Space tourism projects at a glance

February 15 2016, byJohn Antczak

This undated image provided by XCOR shows the XCOR Lynx, a suborbital horizontal-takeoff, horizontal-landing, rocket-powered spaceplane under development by the California-based company XCOR. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons. While developers envision ultimately taking people to orbiting habitats, the moon or beyond, the immediate future involves short flights into or near the lowest reaches of space without going into orbit. (XCOR via AP)

Virgin Galactic later this month in Mojave, California, is preparing to roll out its new SpaceShipTwo, a vehicle the company hopes will one day take tourists to the edge of space. It comes roughly 15½ months since an earlier incarnation was destroyed in a test flight, killing one of the pilots. Despite the setback, the dream of sending tourists to the edge of space and beyond is still alive. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons.

A look at projects currently under development:

VIRGIN GALACTIC

The most prominent space tourism program, the commercial space line founded by adventurer-business mogul Sir Richard Branson will use a winged rocket plane dubbed SpaceShipTwo, successor to SpaceShipOne, which in 2004 won the $10 million Ansari X Prize that was intended to spur the industry's development.

SpaceShipTwo is designed to be flown by two pilots and carry up to six passengers on a suborbital trajectory to altitudes above 62 miles (100 kilometers), an internationally recognized boundary of space.

Like early U.S. X-planes, Virgin Galactic's craft will be carried aloft by another aircraft, called WhiteKnightTwo, and released at about 50,000 feet before its rocket engine is ignited for a supersonic thrill ride to the fringes of space and a view of the Earth far below.

The space line says SpaceShipTwo's cabin is roomy enough for passengers to float during a few minutes of weightlessness before beginning an unpowered glide to a runway landing.

An undated image provided by World View shows an illustration of the World View space capsule which is complete with Wi-Fi, a bar, a lavatory and a 360-degree view. The World View travel experience is more approachable than a brief, jolting rocket ride. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons. While developers envision ultimately taking people to orbiting habitats, the moon or beyond, the immediate future involves short flights into or near the lowest reaches of space without going into orbit. (World View via AP)

A key feature of the design is the so-called feathering system—a term derived from the feathers of a badminton projectile. Twin tails extending rearward from the tips of each wing rotate upward as a means to slow and stabilize SpaceShipTwo as it re-enters the atmosphere. The "feathers" then rotate back to their normal position for the rest of the glide and landing.

Virgin Galactic's first SpaceShipTwo was destroyed on Oct. 31, 2014, when a co-pilot prematurely unlocked the feathers during a powered test flight and aerodynamic forces broke the craft apart. The co-pilot was

killed but the pilot parachuted to safety. The company will roll out its new SpaceShipTwo later this month in Mojave, California, but the timeline for testing and commercial operation has not been released.

Hundreds of people have put down deposits of $250,000 for a chance to fly into space with Virgin Galactic, which plans to operate from Spaceport America in New Mexico.

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This undated image provided by Blue Origin shows an illustration of the capsule that will be used to take tourist into space. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons. While developers envision ultimately taking people to orbiting habitats, the moon or beyond, the immediate future involves short flights into or near the lowest reaches of space without going into orbit.(Blue Origin via AP)

BLUE ORIGIN

Amazon founder Jeff Bezos' Blue Origin project is testing a vertical-takeoff rocket topped by a six-passenger capsule for suborbital hops.

Like Astronaut Alan Shepard's pioneering 1961 flight during Project Mercury, the capsule separates from the booster rocket and descends beneath parachutes without going into orbit around the Earth.

The unconventional twist is reusability.

This undated image provided by Virgin Galactic shows Virgin Galactic's first SpaceShipTwo, an air-launched suborbital spaceplane type designed for space tourism. It is manufactured by The Spaceship Company, a California-based company owned by Virgin Galactic. Space tourism companies are employing

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Blue Origin recently conducted a test launch from Texas in which the rocket dubbed New Shepard performed a vertical landing, slowing its descent by relighting its engine as it fell back to Earth. In January, the company launched the same rocket and it again landed intact.

Blue Origin says that during flights passengers will experience a few minutes of weightlessness after the capsule separates from the booster. Passengers will be able to leave their seats and float about the capsule before a signal tells them to be reseated for landing.

The company has chosen Florida for its base of operations. Details of space tourism operations have not been released.

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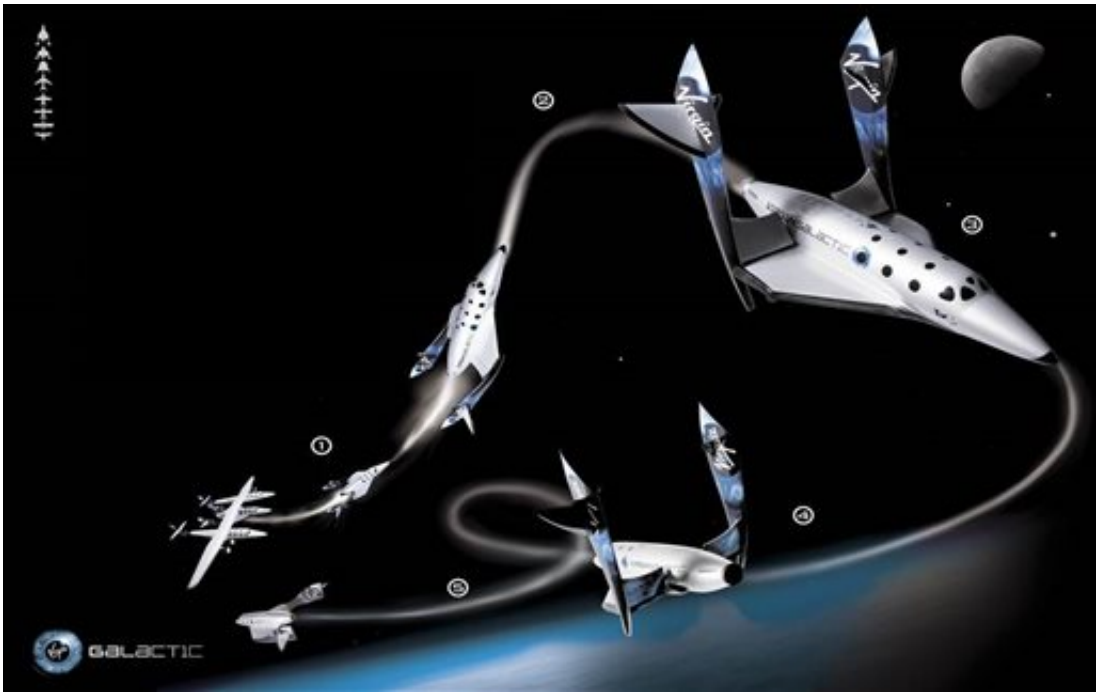
XCOR AEROSPACE

The company has spent years developing a rocket plane named Lynx that is intended to be capable of making multiple flights each day with a pilot and one passenger aboard.

Unlike Virgin Galactic's SpaceShipTwo, the Lynx will take off under its own power from a runway, climb toward space and then glide back to a runway landing. XCOR also plans flights surpassing an altitude of 62 miles.

In December, the company said it reached a milestone in development of the Lynx propulsion system by successfully using waste heat to drive essential engine parts, eliminating the need for large and heavy tanks of compressed gas.



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XCOR, now headquartered in Midland, Texas, also reported progress late last year in completing structural components of its first Lynx as

well as a flight simulator system for pilot training.

The company says it has more than 350 clients. The price of booking a seat rose from $100,000 to $150,000 on Jan. 1, but the company has not said when flights will begin.

"The fact is that we are in a process in which you just can't rush things," Lynx test pilot Harry van Hulten said in press release last fall.

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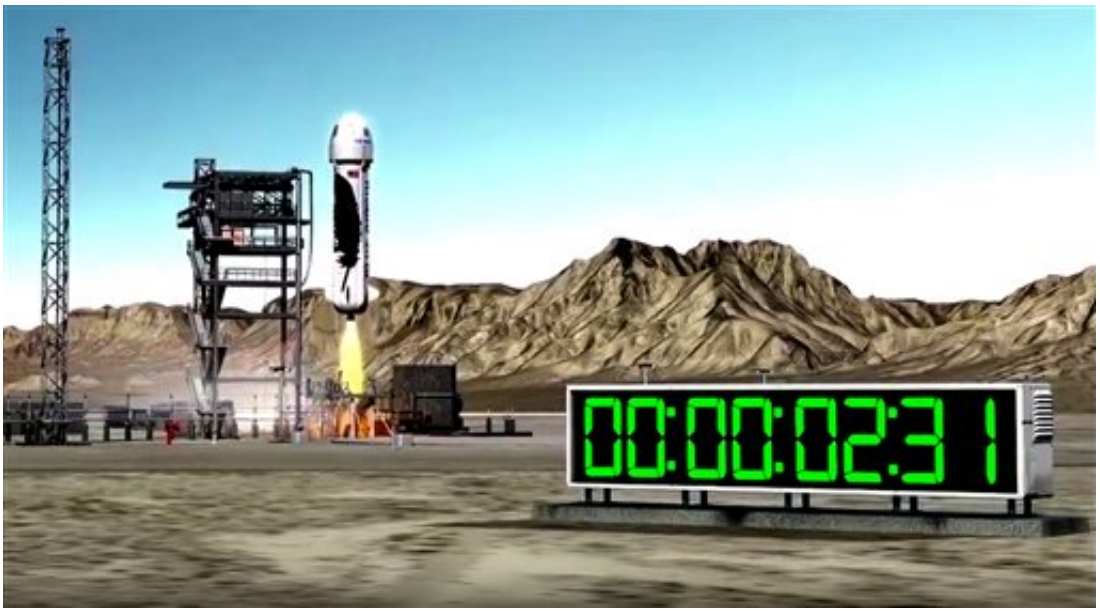

This undated image provided by Blue Origin shows an illustration of a rocket taking off from a launch pad. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons. While developers envision ultimately taking people to orbiting habitats, the moon or beyond, the immediate future involves short flights into or near the lowest reaches of space without going into orbit.(Blue Origin via AP)

WORLD VIEW

The Arizona company plans to loft passengers to altitudes above 100,000 feet in a capsule suspended below a "parawing" and a helium balloon.

The trip some 19 miles high would be to "near space" but would give a substantial view of the Earth far below while avoiding the stress of G forces endured during rocket flight.

Compared to flights on rocket-powered space tourism vehicles offering a few minutes at the top of a suborbital trajectory, World View envisions spending two hours at the maximum altitude, with amenities such as a lavatory.

This undated image provided by World View shows World View capsule and balloon spacecraft that will rise to 100,000 feet above Earth for passengers to see the curvature of the planet and the blackness of space. Space tourism companies are employing designs including winged vehicles, vertical rockets with capsules and high-altitude balloons. While developers envision ultimately taking people to

orbiting habitats, the moon or beyond, the immediate future involves short flights into or near the lowest reaches of space without going into orbit. (World View via AP)

The two-member crew then begins the landing process by venting helium until the capsule descends to 50,000 feet. The balloon is then released and the parawing allows the capsule to glide to a landing spot.

The company announced last month that it plans to conduct launches from Spaceport Tucson.

Things to know about the space tourism industry

Space tourism projects leaped off the drawing board when a $10 million prize was offered as an incentive for private development of manned rockets, but it took years to make a winner. Many more years have passed since, but the only space tourists have been a few wealthy people who paid millions of dollars for trips aboard Russian rockets to the International Space Station. Things to know about space tourism:

X PRIZE

In 1995, the St. Louis-based X Prize Foundation conceived the idea of a $10 million reward for development of a privately financed, reusable spaceship capable of carrying three people to an altitude of 62 miles twice within two weeks.

The X Prize announcement the following year was timed to an anniversary of Charles Lindbergh's nonstop flight from New York to Paris aboard the Spirit of St. Louis in 1927, which won the aviator the $25,000 Orteig Prize that was offered in 1919 for the trans-Atlantic

flight.

At the time the X Prize was announced, maverick aerospace designer Burt Rutan, creator of the Voyager aircraft that circled the globe in 1986, speculated that the $10 million prize could be won in three years. In fact it took more than eight.

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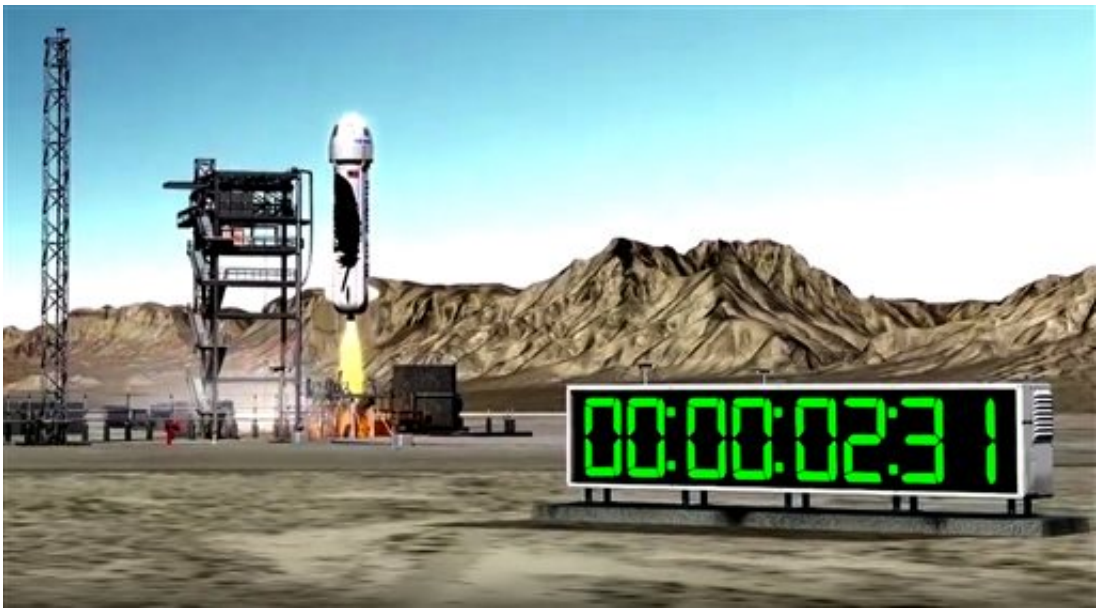
SPACESHIPONE

The Kittyhawk moment for private manned spaceflight occurred on June 21, 2004, when SpaceShipOne—designed by Rutan and funded by Microsoft co-founder Paul Allen—soared more than 62 miles above the California desert and then glided to a landing at Mojave Airport as crowds cheered.



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Standing by the stubby-winged, three-seat spacecraft, test pilot Mike

Melvill said seeing the curvature of the Earth from that altitude was "almost a religious experience."

The feat placed SpaceShipOne in the lead among more than two dozen competitors for the $10 million reward, by then renamed the Ansari X Prize after the Ansari family of Dallas, which made its wealth in telecommunications and funded the prize.

Rutan subsequently announced he would go for the prize later that year.

SpaceShipOne launched again on Sept. 29, reaching the required altitude after Melvill ignored a request to abort because the craft went into a series of rolls. Well within the two-week period required by the contest, the craft launched on Oct. 4 with test pilot Brian Binnie at the controls. After it landed, X Prize founder Peter Diamandis announced the altitude was official and the SpaceShipOne team clinched the prize.

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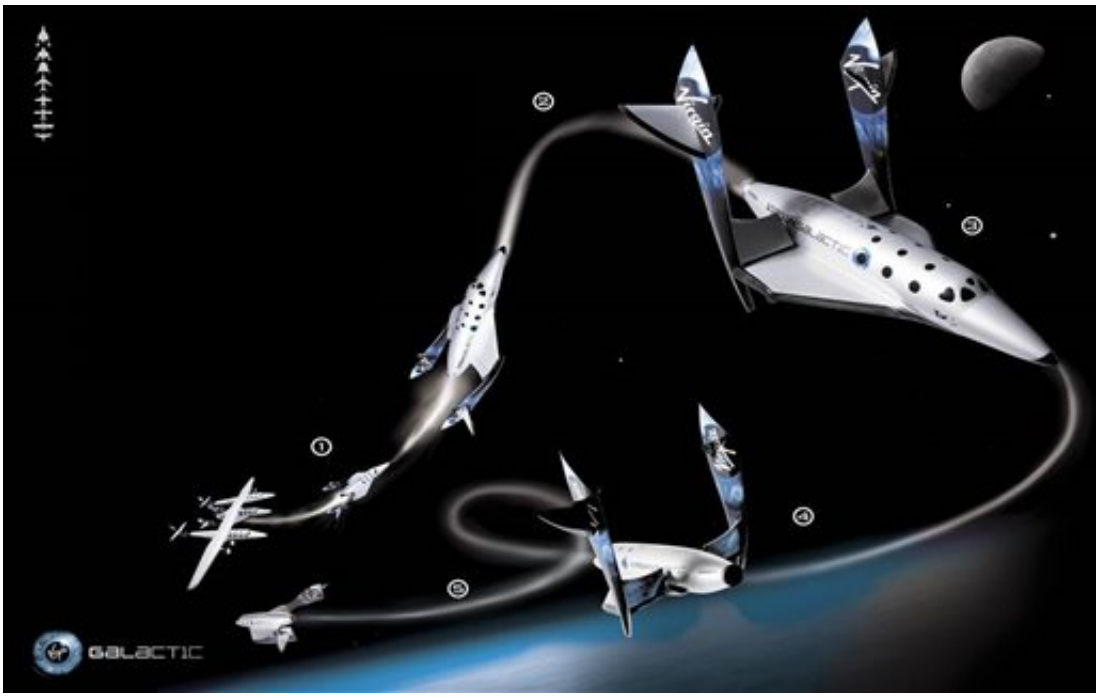
WHERE DOES SPACE BEGIN?

Earth's atmosphere does not abruptly stop and the vacuum of space begin, but the altitude of 62 miles (100 kilometers) is accepted as a useful boundary line by the Federation Aeronautique Internationale, a keeper of flight records.



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Known as the Karman line, it is used to distinguish between aeronautics and astronautics. Melvill, the SpaceShipOne pilot, received the first commercial astronaut wings awarded by the Federal Aviation Administration after surpassing the line.

The U.S. Air Force, however, awarded astronaut wings to five of its pilots who flew above 50 miles decades ago in X-15 rocket planes used for hypersonic research. Three civilian X-15 pilots who also surpassed

that altitude were belatedly awarded astronaut wings in 2005, two posthumously.

The first American in space, Mercury astronaut Alan Shepard, rocketed to an altitude of 116 miles on May 5, 1961.

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SPACEPORT

In a remote stretch of desert in southern New Mexico, officials at Spaceport America—the world's first futuristic hangar and runway designed specifically for commercial space travel—have been anxiously awaiting Virgin Galactic.

Taxpayers footed the nearly quarter-billion-dollar bill for the spaceport years ago in hopes of it being a gateway for space tourism. With Virgin as the anchor tenant, the delay in flights has made it tough for the spaceport to get off the ground.

Spaceport director Christine Anderson can't wait to attend the upcoming unveiling of SpaceShipTwo. She said seeing it in person will make the progress even more real.

"I'm excited they have a spaceship built and things are looking forward and it's full speed ahead for them," she said.

Anderson acknowledged there's no question that Virgin Galactic is the linchpin for the state's space tourism aspirations. With flights expected to start sometime in 2017, the spaceport expects to see as many as 100,000 visitors by 2020.