ROCKET LAB USA 2019

DARPA R3D2 PRESS KIT MARCH 2019

ROCKET·LAB

ROCKET LAB PRESS KIT
'DARPA R3D2' 2019

LAUNCH INFORMATION

LAUNCH WINDOW:
17 - 30 MARCH, 2019 NZDT
(16 - 29 MARCH, 2019 UTC)

DAILY LAUNCH TIMING
11:30 – 15:30 NZDT / 22:30 – 02:30 UTC
(4 HOUR DAILY WINDOW)

Watch the live launch webcast: www.rocketlabusa.com/live-stream.

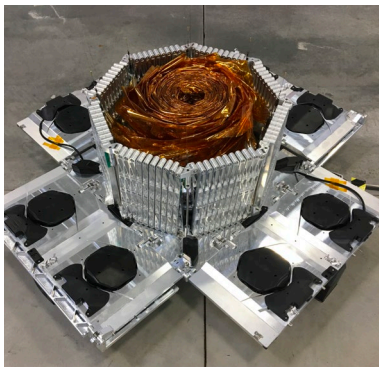
For information on launch day, visit www.rocketlabusa.com/launchinfo/launch-complex-1 and follow Rocket Lab on Twitter @RocketLab.

'ELANA-19' MISSION LIFTS OFF FROM ROCKET LAB LC-1 | December 2018

DARPA R3D2 PAYLOAD

The DARPA R3D2 mission is Rocket Lab's fourth orbital mission and the company's first launch in 2019.

The R3D2 (Radio Frequency Risk Reduction Deployment Demonstration) mission intends to space-qualify a prototype reflect array antenna to improve radio communications in small spacecraft. The R3D2 antenna, made of a tissue-thin Kapton membrane, packs tightly inside the small satellite for stowage during launch, before deploying to its full size of 2.25 meters in diameter once it reaches low Earth orbit. By compacting a large antenna into a small satellite, the spacecraft can provide significant capability, negating the need for satellite owners to build large satellites that can only be launched as a ride-share payload on big rockets with significant price tags and lengthy delays.



DARPA R3D2 | January 2019

MISSION OVERVIEW

The 150kg R3D2 satellite will lift-off on board an Electron rocket from Launch Complex 1 on New Zealand's Māhia Peninsula. R3D2 will be deployed to a 425kmx425km orbit at 39.5 degrees by Electron's Kick Stage, a nimble upper stage designed to insert payloads with precise accuracy.

ROLL OUT IN PREPARATION FOR R3D2 MISSION AT LC-1 | February 2019

ELECTRON R3D2 SUCCESSFUL WET DRESS REHERSAL | February 2019

ABOUT DARPA

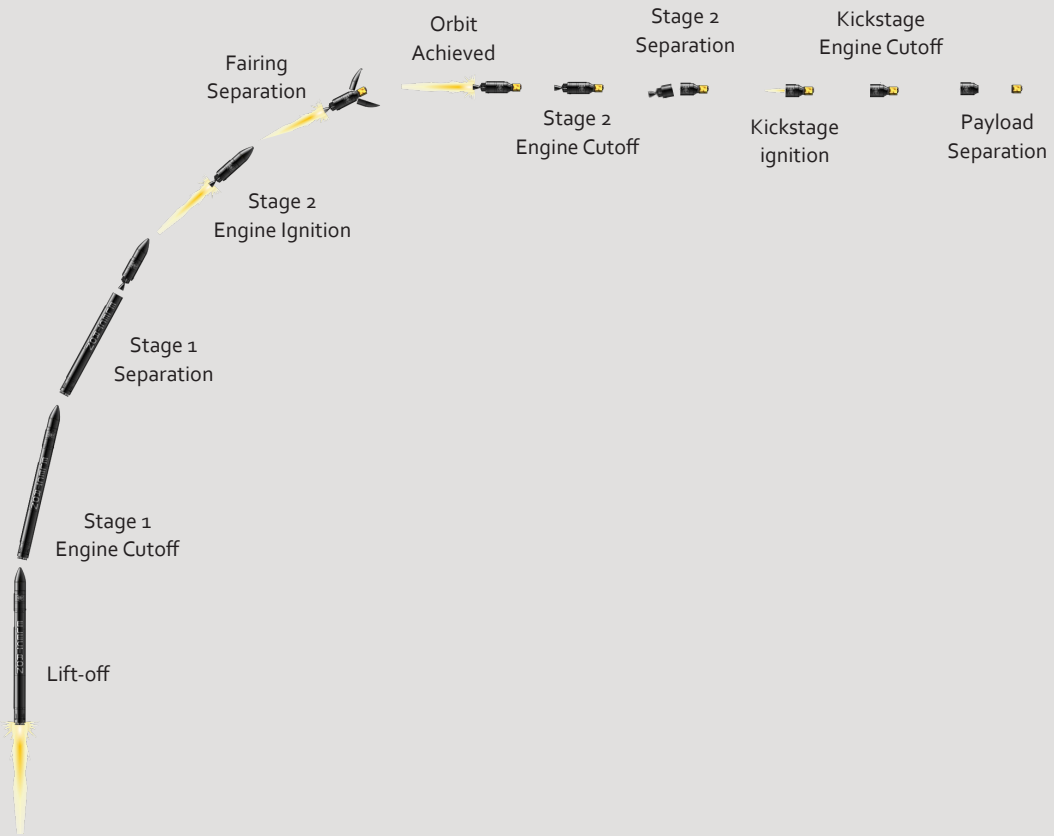
DARPA (Defense Advanced Research Projects Agency) is a US Government organisation and an innovation icon. DARPA has created many breakthrough technologies that have had sweeping societal and economic impacts, including portable GPS receivers, new types of computer chips, voice-recognition software, interactive and personal computers, and, most famously, the ARPANET and its successor, the internet. Current DARPA research also may have dramatic future impacts, including self-driving vehicles, robots and exoskeletons, and cognitive computing - computers that emulate brain-like processing.

ELECTRON FAIRING FOR DARPA 'R3D2' MISSION | January 2019

SUCCESSFUL STAGE ONE STACK TEST FOR 'R3D2' MISSION | January 2019

TIMELINE OF EVENTS

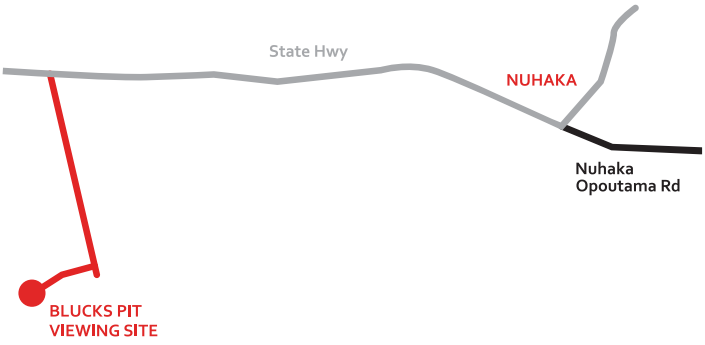
HOURS:MINUTES:SECONDS FROM LIFT-OFF	EVENT
	The team move the rocket from the hangar to the launch pad and assess weather conditions up to lift-off
-06:00:00	Road to the launch site closed
-04:00:00	Electron lifted to vertical position and filled with fuel
-02:30:00	Launch pad personnel exit area in preparation for launch
-02:00:00	Electron filled with liquid oxygen (LOx)
-01:00:00	Safety zones are activated for marine and air space
-00:18:00	The Launch Director conducts a go/no-go poll of launch operators to confirm Electron is ready for launch
-00:02:00	Autosequence commences and Electron's on-board computers initiate the launch sequence
-00:00:02	Ignition of the nine Rutherford engines powering Electron's first stage
00:00:00	Lift-off – Electron climbs from the launch pad – initially rising slowly and increasing in speed as the Electron gets lighter
+00:02:34	Main engines (Stage 1) cut off
+00:02:37	Stage 1 of Electron separates
+00:02:41	The vacuum Rutherford engine on Stage 2 ignites
+00:03:06	Electron's fairing separates
+00:08:50	Electron reaches orbit
+00:08:53	Stage 2 engine cuts off
+00:08:57	Stage 2 of Electron separates
+00:49:52	Kick Stage ignites
+00:51:45	Curie engine powering Kick Stage cuts off
+00:53:15	Payload separates from launch vehicle



VIEWING A LAUNCH

VIEWING IN PERSON

Wairoa District Council has allocated a rocket launch viewing area for the public near Nuhaka, accessible via Blucks Pit Road. Visit www.visitwairoa.co.nz/welcome-to-wairoa/space-coast-new-zealand/ for more information. Scrubs and postponements are likely during launch windows, so visitors to the Blucks Pit viewing site should anticipate multiple postponements, sometimes across several days.



LC-1 LAUNCH VIEWING AREA | Blucks Pit Road, near Nuhaka

LAUNCH VIEWING AREAS DISTANCE FROM ROCKET LAB LC-1

As Rocket Lab's top priority during the test launch is public safety, there are safety zones in place during a launch and no access will be permitted to Onenui Station where Launch Complex 1 is located.

LIVESTREAM

The best way to view a launch is via Rocket Lab's live video webcast. This offers the best views of launch and includes helpful commentary about the launch process. A livestream will be made available approximately 15 - 20 minutes prior to a launch attempt. Rocket Lab will post links to the web cast when live via Facebook and Twitter. The livestream is viewable at www.rocketlabusa.com/live-stream and Rocket Lab's YouTube channel.

ROCKET LAB'S LIVESTREAM OF 'ELANA-19' MISSION | December, 2018

LAUNCH FOOTAGE AND IMAGES

Images and video footage of the DARPA R3D2 launch will be available shortly after a successful mission at www.rocketlabusa.com/news/updates/link-to-rocket-lab-imagery-and-video

Images and footage of previous Rocket Lab launches can also be found at that link.

SOCIAL MEDIA

For real time updates on the launch follow the Rocket Lab Twitter page @RocketLab

@RocketLabUSA @RocketLab

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ABOUT ROCKET LAB

We open access to space to improve life on Earth

The wait is over. Frequent and reliable launch for small satellites is here with the Electron launch vehicle. With three orbital missions and 24 satellites launched to orbit in 2018 alone, Electron is the world's only operational private launch vehicle dedicated to small satellites. We're connecting the ideas of the future to space, and we're doing it now.

We are in an exciting new era of small satellite technology - one that's making life on Earth better. Small satellites keep us connected, provide security, help us monitor resources and environmental change, and they enable us to explore new and exciting science that benefits us all.

We believe getting these satellites to space should be simple, seamless and tailored to each mission - from idea to orbit.

Since the Electron launch vehicle was first conceived in 2013, every detail of the Rocket Lab launch experience has been designed to provide small satellites with rapid, reliable, and affordable access to space. Innovation is at the core of the Electron launch vehicle, just as it's at the core of the revolutionary small satellites we're launching to orbit. We've designed Electron to be built and launched with unprecedented frequency, while providing the smoothest ride and most precise deployment to orbit.

Led by founder and Chief Executive Peter Beck, Rocket Lab has grown to a global team of more than 400 highly-skilled engineers and technicians. Rocket Lab is a privately funded company. Investors include Khosla Ventures, DCVC (Data Collective), Bessemer Venture Partners, Future Fund, Greenspring Associates, ACC, K1W1, Promus Ventures and Lockheed Martin.

ELECTRON AT ROCKET LAB LAUNCH COMPLEX 1 | Māhia Peninsula, 2017

ABOUT LAUNCH COMPLEX-1

Electron is launched from Rocket Lab Launch Complex 1, the world's only private orbital launch range. Located in Māhia, New Zealand, and licensed to launch up to 120 times per year, Rocket Lab can accommodate an unprecedented launch cadence and reach orbital inclinations from sun-synchronous through to 39 degrees from a single site. Rocket Lab is also developing a second launch site to provide unmatched schedule and launch location freedom. Launch Complex 2 is being built at the Mid-Atlantic Regional Spaceport in Wallops Flight Facility, Virginia, USA.

ROCKET LAB MISSION CONTROL | October, 2018

ELECTRON'S RUTHERFORD ENGINES DURING LIFT OFF OF THE ELANA-19 MISSION | December, 2018 | Image credit: Brady Kenniston

ABOUT RUTHERFORD ENGINE

Rutherford is a state of the art oxygen and kerosene pump fed engine specifically designed from scratch for Electron, using an entirely new propulsion cycle. A unique feature of Rutherford is the high-performance electric propellant pumps which reduce mass and replace hardware with software.

Rutherford is the first engine of its kind to use 3D printing for all primary components. These features are world firsts for a high-performance liquid rocket engine with propellants that are fed by electric turbopumps. The production-focused design allows Electron launch vehicles to be built and satellites launched at an unprecedented frequency.

RUTHERFORD ENGINE TEST | 2016

RUTHERFORD IS A STATE OF THE ART OXYGEN AND KEROSENE PUMP FED ENGINE SPECIFICALLY DESIGNED FROM SCRATCH FOR ELECTRON, USING AN ENTIRELY NEW PROPULSION CYCLE.

ELECTRON

NOMINAL PAYLOAD
150KG

STAGES
2

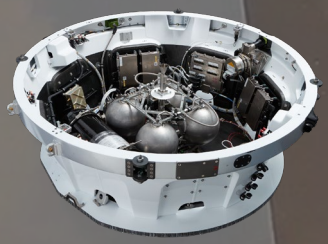
HEIGHT
18M

NOMINAL SUN-SYNC. ORBIT
500KM

DIAMETER
1.2M

DEDICATED
Electron can deliver your payload when and where required.

RIDESHARE
Fly with other payloads at commercially competitive prices.



OPTIONAL KICK STAGE
Rocket Lab's Kick Stage can execute multiple burns to place numerous payloads into different, circularized orbits. It opens up significantly more orbital options, particularly for rideshare customers that have traditionally been limited to the primary payload's designated orbit. Powered by Rocket Lab's 3D printed Curie engine, the Kick Stage is capable of 120N of thrust and multiple burns.

THE ROCKET LAB KICK STAGE

RESPONSIBLE ORBITAL DEPLOYMENT

As the small satellite industry experiences rapid growth, we're determined to be part of the solution for sustainability and the reduction of orbital debris in space. Traditional methods of deploying satellites can leave large rocket stages in orbit, contributing to the global issue of space junk. We know there's a better way.

The Rocket Lab Kick Stage is designed to deliver small satellites to precise orbits, before deorbiting itself to leave no part of the rocket in space.

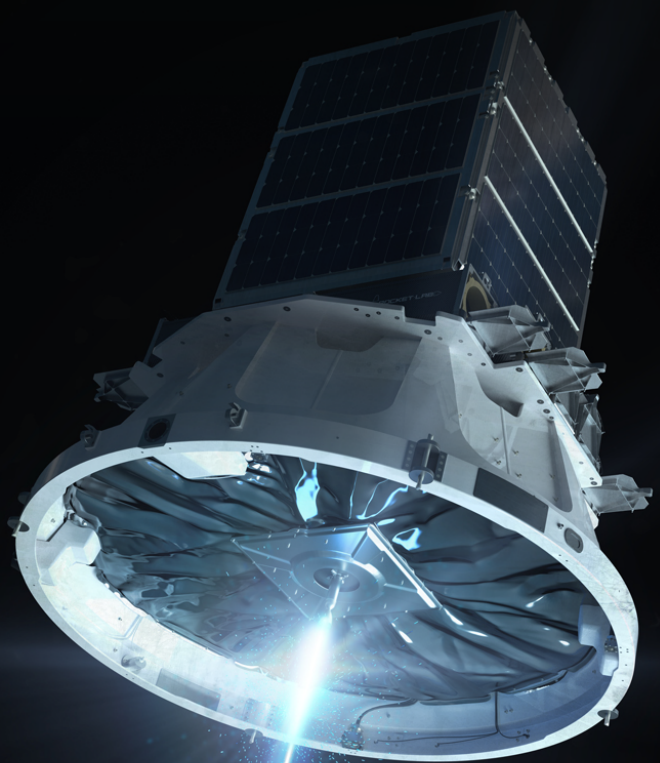
Powered by the Curie engine, named after physicist and chemist Marie Curie, the Kick Stage is a nimble but powerful extra stage on Electron designed to circularize payload orbits. It employs a cold gas reaction control system to precisely point itself and deploy satellites to independent yet highly precise orbits, and also eliminate the risk of recontact with other spacecraft during deployment.

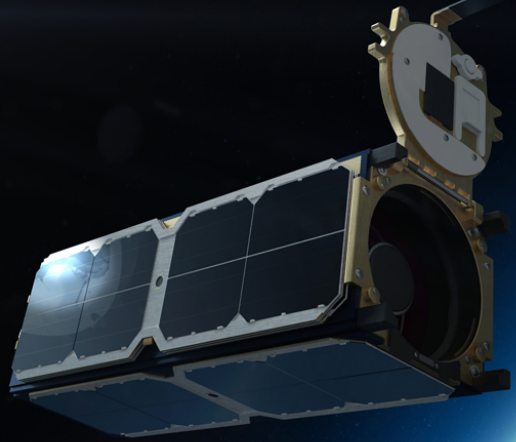
After all payloads are deployed, the Kick Stage can reorient itself and reignite the Curie engine one last time to perform a deorbit maneuver. This drastically lowers the Kick Stage's orbit, enabling it to re-enter the atmosphere and burn up without a trace.

'ELANA-19' PAYLOAD INTEGRATION ONTO THE KICK STAGE | 2018

DESIGNED TO LEAVE NOTHING IN ORBIT BUT OUR CUSTOMERS' SATELLITES - THE WAY IT SHOULD BE.

PAYLOADS ON THE KICK STAGE FOR THE 'ITS BUSINESS TIME' MISSION | Space, 2018





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