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CUBESATS & NANOSATELLITES - 2024 STATISTICS, FORECAST AND RELIABILITY

Abstract

A record of 396 nanosatellites were launched in 2023. That is 365 CubeSats, 20 PocketQubes, 5 other nanosats and 6 other picosatellites. Planet again led with 72 CubeSats, followed by Swarm (SpaceX) with 24 and Spire with 22 CubeSats. Almost 75% of nanosats flew on Falcon-9 in 2023. Furthermore, 2000 launched CubeSats were surpassed in early 2023. It took close to 4 years to reach the second thousand, compared to almost 16 years for the first thousand. Nanosats Database (www.nanosats.eu) has been tracking CubeSats, pico- and nanosatellites since 2014. There are now over 4000 satellites, including 2522 launched. For comparison, there were 3300 entries in the previous survey 2 years ago. While most commercial constellations are moving to larger satellites, nanosatellites are not going anywhere.

The first part of the manuscript presents the latest nanosatellite and CubeSat launch statistics. Results and trends will be discussed by yearly launch amounts, geographical distribution, form factors, orbits, statuses, organisation types, deployers and launchers. For example, the form factors continue to both get larger and smaller. Upcoming missions will also be plotted based on announced launch years.

In the second part, a new launch forecast for the next 5 years will be created based on scheduled missions and historic trends. This will be an update to the previous quantitative predictions by the author in 2018, 2020 and 2022. Adjacent databases for commercial constellations allow broader insights into the future when compared solely to past launch trends.

Third section introduces CubeSat Educational Levels. The educational depth and impact of satellite projects can be very different based on the mission, in-house developments, troubleshooting, operations activities and numerous other factors. Repeat missions from the same organisations will be also analysed.

The fourth part focuses on reliability. Nanosatellite lifetimes and failure reasons have also been collected when available, but have not yet been published by the author in a systematic qualitative and quantitive way. One question to be answered is whether the failures and dead-on-arrival cases of academic CubeSats have increased? However, not every mission should be compared by the same metrics. A partially operational complicated CubeSat is still likely to push the needle further than a simpler CubeSat with a common mission and many commercial components.