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Comet's Mars encounter: Concern, but no panic

A comet's close approach to Mars in October is unlikely to endanger spacecraft orbiting the planet, but the encounter will nevertheless create concern for scientists and engineers, reported speakers during an astronomy panel at SPACE 2014. On Oct. 19, Comet Siding Spring, or 2013A1, will approach within about 150,000 kilometers of Mars — just under one-third the distance between Earth and the moon. The comet's dust will pass over the Martian north pole, possibly endangering spacecraft on station in the region during a 30-minute window.

Three spacecraft are currently in Martian orbits: NASA's Mars Reconnaissance Orbiter and Mars Odyssey, and the European Space Agency's Mars Express. Joining them this month will be NASA's Mars Atmosphere and Volatile Evolution — MAVEN — and India's Mars Orbiter Mission, which are en route to the planet.

However, concerns about the dust may turn out to be “much ado about nothing,” said panelist Paul Chodas, a senior scientist at NASA's Jet Propulsion Laboratory. “Multiple studies at JPL, the University of Maryland and other sites have confirmed that the

comet's dust trail is unlikely to threaten the orbiting systems,” Chodas said. He added that the comet did not begin to eject dust at the critical distance — between 15 and 20 astronomical units from the sun — which would have to have happened for the dust cloud to fully impact the orbiters' operations. Chodas said “the comet's bulk dust is being ejected at speeds below 1 meter per second,” well below the speeds where it would pose a threat to systems.

Based on the data, researchers have concluded that the cloud will pass up and over Mars, barely skirting a 1-kilometer edge of the orbiters' operating zone for a half-hour. This prompted Joseph Guinn, manager of the mission design and navigation section at JPL, to joke that the situation is not one of “seven minutes of terror, but more like 30 minutes of concern.” Chodas added, however, that if the models are wrong, there will be particles measuring between 1 millimeter and 1 centimeter, “about the size range of a sunflower seed to a grain of rice,” impacting the orbiters like “cannonballs, causing extensive, most likely catastrophic, damage.”

Charles D. Edwards, Jr., chief technologist of the Mars Exploration Program and telecommunications engineer at JPL, said, “Despite the low risk of impact posed by the dust, NASA, ESA and ISRO [Indian Space Research Organisation] did develop plans to shield the orbiters during the 30-minute window,” with each agency having plans to adjust the attitudes of their spacecraft, including “hiding” them behind Mars during the window to shield them from any impacts. The mitigation plans are especially critical for MAVEN and the Mars Orbiter Mission, which will arrive on station shortly before the comet's flyby.

The minimized dust risk means researchers can focus on gleaning valuable scientific data from the fly-by, including Siding Spring's spin speed, nucleus shape and corona composition, Edwards said.

Richard Zurek, chief scientist of the Mars Exploration Program at JPL, said this is “a unique chance to get a first-ever resolution of the nucleus of a long-period comet, especially as the nucleus is thought to be a kilometer wide.”

Additional areas of study, according to Zurek, “will be the comet's effect on the upper Martian atmosphere, at about 150 kilometers, especially allowing scientists to better understand how atoms potentially escape the Martian atmosphere, as well as the potential for the comet's ejaculate to form cirrus clouds above Mars.” Cameras on the Curiosity and Opportunity rovers will also provide excellent images of the comet.

Zurek concluded the session by warning that the data from the fly-by can only come about if the dust models are right, saying there are “no guarantees here — all the dice are being thrown, but it only takes one particle. The chance...that we get damage” is “very low,” said Zurek, “but it's not zero.”

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Comet Siding Spring is “unlikely” to harm spacecraft, says Paul Chodas of NASA's Jet Propulsion Laboratory.