



Te Matataua

The Scouting Party of Air Power

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Future Uses and Benefits of New Zealand Space Power

New Zealand's unique location and conditions make it an attractive choice for an increasing amount of space activity¹

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With the formation of the New Zealand Space Agency in 2016, and Rocket Lab NZ² now on the cusp of launching payloads into space, New Zealand has officially entered into the realm of delivering space effects and its space power is something that is only going to grow stronger over the coming years. Space Power is defined as "The total strength of a nation's capabilities to conduct and influence activities to, in, through, and from space to achieve its objectives."³ As a party to the Outer Space Treaty⁴ (1967) New Zealand bears responsibility for national space activities and for upholding space law.

New Zealand's emerging space power has opened up a whole new frontier of the commercial space industry, benefiting not only the scientific and technical communities but other industries as well, such as agriculture and meteorology. Rocket Lab is aiming to provide affordable opportunities for commercial organisations to access space. To accomplish this they have developed the Electron rocket, which has required development of

advanced technologies, such as carbon-fibre composites, modern avionics and software, and a new bespoke propulsion system utilising advances in 3D printing / additive manufacturing. This has been achieved through investment from a number of New Zealand companies, including Data Collective, Promus Ventures and K1W1.



A CubeSat (www.cubesat.org)

Currently the only worthwhile payloads that can be launched into space from New Zealand are small satellites known as CubeSats, but how will these CubeSats advance New Zealand's space power capabilities, and how will this benefit New

Zealand businesses, government agencies, and the New Zealand Defence Force?

Science and Technology. CubeSats can be used to focus on technology demonstrations that allow industries to refine materials and processes. The Centre for Space Science Technology⁵ (CSST) is a New Zealand organisation that is committed to helping New Zealand industry access space, and provide specific solutions to meet industry needs. As part of that mission CSST is establishing New Zealand's first satellite program, primarily using

CubeSats that will help high-tech industries to develop new technologies and applications such as avionics, software and tele-communications, and sensors to assist agriculture.

Meteorology. Satellites have been integral in monitoring the weather and climate around the world since the first weather satellite, Vanguard 2, was launched in 1959 to measure cloud cover and resistance. Since then, they have evolved to include monitoring of pollution, auroras, dust storms and snow cover.

Spire⁶ is a multinational data analytics company and has developed a number of CubeSats that are equipped with GPS radio occultation receivers to monitor atmospheric pressure and temperature, which can be used to improve weather forecasts.

Spire is planning on launching two of its Lemur CubeSats on Rocket Lab's Electron rocket for weather mapping. The relatively cheap CubeSats, coupled with on-board open source software, will open up enhanced weather data to businesses that rely on accurate forecasts. In the past this would have been out of their reach.

Agriculture (Agri-Technology). New Zealand is still very much an agrarian society in that a high proportion of our economy is based on producing and maintaining crops and farmland. With satellite imagery from orbital CubeSats, farmers will be able to optimise returns while preserving resources. Further understanding of crop variability and local up-to-date weather data will ensure improved decision making and complementary planting techniques.

The real benefit of using space power is in the ability to integrate it with other emerging technologies. Sensors, crop yield monitors, drones, smart devices and satellite imagery all combine to help farmers improve productivity, efficiency and sustainability.

Oceanography. Since the founding of the New Zealand Oceanographic Institute in 1954 there has been considerable progress in understanding the oceanic environment around New Zealand, however much still remains to be done. With the increasing world population requiring increasing amounts of mineral resources and food supplies, the oceans are going to become more important over

the coming decades. The increasing sophistication of technology is making new techniques available to solve the problems in hand.

The use of satellite remote sensing techniques, concentrating on shelf circulation around New Zealand, will help establish patterns of ocean currents, which can be used to assess tsunami occurrences and their impact on New Zealand. Additionally, the relationships between these currents and driving forces, such as meteorological conditions, can also be more easily evaluated.

National Security & Defence. Satellites have been used for national security and reconnaissance purposes since the early days of space travel with both the United States and Soviet Union developing military satellites designed to take high-resolution photographs of high value targets. Currently John Hopkins University in the US is developing two CubeSats for a range of national security and military operations due to their relatively low cost to build, launch and operate.

Defence White Paper 2016 states that one of the key strategic goals of the NZDF over the coming 25 years shall be the contribution to space security for the protection of our networked infrastructure, and for general national security. The development of CubeSats with reconnaissance and intelligence gathering capabilities, able to be launched from New Zealand soil, means that the ability for the NZDF to achieve this goal is now a viable reality.

Key Points

- New Zealand has entered the realm of delivering space effects and has opened up a new frontier of the commercial space industry.
- This will benefit the scientific and technical communities, agriculture, oceanography, meteorology and defence.
- CubeSats are a relatively cheap form of accessing space and can be launched via Rocket Lab's Electron rocket.

References

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3. www.militarydictionary.org
4. United Nations Office for Outer Space Affairs (UNOOSA) – www.unoosa.org
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APDC Update

The APDC welcomes bulletin contributions from writers.

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