

DECEMBER 23, 2021

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Live coverage: SpaceX launches Starlink satellites from California

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Live coverage of the countdown and launch of a Falcon 9 rocket from Vandenberg Space Force Base in California with 51 Starlink internet satellites. Text updates will appear automatically below; **there is no need to reload the page**. Follow us on [Twitter](#).

SpaceX Webcast



Starlink Mission



SpaceX Mission Audio ▼

Starlink Mission Control Audio



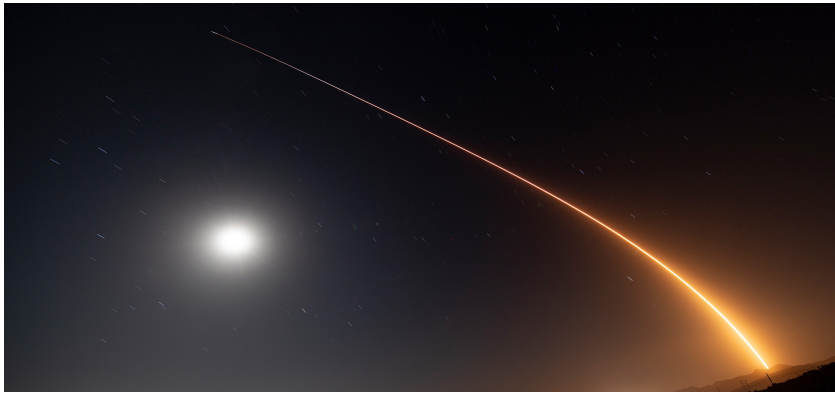
Last Updated: 09/14/2021 07:23



09/14/2021 07:23

 Stephen Clark





SpaceX delivered 51 more Starlink internet spacecraft to orbit Monday night with a successful Falcon 9 rocket launch from California, introducing new inter-satellite optical laser links to improve how the network relays broadband signals around the world.

[Read our full story.](#)

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After waiting for a communications pass over a ground station in Chile, SpaceX confirms all 51 Starlink satellites successfully deployed from the Falcon 9 rocket's second stage in orbit. This completes SpaceX's 22nd Falcon 9 launch of the year.

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SpaceX's webcast commentator says the Starlink satellites should have deployed a few minutes ago, but ground teams won't receive confirmation of the event until the next pass over a ground station in Argentina at T+plus 26 minutes.

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SpaceX flight sets record for most orbital launches from Space Coast in a year

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Falcon 9 has landed!

This marks the 10th successful launch and landing of this reusable first stage booster.


The Falcon 9's second stage has shut down after reaching orbit with its payload of 51 Starlink satellites.

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 December 21, 2021



Live coverage:
SpaceX launches cargo mission to International Space Station

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T+plus 8 minutes. As the Falcon 9's upper stage Merlin-Vacuum engine continues firing into orbit with the Starlink satellites, the 15-story-tall first stage is plunging toward SpaceX's drone ship off the coast of Baja California.

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SpaceX has confirmed completion of the first stage entry burn.

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The first stage has begun its entry burn to target a landing on SpaceX's drone ship "Of Course I Still Love You."

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The kerosene-fueled Merlin 1D upper stage engine can generate up to 220,000 pounds of thrust in vacuum.

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The first stage has deployed four grid fins to aid in its landing.

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Here's a replay of the Falcon 9 launch moments ago.

Liftoff of SpaceX's Falcon 9 rocket from Vandenberg Space Force Base with the next series of Starlink internet satellites.
<https://t.co/uAcXQDmddZ> pic.twitter.com/NZZA1lwQBv



— *Spaceflight Now (@SpaceflightNow)*

September 14, 2021

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T+plus 5 minutes. Everything reported to be going well with this second stage engine firing. The Merlin vacuum engine uses an ultra-thin nozzle extension for greater efficiency in the upper atmosphere.

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T+plus 3 minutes, 10 seconds. The Falcon 9's payload fairing has been jettisoned.

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T+plus 2 minutes, 50 seconds. The Falcon 9 first stage engines have cut off, the stages have separated, and the rocket's second stage Merlin vacuum engine has ignited for its approximately six-minute firing to reach orbital velocity.

Cold gas nitrogen thrusters are now firing to re-orient the 156-foot-tall first stage booster in the correct attitude for its engine burns to target a landing on SpaceX's offshore drone ship.

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T+plus 2 minutes. Now soaring at an altitude of more than 25 miles, the Falcon 9 rocket's first stage will shut down and jettison in less than 15 seconds.

And chilldown of the second stage's vacuum-rated Merlin 1D engine has started in preparation for its ignition.

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T+plus 70 seconds. The Falcon 9 is now supersonic as it soars to the south-southeast from Vandenberg Air Force Base.

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Liftoff of SpaceX's Falcon 9 rocket from Vandenberg Space Force Base with the next series of Starlink internet satellites.

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T-minus 60 seconds. The Falcon 9's autonomous flight termination system is ready for launch.

In the final minute of the countdown, the flight computer will command checks of the first stage Merlin engine steering system and the Falcon 9 propellant tanks will be pressurized for flight. Thousands of gallons of water from water nozzles on the ground facility's fire suppression system will also be dumped onto the launch pad deck to suppress the sound and acoustics of liftoff.

The command to start the ignition sequence for the first stage will be issued at T-minus 3 seconds, triggering the Merlin engines' ignitor moments before the powerplants actually ramp up to full power.

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Falcon 9 is on internal power.

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Second stage liquid oxygen loading is complete. The Falcon 9 rocket is fully fueled for launch, and weighs around 1.2 million pounds.



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T-minus 2 minutes and counting. The Falcon 9 rocket is operating on internal power for liftoff at 8:55 p.m. PDT (11:55 p.m. EDT; 0355 GMT).

Gas closeouts have started, and the second stage liquid oxygen tank is being topped off for flight.

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T-minus 3 minutes and counting. Retraction of the strongback is confirmed complete. First stage liquid oxygen loading is concluding at this time.

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The strongback umbilical tower is being lowered to angle of 13 degrees from the Falcon 9 to clear the rocket for launch. The procedure begins with opening of cradles gripping the rocket at attach points, then hydraulics lower the tower into position for liftoff.

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The Falcon 9's guidance and navigation system is now being configured for flight.

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T-minus 5 minutes, 30 seconds. The first stage's load of RP-1 kerosene fuel is complete.

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The Falcon 9's navigation system will be aligned for flight shortly.

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T-minus 7 minutes. Prevalves leading to the Falcon 9's Merlin 1D first stage engines are opening, permitting super-cold liquid oxygen to flow into the engines to condition the turbopumps for ignition.

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There's a 100% chance of acceptable weather conditions for launch of the Falcon 9 rocket tonight at Vandenberg. The coastal marine layer is enshrouding the rocket at Space Launch Complex 4-East.

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Hydraulics in the first and second stage Merlin engines are being activated for the Falcon 9's steering system.

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T-minus 10 minutes. SpaceX's live webcast for this morning's mission is underway.





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T-minus 13 minutes. The Falcon 9 rocket stands more than 229 feet tall and measures 12 feet in diameter. At liftoff, its nine Merlin 1D first stage engines will generate about 1.7 million pounds of thrust.

When it is fully fueled for launch, the Falcon 9 will contain more than a million pounds of kerosene and liquid oxygen propellants, with a total launch mass of around 1.2 million pounds.

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T-minus 16 minutes. Liquid oxygen loading into the second stage is beginning at this time.

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T-minus 20 minutes. SpaceX confirms the second stage's kerosene fuel tank is now fully loaded. Kerosene and liquid oxygen continue flowing into the Falcon 9's first stage, and liquid oxygen will begin pumping into the second stage at T-minus 16 minutes.

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We've embedded SpaceX's mission audio feed. Reload this page to listen to a "clean" audio feed of SpaceX's control team going through the final countdown procedures.

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T-minus 35 minutes. Filling of the Falcon 9 rocket with super-chilled, densified kerosene and liquid oxygen is underway at Vandenberg Space Force Base. This will mark SpaceX's 22nd Falcon 9 launch of the year, and the 125th flight of a Falcon 9 rocket since June 2010.

The liquid oxygen flowing into the first stage is chilled to near minus 340 degrees Fahrenheit (minus 206 degrees Celsius).

Propellant loading begins with pumping RP-1 kerosene into both stages of the Falcon 9 rocket, and liquid oxygen into the first stage. Liquid oxygen begins loading into the second stage at T-minus 16 minutes.

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SpaceX's launch conductor is expected to poll the Falcon 9 launch team in a few minutes for approval to begin fueling the 229-foot-tall (70-meter) rocket at Space Launch Complex 4-East.

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We've now embedded SpaceX's live webcast on this page. Please reload the page if you don't see the YouTube embed.



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T-minus 60 minutes. Here are some statistics on tonight's mission:

- 125th launch of a Falcon 9 rocket since 2010
- 133rd launch of Falcon rocket family since 2006
- 10th launch of Falcon 9 booster B1049
- 30th dedicated launch of Starlink satellites
- 17th SpaceX launch from Vandenberg Space Force Base
- 70th flight of a reused Falcon 9 booster
- 22nd Falcon 9 launch of 2021
- 22nd orbital launch by SpaceX in 2021
- 4th orbital launch attempt based out of Vandenberg in 2021

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The next major step in the countdown is the start of fueling of the Falcon 9 with super-chilled, densified RP-1 kerosene and liquid oxygen propellants.

SpaceX's launch conductor will verify all members of the launch team are ready to proceed with the final 35-minute automated countdown sequence at 8:17 p.m. PDT (11:17 p.m. EDT; 0317 GMT), followed by the start of filling the rocket with super-chilled, densified RP-1 kerosene and liquid oxygen propellants at 8:20 p.m. PDT (11:20 p.m. EDT; 0320 GMT).

Liquid oxygen loading into the second stage will begin at T-minus 16 minutes, at 8:39 p.m. PDT (11:39 p.m. EDT; 0339 GMT), followed by final chilldown of the rocket's nine Merlin first stage engines, a final pre-flight engine steering check, switching



of the rocket to internal power, and pressurization of the Falcon 9's propellant tanks leading up to liftoff.

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09/13/2021 19:38



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Tonight's mission will bring the total number of Starlink spacecraft SpaceX has launched to 1,791 satellites, adding to the largest fleet ever put into orbit.

A tabulation by Jonathan McDowell, an astronomer and respected tracker of spaceflight activity, shows SpaceX currently has 1,420 operational Starlink satellites, with more than 100 additional craft moving into their operational positions in orbit.

The 51 new Starlink satellites will separate from the Falcon 9 launcher in an elongated orbit between 132 miles and 213 miles (213-by-343 kilometers). The spacecraft will turn on their krypton-fueled plasma thrusters to maneuver into their final circular orbit at an altitude of 354 miles (570 kilometers).

Most of the Starlink satellites launched so far have deployed into a 341-mile-high (550-kilometer), 53-degree inclination orbit, the first of five orbital "shells" the company plans to complete full deployment of the Starlink network.

With that shell on the verge of having more than 1,500 active satellites, SpaceX is transitioning to a new phase of the Starlink program.

The completion of the first Starlink "shell" enables the network to provide high-speed, low-latency internet services to lower latitudes, such as the southern United States. The partial deployment of satellites into the first orbital shell initially provided service over northern regions of the United States, Canada, and Europe, as well as higher-latitude regions in the southern hemisphere.

SpaceX, founded and led by billionaire Elon Musk, is currently providing interim internet services through the Starlink satellites to consumers who have signed up for a beta testing program.

Aside from the 53-degree and 70-degree orbital shells.



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