercial Space (2024–2028) sets several key milestones. By 2026, Guangdong aims to grow its commercial aerospace economy and related industries to RMB 300 billion (USD 42 billion), and by 2028, it aims to have processes in place to advance satellite and rocket R&D.[79] Areas of focus include strengthening technology R&D, cross-sector collaboration, industrial innovation, industrial chains, infrastructure development, the applicability of aerospace to key industries, and information and data exchanges.[80]

The province appears focused on space launch and rocket technology. In 2025, it announced plans to construct the Yangjiang Space Launch Center, with investments totaling over RMB 9.2 billion (USD 1.3 billion).[81] The coastal city space port is planning sites for rocket and satellite final assembly and testing, and sea- and land-based launch operations.[82] Other regions in the province will support rocket engine and satellite manufacturing, assembly, testing, and production. The space launch company CAS Space, headquartered in Guangzhou, claims it is the first Chinese commercial aerospace company capable of producing 30 rockets per year.[83] A CAS Space executive went further when highlighting the growing demand for rockets and rocket engines being generated by Chinese satellite broadband plans, saying that the company "aim[s] to make about 100 engines in Guangzhou each year in the near future to respond to the market demand."[84]

JIANGSU (江苏)

Jiangsu published its Three-Year Action Plan for the Development of the Aerospace Industry in Jiangsu Province (2023–2025) in April 2023.[85] The province aims to grow its aerospace industry output to over RMB 150 billion (USD 20.8 billion) by 2025. While the majority of covered programs seem to be focused on the aviation sector, the plan does emphasize a need to prioritize commercial space development, specifically focusing on the development of rocket engines, microsatellites, and the integration of satellite data with other information systems.[86]

Within the province, the city of Wuxi seeks to become a key industrial contributor to the nation's aerospace industry. In October 2025, city officials released a plan detailing measures to promote the development of the city's aerospace industry through the end of 2027.[87] Key areas of focus include providing nascent companies in rocket or satellite development with up to RMB 5 million (USD 694,000) in annual support, fostering talent cultivation and recruitment, and using government funds to support commercial aerospace companies.[88] Hongqing Technology, MinoSpace, and Juntian Aerospace have satellite manufacturing projects underway, while LandSpace announced plans in 2024 for an "intelligent manufacturing industrial base project" in Wuxi.[89] There are even ambitions for building an aerospace theme park.[90]

To the immediate northeast of Wuxi city, Nantong has established a key aerospace manufacturing center, specifically anchoring to GalaxySpace, a company building LEO broadband communication

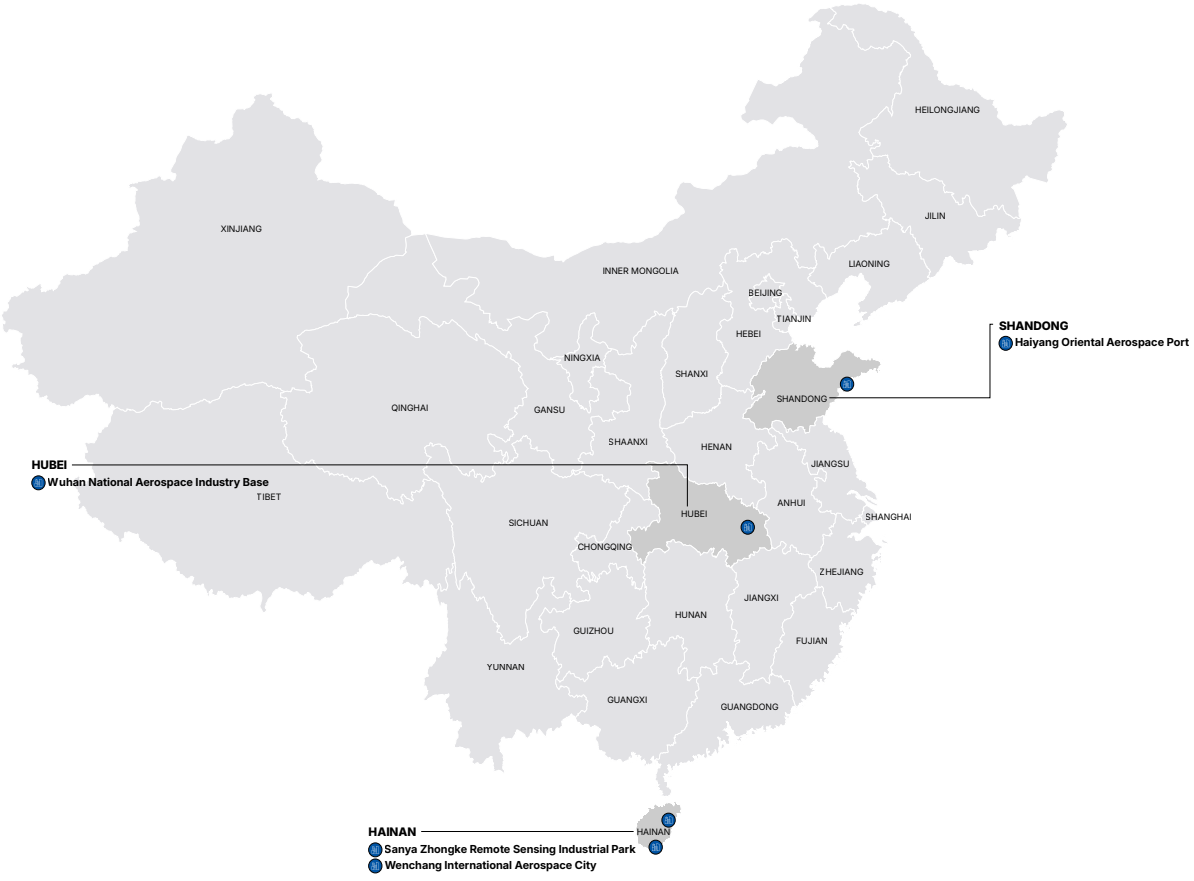
satellites for both government and commercial entities.[91] Its "Smart Satellite Super Factory" opened in 2020 with a capacity for 100–150 medium-sized satellites per year and plans to expand manufacturing capacity to 300–500 satellites per year. [92]

HUBEI (湖北)

Hubei has positioned commercial space as a "breakthrough" growth industry, issuing the Hubei Province Action Plan for Breakthrough Development of Commercial Aerospace (2024–2028) in May 2024.[93] The plan frames provincial development around "four chains"—rockets, satellites, data, and services—and calls for building a full "rocket-satellite-network-terminal" (箭, 星, 网, 端) ecosystem. By 2028, Hubei is targeting the capacity to manufacture 60 launch vehicles and 500 commercial satellites annually, and it sets an explicit goal of scaling the province's commercial space and related industries to over RMB 100 billion (USD 14 billion). The plan also prioritizes a technology agenda that includes methane-liquid oxygen (methalox) rocket engines, reusability, and improved low-cost satellite production as core bottlenecks to overcome.

The Rise of Aerospace Cities

Figure 7: China's Aerospace Cities



Source: CSIS Aerospace Security Project.

In addition to provincial and district action plans, Chinese cities are positioning themselves as national hubs for commercial space activity, reflecting Beijing's broader strategy of consolidating technological self-reliance and industrial depth in space. One major trend is the rise of big space cities, centers, and industrial parks, with the Wuhan National Aerospace Industry Base, the Wenchang International Aerospace City on Hainan Island, and the Haiyang Oriental Aerospace Port as emblematic examples of this movement.

Chinese cities are positioning themselves as national hubs for commercial space activity.

WUHAN NATIONAL AEROSPACE INDUSTRY BASE (武汉国家航天产业基)

Benefitting from early provincial and local investment in space development, Hubei's capital city of Wuhan has emerged as a major industrial hub. The Wuhan National Aerospace Industry Base, first developed in 2017, is a joint endeavor between the Hubei provincial government and CASIC. It is also China's first national-level commercial aerospace base.[94] The massive complex, located along the Yangtze River in eastern Wuhan, remains under development, with construction on new manufacturing facilities and enterprise centers continuing into 2026. Notably, the complex is just 2 km upriver from China's Wuchang Shipyard, a major production site for China's modern Type 039A/B diesel-electric submarines.[95] SASTIND and the Hubei provincial government have explicitly grouped the Wuhan National Aerospace Industry Base and Wuchang Shipyard's Shuangliu base together as "major military-civil fusion projects."[96]

Local officials have branded Wuhan as "China's Satellite Valley" (中国星谷) and aim to turn the region into a "key hub" in China's commercial aerospace architecture, boasting a "complete aerospace system" and an industry worth in excess of RMB 100 billion (USD 14 billion).[97] The emerging Aerospace Industry Base has infrastructure to support rocket and satellite manufacturing as well as provide ground system support and satellite application services.[98] According to the deputy general manager of the Space Engineering Department at the Second Academy of CASIC, China's Satellite Valley now hosts the nation's first intelligent manufacturing line for small satellites, creating a supply chain that allows it to go from "building satellites" to "using satellites."[99] The layout of the industry base gathers "unicorns" and "small giants" in upstream and downstream chains of satellite and rocket manufacturing to drive innovation and supply chain integration.

In July 2024, Wuhan released measures promoting the development of commercial aerospace, which lay out a "one core, two zones, and multiple parks" industrial geography anchored by the Wuhan National Aerospace Industry Base. The measures explicitly focus on new launch vehicles, satellite platforms and payloads, and launch-related services while encouraging differentiated "Aerospace+" demonstration parks across districts. The city has also committed significant fiscal support for commercialization and technological upgrades. For example, the city authorizes up to RMB 30 million (USD 4 million) per project for major "key core technology" efforts—explicitly including reusable rockets and integrated communications, navigation, and remote sensing (通导

遥一体化)–and provides additional matching support mechanisms tied to provincial awards and national-level science and technology programs.[100]

As of the end of 2025, Hubei officials claim that the valley is capable of producing 240 satellites and 50 rockets per year.[101] At the 2025 China (International) Commercial Aerospace Forum in Wuhan–China's leading annual gathering of government and commercial aerospace leaders–22 new projects were signed to be hosted in Wuhan, with a total investment of RMB 25.6 billion (USD 3.6 billion). These are in addition to the 216 projects already underway.[102]

Figure 8: Aerial Photo of Wuhan National Aerospace Industry Base Under Construction, July 2025

Source: Gu Jianao/Hubei Daily via CGB. See "武汉国家航天产业基地建设有序推进" [Construction of the Wuhan National Aerospace Industry Base Progresses Steadily], *湖北日报* [*Hubei Daily*], July 20, 2025, http://m.cnhubei.com/content/2025-07/20/content_19350447.html.

WENCHANG INTERNATIONAL AEROSPACE CITY (文昌国际航天城)

Hainan Province has emerged as a primary example of China's determination to build up its aerospace industry and co-locate space R&D, satellite and rocket manufacturing, launch sites, and satellite data services industries. The Three-Year Action Plan for Accelerating the Development of a Modern Industrial System with Distinctive Features and Advantages in Hainan Province (2025-2027) commits to "accelerate cultivation of the full commercial aerospace industry chain."[103] By 2027, the Wenchang International Aerospace City is projected to have an annual revenue of RMB 10 billion (USD 1.4 billion).[104] The aerospace city is planned to include a "super satellite manufacturing facility" and will leverage the Hainan Satellite Data and Application Research Center and Hainan Aerospace Technology Innovation Center to promote technological breakthroughs.[105] Already home to major launch sites such as Wenchang Space Launch Center and Hainan Commercial Space

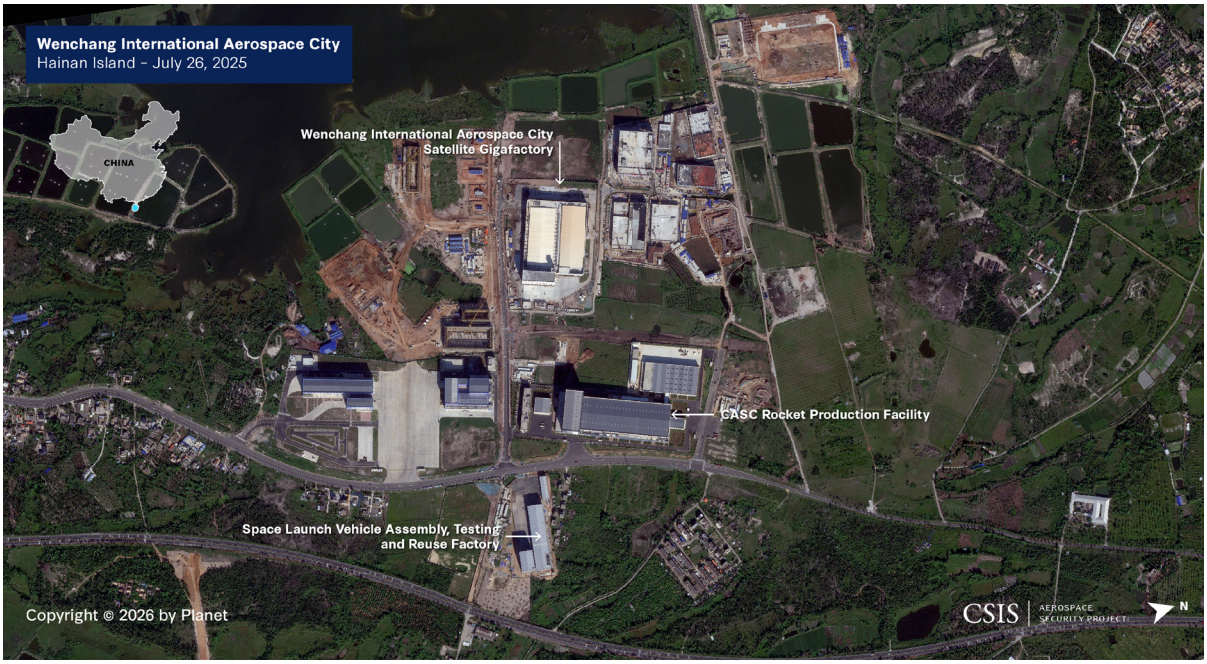
Launch Site, Hainan Island is seeing an expansion of its satellite manufacturing, satellite remote sensing, and rocket launch industries.

One of the most visible signs of China's satellite production potential is the Wenchang satellite gigafactory. With a total investment of RMB 1.1 billion (USD 153 million) and covering an area of 60,000 square meters, it will be the largest satellite factory in Asia once complete.[106] While initial satellite production reportedly started in June 2025, it will be capable of producing approximately 1,000 satellites per year once completed, according to an official release from the CCP Wenchang Municipal Committee.[107] By comparison, the world's largest satellite manufacturing plant is Boeing's factory in El Segundo, California, measuring over 92,000 square meters.[108]

Figure 9: Aerial Photo of Wenchang International Aerospace City Under Construction Circa June 2025

Source: Sohu via Wenchang International Aerospace City. See "《经济日报》关注：海南创新驱动产业提质" [Economic Daily Focus: Hainan Drives Industrial Upgrading Through Innovation], Sohu, September 15, 2025, https://www.sohu.com/a/934733862_12110699.

Figure 10: Wenchang International Aerospace City Under Construction, July 26, 2025



Source: Planet Labs PBC.

Also on Hainan Island is the Sanya Zhongke Remote Sensing Industrial Park, established in 2016, which has a focus on remote sensing and satellite technology.[109] The park is developing a national laboratory, an international academic exchange center, and a space science and technology museum. Located at the park are satellite ground stations supporting Chinese Earth observation and scientific satellites, specifically "38 large-diameter data receiving antennas and multiple high-speed fiber-optic data transmission links, enabling real-time data reception across the totality of China's territory," according to the deputy director of the China Remote Sensing Satellite Ground Station.[110]

Figure 11: Sanya Zhongke Remote Sensing Industrial Park, December 5, 2025

Source: Planet Labs PBC. Inset source: Pu Xiaoxu/Xinhua.

Figure 12: Aerial Photo of China Remote Sensing Satellite Ground Station at Sanya Remote Sensing Industrial Park on Hainan Island, July 5, 2024

Source: Pu Xiaoxu/Xinhua.

HAIYANG ORIENTAL AEROSPACE PORT (中国东方航天港)

Located in Shandong Province, Haiyang Oriental Aerospace Port is an aerospace launch and industry center. It comprises a space launch facility specifically designed to support seaborne rocket launches, headquarters to support its space launch growth, and various R&D, test, and manufacturing facilities.[111] Shandong Province is also home to the Wenhe Aerospace Economic Industrial Park (汶河空天经济产业园) in Tai'an city, where manufacturing facilities for Deep Blue Aerospace and Orienspace are located.[112] Also underway in the province is the development of a satellite internet industrial park, which is expected to be completed in 2027.[113]

Figure 13: Layout of the Haiyang Oriental Aerospace Port, Undated

Source: Qianling/Zhihu. Authors' translation to English. See QianLing, "东方航天港揭秘：山东海上固体火箭发射基地" [Unveiling the Haiyang Oriental Aerospace Port: Shandong's Offshore Solid-Fuel Rocket Launch base], Zhihu, October 15, 2022, https://zhuanlan.zhihu.com/p/573931903?utm_id=0.

Beyond high-profile behemoths such as Wenchang International Aerospace City, a range of other "aerospace cities" and industrial hubs are emerging across China. Some are developing niche specialization, while others are integrating multiple aspects of the space value chain. Examples include the aforementioned Nantong, which is strengthening its satellite manufacturing base through firms such as GalaxySpace, and Chengdu, which focuses on satellite components such as Aotian Technology's satellite electric propulsion facilities. Beijing and Shanghai continue to anchor company headquarters and technology hubs, while newer entrants such as Ningbo are seeking to replicate Wenchang's integrated model, combining development, manufacturing, testing, and launch capabilities. At the provincial level, Sichuan's traditional state launch infrastructure is expanding to include commercial operators and manufacturing sites.

3

Space Sector: Space Launch

Introduction

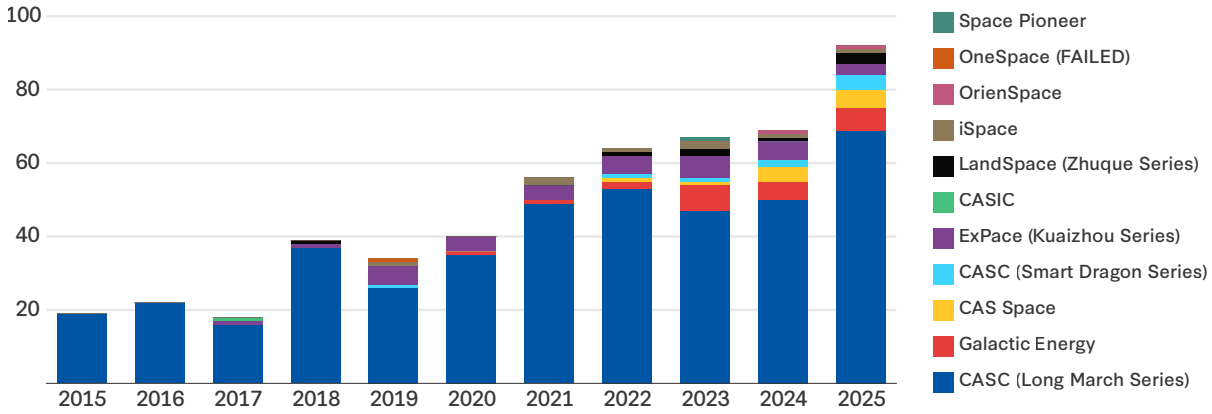
The launch sector is a foundational pillar of the space economy. Developing reliable, cost-effective launch systems is an essential gateway to building a downstream industry. For China, improving launch cadence and reducing cost are especially critical if the country aims to scale commercial applications and support its expanding national constellation ambitions.

Attempts at cultivating a state-owned "commercial" launch business in the 1990s largely ended when Beijing was found to be stealing U.S. rocket technology to improve its missiles.[114] It took Beijing another 15 years to try again. China's 2014 policy decision to open selected areas of the space sector to private capital transformed this domain from a closed state monopoly into one of China's most dynamic technology frontiers. Over the following decade, at least ten commercial launch firms—such as LandSpace, Galactic Energy, ExPace, and iSpace—emerged, many with close links to established SOEs. These companies have focused on improving small- and medium-lift capability, experimenting with reusable rockets, and pursuing vertical integration to reduce cost.

Major policy documents reflect a steady elevation of launch within broader space and industrial planning. The 2016 white paper on China's space activities called on the country to "expedite the development of . . . new-generation launch vehicles" and "expand its capacity to enter and utilize space."[115] By the time of the 2021 edition, the language had become more urgent, pledging to "improve the capacity and performance of the space transport system" and to "move faster to upgrade launch vehicles."[116]

China has set ambitious targets for its annual orbital launch cadence. In February 2024, the CASC Blue Book formally projected "approximately 100 launches" for the year, but the sector ultimately delivered just 68, a shortfall that Chinese industry analysts attributed principally to bottlenecks in production capacity in the commercial sector rather than pad availability or delays in regulatory approval.[117] Annual totals have nonetheless increased nearly fivefold since 2015, with 92 launches in 2025, the country's highest annual cadence on record. While commercial firms are helping to drive up launch numbers, the bulk of launches in 2025 were driven by SOEs (see Figure 14).

Figure 14: Orbital Launches by Rocket Manufacturer



Source: "Master Orbital Launch Log," Jonathan McDowell's Space Page, https://planet4589.org/space/gcat/data/derived/launchlog.html.

Space Launch Companies and Capabilities

Until recently, China's space launches were conducted exclusively on the Long March (长征, Changzheng, or CZ) family of rockets. These systems are built and operated by CASC and its subsidiaries—the China Academy of Launch Vehicle Technology (CALT) and Shanghai Academy of Spaceflight Technology (SAST)—with the China Great Wall Industry Corporation providing launch services to the international market.[118] As one indicator of the state's extensive efforts to grow its commercial launch business, CASC has introduced 12 distinct series of Long March rockets; most were originally designed for military or civil missions, but they are increasingly used for commercial launches. These have carried commercial payloads from Argentina, Belarus, Denmark, and Spain over the last 10 years.[119] All Long March rockets are expendable (or single-use), but China is developing versions of the CZ-8, CZ-9, and CZ-10 with reusability in mind.

Since 2014, a series of dynamic new commercial launch companies have emerged to both challenge and complement the Long March monopoly (several of which are described below). Some of these firms are themselves commercially oriented subsidiaries of CASC or CASIC, such as ExPace, but others are genuinely private enterprises carving out small areas of the industry.[120] Many of these companies are emulating the SpaceX model, adopting similar technologies and aspiring to achieve comparable launch costs, all with the hopes of gaining a similar level of success.

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In 2019, the company iSpace became the first private Chinese firm to successfully reach orbit when it launched its Hyperbola-1 rocket into LEO carrying several small satellites.[121] In the years since, a growing share of China's annual orbital launches have been carried by rockets developed by private firms. In 2025, one-quarter of China's space launches were conducted by commercial companies (see Figure 14).

LANDSPACE (蓝箭航天)

Founded in 2015 in Beijing by entrepreneur Zhang Changwu, LandSpace was one of China's first private firms to focus on liquid-propellant orbital launch vehicles.[122] The company specializes in methalox propulsion—using liquid methane and liquid oxygen—and aims to build a family of fully reusable rockets. LandSpace made international headlines in July 2023, when its Zhuque-2 became the world's first methane-fueled rocket to successfully reach orbit, ahead of similar systems under development by SpaceX and Relativity Space.[123]

Since then, the company has conducted follow-on Zhuque-2 missions which have demonstrated improving reliability and payload capacity. On December 2, 2025, LandSpace debuted its partially reusable Zhuque-3 rocket with a test flight that successfully reached orbit, demonstrating the viability of its large methalox launcher. While the booster was lost during the attempted recovery, Zhuque-3 became the first reusable-class rocket from a Chinese private firm to reach orbit, a milestone that firmly establishes LandSpace at the forefront of China's commercial launch sector.[124] LandSpace has stated it plans to reattempt Zhuque-3 first-stage recovery in the second quarter of 2026.[125]

SPACE PIONEER (天兵科技)

Space Pioneer (also known as Beijing Tianbing Technology Co., Ltd.) was founded in January 2019 in Beijing by veteran aerospace engineer Kang Yonglai, who previously served as chief technology officer at LandSpace. The company specializes in liquid-propellant rockets (kerosene and liquid oxygen, or kerolox) and is developing a family of medium- and heavy-lift launch vehicles with reusability ambitions, including the Tianlong series.

In April 2023, it achieved a major milestone with its first orbital launch: The Tianlong-2 successfully reached orbit on its maiden attempt—making Space Pioneer the first Chinese private company to orbit a liquid-fueled rocket. The firm's recorded success rate currently stands at one launch and one success for the Tianlong-2. In mid-2024, the company reported a setback when a ground test of its larger upcoming vehicle, the Tianlong-3, resulted in the first stage detaching prematurely and crashing near Gongyi, in central China. The maiden orbital flight of Tianlong-3 on April 3, 2026, also failed, with the vehicle lost approximately 33 seconds after liftoff from the Jiuquan Satellite Launch Center.[126]

GALACTIC ENERGY (星河动力)

Founded in February 2018 in Beijing by aerospace engineers Liu Baiqi and Xia Dongkun, Galactic Energy has become one of China's most reliable and innovative private launch firms. The company specializes in small- and medium-lift orbital launch vehicles, beginning with the Ceres-1, a four-stage solid-propellant rocket designed to place small satellites into LEO. It achieved its first successful orbital launch in November 2020, becoming only the second private Chinese company to reach orbit.

In September 2023, Galactic Energy also conducted China's first private sea-based launch, expanding its operational flexibility and access to orbital inclinations. To date, it has completed 23 Ceres-1 missions, with two recorded failures, giving it one of the highest success rates in China's commercial launch sector.[127] The company is now developing the Pallas-1, a kerolox-powered, partially reusable medium-lift rocket slated for its debut flight in 2026, signaling its move into the reusable launch arena.

CAS SPACE (中科宇航)

Founded in 2018, CAS Space is a commercial launch company spun out of CAS. The firm was initially based in Beijing but later relocated its headquarters to Guangzhou, Guangdong Province, as part of a broader push to develop the region's aerospace industry. CAS Space develops the Kinetica (Lijian-1 or ZK-1) family of solid-propellant small-satellite launch vehicles, designed for high-efficiency, low-cost orbital delivery.

The Kinetica-1 achieved orbital success on its maiden flight in July 2022, carrying six satellites into LEO—a notable milestone for a new entrant in China's growing commercial space sector. Since then, the company has conducted multiple successful launches, maintaining one of the strongest reliability records among Chinese small-launch providers. CAS Space is also advancing liquid-propellant and reusable medium-lift rockets, signaling ambitions to move beyond small-satellite launches toward a broader commercial and international market presence.

DEEP BLUE AEROSPACE (深蓝航天)

Founded in 2016 by engineer Huo Liang, Deep Blue Aerospace is headquartered in Wuxi, Jiangsu Province, with major testing facilities in Nantong, Jiangsu Province, and Beijing's Yizhuang district. The company specializes in reusable liquid-propellant rockets, powered by its proprietary Thunder-R and Thunder-RS kerolox engines. Its primary launch vehicles, the Nebula-1 and Nebula-2, are designed for vertical takeoff and vertical landing (VTVL) to enable rapid reusability and lower launch costs. In September 2024, the Nebula-1 completed a 10 km hop test that met most technical objectives but ended in a hard landing. Deep Blue Aerospace has not yet reached orbit, and its plans for Nebula-1's maiden orbital launch in mid-2025 did not materialize. Nebula-1 will likely conduct its debut flight in 2026.[128]

ORIENSPACE (东方空间)

Founded in June 2020 and headquartered in Yantai, Shandong Province, Orienspace is a rapidly growing private launch company specializing in heavy payload commercial rockets. The firm develops the Gravity series of launch vehicles, designed to provide flexible, cost-effective access

to orbit. Its first rocket, the Gravity-1, is an all-solid-propellant vehicle that successfully reached orbit in January 2024, lifting off from a floating barge in the Yellow Sea. Gravity-1 stands out as the most powerful commercial solid rocket made by China to date. The vehicle can carry 6,500 kg to LEO or 4,200 kg to sun-synchronous orbit, marking a significant step forward for China's private space sector.

Despite this initial success, Orienspace has struggled to maintain momentum. Gravity-1's second launch was met with significant delays due to its manual production processes, leadership turnover in the company, and funding challenges.[129] Orienspace is now developing the Gravity-2, a liquid-propellant, partially reusable rocket, signaling the company's transition toward reusable heavy-lift systems.[130] Gravity-2 was expected to make its debut in 2025, but its first flight is now anticipated in 2026. Its larger Gravity-3 tri-core variant, which aims to be capable of carrying a 30,600 kg payload to LEO or 20,500 kg to sun-synchronous orbit, is projected to fly in 2027.[131]

Table 3: Space Launch Companies and Capabilities

Company	Rockets (First Flight)*	SLV Capabilities	Notes
LandSpace 蓝箭航天空间科技股份有限公司	■ Zhuque-1 (Vermilion Bird 1) (2018) ■ Zhuque-2 (Vermilion Bird 2) (2023) ■ Zhuque-3 (Vermilion Bird 3) (2025)	Small-, medium-, and heavy-lift to LEO	Launches: ■ Zhuque-1 and -2 first flights failed ■ Zhuque-2 is first-ever methalox rocket ■ Zhuque-3 successful flight in 2025 (reached orbit, did not recover booster)
Space Pioneer 天兵科技	■ Tianlong-2 (2023) ■ Tianlong-3 (projected for 2026)*	Medium-lift to LEO; reusable first stage	Launches: ■ Tianlong-3 first flight test failure in 2024; next flight planned for 2026
Galactic Energy 星河动力	■ Ceres-1 (2020) ■ Ceres-2* ■ Pallas-1 (projected for 2026)*	Small- and medium-lift to LEO	Launches: ■ Ceres-1 has 23 successful launches, including 6 sea launches (as of April 2026) ■ Ceres-2 first flight failure in 2026
Deep Blue Aerospace 深蓝航天	■ Nebula-1 (2024) ■ Nebula-2 (projected for 2027)* ■ Space Tourism Vehicle (projected for 2027)*	Medium- and heavy-lift to LEO; reusability	Launches: ■ Nebula-1 first flight test failure in 2024 ■ Nebula-2 under development ■ Space tourism vehicle scheduled for tests in 2026 to prepare for spaceflight tourism trips in 2027
CAS Space 中科宇航	■ Lijian-1 (Kinetica-1) ■ Lijian-2 (Kinetica-2) (projected for 2026)* ■ Kinetica 2H*	Medium- and heavy-lift to LEO	Launches: ■ Kinetica-1 has 6 launches, with 1 failure (2024) ■ Kinetica-2 projected launch in 2026 ■ Plans for reusable first stage by 2028

Company	Rockets (First Flight)*	SLV Capabilities	Notes
Orienspace 东方空间	■ Gravity-1 (2024) ■ Gravity-2 (projected for 2026)* ■ Gravity-3 (projected for 2027)*	Medium- and heavy-lift to LEO, GTO	Launches: ■ Gravity-1, first flight in 2024
iSpace/ Beijing Interstellar Glory Space Technology Ltd. 星际荣耀	■ Hyperbola-1 (Shuang Quxian-1) (2019) ■ Hyperbola-2 (Shuang Quxian-2) ■ Hyperbola-3 (Shuang Quxian-3) (projected for 2026)* ■ Hyperbola-3B (Shuang Quxian-3B)*	Small- and medium-lift to LEO	Launches: ■ Hyperbola-1 first flight in 2019; first privately backed Chinese launch company to reach orbit ■ Hyberbola-1 has mixed record, with 4 of 7 launches having failed in the past ■ Hyperbola-2 test in 2023; now repurposed as a testbed
ExPace 航天科工火箭技术有限公司	■ Kuaizhou-1 ■ Kuaizhou-1A ■ Kuaizhou-11	Small-lift to LEO	Launches: ■ Kuaizhou-1/1A has 32 total launches and 3 failures (as of July 2025) ■ Kuaizhou-11 first flight failure in 2020; 2 successful launches in 2022, 2024 Additional Facts: ■ Commercial subsidiary of state-owned CASIC
OneSpace 零壹空间	■ OS-X0 ■ OS-X1 ■ OS-X6B ■ OS-M1 (launched, but failed to achieve orbit) ■ OS-M2* ■ OS-M4*	Small-lift to LEO	Additional Facts: ■ Targeting market for microsatellites and nanosatellites
Nayuta Space 千亿航天	■ Xuanniao-R (Black Bird-R) (projected for 2026)*	Medium-lift to LEO	Additional Facts: ■ 480,000 kg mass fully fueled, methalox engine, reusable booster

Note: SLV = space launch vehicle. Small SLVs carry up to 2,000 kg to LEO; medium SLVs carry 2,000–20,000 kg; heavy SLVs carry 20,000–50,000 kg; and super heavy SLVs carry over 50,000 kg.

*First flight not yet achieved.

Source: CSIS Aerospace Security Project.

Trends and Observations

ADOPTING THE SPACEX MODEL

SpaceX is the model and benchmark for much of China's commercial launch sector, with companies adopting similar technologies and striving for comparable cost points.[132] One central focus is reusability—a shift from expendable rockets toward recoverable first stages designed to reduce costs and increase cadence. Qu Wei of the China Academy of Aerospace Aerodynamics, a CASC subsidiary, has emphasized that China must "master reusable rocket technologies" to compete internationally.[133] Several leading firms, including iSpace, Orienspace, CAS Space, Deep Blue Aerospace, Galactic Energy, and Space Pioneer, are developing rockets with planned first-stage recovery and reuse, although none have successfully recovered and reused a booster.

In parallel, most Chinese manufacturers are expanding into liquid propulsion (from solid propulsion), typically using kerolox engines. Liquid engines are essential for reusability, as they allow precise throttling, restart capability, and controlled descent.[134]

China must "master reusable rocket technologies" to compete internationally. Several leading firms . . . are developing rockets with planned first-stage recovery and reuse.

On costs, Orienspace founder Yao Song has stated that the company's goal is "to go lower than Falcon 9."[135] Cost reduction has become an important objective for China's commercial launch companies. Public cost estimates point to steady convergence with leading market standards: A Falcon 9 launch costs an average of roughly $2,700 per kilogram to LEO, compared with an initial $4,000 per kilogram for Orienspace's Gravity-1.[136] LandSpace aims to cut its per-kilogram cost from about $8,500 on the Zhuque-2 to roughly $2,800 on the reusable Zhuque-3.[137]

Galactic Energy reports that its Ceres-1 small-lift vehicle costs about $4.5 million per launch—significantly below Rocket Lab's Electron rocket, which costs roughly $7.5 million for a similar payload.[138] The company is also developing an electromagnetic launch pad for debut in 2028, which "could double payload capacity and lower launch cost," according to Li Ping of the Ziyang Commercial Space Launch Technology Research Institute.[139] Although firms disclose few verifiable financial figures, their stated targets reflect a coordinated push to narrow the cost gap with leading Western launch providers and make Chinese systems more competitive in global commercial markets.

EXPANDING PAYLOAD CAPACITY

Chinese commercial launch firms are rapidly scaling up vehicle size and lift capability, viewing heavier payloads as essential for constellation deployment and international competitiveness. Most leading developers are pursuing next-generation rockets designed to increase lift capacity by an order of magnitude or more over earlier models. LandSpace's Zhuque-3 is expected to carry up to

21,000 kg to LEO, compared with 6,000 kg for the Zhuque-2.[140] Space Pioneer's Tianlong-3 targets 17,000 kg, up from 2,000 kg on the Tianlong-2.[141]

Other firms are following similar trajectories. Galactic Energy's Pallas-1, now in development, is projected to lift 8,000 kg to LEO—20 times the capacity of its Ceres-1 rocket—and future variants could reach 30,000 kg.[142] Deep Blue Aerospace plans for its Nebula-2 heavy-lift vehicle to have a 25,000 kg capacity, while CAS Space's Kinetica-2 and Kinetica-2H aim for a capacity of 12,000 kg and 22,000 kg, respectively.[143] Orienspace's Gravity-2 is designed to take roughly 25,600 kg to orbit, and iSpace's Hyperbola-3B will reportedly carry 15,000 kg, up from just 300 kg on the Hyperbola-1.[144]

RISING USE OF SEA LAUNCHES

China is turning to maritime launch to expand capacity, diversify access points, and improve scheduling flexibility. As of November 2025, Galactic Energy has completed five successful sea launches of its Ceres-1 rocket, and Orienspace conducted the maiden flight of its Gravity-1 from a converted barge in the Yellow Sea in 2024.[145] New dedicated platforms under development near Hainan and Ningbo illustrate growing state and provincial investment in maritime infrastructure.

Sea-based operations reduce congestion at inland pads, improve range safety by shifting trajectories over open ocean, and enable easier access to high-inclination and equatorial orbits. They also provide more favorable downrange recovery zones for potential reusability testing and allow launch windows that are harder to achieve from terrestrial sites.

PERSISTENT STATE INVOLVEMENT

Despite the rapid growth of private firms, China's launch sector remains deeply intertwined with state institutions at multiple levels. The military, central government, and provincial authorities all play active roles in financing, oversight, and operations. Even ostensibly commercial companies rely on state-linked investment and infrastructure. ExPace and CAS Space remain subsidiaries of major state-owned conglomerates—CASIC and CAS, respectively—blurring the line between public and private enterprise.[146]

A growing mix of national and local funds has also fueled the sector's expansion. LandSpace received roughly RMB 900 million (USD 125 million) in 2024 from the National Manufacturing Transformation and Upgrading Fund.[147] Space Pioneer raised RMB 1.5 billion (USD 208 million) that same year, while Galactic Energy secured RMB 1.1 billion (USD 153 million) in 2023—both through a combination of private and state-backed investment.[148] In 2025, Deep Blue Aerospace obtained almost RMB 500 million (USD 69 million) from the Taian Yuanwang New Energy Industry Investment Fund. Also in 2025, iSpace announced two fundraising rounds: a Series D round worth several hundred million RMB in March 2025, led by the Sichuan Tianfu Xinyun Digital Economy Development Fund (a provincial vehicle managed by Sichuan Development (Holding) Co., Ltd.), and a Series D+ round worth RMB 700 million (USD 97 million) in September 2025.[149]

These institutional ties extend beyond finance. CAS Space and ExPace benefit from access to state testing facilities, engine technologies, launch infrastructure, and intellectual property that can be absorbed by their parent SOEs if commercial ventures fail. Close ties to state players can provide firms with preferential access to services such as assembly, integration, and testing (AIT) from

established providers.[150] Startups remain constrained by military oversight as well. Orienspace founder Yao Song remarked after the 2024 maiden launch of Gravity-1, "A lot of the operation actually is conducted by the military, not by us," reflecting the limited autonomy private actors still hold within China's tightly controlled launch ecosystem.[151]

The talent pipeline into China's commercial launch sector runs deeply through state defense industrial institutions, including PLA-affiliated ones. Founders of the leading firms came directly from the Chinese state aerospace establishment after senior roles in military and PLA-adjacent programs. Space Pioneer's Kang Yonglai led the conceptual design of the Dongfeng (DF)-17 hypersonic glide vehicle, participated in CALT's Long March 11 program before founding the company, and is publicly designated by his own company as a "PLA Rocket Force expert."[152] CAS Space's Yang Yiqiang, a National University of Defense Technology graduate, was the founding chief director of CALT's Long March 11 program and currently sits on the CMC Equipment Development Department's Launch and Launch Technology Specialty Group. Galactic Energy's Liu Baiqi, a Beihang University PhD, spent seven years on launch vehicle design at CALT and was seconded during that tenure to the CMC Innovation Special Zone to work on PLA strategic frontier technology and equipment planning.[153] LandSpace itself markets this lineage openly, describing its operating model as constituting "a new model of civil-military fusion" and itself as "an active practitioner and vanguard of civil-military fusion."[154]

OUTLOOK AND INDUSTRY CONSOLIDATION

Despite this breadth of activity and enthusiasm, Chinese firms are confronting the technical and operational complexities inherent to launch development and operations. No commercial launch company has successfully recovered and reused a rocket. China's commercial launch market is likely to enter a consolidation phase in which only a handful of firms achieve sustained success. Companies with strong financial backing, demonstrated reusability technology, and established relationships with state institutions appear best positioned to endure. LandSpace, Space Pioneer, ExPace, Galactic Energy, Deep Blue Aerospace, and iSpace have each secured sizable funding rounds—many involving provincial or state-linked investors—and are advancing toward reusable or heavy-lift systems aligned with national priorities.

Smaller or less diversified firms face growing pressure as capital concentrates around proven performers. OneSpace, once an early private pioneer, has effectively exited the market, and AZSpace remains marginal, focusing primarily on spacecraft rather than orbital launch. Nevertheless, there are still new launch companies being established in China, despite the 10-year head start from companies such as LandSpace, suggesting that no commercial launch company has yet to take an insurmountable lead over the field and that Chinese cities and provinces continue to attract rocket entrepreneurs. However, as costs rise and government procurement gravitates toward technically reliable providers, the field is likely to narrow further. The result may eventually resemble other high-tech sectors in China, where a small number of "national champions" operate within a state-guided but commercially competitive framework.

IMPLICATIONS

Commercial space launch remains one of the few sectors where China still heavily trails the United States, but the technical gap is narrowing. Once Chinese firms achieve reliable medium- and heavy-lift capabilities comparable to the Falcon 9, they will likely be able to leverage the country's manufacturing base and cost advantages to quickly scale and increase launch cadence. Such launch capacity and cadence will be needed to deploy the many large satellite constellations that Chinese firms have in development (and discussed throughout this report). This expansion could very well undercut the competitiveness of U.S. and allied launch providers as Chinese companies target global—especially emerging—launch markets and seek to capture a growing share of the global satellite services economy.

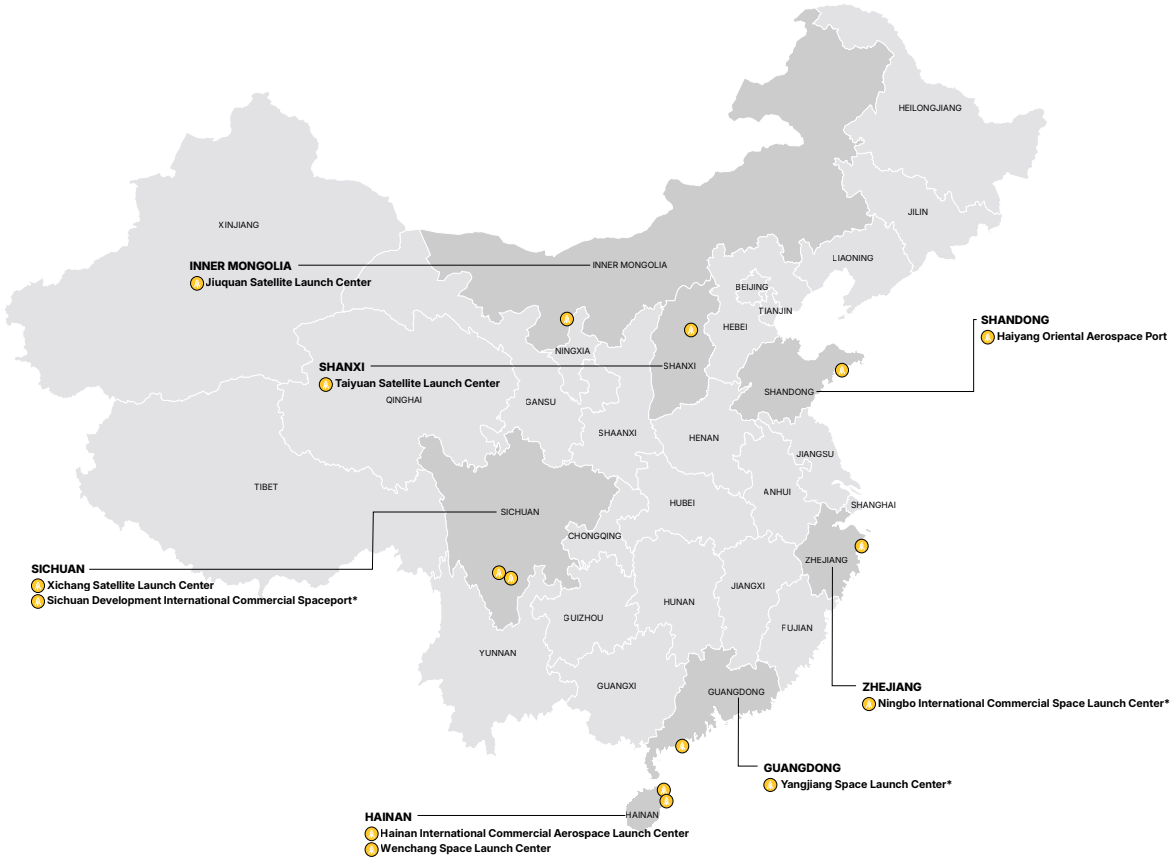
Commercial space launch remains one of the few sectors where China still heavily trails the United States, but the technical gap is narrowing.

Moreover, despite the rise of "private" launch companies, China's government and military remain deeply embedded across the sector, shaping investment, licensing, procurement, and mission priorities. While Western observers may view these firms through a commercial lens, they operate within the framework of military-civil fusion, which blurs the boundary line between civil and defense applications and raises questions about how expanded commercial capacity could support Chinese military systems and space operations. Chinese firms moving from experimental efforts to routine heavy-lift missions would mark a shift in global launch competition with commercial and strategic implications.

Space Launch Sites

As the pace of China's commercial launches has accelerated, demand has grown for dedicated launch facilities to accommodate them. For decades, the country relied on three inland sites—Jiuquan Satellite Launch Center in Inner Mongolia, Taiyuan Satellite Launch Center in Shanxi, and Xichang Satellite Launch Center in Sichuan—each established and operated by the PLA.[155] Their remote locations minimized safety risks from launch failures but limited payload size and launch frequency due to restrictive flight corridors over land.

Figure 15: Space Launch Sites



Note: *In development.

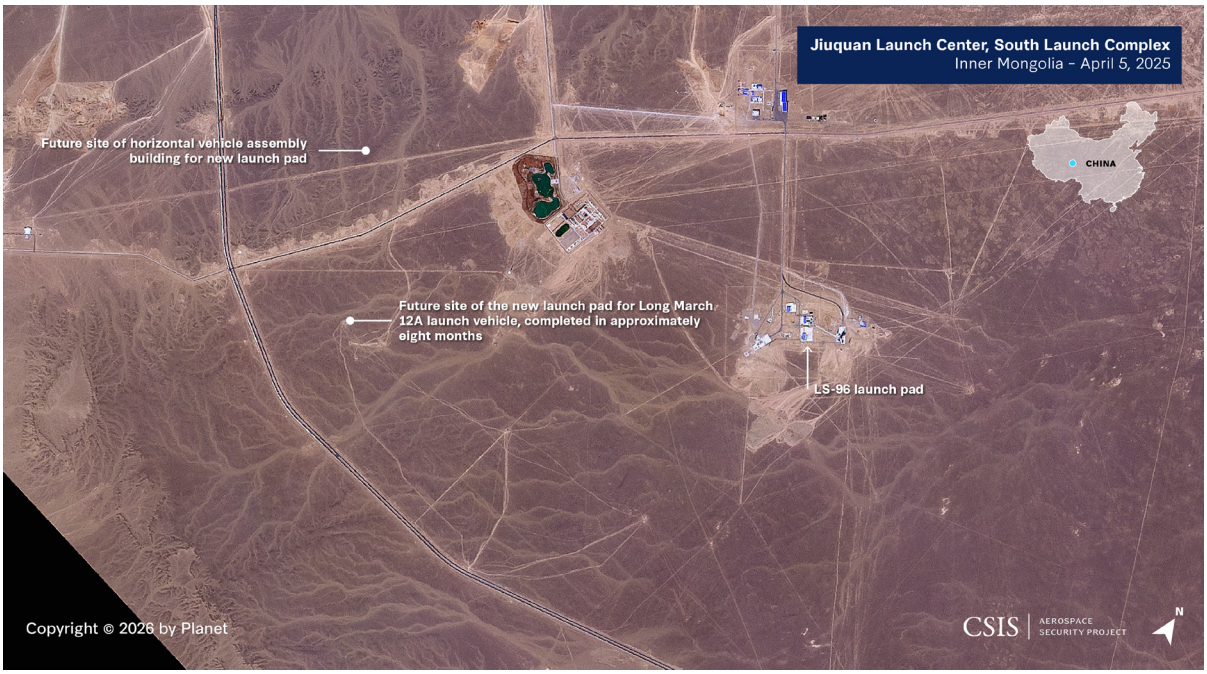
Source: CSIS Aerospace Security Project.

The limitations of China's military launch facilities to meet the demands of this rapidly growing industry have led to an expansion at these sites as well as the buildup of new sites better suited to modern missions. In total, China now has five active dual-use launch sites, with more under development.

China's legacy facilities, such as Jiuquan and Taiyuan, have seen the rapid construction of new launch pads built to accommodate both government and commercial launches. For example, at the Jiuquan Satellite Launch Center a new launch pad and vehicle assembly building appear to have been constructed in under six months, according to satellite imagery (see Figure 16 and Figure 17).

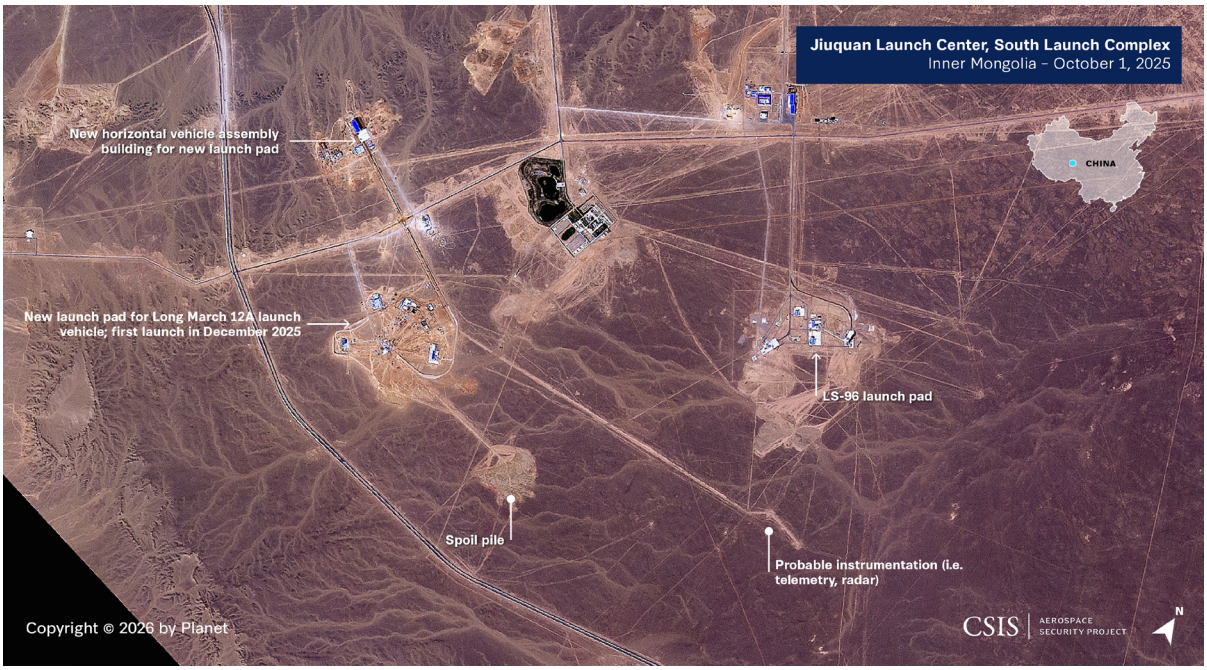
Newer facilities at Wenchang in the south and Haiyang in the north overcome the geographic limits of older inland sites. The coastal locations of both allow for heavier payloads, safer launch trajectories over the ocean, and more flexible launch trajectories. This chapter further discusses these two newer launch sites, each of which is designed to accommodate commercial launch growth.

Figure 16: New Launch Facilities Under Construction at Jiuquan Launch Center, April 5, 2025



Source: Planet Labs PBC.

Figure 17: New Launch Facilities Under Construction at Jiuquan Launch Center, October 1, 2025



Source: Planet Labs PBC.

WENCHANG SPACE LAUNCH CENTER (文昌航天发射场)

Located on Hainan Island, Wenchang Space Launch Center is China's fourth and southernmost spaceport. Approved in 2007 and completed in 2014, it was built to overcome the geographic limits of older inland sites. Its coastal location allows heavier payloads, safer launch trajectories over the ocean, and sea delivery of large rocket components. Wenchang now serves as the main launch site for the Long March 5 and other heavy-lift vehicles operated by CASC. It is also used by commercial firms such as Space Pioneer and Deep Blue Aerospace.

Hainan Island also hosts China's first dedicated commercial spaceport, Hainan International Commercial Aerospace Launch Center (海南商业航天发射场), which opened in 2024. It is located directly adjacent to the Wenchang Space Launch Center's main complex.[156] The facility is owned by Hainan International Commercial Aerospace Launch Co., Ltd., a joint venture of the Hainan provincial government, CASC, CASIC, and China Satellite Network Group Co., Ltd. (China SatNet). Together, the commercial spaceport and space launch center make Wenchang the hub of China's expanding coastal launch capacity and a model for integrating commercial operators within a state-controlled framework.

Figure 18: Wenchang Space Launch Center, July 4, 2021

Source: Planet Labs PBC.

Figure 19: Wenchang Space Launch Center, July 26, 2025

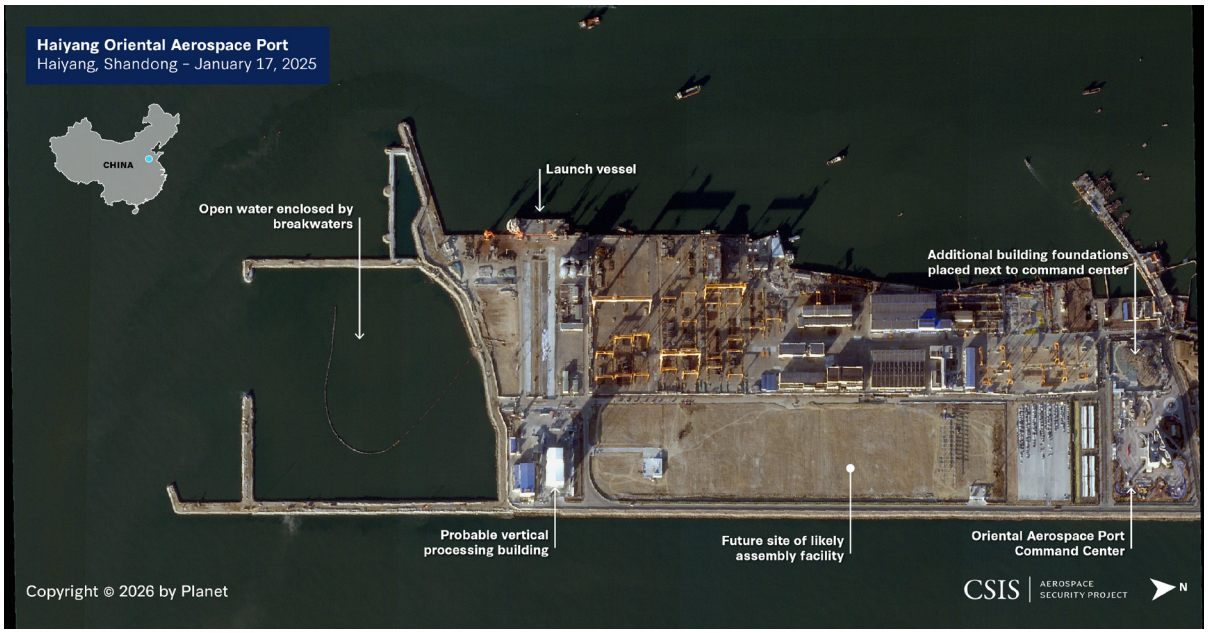
Source: Planet Labs PBC.

HAIYANG ORIENTAL AEROSPACE PORT (中国东方航天港)

The city of Haiyang in Shandong Province is developing the Haiyang Oriental Aerospace Port to serve as China's fifth launch center and the country's first dedicated maritime launch hub.[157] Approved in 2019, the facility supports sea-launch operations in the Yellow Sea, including launches by private firms such as Orienspace and Galactic Energy.[158] Its sea-based launch platform enables lower fuel requirements and faster turnarounds; according to local officials, preparation time could fall by half compared with land launches.

Around the launch complex, Haiyang is building a full ecosystem, including a Satellite Data Industrial Park, rocket manufacturing and testing zones, and a logistics and sea transport infrastructure, as well as providing support for space tourism facilities.[159] State media has touted the site as "an industrial agglomeration area covering the entire industrial chain."[160] Haiyang exemplifies the model of vertical integration, co-locating satellite and launch vehicle manufacturing and assembly, payload integration, and launch operations at a single site. Recent satellite imagery shows that portions of the complex remain under construction, indicating that the site continues to expand toward full operational capability (see Figures 20 and 21).

Figure 20: Haiyang Oriental Aerospace Port in Shandong, January 17, 2025



Source: Planet Labs PBC.

Figure 21: Haiyang Oriental Aerospace Port in Shandong, August 6, 2025

Source: Planet Labs PBC.

In addition to China's five active dual-use launch sites, several additional launch sites are currently under development.

SICHUAN DEVELOPMENT INTERNATIONAL COMMERCIAL SPACEPORT (四川发展国际商业航天港)

The Spaceport was formally announced by Liangshan Prefecture officials in October 2024, with the unveiling of Sichuan Development International Commercial Spaceport Co., Ltd.[161] The project represents a provincial effort to extend the capacity of the nearby Xichang Satellite Launch Center and position Sichuan as a hub for China's growing commercial space sector. Details remain limited, but the facility is described as a "commercial aerospace launch platform" that will leverage the region's favorable latitude (comparable to Cape Canaveral, Florida) for orbital launches.[162]

Notably, local authorities from the provincial MCF office attended the event and emphasized that the facility will accelerate integration of aerospace industrial activity with national defense-adjacent launch infrastructure. While construction timelines and supported rocket classes remain unclear, provincial authorities have outlined plans for dedicated launch stations and an aerospace industrial cluster valued at over RMB 100 billion (USD 13.9 billion) by 2027, suggesting that the Sichuan site will serve as a long-term anchor for China's inland commercial launch expansion.[163]

NINGBO INTERNATIONAL COMMERCIAL SPACE LAUNCH CENTER (浙江宁波国际商业航天发射中)

Located in Zhejiang Province, the project was unveiled under the province's 14th Five-Year Plan in March 2021.[164] Local reporting suggests that officials are planning for the site to be capable of supporting up to 100 launches per year once operational.[165] Its coastal location at a latitude similar to Cape Canaveral, Florida, gives it favorable orbital insertion conditions for high-frequency missions.

The planned site covers roughly 67 square kilometers and carries an estimated investment of about RMB 20 billion (USD 2.8 billion). Half of the area will host launch facilities, with the remainder devoted to aerospace manufacturing and supporting infrastructure. The last public construction update came in 2023, and reports from site visits as recently as November 2025 documented no visible construction at the planned launch zone.[166] However, two recent entity formations, including a county-level commercial launch company in Xiangshan and the state capital-led Ningbo Commercial Aerospace Development Co., which had RMB 1 billion (USD 139 million) in registered capital as of January 2026, suggest a possible restart, though no construction or procurement activity has yet followed.[167]

YANGJIANG SPACE LAUNCH CENTER (阳江商业航天创新发射中心)

The coastal city of Yangjiang in Guangdong Province plans to build the Yangjiang Space Launch Center as part of the province's broader effort to develop a commercial aerospace cluster.[168] The project falls under the province's 2024–2028 Action Plan for High-Quality Development of Commercial Space and will support both land- and sea-based launch operations. Yangjiang's location offers key advantages, including enabling southward launches into sun-synchronous orbits and reducing transportation distances between rocket manufacturing sites and launch platforms.

The spaceport complements Guangdong's growing aerospace ecosystem centered in Guangzhou, which already hosts launch provider CAS Space and Geespace, the satellite arm of automaker Geely.

Provincial officials aim to integrate the new launch center with the region's existing manufacturing base to create a full "satellite-rocket-launch-application" value chain. Construction timelines have not been announced, and the project remains to be approved by national authorities. However, the scheme signals Guangdong's intent to establish a major coastal launch hub in an intensifying competition between provinces to capture a central position in the emerging space economy.[169]

IMPLICATIONS

China's expansion of launch infrastructure reflects a concerted effort to build sustained launch capacity and reduce reliance on a few overused sites. New launch centers—many designed for dual-use or commercial access—enable more frequent testing, faster development cycles, and greater flexibility in mission scheduling.

China's expansion of launch infrastructure reflects a concerted effort to build sustained launch capacity and reduce reliance on a few overused sites.

According to unverified Chinese media accounts, China is building a coastal "South-Central-North" commercial launch corridor ("南-中-北"沿海商业发射带) comprising the Wenchang, Yangjiang, and Haiyang spaceports, reflecting how local-level initiatives feed into national goals.[170] The buildout of these coastal sites is expected to support a growing commercial launch sector and expand launch capacity for China's ambitious satellite deployment plans, including LEO broadband constellations. These hubs also reflect a broader emphasis on vertical integration—co-locating manufacturing, integration, and operations into one geographic area—which can significantly compress timelines for development, transport, and launch.[171]

At the same time, the surge in provincially driven projects raises concerns about overcapacity and uneven coordination, as some local governments are investing heavily in costly facilities that may ultimately see limited use. This concern does not necessarily conflict with near-term satellite deployment demands outlined in the satellite communications section that follows. Chinese industry analysts consistently identify rocket production capacity—not launch pad availability—as the primary constraint on launch cadence. In 2025, the operator of the Thousand Sails mega-constellation failed twice to attract three qualified bidders for commercial launch contracts, ultimately accepting "futures" bids in which suppliers committed only to achieving a maiden flight by year's end.[172]

4

Space Sector: Satellite Communications

Introduction

China's SATCOM industry has long been state driven, developed and operated through SOEs, with satellites largely in geosynchronous Earth orbit (GEO) providing domestic communications and broadcast services and infrastructure. However, SATCOM was the one area where the national government promoted commercialization, dating back to its 2006 official space policy white paper. State-owned, yet publicly listed on the Shanghai stock exchange, China Satellite Communications Co., Ltd. (China Satcom) operates a fleet of 19 satellites providing telecommunications, broadcasting, government, and enterprise services across China, the Asia-Pacific, the Middle East, Africa, and Europe.[173]

Since then, Chinese policy shifts and investment have spurred advancements in commercial and mobile services, including the rise of Huawei and ZTE, and global telecommunications expansion. Today, China is building complementary broadband from space through mega-constellations in LEO, integrated with terrestrial networks and bundled with other information services such as imagery and the BeiDou global navigation satellite system (GNSS)—serving both national security needs and export markets.

China is positioning itself to become a formidable competitor in the global satellite broadband race.

In 2020, the Chinese State Council—through its National Development and Reform Commission—formally incorporated satellite internet into China's "new-type infrastructure" framework, placing it alongside 5G telecommunications, the Internet of Things (IoT), and the industrial internet as a national technology priority.[174] Since then, Beijing has backed an ambitious wave of satellite internet constellations, including four mega-projects—Guowang, Thousand Sails, Honghu, and Huawei—each planning fleets of more than 10,000 satellites, as well as smaller ventures from firms such as Geely, GalaxySpace, and EllipSpace. Earlier entrants such as Guodian Gaoke and HEAD Aerospace provided a foundation, but the vast majority of LEO communications players have emerged in just the past five years. With most initiatives blending state support and private investment, and many explicitly aiming to rival SpaceX's Starlink, China is positioning itself to become a formidable competitor in the global satellite broadband race.

Companies and Capabilities

China's commercial SATCOM industry is evolving quickly, anchored by state-backed mega-constellations and reinforced by emerging private ventures. Projects such as Guowang, Thousand Sails, and GEESATCOM illustrate how Beijing is mobilizing both government and commercial resources to build global LEO broadband networks to rival international competitors.

GUOWANG (国网)

While not a commercial system, discussion of China's ambitions in LEO broadband must include the Guowang constellation, which is being developed and operated by the state-owned China SatNet.[175] Planned as a 12,992-satellite internet service constellation, based on 2020 International Telecommunication Union (ITU) filings, Guowang represents the merger of two earlier projects—CASC's Hongyan and CASIC's Hongyun, announced in 2016 and 2017, respectively—to provide global broadband connectivity.[176] These programs were folded into a single "super-constellation," and in 2021, China SatNet was established to oversee its development and operation.

Public details on Guowang remain limited, with little confirmed about satellite size, mass, or service capabilities compared to other constellations such as Thousand Sails. Early test satellites were launched in 2022, built by CGSTL for China SatNet.[177] The first launches of operational satellites are believed to have occurred in December 2024, when the Xinhua News Agency announced the deployment of satellites for an unnamed "satellite internet constellation."[178] Leaked mission patches reportedly revealed the launch was for China SatNet.[179]

ITU requirements impose ambitious deadlines for Guowang launches: 1,300 satellites (10 percent of the network) must be in orbit by September 2029, and half the constellation—6,500 satellites—must be deployed by 2032. As of April 2026, an estimated 168 Guowang satellites have been launched, with plans for 310 total satellites launched in 2026 and 900 in 2027, which would require 75 satellites launched per month.[180] While such near-term rates may be achievable, deployments

to date have proceeded at a much lower and slower pace. Guowang satellites have typically been launched in batches of 5 to 10 atop Long March variants (5B, 6A, 8A, and 12), with 16 launches conducted in 2025 and 4 in 2026 as of April.[181]

Guowang satellite development and manufacturing appear to be distributed across multiple entities. The China Academy of Space Technology (CAST) (under CASC) and Innovation Academy for Microsatellites (IAMCAS) (under CAS) are key players.[182] Satellite internet tests have also involved SAST, CAST, IAMCAS, GalaxySpace, and CGSTL.[183] In 2025, GalaxySpace became the first private commercial firm to supply satellites to the state-led Guowang constellation, which were launched on a Long March 12 rocket in August 2025.[184]

THOUSAND SAILS (千帆)

Thousand Sails is China's answer to Starlink. This mega-constellation, operated by Shanghai Spacecom Satellite Technology (SSST) and backed by the Shanghai municipal government, will provide LEO broadband internet services, including direct-to-device services.[185] It is integral to Shanghai's ambitions to "establish a flourishing commercial space ecosystem" under the Yangtze River Delta G60 Science and Technology Innovation Corridor.[186]

Officially announced in November 2023, the program aligns with government goals to achieve 600 satellite deployments and 50 commercial rocket launches annually by 2025. Thousand Sails emerged partly from the collapse of a joint venture between Germany's Kleo Connect and Chinese financiers, where SSST represented the Chinese side before the project ended in disputes and lawsuits.[187]

To support the constellation, SSST partnered with IAMCAS to establish Genesat (Gesi Aerospace) in 2022, dedicated to satellite production with both state (Shanghai government) and venture backing.[188] The initial phase consists of 1,296 satellites—648 targeted for on-orbit operations by the end of 2025—with global coverage anticipated by 2027.[189] In total, 15,000 satellites are planned.[190] However, early missions encountered difficulties, including satellites failing to reach their intended orbits and debris creation during the inaugural launch in July 2024, when a Long March 6A's upper stage broke up.[191] As of April 2026, only 126 satellites are in orbit.[192]

Although SSST is framed as a commercial venture, its capital structure is overwhelmingly state backed. Beyond its controlling shareholder Shanghai Alliance Investment, other investors include the China Development Bank-linked Manufacturing Transformation and Upgrading Fund, which led the February 2024 RMB 6.7 billion (USD 930 million) Series A round, CASSTAR and Guoke Capital (both CAS-affiliated), and additional state-linked vehicles.[193] Its satellite manufacturer, Genesat, has a similar funding structure: Aside from a handful of private investors, most of its capital comes from state-led or SOE-backed entities.[194]

GEESATCOM (吉利星座)

An unconventional entrant in the LEO SATCOM sector, Geely, founded in 1986, is one of China's largest private companies and a global automotive leader. A consistent Fortune Global 500 company employing over 120,000 people worldwide, Zhejiang Geely Holding Group ranks 10th in global auto sales and owns brands such as Volvo Cars, Polestar, Lotus, Lynk & Co, and ZEEKR.[195]

Seeking to integrate aerospace with future mobility and AI, Geely created Geespace in 2018 to develop a LEO satellite network known as GEESATCOM, aimed at supporting self-driving cars with precise positioning data.[196]

The Geespace constellation plans for 240 satellites in its initial buildout, with 30 already launched into a 590 km orbit. Each satellite weighs about 130 kg, and the constellation seeks to enable 90 percent global coverage. Phase 1 envisioned 72 satellites in orbit by 2025, with Phase 2 expanding to 264 and Phase 3 aiming for a dramatic scale-up to 5,676 satellites.[197] In 2025, Geely successfully launched 34 satellites, increasing the total size of its constellation to 64—slightly below the company's stated target of 72 satellites.[198] The network will provide broadband services, direct-to-device connectivity, and precision positioning for both consumer and industrial applications.

Since 2018, Geespace has established a full industrial chain for satellite development, production, and operations, supported by R&D centers in Shanghai, Xi'an, and Nanjing; operations hubs in Guangzhou and Qingdao; and business centers in Beijing and Taizhou.[199] The Geespace Satellite MegaFactory in Taizhou, launched in 2021, has a reported annual capacity of 500 satellites.[200] By drawing on Geely's automotive expertise in automation, modular design, and pulsed assembly lines, the facility represents one of China's first true automotive-style "smart factories" for aerospace.

Initially targeting China and the Asia-Pacific, Geely plans to expand globally after 2026. Beyond mobility services, the company plans direct-to-device services.[201]

A more expansive constellation, the GEESATCOM/Future Mobility Constellation, also incorporates remote sensing capabilities, which can provide 1.5-meter resolution imagery for environmental monitoring, crop tracking, and livestock management.[202] By merging automotive, communications, and remote sensing technologies, Geely is positioning itself as a unique hybrid player in China's commercial space sector, connecting space services to mass consumers.

Two other notable LEO broadband constellations, which the authors have little information on, are Hongqing Technology's Honghu (鸿鹄) constellation and Huawei's Hua Chain planned mega-constellation project. Honghu, partly owned by LandSpace, envisions a network of 10,000 or more satellites called Honghu-3. To date, it has only launched two test satellites—Honghu-1 and -2 in December 2023—the latter built by small satellite (50 kg class) maker Spacety.[203] Huawei, meanwhile, has proposed an equally ambitious constellation, potentially exceeding 10,000 satellites, designed to integrate with 6G networks and deliver low-latency connectivity for mobile, automotive, and IoT applications. To date, analysts speculate that Huawei has launched just two pairs of Ka-band prototypes (in 2023)—although no Chinese media has confirmed the launches—and is collaborating with China Star Network on trials expected in 2025, with rollout projected around 2030.[204] However, specifics on system size, spectrum, and financing remain uncertain, with further speculation that Huawei could be reusing frequencies once tied to Kleo Connect. The limited information available on both programs highlights their uncertain timelines, capabilities, and ultimate viability.

Table 4: LEO SATCOM Companies and Capabilities

Constellation Company	**Planned Constellation**	**First Launch**	**Notes**
Guowang* 国网 China Satellite Network Group Co., Ltd. (China SatNet)	13,000 LEO	December 2024	■ Capabilities: Broadband satellite internet ■ Operational goal: 1,300 satellites deployed by 2029 ■ Manufacturer: CAST and IAMCAS, with involvement from SAST, GalaxySpace, and CGSTL
Thousand Sails (Qianfan) 千帆 Shanghai Spacecom Satellite Technology (SSST)	15,000 LEO	August 2024	■ Capabilities: Broadband satellite internet; direct-to-device (by 2027) ■ Operational goal: 648 satellites deployed by 2026; 14,000 deployed by 2030 ■ Manufacturer: Genesat, IAMCAS
Hua Chain Huawei	10,000+ LEO	Unknown	■ Capabilities: Broadband satellite internet; 6G network integration
Honghu 鸿鹄 LandSky Hongqing Technology	10,000 LEO	December 2023	■ Capabilities: Broadband satellite internet ■ Manufacturer: Spacety
GEESATCOM Geely Geespace	5,000+ LEO	June 2022	■ Capabilities: Broadband satellite internet; IoT; precision navigation signals ■ Operational goal: 72 satellites by 2025 ■ Manufacturer: Geespace (in house)
Yinhe (Mini Spider) 银河 GalaxySpace	Unknown LEO	March 2022	■ Capabilities: Broadband satellite internet; direct-to-device ■ Manufacturer: GalaxySpace
Tianqi (Apocalypse) 天启 Guodian Gaoke	38 LEO	October 2018	■ Capabilities: IoT narrowband connectivity ■ Operational goal: 38 satellites by 2025 ■ Manufacturer: Shandong Institute of Aerospace Electronics Technology, ASES Spaceflight Technology (under SAST)
Skywalker 天行者星座 HEAD Aerospace	48 LEO	November 2017	■ Capabilities: IoT narrowband connectivity, ADS-B, AIS/VDES ■ Manufacturer: SAST
StarPool 星池计划 EllipSpace	100+ LEO	December 2023	■ Capabilities: Integrated architecture of communications, navigation, and remote sensing satellites ■ Manufacturer: Shanghai Lizheng Satellite Application Technology (under SAST)
Smart Skynet 智慧天网 Tsingshen Tech	32 MEO	May 2024	■ Capabilities: Medium Earth orbit (MEO) broadband ■ Manufacturer: SAST

Note: ADS-B (Automatic Dependent Surveillance-Broadcast), AIS/VDES (Automatic Identification System/ VHF Data Exchange System).

* While Guowang is not a commercial system, it is an important piece of China's overall ambitions in LEO broadband.

Source: CSIS Aerospace Security Project (data current as of April 2026).

Trends and Observations

PROLIFERATED LEO CONSTELLATIONS

China's commercial SATCOM sector is centered on building proliferated LEO constellations for space-based internet services, following models such as SpaceX's Starlink, Amazon LEO, and OneWeb. At least five Chinese firms are pursuing constellations with 5,000–10,000 satellites or more, almost all targeting LEO operations (below 1,000 km). While there are Chinese entities pursuing GEO and medium Earth orbit (MEO) constellations for data relay and networking services, including Cangyu Space Technology, Tsingshen Tech, and Smart Skynet, this report focuses on LEO.[205]

The sheer number of satellites planned for these proliferated LEO constellations is generating a massive demand signal for China's satellite manufacturing base.

As will be discussed in later sections, the sheer number of satellites planned for these proliferated LEO constellations is generating a massive demand signal for China's satellite manufacturing base. This includes driving a large-scale buildup of satellite manufacturing capacity and is leading to innovation in satellite manufacturing and assembly, including drawing best practices and technologies from the automotive sector.

To achieve global coverage and meet ITU deadlines where a certain number of satellites must be deployed on orbit by certain dates, operators will need to emphasize faster design-manufacture-launch cycles. For example, Guowang will require an aggressive launch schedule of over 300 satellites per year by 2029, ramping to more than 1,700 per year by 2032.

Chinese engineers are also attentive to the user equipment, or terminals, associated with these LEO broadband services. Again, benchmarking against SpaceX, engineers have posted detailed analysis of different generations of deconstructed Starlink terminals, stating that the ability for "Starlink engineers to achieve plug-and-play user experience is worthy of our emulation."[206]

SYNERGIES WITH THE STATE

Many commercial firms trace their roots to China's aerospace SOEs, drawing talent and technical know-how from CASIC, CASC, CAS, and related institutions. MinoSpace's cofounder Gao Enyu, for instance, worked at CAST and CALT; EllipSpace leadership, president Di Fengping and chairman Zhang Tao, are former senior planners for China's manned space program; and Guodian Gaoke's current chairman and CEO Lu Qiang is a veteran of China's first high-capacity Ka-band satellite design.[207] These firms also collaborate with state entities, contributing to national satellite internet demonstration programs that both advance state goals and strengthen their own technologies.

Further, many of these companies blend state and private investment and ownership, positioning them to serve both government and commercial markets, and placing them under the direct influence of government minders.

PATHFINDING IN EMERGING TECHNOLOGY AREAS

Commercial enterprises are increasingly advancing state-of-the-art technology and innovation alongside government-driven initiatives. Notable examples include laser communications, where private aerospace firms demonstrated in 2025 the first high-speed laser crosslink between two LEO satellites and breakthroughs in satellite-to-ground (downlink) laser data transmission.[208] Startups, such as Bluelink Satcom, are pursuing ambitious projects, including a satellite network designed to detect Bluetooth signals from space for global asset monitoring and device connectivity.[209] At the same time, corporations with strong state affiliations, such as Alibaba, are also experimenting with satellite-enabled services, launching a small communications payload in 2018 to broadcast promotional messages to shoppers' mobile devices.[210] Looking ahead, Chinese entities—both public and private—are expected to contribute significantly in areas such as quantum communications, on-orbit supercomputing, orbital data centers, and AI in alignment with Beijing's strategy of intelligentized warfare.[211]

INTEGRATING SATCOM INTO THE BELT AND ROAD INITIATIVE

Chinese firms are increasingly integrating SATCOM into Beijing's Belt and Road Initiative (BRI) through the Spatial Information Corridor (空间信息走廊), or Space Silk Road, offering market-oriented space services such as broadband, imagery, and broadcasting to partner nations.[212] The state-backed Thousand Sails constellation has pursued an outward-facing strategy: signing agreements with Brazil's Telebras and Malaysia's Measat to expand rural satellite internet and integrate with GEO communications satellites; establishing a subsidiary in Kazakhstan to increase its global reach; and reportedly engaging with over 30 countries, often in places where Starlink has faltered.[213] Similarly, GalaxySpace has positioned Thailand as a regional hub providing integrated networking solutions and secured agreements in more than 10 countries.[214] The company is also part of discussions between Beijing and Islamabad to deepen cooperation in satellite design and manufacturing and internet infrastructure.[215] Collectively, these efforts highlight how China is leveraging commercial SATCOM as both a market expansion opportunity and a tool of international outreach.

MIXED START AND OUTLOOK

Despite strong state backing and private investment, not all of China's LEO broadband ventures are likely to survive. While SatNet's Guowang, the national constellation, and SSST's Thousand Sails receive widespread political, financial, and industrial attention, and Geeley's GEESATCOM benefits from its automotive nexus, other firms such as Huawei's Hua Chain and Hongqing Technology's Honghu have shown less visible progress. This is notable given Huawei's considerable capital and technical expertise and Honghu's recent momentum, including a 2025 funding round and a new factory in Wuxi.[216]

As Chinese firms venture into large-scale satellite development, some have struggled with delays, inexperience, in-orbit failures, and quality issues.

These large LEO satellite constellations will require scaled-up manufacturing and launch capacity to meet their milestones. However, as Chinese firms venture into large-scale satellite development, some have struggled with delays, inexperience, in-orbit failures, and quality issues. Thousand Sails exemplifies these challenges. Of the first 90 satellites launched, 13 failed to reach their target orbit, and only 5 of 18 satellites from a second launch achieved proper altitude.[217] The 90 satellites also fall far short of SSST's goal to have 648 satellites in orbit by 2025.[218] Beyond launch capacity constraints discussed in this report, the manufacturer-specific failure pattern raises broader questions about whether China's commercial satellite production base, particularly the new "smart factory" lines that support proliferated LEO constellations, is yet mature enough to deliver the volumes its operators have promised.

5

Space Sector: Remote Sensing

Introduction

As observed in one recent study, "Neither the United States nor China has a clear across-the-board lead in commercial remote sensing."[219] China's space-based commercial remote sensing sector is expanding rapidly. Companies—often in close partnership with state entities—are developing advanced satellites and offering imagery, data, and analytic services across applications, such as for mapping, land use, and defense and intelligence, both domestically and on the global market.

This section draws on the 2024 CSIS report, *Gold Rush: The 2024 Commercial Remote Sensing Global Rankings*, produced in collaboration with the Taylor Geospatial Institute, Taylor Geospatial Engine, and United States Geospatial Intelligence Foundation. That report assessed the technical performance of commercial space-based remote sensing systems worldwide and, taking inspiration from the Olympic games, awarded "medals" to leading providers across multiple capability categories. Accordingly, this section diverges from other sections, as it does not attempt to provide a comprehensive survey of Chinese remote sensing companies, particularly newer market entrants. Instead, it builds on existing CSIS research, focusing on firms—both state-linked and private—that were assessed as top-performing commercial operators with satellites in orbit and commercially available data offerings as of July 2024.

The *Gold Rush* findings highlight both the competitive pressures facing U.S. providers and the rising sophistication of Chinese offerings. They also offer a valuable lens into the broader capabilities and trends shaping China's commercial remote sensing sector.

Companies and Capabilities

Following Beijing's 2014 policy reforms came a flurry of Chinese commercial activity in space-based remote sensing. In 2015, CASC announced plans to construct a large commercial constellation comprising 20 high-resolution electro-optical (EO) imaging satellites, four synthetic aperture radar (SAR) satellites, and several video satellites.[220] These formed the GaoJing (SuperView) system, now operated by Siwei Star Co., Ltd., with 10 satellites currently in orbit.[221]

That same year, Chang Guang Satellite Technology company launched Jilin-1 (Gaofen), an EO imaging satellite that anchored plans for a 138-satellite constellation providing high-resolution, high-revisit imagery.[222] Subsequent years brought additional constellations spanning SAR, hyperspectral, and infrared satellites (see Table 5).

Table 5: Chinese Space-Based Commercial Remote Sensing Systems

Constellation	Planned Constellation	First Launch	Notes
Siwei GaoJing (SuperView) 四维高景	28+ LEO	2016	■ Modality: PAN EO (0.5 m and 0.3 m resolution); MSI (2 m res), SAR X-band (0.5 m res) ■ Owner/Operator: Siwei Star ■ Imagery distribution: SpaceWill
Jilin-1 / Gaofen 吉林一号	138 LEO	2015	■ Modality: PAN EO (30 cm–1.2 m resolution), video, MSI (2 m res), SAR, SWIR, MWIR, LWIR ■ High-resolution, high-revisit service ■ Owner/Operator: CGSTL ■ Imagery distribution: CGSTL and HEAD Aerospace
GaoFen-3 and -12 高分三号/高分十二号	7 LEO	2016	■ Modality: SAR C-band ■ Part of China's national High Resolution Earth Observing System (CHEOS) ■ Owner/Operator: CNSA ■ Imagery distribution: SpaceWill and HEAD Aerospace
Tianxian (Chaohu-1) 天仙星座(巢湖一号)	96 LEO	2022	■ Modality: SAR C-band ■ Owner/Operator: Spacety (with CETC) working on 96-satellite X- and C-band SAR constellation
ZiYuan-1 02D/E 资源一号02D/E	Unknown LEO	2019	■ Modality: MSI, HSI, SWIR, LWIR ■ Two satellites on orbit ■ Imagery distribution: SpaceWill
Zhuhai Orbita* 珠海一号	34 LEO	2017	■ Modality: Video, HSI. Plans for SAR, infrared ■ Owner/Operator: Orbita Aerospace

Note: PAN (panchromatic), EO (electro-optical), MSI (multispectral imaging), HSI (hyperspectral imaging), SAR (synthetic aperture radar), SWIR (short-wave infrared), MWIR (mid-wave infrared), LWIR (long-wave infrared), CNSA (China National Space Administration), and CGSTL (Chang Guang Satellite Technology).

* Zhuhai Orbita has been rebranded to Zhuhai Aerospace Microtech. While the company appears to still sell imagery from satellites operating on orbit, its business has shifted to developing aerospace-grade electronic components.

Source: Bingen, Gauthier, and Chang, *Gold Rush.*

The 2024 *Gold Rush* assessment highlighted how quickly Chinese firms have advanced. In just three years, they had matched U.S. and European competitors in certain technical performance areas, such as offering 30-cm-class EO satellite imagery, exemplified by Siwei Star's SuperView Neo-1, launched in 2022. Meanwhile, CGSTL's Jilin-1 constellation led globally in EO revisit rates (i.e., the ability to rapidly revisit terrestrial targets), with more than 100 operational satellites providing near-continuous global coverage.[223]

Figure 22: The 2024 Commercial Remote Sensing Global Rankings

Source: Bingen, Gauthier, and Chang, *Gold Rush*.

Trends and Observations

CHINESE STRENGTHS AND GAINS

Chinese remote sensing firms have overtaken international competitors in some capability areas. In the 2024 *Gold Rush* assessment, Chinese firms held leading positions in high-resolution EO imaging and global revisit, C-band SAR, and multispectral and hyperspectral sensing offerings (see Figure 22).[224] C-band SAR provides lower-resolution radar imagery over larger areas and is well suited for environmental analysis, including global mapping, landform changes, and ocean monitoring. Long-wave infrared (LWIR) imaging is particularly useful for applications such as climate change, agriculture, and wildfire monitoring. Chinese companies offer both C-band SAR and LWIR imaging products on the commercial market, a contrast from the United States, where radars and infrared satellite sensors have served largely scientific and military purposes and U.S. regulatory restrictions have slowed the development of commercial solutions and cultivation of commercial markets.[225]

While the 2024 *Gold Rush* assessment concluded that U.S. and European companies are outperforming Chinese ones in higher-resolution X-band SAR imagers, Chinese firms are steadily

progressing in the deployment of their own capabilities, such as with the launch of a Jilin-1 SAR satellite in September 2024 and two SuperView Neo-2 SAR satellites in November 2024.[226]

DEEP STATE AND COMMERCIAL RELATIONSHIPS

State-industry integration remains a defining feature of China's remote sensing ecosystem, including with newer private ventures. These commercial firms rely heavily on state-owned partners for development, manufacturing, and launch services. For instance, the GaoJing (SuperView Neo-1) high-resolution imaging satellites launched in February 2025 were developed and manufactured by CASC.[227] Although Siwei Star owns and operates the satellites, their imagery is offered to the global market through SpaceWill (formerly Space View Technology). SpaceWill is also authorized by the government to distribute satellite imagery-related geospatial products and services from official state systems.[228] This structure highlights how state backing underpins commercial activity, ensuring alignment with national priorities while enabling firms to operate with the appearance of market independence.

SANCTIONS AND INCREASING BATTLEFIELD TRANSPARENCY

Several leading Chinese remote sensing companies and satellite imagery distributors—including Spacety, HEAD Aerospace, and CGSTL—have been sanctioned by the United States for activities deemed threatening to U.S. and allied interests. In January 2023, Spacety and HEAD Aerospace were sanctioned for providing satellite imagery to the Wagner Group during its attacks in Ukraine. In April 2025, the United States accused CGSTL of supplying imagery to the Houthis for targeting U.S. naval and international vessels in the Red Sea.[229] Other firms, such as Orbita Aerospace, were sanctioned for supporting the PLA's military modernization, including "attempting to acquire U.S.-origin items in support of China's military modernisation efforts."[230]

Greater accessibility to commercial space assets and commercial imagery is introducing new levels of transparency to the battlefield.

Greater accessibility to commercial space assets and commercial imagery is introducing new levels of transparency to the battlefield. Persistent surveillance from worldwide remote sensing satellites means movements and signatures are increasingly visible to a wide range of actors, not just governments, accelerating targeting cycles and complicating operational security for all actors.

MULTIFUNCTIONAL CONSTELLATIONS AND MARKET DIRECTION

Despite limited publicly available information, emerging large-scale constellations nevertheless point to the continued expansion of China's commercial remote sensing ambitions. Some initiatives—such as SpaceWill's ZiYuan-1 02D/E spectral and infrared systems—have disclosed relatively few details regarding planned upgrades or deployment timelines. Others, including CGSTL, have announced ambitious plans for extensive remote sensing constellations and have already deployed more than 100 satellites.

Another interesting trend that does not fit neatly into any single space-related sector is the shift toward multifunctional satellite networks. For example, Tianjin Satcom Geohe Technologies Co., Ltd., envisions a 36-satellite constellation combining panchromatic, multispectral, hyperspectral, and SAR sensor data with ground sensor data for disaster response, though progress since its 2021 announcement remains opaque.[231] Similarly, EllipSpace's Starpool project—a multifunctional LEO satellite network integrating remote sensing, navigation, and communications services—plans to launch over 100 satellites by 2027. According to Beijing's *Global Times*, EllipSpace "has established in-depth cooperation with more than 10 countries involved in the Belt and Road Initiative," extending China's information influence through commercial collaboration."[232]

6

Space Sector: Other Areas

China also seeks to commercialize other space sectors, including global navigation satellite system and weather, as well as nascent areas such as in-space servicing, assembly, and manufacturing (ISAM), human spaceflight, and deep space exploration. MCF is at the core of China's focus on amplifying its state-owned capabilities with commercial space assets. Specifically, a shift toward multifunctional satellite networks—integrating remote sensing, weather, and GNSS data into exportable information networks—provides China an avenue for market expansion while also creating soft-power influence.[233]

Global Navigation Satellite System

GNSS platforms provide position, navigation, and timing (PNT) services essential to modern military, commercial, and civilian operations. By integrating commercial capabilities into the state-owned BeiDou system—originally developed for military purposes—China seeks to enhance the accuracy of its GNSS services at sea and in near-Earth space while expanding overall system coverage.[234] At the same time, BeiDou serves broader strategic objectives. Analysts have noted that the system "provides a foundation for Chinese infrastructure exports" related to the BRI and Digital Silk Road, reinforcing China's technological influence abroad.[235]

According to the China Satellite Navigation Office, the next-generation BeiDou satellites are planned to be completed by 2035.[236] The office states that the upgraded satellites will be able to deliver real-time PNT "with precision levels ranging from meters to decimeters," and further increase resiliency by using a mixed constellation structure, combining GEO, MEO, and LEO satellites.[237]

Beijing Future Navigation Technology Co., Ltd., is a commercial company developing the CentiSpace (Xiangrikui) LEO constellation, which provides GNSS augmentation services to improve position and navigation accuracy. The constellation has 120 planned micro- and nanosatellites, with 15 satellites currently in orbit.[238] CentiSpace satellites were developed and built in collaboration with CAS and the 29th Institute of the China Electronics Technology Group Corporation (CETC).[239] The integration of CentiSpace into state GNSS services aims to improve autonomous driving, geographic information systems, disaster response and management, and precision agriculture.

Table 6: Chinese Commercial GNSS Companies

Constellation	Planned Constellation	First Launch	Notes
CentiSpace (Xiangrikui) 微厘空间	120 LEO	September 2018	■ Owner/Operator: Beijing Future Navigation Technology Co., Ltd. ■ Services: GNSS augmentation

Source: CSIS Aerospace Security Project.

By integrating commercial enhancements into its government-run GNSS, China is boosting performance while strengthening resilience against potential jamming and spoofing. Through the export of these commercial GNSS services—often bundled with other digital infrastructure to BRI countries—Beijing is fostering dependence on its BeiDou-enhanced navigation network, which operates outside U.S. and Western systems. This approach mirrors China's broader strategy of expanding influence through infrastructure, connectivity, and aid initiatives.

Weather

Mirroring the approach long adopted by European and U.S. weather services of integrating commercial weather satellite data into national forecasting systems, the China Meteorological Administration (CMA) began incorporating commercial satellite data into its services in 2024.[240] According to official statements, this integration is intended to advance China's ability to deliver more accurate, higher-resolution, and timely meteorological information, while positioning the country as "a key contributor and provider of global public goods" in weather and climate services.[241]

According to a CMA vice director, China has established "the world's largest in scale, most comprehensive in coverage, land-sea-air-space-coordinated integrated observation system."[242] The system reportedly covers more than 90 percent of densely populated regions worldwide. As part of this effort, CMA has integrated approximately 35 commercial satellites into its national architecture, including 23 Tianmu-1 and 12 Yuanyao-1 satellites.[243] These satellites complement the state-owned FengYun meteorological satellites, aiding in temporal and spatial coverage.[244]

Aerospace Tianmu, in partnership with MagicCubeSat, manufactures and operates the Tianmu-1 constellation.[245] The system, comprising 23 operational satellites of 72 total planned satellites, provides data products for weather forecasting, aviation meteorology, ocean routing, and

monitoring of the ionosphere and near-space environment.[246] Similarly, Yunyao Aerospace produces the Yunyao-1 satellite constellation. Currently, 41 satellites are in orbit, with 90 total planned. The company aims to deliver real-time atmospheric data, earthquake forecasting, and improve the speed and accessibility of meteorological data services for BRI countries.[247]

Table 7: Chinese Commercial Weather Companies

Constellation	Planned Constellation	First Launch	Notes
Tianmu-1 天目	72 LEO	January 2023	■ Owner/Operator: Aerospace Tianmu with MagicCubeSat ■ Services: Weather forecasting; multidomain meteorological support; data products
Yunyao-1 云摇	90 LEO	December 2021	■ Owner/Operator: Yunyao Aerospace ■ Services: Earthquake forecasting; weather forecasting; data products

Source: CSIS Aerospace Security Project.

While explicit partnerships with the government did not begin until 2024, companies providing commercial weather services historically retained ties with the government. Aerospace Tianmu is a subsidiary of CASIC, and the core group of aerospace engineers forming Yunyao are former CASC employees.[248] As Chinese commercial weather services proliferate globally, Beijing is engineering foreign dependence on its meteorological infrastructure. Pakistan, Ethiopia, the Solomon Islands, Mongolia, and Djibouti have already integrated Chinese climate disaster early warning systems. By embedding its commercial weather satellites into the broader global meteorological network, China is leveraging essential data access as a vehicle for soft-power projection and long-term geopolitical influence.

China is leveraging essential data access as a vehicle for soft-power projection and long-term geopolitical influence.

In-Space Servicing, Assembly, and Manufacturing

Mastering ISAM technologies can enable satellite operators to conduct on-orbit inspections, repairs, refueling, and upgrades, as well as to relocate space assets or debris. ISAM services may also support the construction of larger structures in orbit through the assembly of modular components. As these capabilities mature, they could advance China's ambitions to expand its Tiangong space station by enabling more cost-effective assembly of additional modules and extending the operational lifespan of existing systems.[249]

At the same time, these technologies possess significant dual-use potential. The same robotic arms, rendezvous-and-docking systems, and proximity operations capabilities used for satellite

servicing or debris removal could also support noncooperative orbital activities and counterspace missions. In line with China's MCF strategy, the PLA is likely to directly benefit from technological progress in this area.

Table 8: Chinese Commercial ISAM Companies

Company	Planned Systems	First Launch	Notes
Sustain Space 三垣航天	Unknown	Unknown	■ Services: Debris removal; satellite maintenance operations; on-orbit servicing

Source: CSIS Aerospace Security Project.

Sustain Space is a company based in Suzhou, Jiangsu Province, focused on developing orbital servicing technologies for active debris removal, satellite life extension operations, and on-orbit repair and manufacturing. Its parent company, Emposat—a leading space telemetry, tracking, and command company—is illustrative of a growing trend among Chinese aerospace companies that diversify their portfolios across space sectors. The company received funding in 2024 to complete an orbital demonstration, but there are currently no reports on the progress of this mission.[250]

Human Spaceflight, Space Tourism, and Space Mining

Mirroring the space tourism ambitions of Blue Origin and Virgin Galactic, several Chinese firms are pursuing commercial human spaceflight and the extraction of extraplanetary resources. Most of the leading actors in this area are private launch providers developing reusable rocket technologies. Advances in ISAM capabilities complement these efforts by enabling potential applications in on-orbit manufacturing and space resource utilization.

Three companies are focused on Chinese human spaceflight operations in China. CAS Space and Deep Blue Aerospace are both developing suborbital tourism vehicles, with commercial service targets of 2028 and 2027, respectively.[251] AZSpace likewise plans to conduct crewed test flights by 2027 or 2028.[252] The company successfully launched its first cargo spacecraft in December 2025, a platform that could support future resupply missions to the Tiangong space station.[253] In November 2024, Deep Blue Aerospace sold two seats aboard its maiden crewed suborbital flight planned for 2027, with tickets priced at RMB 1.5 million (USD 208,000) each.[254] Like U.S. space tourism companies, Chinese firms also seek to reduce the cost of space travel. A general manager at CAS Space stated that the country aims to lower ticket prices to around RMB 100,000 (USD 13,800) by 2030.[255]

Chinese firms have also expressed interest in developing in-space resource extraction, or space mining capabilities, an area in which ISAM technologies will play an important role.[256] Origin Space, headquartered in Nanjing, Jiangsu Province, was founded in 2019 as China's first company dedicated to the exploration and utilization of space resources. In 2021, it launched NEO-01, a research and technology verification satellite for space resource mining. It also launched the

Yangwang-01 optical space telescope that same year to advance future mining operations.[257] However, as of late 2025, the company website was no longer accessible, raising questions about the firm's operational viability and long-term prospects.

Table 9: Chinese Commercial Human Spaceflight, Space Tourism, and Space Mining Companies

Company	First Launch	Notes
Origin Space 起源太空	2021	■ Mission: Space resource mining ■ System/Product: NEO-01 (4/2021) and Yangwang-01 (6/2021)
CAS Space 中科宇航	2028*	■ Mission: Space tourism
Deep Blue Aerospace 深蓝航天	2027*	■ Mission: Space tourism
AZSpace 北京紫微宇通科技有限公司	2027 or 2028*	■ Mission: Space tourism

Note: * First launch not yet achieved.

Source: Authors' research and analysis.

7

Satellite Production Capacity and Manufacturing Trends

Introduction

Domestic satellite production is scaling quickly across China, with aerospace hubs emerging around newly built satellite "superfactories" and "gigafactories" such as Wenchang International Aerospace City and in Wuxi City. Even carmaker Geely operates a satellite factory, where it leverages its automotive prowess to build both cars and satellites.

Estimates vary, but China is rapidly approaching industrial-scale capacity. The authors assess that China's manufacturing buildup across 17 facilities could support a production capacity of 4,100 to nearly 5,000 satellites annually, mostly small satellites in the 100–500 kg range. One Chinese trade blog estimates that, as of April 2026, there is a current nationwide production capacity of 4,050 satellites per year across 36 factories, and an additional capacity of 3,310 per year being added with 16 facilities under construction and another 3 facilities planned (bringing total annual planned production capacity to 7,360 satellites).[258] As an example of rapid progress, "the total capacity of all Chinese plants in early 2023 was only about 500 satellites per year."[259] For comparison, SpaceX's Starlink line can produce 70 satellites per week (translating to over 3,600 satellites per year).[260]

This expansion, however, may outpace near-term demand. Multiple Starlink-like LEO broadband networks, remote sensing constellations, and other commercial ventures are driving growth, but many face technical hurdles, quality issues, or uncertain business cases. Progress is uneven and often opaque, though stealth development and limited transparency make it difficult to assess outcomes with certainty.

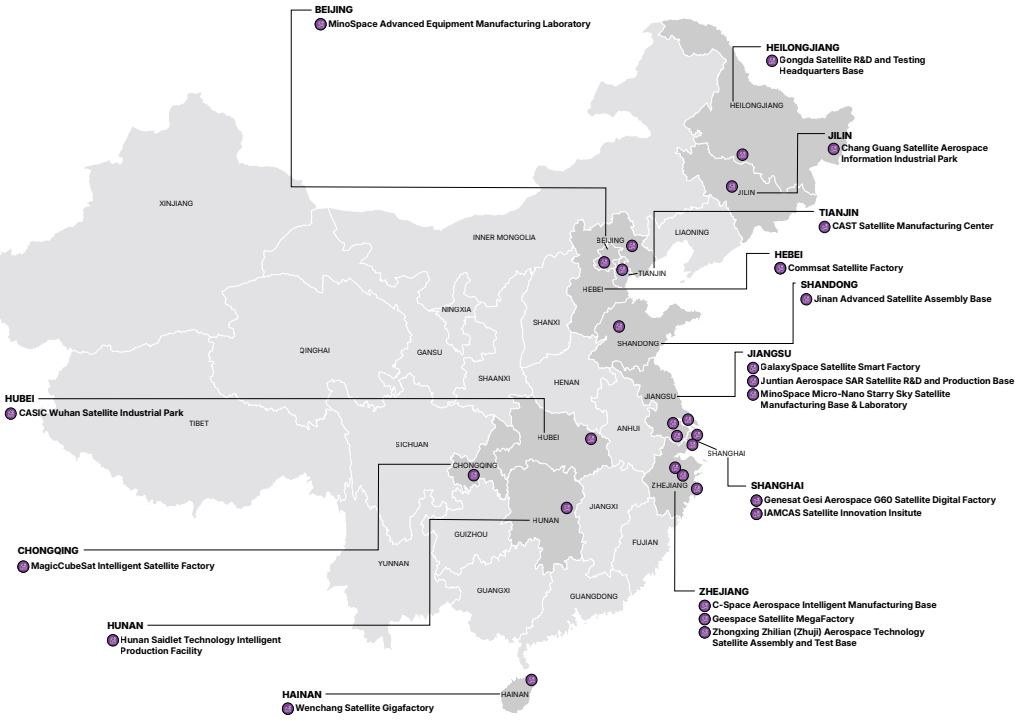
Alongside capacity growth, Chinese companies are introducing advanced processes—digital twin modeling, pulsation production lines, and "smart factory" techniques—while innovating in key subsystems such as satellite thrusters, fuel tanks, and solar panels. Collectively, these efforts position China to achieve mass satellite production at a scale that could challenge U.S. and allied industrial output.

Satellite Factories

This section examines China's expanding network of satellite manufacturing facilities supporting commercial space activities and their estimated planned production capacities. The reported estimates draw from publicly available information, including company websites, news releases, and social media postings. The authors fully acknowledge that these numbers may not reflect the totality of operational factories or current production rates, as there is limited publicly available data on the status of these facilities. Although the exact timeline for current facilities to achieve their full advertised output remains unclear, available data nevertheless indicates the development of a manufacturing base geared toward rapid, high-volume production.

Reported capacity figures also warrant careful interpretation, as manufacturing rates vary substantially according to satellite size, mass, and complexity. For example, smaller satellites typically require less time to manufacture and thus a factory will be able to produce them at a higher volume. Where possible, the authors identify the satellite size and mass categories each factory is designed to produce.

Figure 23: Satellite Factories



Source: CSIS Aerospace Security Project.

Table 10: Satellite Size and Mass Categories

Satellite Size	Mass
Large	1,000+ kg (2,200+ lbs)
Medium	500–1,000 kg (1,100–2,200 lbs)
Small	100–500 kg (220–1,100 lbs)
Microsatellite	10–100 kg (22–220 lbs)
Nanosatellite	1–10 kg (2.2–22 lbs)
Picosatellite	0.1–1 kg (0.22–2.2 lbs)

Source: "Satellites," Space Foundation, n.d., https://www.spacefoundation.org/space_brief/satellites/.

Table 11: Chinese Satellite Manufacturing Companies

Company / Factory (product)	**City / province**	**Production capacity (annual estimate)**	**Notes**
Wenchang Satellite Gigafactory 文昌国际航天城卫星超级工厂 (LandSky Hongqing Tech LEO broadband)	Wenchang, Hainan Province	1,000	■ Est. capacity: Up to 1,000 satellites/year when completed in 2026 ■ Efficiencies: Streamlines satellite production, research, and testing; draws on automotive assembly line processes and technologies ■ Factory composition: Includes the International Satellite Advanced Manufacturing Center, International Satellite-Rocket Collaborative R&D Center; co-located with launch and other facilities to enable satellite "production-to-launch" ■ Factory size: 60,000 sq. meters—largest in Asia ■ Relationships: Jointly owned by Wenchang International Aerospace City Administration and CASC Commercial Satellite Co., Ltd. ■ Description: Characterized as "SatNet compliant," indicating the factory is, in part, purpose built to serve the China SatNet (i.e., national GuoWang) constellation
Genesat Gesi Aerospace G60 Satellite Digital Factory 格思航天G60卫星数字工厂 (Thousand Sails LEO broadband)	Shanghai Municipality	300–600	■ Est. capacity: 600 satellites/year (small satellite category) by 2026 ■ First phase completed 2023, with estimated capacity of 300 satellites/year (small satellite category, <500 kg) ■ Second phase announced in 2025, with a planned capacity of 150 satellites/year (large satellite category, ~1,000 kg) ■ Efficiencies: Aims to reduce satellite production time from 2–3 months to 1.5 days and reduce cost by 35 percent per satellite ■ Description: Thousand Sails is China's response to Starlink, with a "flat sat" design, stacking and separation technology, and pulsed production lines
Geespace Satellite MegaFactory 吉利卫星超级工厂 (Geespace LEO broadband)	Taizhou, Zhejiang Province	500	■ Est. capacity: 500 satellites/year ■ Efficiencies: Aim to produce 1–2 satellites/day and reduce satellite manufacturing cost by 45 percent ■ Description: Integrates aerospace and automotive manufacturing technologies to enable satellite mass production

Company / Factory (product)	**City / province**	**Production capacity (annual estimate)**	**Notes**
GalaxySpace Satellite Smart Factory 银河航天南通卫星智慧工厂 (GalaxySpace Mini-Spider LEO broadband)	Nantong, Jiangsu Province	300	■ Est. capacity: 100–150 satellites/year (medium-to-large satellite category) or 300 satellites/year (small satellite category) ■ Efficiencies: Aims to reduce production timelines (i.e., 80 percent faster than traditional satellite R&D) ■ Description: "Flat sat" design, mass production incorporates automotive manufacturing processes and advanced assembly equipment
IAMCAS Satellite Innovation Institute* 国科学院微小卫星创新研究院	Shanghai Municipality	300	■ Est. capacity: 300 satellites/year (micro-to-small satellite category) total for institute but also supports development and test of multi-ton satellites ■ Factory composition: Parks contain satellite manufacturing and assembly facilities and test chambers; incorporating advanced tech and methods into manufacturing, including pulsed production lines and automated logistics and distribution systems ■ Factory size: Institute comprises Lingang Park (125,000 sq. meters), Zhangjiang Park (27,000 sq. meters), and Songjiang Park (under construction; 34,000 sq. meters)
CASIC Wuhan Satellite Industrial Park* 武汉卫星产业园	Wuhan, Hubei Province	240	■ Est. capacity: 240 satellites/year (small-to-medium satellite category, <1,000 kg) ■ Efficiencies: Aims to improve small satellite production efficiency by 40 percent ■ Description: China's first "smart" manufacturing facility for small satellites
CAST Satellite Manufacturing Center* 中国空间技术研究院天津卫星柔性智造中心	Tianjin Municipality	240	■ Est. capacity: 240 satellites/year (small satellite category), with production of approx. 4–5 satellites/week ■ Efficiencies: Aims to reduce satellite production time from six months to 20 days ■ Factory size: 4,000 sq. meters with 13 production sites, forming a pulsed production line, and leveraging advanced assembly technologies ■ Description: Satellite "flexible intelligent" production line of the Fifth Academy

Company / Factory (product)	**City / province**	**Production capacity (annual estimate)**	**Notes**
C-Space Aerospace Intelligent Manufacturing Base 诸暨空天智能制造基地 (Remote Sensing)	Zhuji, Zhejiang Province	200–500	▪ Est. capacity: 200 satellites/year growing to 500 satellites/year
Zhongxing Zhilian (Zhuji) Aerospace Technology Satellite Assembly and Test Base 众星志连(诸暨)航天科技	Hangzhou, Zhejiang Province	200	▪ Est. capacity: 200 satellites/year ▪ Efficiencies: 95 percent in-house component development ▪ Relationships: Incubated at the Microsatellite Research Center of Zhejiang University
Chang Guang Satellite Aerospace Information Industrial Park 长光卫星航天信息产业园 (Remote Sensing-EO)	Changchun, Jilin Province	100–200	▪ Est. capacity: 100–200 satellites/year (small satellite category) ▪ Factory composition: Part of an aerospace information industrial park covering 216,000 sq. meters ▪ Description: Chang Guang Jilin-1 remote sensing constellation of over 100 EO satellites on orbit with plans to expand to 300 satellites. Jilin-1 satellite advancements include reducing satellite weight and costs
Gongda Satellite R&D and Testing Headquarters Base 工大卫星研发试验总部	Harbin, Heilongjiang Province	180	▪ Est. capacity: 180 satellites/year (small satellite category, 500 kg) ▪ Description: 24 of its satellites successfully launched; company has orders for >100 satellites and expects to deliver 20 in 2025 ▪ Relationships: Ties to Harbin Institute of Technology Satellite Technology Co., Ltd (HIT-SAT)
MinoSpace Micro-Nano Starry Sky Satellite Manufacturing Base & Laboratory 微纳星空智能化园区and **MinoSpace Advanced Equipment Manufacturing Laboratory** 微纳星空先进装备制造实验室 (Remote Sensing - SAR, EO)	Wuxi, Jiangsu Province, and Beijing Municipality	150	▪ Est. capacity: 150 satellites/year (micro-to-small satellite category, 50–300 kg) across Wuxi and Beijing plants ▪ Facility size: Wuxi manufacturing plant (23,000 sq. meters) still under development ▪ Facility composition: Beijing manufacturing laboratory (5,000 sq. meters) is operational, conducts AIT functions and is main testing and production base for Micro-Nano Starry Sky's commercial satellites ▪ Description: 24 of its satellites successfully launched, including first privately developed 0.5-meter-resolution EO satellite and first X-band commercial SAR satellite

Company / Factory (product)	**City / province**	**Production capacity (annual estimate)**	**Notes**
Hunan Saidlet Technology Intelligent Production Facility 赛德雷特卫星智能制造工厂	Zhuzhou, Hunan Province	150	■ Est. capacity: 150 satellites/year (micro-to-small satellite category, 50–500 kg) ■ Facility composition: R&D center, satellite manufacturing factory, space environment test center, and space materials test and evaluation center ■ Description: Company has secured satellite orders, including contract to develop satellites for "Zhuzhou Constellation"
MagicCubeSat Intelligent Satellite Factory 魔方卫星智能卫星工厂 (Remote Sensing, Weather)	Chongqing Municipality	100	■ Est. capacity: 100 satellites/year (small satellite category) and produces satellite components ■ Description: Developed 22 remote sensing/weather satellites for the Tianmu constellation with Aerospace Tianmu
Commsat Satellite Factory 九天微星智能卫星工厂 (LEO broadband)	Tangshan, Hebei Province	100	■ Est. capacity: 100 satellites/year (micro-to-small satellite category, 100 kg) ■ Description: Factory manufactures satellites and conducts research on communications technologies and ground applications
Jinan Advanced Satellite Assembly Base 济南卫星总装基地	Jinan, Shandong Province	20–100	■ Est. capacity: 20 satellites/year (small satellite category, 500 kg) in the first phase, growing to 100 satellites/year (small satellite category, 500 kg) ■ Facility size: Construction area covers 53,000 sq. meters, with floor area estimated at 9,600 sq. meters; first phase to complete in 2025 and includes R&D and AIT facilities
Juntian Aerospace SAR Satellite R&D and Production Base 北京钧天航宇技术有限公司	Wuxi, Jiangsu Province	100	■ Est. capacity: 100 satellites/year ■ Efficiencies: Aims to reduce satellite costs ■ Relationships: Ties to CASC
	Total	**4,180–4,960**	

Note: * Includes select SOEs.

Source: CSIS Aerospace Security Project.

Trends and Observations

The authors conducted extensive open-source research and analysis of Chinese satellite manufacturers and identified several key trends.

MASS PRODUCTION DRIVEN BY LEO BROADBAND

LEO broadband constellations are the main driver of domestic capacity expansion, with multiple firms aiming to rival SpaceX's Starlink. The Thousand Sails constellation represents China's direct competitor to Starlink, with plans for more than 15,000 satellites. To meet demand, Thousand Sails and IAMCAS established Genesat in Shanghai. Its Gesi Aerospace G60 Digital Factory will initially produce 300 satellites annually (under 500 kg), with a target of 500–600 satellites by 2026. GalaxySpace is also scaling aggressively to get closer to Starlink, with plans to manufacture 300–500 satellites per year at its Nantong Smart Factory.[261] Founder Xu Ming has argued that this facility could narrow China's production gap with the United States to within two years.[262]

LEO broadband constellations are the main driver of domestic capacity expansion, with multiple firms aiming to rival SpaceX's Starlink.

Following Starlink, firms such as Genesat are employing similar technology and designs, such as flat panel satellite designs, advanced stacking, and separation technologies. Most production lines are focused on small satellites in the 100–500 kg range, with efforts to shorten production timelines from months to days while cutting costs. Genesat aims to reduce satellite production timelines from two to three months to one and a half days and reduce cost by 35 percent per satellite.[263]

Figure 24: Wenchang Satellite Gigafactory Under Construction and Geely's Intelligent Satellite Production and Testing Center, Both Undated

Source: Baidu, details redacted to protect source material; and 胡祥熙 [Hu Xiangxi], "年产500颗，我们去吉利卫星超级工厂看了看" [Annual production of 500 units: We visited Geely's satellite super factory], 观察者 [The Observer], December 24, 2024, https://www.guancha.cn/economy/2024_12_24_759989.shtml.

CO-LOCATED MANUFACTURING AND LAUNCH FACILITIES

Chinese manufacturers are increasingly adopting vertical integration models, co-locating design; development; assembly, integration, and testing; and launch facilities to streamline production and speed the delivery of systems to orbit. The Wenchang Satellite Gigafactory will sit only a few miles from the Wenchang Launch Center. According to Wenchang International Aerospace City officials, the facility will allow satellites to be launched immediately after completion, eliminating lengthy transport delays: "In the past, the satellites were manufactured all over the country and then shipped to Hainan, with the help of the factory, however, we will be able to launch the satellites once they are built."[264]

SCALE AND DUAL-USE APPLICATIONS ACCELERATED BY STANDARDIZATION

According to Chinese state media reporting, production lines at the Wenchang Satellite Gigafactory on Hainan Island were built "according to China SatNet's production-line standards," suggesting the facility was designed, at least in part, to support production of satellites for the national Guowang LEO broadband constellation in addition to commercial purposes.[265] As discussed earlier, Guowang satellite manufacturing appears to be distributed across multiple entities, including CAST, IAMCAS, CGSTL, GalaxySpace, and Wenchang-based manufacturing facilities. Such distributed production enables faster scaling but also requires a significant degree of centralized government coordination and standardization to ensure satellites are built to common technical and production standards.

Operationally, standardization allows satellites produced by different entities to maintain interoperability and integrate seamlessly within the same network architecture. Additionally, launch vehicle interface standards allow Guowang satellites to fly aboard a range of rockets. To date, deployments have relied primarily on variants of the national Long March rocket family, but achieving the constellation's planned scale will likely require a broader mix of launch providers and vehicles. Similarly, the Thousand Sails mega-constellation, which has also depended on Long March rockets, will benefit from standardized satellite manufacturing and launch vehicle interfaces.

RISKS FROM OVERPRODUCTION AND MARKET SATURATION

Despite rapid expansion, questions remain about whether demand can sustain this level of domestic production. With over one-third of the world's population lacking internet access—particularly among populations in the Global South—opportunities exist in telecommunications and related services.[266] Given the number of Chinese LEO broadband ventures, however, it is highly unlikely that all will succeed—either technically and operationally, or with a viable business case and sustained investment. China only needs a few ventures to succeed to establish global competitiveness. On the other hand, if overcapacity builds faster than market demand, China's satellite production sector could draw strong parallels to the country's boom and bust real estate cycle. It is unclear whether the sector will engage in consolidation if demand starts to lag.

The commercial space base is growing alongside state-backed players such as CAST, with private firms implementing government policies aimed at accelerating growth across all facets of China's space programs. New factories are being rapidly constructed to serve both state and commercial interests, as the Wenchang Satellite Gigafactory exemplifies. For policymakers, the takeaway is that China's industrial strategy is not merely about catching up—it is about creating a system capable of

speed and scale that can outproduce and outmaneuver its competitors across both commercial and strategic domains.

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Manufacturing Trends

China has the advantage of building "greenfield" satellite manufacturing facilities, unburdened by legacy systems or procedures. This allows new facilities to incorporate advanced techniques from the outset—drawing on automotive-style production lines, digital twin modeling, robotic assembly, automation, and pulsed production methods—to boost efficiency, scale, and speed.

China has the advantage of building "greenfield" satellite manufacturing facilities, unburdened by legacy systems or procedures. This allows new facilities to incorporate advanced techniques from the outset.

While Chinese firms are still facing a steep learning curve that U.S. companies spent decades refining, the absence of entrenched practices enables greater flexibility and rapid innovation. The result is a manufacturing base that can experiment with process optimization at scale, even if satellite quality may initially lag more established players.

SPEED AND VOLUME FROM "SMART" FACTORIES AND "INTELLIGENT" PRODUCTION LINES

A new wave of smart factories and intelligent production lines is shortening build times and automating assembly. MinoSpace's "intelligent production line project" in Wuxi, Jiangsu Province, expects to reduce satellite assembly from three to four months to one or one and a half months.[267] GalaxySpace's "smart factory" in Nantong, Jiangsu Province, is China's first of its kind in the Yangtze River Delta, employing robotic assembly, digital manufacturing systems, precision measurement systems, and automated testing platforms, operating much like an automotive assembly line.[268]

INNOVATIVE METHODS SOURCED FROM AUTOMOTIVE MANUFACTURING

Chinese aerospace firms are also adopting automotive-style production methods. Geely, China's first company to build both cars and satellites simultaneously, operates a gigafactory in Taizhou, Zhejiang Province. It is "the world's first satellite mass-production plant which integrates automotive manufacturing capabilities to mass-produce aerospace products."[269] Leveraging

"modular design and AI-enabled quality control," Geely has reportedly reduced satellite unit costs by 45 percent and increased production speed by 300 percent.[270] The facility expects an annual output of up to 500 satellites as it ramps up its future mobility constellation of LEO broadband satellites.[271] Officials in Wenchang, citing the Wenchang Satellite Gigafactory, also point to its automotive-style assembly as a model for satellite manufacturing efficiency.[272]

Pulse production lines are an assembly line approach adapted from the automotive sector in which workstations are fixed and satellites move through them in synchronized pulses. This approach is gaining traction in China's space manufacturing ecosystem. The aim is to boost production cadence and standardization, enabling rapid output of large numbers of analogous satellites. Several firms, including Geely, Genesat, CAST, and IAMCAS, have reportedly adopted such techniques to streamline their satellite manufacturing operations.[273]

In China's launch and satellite manufacturing sector, the shift from traditional "push" production models toward an automotive-style "pull" system reflects broader industrial reforms. Researchers note that the nation's space industry is implementing a "final-assembly pull" system, where components are drawn through the assembly line in response to downstream demand rather than being stockpiled in advance.[274]

DIGITIZATION AND AUTOMATION SHORTENING TIMELINES

Chinese manufacturers are increasingly turning to digital twin modeling—a virtual replica of a physical object or system—to accelerate satellite design and automate mass production in smart factories. Entities such as Genesat and IAMCAS are developing "intelligent three-dimensional warehouses" and virtual replicas of spacecraft to simulate, test, and optimize designs before physical assembly.[275] These systems shorten design-to-production timelines, lower failure rates, and enable predictive maintenance across satellite components.

Meanwhile, robotics and automation are becoming central to smart satellite factories. GalaxySpace deploys robotic systems to handle repetitive precision tasks such as bolting, wiring, or soldering, while CAST uses programmable robotic arms to install solar panels or maneuver large satellite components.[276] These technologies improve safety, increase throughput, reduce human error, and drive down costs—bringing satellite production closer to the efficiencies of automotive assembly lines.

Figure 25: CASIC Small Satellite Factory

Source: China Aerospace Science and Industry Corporation, Ltd. See Xinhua, "China's Small-Satellite Smart Manufacturing Facility Starts Operations," *China Daily*, May 14, 2021, https://global.chinadaily.com.cn/a/202105/14/WS609dda55a31024ad0babdde2.html.

One robotics company that illustrates both the targeting of Western technology and its implications for advancing Chinese industrial and military capabilities is KUKA—an advanced industrial robotics company powering aerospace, automotive, electronics, and other manufacturing sectors. A leading German industrial robotics company, KUKA became the subject of a hostile takeover in 2016 by the Chinese home appliance company Midea Group, which eventually expanded its ownership to roughly 95 percent of the company (and, by 2022, assumed full ownership). The acquisition was regarded as "a defining moment in the evolution of China's manufacturing sector," accelerating its transition from low-cost, labor-intensive production toward advanced industrial manufacturing.[277] It was also seen as a "blueprint" for how Chinese entities could target and acquire strategically valuable foreign technologies, triggering significant backlash in Germany over the perceived "sell-off of German know-how."[278]

SPACEX AS A BENCHMARK FOR DESIGN AND PRODUCTION

Chinese aerospace design and manufacturing show clear influence from SpaceX, particularly in adopting flat production for satellites and horizontal assembly for launch vehicles. Companies such as Genesat and GalaxySpace use modular, flat satellite form factors to streamline assembly, reduce handling complexity, and enable efficient stacking for transport. At the same time, horizontal assembly, testing, and transport of rockets simplify integration, cut pre-launch preparation time, and lower infrastructure needs.[279] Together, these approaches support faster launch cadences and higher payload volumes—essential for deploying large-scale satellite constellations.

The influence of SpaceX is also evident in materials selection. Lightyear Exploration, a venture-backed Chinese startup, is developing stainless steel structures and tanks for launch vehicles.[280] Compared to traditional aluminum alloy tanks, stainless steel is cheaper and easier to

manufacture and offers performance advantages as Chinese government and commercial entities pursue reusable and super-heavy rockets.

China's metal additive manufacturing (AM) industry is booming, driven in part by the demands of its aerospace sector.[281] Also known as metal 3D printing, metal AM supports the efficient mass production of satellite and rocket components, including structures, antenna brackets, engine parts, and nozzles. The technology enables "lighter components for reduced launch costs, on-demand printing for faster turnaround times and the ability to create intricate designs that are impossible with traditional methods."[282] For companies such as Bright Laser Technologies in Xi'an, Shaanxi Province, AM technology "has played a pivotal role in the success of recent vertical takeoff and landing tests conducted by LandSpace's ZQ-3 VTVL-1 reusable rocket."[283]

IMPLICATIONS FOR MANUFACTURING

China is not only developing the capacity to mass produce satellites but is also optimizing its space industrial base for speed, scale, and cost efficiency. Through modern processes, automotive-style assembly, and co-located satellite and launch facilities, Beijing's industrial base is positioning for sustained mega-constellation production and deployment. While not all ventures will succeed, Chinese firms could outpace Western competitors on both time-to-launch and price, shifting the balance of commercial competitiveness—particularly in LEO broadband, remote sensing, and weather services offered through BRI partnerships.

However, quality remains a major uncertainty. Early performance issues, including reports of underperforming Thousand Sails satellites, hint at growing pains that could undermine reliability and exacerbate orbital debris risks if failures multiply.[284] Yet China's rapid scaling may also accelerate learning and technological improvement, increasing the likelihood that China will overcome these issues quickly. Its EV industry offers a relevant precedent: Companies that once struggled with quality and safety concerns ultimately leveraged scale, iteration, and state support to dominate the EV market. Even modest performance gains, combined with mass production, could erode the comparative advantage of U.S. and allied firms.

Investment Trends

Over the past decade, China's commercial space sector has evolved from a state-dominated field into a hybrid ecosystem fueled by a mix of state-backed industrial funds, provincial investment, and private capital.

THE EMERGENCE OF SPACE UNICORNS VIA ADMINISTRATIVE FUNDS

A few breakout Chinese companies have reached or claimed "unicorn" status—that is, a privately held company with a valuation exceeding USD 1 billion. GalaxySpace declared itself China's first space unicorn in November 2020, when a series B1 funding round drove its valuation to approximately RMB 8 billion (USD 1.1 billion).[285] In June 2024, MinoSpace, a satellite manufacturer, announced it had become a "commercial space unicorn" following a RMB 1 billion (USD 139 million) financing round.[286] Both firms' fundraising was led by regional industrial investment funds tied to economic and technology development zones—GalaxySpace by the Nantong Intelligent

Manufacturing Industrial Investment Fund and MinoSpace by the Wuxi Economic Development Zone Shangxian Industry Investment Fund.[287] The funding rounds are enabling GalaxySpace to expand its Satellite Smart Factory in Jiangsu Province and MinoSpace to build out its remote sensing satellite manufacturing.[288]

A few breakout Chinese companies have reached or claimed "unicorn" status.

Provincial and city governments have become important financiers of China's commercial space companies as they seek to advance their own regional economic, technological, and industrial interests. These local government funds serve to anchor emerging aerospace clusters, diversify regional economies, and align with national "new quality productive forces" policies. For example, iSpace and Deep Blue Aerospace, both private launch startups, have received investment from local-level vehicles aimed at "deepen[ing] the integration of the aerospace industry with the regional economy."[289]

MIXED CAPITAL FINANCING AEROSPACE GROWTH

After Beijing's 2014 policy change "encourage[d] private capital to participate in the development of national civil space infrastructure," private capital poured into China's space ecosystem.[290] Since then, a steady inflow of hybrid capital—combinations of state, state-affiliated, and private funds—has financed the sector's growth.

LandSpace, a launch startup, illustrates this model well. Its early investment came from the National Manufacturing Transformation and Upgrading Fund, a state-owned vehicle.[291] Later rounds attracted both state-affiliated funds, such as the China SME Development Fund (established by the State Council), and private venture capital, including Sequoia China, Matrix Partners China, and Lightspeed China Partners.[292] This blend of public and private backers has become a defining feature of how China funds high-tech dual-use industries such as space.

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NONTRADITIONAL, CROSS-SECTOR INVESTORS

A newer trend is the participation of nontraditional investors and cross-industry conglomerates. For example, in 2022, Orienspace raised RMB 400 million (USD 56 million) with participation from miHoYo, the video game developer behind Genshin Impact—an unusual crossover between entertainment and aerospace technology.[293]

Geely Holding Group, the automotive giant, has also moved aggressively into the space sector through its subsidiary Geespace, which is developing a LEO satellite constellation for IoT applications. In September 2025, Geespace secured RMB 2 billion (USD 278 million) from the Zhejiang New Energy Vehicle Industry Fund, with "strong support from the provincial, municipal, and district governments," according to a company statement.[294] This case highlights how China's industrial policy encourages synergy between strategic manufacturing industries (e.g., the automotive sector) and aerospace infrastructure.

INSPIRATION FROM U.S. VENTURE MODELS

Chinese venture capital firms and fund managers are openly adopting U.S.-inspired accelerator models while tailoring them to national industrial priorities. For instance, Essential Capital is one of the leading aerospace private venture capital firms in China—investing in at least nine commercial space companies and participating in over 18 financing rounds.[295] It has invested in companies such as MinoSpace, Galactic Energy, Emposat, Sanyuan Aerospace, and Yunyao Aerospace.[296] Another firm of note is MiraclePlus, an investor in Orienspace established in 2018 following the closure of Y Combinator China, which has since become one of China's largest startup accelerators.[297] Similarly, Zhongke Chuangxing (CAS Star), an investor in CAS Space and linked to CAS, operates as a "hard tech" incubator, guiding companies to successful initial public offerings (IPOs).[298] These modern investors demonstrate how China is blending entrepreneurial approaches and private capital with government-aligned strategic direction.

CROSS-BORDER AND SANCTION-BLURRED INVESTMENT PATTERNS

A less discussed but notable pattern in China's commercial space investment landscape involves venture firms with U.S. ties and those investing across both sanctioned and non-sanctioned entities. Firms such as Matrix Partners China (MPC), Sequoia China (now HongShan Capital Group), and Lightspeed China Partners (Luminous Ventures) maintain historical or structural links to U.S. venture networks while adapting their strategies to China's regulatory and political environment. MPC, for instance, has invested in private launch companies such as LandSpace, Orienspace, and iSpace, as well as in CGSTL—a firm later sanctioned by the U.S. government for supplying satellite imagery to Russian military entities.[299] This may suggest that Chinese venture investors tend to take a broad, sectoral approach, backing commercially promising firms regardless of their geopolitical risk profile.

Similarly, Sequoia's 2023 restructuring, which split its Chinese arm into an independent entity, HongShan Capital Group, reflects growing pressure on cross-border capital ties, even as the firm has remained a key investor in Chinese aerospace ventures such as LandSpace.[300] This blurring of financial and geopolitical boundaries has amplified U.S. concerns that Western capital, often indirectly, may be contributing to the PLA's broader technological modernization efforts.[301]

8

Strategic Implications

China's commercial space expansion is not simply an economic project. Beijing has designated space as a strategic industry essential to economic growth, military power, and long-term technological competitiveness, and it is investing heavily to build a global infrastructure ecosystem spanning launch, communications, remote sensing, navigation, and data services. This report examines the domestic facilities, investment patterns, industrial policies, and market signals driving that expansion. While not exhaustive, the evidence points to a clear conclusion: Beijing is moving with extraordinary speed and scale to position itself as a dominant space power.

American analysts often highlight industrial disparities in sectors such as shipbuilding or drones. Chinese shipbuilding exceeds U.S. production 230 to 1. Ukraine is expected to produce 7 to 8 million drones in 2026 alone, while the U.S. Department of Defense's drone dominance program will fund the manufacturing of 340,000 small drones over the course of two years.[302] China's emerging space industrial base deserves similar attention. The scale of factory construction, satellite production, launch infrastructure development, and state and private investment now underway is striking. Even if inefficiencies and fragmentation persist, China is rapidly building the production capacity, financing mechanisms, and export channels necessary to reshape the global space economy.

U.S. policymakers must understand these dynamics now, before commercial space follows the trajectory of sectors such as 5G telecommunications, shipbuilding, and drones, where China leveraged scale, state support, and industrial policy to build industrial advantages with significant economic and national security implications.

One reason the challenge remains underappreciated is that prevailing measures of space power—such as launch totals and satellite counts—are largely lagging indicators. The facilities, industrial clusters, financing patterns, and manufacturing capacity examined throughout this report provide earlier signals of China's long-term trajectory. Without a clearer picture of that underlying ecosystem, the United States risks recognizing the scale of China's competitive position only after it has already matured.

U.S. policymakers must understand these dynamics now, before commercial space follows the trajectory of sectors such as 5G telecommunications, shipbuilding, and drones, where China leveraged scale, state support, and industrial policy to build industrial advantage.

Several strategic implications emerge from this analysis.

STRATEGIC COHERENCE AND INTERNAL DARWINISM BEHIND CHINA'S SPACE AMBITIONS

China's commercial space ecosystem has become central to Beijing's broader national strategy and ambition to become a global space power. It serves multiple objectives: accelerating technological innovation, supporting military modernization, reducing reliance on foreign technology, and expanding China's geopolitical influence abroad.[303] Rather than existing separately from the state, commercial space companies function as extensions of national power.

That strategic coherence is visible across the system. National ministries, provincial governments, state-owned enterprises, startups, universities, and military-linked actors are all progressing in the same direction. Aerospace industrial parks are appearing across the country. Local governments compete to attract launch firms and satellite manufacturers. Space themes increasingly appear in popular culture, education, tourism, and public messaging, reflecting how the sector is being woven into China's industrial identity and national psyche.

At the same time, this rapid expansion is producing visible inefficiencies. Local governments frequently duplicate investments in an effort to cultivate regional space champions, contributing to growing concerns inside China about overcapacity and fragmented development. Chinese commentators have pointed out that seven leading launch firms have established 51 production sites nationwide, suggesting mounting structural inefficiency.[304] Some of these investments will succeed. Others will not.

But inefficiency does not negate strategic impact. China's system is capable of sustaining excess capacity for long periods if doing so advances broader national objectives. Nor does every company need to survive. The commercial space ecosystem documented in this report—including 10 launch companies, 10 satellite communications firms, and 17 satellite manufacturing facilities—is designed to generate scale, spur competition, and advance technological innovation. These firms benefit

from access to state financing, testing infrastructure, industrial parks, and political support that would be difficult to replicate elsewhere.

Beijing appears willing to tolerate duplication and failure so long as the process produces globally competitive national champions. In effect, China is applying its broader industrial playbook to space: Flood the sector with capital, infrastructure, and policy support, allow intense internal competition to play out, and ultimately consolidate around the firms capable of advancing national strategic goals at home and abroad.

COMMERCIAL SPACE AS AN ENGINE OF NATIONAL POWER

China's leadership increasingly views commercial space firms as drivers of long-term technological and industrial competitiveness. These companies inject speed, experimentation, and innovation into a sector historically dominated by large SOEs, while also creating new pathways for developing technologies with direct military utility. Profitability, for now, appears secondary. Beijing is likely to continue backing commercial space firms so long as they push the technological frontier and unlock new trajectories for China's industrial growth.

This is where Beijing's MCF strategy becomes critical. Under MCF, the distinction between commercial and military technology is blurred. As in other strategic industries, China's commercial space sector remains deeply intertwined with the state. Advances in launch systems, satellite communications, remote sensing, and data platforms are not viewed solely as commercial achievements; they also contribute directly to PLA modernization.

Beijing has built an extensive legal and regulatory framework to ensure that commercial entities operate in alignment with state interests. National security laws, cybersecurity regulations, data governance measures, and party oversight mechanisms give the state broad authority to direct companies, compel cooperation, and access data when needed.[305] China's 2017 national intelligence law, for example, requires that "all organizations and citizens shall support, cooperate with, and collaborate in national intelligence work."[306]

This differs fundamentally from the U.S. model. The United States also relies heavily on private industry for space innovation and national security capabilities, but legal and institutional barriers still separate government authority from private enterprise. U.S. companies retain greater operational autonomy and can reject government projects on commercial, legal, or ethical grounds. In recent years, firms such as Google and Anthropic have withdrawn from defense-related initiatives, a choice that would not be possible in China.[307] China's system is designed to eliminate those boundaries entirely.

In China's system, commercial success and national strategy are not separate pursuits. They are increasingly treated as mutually reinforcing objectives.

CHINA CLOSING THE GAP

China's commercial space push is driven in part by direct competition with the United States. As highlighted throughout the report, SpaceX has emerged as both a benchmark and motivator for Chinese launch startups and satellite broadband ventures. Chinese firms openly model themselves

on the Falcon 9 and Starlink playbook, pursuing reusable launch, mass satellite production, vertically integrated operations, and lower-cost satellite deployments.

The question is no longer whether China can compete in commercial space. It is whether the United States can sustain its lead as China's capabilities mature and scale.

The United States still leads in innovation, but China is rapidly gaining ground through industrial scale, state-backed financing, and the ability to align national policy, infrastructure, and capital behind strategic sectors.

The question is no longer whether China can compete in commercial space. It is whether the United States can sustain its lead as China's capabilities mature and scale.

That model matters in space because scale is increasingly shaping competitiveness. Launch cadence, satellite production capacity, supply chains, financing, and infrastructure deployment may prove just as important as technological breakthroughs alone.

For years, the United States—and SpaceX in particular—has maintained a decisive lead through speed, innovation, and execution. But China is rapidly catching up in several key areas. If Chinese firms achieve comparable launch reliability and lower-cost services at industrial scale, the competitive landscape could shift significantly, especially across emerging markets where price and infrastructure access often outweigh brand or performance margins.

The strategic challenge for the United States is therefore broader than a race between individual companies. It is whether the U.S. commercial and industrial base can continue to innovate fast enough, scale production rapidly enough, and mobilize sufficient long-term capital to compete against a state-backed ecosystem designed for sustained competition and intent on positioning China as the global leader in space.

BUILDING A GLOBAL INFORMATION INFRASTRUCTURE

China's ambitions extend well beyond launch services or satellite manufacturing. Beijing is working to construct an integrated global information architecture that links terrestrial and space-based infrastructure into a unified network. The objective extends beyond commercial connectivity to the ability to collect, process, move, and control information across civilian and military domains.

Projects such as the Space-Ground Integrated Information Network, approved under the 13th Five-Year Plan and led by CETC, illustrate this vision. According to Chinese academic Li Deren, the network seeks to connect "terrestrial and non-terrestrial (airborne, space) sensor networks, command networks and tactical information distribution networks," enhancing China's ability to conduct real-time tracking, situational awareness, and information control.[308] In practice, this would integrate space-based communications, remote sensing, navigation, and weather services into a broader information architecture serving both civilian and military purposes.[309]

The BRI—and specifically the Space Silk Road, or Spatial Information Corridor—has become a major vehicle for exporting this architecture abroad. Chinese firms are bundling satellite communications, remote sensing, navigation services, and terrestrial digital infrastructure, along with financing, training, and operational support, into turnkey packages for developing countries seeking affordable connectivity and digital modernization.

National and provincial planning documents openly frame commercial space infrastructure and services as tools for expanding China's technological and economic influence. Shanghai's 2023 action plan called for using space capabilities to "serve the Belt and Road Initiative."[310] Guangdong's 2024 provincial action plan emphasized "expand[ing] markets in countries and regions along the Belt and Road initiative," while Jiangsu's 2023 action plan calls for "support[ing] leading enterprises to participate in domestic and international markets" and "strengthen[ing] efforts to create standards in the aerospace sector and take the lead in helping formulate international standards."[311]

EXPORTING DEPENDENCY AND BUILDING A PARALLEL COMMUNICATIONS ECOSYSTEM

Broadband constellations such as Guowang and Thousand Sails, whether state-led or commercial in nature, could allow China to establish alternative communications infrastructure across Africa, Latin America, Southeast Asia, and elsewhere. By embedding Chinese satellite networks in partner nations' digital ecosystems, Beijing is laying the foundation for a parallel internet architecture operating increasingly outside Western platforms, standards, and influence.

Price is central to this strategy. Chinese firms can leverage state support and subsidized pricing to undercut Western competitors and secure market share abroad. Beijing has reduced domestic internet service rates in part to strengthen its companies' international competitiveness.[312] Chinese commercial space companies "will continue attempts to undercut the price of Western firms in more competitive markets," according to the U.S. Intelligence Community.[313] To this point, a European Commission investigation found that Huawei underbid its 5G telecommunications competitors in Europe by as much as 70 percent, well below estimated production costs absent state support.[314]

For many developing economies, Chinese space launch and satellite services may prove more accessible than Western alternatives. These offerings—bundled with turnkey systems, concessional financing, and local training—make adoption attractive, particularly for governments with limited domestic capacity seeking rapid digital expansion.

Countries that rely on Chinese infrastructure and services may become increasingly tied to Chinese technology standards, regulatory frameworks, and data governance models.[315] Over time, this can translate into political and regulatory influence. Tanzania, for example—a BRI partner country—adopted elements of China's data governance and cybersecurity approach, contributing to tighter controls over the country's social media landscape and information flows.[316]

China is not simply seeking a larger role within the existing global communications architecture. It is positioning itself to build a parallel one.

From a security perspective, these networks also raise concerns about surveillance, censorship, data access, and loss of data sovereignty. Incidents such as the reported transfer of African Union data to servers in China have intensified fears that Beijing could leverage digital infrastructure relationships for intelligence collection or political leverage.[317]

China is not simply seeking a larger role within the existing global communications architecture. It is positioning itself to build a parallel one. If successful, Beijing could shape not only infrastructure markets, but also the rules, standards, and information flows that govern them. Over time, portions of the world could become integrated into Chinese-built communications and data ecosystems increasingly separate from Western platforms, services, and standards. In the extreme, this could contribute to a more fragmented global information environment divided between competing technological and political spheres.

That competition extends far beyond satellites or launch services. It will shape who controls the infrastructure through which information, communications, and digital power flow in the decades ahead.

PERSISTENT CONSTRAINTS AND STRUCTURAL WEAKNESSES

Despite its momentum, China's commercial space sector still faces considerable headwinds, and its long-term trajectory remains uncertain.

The industry remains heavily dependent on state financing and administrative direction rather than durable market demand. That model, which enables rapid expansion, has fueled overcapacity in other strategic industries such as solar energy and EVs.[318] China may ultimately produce more satellites, launch firms, and manufacturing capacity than the market can realistically sustain.

China also faces practical bottlenecks. While Chinese launch systems are improving rapidly, many still trail leading U.S. competitors in capability, reusability, and operational maturity. Launch capacity remains constrained relative to China's constellation ambitions, potentially slowing deployment timelines for large-scale broadband and remote sensing networks.

At the same time, China's tight political oversight of the sector creates additional complications. Military oversight and security controls also complicate international collaboration and can discourage foreign investment and technology transfer. Tightening U.S. and allied export controls and capital restrictions may further increase those pressures.

These weaknesses complicate Beijing's ability to create a truly efficient and globally competitive commercial space ecosystem. But they are unlikely to thwart continued expansion. Beijing has repeatedly shown a willingness to tolerate inefficiency, excess capacity, and long investment horizons in sectors viewed as strategically important.

The more likely outcome is not stagnation, but uneven growth: a commercial space sector that may struggle to achieve consistent profitability or market efficiency while still expanding rapidly in scale, production capacity, and global presence.

Conclusion

China's commercial space sector is no longer a niche industry or a secondary component of state policy. It is part of a broader national effort to build industrial capacity, expand technological influence, and shape the infrastructure through which communications, data, and digital services increasingly flow.

Even if China's commercial space sector develops unevenly, its scale alone could reshape global markets for launch, satellite communications, remote sensing, and space-enabled services. Beijing does not need every company or constellation to succeed. It needs enough successful firms, infrastructure, and international adoption to secure long-term strategic advantage.

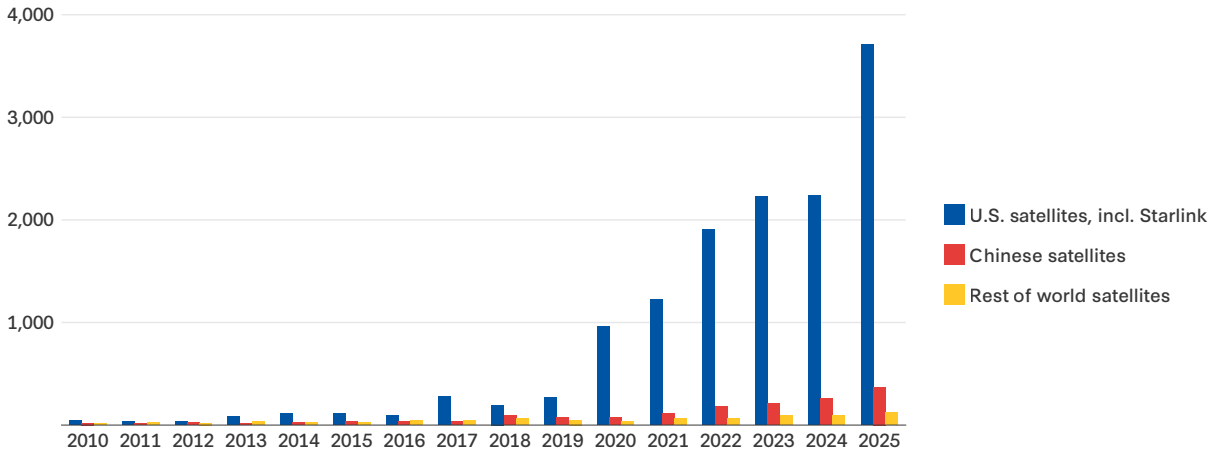
For the United States, the challenge is not limited to military competition alone. Sustaining U.S. leadership will require outpacing China in innovation, affordability, and trustworthiness, offering alternatives that preserve the openness, interoperability, and transparency that have historically defined the Western-led information order.

The stakes extend beyond rockets and satellites. Commercial space systems are increasingly becoming part of the infrastructure that underpins global communications, information access, economic activity, and national power. Countries that shape that ecosystem will shape the broader global strategic environment.

Appendix

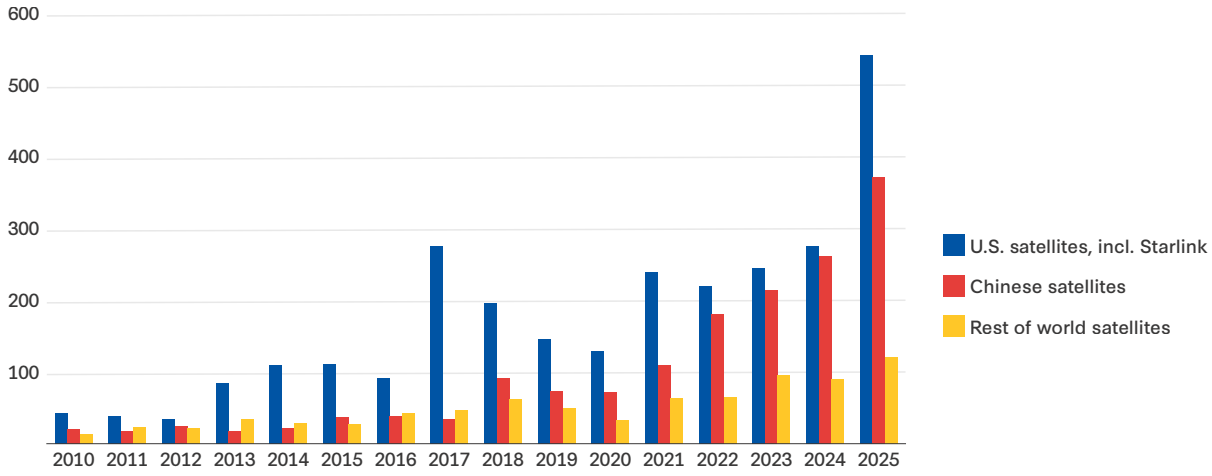
The share of commercial satellites in China's total satellites launched per year has risen steadily, reflecting the growing scale and maturity of the country's private space sector. While the total number of U.S. satellites launched per year far exceeds their Chinese and rest of world counterparts when accounting for Starlink (see Figure A-1), the numbers are much closer in recent years when Starlink is removed from the dataset (see Figure A-2).

Figure A-1: Total Satellites Launched by Year (United States, China, and Rest of World), Including Starlink



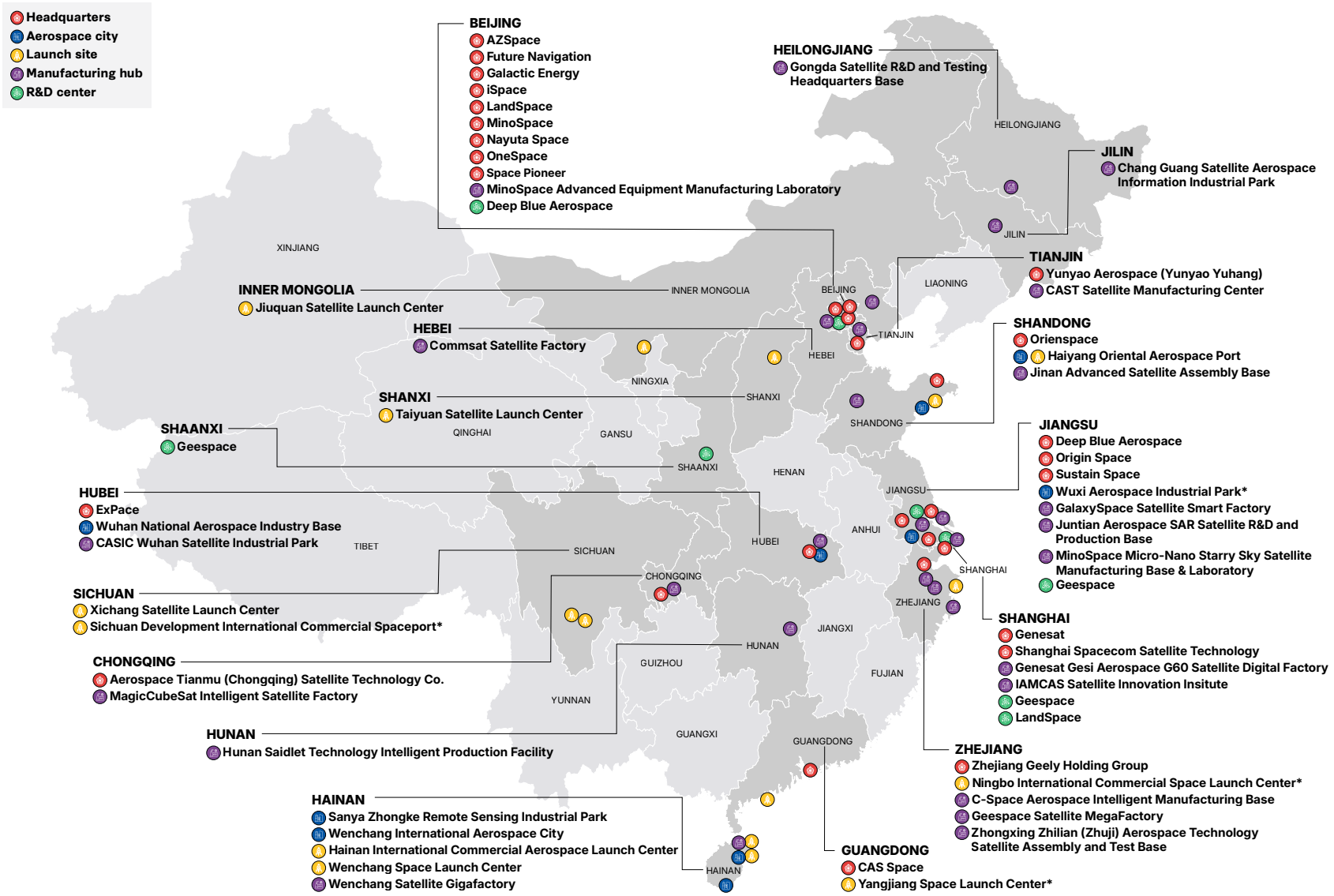
Source: Harrison, "Global Space Data Navigator," accessed January 17, 2026.

Figure A-2: Total Satellites Launched by Year (United States, China, and Rest of World), Excluding Starlink



Source: Harrison, "Global Space Data Navigator," accessed January 17, 2026.

Figure A-3: China's Commercial Space Footprint (Expanded View)



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Endnotes

1 "New Year's 2025: Celebrations Around the World," *The New York Times*, January 1, 2025, https://www.nytimes.com/2024/12/31/world/new-years-eve-photos.html.

2 Xin Dingding, "'Exploration Part of Chinese Dream,'" *China Daily*, June 25, 2013, https://usa.chinadaily.com.cn/china/2013-06/25/content_16653623.htm; "Backgrounder: Xi Jinping's Vision for China's Space Development," *Xinhua*, April 24, 2017, http://www.xinhuanet.com/english/2017-04/24/c_136232642.htm; "Xi Calls for Accelerating Progress in China's Space Endeavors," National Committee of the Chinese People's Political Consultative Conference, September 24, 2024, http://en.cppcc.gov.cn/2024-09/24/c_1024517.htm; and "Full Text: China's Space Program: A 2021 Perspective," State Council Information Office of the People's Republic of China, January 28, 2022, https://english.www.gov.cn/archive/whitepaper/202201/28/content_WS61f35b3dc6d09c94e48a467a.html.

3 Office of the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community* (Washington, DC: Office of the Director of National Intelligence, 2024), 11, https://www.dni.gov/files/ODNI/documents/assessments/ATA-2024-Unclassified-Report.pdf.

4 Note that reported manufacturing capacity figures warrant careful interpretation, as publicly available information on the status of production facilities remains limited and manufacturing rates vary substantially according to satellite size and complexity.

5 WeChat, details redacted to protect source material.

6 This report uses the conversion rate of USD 1 = RMB 7.2 averaged from data from January 1, 2025, to October 24, 2025, https://www.federalreserve.gov/releases/h10/hist/dat00_ch.htm.

7 "China's Space Program: A 2021 Perspective," State Council Information Office.

8 Howard Wang, Gregory Graff, and Alexis Dale-Huang, *China's Growing Risk Tolerance in Space: People's Liberation Army Perspectives and Escalation Dynamics* (Santa Monica, CA: RAND Corporation, June 2024), https://www.rand.org/content/dam/rand/pubs/research_reports/RRA2300/RRA2313-2/RAND_RRA2313-2.pdf.

9 "China's Space Program: A 2021 Perspective," State Council Information Office.

10 Khyle Eastin, interview by Lily Huang, "China's Vision for Space," National Bureau of Asian Research, November 21, 2023, https://www.nbr.org/publication/chinas-vision-for-space/.

11 "Xi Urges Heilongjiang to Firmly Grasp Strategic Position in China's Overall Development, Strive to Open New Ground for High-Quality Development," *Xinhua*, September 10, 2023, https://english.news.cn/20230910/24ffced24a8349d6948dcea253cd61fd/c.html.

12 World Economic Forum and McKinsey & Company, *Space: The $1.8 Trillion Opportunity for Global Economic Growth* (Davos: World Economic Forum, April 2024), https://www3.weforum.org/docs/WEF_Space_2024.pdf.

13 Li Qiang, "Report on the Work of the Government," delivered at the Second Session of the 14th National People's Congress, Beijing, China, March 5, 2024, https://npcobserver.com/wp-content/uploads/2024/03/2024-Government-Work-Report_EN.pdf.

14 Li Qiang, "Report on the Work of the Government," delivered at the Third Session of the 14th National People's Congress, Beijing, China, March 5, 2025, https://npcobserver.com/wp-content/uploads/2025/03/2025-Government-Work-Report_NON-FINAL_EN.pdf.

15 Data set on globally published space-related technology patents specific to the areas of space launch, satellite communications, and remote sensing, as provided to the authors by Strider Technologies. The dataset is current as of October 2025.

16 Office of the Chief Economist, "Privatizing the Space Economy," United States Patent and Trademark Office, January 2025, https://www.uspto.gov/sites/default/files/documents/oce-ip-and-space.pdf.

17 "China's IP progress contributes to economic growth, international cooperation," *Xinhua*, July 30, 2024, https://english.www.gov.cn/news/202407/30/content_WS66a84eb0c6d0868f4e8e994f.html.

18 李静慧, 杨璐茜, and 李晓明 [Li Jinghui, Yang Luqian, and Li Xiaoming], "蓝箭航天：助力航天强国发展" [LandSpace: Helping build China into a space power], *卫星应用* [*Satellite Applications*], no. 10 (2024): 41–43.

19 张建松 and 孙青 [Zhang Jiansong and Sun Qing], "打造卫星批量化生产新模式–探访中国科学院微小卫星创新研究院" [Forging a new model for mass satellite production–a visit to the Chinese Academy of Sciences Micro-satellite Innovation Institute], 中国科学院 [Chinese Academy of Sciences], April 25, 2024, https://www.cas.cn/cm/202404/t20240425_5012615.shtml.

20 薛钦源, 史丹, and 史可寒 [Xue Qinyuan, Shi Dan, and Shi Kehuan], "新质生产力的形成逻辑、新质特征和理论要素" [The formation logic, new quality characteristics and theoretical elements of new quality productive forces-institute of industrial economics], Institute of Industrial Economics of CASS, August 22, 2024, http://gjs.cass.cn/kydt/kydt_kycg/202408/t20240822_5773315.shtml.

21 "China's Space Program: A 2021 Perspective," State Council Information Office. For discussion of trends in Chinese counterspace weapons development, refer to past CSIS Space Threat Assessment reports; for example, Clayton Swope, Kari A. Bingen, Makena Young, and Kendra Lafave, *Space Threat Assessment 2025* (Washington, DC: CSIS, 2025), https://csis-website-prod.s3.amazonaws.com/s3fs-public/2025-04/250425_Swope_Space_Threat.pdf?VersionId=orhySgjISemJLjhdQKKes2OVb35jwkU5.

22 China Aerospace Studies Institute, *In Their Own Words: Science of Military Strategy 2020* (Montgomery, AL: China Aerospace Studies Institute, January 2022), https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2022-01-26%202020%20Science%20of%20Military%20Strategy.pdf.

23 梁敏 and 高菲 [Liang Min and Gao Fei], "太空制高点'高'在哪里" [Where is 'high' of the high ground in space], 解放军报 [People's Liberation Army Daily], http://www.81.cn/jfjbmap/content/2022-07/19/content_320118.htm.

24 Jacob Stokes, "Military Artificial Intelligence, the People's Liberation Army, and U.S.-China Strategic Competition," testimony before the U.S.-China Economic and Security Review Commission, Center for a New American Security, February 1, 2024, https://www.cnas.org/publications/congressional-testimony/military-artificial-intelligence-the-peoples-liberation-army-and-u-s-china-strategic-competition.

25 John C. Costello and Joe McReynolds, *China's Strategic Support Force: A Force for a New Era* (Washington, DC: National Defense University Press, 2018), https://digitalcommons.ndu.edu/cgi/viewcontent.cgi?article=1006&context=china-strategic-perspectives.

26 U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2024* (Washington, DC: U.S. Department of Defense, December 2024), https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF; and John Costello, "PLA Military Aerospace Force: On the Frontier of Innovation and Competition," Jamestown Foundation, July 11, 2025, https://jamestown.org/pla-military-aerospace-force-on-the-frontier-of-innovation-and-competition/.

27 See, e.g., 杜雁芸 and 张煌 [Du Yanyun and Zhang Huang], "Starlink Militarization and Its Impact on Global Strategic Stability ["星链"军事化发展及其对全球战略稳定性的影响]," CSIS Interpret: China, original work published in *Journal of International Security Studies* [*国际安全研究*], September 19, 2023, https://interpret.csis.org/translations/starlink-militarization-and-its-impact-on-global-strategic-stability/. For a comprehensive synthesis of approximately 120 Chinese-language articles and 10 PLA textbooks on Starlink, see Cynthia R. Wang, Mark A. Smith, and Cristina L. Garafola, *PLA Perspectives on Starlink and Other Proliferated LEO Constellations*, RR-A3139-1 (Santa Monica, CA: RAND Corporation, 2025), https://www.rand.org/pubs/research_reports/RRA3139-1.html. Force-multiplier framings (力量倍增器, 战力倍增器) recur across PLA Daily commentary and PLA-affiliated journal literature; see also 潘宇翔 and 叶星国 [Pan Yuxiang and Ye Xingguo], "警惕披着民用外衣的'星链'" [Beware of 'Starlink' Cloaked in Civilian Garb], *PLA Daily*, January 21, 2022, http://eng.chinamil.com.cn/BILINGUAL/Opinions_209205/10125810.html.

28 "China's planned lunar research station ushers in new era of global space collaboration," State Council Information Office of the People's Republic of China, September 7, 2024, https://english.www.gov.cn/news/202409/07/content_WS66dbeb9dc6d0868f4e8eab63.html; and "China unveils International Lunar Research Station details," State Council Information Office of the People's Republic of China, April 26, 2024, http://english.scio.gov.cn/chinavoices/2024-04/26/content_117152685.htm.

29 Andrew Jones, "Senegal Among New Members of China's ILRS Moon Base Project," *SpaceNews*, September 5, 2024, https://spacenews.com/senegal-among-new-members-of-chinas-ilrs-moon-base-project/.

30 中国科学院, 国家航天局, and 中国载人航天工程办公室 [Chinese Academy of Sciences, China National Space Administration, and China Manned Space Agency], "国家空间科学中长期发展规划(2024–2050年)" [National Medium- and Long-Term Development Plan for Space Science (2024-2050)], China National Space Administration, October 15, 2024, https://www.cnsa.gov.cn/n6758823/n6758839/c10616380/content.html.

31 "China's Chang'e-6 Collects 1,935.3 Grams of Samples from Moon's Far Side," China National Space Administration, June 28, 2024, https://www.cnsa.gov.cn/english/n6465652/n6465653/c10573149/content.html.

32 Lan Shunzheng, "Commercial Space Missions Boast Vibrant Industry," *China Daily*, April 24, 2025, https://www.chinadaily.com.cn/a/202504/24/WS68097ab4a3104d9fd38212d4.html.

33 中关村科学城党工委、管委会 [Zhongguancun Science City Party Working Committee and Administrative Committee], "海淀区建设商业航天创新高地行动计划(2024-2028年)" [Haidian District action plan for building a commercial space innovation hub (2024–2028)], 京市海淀区人民政府办公室 [General Office of the People's Government, of Haidian District, May 6, 2025, https://zyk.bjhd.gov.cn/jbdt/auto4510_51816/auto4510_54705/auto4510/auto4510/202408/t20240806_4664279.shtml; and "Interpretation of *Action Plan of Beijing to Expedite Innovative Development of Commercial Aerospace Industry (2024–2028)*," People's Government of Beijing Municipality, January 25, 2024, https://english.beijing.gov.cn/investinginbeijing/WhyBeijing/Environment/bus_env_policy/bizenv_industrial/202407/t20240709_3741623.html.

34 Fei Miao and Jing Jin, "The Rise of Chinese Space-Themed SF: Western Influences and Chinese Cultural Roots," *Critical Arts* (2025): 1–15, https://doi.org/10.1080/02560046.2025.2526031; Zhao Chenchen, "Chinese Movies Dare to Boldly Go into Space," CGTN, September 6, 2025, https://news.cgtn.com/news/2025-09-06/Chinese-movies-dare-to-boldly-go-into-space-1GrikNzJtAI/p.htm; and Xueting Christine Ni, "The Wandering Earth and China's sci-fi heritage," BBC, April 28, 2019, https://www.bbc.com/news/world-asia-china-47769882.

35 Wuxi China, details redacted to protect source material.

36 胡寒笑 [Hu Hanxiao], "海南文昌：加快商业航天全链发展 打造'航天旅游之都'" [Wenchang, Hainan: accelerating full-chain commercial space development to build the 'space tourism capital'], Sohu, January 24, 2025, https://www.sohu.com/a/852743011_121443915.

37 Lilit Marcus and Marc Stewart, "'China's Cape Canaveral' Is Booming, Fueled by Moon Mission and Space Program," CNN, May 3, 2024, https://www.cnn.com/travel/hainan-china-space-tourism-boom-intl-hnk.

38 Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China, *U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Washington, DC: U.S. House of Representatives, January 1999), https://www.govinfo.gov/content/pkg/GPO-CRPT-105hrpt851/pdf/GPO-CRPT-105hrpt851.pdf.

39 State Council of the People's Republic of China, "国务院关于创新重点领域投融资机制鼓励社会投资的指导意见" [Guiding opinions of the state council on innovating investment and financing mechanisms in key areas and encouraging social investment], November 16, 2014, https://www.gov.cn/zhengce/content/2014-11/26/content_9260.htm.

40 Georgetown Center for Security and Emerging Technology, translation of "National Medium- to Long-Term Civilian Space Infrastructure Development Plan (2015-2025)" [国家民用空间基础设施 中长期发展规划(2015-2025年)], originally published on the PRC National Development and Reform Commission website, October 26, 2015, https://cset.georgetown.edu/wp-content/uploads/t0218_space_infrastructure_EN.pdf.

41 State Council Information Office of the People's Republic of China, "《中国的航天》白皮书(2000年版)" [China's Space Activities in 2000: A White Paper (2000 Edition)] China National Space Administration, December 1, 2000, https://www.cnsa.gov.cn/n6758824/n6758845/c6772480/content.html.

42 State Council Information Office of the People's Republic of China, "2006年中国的航天白皮书" [China's Space Activities in 2006 White Paper], 中华人名共和国中央人民政府 [Central People's Government of the People's Republic of China], October 12, 2006, https://www.gov.cn/zhengce/2006-10/12/content_2615758.htm.

43 State Council Information Office of the People's Republic of China, "《2011年中国的航天》白皮书" [China's Space Activities in 2011 White Paper], China National Space Administration, December 29, 2011, https://www.cnsa.gov.cn/n6758823/n6758839/c6796175/content.html.

44 State Council Information Office of the People's Republic of China, "2016中国的航天白皮书" [China's Space Activities in 2016], 中华人名共和国中央人民政府 [Central People's Government of the People's Republic of China], December 27, 2016, https://www.gov.cn/zhengce/2016-12/27/content_5153378.htm.

45 State Council Information Office of the People's Republic of China, "2021中国的航天白皮书" [China's Space Program: A 2021 Perspective], 中华人名共和国中央人民政府 [Central People's Government of the People's Republic of China], January 28, 2022, https://www.gov.cn/zhengce/2022-01/28/content_5670920.htm.

46 State Council of the People's Republic of China, "China's Space Authority Sets up New Department to Oversee Commercial Space Sector," November 30, 2025, https://english.www.gov.cn/news/202511/30/content_WS692b9763c6d00ca5f9a07da0.html.

47 Jean Deville, "5 Facts to Understand China's Thriving New Space Start-Up," LinkedIn, December 15, 2018, https://www.linkedin.com/pulse/5-facts-understand-chinas-thriving-new-space-start-up-jean-deville/.

48 Blaine Curcio, "2025 Funding Recap of the Chinese Space Industry," SpaceWatch Global, January 13, 2026, https://spacewatch.global/2026/01/2025-funding-recap-of-the-chinese-space-industry/; and Magdalena Petrova, "How China is challenging the U.S. to become the next great space power," CNBC, March 7, 2026, https://www.cnbc.com/2026/03/07/china-us-space-race-rockets.html.

49 Blaine Curcio, "2025 Funding Recap of the Chinese Space Industry."

50 China National Space Administration, "关于印发《国家航天局推进商业航天高质量安全发展行动计划(2025–2027年)》的通知" [Notice on Issuing the "National Space Administration Action Plan for Promoting High-Quality and Safe Development of Commercial Space Activities (2025–2027)], China National Space Administration, November 25, 2025, https://www.cnsa.gov.cn/n6758823/n6758839/c10719382/content.html; and Xinhua, "China's Space Authority Sets Up New Department to Oversee Commercial Space Sector," State Council of the People's Republic of China, updated November 30, 2025, https://english.www.gov.cn/news/202511/30/content_WS692b9763c6d00ca5f9a07da0.html.

51 Camille Boullenois, Malcolm Black and Daniel H. Rosen, "Was Made in China 2025 Successful?," Rhodium Group, May 5, 2025, https://rhg.com/research/was-made-in-china-2025-successful/.

52 Karen M. Sutter, "Made in China 2025 and Industrial Policies: Issues for Congress," Congressional Research Service, IF10964, December 12, 2024, https://www.congress.gov/crs_external_products/IF/PDF/IF10964/IF10964.12.pdf.

53 曹俊, 吴佳骏, and 郭永刚 [Cao Jun, Wu Jiajun, and Guo Yonggang], "'十五五'商业航天发展思路与路径" [Ideas and pathways for commercial space development during the 15th Five-Year Plan], *电讯技术* [*Telecommunications Technology*] 64, no. 4 (2024): 481–486.

54 China's 15th Five-Year Plan has not yet been released in full as of December 31, 2025; however, an initial recommendations document released following the CCP Central Committee's Fourth Plenum held in Beijing in October described aerospace as an "emerging pillar industry" and called for the country to "accelerate the development of industrial clusters in strategic emerging fields," including aviation and aerospace. "Full text: Recommendations of the Central Committee of the Communist Party of China for Formulating the 15th Five-Year Plan for National Economic and Social Development," *Global Times*, October 28, 2025, https://www.globaltimes.cn/page/202510/1346771.shtml.

55 “开创新时代军民融合深度发展新局面” [Opening up new horizons for deepening military-civilian integration in the new era], *Xinhua*, July 16, 2018, http://www.xinhuanet.com/politics/2018-07/16/c_1123133733.htm.

56 Ownership information dataset provided by Strider Technologies.

57 PLA supplier list dataset provided by Strider Technologies.

58 Lorand Laskai, “Building China’s SpaceX: Military-Civil Fusion and the Future of China’s Space Industry,” testimony before the U.S.-China Economic and Security Review Commission, USCC, April 25, 2019, https://www.uscc.gov/sites/default/files/Lorand%20Laskai%20USCC%2025%20April.pdf.

59 Brian Weeden, Cassandra Steer, and Fiona Cunningham, “Chinese Assessments of Starlink and U.S.-China Space Relations,” *Interpret: China*, CSIS, December 2, 2024, last modified February 5, 2025, https://interpret.csis.org/chinese-assessments-of-starlink-and-u-s-china-space-relations/.

60 李俊, 吴长枝, 齐晓飞, and 赵耀 [Li Jun, Wu Changzhi, Qi Xiaofei, and Zhao Yao], “军民融合发展战略视角下的智慧地球概念及应用刍议” [Preliminary discussion on the concept and application of smart earth from the perspective of the military-civil fusion development strategy], *测绘科学* [*Surveying and Mapping Science*] 48, no. 12 (2023): 14–22.

61 Kevin Pollpeter, Eric Anderson, Jordan Wilson, and Fan Yang, “China Dream, Space Dream: China’s Progress in Space Technologies and Implications for the United States,” U.S.-China Economic and Security Review Commission, March 2, 2015, https://www.uscc.gov/sites/default/files/Research/China%20Dream%20Space%20Dream_Report.pdf; and Karen M. Sutter, “Made in China 2025 and Industrial Policies: Issues for Congress.”

62 Yang Cheng, Wang Songsong, and Li Jiaying, “Beijing rockets to the top as commercial space hub,” *China Daily*, June 21, 2025, https://www.chinadaily.com.cn/a/202506/21/WS6855eab9a310a04af22c7945.html.

63 “Interpretation of *Action Plan of Beijing*,” People’s Government of Beijing Municipality.

64 北京市人民政府办公厅 [The People’s Government of Beijing Municipality], “北京市人民政府办公厅关于印发《北京市加快商业航天创新发展行动方案(2024-2028年)》的通知” [Action plan of Beijing to expedite innovative development of commercial aerospace industry (2024–2028)], 北京市人民政府办公厅 [The People’s Government of Beijing Municipality], January 24, 2024, https://www.beijing.gov.cn/zhengce/zhengcefagui/202401/t20240124_3544601.html.

65 Ibid.

66 Ibid.

67 WeChat, details redacted to protect source material; and Jack C., “China’s Launch Sites and Launch Vehicles,” China in Space, May 10, 2025, https://www.china-in-space.com/p/chinas-launch-sites-and-rockets.

68 Beijing’s Rocket Street plans to cover 15.65 acres, with a total floor space of about 140,000 square meters, and create over 10 shared experimental platforms for rocket R&D, testing, and manufacturing. See People’s Daily Online, “‘Beijing Rocket Street’ Project Launched to Create a Commercial Aerospace Research and Production Base,” International Center for Science & Technology Innovation, July 17, 2024, https://en.ncsti.gov.cn/Latest/news/202407/t20240722_172294.html.

69 “Interpretation of Action Plan of Beijing,” People’s Government of Beijing Municipality.

70 Andrew Jones, “Beijing district moves to boost commercial space development, reveals ambitious launch targets,” *SpaceNews*, February 18, 2025, https://spacenews.com/beijing-district-moves-to-boost-commercial-space-development-reveals-ambitious-launch-targets/.

71 Ibid.

72 “Beijing Becomes Hub for Chinese Commercial Space Companies,” CCTV, March 2, 2024, https://www.cctvplus.com/news/20240302/8365855.shtml; and Peng Chao, “Chengdu on Fast Track to Satellite Parts Biz Glory,” *China Daily*, December 10, 2024, https://www.chinadaily.com.cn/a/202412/10/WS6757a091a310f1265a1d20b0.html.

73 [Zhongguancun Science City Party Working Committee and Administrative Committee], [“Notice of the Zhongguancun Science City Management Committee”].

74 [The People’s Government of Beijing Municipality], [“Action Plan of Beijing”].

75 上海市人民政府办公厅 [General Office of the Shanghai Municipal People's Government], “上海市人民政府办公厅关于印发《上海市促进商业航天发展打造空间信息产业高地行动计划(2023—2025年)》的通知” [Shanghai action plan for promoting commercial space development and building a high-ground for the space information industry (2023-2025)], 一网通办 [Government Online-Offline Shanghai], November 20, 2023, https://www.shanghai.gov.cn/nw12344/20231120/5e53f1fe1b1543f38a49153eb563cfbb.html.

76 Ibid.; and Andrew Jones, “Shanghai to foster commercial space ecosystem,” *SpaceNews*, November 30, 2023, https://spacenews.com/shanghai-to-foster-commercial-space-ecosystem/.

77 Shanghai Municipal Commission of Economy and Information Technology et al., “上海市关于加快培育商业航天先进制造业集群的若干措施” [Several Measures of Shanghai Municipality on Accelerating the Cultivation of Advanced Manufacturing Clusters for Commercial Aerospace], April 24, 2025, https://www.sheitc.sh.gov.cn/cyfz/20250424/822fed5c1b13459a93be500155a61a1f.html.

78 黄晏浩 [Huang Yanhao], “航天企业仍在 “内卷” 多位上海政协委员建言加快国际化” [Aerospace firms still engaged in ‘involution’; multiple Shanghai CPPCC members urge accelerated internationalization], 财新 [Caixin], January 15, 2025, https://science.caixin.com/2025-01-15/102279452.html.

79 广东省人民政府办公厅 [General Office of the People's Government of Guangdong Province], “广东省人民政府办公厅关于印发《广东省推动商业航天高质量发展行动方案(2024—2028年)》的通知” [Action plan for promoting the high-quality development of commercial space (2024-2028)], 广东省人民政府 [People’s Government of Guangdong Province], October 14, 2024, http://www.gd.gov.cn/zwgk/wjk/qbwj/yfb/content/post_4507561.html.

80 [General Office of the People's Government of Guangdong Province], [“Action plan for promoting the high-quality”].

81 Baidu, details redacted to protect source material.

82 Sina Finance, “阳江商业发射场：第二个海南商发？” [Yangjiang Commercial Launch Site: Hainan's Second Commercial Launch Facility?], Baidu, June 8, 2025, https://baijiahao.baidu.com/s?id=1835228060333896258&wfr=spider&for=pc.

83 Zhao Lei, “Rocket engine test facility being built in Guangzhou,” *China Daily*, December 3, 2023, https://www.chinadailyhk.com/hk/article/364657.

84 Ibid.

85 江苏省人民政府办公厅 [General Office of the People's Government of Jiangsu Province], “省政府办公厅关于印发江苏省航空航天产业发展三年行动计划(2023—2025年)的通知” [Notice of the general office of the provincial government on issuing the three-year action plan for the development of the aerospace industry in Jiangsu Province (2023-2025)], 江苏省人民政府 [People’s Government of Jiangsu Province], April 27, 2023, https://www.jiangsu.gov.cn/art/2023/4/27/art_84418_10878239.html.

86 Ibid.

87 无锡市人民政府办公室 [Office of the Wuxi Municipal People's Government], "市政府办公室关于印发无锡市促进航空航天产业发展若干措施的通知" [Notice of the municipal government office on issuing several measures to promote the development of the aerospace industry in Wuxi], 无锡市人民政府 [Wuxi Municipal People's Government], October 23, 2025, https://www.wuxi.gov.cn/doc/2025/10/23/4670394.shtml.

88 Ibid.

89 "蓝箭航天运载火箭智能制造产业基地项目奠基, 鸿擎科技卫星制造项目同步签约" [Blue Arrow Aerospace launches groundbreaking ceremony for intelligent manufacturing industrial base project; Hongqing Technology concurrently signs satellite manufacturing project agreement], 凤凰新媒体 [Phoenix News], May 23, 2024, https://js.ifeng.com/c/8ZofUqU2zpN.

90 Wuxi Government, details redacted to protect source materials.

91 "批量制造各类卫星年产量可达到150颗" [Batch Manufacturing of Various Satellites Reaches Annual Capacity of 150], Nantong Municipal People's Government, April 20, 2024, https://www.nantong.gov.cn/ntsrmzf/ntxw/content/32c1ae65-922a-480a-8922-878cce69ba38.html.

92 "Chinese private satellite firm Galaxy Space attracts new funds," *Global Times*, November 19, 2020, https://www.globaltimes.cn/content/1207404.shtml; and "China Advances Scale and Speed of Satellite Manufacturing for Mega-Constellation Push," Exovera, May 2025, https://exovera.com/wp-content/uploads/2025/05/China_Advances_Scale_and_Speed_of_Satellite_Manufacturing_for_Mega_Constellation.pdf.

93 省人民政府办公厅 [General Office of the Provincial People's Government], "省人民政府办公厅关于印发《湖北省突破性发展商业航天行动计划(2024—2028年)》的通知" [Notice of the General Office of the Provincial People's Government on Issuing the Hubei Province Breakthrough Development Commercial Space Action Plan (2024–2028)], 湖北省人民政府 [Hubei Provincial People's Government], May 9, 2024, https://www.hubei.gov.cn/zfwj/ezbf/202405/t20240509_5185171.shtml.

94 Wuhan Municipal Bureau of Information Industry and Wuhan Municipal Information Center, "China's Wuhan Steers Commercial Aerospace Industry into Broader Space," Wuhan News, accessed January 27, 2026, https://english.wuhan.gov.cn/H_1/NWP/202311/t20231118_2303288.shtml.

95 Joseph Trevithick, "Odd Activity At Chinese Submarine Shipyard Draws Interest," The War Zone, July 18, 2024, https://www.twz.com/news-features/odd-activity-at-chinese-submarine-shipyard-draws-interest.

96 State Administration of Science, Technology and Industry for National Defense (SASTIND), details redacted to protect source material; and "新洲区双柳街道：全力托举'中国星谷' 以航天品质打造宜居宜业新家园" [Shuangliu Subdistrict, Xinzhou District: Fully Committed to Building 'China's Space Valley'—Creating a New Home Ideal for Living and Working with Aerospace-Grade Quality], 武汉市人民政府 [Wuhan Municipal Government], December 23, 2024, https://www.wuhan.gov.cn/whyw/gqdt/202412/t20241223_2506413.shtml.

97 "'中国星谷'崛起, 武汉打造千亿商业航天产业" [China's Satellite Valley Emerges as Wuhan Builds a Hundred-Billion-Yuan Commercial Space Industry], 武汉市人民政府 [Wuhan Municipal People's Government], December 3, 2025, https://www.wuhan.gov.cn/sy/whyw/202512/t20251203_2686193.shtml.

98 赖俊 [Li Jun], "武汉国家航天产业基地又入驻22个项目, 216个项目正推进！'中国星谷'繁星满天," [Wuhan National Aerospace Industry Base Welcomes 22 New Projects, with 216 Projects Currently in Progress! 'China Satellite Valley' Shines Brightly], 武汉市人民政府 [Wuhan Municipal People's Government], December 4, 2025, https://www.wuhan.gov.cn/sy/whyw/202512/t20251204_2690053.shtml.

99 ["China's Satellite Valley Emerges"], [Wuhan Municipal People's Government].

100 “市人民政府关于印发武汉市推进商业航天突破性发展若干措施的通知” [Notice of the Municipal People's Government on Issuing Several Measures for Promoting Breakthrough Development in Commercial Space Activities in Wuhan], 武汉市人民政 [Wuhan Municipal People’s Government], July 16, 2024, https://www.wuhan.gov.cn/zwgk/xxgk/zfwj/gfxwj/202407/t20240716_2429150.shtml.

101 “‘中国星谷’崛起 千亿级商业航天产业生态圈加速形成 [‘China Satellite Valley’ Emerges as Trillion-Yuan Commercial Space Industry Ecosystem Accelerates Formation], 湖北省经济和信息化厅 [Department of Economy and Information Technology of Hubei Province], December 28, 2025, https://jxt.hubei.gov.cn/bmdt/rdjj/202512/t20251229_5843698.shtml.

102 Ibid.

103 海南省人民政府办公厅 [General Office of the People's Government of Hainan Province], “海南省人民政府办公厅关于印发《海南省加快构建具有特色和优势现代化产业体系三年行动方案 (2025-2027年)》的通知” [Notice of the General Office of the People’s Government of Hainan Province on issuing the ‘Three-Year Action Plan for Accelerating the Development of a Modern Industrial System with Distinctive Features and Advantages in Hainan Province (2025-2027)], 海南省人民政府 [The People’s Government of Hainan Province], August 4, 2025, https://www.hainan.gov.cn/hainan/zcfw/202508/c27cc794de4f4b52b2ff-be26c162c6a1.shtml?ddtab=true.

104 Ibid.

105 Ibid.

106 中共文昌市委人才发展局 [Wenchang Municipal Committee Talent Development Bureau], “海南文昌国际航天城卫星超级工厂” [Hainan Wenchang Aerospace City Satellite Super Factory], WeChat, October 23, 2025, https://mp.weixin.qq.com/s/igVRyUEjkM8amoD2m5HPRw.

107 WeChat, details redacted to protect source material; and [Wenchang Municipal Committee Talent Development Bureau], [“Hainan Wenchang Aerospace City Satellite Super Factory”].

108 Boeing, “Boeing Debuts High-Throughput Small Satellite Production Facility,” press release, March 30, 2022, https://boeing.mediaroom.com/news-releases-statements?item=131027.

109 “三亚中科遥感信息产业园投资有限公司” [Sanya Zhongke Remote Sensing Information Industrial Park Investment Co., Ltd.], Baidu, https://baike.baidu.hk/item/%E4%B8%89%E4%BA%9A%E4%B8%AD%E7%A7%91%E9%81%A5%E6%84%9F%E4%BF%A1%E6%81%AF%E4%BA%A7%E4%B8%9A%E5%9B%AD%E6%8A%95%E8%B5%84%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8/51675473.

110 “China Develops Space-ground Information Ports,” Chinese Academy of Sciences, September 25, 2024, https://english.cas.cn/newsroom/cas_media/202409/t20240926_690670.shtml.

111 Devon Johannessen, “The Oriental Maritime Space Port: China’s Sea-Based Space Expansion,” Chinese Aerospace Studies Institute, June 2025, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2025-06-16%20Oriental%20Maritime%20Space%20Port.pdf?ver=WxcGQEB18G7p2Ivlm-SPfNw%3d%3d.

112 Andrew Jones, “Deep Blue Aerospace raises new funds, targets mid-year orbital launch,” *SpaceNews*, March 10, 2025, https://spacenews.com/deep-blue-aerospace-raises-new-funds-targets-mid-year-orbital-launch/; Zhao Lei, “Private firm launches world’s most powerful solid-fuel rocket,” *China Daily HK*, January 11, 2024, https://www.chinadailyhk.com/hk/article/371117; and 苏州深蓝航天有限公司 [Suzhou Deep Blue Aerospace Co., Ltd.], “近5亿！深蓝航天完成新一轮融资 加速布局可回收火箭赛道” [Almost 500 million! Deep Blue Aerospace completes a new funding round to accelerate expansion into reusable rocket sector], WeChat, March 5, 2025, https://mp.weixin.qq.com/s/xJ5VIDngBl4DkCtAmS_Jsg.

113 “Aerospace industry cluster to be built in Haiyang,” *China Daily*, October 10, 2022, http://shandong.chinadaily.com.cn/yantai/2022-10/10/c_818503.htm.

114 For fulsome discussion on the history, see Select Committee on U.S. National Security and Military/Commercial Concerns with the People’s Republic of China, *U.S. National Security and Military/Commercial Concerns with the People’s Republic of China*.

115 “Full text of white paper on China’s space activities in 2016,” State Council Information Office of the People’s Republic of China, December 28, 2016, https://english.www.gov.cn/archive/white_paper/2016/12/28/content_281475527159496.htm.

116 “China’s Space Program: A 2021 Perspective,” State Council Information Office.

117 Gunter D. Krebs, “Orbital Launches of 2024,” Gunter’s Space Page, last modified October 26, 2025, https://space.skyrocket.de/doc_chr/lau2024.htm; 胡蓝月 [Hu Lanyue], “中国航天科技活动蓝皮书(2023年)” [Blue Book of Chinese Aerospace Science and Technology Activities (2023)], China Aerospace Science and Technology Corporation, February 26, 2024, https://www.spacechina.com/n25/n2014789/n2014804/c4048651/content.html; “盘点2024年度中国宇航发射” [Reviewing China’s 2024 Aerospace Launches], Tencent News, December 31, 2024, https://news.qq.com/rain/a/20241213A04FGE00; and 经济观察报 / 澎湃新闻 [Economic Observer / The Paper], details redacted to protect source material.

118 Andrew Jones, “China to debut new Long March and commercial rockets in 2025,” *SpaceNews*, January 2, 2025, https://spacenews.com/china-to-debut-new-long-march-and-commercial-rockets-in-2025/; and “Launch Services Management,” China Great Wall Industry Corporation (CGWIC), https://www.cgwic.com/Launchservice/index.html.

119 Yuanying Zhou, “THE LONG MARCH LAUNCH SERVICES-YOUR RELIABLE PARTNER TO SUSTAINABLE EXPLORATION IN SPACE,” United Nations/China Forum on Space Solutions: Realizing the Sustainable Development Goals, April 25, 2019, https://www.unoosa.org/documents/pdf/psa/activities/2019/UNChinaSymSDGs/Presentations/Yuanying_Zhou.pdf.

120 Recent unconfirmed reporting suggests that CASC has sold its stake in ExPace to a buyer connected to the Sichuan provincial government. Details redacted to protect source material.

121 Andrew Jones, “Chinese iSpace achieves orbit with historic private sector launch,” *SpaceNews*, July 25, 2019, https://spacenews.com/chinese-ispace-achieves-orbit-with-historic-private-sector-launch/.

122 “About Us,” LandSpace, https://www.landspace.com/en/about.html?mao=2.

123 SpaceRef, “GCL and LandSpace Join Forces to Propel World’s First Methane-Powered Rocket to Orbit,” *SpaceNews*, July 15, 2024, https://spacenews.com/gcl-and-landspace-join-forces-to-propel-worlds-first-methane-powered-rocket-to-orbit/.

124 Andrew Jones, “Zhuque-3 reaches orbit on test flight, first stage lost during landing attempt,” *SpaceNews*, December 3, 2025, https://spacenews.com/zhuque-3-reaches-orbit-on-test-flight-first-stage-lost-during-landing-attempt/.

125 “朱雀三号回收遇挫复盘, 深挖五大故障根源, 蓝箭重整旗鼓再度挑战” [Zhuque-3 Recovery Setback Post-Mortem: Five Root Causes Identified, LandSpace Regroups for Another Attempt], 网易 [NetEase], April 20, 2026, https://www.163.com/dy/article/KQV3AR2Q05538JEM.html.

126 Details redacted to protect source material.

127 Jack C., “Commercial Sea Launch Lofts Four Internet of Things Satellites [Ceres-1S Y7],” China in Space, January 15, 2026, https://www.china-in-space.com/p/commercial-sea-launch-lofts-four.

128 Huang Nan, "China's reusable rocket dream took flight with Nebula-1, but the landing hit a snag," 36Kr, translated and adapted by KrASIA, September 24, 2024, https://kr-asia.com/chinas-reusable-rocket-drea m-took-flight-with-nebula-1-but-the-landing-hit-a-snag; Jones, "Deep Blue Aerospace raises new funds"; and Jack C., "Nebula-1's Second-Stage Conducts Static Fire Ahead of Launch Campaign," China in Space, September 30, 2025, https://www.china-in-space.com/p/nebula-1s-second-stage-conducts-static.

129 Jack C., "Orienspace's Gravity-1 to Fly Again After Long Hiatus," China in Space, October 9, 2025, https://www.china-in-space.com/p/oriens paces-gravity-1-to-fly-again.

130 Andrew Jones, "Orienspace targets 2025 test flight of Gravity-2 after engine test," *SpaceNews*, July 10, 2025, https://spacenews.com/orienspace-targets-2025-test-flight-of-gravity-2-after-engine-test/.

131 Jack C., "Where is OrienSpace?," China in Space, March 25, 2025, https://www.china-in-space.com/p/where-is-orienspace.

132 Clarence Leong, "China's Own Elon Musks Are Racing to Catch Up to SpaceX," *Wall Street Journal*, March 23, 2025, https://www.wsj.com/world/china/chinas-own-elon-musks-are-racin g-to-catch-up-to-spacex-74b02a95.

133 David Ariosto, "What's driving China's commercial launch industry," *SpaceNews*, March 14, 2025, https://spacenews.com/whats-driving-chinas-commercial-launch-industry/.

134 Andrew Jones, "China's new reusable rocket aces key engine tests," Space.com, April 22, 2024, https://www.space.com/china-reusable-rocket-aces-key-engine-tests.

135 Ariosto, "What's driving China's commercial launch industry."

136 Ibid.

137 Adrian Bell, "China Roundup: ZhuQue-3 moves left, Tianlong-3 gets engines, and Chang Zheng rockets launch," NSF, April 18, 2024, https://www.nasaspaceflight.com/2024/04/china-roundup-april-2024/.

138 "Rocket Lab - Electron," NewSpace Index, last modified May 27, 2025, https://www.newspace.im/launchers/rocket-lab.

139 Zhang Tong, "China in bid to challenge SpaceX by deploying maglev rocket launch pad by 2028," *South China Morning Post*, March 25, 2025, https://www.scmp.com/news/china/science/article/3303761/chin a-bid-challenge-giant-spacex-deploying-maglev-rocket-launch-pad-2028; and Chris Young, "China plans world's first electromagnetic rocket launch pad to rival SpaceX," Interesting Engineering, March 26, 2025, https://interestingengineering.com/innovation/spacex-rival-chinas-maglev-launch-pad.

140 Andrew Jones, "China to launch 2 new space station cargo spacecraft on commercial rockets in 2025," *SpaceNews*, February 4, 2025, https://spacenews.com/china-to-launch-2-new-space-station-cargo-spac ecraft-on-commercial-rockets-in-2025/; and Gunter D. Krebs, "Zhuque-2 (ZQ-2, LandSpace-2, LS-2)," Gunter's Space Page, retrieved October 30, 2025, https://space.skyrocket.de/doc_lau/zhuque-2.htm.

141 Andrew Jones, "Space Pioneer raises $207 million for reusable rocket," *SpaceNews*, June 6, 2024, https://spacenews.com/space-pioneer-raises-207-million-for-reusable-rocket/; and Gunter D. Krebs, "Tianlong-2," Gunter's Space Page, retrieved October 30, 2025, https://space.skyrocket.de/doc_lau/tianlong-2.htm.

142 Andrew Jones, "Chinese launch startup Galactic Energy raises $154 million for Pallas-1 reusable rocket," *SpaceNews*, December 20, 2023, https://spacenews.com/chinese-launch-startup-galactic-energy-raises-154-million-for-pallas-1-reusable-rocket/; and Andrew Jones, "Ceres-1 rocket launches 8 Chinese commercial satellites," *SpaceNews*, March 17, 2025, https://spacenews.com/ceres-1-rocket-launches-8-chines e-commercial-satellites/.

143 Jones, "Deep Blue Aerospace raises new funds"; Gunter D. Krebs, "Lijian-1 (Kinetica-1, Zhongke-1, ZK-1)," Gunter's Space Page, retrieved October 29, 2025, https://space.skyrocket.de/doc_lau/lijian-1.htm; and "Technology: Kinetica-2 and Kinetica-2H," CAS Space, accessed October 31, 2025, https://en.cas-space.com/index/index/technology.

144 Andrew Jones, "Orienspace breaks Chinese commercial launch records with Gravity-1 solid rocket," *SpaceNews*, January 11, 2024, https://spacenews.com/orienspace-breaks-chinese-commercial-launch-records-with-gravity-1-solid-rocket/; and Andrew Jones, "China's iSpace launches and lands rocket test stage," *SpaceNews*, November 2, 2023, https://spacenews.com/chinas-ispace-launches-and-lands-rocket-test-stage/.

145 Andrew Jones, "Galactic Energy launches six satellites with third sea launch," *SpaceNews*, August 29, 2024, https://spacenews.com/galactic-energy-launches-six-satellites-with-third-sea-launch/; "Tianqi 16-18 & 20," Next Spaceflight, May 19, 2025, https://nextspaceflight.com/launches/details/7856/; "Loong," Next Spaceflight, December 19, 2024, https://nextspaceflight.com/launches/details/7727; "How Far I'll Go," Next Spaceflight, August 29, 2024, https://nextspaceflight.com/launches/details/7591; "Beautiful World," May 29, 2024, https://nextspaceflight.com/launches/details/7566; "The Little Mermaid," Next Spaceflight, September 5, 2023, https://nextspaceflight.com/launches/details/7274; and Jones, "Orienspace breaks Chinese commercial launch records.

146 Jones, "China to launch 2 new space station cargo spacecraft."

147 Andrew Jones, "China's Landspace Secures State-Backed Funding for Reusable Rockets," *SpaceNews*, December 26, 2024, https://spacenews.com/chinas-landspace-secures-state-backed-funding-for-reusable-rockets/.

148 Jones, "Space Pioneer raises $207 million"; and Jones, "Chinese launch startup Galactic Energy."

149 Jones, "Deep Blue Aerospace raises new funds"; and Andrew Jones, "China's iSpace Secures D Round Funding, Targets December Orbital Launch and Landing," *SpaceNews*, March 14, 2025, https://spacenews.com/chinas-ispace-secures-d-round-funding-targets-december-orbital-launch-and-landing/; Andrew Jones, "China's iSpace Launch Firm Raises Record $729 Million for Reusable Rockets," *SpaceNews*, February 13, 2026, https://spacenews.com/chinas-ispace-launch-firm-raises-record-729-million-for-reusable-rockets/.

150 王莹 [Wang Ying], "一箭六星！我国迄今运载能力最大的固体运载火箭'力箭一号'首飞成功" [Six Satellites in One Launch! China's 'Li Jian-1,' the Country's Most Powerful Solid-Fuel Launch Vehicle to Date, Successfully Completes Its Maiden Flight], *Xinhua News*, July 28, 2022, https://www.news.cn/politics/2022-07/28/c_1211671251.htm.

151 Ariosto, "What's driving China's commercial launch industry."

152 Space Pioneer, details redacted to protect source material; and Baidu Baike, details redacted to protect source material.

153 "北航博士造火箭, 6年融资25亿" [Beihang PhD Builds Rockets, Raises RMB 2.5 Billion in 6 Years], Sina Finance, December 21, 2024, https://finance.sina.com.cn/wm/2024-12-21/doc-ineahafm1181184.shtml.

154 VB Data, details redacted to protect source material.

155 Jack C., "China's Launch Sites and Rockets," China in Space, May 10, 2025, https://www.china-in-space.com/p/chinas-launch-sites-and-rockets.

156 Andrew Jones, "China Completes New Commercial Launch Pad to Boost Access to Space," *SpaceNews*, January 5, 2024, https://spacenews.com/china-completes-new-commercial-launch-pad-to-boost-access-to-space/.

157 The port is also referred to as the Dongfang Aerospace Port.

158 “Coastal city boosts development path with space launches,” *Xinhua*, November 8, 2023, https://english.news.cn/20231108/f5dc799f12264d36bd81d051416bab51/c.html.

159 程尔凡 [Cheng Erfan], “奔向星辰大海！东方航天港卫星数据产业园激活‘星空之力’” [Race toward the stars and the vast seas! Oriental spaceport satellite data industrial park unleashes the power of the cosmos], *China Daily*, January 9, 2024, https://cn.chinadaily.com.cn/a/202401/09/WS659cd48aa310af3247ffb4e9.html.

160 “Yantai’s Haiyang a rising star in country’s aerospace industry,” *China Daily*, March 5, 2024, http://shandong.chinadaily.com.cn/yantai/2024-03/05/c_967691.htm.

161 “四川发展国际商业航天港有限公司揭牌成立” [Sichuan Development International Commercial Spaceport Co., Ltd. officially launched], Sina Finance, October 10, 2024, https://finance.sina.com.cn/jjxw/2024-10-10/doc-incrzuhw9149518.shtml.

162 Ibid.

163 赵俊峰 and 彭超 [Zhao Junfeng and Peng Chao], “四川凉山发布航空航天和低空经济产业链投资合作机遇” [Liangshan, Sichuan announces investment opportunities in aerospace and low-altitude economy industrial chains], *China Daily*, July 28, 2025, https://sc.chinadaily.com.cn/a/202507/18/WS687a3552a310028a84abea0a.html.

164 Weibo, details redacted to protect source material; Andrew Jones, “China completes new commercial launch pad to boost access to space,” *SpaceNews*, January 5, 2024, https://spacenews.com/china-completes-new-commercial-launch-pad-to-boost-access-to-space/; and Jones, “Ningbo, Wenchang.”

165 “浙江宁波将建国际商业航天发射中心, 年发射规模100发” [Ningbo, Zhejiang Province, to establish international commercial space launch center with annual capacity of 100 launches], 澎湃新闻 [The Paper], April 7, 2021, https://m.thepaper.cn/wifiKey_detail.jsp?contid=12080129&from=wifiKey#.

166 知乎 [Zhihu], details redacted to protect source material.

167 “宁波国际商业航天发射中心,” [Ningbo International Commercial Space Launch Center], 东方财富网 [Eastmoney], March 8, 2026, https://caifuhao.eastmoney.com/news/20260308122903029259110.

168 Andrew Jones, “China’s Guangdong province lays out ambitious commercial space objectives,” *SpaceNews*, August 28, 2025, https://spacenews.com/chinas-guangdong-province-lays-out-ambitious-commercial-space-objectives/. The center is also known as the Guangdong (Yangjiang) Space Launch Center.

169 未来天机 [Future Phecda], details redacted to protect source material.

170 WeChat, details redacted to protect source material.

171 Andrew Cox, “The Rocket’s Red Glare: China’s Ambitions to Dominate Space,” Testimony before the U.S.-China Economic and Security Review Commission, April 3, 2025, https://www.uscc.gov/sites/default/files/2025-04/Andrew_Cox_Testimony.pdf.

172 经济观察报 / 澎湃新闻 [Economic Observer / The Paper], details redacted to protect source material.

173 中国卫通集团股份有限公司 [China Satellite Communications Co., Ltd.], details redacted to protect source material.

174 “国家发展改革委举行4月份新闻发布会 介绍宏观经济运行情况并回应热点问题” [National Development and Reform Commission holds April press conference to introduce macroeconomic performance and address hot topics], 国家发展和改革委员会 [National Development and Reform Commission], April 20, 2020, https://www.ndrc.gov.cn/xwdt/xwfb/202004/t20200420_1226031.html; “国务院常务会议部署

新基建：坚持以市场投入为主, 以'一业带百业" [State Council executive meeting deploys new infrastructure: prioritize market investment, drive hundreds of industries through one leading sector], State Council of the People's Republic of China, April 29, 2020, https://www.gov.cn/zhengce/2020-04/29/content_5507396.htm; and Dongfang Hour, details redacted to protect source material.

175 In April 2021, China established a new company called China Satellite Network Group, or "China SatNet," to be the operator of the future Guowang national satellite internet constellation. Baidu Baike, details redacted to protect source material; and Blaine Curcio, "Why The Chinese Equivalent to Starlink Could Launch in 2023," SpaceRef, March 28, 2023, https://spaceref.com/space-commerce/why-the-chinese-equivalent-to-starlink-could-launch-in-2023/.

176 CASC announced its plan for a constellation of 60 satellites in LEO on November 2, 2016, named Hongyan, aiming for completion by 2020. On February 2, 2018, Xinhua reported that Hongyan would be composed of over 300 satellites. On March 31, 2017, CASIC announced its plans for the Hongyun constellation of 156 satellites, with individual satellite capacities of 10 gigabits per second, orbiting at an altitude of 1,175 km.

177 Details redacted to protect source material.

178 "China launches internet satellite group," *Xinhua*, December 16, 2024, http://www.china.org.cn/china/Off_the_Wire/2024-12/16/content_117611115.htm.

179 Andrew Jones, "China's Guowang launch raises questions about satellite purpose and transparency," *SpaceNews*, January 7, 2025, https://spacenews.com/chinas-guowang-launch-raises-questions-about-satellite-purpose-and-transparency/; and Brie, X Post, December 9, 2024, 1:29PM, https://x.com/BanhmiBrieoche/status/1866233719058735583?s=20.

180 Jack C., "GuoWang Mission Ends China's Month-Long Launch Hiatus [Long March 8A Y8]," China in Space, March 12, 2026, https://www.china-in-space.com/p/guowang-mission-ends-chinas-month.

181 Jack C., "China's Mega-Constellations Mega-Article," China in Space, April 23, 2026, https://www.china-in-space.com/p/chinas-mega-constellations-mega-article.

182 Andrew Jones, "China Launches New Guowang Satellites, Long March 12A Launch and Landing Attempt Date Set," *SpaceNews*, December 12, 2025, https://spacenews.com/china-launches-new-guowang-satellites-long-march-12a-launch-and-landing-attempt-date-set/; Ryan Daws, "China launches first satellites for GuoWang constellation," Telecoms, December 17, 2024, https://www.telecomstechnews.com/news/china-launches-first-satellites-guowang-constellation/; Rana Maheswari Ummairah, "Chinese Space Company Launches Unnamed Internet Satellite Charging," VOI, November 24, 2023, https://voi.id/en/technology/332603; and Huiji Wiki, details redacted to protect source material.

183 Huiji Wiki, details redacted to protect source material.

184 Andrew Jones, "Long March 12 launches first Guowang satellites developed by private firm," *SpaceNews*, August 4, 2025, https://spacenews.com/long-march-12-launches-first-guowang-satellites-developed-by-private-firm/; and "New Satellite Internet Group in Orbit [Long March 12 Y2]," China in Space, August 2025, https://www.china-in-space.com/p/new-satellite-internet-group-in-orbit.

185 Eduardo Baptista, "China will launch first satellites of constellation to rival Starlink, newspaper reports," Reuters, August 6, 2024, https://www.reuters.com/technology/space/china-launches-first-satellites-constellation-rival-starlink-newspaper-reports-2024-08-05/.

186 "First satellite for Chinese 'Starlink' G60 Mega Constellation Roll off Assembly line in the Race for Global Satellite Internet Dominance," Defense News, December 29, 2023, https://www.thedefensenews.com/news-details/First-satellite-for-Chinese-Starlink-G60-Mega-Constellation-Roll-off-Assembly-line-in-the-Race-for-Global-Satellite-Internet-Dominance/.

187 Chris Forrester, "Kleo Connect out of cash," Advanced Television, February 5, 2024, https://www.advanced-television.com/2024/02/05/kleo-connect-out-of-cash/.

188 Some sources cite the Shanghai Engineering Center for Microsatellites (SECM) also having a role in satellite manufacturing. SECM evolved into the Innovation Academy for Microsatellites of CAS (IAMCAS). IAMCAS was officially established in 2017 as a public institution by the Chinese Academy of Sciences and Shanghai Municipality focused on "scientific research, technological development and experiments and applications of microsatellites." Its Lingang industrial park containing satellite manufacturing facilities is one of Shanghai's major municipal projects. "History," Innovation Academy for Microsatellites Chinese Academy of Sciences, accessed November 2, 2025, http://english.microsate.cas.cn/aboutus/history/.

189 "China's Thousand Sails satellite plan at Phase 2," SatNews, April 1, 2025, https://news.satnews.com/2025/04/01/chinas-thousand-sails-satellite-plan-at-phase-2/.

190 北京科技报 [Beijing Science and Technology Report], details redacted to protect source material; "China launches first satellites for Starlink rival Thousand Sails Constellation," Technology Org, August 5, 2024, https://www.technology.org/2024/08/05/china-launches-first-satellites-for-starlink-rival-thousand-sails-constellation/; and Baptista, "China Will Launch."

191 Andrew Jones, "China resumes launches for Thousand Sails constellation, CAS Space launches new international payload," *SpaceNews*, October 19, 2025, https://spacenews.com/china-resumes-launches-for-thousand-sails-constellation-cas-space-launches-new-international-payload; and Andrew Jones, "China's Long March 6A rocket appears to have an orbital debris problem," *SpaceNews*, July 12, 2024, https://spacenews.com/chinas-long-march-6a-rocket-appears-to-have-an-orbital-debris-problem/.

192 Andrew Jones, "China conducts pair of Long March launches for Thousand Sails and Guowang megaconstellations," *SpaceNews*, April 9, 2026, https://spacenews.com/china-conducts-pair-of-long-march-launches-for-thousand-sails-and-guowang-megaconstellations/.

193 Andrew Jones, "Shanghai firm behind G60 megaconstellation raises $943 million," *SpaceNews*, February 2, 2024, https://spacenews.com/shanghai-firm-behind-g60-megaconstellation-raises-943-million/; "67亿!我国卫星企业单轮融资最大金额刷新, 国开制造业转型升级基金领投" [6.7 Billion! Largest Single-Round Financing for a Chinese Satellite Enterprise; CDB Manufacturing Transformation and Upgrading Fund Leads], 财联社 [Cailianshe], February 4, 2024, https://www.cls.cn/detail/1590045; and CAS Capital, details redacted to protect source material.

194 Andrew Jones, "Satellite manufacturer for Chinese megaconstellation secures $137 million funding," *SpaceNews*, December 30, 2024, https://spacenews.com/satellite-manufacturer-for-chinese-megaconstellation-secures-137-million-funding/.

195 Geely Holding Group, details redacted to protect source material; and Wei Wen, "Geely Joins BYD as One of World's Top 10 Best-Selling Carmakers," Yicai Global, February 6, 2025, https://www.yicaiglobal.com/news/two-chinese-carmakers-join-global-top-10-for-first-time.

196 "时空道宇" [Geespace], details redacted to protect source material.

197 "2025年将建成'星座'一期覆盖全球 吉利加速布局天地一体化出行生态" [By 2025, the first phase of the "Constellation" satellite network will achieve global coverage. Geely is accelerating the development of an integrated space-ground mobility ecosystem], Tencent, January 1, 2025, https://news.qq.com/rain/a/20250101A05J3Q00.

198 Geely, details redacted to protect source material.

199 Geespace, details redacted to protect source material; and Geely, details redacted to protect source material.

200 Geely, details redacted to protect source material.

201 "By 2025, the first phase of the 'Constellation' satellite network," Tencent.

202 Geely, details redacted to protect source material.

203 Andrew Jones, "Chinese firm files plans for 10,000-satellite constellation," *SpaceNews*, May 27, 2024, https://spacenews.com/chinese-firm-files-plans-for-10000-satellite-constellation/; "CHN2024-67701," International Telecommunication Union, May 24, 2024, https://www.itu.int/ITU-R/space/asreceived/Publication/DisplayPublication/56565; Zhang Yiya, "Private satellite network launches first global communication services," *Global Times*, September 8, 2024, https://www.globaltimes.cn/page/202409/1319460.shtml; and "Spacety made a complete success on its 18th launching mission! 30 satellites have been launched into space," Spacety, January 14, 2024, https://en.spacety.com/index.php/2024/01/14/spacety-made-a-complete-success-on-its-18th-launching-mission-30-satellites-have-been-launched-into-space/.

204 "Huawei (Hua Chain)," NewSpace Index, last modified September 30, 2024, https://www.newspace.im/constellations/huawei; "Huawai confirms satellite mega-constellation," Advanced Television, November 23, 2023, https://www.advanced-television.com/2023/11/23/huawai-confirms-satellite-mega-constellation/; Emiko Matsui, "Huawei may upgrade satellite communication tech to elevate call experience," Huawei Central, May 6, 2025, https://www.huaweicentral.com/huawei-may-upgrade-satellite-communication-tech-to-elevate-call-experience/; and John Ho, "The Connectivity Revolution: Starlink and Huawei's 6G Redefining Global AI Communication," LinkedIn, February 27, 2025, https://www.linkedin.com/pulse/connectivity-revolution-starlink-huaweis-6g-redefining-john-ho-vnr2c/.

205 Andrew Jones, "China launches its first medium Earth orbit broadband satellites," *SpaceNews*, May 9, 2024, https://spacenews.com/china-launches-its-first-medium-earth-orbit-broadband-satellites/; and Andrew Jones, "China's Cangyu plans mixed-orbit commercial data relay satellite system," *SpaceNews*, June 16, 2025, https://spacenews.com/chinas-cangyu-plans-mixed-orbit-commercial-data-relay-satellite-system/.

206 WeChat, details redacted to protect source materials.

207 Simon Mansfield, "Ellipspace to Unveil Comprehensive Satellite Network by 2027," Space Daily, March 15, 2024, https://www.spacedaily.com/reports/Ellipspace_to_Unveil_Comprehensive_Satellite_Network_by_2027_999.html; 澎湃新闻 [The Paper], details redacted to protect source material; Baidu, details redacted to protect source material; and 科创中国 [Innovation China], details redacted to protect source material.

208 Laser Starcom, a commercial aerospace firm established in Beijing in 2020, announced in March that it had achieved a 400-gigabit-per-second communications link between satellites. See Andrew Jones, "China Makes High-Speed Laser Links in Orbit 400-gigabit-per-second intersatellite comms reduce the need for ground stations," IEEE Spectrum, May 12, 2025, https://spectrum.ieee.org/satellite-internet-china-crosslink. China's Chang Guang Satellite Technology Co. recently announced that it had achieved a record-breaking 100 gigabit-per-second satellite-to-ground laser data transmission—10 times faster than its previous record. See "Chinese breakthrough in laser data transmission to shake up telecom industry," Policy Circle, March 24, 2025, https://www.policycircle.org/industry/laser-data-transmission-china/.

209 Bluelink Satcom's full name is Beijing Lanying Xingtong Technology Co., Ltd. See Andrew Jones, "Chinese Bluetooth satellite startup raises early funding," *SpaceNews*, March 31, 2025, https://spacenews.com/chinese-bluetooth-satellite-startup-raises-early-funding/.

210 Gunter D. Krebs, "Tangguo Guan (Candy Jar)," Gunter's Space Page, retrieved October 28, 2025, https://space.skyrocket.de/doc_sdat/tangguo_guan.htm.

211 Andrew Jones, "China to launch new quantum communications satellites in 2025," *SpaceNews*, October 8, 2024, https://spacenews.com/china-to-launch-new-quantum-communications-satellites-in-2025/.

212 Rob Miltersen, "Chinese Aerospace Along the Belt and Road," China Aerospace Studies Institute, June 2020, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Infrastructure/2020-06-10%20Chinese%20Aerospace%20Along%20the%20Belt%20and%20Road.pdf.

213 Eduardo Baptista, "Chinese rival to Starlink strikes deal to enter Brazil," Reuters, November 20, 2024, https://www.reuters.com/technology/space/chinas-starlink-rival-agrees-deal-enter-brazilian-market-2024-11-20/; "China's satellite internet provider Spacesail sets up in Kazakhstan," IntelliNews, January 23, 2025, https://www.intellinews.com/china-s-satellite-internet-provider-spacesail-sets-up-in-kazakhstan-363065/; Sergey Kwan, "Shanghai SpaceSail to Deliver Satellite Internet in Kazakhstan," *Times of Central Asia*, August 7, 2025, https://timesca.com/shanghai-spacesail-to-deliver-satellite-internet-in-kazakhstan/; Andrew Jones, "Chinese constellation operator Spacesail signs agreement with Measat of Malaysia," *SpaceNews*, February 7, 2025, https://spacenews.com/chinese-constellation-operator-spacesail-signs-agreement-with-measat-of-malaysia/; Selam Gebrekidan and Malka Khurana, "This Was Supposed to Be the Year China Started Catching Up With SpaceX," *New York Times*, July 23, 2025, https://www.nytimes.com/interactive/2025/07/23/world/asia/starlink-spacex-musk-china-satellites.html; and Lam Le, "China's SpaceSail is expanding where Elon Musk is stumbling," Rest of World, March 31, 2025, https://restofworld.org/2025/chinas-spacesail-is-expanding-where-elon-musk-is-stumbling/.

214 Deng Xiaoci, "Chinese firm shows mobile-to-satellite communication technology," *Global Times*, February 13, 2025, https://www.globaltimes.cn/page/202502/1328408.shtml; and Komsan Tortermvasana, "True, GalaxySpace form partnership," *Bangkok Post*, February 12, 2025, https://www.bangkokpost.com/business/general/2959228/true-galaxyspace-form-partnership.

215 Matt Swayne, "Pakistan Eyes Expanded Space Ties with China Amid Push for Satellite Services," Space Insider, May 9, 2025, https://spaceinsider.tech/2025/04/23/pakistan-eyes-expanded-space-ties-with-china-amid-push-for-satellite-services/.

216 "CHN2024-67701," International Telecommunication Union.

217 Zeyi Yang, "China's Effort to Build a Competitor to Starlink Is Off to a Bumpy Start," *Wired*, May 20, 2025, https://www.wired.com/story/china-starlink-competitor-satellites/.

218 Ling Xin, "Has the Qianfan satellite network – China's Starlink rival – run into trouble?," *South China Morning Post*, July 23, 2025, https://www.scmp.com/news/china/science/article/3319163/has-qianfan-satellite-network-chinas-starlink-rival-run-trouble; and "China's Thousand Sails," SatNews.

219 Kari A. Bingen, David Gauthier, and Madeleine Chang, *Gold Rush: The 2024 Commercial Remote Sensing Global Rankings* (Washington, DC: CSIS, October 2024), https://www.csis.org/analysis/gold-rush-2024-commercial-remote-sensing-global-rankings.

220 "The Development of Commercial Remote Sensing Satellites and LEO Communication Constellation," International Astronautical Federation, September 26, 2016, https://www.iafastro.org/events/iac/iac-2016/global-networking-forum/heads-of-agencies-press-conference.html.

221 Andrew Jones, "China adds to SuperView remote sensing constellation with Long March 2C launch," *SpaceNews*, February 27, 2025, https://spacenews.com/china-adds-to-superview-remote-sensing-constellation-with-long-march-2c-launch/; and 陈文达, 马文佳, and 姜肖英 [Cheng Wenda, Ma Wenjia, and Jiang Xiaoying], "长征二号丁成功发射四维高景三号02星" [Long March 2D successfully launched the Gaojing-3 02 satellite], WeChat, CASC, March 15, 2025, https://mp.weixin.qq.com/s/VaWzmVmeRVNlWd-3fIegIyw.

222 William Graham, "China launches Jilin-1 Gaofen-02F remote sensing satellite via Kuaizhou 1A," NASASpaceflight, October 27, 2021, https://www.nasaspaceflight.com/2021/10/jilin-1-gaofen-02f/.

223 Bingen, Gauthier, and Chang, *Gold Rush*.

224 Ibid.

225 This is starting to change in the United States, with a few companies planning systems capable of imaging in the LWIR spectral range (e.g., Albedo Space and Muon Space). See Bingen, Gauthier, and Chang, *Gold Rush*.

226 Ibid.; Andrew Jones, "China's CAS Space launches 5 satellites with its 4th rocket (video)," Space.com, September 27, 2024, https://www.space.com/china-cas-space-fourth-rocket-launch-video; "Jilin / Gaofen Constellation," eoPortal, last updated March 3, 2025, https://www.eoportal.org/satellite-missions/jilin-con#launches; and Andrew Jones, "China launches pair of SuperView Neo-2 radar satellites," *SpaceNews*, November 25, 2024, https://spacenews.com/china-launches-pair-of-superview-neo-2-radar-satellites/.

227 Andrew Jones, "China adds to SuperView remote sensing constellation with Long March 2C launch," *SpaceNews*, February 27, 2025, https://spacenews.com/china-adds-to-superview-remote-sensing-constellation-with-long-march-2c-launch.; and 中国四维 [SiWei], "'四维高景一号'03、04星发射成功" [Siwei Gaojin 1-3, 1-4, successfully launched], WeChat, February 27, 2025, https://mp.weixin.qq.com/s/yndVyTswJsd3-CBV-s1OyA.

228 For example, CNSA's Gaofen-2 and CRESDA's ZiYuan-3A and Huan Jing-1. "GaoJing / SuperView Earth Observation Constellation," eoPortal, last updated August 26, 2025, https://www.eoportal.org/satellite-missions/gaojing#space-and-hardware-components.

229 Humeyra Pamuk, Simon Lewis, and David Brunnstrom, "US says Chinese satellite firm is supporting Houthi attacks on US interests," Reuters, April 17, 2025, https://www.reuters.com/world/middle-east/us-says-chinese-satellite-firm-is-supporting-houthi-attacks-us-interests-2025-04-17/; U.S. Department of the Treasury, "Treasury Sanctions Russian Proxy Wagner Group as a Transnational Criminal Organization," press release, January 26, 2023, https://home.treasury.gov/news/press-releases/jy1220; "Russia-Related Designations; Issuance of Russia-Related General Licenses and Frequently Asked Question; Revocation of Russia-Related General License," U.S. Department of the Treasury, Office of Foreign Assets Control, April 12, 2023, https://ofac.treasury.gov/recent-actions/20230412; and "Treasury Imposes Sanctions on More Than 150 Individuals and Entities Supplying Russia's Military-Industrial Base," U.S. Department of the Treasury, February 13, 2026, https://home.treasury.gov/news/press-releases/jy1978.

230 Jiaxing Li, "Tech war: Chinese satellite data company plays down impact of US sanctions," *South China Morning Post*, August 25, 2022, https://www.scmp.com/tech/tech-war/article/3190201/tech-war-chinese-satellite-data-company-plays-down-impact-us.

231 The constellation also involves Satellite (Zhuhai) Aerospace Technology Co, Ltd., the Harbin Institute of Technology, and the Ministry of Natural Resources. See Andrew Jones, "China's SAR Satellite Surge Continues with New Constellation Plan," *SpaceNews*, December 7, 2021, https://spacenews.com/chinas-sar-satellite-surge-continues-with-new-constellation-plan/.

232 Zhao Lei, "Commercial Satellite Network Taking Shape," *China Daily*, March 14, 2024, https://global.chinadaily.com.cn/a/202403/14/WS65f24f52a31082fc043bc900.html.

233 "Full text of white paper on China's space activities in 2016," State Council Information Office.

234 Ling Xin, "China launches experimental satellites to improve BeiDou network's accuracy," *South China Morning Post*, October 8, 2022, https://www.scmp.com/news/china/science/article/3195299/china-launches-experimental-satellites-improve-beidou-networks.

235 Sarah Sewall, Tyler Vandenberg, and Kaj Malden, "China's BeiDou: New Dimensions of Great Power Competition," Belfer Center for Science and International Affairs, Harvard Kennedy School, February 2023, https://www.belfercenter.org/publication/chinas-beidou-new-dimensions-great-power-competition.

236 Andrew Jones, "China to launch next-generation Beidou satellites in 2027," *SpaceNews*, November 28, 2024, https://spacenews.com/china-to-launch-next-generation-beidou-satellites-in-2027/.

237 "China set to build next-generation BeiDou system," State Council Information Office of the People's Republic of China, November 28, 2024, https://english.www.gov.cn/news/202411/28/content_WS674823e4c6d0868f4e8ed7e8.html.

238 "10 x CentiSpace-1," Next Spaceflight, January 12, 2025, https://nextspaceflight.com/launches/details/7746.

239 Lin Chen et al., "Performance Evaluation of CentiSpace Navigation Augmentation Experiment Satellites," *Sensors* 23, no. 12 (June 19, 2023): 5704, https://doi.org/10.3390/s23125704; and "China Launches Centispace-1-s1 Satellite," Chinese Academy of Sciences, September 30, 2018, https://english.cas.cn/newsroom/archive/news_archive/nu2018/201809/t20180930_197949.shtml.

240 Mary Hui, "China Opens Huge Weather Market Wider to Commercial Operators," Bloomberg, January 6, 2025, https://www.bloomberg.com/news/newsletters/2025-01-06/china-opens-huge-weather-market-wider-to-commercial-operators.

241 "Tech fuels global weather governance," State Council Information Office of the People's Republic of China, October 15, 2025, https://english.www.gov.cn/news/202510/15/content_WS68ef079ac6d00ca5f9a06d08.html; and "Data from commercial meteorological small satellites were allowed to enter China's meteorological operational system for the first time," China Meteorological Administration, February 1, 2025, https://www.cma.gov.cn/en/observation/news/202501/t20250102_6770990.html.

242 刘亮 and 刘慧 [Liu Liang and Liu Hui], "我国已建成世界规模最大覆盖最全陆海空天协同的综合观测体系" [Our Country Has Built the World's Largest in Scale, Most Comprehensive in Coverage, Land-Sea-Air-Space-Coordinated Integrated Observation System], CCTV, October 11, 2025, https://news.cctv.com/2025/10/11/ARTINzilqBKyEsE4T12xqFh6251011.shtml.

243 "Data from Commercial Meteorological Small Satellites," China Meteorological Administration.

244 Ibid.; and太空地图 [Space Mapper], details redacted to protect source material.

245 深圳市魔方卫星科技有限公司 [MagicCubeSat], details redacted to protect source material; and 西部重庆科学城 ["Western Chongqing Science City"], "22颗'科学城造'天目卫星成功升空组网！来看各级媒体详细报道" [22 'Science City-made' Tianmu satellites successfully launched and networked! Check out detailed coverage from different media outlets], WeChat, January 6, 2024, https://mp.weixin.qq.com/s/Kdrbwfhv2ydt2yB-nU7yTg.

246 "Tianmu-1 01….22," Gunter's Space Page, accessed November 3, 2025, https://space.skyrocket.de/doc_sdat/tianmu-1.htm; and iChongqing, details redacted to protect source material.

247 Baidu Baike, "云遥一号卫星" [Yunyao-1 satellite], Baidu, accessed November 2, 2025, https://baike.baidu.hk/item/%E4%BA%91%E9%81%A5%E4%B8%80%E5%8F%B7%E5%8D%AB%E6%98%9F/63948494; and Hengyi Yue et al., "The Yunyao LEO Satellite Constellation: Occultation Results of the Neutral Atmosphere Using Multi-System Global Navigation Satellites," Remote Sensing 17, no. 16, August 16, 2025, https://doi.org/10.3390/rs17162851.

248 Andrew Jones, "Chinese space firm raises funds for commercial weather data satellite constellation," *SpaceNews*, August 5, 2022, https://spacenews.com/chinese-space-firm-raises-funds-for-commercial-weather-data-satellite-constellation/.

249 U.S. Government Accountability Office, *In-Space Servicing, Assembly, and Manufacturing: Benefits, Challenges, and Policy Options*, GAO-25-107555 (Washington, DC: U.S. Government Accountability Office, July 2025), https://www.gao.gov/products/gao-25-107555.

250 Andrew Jones, "Chinese on-orbit servicing and debris removal company secures early funding," *SpaceNews*, September 16, 2024, https://spacenews.com/chinese-on-orbit-servicing-and-debris-removal-company-secures-early-funding/.

251 Eduardo Baptista, "Chinese state-backed company to launch space tourism flights by 2028," Reuters, May 16, 2024, https://www.reuters.com/science/chinese-state-backed-company-launch-space-tourism-flights-by-2028-2024-05-17/; and Andrew Jones, "China's Deep Blue Aerospace reveals suborbital tourism plans," *SpaceNews*, October 24, 2024, https://spacenews.com/chinas-deep-blue-aerospace-reveals-suborbital-tourism-plans/.

252 Andrew Jones, "Chinese company targets crewed orbital spaceflight," *SpaceNews*, March 19, 2025, https://spacenews.com/chinese-company-targets-crewed-orbital-spaceflight/.

253 紫微科技AZSPACE, "喜报 | 迪迩五号•中国科技城号发射成功, 率先实现小型货运飞船商业化运营" [Great News | Dear-5 Satellite Successfully Launched, Pioneering Commercial Operation of Small Cargo Spacecraft], WeChat, December 12, 2025, https://mp.weixin.qq.com/s/7HZwS0M80XGQdIKlluEwKg; and Andrew Jones, "Chinese Company Targets Crewed Orbital Spaceflight," *SpaceNews*, March 19, 2025, https://spacenews.com/chinese-company-targets-crewed-orbital-spaceflight/.

254 长江云新闻 [Changjiang Yun News], "国产太空船票+1!" [Domestic space tourism flight ticket +1!], WeChat, November 14, 2024, https://mp.weixin.qq.com/s?_biz=MzI1MTAyOTA4Ng==&mid=2650295111&idx=1&sn=5d5f248e23fac6d37040530e1f9ccd76&chksm=f060cb39b89a53cc989112e6012b3479e78a07b1637fe29a0fbdadff137b714af0225d232cb2#rd.

255 长江云新闻 [Changjiang Yun News], ["Domestic Space Tourism"].

256 "China Steps up Research on 'Space Mining' Technologies," CGTN, January 29, 2026, https://news.cgtn.com/news/2026-01-29/China-steps-up-research-on-space-mining-technologies-1KkNO1r4G0E/p.html.

257 "起源太空" [Origin Space], Baidu Baike, https://baike.baidu.com/item/%E8%B5%B7%E6%BA%90%E5%A4%AA%E7%A9%BA/61575997?fr=aladdin#reference-4.

258 These reported capacity figures warrant careful interpretation, as there is limited publicly available data on the status of these facilities and manufacturing rates differ substantially according to satellite size and complexity. Details redacted to protect source material.

259 Ibid.

260 Michael Kan, "SpaceX Offers Rare Peek Inside a Starlink Satellite Factory, 'Tips Mini Lasers'," PC Mag, August 26, 2025, https://www.pcmag.com/news/spacex-offers-rare-peek-inside-a-starlink-satellite-factory-tips-mini-lasers.

261 "Chinese private satellite firm Galaxy Space attracts new funds," *Global Times*, November 19, 2020, https://www.globaltimes.cn/content/1207404.shtml; and "China Advances Scale and Speed of Satellite Manufacturing for Mega-Constellation Push," Exovera, May 2025, https://exovera.com/wp-content/uploads/2025/05/China_Advances_Scale_and_Speed_of_Satellite_Manufacturing_for_Mega_Constellation.pdf.

262 "Chinese private satellite firm," *Global Times*.

263 "China's Thousand Sails satellite plan at Phase 2," Sat News, April 1, 2025, https://news.satnews.com/2025/04/01/chinas-thousand-sails-satellite-plan-at-phase-2/; and Blaine Curcio, "Some interesting nuggets emerging from China Space Day in Shanghai last month," LinkedIn, May 2025, https://www.linkedin.com/posts/blaine-curcio_chinaspaceguy-activity-7324868855946694656-JSbc.

264 "Hainan to Build Groundbreaking Factory Producing up to 1,000 Satellites Annually," TropicalHainan.Com, April 9, 2024, https://www.tropicalhainan.com/hainan-to-build-groundbreaking-factory-producing-up-to-1000-satellites-annually/.

265 王晓樱 and 王轩尧 [Wang Xiaoying and Wang Xuanyao], "'箭'指苍穹 逐梦航天——海南文昌以航天科技引领高质量发展" ['Arrows' Pointing Skyward, Chasing the Space Dream – Hainan Wenchang Leads High-Quality Development through Aerospace Technology], *光明日报* [*Guangming Daily]*, March 28, 2024, https://news.gmw.cn/2024-03/28/content_37229740.htm.

266 Makena Young and Akhil Thadani, *Low Orbit, High Stakes: All-In on the LEO Broadband Competition* (Washington, DC: CSIS, December 2022), https://www.csis.org/analysis/low-orbit-high-stakes.

267 无锡日报 [Wuxi Daily], "批量造'星' 这家'星工场'落户无锡" [Mass-Producing 'Stars: This 'Satellite Factory' Settles in Wuxi], 无锡市人民政府 [Wuxi Municipal People's Government], March 15, 2025, https://www.wuxi.gov.cn/doc/2025/03/15/4521177.shtml.

268 "Nantong-made satellites launched into orbit," *China Daily - Nantong*, August 11, 2025, https://regional.chinadaily.com.cn/nantong/netda/2025-08/11/c_1115891.htm; and "China Advances Scale and Speed," Exovera.

269 Details redacted to protect source material.

270 Exovera, "China Advances Scale and Speed."

271 Ibid.

272 Baidu, details redacted to protect source material.

273 CAS Capital, details redacted to protect source material; "Mystery Of China's Satellite Manufacturing Factory: Before Half A Year 1 Now Only 20 Days," Hansheng Automation, July 18, 2024, https://www.hansmat.com/news/mystery-of-china-s-satellite-manufacturing-fac-79152877.html; and Huiji Wiki, details redacted to protect source material.

274 "Space pull system: China's industrial revolution to make rockets and satellites like cars," *South China Morning Post*, September 28, 2025, https://www.scmp.com/news/china/science/article/3326060/space-pull-system-chinas-industrial-revolution-make-rockets-and-satellites-cars.

275 CAS Capital, details redacted to protect source material; and Huiji Wiki, details redacted to protect source material.

276 "Chinese GalaxySpace unveils Rollable Solar Panels for Satellites," *Daily CPEC*, July 26, 2025, https://thedailycpec.com/chinese-galaxyspace-unveils-rollable-solar-panels-for-satellites/; and "Mystery of China's Satellite Manufacturing Factory," Hansheng Automation.

277 Edward Tse, "Midea's move for German robot maker Kuka may be a turning point for Chinese manufacturing," *South China Morning Post*, August 21, 2016, https://www.scmp.com/comment/insight-opinion/article/2006054/mideas-move-german-robot-maker-kuka-may-be-turning-point.

278 Nikolaus Doll, "The great concern about the 'sell-off of German know-how'," Welt, February 4, 2018, https://www.welt.de/wirtschaft/article173175841/Know-how-Chinas-Unternehmen-auf-Einkaufstour-in-Deutschland.html; and "Midea-Kuka: A blueprint for Chinese outbound investment," Freshfields, December 24, 2024, https://www.freshfields.com/en/our-thinking/case-studies/midea-kuka-case-study.

279 "The G60 satellite digital factory was put into operation, and the first commercial satellite in the Yangtze River Delta rolled off the assembly line," *Lai Times*, December 29, 2023, https://www.laitimes.com/en/article/6a61a_6qic6.html; "Chinese GalaxySpace Unveils," *Daily CPEC*; and Lan Shunzheng, "Commercial space missions boast vibrant industry," *China Daily*, April 24, 2025, https://www.chinadaily.com.cn/a/202504/24/WS68097ab4a3104d9fd38212d4.html.

280 “北航博士到苏州创业做火箭贮箱「光年探索」完成千万元融资” [A Beihang University PhD returns to Suzhou to launch rocket startup; “Lightyear Exploration” secures tens of millions in funding], Sohu, April 8, 2024, https://www.sohu.com/a/769931896_604684; Andrew Jones, “China is making stainless steel tanks for its future super heavy-lift rockets,” *SpaceNews*, April 30, 2025, https://spacenews.com/china-is-making-stainless-steel-tanks-for-its-future-super-heavy-lift-rockets/; and “LightYear Exploration Overview,” PitchBook, n.d., https://pitchbook.com/profiles/company/593452-27#overview.

281 “Metal Additive Manufacturing: an introduction,” Metal Additive Manufacturing, n.d., https://www.metal-am.com/introduction-to-metal-additive-manufacturing-and-3d-printing/; and “An inside perspective on China’s thriving metal Additive Manufacturing industry,” Metal Additive Manufacturing, April 5, 2023, https://www.metal-am.com/articles/an-inside-perspective-on-chinas-thriving-metal-additive-manufacturing-industry/.

282 Mike Richardson, “Unlocking am potential in space,” Aerospace Manufacturing, September 3, 2024, https://www.aero-mag.com/unlocking-am-potential-in-space.

283 “Additive Manufacturing plays pivotal role in Land Space’s ZQ-3 reusable rocket,” Metal Additive Manufacturing, February 23, 2024, https://www.metal-am.com/additive-manufacturing-plays-pivotal-role-in-land-spaces-zq-3-reusable-rocket/.

284 According to a *Wired* article, “Jonathan McDowell, a researcher who maintains a website that analyzes information collected about low Earth orbit satellite networks, says that, of the 90 satellites that Qianfan has launched, 13 seem to have exhibited irregular behavior, namely they didn’t rise up to their target orbit height along with their peers. Qianfan’s second batch, which it launched in October 2024, contained only five satellites that reached their planned height out of 18, according to McDowell. . . . Overall, Qianfan’s satellites clearly underperform compared to others.” See Yang, “China’s Effort to Build a Competitor to Starlink.”

285 “Chinese Private Satellite Firm,” *Global Times*.

286 微纳星空 [MinoSpace], “微纳星空完成10亿元融资” [MinoSpace completes 1 billion RMB financing round], WeChat, June 23, 2024, https://mp.weixin.qq.com/s/qkN8S69I54_zfrwfRgbtiA; and Andrew Jones, “Chinese satellite manufacturer MinoSpace raises $137 million,” *SpaceNews*, July 3, 2024, https://spacenews.com/chinese-satellite-manufacturer-minospace-raises-137-million/.

287 “Chinese private satellite firm,” *Global Times*; [MinoSpace], [“MinoSpace completes 1 billion RMB financing round”]; and Jones, “Chinese satellite manufacturer MinoSpace.”

288 “Chinese private satellite firm,” *Global Times*, and [MinoSpace], [“MinoSpace completes 1 billion RMB financing round”].

289 Jones, “Deep Blue Aerospace raises new funds”; and Jones, “China’s iSpace secures D round funding.”

290 [State Council of the People’s Republic of China], [“Guiding opinions of the state council on innovating investment and financing mechanisms in key areas and encouraging social investment”].

291 Pramod Mathew, “Chinese Fund Fuels Aerospace Growth With Two $100-Plus Deals,” Deal Street Asia, January 2, 2025, https://www.dealstreetasia.com/stories/chinas-national-fund-backs-commercial-aerospace-mega-deals-425017.

292 Mathew, “Chinese Fund Fuels Aerospace Growth”; and “China SME Development Fund – overview,” Preqin, accessed November 3, 2025, https://www.preqin.com/data/profile/fund-manager/china-sme-development-fund/400307.

293 Roxanne Liu and Kane Wu, "China's OrienSpace could be valued at $823 mln in new fundraising -sources," Reuters, August 22, 2023, https://www.reuters.com/business/aerospace-defense/china s-orienspace-could-be-valued-823-mln-new-fundraising-sources-2023-08-22/; MiHoYo, details redacted to protect source material; and Kristine "Kurisu" Tuting, "Genshin Impact's MiHoYo is so rich, it invested in a rocket," ONE Esports, May 22, 2022, https://www.oneesports.gg/genshin-impact/mihoyo-so-rich-invested-rocket/.

294 时空道宇 [GEESPACE], "浙江时空道宇全球总部项目落地暨战略合作签约 助力吉利星座迈向全球规模化应用" [GEESPACE global headquarters project launches and strategic cooperation agreement signed, helping Geely constellation advance toward global scalable application], WeChat, September 19, 2025, https://mp.weixin.qq.com/s/FWg0UUpfDWMOlRT6ATUpbw; and Andrew Jones, "Geespace secures $281 million for IoT constellation and global HQ," *SpaceNews*, September 24, 2025, https://spacenews.com/geespace-secures-281-million-for-iot-constellation-and-global-hq/.

295 Details redacted to protect source material; and PitchBook, "Essential Capital (China) Overview."

296 Baidu, details redacted to protect source material; and "Essential Capital (China) Overview," PitchBook, accessed May 10, 2026, https://pitchbook.com/profiles/investor/301622-32.

297 MiraclePlus, details redacted to protect source material.

298 CAS Star, details redacted to protect source material.

299 Matrix Partners China, details redacted to protect source material; and U.S. Department of the Treasury, "Treasury Imposes Sanctions on More Than 150 Individuals and Entities Supplying Russia's Military-Industrial Base," press release, December 12, 2023, https://home.treasury.gov/news/press-releases/jy1978.

300 Kane Wu, Julie Zhu, and M. Sriram, "Sequoia to split off China, India/Southeast Asia businesses amid geopolitical tension," Reuters, August 2, 2023, https://www.reuters.com/business/finance/sequoia-separate-china-india-southeast-asia-by-march-2024-2023-06-06/.

301 House Select Committee on the Strategic Competition between the United States and the Chinese Communist Party, *Committee Report: American VC Firms Investing Billions into PRC Companies Fueling the CCP's Military, Surveillance State, and Uyghur Genocide* (Washington, DC: U.S. House of Representatives, February 2024), https://selectcommitteeontheccp.house.gov/media/reports/committee-report-american-vc-firms-investing-billions-prc-companies-fueling-ccps.

302 C. Todd Lopez, "War Department Asks Industry to Make More Than 300K Drones, Quickly, Cheaply," Pentagon News, December 2, 2025, https://www.war.gov/News/News-Stories/Article/Article/4346822/war-department-asks-industry-to-make-more-than-300k-drones-quickly-cheaply/.

303 Meia Nouwens and Lucie Béraud-Sudreau, "Xi Looks to China's Private Sector as He Pursues a Slimmer, Smarter PLA," War on the Rocks, February 23, 2018, https://warontherocks.com/2018/02/xi-looks-china s-private-sector-pursues-slimmer-smarter-pla/.

304 WeChat, details redacted to protect source material.

305 For example, under the PRC's 2021 Data Security Law, "all Chinese technology companies are legally obligated to provide any requested data to the Chinese Communist Party (CCP), regardless of where that data is collected or stored. This law extends far beyond China's borders, meaning that any data transmitted through China's LEO network could be subject to surveillance, storage, and potential exploitation by the Chinese government," according to a Foreign Policy Research Institute analysis. Similarly, according to a U.S. Department of Homeland Security advisory, the PRC's 2017 National Intelligence Law "compels all PRC firms and entities to support, assist, and cooperate with the PRC intelligence services, creating a legal obligation for those entities to turn over data collected abroad and domestical-

ly to the PRC." The advisory goes further to note that "the National Intelligence Law may compel PRC firms to create backdoors and other security vulnerabilities in equipment and software sold abroad so that the PRC government can easily access data not controlled by PRC firms." See U.S. Department of Homeland Security, *Data Security Business Advisory: Risks and Considerations for Businesses Using Data Services and Equipment from Firms Linked to the People's Republic of China* (Washington, DC: U.S. Department of Homeland Security, December 2020), https://www.dhs.gov/sites/default/files/publications/20_1222_data-security-business-advisory.pdf.

306 Murray Scot Tanner, "Beijing's New National Intelligence Law: From Defense to Offense," Lawfare, July 20, 2017, https://www.lawfareblog.com/beijings-new-national-intelligence-law-defense-offense.

307 Billy Mitchell, "Google's departure from Project Maven was a 'little bit of a canary in a coal mine,'" FedScoop, November 5, 2019, https://fedscoop.com/google-project-maven-canary-coal-mine/; and Allen Adamson, "Anthropic Said No To The Pentagon. Claude Hit Number One," Forbes, March 10, 2026, https://www.forbes.com/sites/allenadamson/2026/03/10/anthropic-said-no-to-the-pentagon-claude-hit-number-one/.

308 Li Deren is a Chinese scientist and professor at Wuhan University, former president of Wuhan University of Surveying and Mapping Technology, and member of the Chinese Academy of Sciences and the Chinese Academy of Engineering. Details redacted to protect source material.

309 U.S. Department of Homeland Security, *Data Security Business Advisory*.

310 [General Office of the Shanghai Municipal People's Government], ["Shanghai action plan for promoting commercial space development"].

311 [General Office of the People's Government of Guangdong Province], ["Action plan for promoting the high-quality development"]; and [General Office of the People's Government of Jiangsu Province], ["Notice of the general office of the provincial government on issuing the three-year action plan"].

312 "Faster and cheaper internet services to benefit Chinese economy," *Xinhua*, May 15, 2019, http://www.xinhuanet.com/english/2019-05/15/c_138061332.htm.

313 Office of the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community* (Washington, DC: Office of the Director of National Intelligence, 2023), 8, https://www.dni.gov/files/ODNI/documents/assessments/ATA-2023-Unclassified-Report.pdf.

314 Noah Berman, Lindsay Maizland, and Andrew Chatzky, "Is China's Huawei a Threat to U.S. National Security?," Council on Foreign Relations, February 8, 2023, https://www.cfr.org/backgrounder/chinas-huawei-threat-us-national-security; and Ellen Nakashima, "U.S. pushes hard for a ban on Huawei in Europe, but the firm's 5G prices are nearly irresistible," *Washington Post*, May 29, 2019, https://www.washingtonpost.com/world/national-security/for-huawei-the-5g-play-is-in-europe--and-the-us-is-pushing-hard-for-a-ban-there/2019/05/28/582a8ff6-78d4-11e9-b7ae-390de4259661_story.html.

315 Young and Thadani, "Low Orbit, High Stakes."

316 Ibid.

317 Ibid.

318 Sam Meredith, "China calls for 'concerted' industry efforts to tackle excess solar production," CNBC, April 20, 2026, https://www.cnbc.com/2026/04/20/china-solar-production-energy-iran-war.html; and Keith Bradsher, "Why China Is Trying to Tame Its Electric Car Frenzy," *New York Times*, September 2, 2025, https://www.nytimes.com/2025/09/02/business/china-electric-vehicles-overcapacity.html.

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