

World View's Hartman on balloon tourism

Robot painters for hypersonic missiles

Closing the gaps on today's airliners

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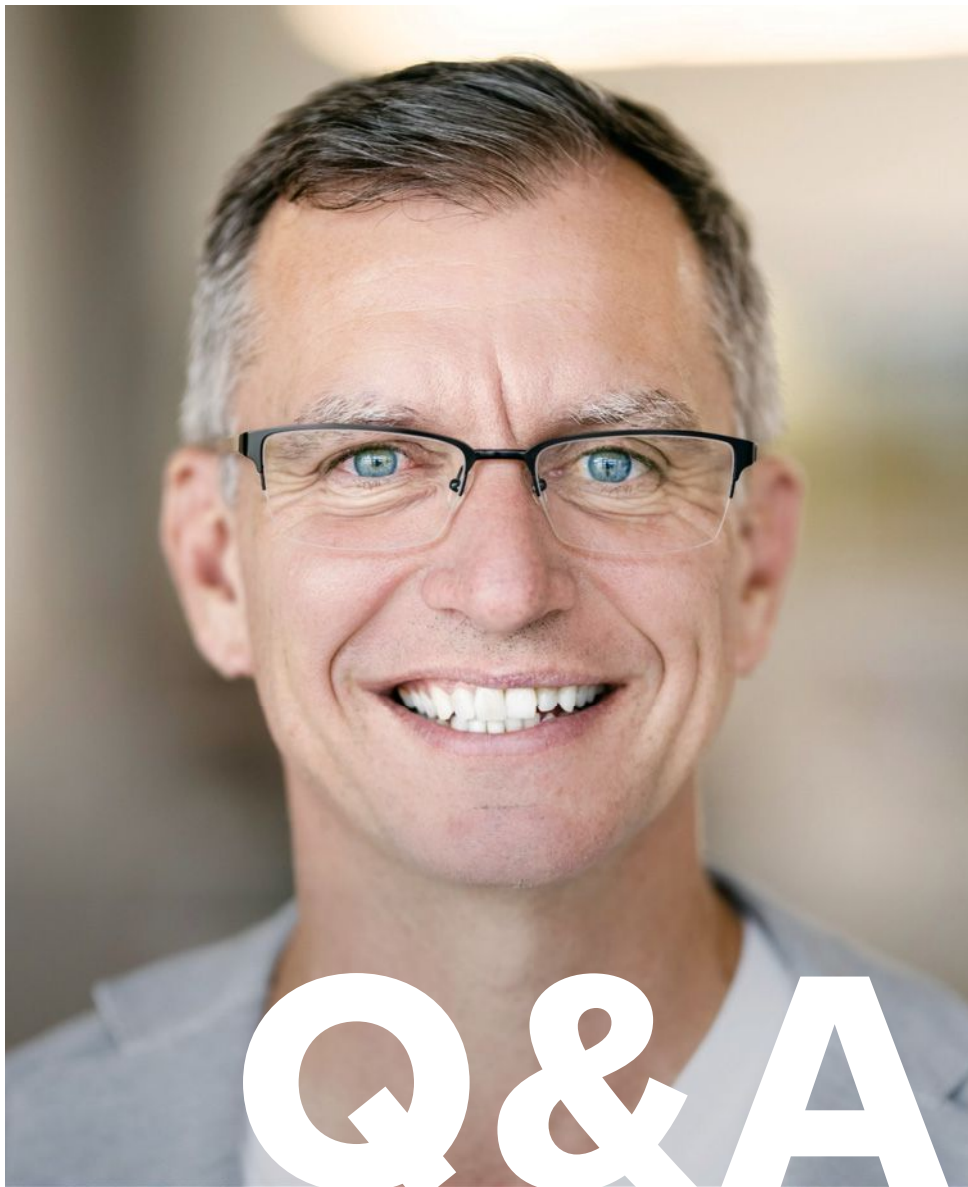


Why this old idea is making a comeback.

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Fueling up in space





Stratospheric tourism visionary

World View's stratospheric balloons are already in the history books, one of them having hoisted former Google executive Alan Eustace to an altitude of 41 kilometers for his record-breaking skydive in 2014. Now, CEO Ryan Hartman and his team are closing in on a loftier goal: regular passenger flights to the stratosphere via those same balloons starting in 2024. They have raised \$120 million to fund test flights with eight-passenger capsules starting later this year. The company is racing against Florida-based Space Perspective, a stratospheric balloon venture focused entirely on tourist flights that was founded in 2018 by two former World View executives. To set itself apart, World View plans to make its six- to eight-hour balloon flights part of a multiday experience in which passengers would spend several days touring famous sites, including the Grand Canyon, before boarding their balloons for aerial views of these natural wonders. I called Hartman in his Arizona office to discuss the road to that first passenger flight. — *Paul Brinkmann*

RYAN HARTMAN

POSITIONS: Since 2019, president and CEO of World View. Since 2016, a member of FAA's NextGen Advisory Committee and Drone Advisory Committee that advise the agency on ongoing modernization of the U.S. air traffic system and how to integrate new aircraft, including drones. 2014-2018, president and CEO of Insitu, Boeing's Bingen, Washington, subsidiary that builds drones primarily for the U.S. military. 2002-2010, director and program manager at Raytheon, where he led the Unmanned Systems Directorate. 1999-2002, program manager at Raytheon Network Centric Systems, the company's communications security division. 1996-2002, naval aviator in the U.S. Navy. 1991-1994, airman in the U.S. Air Force.

NOTABLE: Has led World View to the sale of 1,200 advance tickets for its stratospheric balloon rides. Also under his leadership, the company has launched dozens of uncrewed balloons with research equipment aboard and kept one balloon aloft for 32 days. At Raytheon, oversaw development and production of the catapult-launched KillerBee drones instrumental in the U.S. Army's early development and testing of drone swarms.

AGE: 48

RESIDES: Tucson, Arizona

EDUCATION: Bachelor of Science in aerospace engineering and technical management, Embry-Riddle Aeronautical University, 2009.



World View says tickets are already sold out for 2024, the year the company plans to begin passenger flights in its Explorer capsule, shown here in an illustration. Test articles are scheduled to begin undergoing tests this year, along with the parafoils that would steer the capsule back to Earth after the high-altitude flights.

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IN HIS WORDS

The benefits of balloon flight

Our approach is to not sell something that is a thrill but to sell something that is truly a life-changing experience. We exist to inspire, create and explore new perspectives for a radically improved future. And the seven launch locations we are planning to build spaceports near, the seven wonders, were chosen for that purpose: the Grand Canyon, the Great Barrier Reef, the Giza pyramids, the Serengeti, the Amazon jungle, the aurora borealis in northern Norway and the Great Wall of China. So these are places where people can truly immerse themselves in the beauty of an area — the fragility and history of an area — before they spend time above it. So the time on the ground is important, and then time aloft viewing these places means so much more. So, yes, it's a slow ascent into the stratosphere versus a 6G rocket ride. Ultimately, that also means we can open this up to a broader set of passengers with physical abilities and age groups.

Choosing the launch sites

It started with listening to astronauts explain their experience with the overview effect. *He means the term coined by space philosopher and author Frank White in a 1987 book of the same name to describe the powerful shifts in perspective astronauts experience when they view Earth from space, especially because there are no national borders visible.* — PB One of the things that I heard repeatedly, as we were designing our space tourism solution, was that oftentimes for an astronaut the overview effect was triggered when they saw something they recognized, something they had seen or experienced up close. So that got us thinking about how we could deliver that kind of experience to the public. It became clear that we shouldn't limit ourselves to one place.

The World View experience

Each flight has eight customer seats with two crew: a pilot and concierge. We offer this as a five-day experience, and each location will have a hotel, restaurant, virtual reality experience and local tours. The flight itself will launch before sunrise, which will give the passengers or customers the opportunity to view sunrise from the stratosphere. So you're seeing the sunrise against the backdrop of space, emerging from the dark behind the sun, which will be a very unique experience. Once they reach an apogee of about 100,000 feet

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▲ World View designed its hexagonal capsule, shown here in an illustration, so that each of the eight passenger seats would face a window.

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[30 kilometers], then they'll be guided through the experience, meaning the pilot on board will be helping them understand what they're seeing. Each trip will be six to eight hours, and as long as 10, depending on weather conditions during flight or in the landing zone. We have hospitality experience on our leadership team with Dale Hipsh, our president, who formerly was a senior vice president with Hard Rock International. Passenger training will be more like an orientation, and it's really for them to understand the experience that they're going to have. At our first location, the Grand Canyon, we have identified a site for our Spaceport Grand Canyon in Page, Arizona. We have designs for a hotel and restaurant and are in the process of finalizing those designs and working through the permitting processes.

Passenger prerequisites

Right now, that's governed by FAA Part 460, Human Spaceflight Requirements. *Part 460's requirements include that passengers must be at least 18 years old, sign a waiver before flying and must be trained in emergency procedures.* — PB But I'm bothered by the idea that somebody who has a physical disability is locked out of space tourism. This is a solution that, all of a sudden, makes it possible. The nice thing about this industry, commercial spaceflight as a whole, is that we are all pulling in the same direction to ensure progress toward democratizing space tourism as a whole.

“Diverse” group of early travelers

We don't have plans finalized for our first crew, but we will work with the nonprofit Space for Humanity, whose mission is to expand access to space for all of humanity. We're approaching about 1,200 tickets sold. It's a very diverse group of people. There are space enthusiasts, and that's where we see younger folks buying reservations. And then we're seeing luxury travelers, those who like to find unique vacations or events. And then the other group of people are just the adventure travelers, maybe a 30- to 40-year-old couple that spends a lot of time traveling. So it's a broad spectrum of demographics that are purchasing tickets. We are seeing some people recognizing that this can be a yearly vacation because of the many sites we are launching from, so they can come to a different site next year.

Helium over hydrogen

A helium-filled balloon is simply the safest way to do this. We've done a lot of studies on the amount of helium we will need and the combustibility of other gases, and the reality is no matter how you try and spin it, hydrogen is still a combustible gas. The probability of an incident with hydrogen can't be said to be zero, but with helium there really is 0% chance of any combustibility or issues with the lift gas. It's true that helium is a finite gas, which is mined or extracted through radioactive decay of certain elements, but over a 10-year period we'll



use less than 3% of the global supply of helium. We'll have a disciplined, deliberate approach and long-term contracts for the mining of helium. If there was a helium shortage, as there is sometimes, there's always a prioritization of needs such as medical uses, and we would subject to that.

Keeping a human in the loop

Most people familiar with skydiving these days understand the use of a parafoil, an inflatable parachute shaped like a wing that gives you some steering ability when landing. Our balloons will have a parafoil to enable use to choose a landing site. For example, Spaceport Grand Canyon will have six landing sites. Parafoil technology has been proven, so really the challenge is working through our program in designing and iterating things to a standard that is far beyond what is expected of us. We're adopting design standards for the parafoil that go above and beyond what is required of us. There will also be a backup parafoil in the event the first fails. The crew is there for customer convenience. So, the pilot is there to attend to the system itself and for passenger and crew safety, and the concierge is there to support the pilot but also to support the needs of the passengers: serving customers a light meal, serving drinks and cocktails, and just keeping them comfortable.

Coming soon: test flights

We are nearly through preliminary design and are

entering critical design. And so we'll start cutting metal on prototypes of the initial flight asset early to middle of next year. We will test fly a full-size mass simulator with a full-size balloon, planned this year. The balloons are the exact same material and design that we use in our existing business for remote sensing balloons — our own blend of polyethylene — only much bigger. Remote sensing balloons are 4.5 million cubic feet [127,425 cubic meters], while the passenger flight balloon will be nearly four times larger at 17.5 million cubic feet [495,500 cubic meters]. The pressure vessel for the capsule will be carbon composite with external fairings, likely with a titanium structure to hold the capsule under the balloon. Testing starts with the full-mass simulator tests that we'll do later this year. Another series of tests will be done to further validate the parafoil technology. And then there's a series of tests to validate the capsule itself — pressurization tests, emergency procedures and so on. Then we'll enter into a flight test program where the capsule is instrumented, but without humans on board, to validate the environmental control and life support system, the pressurization, launch loads. And then we'll go into a fully integrated test, where we're testing the proposed production balloon sets, the proposed production parafoil sets, the proposed production capsule with humans on board. We'll go through all of that a number of times before we declare the system suitable for commercial operations. ★

▲ World View plans to open a handful of spaceports around the world near scenic attractions that include the Grand Canyon in the U.S. and the Great Barrier Reef in Australia. Passengers would spend a few days taking tours of the area, then board their Explorer Space capsule for a six- to eight-hour balloon ride at an altitude of about 30 kilometers.

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