

## → NEWSLETTER DECEMBER 2021

### ESA's NEO Coordination Centre

#### Current NEO statistics

The usual large number of discoveries during the month of November brought the total count of known NEOs above 27 500.

- Known NEOs: 27 566 asteroids and 117 comets
- NEOs in risk list\*: 1278
- Number of NEOs designated during last month: 377
- NEOs discovered since 1 January 2021: 2874

#### Focus on

In addition to the IAWN campaign on 2019 XS, the month of November gave observers the opportunity to test their techniques on two challenging man-made objects.

On 24 November, the DART mission, NASA's contribution to the AIDA project, launched from California on a Falcon 9 rocket. The spacecraft and its booster became observable shortly after, at a very low solar elongation of just 45°. A challenging observation that was nevertheless successful, revealed two co-moving bodies just an arcminute apart.

A few days later, on 27 November, ESA's own Solar Orbiter spacecraft had a very close gravity assist encounter with the Earth. The object flew-by just 460 km above the Earth's surface, over Morocco, the closest Earth fly-by ever for an inbound spacecraft. Observers in Morocco would have been able to detect the object with the naked eye; however, we are not aware of any successful visual report. On the other hand, multiple observers in the United States were able to observe it telescopically just a few minutes after the closest approach, including about a dozen observers of the Unistellar network. Data from these stations are currently being analysed.

#### Upcoming interesting close approaches

Two numbered objects are having distant fly-bys in December.

- (4660) Nereus will come as close as 10 lunar distances on 11 December. It is a 500-metre object, and will reach magnitude 13 during the fly-by.
- (163899) 2003 SD220 is an even larger 800-metre object, which will pass by at 14 lunar distances six days later, reaching magnitude 14.

#### Recent interesting close approaches

During the month of November more than 200 objects entered our list of close approachers, coming within a distance of 0.05 au of our planet.

- A total of 15 objects came closer than the Moon, with 2021 VH being the closest, reaching just 23 000 km from the surface of the Earth.
- 2019 XS, the target of the IAWN timing campaign, came to within 1.5 lunar distances, and reached magnitude 14, an easy target even for modest apertures.

#### News from the risk list

No new objects entered the top-10 of our risk list this month, but some of the older objects are still there.

- 2021 UH9 and 2021 SU1, two objects that entered the top positions of our risk list last month, are still high-ranked despite some additional follow-up.

\*The risk list of all known objects with a non-zero (although usually very low) impact probability can be found at <https://neo.ssa.esa.int/risk-list>

## In other news

- NASA's DART spacecraft was successfully launched on 24 November.

## Upcoming events

Four events are in the list of relevant international meetings over the next months.

- Apophis T-7 Years: Knowledge Opportunities for the Science of Planetary Defense, 11-13 May 2022, Virtual <https://www.hou.usra.edu/meetings/apophis2022>
- 53<sup>rd</sup> Lunar and Planetary Science Conference, 7-11 March 2022, The Woodlands, Texas, USA <https://www.hou.usra.edu/meetings/lpsc2022>
- Europlanet Science Congress (EPSC) 2022, 18-23 September 2022, Granada, Spain <https://www.europlanet-society.org/epsc>
- 54<sup>th</sup> Annual Meeting of the AAS Division for Planetary Sciences, 2-7 October 2022, London, Canada <https://dps.aas.org/meetings/future>

## Top-10 table of risky objects

The table shows the first ten objects in our risk list of 1 December.

Designator	Size range in m	Date of possible impact	Impact probability	Palermo scale	Torino scale	Impact velocity in km/s
2021 QM1	40–80	2052-04-02 01:36	1 / 3 000	-2.72	0	23.72
2010 RF12	6–13	2095-09-05 23:49	1 / 14	-3.07	0	12.29
1979 XB	500–1200	2056-12-12 21:39	1 / 3 500 000	-3.22	0	27.54
2021 UH9	19–40	2111-12-08 03:00	1 / 400	-3.32	0	13.01
2000 SG344	29–70	2071-09-16 00:57	1 / 1 100	-3.37	0	11.27
2021 GX9	22–50	2032-04-16 21:52	1 / 14 000	-3.54	0	20.17
2008 JL3	23–50	2027-05-01 09:06	1 / 7 000	-3.66	0	14.01
2009 JF1	10–22	2022-05-06 08:13	1 / 4 000	-3.70	0	26.41
2018 JD	12–27	2067-05-08 13:22	1 / 800	-3.82	0	13.76
2011 DU9	12–27	2046-02-23 20:45	1 / 1 400	-3.90	0	14.21

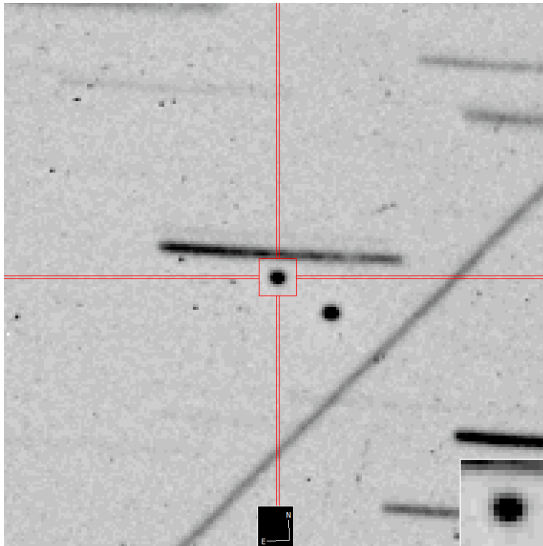


Image of the NASA DART spacecraft (center) and its Falcon 9 booster (lower right of center), obtained combining 48 individual 45 s exposures taken with the 1.5 m telescope of the Observatorio de Sierra Nevada, Spain.

The two objects are roughly 30 arcseconds apart. The nearly-horizontal lines in the image are field stars, appearing trailed because the images are co-added on the exact known motion of the spacecraft. Their slight curvature is indicative of the fact that the spacecraft's motion in the sky is not linear, due to the close distance of the target. The diagonal line is a low-orbiting artificial satellite crossing the frame.

Credit: T. Santana-Ros (ICCUB / IEEC-UB), V. Casanova (Observatorio de Sierra Nevada, IAA-CSIC)

## Links for more information

Website: <https://neo.ssa.esa.int>

Close approaches page: <https://neo.ssa.esa.int/close-approaches>

Risk List: <https://neo.ssa.esa.int/risk-list>

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