

**NEWS** · 26 MAY 2020

UPDATE 28 MAY 2020 , UPDATE 30 MAY 2020 , CORRECTION 01 JUNE 2020

# SpaceX to launch astronauts — and a new era of private human spaceflight

The Crew Dragon capsule is set to be the first commercially built craft to take people to orbit.

**Alexandra Witze**

NASA astronauts Doug Hurley and Bob Behnken will be the first spacefarers to launch to orbit on a privately built rocket. Credit: Bill Ingalls/AP/Shutterstock

*Update 31 May: SpaceX's Crew Dragon lifted off successfully at 3.22 p.m. US Eastern time on 30 May. It docked with the International Space Station on 31 May.*

On Wednesday, if the weather in Florida cooperates, two NASA astronauts plan to strap themselves into a capsule atop a SpaceX rocket and travel to space. If the launch succeeds, it will mark a number of firsts in human spaceflight. It will be the first time a private company has

flown humans to orbit, and the first time astronauts have launched from US soil since NASA retired the Space Shuttle in 2011.

Perhaps most significantly, it is the first time in 17 years that anyone has launched a new type of spaceship to carry humans to Earth orbit (see ‘How humans have reached orbit’). “This is a whole new way of sending people to space,” says Robert Cabana, a former NASA astronaut who is now director of the Kennedy Space Center in Florida.



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If all goes well, astronauts Robert Behnken and Douglas Hurley will fly the spaceship, called Crew Dragon, to the International Space Station (ISS). Roughly 19 hours after launch, they will dock with the space station, then float inside to join three spacefarers who have been living and working there since April.

Mission controllers are watching the weather carefully to see if conditions are good enough to launch on Wednesday. If not, the next two available launch opportunities are 30 and 31 May.

## Commercial flight

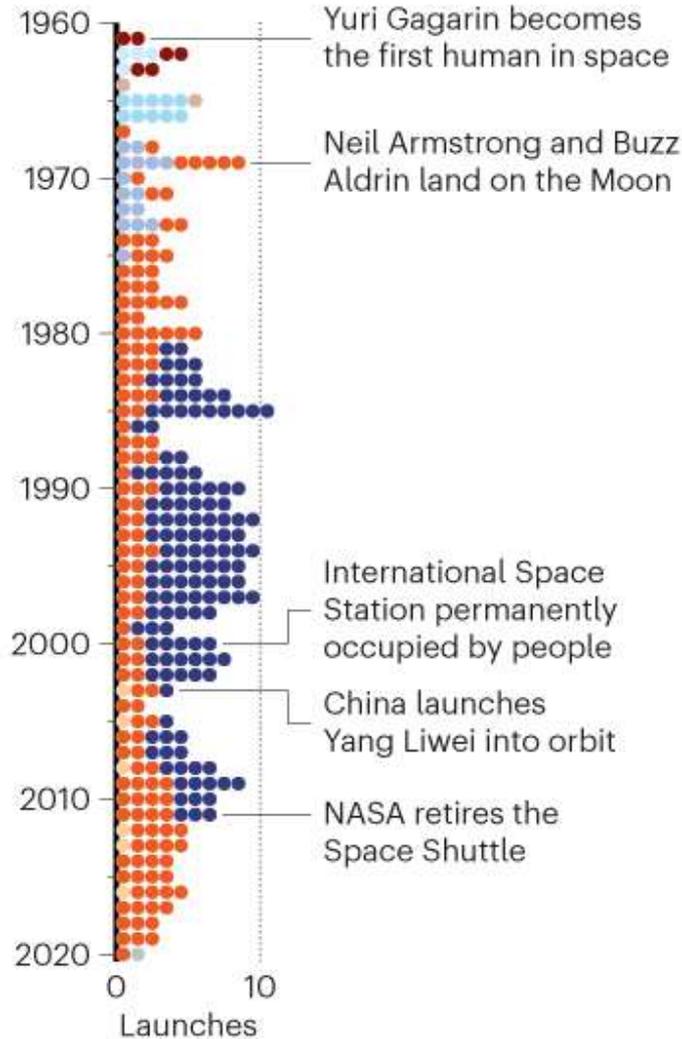
The flight is the culmination of NASA’s long-running push to transition from using its own vehicles to ferry astronauts to the space station to using spaceships provided by private companies. Since 2011, NASA – like all other space agencies – has had to rely on Russian Soyuz craft, originally designed in the 1960s, to take people to orbit. But if the SpaceX test flight goes as planned, the agency will begin using Crew Dragon to transport astronauts to and from the ISS.

# HOW HUMANS HAVE REACHED ORBIT

## The ninth spaceship

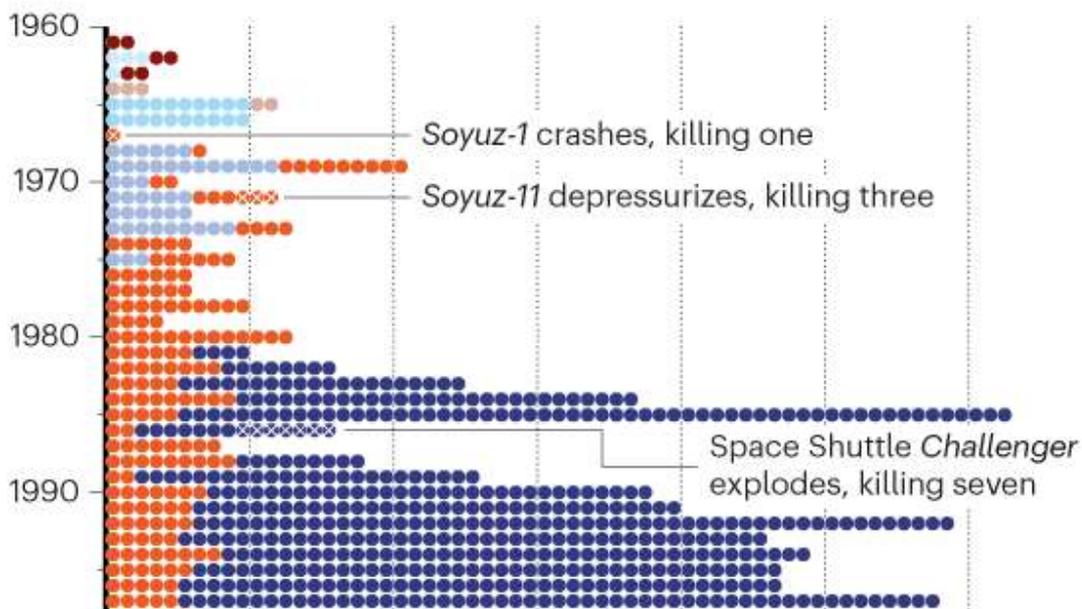
The Crew Dragon launch, if successful, will mark the ninth time humans have rocketed into orbit on a brand-new spaceship, following four US craft, three Soviet and one Chinese. The Crew Dragon, built by SpaceX for NASA, will be the first privately developed spaceship to take people to orbit.

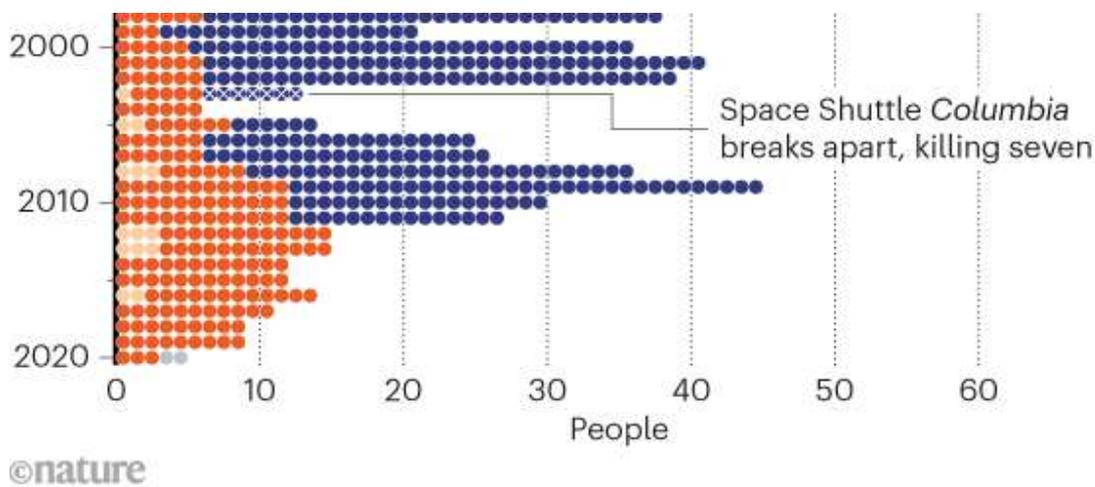
- Mercury
- Gemini
- Apollo
- Space Shuttle
- Vostok
- Voskhod
- Soyuz
- Shenzhou
- Crew Dragon



## Space travellers

Humans have flown into orbit more than 1,250 times — most during the Space Shuttle’s heyday in the 1990s, when the International Space Station was built. Many people have flown on multiple occasions. People of 41 nationalities have been to orbit, including 64 women. The third country to send people to space, after the Soviet Union and the United States, was Czechoslovakia.





Data source: Jonathan McDowell

SpaceX, of Hawthorne, California, has been in the vanguard of private spaceflight, and has been taking cargo to and from the ISS since 2012. It is the first of two companies chosen by NASA to conduct a crewed test flight, and jumped ahead in the race to carry humans by using the same basic spacecraft design it has been using to make the cargo runs. This week's flight just adds astronauts. Its competitor – Boeing, based in Chicago, Illinois – is further behind. Boeing's spaceship, called Starliner, spent two days in Earth orbit without a crew in December and encountered several problems, including a crucial timing error in its software. Starliner will do another uncrewed test flight in the coming months and is not likely to fly astronauts until next year.

## Bullet capsule

Crew Dragon is an 8.1-metre-long, 4-metre-wide bullet-shaped capsule, roughly similar to the Apollo capsules that carried NASA astronauts to the Moon between 1969 and 1972. Crew Dragon can carry up to four people for NASA missions. It will launch on one of SpaceX's Falcon 9 rockets, which have slashed the cost of getting satellites to space, in part because they reuse expensive components such as rocket boosters. NASA is thought to be paying around US\$60 million for each seat on the Crew Dragon, compared with the \$90 million it has been paying the Russian space agency for seats aboard the Soyuz.

The first crewed flight of any new spacecraft is always nail-biting, given that astronauts have died during missions. Behnken and Hurley are former US military test pilots and veteran astronauts who each flew twice on the Space Shuttle. (They are also both married to other astronauts.) In a 1 May briefing with reporters, both said they felt that flying aboard Crew Dragon was less risky than flying on the shuttle, which resembled a large space aeroplane. "The capsule design is generally safer than a winged vehicle," said Hurley. For instance, if something goes wrong aboard Crew Dragon, the astronauts have more chances to abort the mission than

they would on the shuttle — if something goes wrong soon after launch, they can fire eight special engines to manoeuvre the capsule away from the Falcon 9 rocket, deploy parachutes and splash down in the ocean.



The SpaceX Crew Dragon spacecraft will be launched to the International Space Station on a Falcon 9 rocket. Credit: SpaceX

If they reach the space station safely, the astronauts will live and work there for one to four months. Among other tasks, they will help with the various research projects being conducted on the station, including experiments on how flames burn and plants drink water in space. In January, astronauts Christina Koch and Jessica Meir installed a major upgrade to a cold-atom laboratory on the station, which chills clouds of atoms to just above absolute zero to see how they behave in near-zero gravity. Koch and Meir were “indispensable” in pulling off the eight-day upgrade of the experiment, says Kamal Oudrhiri, the project’s manager at the Jet Propulsion Laboratory in Pasadena, California — showing that astronauts can make critical contributions to science in orbit.

## Extraordinary circumstances

Because of the COVID-19 pandemic, Wednesday's historic launch will be unlike any that has ever departed from Florida's storied space centre. NASA is warning members of the public to stay away and watch the launch online, rather than crowd onto nearby beaches as they typically do. When Behnken and Hurley arrived at the Cape on 20 May, they were greeted on the runway by NASA's administrator, Jim Bridenstine — who stood well over 2 metres away from them, practising social distancing. As usual, the astronauts are in an extended quarantine before launch, so as to not carry any pathogens up to the space station.

After this launch, NASA's attention will turn back to its aim of returning astronauts to the Moon by the end of 2024.

That goal is looking less feasible as time goes on. NASA has begun buying some of the services needed; for example, it has contracted companies to develop landers that could carry astronauts from lunar orbit to the lunar surface. But the person in charge of the landing strategy resigned on 19 May. Doug Loverro, who had served as head of NASA's human-spaceflight programme for just seven months, cited an unspecified "mistake" he had made in trying to drive the agency towards its lunar-landing dream.

Former astronaut Ken Bowersox is taking over for now — putting him in the hot seat during NASA's most important crewed launch in years.

*doi: 10.1038/d41586-020-01554-8*

## UPDATES & CORRECTIONS

**Update 28 May 2020:** Bad weather postponed the anticipated launch on 27 May. The next opportunity is on 30 May at 3.22 p.m. US Eastern time.

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**Update 30 May 2020:** This story has been updated with details of the Crew Dragon's successful flight to the International Space Station.

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**Correction 01 June 2020:** An earlier version of this story mistakenly said that SpaceX spacecraft had been taking cargo to and from the International Space Station since 2019. In fact, it has been ferrying cargo since 2012.

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**Part 1: Read the article: SpaceX to launch astronauts – and a new era of private human spaceflight and answer the following questions:**

**1) About NASA's next exploratory mission to the Moon:**

- (a) NASA will send astronauts to the Moon by the end of 2024
- (b) It is less likely to send astronauts to the Moon by the end of 2024
- (c) NASA canceled the development of human landing systems, which will be used to land on the surface of the Moon by 2024
- (d) None of the above

**2) The astronauts Robert Behnken and Douglas Hurley**

- (a) Had dinner with NASA's administrator, Jim Bridenstine on 20 May
- (b) Were recommended by NASA's administrator, Jim Bridenstine
- (c) Will work at the space station for at least 1 month
- (d) None of the above

**3) Which sentence is correct?**

- (a) Space X is the only private company developing spaceships.
- (b) The Russian Soyuz craft is old and unreliable.
- (c) The cost of each seat on the Crew Dragon is 2/3 of the cost for a seat aboard the Soyuz
- (d) None of the above

**4) The Starliner spaceship**

- (a) is more expensive than the Crew Dragon
- (b) has been already on space
- (c) will transport astronauts to the ISS up to the end of this year
- (d) spent 20 days in Earth orbit without a crew

**5) The Crew Dragon spaceship**

- (a) is an updated copy of the Apollo capsules
- (b) will be used to land on the surface of the Moon
- (c) will transport Ken Bowersox on its next mission
- (d)- can detach from the Falcon 9 rocket in case of emergency

**6) SpaceX:**

- (a) has been taking cargo to and from the ISS for more than 6 years.
- (b) has been taking astronauts to and from the ISS since 2012.
- (c) is the second private company to transport humans to the ISS
- (d) is closed due to the COVID-19 pandemic

**7) The launch of the Crew Dragon with two NASA astronauts:**

- (a) was made on Wednesday, 27 May
- (b) was made on 30 May
- (c) was made on 31 May
- (d) was delayed to the next month due to bad weather

**Part 2: Read the travel blog and comments. Answer the following questions:**

**Best Cities in the World**

by Norman Nomad / May 26

I just returned from Barcelona, and I have to say that it's the most wonderful city in the world! The architect Antoni Gaudi built some of the most stunning buildings I've ever seen. The view from his Parc Guell is amazing. Barcelona is culturally diverse, with artists from all over the world creating a vibrant art scene. The city officials are working hard to help the homeless and to keep the city clean. I can't think of anything negative to say about Barcelona.

**1 comment**

Daphne

Norman, I basically agree with you that Barcelona is an amazing city, but there is one negative. The city has a high unemployment rate, which has caused a bit of an increase in the crime rate. I hate to say it, but if you're a tourist, you have to be careful about pickpockets. Of course, every large city with tourists has the same problem. Other than that, I think Barcelona IS one of the best cities in the world – magnificent architecture, friendly people and incredible food.

**8) Which of the following is NOT true:**

- (a) Norman Nomad wasn't impressed with Barcelona's architecture
- (b) People come to Barcelona from many different places
- (c) Norman has nothing negative to say about Barcelona

(d) None of the above

**9) Which of the following would Daphne agree with?**

(a) Norman Nomad's opinion about Barcelona is completely wrong

(b) Unemployment is Barcelona's only major problem

(c) Barcelona has many serious social problems that hurt tourism

(d) None of the above

**10) What do you think that pickpockets are?**

(a) a city official

(b) a kind of thief

(c) a type of street artist

(d) None of the above