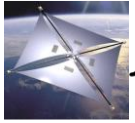



7th IAA Planetary Defense Conference – PDC 2021
April 26th – 30th, 2021, Vienna, Austria

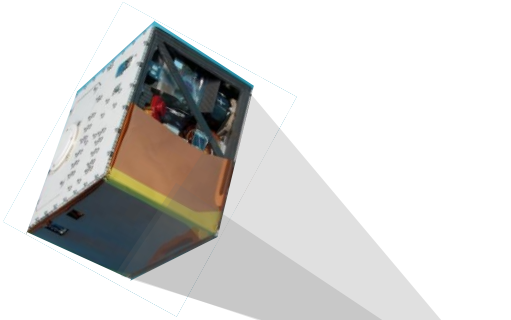
How we beat 2019 PDC to NYC by 2 years, within 2 years, 2 years ago

Matteo Ceriotti[1]*, Patric Seefeldt[2], Lars Kesseler[3], Giulia Viavattene[1], Iain Moore[1], Alessandro Peloni[4], Colin R. McInnes[1], Martin Hillebrandt[5], Martin Zander[5], Jan Thimo Grundmann[2]#

[1]University of Glasgow, Glasgow, Scotland G12 8QQ, United Kingdom – [2]DLR German Aerospace Center, Institute of Space Systems, Robert-Hooke-Strasse 7, 28359 Bremen, Germany – [3]Levity Space Systems, Faculty of Aerospace Engineering, FH Aachen University of Applied Sciences, Aachener-und-Münchener Allee 1, 52074 Aachen, Germany – [4]Consultant to DLR Institute of Space Systems – [5]DLR German Aerospace Center, Institute Composite Structures and Adaptive Systems, 38108 Braunschweig, Germany

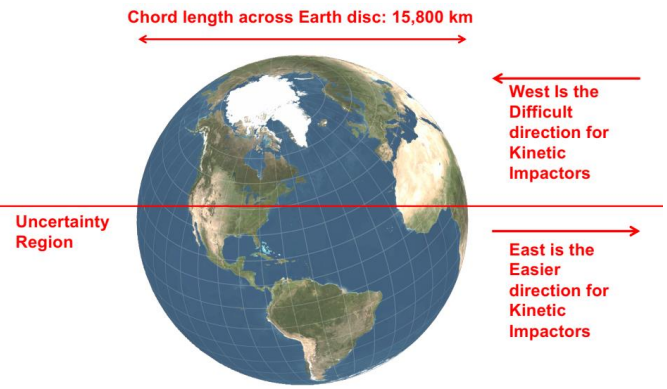
**Matteo.Ceriotti@glasgow.ac.uk – #corresponding coauthor +49-(0)421-24420-1107, jan.grundmann@dlr.de*

IAA-PDC-21-08-YY

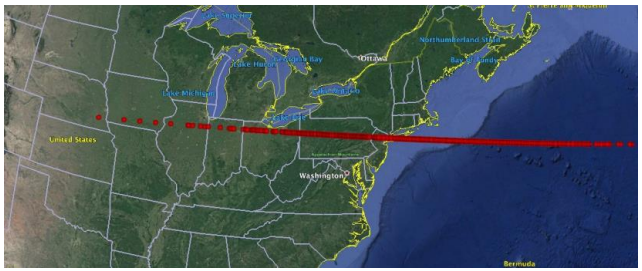


DLR

The PDC 2019 came with its exercise scenario…



- typical PHA headed for Denver
- partially successful deflection
- asteroid fragments
- major fragment bumped eastwards
- out of sight until 10 days before impact
- impact in Central Park, New York City



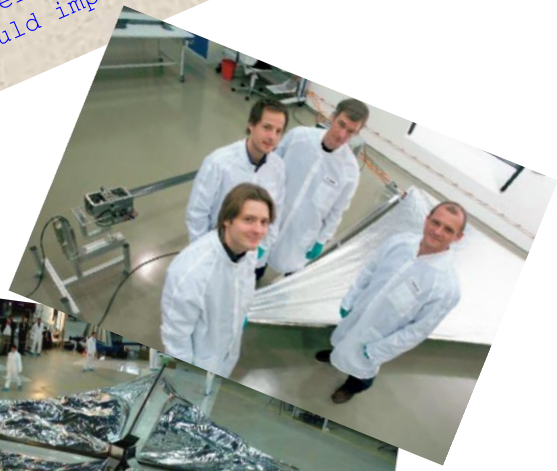
…and we, too.

- new-space start-up
- solar-electric propulsion
- lunar mining precursor

- crowd-built spaceflight
- solar sail
- fly to fly

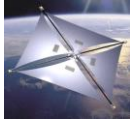
+++ FROM OUR CORRESPONDENT ABROAD, DEC. 24TH, 2019 (CET) +++

The WikiMiti Foundation for Potentially Hazardous Asteroid Mitigation today celebrated the 17-millionth donation to its crowdfunding campaign for a "solar sail" to achieve the first close look at the asteroid known as "2019 PDC" which some astronomers believe could impact Earth in the near future. ...



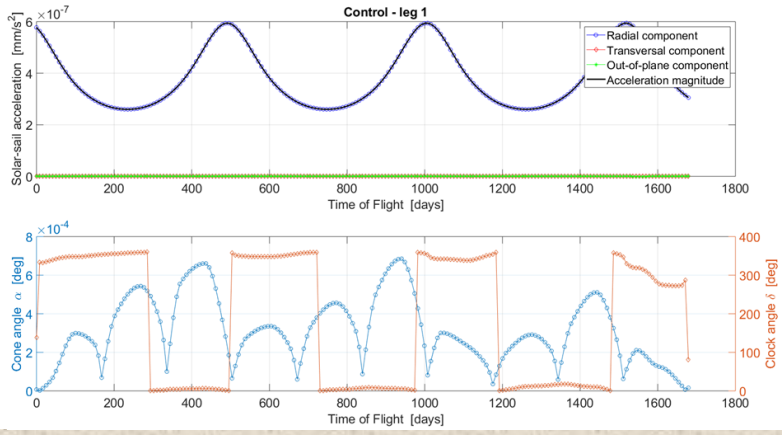
+++ FROM OUR CORRESPONDENT ABROAD, APRIL 29TH, 2019 (UT) +++

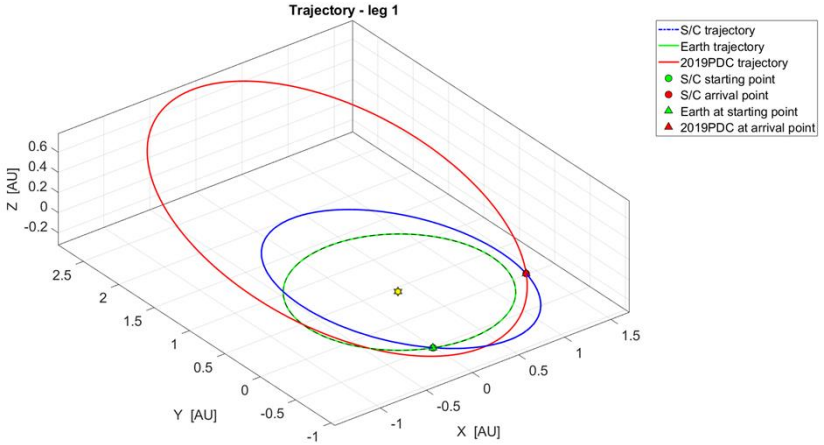
GoLunAr Ltd, an international consortium of small and medium enterprises, semiconductor research and space technology institutes reported today that it raised additional funds to continue and complete the development of a small spacecraft to test new propulsion, solar cell and space structures technologies for future lunar outposts and their commercial supply missions. ...



When the target selects you…
…and you must be kidding

- sail-supported fast fly-by trajectory to fictitious impactor "2019 PDC"
- kick-start launch at $c_3 \approx 56.25$ km²/s² (from our PDC 2017 study)
- 4½ year cruise till intercept





+++ LAUNCH PRESS KIT, MAY 01ST, 2020 (UT) +++

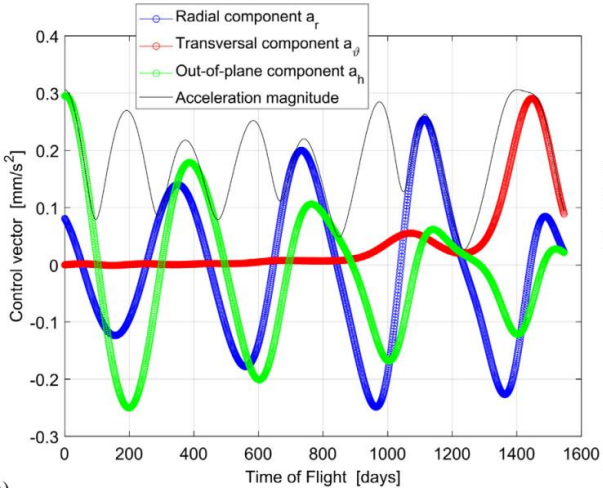
The first test launch of our new and largest launch vehicle will proceed later this month. Instead of launching an instrumented dummy, we accepted the offer by the NEOW0G community to use their recently completed small experimental spacecraft which passed our flight acceptance criteria. It has been equipped with all sensors required to record the launch environment. The deployable cameras on NEOW0G will monitor its membrane experiment in deep space. ...

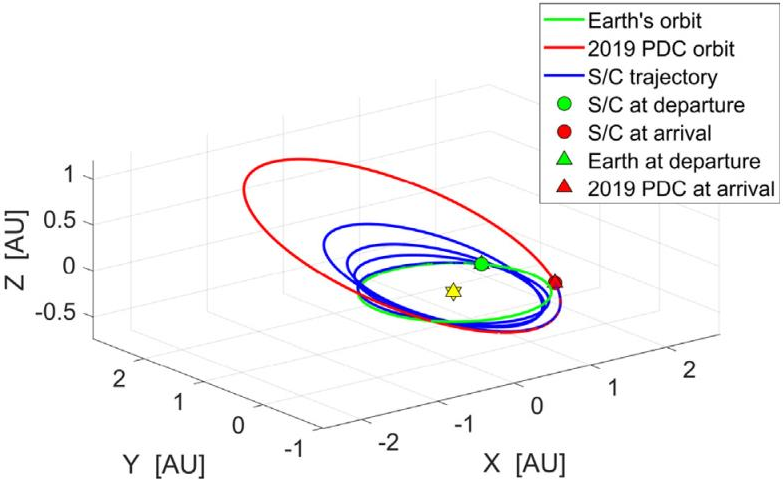
characteristic acceleration a_c	0.1 mm/s²	0.2 mm/s²
launch date	2020-MAY-30	2020-MAY-31
Earth departure velocity, v_∞	≈7.5 km/s	≈7.5 km/s
arrival date	2025-JAN-03	2025-JAN-03
total time of flight	1679 days (4.6 years)	1678 days (4.6 years)
relative distance at arrival	76509 km	4696 km
relative velocity at arrival	10.45 km/s	10.44 km/s
semi-major axis, a	187714562 km (1.25 AU)	187714056 km (1.25 AU)
eccentricity, e	0.2037	0.2038
inclination, i	12°.43	12°.43

Orbital parameters of a 0th/1st generation solar sail fly-by mission at fictitious impactor 2019 PDC

When the target selects you…
…and you quietly slip away

- Low-thrust rendezvous trajectory to fictitious impactor “2019 PDC”
- SEP, 0.3 mm/s²
- 4-year chase





Parameters of a low-thrust rendezvous mission to fictitious impactor “2019 PDC”.

Parameter	Value
Maximum acceleration, a_{max}	0.3 mm/s^2
Departure (launch) date	2020-Oct-27
Earth departure velocity, v_∞	0
Arrival date	2025-Jan-22
Total time of flight	1546 days (4.23 years)
Relative distance at arrival	$<$ 1000 km
Relative velocity at arrival	0
Specific impulse	3000 s (29420 m/s)
Propellant mass ratio	0.342 ($<$0.4)

```
+++ LAUNCH PRESS KIT, OCTOBER 03RD, 2020 (UT) +++
...
13.) Secondary Passenger: GoLunAr
The GoLunAr small spacecraft has been advanced from the originally
manifested launch in February. GoLunAr was completed and
acceptance-tested nearly half a year ahead of schedule. It will be
the last payload separated just prior to upper stage passivation
and safe disposal. GoLunAr Ltd CTO Yvonne Yarborough thanked the
consortium members for their support of responsive space ops: ...
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When the target selects you…

…and you change the game

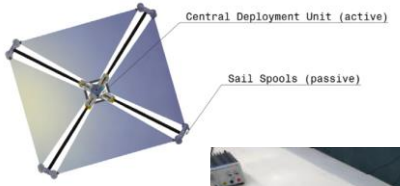
SIDENOTE – THE EXTRA MILE
April 27th, 2027 – Bermuda

While the largest coordinated observation network deployed since the International Geophysical Year of 1957/58 monitored the stupendous obliteration of the empty remains of New York City, a modest telescope and a small antenna pointed into the sky above our island. On time to the millisecond, a pinpoint of light exploded sparkling and faded away forever. The mission of GoLunAr had ended. It was this unlikely spacecraft that, instead of going to the Moon for business, had quietly flown past its original target six years ago, to vanish into deep space for a four year journey to a rendezvous with the object of fear itself. It dropped its Membrane Ageing Studies Concurrent Observation Technology package towards the fragment of 2019 PDC. It transmitted data to predict the burst height of the impact. The low frequency radio link between the two modules enabled precision tracking of the asteroid all the way in ...

+++ JAN.22ND, 2025 +++
U.N. Headquarters, NYC

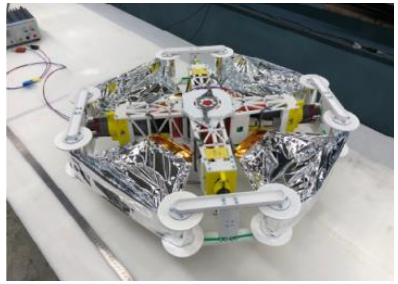
Today, the sobering data returned by the gallant NEOW0G mission were presented. No information had been available for over 100 days on the asteroid headed for Earth. No information would have been available for 2 more years until the asteroid fragments are visible again to the best telescopes. But on January 3rd this year, a tiny and flimsy-looking crowd-funded and crowd-built sailcraft flew by the remains of 2019 PDC in what appears to be a perfectly choreographed sequence of operations. The sail and a small camera ejected by it passed on both sides of the asteroid. The position and speed of the asteroid could be greatly refined. It is headed for impact within the New York City metropolitan area on April 27th, 2027, 12:01:38 EDT. It will release an explosion of 5 to 20 million tons of TNT. Preparations for evacuation can now focus on a much smaller area, and much more of the treasures of art and life of the city can be saved ...

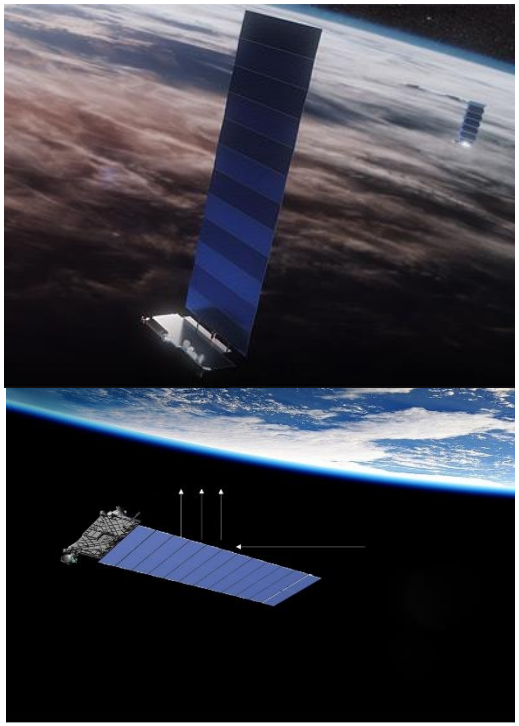
…and we could *do it now!*

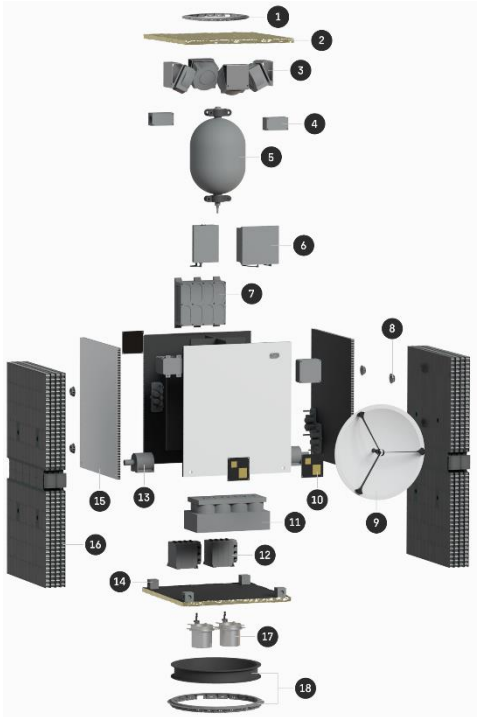


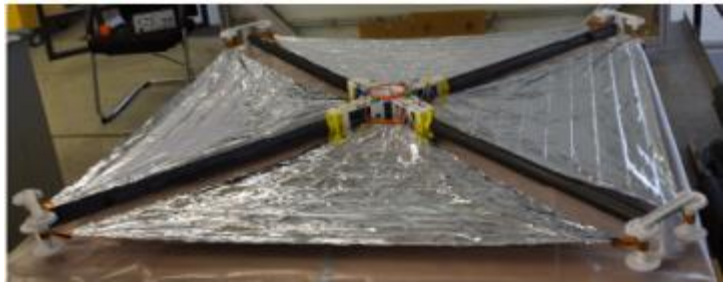
- small spacecraft solar-electric
- lunar payload delivery
- demonstrator mission

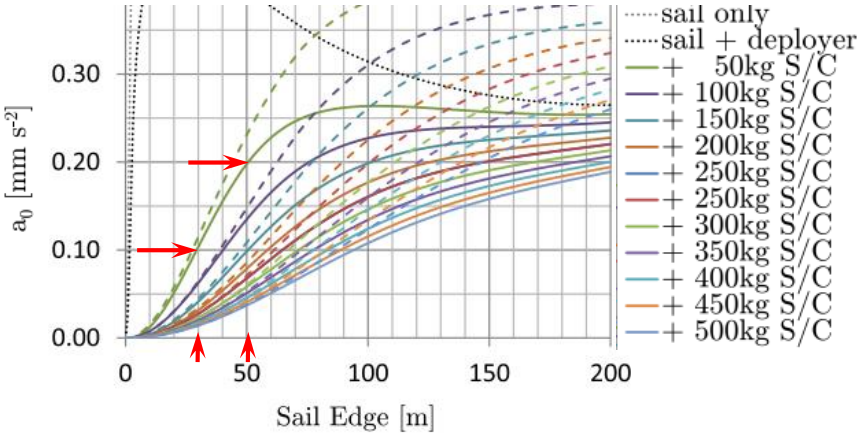
- simplified initial solar sail
- demonstrator mission
- DL_1 space weather



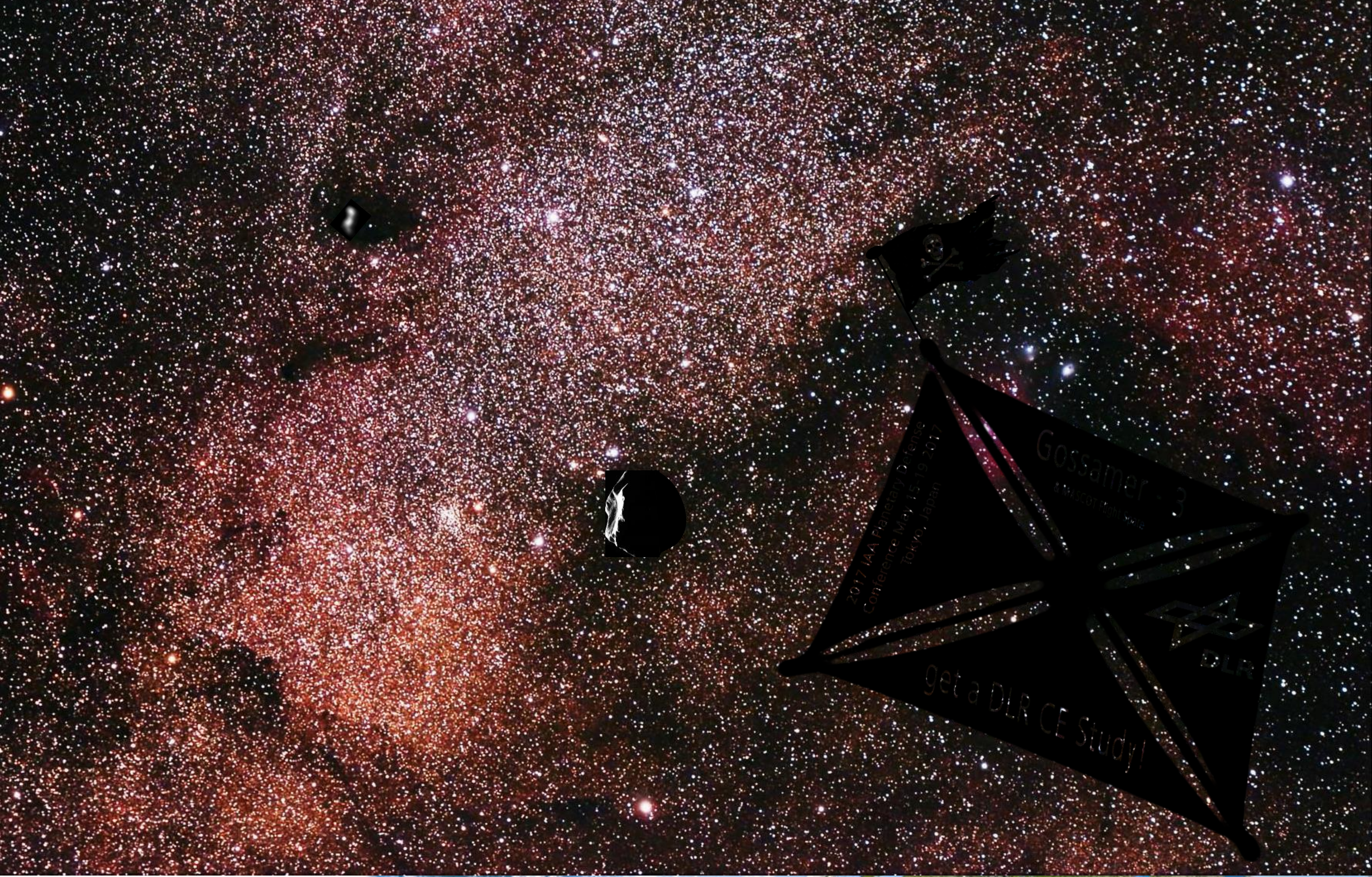








thank you for your attention! – as many questions? as you like, please ! ☺



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- IAA-PDC-21-08-YY – Matteo Ceriotti et al. – How we beat 2019 PDC to NYC by 2 years, within 2 years, 2 years ago *(this one)*
- IAA-PDC-21-08-YY – Thimo Grundmann et al. – More Bucks for the Bang: New Space Solutions, Impact Tourism and one Unique Science & Engineering Opportunity at T-6 Months and Counting

at

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