

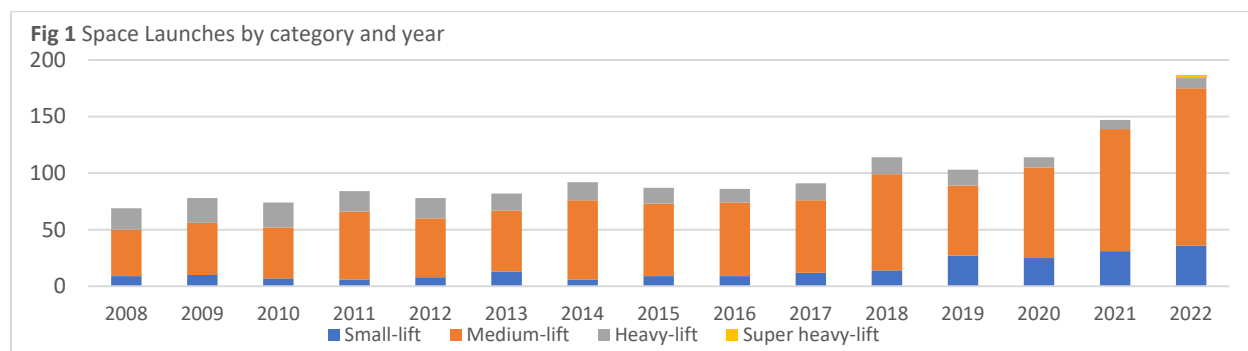
## U.S. Private Space Launch Industry is Out of this World

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*Global space launches continue to increase in frequency each year, with U.S. space launch companies supplying a significant portion of the rockets used to power these flights. Launch companies are meeting the increased demand for launching satellites and other cargo by using new technologies to help increase production and reduce costs. Increased funding from the private sector is also fueling more space launches. This EBOT examines the recent trends in the global and U.S. space launch industries.*

### Space Launches Are Increasing

Global launches of space vehicles – designed to send passengers, spacecraft, and cargo (e.g., satellites) into space – have increased in frequency between 2018–22 when compared to the previous rate of growth over the last fifteen years (figure 1). The average number of space launches between 2008–17 was 82 per year (3.4 percent average annual growth rate) versus an average 133 launches per year between 2018–22 (14.6 percent average annual growth rate). Annual global space launches peaked in 2022 (186 launches); however, 2023 launches are estimated to surpass 2022 levels (197 launches are estimated by year-end 2023). During the period, most launches used medium-lift rockets (capable of lifting 4,400-44,000 lbs). Medium-lift rockets accounted for an increasingly large share in recent years, followed by small-lift (<4,400 lbs), heavy-lift (44,000-110,000 lbs), and super heavy-lift (>110,000 lbs) rockets.



Source: Author calculations; Krebs, “[Orbital Launches](#),” accessed 8/23/23

### Private Sector’s Increasing Investment Role in Space Launches

The public sector drives demand for the heavy- and super heavy-lift space launch services; however, the private sector drives demand for the small- and medium-lift sectors. The small- and medium-lift sectors are both larger and faster-growing than the heavier sectors (figure 1) due to rising demand for launching small satellites and low Earth orbit constellations for telecommunications. Other areas driving private investment in space launch technologies include orbital manufacturing, mining, and tourism. The increased demand for space launches has been largely met by SpaceX’s Falcon 9 medium-lift rocket. The Falcon rocket is already NASA’s primary launch vehicle for orbital missions and SpaceX has been tasked with designing the space vehicle for NASA’s Artemis 3 mission to the moon. Furthermore, NASA has signaled its commitment to work with the private sector as a partner, rather than a contractor, support commercial innovation, and purchase commercial space services from the private sector.

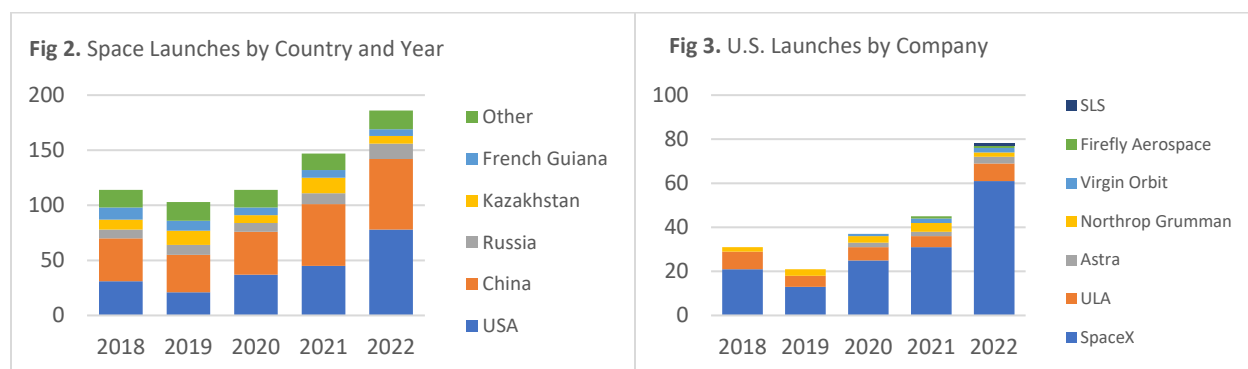
Despite a dip in investment in 2022 due to macroeconomic factors, private sector activity in the space economy is growing, reaching nearly \$362 billion in 2021. Space launches accounted for 11.5 percent of space-related private investment during this period. U.S. companies account for 50 percent of all space-related private investment and for 87 percent of launch-specific investment. Although the private sector has become more active in the space economy, the public sector still plays a role. Global government space budgets totaled more than \$107 billion in 2021, increasing from \$86 billion in 2018. Government expenditures on space are led by the U.S., at 56 percent of global government expenditures on space.

*The views expressed solely represent the opinions and professional research of the author. The content of the EBOT is not meant to represent the views of the U.S. International Trade Commission, any of its individual Commissioners, or the United States government.*

## The United States' Increasing Role in Space Launches

In 2022, the United States surpassed China as hosting the greatest number of space launches. U.S. launches increased 152 percent from 31 in 2018 to 78 in 2022 (China had 64 launches in 2022) (figure 2). Launched exclusively from the United States during this period, SpaceX drove the rise in U.S. launches and increased its share of global launches from 18 percent in 2018 to 33 percent in 2022 and to 45 percent of 2023 launches through July. SpaceX also increased its share of U.S. space launches, from 68 percent in 2018 to 78 percent in 2022 (figure 3). SpaceX has been using its Falcon rocket for the majority of its space launches for more than a decade, but debuted its larger Starship rockets in April 2023.

In addition to SpaceX, there are several newer U.S.-based manufacturers that are creating rockets for space launches, including: Astra (debuted its Astra rocket in 2020), Virgin Orbit (debuted its LauncherOne rocket in 2020 but went bankrupt in 2023), Firefly Aerospace (debuted its Firefly rocket in 2021), and ABL Space Systems (debuted its RS1 rocket in 2023). These three companies represented only a small fraction of the industry during the period, as they accounted for only 6 of the 78 U.S.-based launches in 2022 (compared to 61 by SpaceX). There were also launches from established U.S.-based rocket manufacturers during the period, including launches using the Antares rocket (Northrop Grumman) and the Atlas and Delta rockets (United Launch Alliance (ULA), a joint venture between Lockheed Martin and Boeing). Finally, there were two recent, U.S.-based inaugural launches: 1) the Space Launch System in 2022 (a replacement to the Space Shuttle), jointly manufactured by Aerojet Rocketdyne, Northrop Grumman, Boeing, and ULA; and 2) the Terran rocket in 2023, manufactured by new U.S.-based Relativity Space.



Sources: Author calculations; Krebs, "[Orbital Launches](#)," accessed 8/23/23, (Other: India, Iran, Israel, Japan, New Zealand, and South Korea).

## Technology Innovations Are Driving More Space Launches

Innovations in space launch technology, such as reusable rockets and 3D printing, have reduced costs for space launches and thus driven the rise in the number of launches. Reusable rockets reduce costs by safely landing the rocket's booster after launching the payload portion of the rocket into orbit. By contrast, traditional rocket boosters fall into the ocean after use and cannot be reused. Because boosters account for up to 75 percent of the rocket's total cost, reusing boosters amounts to significant savings. 3D printing also reduces costs, manufacturing time, and the number of parts needed for prototyping and building rockets. This technology is used in all launch sectors, but is most prominent in the small-lift sector. For example, 3D printed materials comprised 85 percent of Relativity Space's small-lift Terran 1 rocket, which launched in March 2023. Although the rocket failed to reach orbit, its launch signaled the potential for 3D printing in the industry. Other factors reducing the cost to launch include advancements in processors, cheaper satellite components, higher launch frequencies, and private sector competition.

Sources: Bank of America, "[The New Space Era](#)," 1/27/23; Burck, "[World's First Large-scale 3D Printed Rocket](#)," 3/23/23; Chow, "[To Cheaply Go](#)," 4/8/22; Daehnick, Gang, and Rozenkopf, "[Space Launch Are We Heading](#)," 4/17/23; de Selding, "[SpaceX's Reusable Falcon 9](#)," 4/25/16; Foust, "[NASA Weighs Changes to Artemis](#)," 8/9/23; Krebs, "[Orbital Launches](#)," accessed 8/23/23; Newton, "[The Incredible Evolution of Rocket Launch Technology](#)," 5/5/22; Oyedemi, "[Private Space Investment Declined](#)," 1/20/23; Space Capital, "[Space Investment Quarterly: Q2 2023](#)," 7/19/23; Space Foundation, "[Data Sets and Graphics](#)," accessed 9/5/23; Weinzierl and Sarang, "[The Commercial Space Age is Here](#)," 2/12/21; Yonekura et al., "[Commercial Space Capabilities](#)," 2022, 17–24.

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