

Meteorite search update: 10-ton rock responsible for fireball in Western Canada last week

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Investigation of the fireball that lit up the skies of Alberta and Saskatchewan on November 20 has determined that an asteroid fragment weighing approximately 10 tonnes entered the Earth's atmosphere over the prairie provinces last Thursday evening. And University of Calgary researcher Alan Hildebrand has outlined a region in western Saskatchewan where chunks of the desk-sized space rock are expected to be found.

The fireball first appeared approximately 80 kilometres above and just east of the border city of Lloydminster, Alberta/Saskatchewan, and traveled SSE towards the Battle River valley fragmenting spectacularly in a series of explosions.

The fireball penetrated the atmosphere at a steep angle of approximately 60 degrees from the horizontal and lasted about five seconds from 17:26:40 to 17:26:45 MST with the largest explosion at 17:26:44. The fireball was recorded on all-sky and security cameras scattered across Saskatchewan and Alberta in addition to being witnessed by tens of thousands of people who saw it streak across the sky, saw its arc-welding blue flash, or heard the subsequent explosions.

"Firstly, we are enormously appreciative of all the people who have volunteered information about the fireball. The public response to this fireball has been the largest that we have ever had in Canada." said Hildebrand, Canada Research Chair in Planetary Science and Coordinator of the Canadian Fireball Reporting Centre at the University of Calgary. Hildebrand said the fireball was like a billion-watt lightbulb shining in the sky, turning night into day with a bluish white light. It illuminated the ground for several hundred kilometers in all directions including as far south as Vauxhall, Alberta.

"Thanks to everyone's help we are now beginning to delineate the trajectory of the fireball, so that its prefall orbit can be determined. We have also outlined an area where its meteorites may have fallen, although we will have more precise predictions to come," Hildebrand added.

The asteroid fragment is now known to have weighed approximately 10 tonnes when it entered the Earth's atmosphere from an energy estimate derived from infrasound records by Dr. Peter Brown, Canada Research Chair in Meteor Physics at the University of Western Ontario. Infrasound is very low frequency sound produced by explosions that can travel thousands of kilometers.

"At least half a dozen infrasound stations ranging from Greenland to Utah, including Canada's Lac Du Bonnett, Manitoba and Elgin Field, Ontario stations, recorded energy from the fireball's explosions. The

indicated energy is approximately one third of a kiloton of TNT," Brown said.

Dr. Brown also says that a fireball this size only occurs over Canada once every five years on average. About ten fireballs of this size occur somewhere over the Earth each year.

Dr. Hildebrand spent the weekend in the field interviewing witnesses and searching for security camera videos.

"We are now trying to get all the transient information about the fireball before it is lost. Many motels and gas stations only keep their security recordings for one week or less, so we urge everyone to check their systems to see if they recorded the fireball or the moving shadows that it cast," Hildebrand said. "Three gas stations and motels in Lloydminster, Lashburn and Maidstone are known to have records, but dozens of other businesses in the area probably have the fireball or its shadows recorded."

If fireball images are found, he suggests immediately saving a copy and contacting him. "With the security camera footage we can compute the fireball's trajectory in the sky to calculate the prefall orbit. Meteorites have only ever been recovered from known orbits nine times previously and we want to make that ten. "

Hildebrand estimates that hundreds of meteorites larger than 50 grams could have landed since the rock was large and its entry velocity was lower than average. The object's speed is calculated to be only roughly 14 km/sec when it entered the atmosphere versus the average of around 20 km/sec.

"We are now starting to reasonably constrain where the meteorites will have fallen. Many witnesses reported seeing a cluster of red fragments

continuing downwards in the sky after the fireball exploded. These represent the rocks slowing down that will eventually fall to the ground as meteorites," Hildebrand said. "An outstanding thing about this fireball is that so many red fragments were seen and that they traveled so low to the ground before becoming invisible in the darkness."

The projected area of fall lies within Saskatchewan's Manitou Lake Rural Municipality north of Marsden and Neilburg, and just south of the Battle River in an area that is mostly cleared for cultivation.

"Several of the nearby eye witnesses describe sounds that could actually be from the meteorites falling through the sky, but we don't know that for sure yet. The eye witness descriptions are remarkably consistent with each other as to the location," Hildebrand said.

The remarkable consistency of the eyewitness accounts is probably partly explained by the dramatic dust clouds that marked the fireball's path. These clouds remained in the sky without much distortion for several minutes. From the fireball's characteristics Hildebrand thinks that it was a relatively strong rock and many rocks the size of a football or bigger are expected in addition to the more numerous small ones. Larger meteorites will have plunged into the ground if at all soft, making small pits with the meteorites at the bottom. Meteorites of common asteroids will have a dark gray or black coating covering their dimpled surface, be denser than the average rock, and will weakly attract a magnet, but other types of meteorites are possible.

The meteorites are expected to be scattered across a strewnfield approximately eight km long and three km wide with the larger stones to the southeast. Noting that they have a substantial commercial value, Hildebrand also advises that meteorites are the property of the landowner where they fall.

Hildebrand and Brown are both members of the Small Bodies Discipline Working Group that is funded by the Canadian Space Agency. Dr. Martin Beech at the University of Regina chairs this working group.

Hildebrand has returned to the field to continue gathering data and will be available only for pre-arranged phone interviews. Both Brown and Beech are available for comment at the contact information below.

See Google Map of search area at: [maps.google.ca/maps/ms?ie=UTF8... .111851,2.570801&z=9](https://maps.google.ca/maps/ms?ie=UTF8&ll=51.111851,-112.570801&z=9)

Source: University of Calgary

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