Virgin ORBIT LAUNCH DEMO

PRESS GUIDE

MAY 2020

Cosmic Girl releases LauncherOne during a drop test in July 2019.

LAUNCH DEMO

"A BUSINESS IS SIMPLY AN IDEA TO MAKE OTHER PEOPLE'S LIVES BETTER."

– RICHARD BRANSON

Virgin Orbit teammates connect Cosmic Girl and LauncherOne to ground support equipment on the runway in Mojave. January 30, 2020.

Cosmic Girl taxis on the runway for with a heavyweight LauncherOne for the first time in May 2019.

Cosmic Girl pitches up at a sharp pitch angle to simulate the release maneuver during a cryogenic captive carry flight. April 2020.

LAUNCH DEMO

MISSION OVERVIEW

For Virgin Orbit's first orbital test flight, the carrier aircraft Cosmic Girl will take off from the Mojave Air and Space Port before traveling out over the Pacific Ocean. After reaching the drop point — approximately 50 miles south of the Channel Islands — Cosmic Girl will release the two-stage LauncherOne vehicle, which will ignite the NewtonThree engine in free fall for the first time ever. The flight will then continue towards its ultimate target of Low Earth Orbit.

If successful, this flight will mark the first air-launch of a liquid-fueled orbital launch vehicle.

TIMING

Virgin Orbit's Launch Demo is scheduled to launch during a four-hour window that opens on Saturday, May 23rd, at 10 A.M. PT. We will only proceed with the mission if all conditions for launch are nominal. Although air-launched systems like ours are less vulnerable to bad weather than fixed ground-launch systems, we'll be watching the weather closely and being cautious for this maiden flight. Should our flight slip, we have launch windows open at similar times on May 24th and 25th.

D-1 DAY	Area cleared for hazardous operations
	Load RP-1
T-4 HRS 20 MIN	Wake up plane, GSE trailers, rocket
T-3 HRS 50 MIN	Pre-flight briefing
T-3 HRS 40 MIN	Area cleared for hazardous operations
	Load LOX and COPVs
T-40 MIN	Disconnect GSE
T-20 MIN	Takeoff readiness poll
T-0 MIN / D-50 MIN	Takeoff
D-20 MIN	Cold pass through drop point
D-16 MIN	Initiate terminal count autosequence
D-1 MIN	Rocket in drop ready mode
D+0 MIN	Pull up maneuver, drop rocket
D+3 SEC	PST Ignition
D+5 SEC	N3 Main Engine Start (MES)
D+2 MIN 54 SEC	Throttle down
D+2 MIN 59 SEC	N3 Main Engine Cutoff (MECO)
D+3 MIN 2 SEC	Stage Separation
D+3 MIN 6 SEC	N4 Second Engine Start (SES-1)
D+3 MIN 26 SEC	Fairing separation
D+9 MIN 13 SEC	N4 Second Engine Cutoff 1 (SECO-1)
D+9 MIN 17 SEC	BBQ Roll
D+30 MIN 24 SEC	Orient for Second Engine Start 2
D+31 MIN 26 SEC	N4 Second Engine Start (SES-2)
D+31 MIN 41 SEC	N4 Second Engine Cutoff 2 (SECO-2)
D+32 MIN 2 SEC	Payload deployment

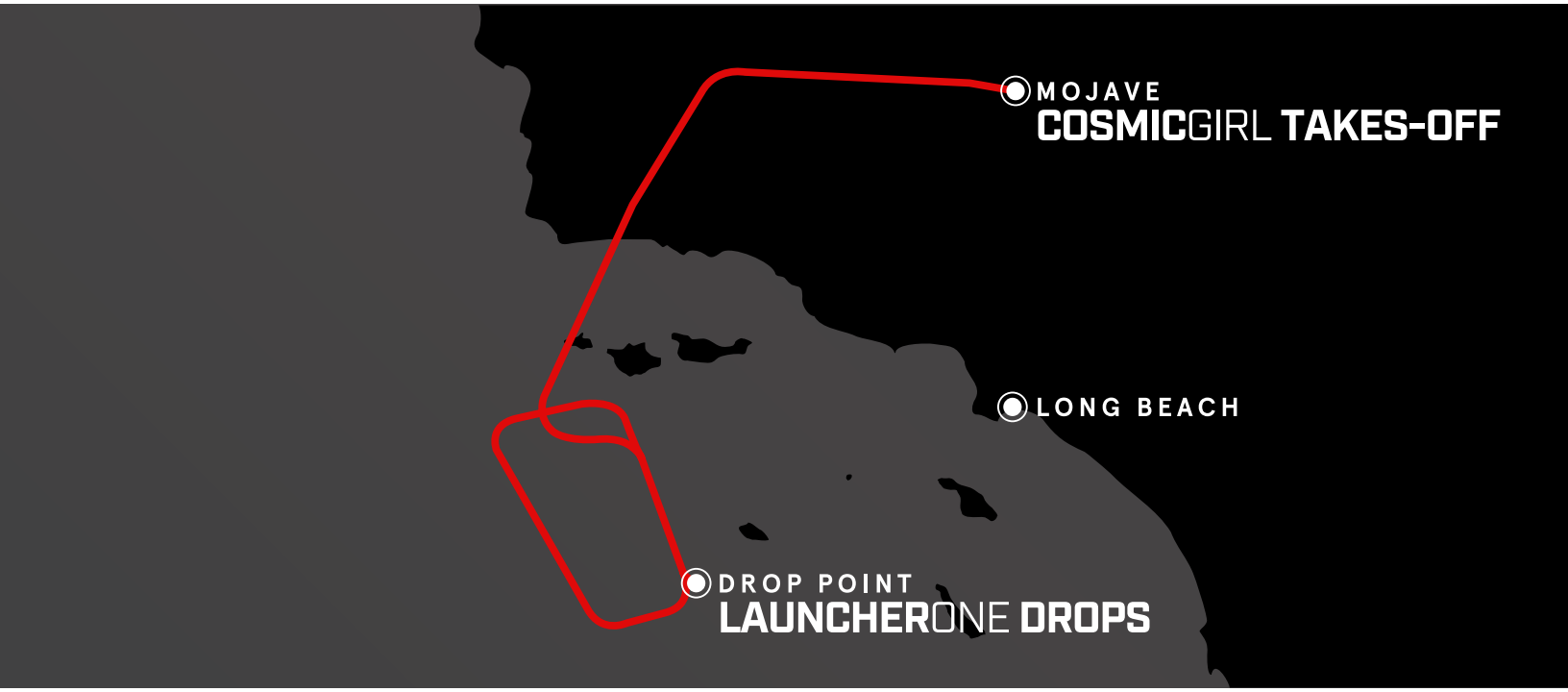
T = TAKEOFF D = DROP

LAUNCH SITE

A two-hour drive north of Virgin Orbit's manufacturing facility in Long Beach, California, the Mojave Air and Space Port is a hub of flight testing, space industry activity, and aircraft maintenance and storage. With a deep history in aerospace, it is the first facility to be licensed in the United States for horizontal spacecraft launches, certified by the Federal Aviation Administration (FAA) in 2004.

Mojave is an ideal location for Virgin Orbit's early flight operations, as it is readily accessible to staff in Long Beach, as well as our 50 or so teammates based at our rocket engine test site nearby. Additionally, the launch site provides easy access to high inclination orbits such as polar or sun-synchronous orbits, common for weather and Earth observation satellites.

Even as Virgin Orbit brings multiple other launch sites online, we expect the Mojave Air and Space Port to remain an attractive option for customers who are most interested in high inclination orbits.



HOW TO STAY IN THE LOOP

This orbital test flight will not be publicly livestreamed. For real-time updates as the mission progresses, follow us on Twitter (@Virgin_Orbit).

Due to the "Shelter in Place" mandates that remain in effect, we will not be able to accommodate any guests on-site. However, we will be collecting high-quality photos and B-roll throughout the day, which you can download shortly after the flight here: Digital News Agency. Please note you will need to register to access the materials. Assets will also be available on our company website.

OUR PEOPLE

Richard Branson
Founder, adventure, serial entrepreneur

Dan Hart
Virgin Orbit President and CEO

Mandy Vaughn
VOX Space President

Kelly Latimer
Chief Test Pilot

Todd Ericson
Co-Pilot

WHO YOU GONNA CALL?

For more information or to set up media interviews, please reach out to Kendall Russell or Will Pomerantz.

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ABOUT VIRGIN ORBIT

Founded by entrepreneur Sir Richard Branson, Virgin Orbit is working to bust open the barriers that limit full utilization of space for all of humankind. We'll do this by making space launches more affordable, frequent and inclusive, and by enabling the thriving global community of small satellite makers.

Virgin Orbit provides reliable, responsive and flexible launches for small satellites using LauncherOne—a two-stage, expendable rocket launched from under the wing of a Boeing 747-400 called Cosmic Girl.

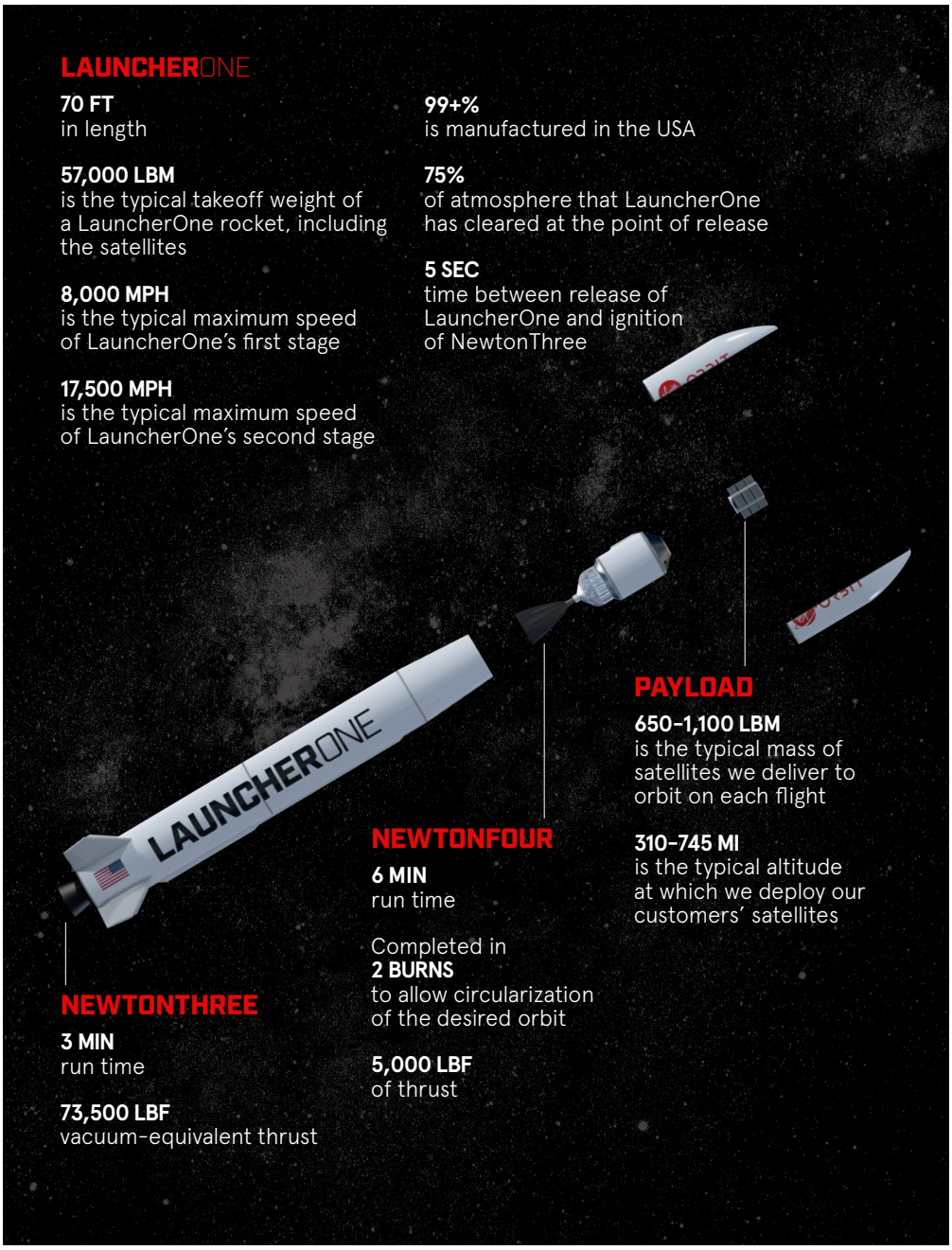
The satellites LauncherOne carries may be as small as a loaf of bread or as large as a home refrigerator, and on any given flight the rocket will ferry 300 kg (660 lb) or more of cargo, which could be one large satellite or dozens of smaller ones.

OUR PURPOSE

The ways that we use space to explore, connect and protect our planet are quickly changing, driven largely by a new wave of satellite technology. NewSpace satellites are growing smaller and less expensive, cracking open an opportunity for more people, governments, and businesses to get involved in the industry than ever before. But even the coolest satellites can't help anyone when they're stuck on the ground.

Large, ground-based rockets have always and still will play a key role, but the market desperately needs more affordable, flexible and responsive pathways to space. That's where LauncherOne comes in. Our goal is to lower the barriers to entry preventing easy access to orbit, and satisfy the ever-increasing demand for dedicated small satellite launch services.

OUR ROCKET



OUR CUSTOMERS

Our customer base is thriving and diverse. As we seek to make space for everyone, we're thrilled to see that our customers range from government agencies and traditional space companies to hot Silicon Valley start-ups to university spin-offs. They are each taking on missions that are both economically and socially meaningful, ranging from bringing internet to underserved regions to monitoring the health of our planet to advancing the state of fundamental space research to helping air traffic controllers.

Currently, our customers include NASA, SITAEL, GomSpace, the U.K. Royal Air Force, and (via our subsidiary VOX Space) the US Air Force.

JOURNEY SO FAR

Sir Richard publicly unveiled our plans to build a small satellite launcher at the 2012 Farnborough Air Show — but we didn't crystallize the current LauncherOne design until early 2015, locking in a system that was the right size and cost for the evolving smallsat community. In 2017, we formally established ourselves as a standalone company within the Virgin Group to focus exclusively on developing small launch capabilities.

The Virgin Orbit team entered 2019 with a brilliant team and a lot of cool technology — but there were some really big milestones we still had yet to cross. We hadn't qualified an engine for flight. We hadn't yet fired our main stage for full duration. We had mountains of simulations for how to fly Cosmic Girl to best deploy LauncherOne, but we hadn't actually taken off with a fully loaded rocket strapped to its wing.

As of early 2020, we've done all of that and so, so much more. We aced a series of progressively challenging test flights, culminating in a hugely successful drop test over Edwards Air Force Base. We've completed hundreds of hotfires on our main stage and upper stage engines. We've had moments of utmost triumph after picture-perfect tests — and, as comes with the territory, we've had days where Murphy's law taught us a few new lessons.

In recent months, our team has run through many simulated missions at our Mojave test site. We've pushed the system to find leaks, and pushed the team to find ways to be safer, smoother, and more effective. With each repetition, our team has become more synced and our processes have gotten faster and more reliable.

For years, everything's been building: our team, our market, our technical expertise, and our enthusiasm. Now, we're ready to light this candle and demonstrate LauncherOne's full capabilities.

WHAT'S NEXT?

Historically, there's about a year-long wait between the first and second flights of new launch systems. Our team intends to move with much more gusto — the small satellite community has already waited long enough for regular rides to space!

In fact, Virgin Orbit's second orbital rocket is currently undergoing final integration on the shop floor of our Long Beach facility. And we've already started building and assembling the components for rockets out to our sixth mission. We planned for the long-term from the very beginning, establishing a manufacturing facility that could ramp up to supporting production of more than 20 rockets per year. We're elated to see that assembly line beginning to take shape.

On the heels of a successful launch demonstration, Virgin Orbit will quickly pivot to commercial operations. Our first customer launch will be for NASA's Venture Class Launch Services (VCLS) program, a collaboration between NASA and several launch providers to provide small satellites access to Low Earth Orbit. Nearly all of the payloads that will fly on that mission — dubbed "ELaNa XX" — will be built and operated by universities from states across the U.S.

GLOSSARY

- **COPV:** Composite overwrapped pressure vessel — small tanks on LauncherOne which provide the pressure that pumps propellants throughout the vehicle
- **Cosmic Girl:** Virgin Orbit's 747-400 carrier aircraft, procured from the fleet of Virgin Atlantic
- **GSE:** Ground support equipment — the set of mobile trailers we use for ground operations before takeoff, including propellant loading
- **Hammerhead:** the staging area on the runway where Virgin Orbit set up our mobile ground support equipment
- **Low Earth Orbit (LEO):** the region between 400 and 1,000 miles above Earth
- **LOX:** liquid oxygen, which we use as the oxidizer for LauncherOne
- **Payload:** what is being sent into orbit, generally a satellite
- **Pylon:** the structural mechanism that hooks LauncherOne to Cosmic Girl's wing
- **RP-1:** Rocket Propellant-1 —a highly reformed form of kerosene which we use as the fuel for LauncherOne
- **Small satellites:** satellites of low mass and size, usually less than 1,100 lb
- **VOX Space:** VOX Space, LLC, is Virgin Orbit's wholly-owned subsidiary, which provides the national security community of the US and allied nations with responsive, dedicated and affordable launch services for small satellites bound for Low Earth Orbit.

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