Sustainability of space activities
- 75m² office space
- 96 m² ISO class 8 cleanrooms
- 96 m² storage room
- 4 ISO class 5 cleanroom cabinets
- 2 Assembly robots
- Calibration setup
- Keyence VHX 3D imaging digital microscope
- TVAC cycling setup
- HALT setup
- Various test and qualification tools and adapters

‘s-Gravedijckseweg 41b
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Unique products

• First analogue fine Sunsensor qualified over -65°C to +105°C

• First analogue Fine Sunsensor with integrated baffle

• First radiation hardened Cubesat Sunsensor
How sustainable are current space activities?

- SSC16
- X
- 2 Utah smallsat

- Expert elicitation (general university-class CubeSat mission, 6 month)
- Expert elicitation (own planned mission)

Density of chance of critical failure on the CubeSat within its mission time [%] (n = 86)
Reliability is an issue

- Reliability of smallsats hasn’t improved according to statistics

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- Commercial constellations are launching hundreds or thousands of satellites with limited reliability

**Figure 5: Reliability of small satellites for different design lifetimes**

- Kaplan-Meier Estimation
- Maximum Likelihood Estimation
- Graphical Method
On average some 1 to 2 satellites per day fall back to Earth and burn up. (https://www.orbitalfocus.uk/Diaries/Launches/Decays.php)

Only satellites in low earth orbit fall back in higher orbit most remain for a very long time.

Spacebee is a demonstration constellation of 0.25U cubesats. Starlink however is a commercial telecom constellation.
Time to market or ROI?

• For commercial terrestrial applications, time to market is quite often one of the most important parameter.
• Question is, does this hold for space applications?
• Return on investment strongly depends on lifetime and quality of service.
• Space debris requirements are most likely going to put more emphasis on reliability
• At some moment in time we all have to worry about the burned up material too.
When quality counts and budgets matter

And sustainability is important

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