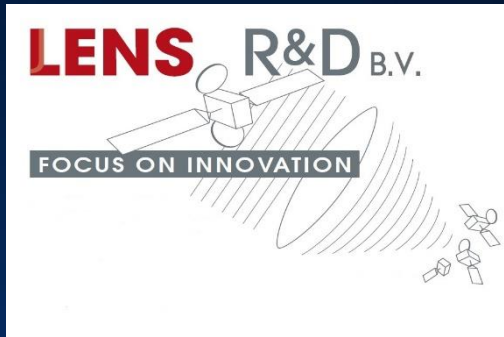


# Sustainability of space activities



's-Gravedijkseweg 41b  
2201CZ Noordwijk



- 75m<sup>2</sup> office space
- 96 m<sup>2</sup> ISO class 8 cleanrooms
- 96 m<sup>2</sup> 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



# Unique products



BiSon64-ET



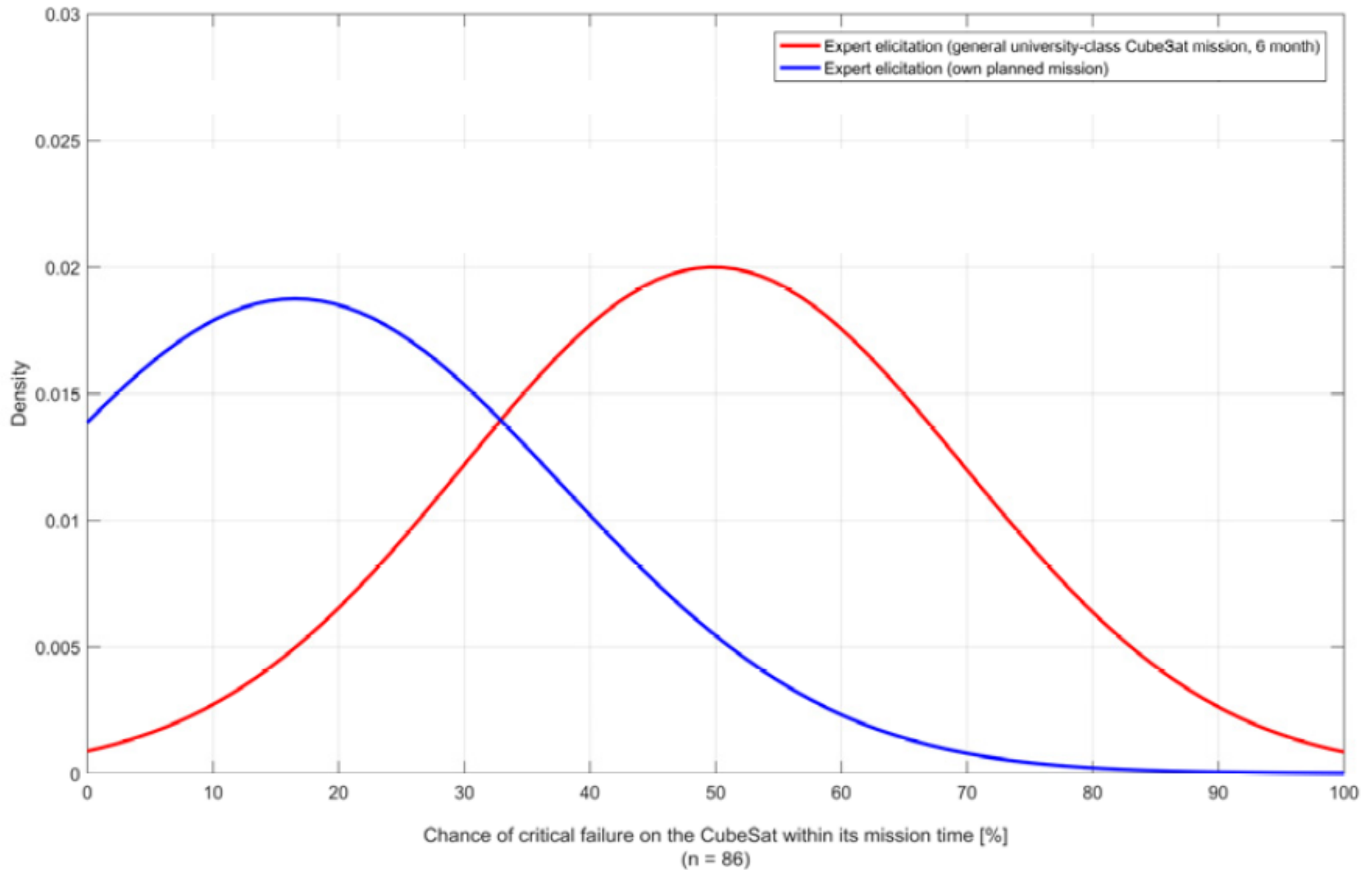
BiSon64-ET-B

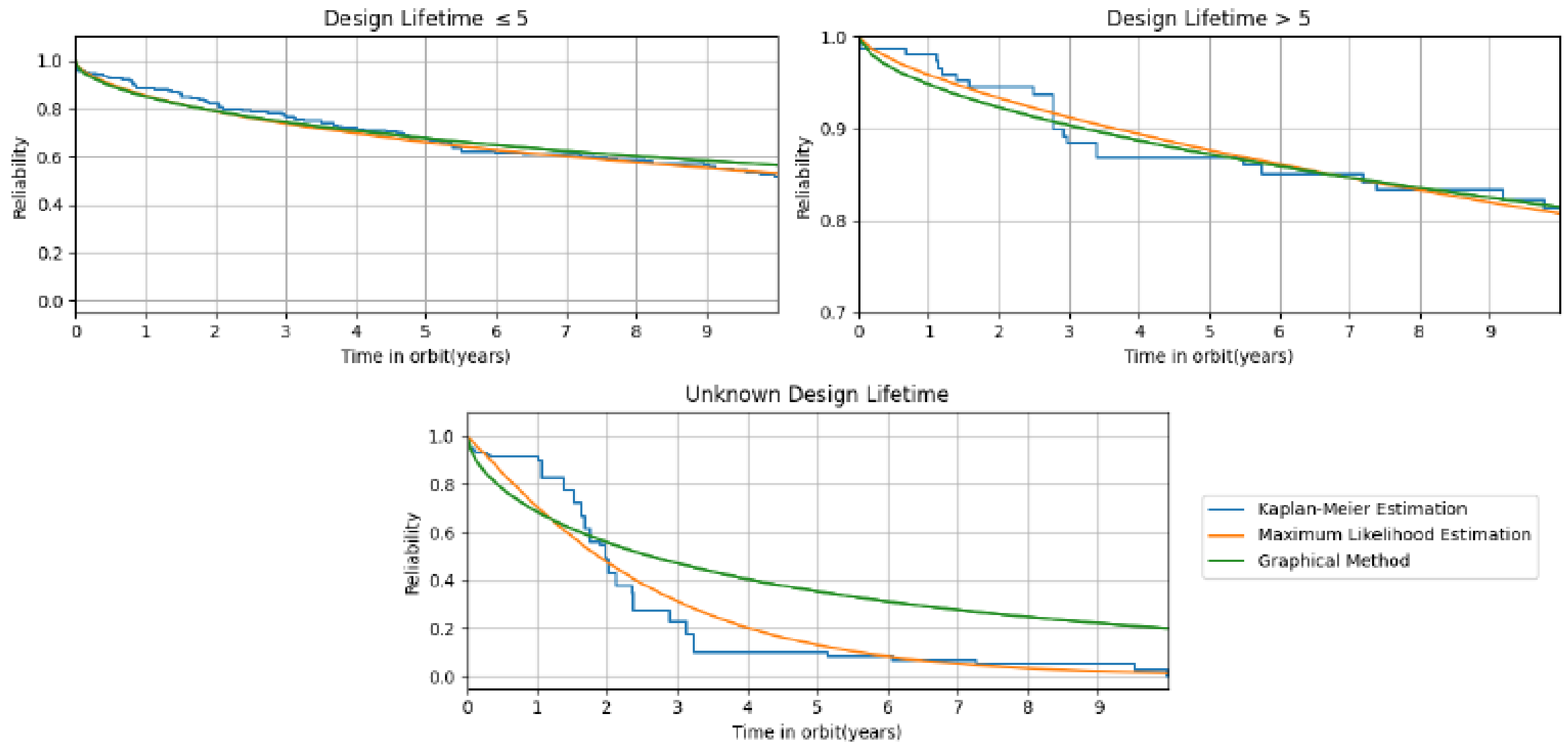


MAUS

- First analogue fine Sunsensor qualified over  $-65^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$
- First analogue Fine Sunsensor with integrated baffle
- First radiation hardened Cubesat Sunsensor







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

# Burn ups

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.

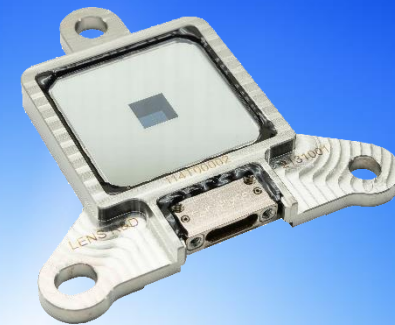
	53791	2022-111U	<b>STARLINK-4736</b>	<b>2022 Nov 20</b>	2022 Oct 27
Ca	53324	2022-089B	<b>SL-4 R/B</b>	<b>2022 Nov 21</b>	2022 Oct 27
46	46945	2020-085S	<b>SPACEBEE-29</b>	<b>2022 Nov 22</b>	2022 Nov 4
54	52351	2022-045W	<b>STARLINK-3816</b>	<b>2022 Nov 22</b>	2022 Nov 4
46	39466	2013-072E	<b>AEROCUBE 5B</b>	<b>2022 Nov 23</b>	2022 Nov 4
30	47711	2021-015N	<b>SPACEBEE-76</b>	<b>2022 Nov 23</b>	2022 Nov 4
45	47714	2021-015Q	<b>SPACEBEE-77</b>	<b>2022 Nov 23</b>	2022 Nov 4
47	46958	2020-085AF	<b>SPACEBEE-39</b>	<b>2022 Nov 24</b>	2022 Nov 4
45	43860	2018-104M	<b>GOERGEN</b>	<b>2022 Nov 25</b>	2022 Nov 4
46	46949	2020-085W	<b>SPACEBEE-30</b>	<b>2022 Nov 26</b>	2022 Nov 4
52	47890	2021-021AG	<b>STARLINK-2350</b>	<b>2022 Nov 27</b>	2022 Oct 27
44	52203	2022-036B	<b>SL-4 R/B</b>	<b>2022 Nov 28</b>	2022 Nov 4
46	46947	2020-085U	<b>SPACEBEE-31</b>	<b>2022 Nov 30</b>	2022 Nov 4
46	47710	2021-015M	<b>SPACEBEE-78</b>	<b>2022 Nov 30</b>	2022 Nov 4
51	53599	2022-104M	<b>STARLINK-4665</b>	<b>2022 Dec 1</b>	2022 Oct 27
38	47712	2021-015P	<b>SPACEBEE-80</b>	<b>2022 Dec 5</b>	2022 Nov 4
46	46946	2020-085T	<b>SPACEBEE-32</b>	<b>2022 Dec 6</b>	2022 Nov 4
45	46763	2020-074AA	<b>STARLINK-1902</b>	<b>2022 Dec 8</b>	2022 Oct 13
53	47715	2021-015R	<b>SPACEBEE-79</b>	<b>2022 Dec 8</b>	2022 Nov 4

# 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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