LeoPulse

LEOLABS

Edition 4: January 2023

In 2019, 800 functional satellites were operating in low Earth orbit (LEO), now there are over 6,000. LeoPulse is your guide to this rapidly changing environment — providing crucial data and expert analysis to help uncover the challenges and solutions for today's dynamic space era.

What's up in low Earth orbit? **Insights from 2022**

It took nearly 50 years to add 10,000 cataloged objects to low Earth orbit. It took just 15 to add the next 10,000 — and just one to add ~2,500. This growth in LEO shows no sign of slowing down. To prepare for another dynamic year to come, here's a look at the most significant changes and events that occurred in 2022.

CLUSTERS OF MASSIVE DERELICTS

Many of the largest objects added to the LEO population this year were abandoned rocket bodies. LEO has been littered with defunct rocket bodies since the early days of the Space Age. Unfortunately, they stick around for decades and account for much of the derelict mass in LEO, making them the likely catalyst for future debris-generating events.

~70 **percent of objects in LEO** are space debris, including derelict rocket bodies, non-operational payloads, and debris fragments.

~50 **rocket bodies** were abandoned with an average altitude above 500 km and an average mass over 2000 kg

7 countries are accountable for these rocket bodies

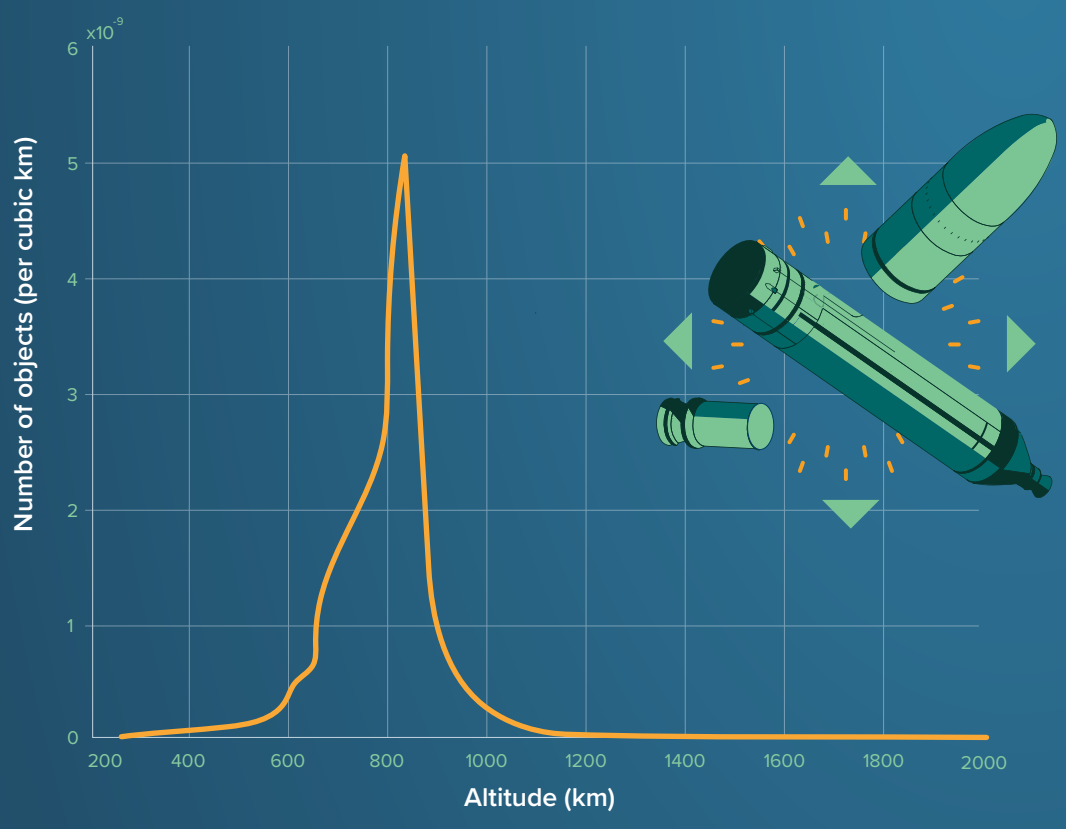
CLOUDS OF FRAGMENTS

In 2022, two notable events contributed to collision hazard from debris clouds: the on-orbit anti-satellite weapons test conducted by Russia in November 2021 and the CZ-6A rocket body explosion in November 2022. This second event occurred in the "bad neighborhood" of 800 km to 900 km. The collision probability from these fragments increased by 9% at the center of the cloud at 830 km.

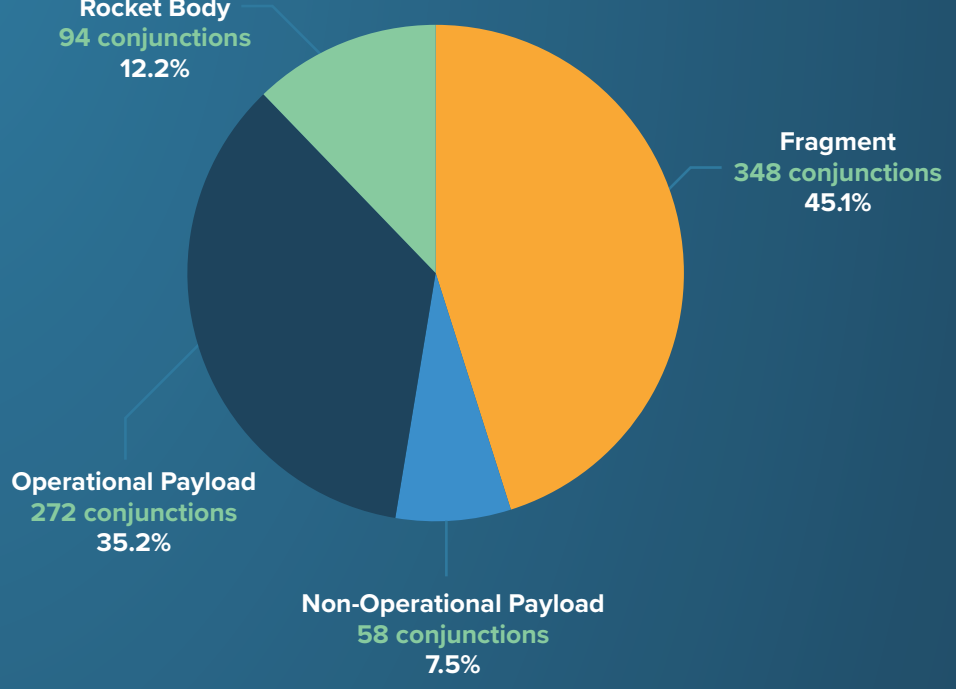
ASAT event resulted in **~1800** cataloged fragments which **decreased to ~400** by December 2022

CZ-6A event resulted in **~475** cataloged fragments as of 1 January 2023, an **increase from ~50** first reported in 2022

Spatial density of the CZ-6A fragments



CZ-6A debris
772 conjunctions between **345** km - **1,441** km



CONSTELLATIONS OF OPERATIONAL PAYLOADS

Several companies experienced double digit constellation growth rates in LEO in 2022. In relation, we observed an increase in Space Traffic Management (STM) conjunctions (i.e., involves at least one operational payload) relative to Space Debris Management (SDM) conjunctions (i.e., involves two derelict objects) this year. This indicates that collision avoidance services and space traffic coordination are becoming increasingly critical.

⊕ ~2,200 payloads in 2022

2x as many STM events as SDM events

- Earlier in the year, proportion was **40% SDM** and **60% STM**
- End of the year, proportion flipped to **80% STM** and **20% SDM**

We're bringing clarity to the dynamic space era. **Join us.**

Reference note: The findings shared in this infographic are derived from the hundreds of thousands of data products LeoLabs' global network of phased array radars collect daily, as well as the analysis and insights pulled together by our team of experts. For specific reference information, please email us.

About LeoLabs: LeoLabs is transforming the way satellite operators, commercial enterprises, and federal agencies across the world launch and track missions in low Earth orbit. Through LeoLabs Vertex™, its exclusive space operations stack, LeoLabs delivers the information superiority needed to succeed in today's space race.

Updated January 2023

For more information, please email us at **contact@leolabs.space**