

A full-page photograph of Richard Branson standing next to the white and silver Virgin Galactic spacecraft. He is wearing a white button-down shirt with a small 'GALACTIC' logo on the left chest, blue jeans, and black sunglasses. He has his right hand resting on the silver nose cone of the spacecraft. The background is a clear blue sky.

Richard Branson's

# VIRGIN GALACTIC

Start of A New Era For Space Tourism

*by Vibha Soni*

**A** dreamer can only dream of going to space in childhood. Richard Branson, an American Billionaire businessman, one of those dreamers, accomplished his dream by building a company, Virgin Galactic. He founded Virgin Galactic by collaborating with the British Virgin Group. Virgin Galactic is a space tourism company that intends to offer commercial suborbital flights to space tourists in 2022.





During an interview,  
Richard Branson said,

“

I really hope that there  
will be millions of kids  
all over the world who  
will be captivated and  
inspired about the  
possibility of them going  
to space one day.

Recently, he made history by experiencing the  
feel of weightlessness in space with his team.  
This success led to a sudden rise in the commercial  
space tourism industry.

This article will talk all about how Virgin Galactic  
came into existence, the spacecraft, flight plans,  
and passengers.

## History of Virgin Galactic

The popularity and success of entities always make  
people curious to know their past. Let's discuss the history  
of Virgin Galactic.

The story of Virgin Galactic begun when its founder watched  
the Apollo moon landing with his father. Branson told his  
father, "One day, I and many other young people would be able  
to go to space". After a long waiting, the moment came when  
Branson registered the name "Virgin Galactic Airways". It was the  
first initiative to bring the concept of commercial space flight.

At the same time, the arrival of SpaceShipOne encouraged the dream of a personal space flight experience. The SpaceShipOne, an award-winning spacecraft (winner of Ansari X Prize in 2004) has been known for being the first non-government human-crewed spacecraft to cross Earth's atmosphere.

In 2004, Richard Branson decided to partner with Burt Rutan, the creator of SpaceShipOne, to create Virgin Galactic. He acquired SpaceShipOne's designs and technology licenses to develop two main vehicles/ spacecraft (WhiteKnightTwo or WK2 and SpaceShipTwo or SS2) for Virgin Galactic. In 2005, Branson started working operations on the dream spacecraft.

**The announcement of space tourism in 2005 led to passenger bookings, and in next few years, the company received most of its investments from these bookings.**

The initial investment was about \$250 million for developing two WK2s and five SS2s spacecraft. The spacecrafts were scheduled to be developed in three years.

Branson originally predicted that he would be able to fly customers to space in 2007. However, a fatal accident at the Scaled

Composites plant during the cold flow test halted the spacecraft developments. The accident led to the death of three and several others were injured.

In 2008, the US Federal Aviation Administration (FAA) permitted the world's first commercial spaceport and granted Spaceport America a license for vertical and horizontal space launching. The New Mexico Space Authority (NMSA) declared it in 2008. The Virgin Galactic took permission from both these government organizations later in 2010.

SpaceShipTwo made its first glide flight in 2010. Also, George Whitesides was named the first CEO of Virgin Galactic in the same year. In 2016, they thought about developing a floating cabin experience with zero gravity. The team worked tirelessly on this mission, and on July 11, 2021, Virgin Galactic began its ascent to the edge of space, carrying Richard Branson and his crew members.

## **Virgin Galactic Spacecraft: WK2 and SS2**

Virgin Galactic has ordered 5 SpaceShip2 (SS2) and 2 WhiteKnight Two (WK2) spacecrafts to be designed and built by Space Composite, a spaceship company formed in 2005. Virgin Galactic unveiled the first of its SS2 craft on December 7, 2009, at the Mojave Air and Space Port in California.



# WhiteKnight

Image source: [wikimedia.org](https://commons.wikimedia.org/wiki/File:Virgin_WhiteKnight_Two.jpg)

Space Composite designed a customized four-engine and dual fuselage jet aircraft known as WhiteKnight Two (WK2) to air-launch SS2 up to an altitude of ~50,000 feet. The 140-foot main wing of WK2 houses large speed brakes that permits it to mimic SS2's aerodynamics characteristics in the gliding portions of SS2's flight. It provides an affordable, safe, and repeatable way to train Virgin Galactic's pilot for the SS2's final approach.

The aircraft could be used as a Zero-G aircraft for passenger training, handle high-altitude mission testing, microgravity science flights, and launch payloads other than SS2.

## The open architecture design is a prominent feature of WK2.

The first WK2 spacecraft was unveiled in July 2008, and on December 21, 2008, it took its first successful maiden flight. It is powered by four Pratt & Whitney PW308A turbofan jet engines. The carrier aircraft is flown by two pilots and is similar to a Boeing 737 with an estimated take-off weight of 65,000kg.



# SpaceShipTwo

The construction of SS2 started in 2007. In May 2009, the first phase of rocket motor test flight was completed. On December 7, 2009, the SS2 craft was unveiled to the public. Here are its major features:

- 1** The cabin is approximately 1,100ft<sup>3</sup>, about the size of a Gulfstream G550 cabin. It can accommodate two pilots and six passengers.
- 2** Since it carries people thus its cabin requires high security along with comfort. And, the customized and articulated cabin seats made it happen where people feel safe when SS2 exposes to G-forces. The spacious cabin has enabled technologies to provide the experience of out-of-seat zero gravity.
- 3** The spacecraft is built using lightweight composite material.
- 4** The integration of solid and liquid rocket engines to build a special hybrid rocket motor to assist carrying SS2 to space. The hybrid aims to combine the controllability of a liquid with the simplicity of a solid motor.
- 5** Another interesting fact is that you can easily shut down the rocket motor without impacting the security during flight.

SpaceShipOne made the history of becoming the first privately funded spacecraft to leave earth's atmosphere.





The Virgin Galactic  
can carry up to six  
passengers.

**6** The spacecraft is equipped with distinctive wings and tail rotations. The design allows stability and deacceleration being in control due to aerodynamic forces. Re-entry to the earth's atmosphere is a great risk; the feathered wings reduce it to a great extent.

**7** The feathering design of SS2 is one of the disruptive innovation of Virgin Galactic. The designer has taken the concepts of traditional capsules and winged space vehicles to make this design look like a badminton shuttlecock.





## WK2 and SS2 Flight Plans

The parabolic flight path has been designed for this flight system to go into low earth orbit slowly.

### The four steps of Spaceship journey

#### 1 TAKEOFF

Any flight journey starts with a launch before climbing. The Virgin Galactic spaceship and its mothership takeoff together and climb up to cross multiple layers of the atmosphere. The Virgin Galactic's interesting feature is that it does not need a large amount of fuel at higher levels of the atmosphere; making it energy-efficient.

#### 3 APOGEE

Next stage is apogee that converts the spaceship's cabin to the playground where passengers can unbuckle themselves to experience weightlessness at approximately 300,000 feet above the Earth.

#### 2 LAUNCH

After takeoff, the next step is air-launch. The pilot releases the spaceship from the mothership by igniting its rockets and sending it into space. It happens when WK2 gets to an altitude of 50,000 feet. As soon as it reaches space, the color outside the window changes from blue to indigo to midnight black. At last, the rocket motor is switched off (one of the unique features of the spacecraft and mission).

#### 4 RE-ENTRY

The last stage is re-entry, where the ship's wings rise up to 60 degrees, and the spaceship moves down towards the thick atmosphere. It lowers the wings and follows the same runway used for takeoff. The boom lowers and SpaceShipTwo guides home.

Richard had scheduled testing of its suborbital space flight system in 2020. The testing includes ground testing, in-flight testing, and crewed flight testing. Ground testing is compulsory before and after each flight. In-flight testings is to ensure the safety of communication systems in space flight systems and other non-commercial flight testing helps pilots become familiar with WK2 aircraft. The testing are crucial for successful execution of the flight plans.

## The Virgin Galactic can carry up to six passengers that unbuckle their seats to feel weightlessness and enjoy Earth's view from the space.

According to the flight system plan, it takes passengers approximately 62 miles or 100 km in the sky. The company started passenger bookings in 2005, as mentioned earlier. In one year, 500 passengers are expected to experience the space adventure and can book their seats at 200,000 dollars for a suborbital flight lasting four minutes. 600 tickets have already been booked until today. According to sources, in the future, there will be 400 flights per year.

The first ticket was sold for \$250,000. The next 100 passengers paid \$200, 000. The next set of passengers would be pioneers who fly in the first year. They will need \$100, 000- \$175, 000 to book tickets with a deposit amount of \$20,000. The company had stopped taking booking in 2018.

The flight duration is 2.30 hours, including the four minutes passengers will get to experience weightlessness. The company provides 3 days of training to passengers. The physical exams are also conducted, and passengers need to clear that exams.

The company also provides training on zero-gravity flights to understand the weightlessness experience. The safety design of the space flight system provides surety of passengers' security.

The company has already declared the commercial flight to begin from 2022 after more test flights have been completed. According to a recent update, the company made the announcement of reopening ticket sales with starting price of \$450, 000 per seat, which is too high compared to the first set.

### Final Thoughts

Aerospace entrepreneurs are registering their names through continuous development in the space tourism industry. Virgin Galactic has finally announced the offering of suborbital spaceflights to people who love space, from 2022. The partnership with SpaceShipOne was a turning point for Virgin Galactic. This is the best example that proves never stop high dreaming and always imagine its executions. Richard Branson has done the same and made his imagination into reality.