When Blue Ice Falls From The Sky!

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What happens when a huge lump of coloured ice falls from a clear sky? Well, there are conjectures, often magical explanations. But the culprits are often commercial aircraft. Read on to find out more.

This piece of blue ice is most likely from an aircraft flying over the International Air Route A791W Kolkata-Karachi on 6 October 1991 found near Mt Abu in Rajasthan
(Photo Courtesy Prof. K.K. Sharma)

ON 19 February 2011, at around 09.30 hrs in the morning, a chunk of green-coloured ice dropped from the sky in the Central Reserve Police Force (CRPF) Camp at Suthyana, Greater Noida near Delhi. The area on the ground where the ice fell also became green in colour. The piece of ice was collected and the matter was reported by CRPF officials to the Police. Scientists are still probing the matter. The only clue was that the area lies at a distance of about 40 km to the east of the Indira Gandhi International Airport in New Delhi and falls in the approach path, where the aircraft align themselves for landing.

A similar incident occurred on 18 May 2008 in a village of Haryana called Hajibas. Delhi and in its neighbouring state Haryana are normally dry with no signs of the Monsoon during this period. The sky was clear and bright. The time was about 10:30 hrs in the morning. A marriage party rested peacefully.

Suddenly, a big blast was heard as if a bomb had gone off. Every one ran outside only to find a clear sky and no clouds, thereby ruling out the possibility of a thunderstorm or lightning strike. And then they saw it! A huge block of blue coloured ice weighing at least 10 kg that had created a hole about half a feet in the ground. Fortunately, no one was injured nor any property damaged.

The big crowd that gathered to watch the phenomenon was at a loss to figure out how such a huge block of ice could have dropped down from the clear skies. People took photographs from their mobile phones. Some wondered whether it was god's curse. The ice block melted after about two and a half hours. Many people collected water samples from the melting ice. And, as expected, the local Hindi newspaper reported the incident as a mystic occurrence the next day.

Now, what could be the reason for such a bizarre event? Could the ice be a collection of ice flakes or a bunch of hails? Of course this was highly improbable, as the weather was clear, there were no clouds, and no thunder was heard. Could the ice have fallen off from some flying object such as an aeroplane? Well, that appeared most likely.

Photo of ice that fell in Imphal on 31 January 2010

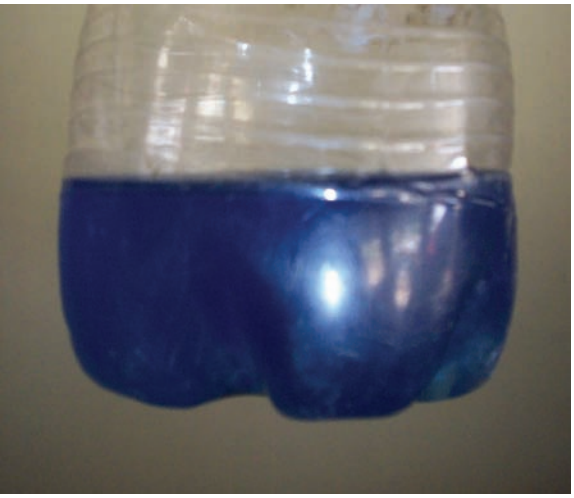
This is how the aircraft toilets are cleaned after landing of aircraft (above); After landing, the ground servicing vehicles clear the toilet tanks by removing the contents for disposal; (above right) Aircraft toilets look like normal toilets though they work on the vacuum suction principle (inset).

The Mystery

The most probable source of the blue ice was indeed a commercial aircraft flying high in the sky, and that too from the most unexpected of places—from one of its lavatories!

Before getting deeper into the mystery, let us see how the toilet system of modern aeroplanes functions. In fact it is quite different than the toilet system installed in our houses.

The typical home toilet uses a tank filled with water. When the toilet is flushed, it starts a siphon that drains the contents. The water then flows into the septic tank or in the drain system due to gravity. Thus, water is the main carrier in home toilets carrying all the waste to the drains.



The blue ice sample of 6 October 2009 after melting turned into a blue liquid, like a sanitizing agent *(Photo Courtesy Prof. K.K. Sharma)*

Unlike the toilets in household bathrooms, toilets installed in modern commercial airliners work on the principle of vacuum suction—active vacuum as compared to passive siphons of household toilets. Since the waste gets sucked out through vacuum suction, these aircraft toilets don't rely on gravity and gush of water.

When the aircraft toilet is flushed, it opens a valve in the drain line, and the vacuum in the line sucks out the contents into a tank. Use of vacuum requires very little water to clean the bowl (water may be replaced by the blue sanitizing liquid). Most vacuum systems flush with just two liters of fluid or less compared to six liters for a water-saving toilet and up to 20 liters for an older toilet.

The use of vacuum system in aircraft offers two clear-cut benefits—reduced weight of the aircraft and saving of water (in fact this also indirectly results in reduction of weight of the aircraft). Because the vacuums are so powerful, the pipes can be made narrow and very little water is required for flushing. And since gravity is not involved, the drainpipes can be run straight up to the septic tanks to conserve space. They can also be made vertically up or down or in any other direction. Thus when a vacuum toilet is flushed, the solid waste and a small amount of blue sanitizing liquid are sucked into the tank.

All along the journey, the lavatory waste is stored in a holding tank on the aircraft. After landing, the toilet cleaning carts are deployed by ground crew personnel who operate a valve to empty the waste storage tank and make it ready for the next part of the journey. It is physically not possible for a pilot to dump a tank while in flight. The exterior lever means only the ground crew can operate the valve that opens the tank while the plane is on the ground.

A chunk of ice that had fallen on the home of a US couple on 21 October 2006 (below); it damaged the bed of the couple after crashing through the roof (bottom)

The United States alone has recorded at least 27 incidents of blue ice impacts between 1970 and 2003, some of which caused considerable damage.

Normally a dark blue coloured chemical (sanitizing liquid) is mixed with cleaning water inside the aircraft lavatory holding tanks to deodorize the waste and to break down any solids. The blue chemical serves another purpose. In the event of any leakage from the drainpipes, the ground engineers are able to detect the leakage by observing the presence of blue colour on the exterior of the aircraft and thus repair it.

How the Problem Starts

Modern commercial aircraft cruise at high altitudes, and the sub-zero temperatures cause any liquid to freeze immediately, hence the term "blue Ice." If any of this "blue Ice" were to fall from an aircraft, it would melt long before it hit the ground, dissipating into miniscule droplets that are nearly invisible.

In the event of any abnormality or defect, such as due to leakage or seepage, small amounts of lavatory fluid leak outside and get condensed due to the low outside temperature. The outside air temperature at high altitudes may be as low as -30^0 C to -150^0 C. Such low temperatures turn the watery fluid into ice and with time more and more ice keeps on accumulating over it. When the ice becomes too heavy it gets detached and falls to the ground.

Normally this happens during the descent when the aircraft encounters higher atmospheric temperature on coming from higher altitude to lower altitude. The colour of such ice is normally blue (obviously due to the presence of blue sanitizing liquid). However, in certain cases it could be green, blackish, yellow, muddy or even grey.

A number of cases of blue ice falling down from commercial airliners have been reported in many countries.

Aircraft Involved

Only passenger airliners are involved in such incidents due to the fact that only these aircraft are equipped with heavy-duty passenger toilets that are regularly used by passengers on board the aircraft. Thus a defence aircraft or a small civil aircraft would not be involved in such incidents.

In other words, one of the primary conditions for occurrence of such cases is that the place of incident must be located below an established air-route or it should be close to an airport where passenger airliners are operating.

Another condition is that the ice will get formed during flight only when there is some kind of leakage or seepage in the aircraft toilets. This ice will however fall on the ground only under two conditions:

i) When the airliner is descending (may be for the purpose of landing) so that the atmospheric temperature outside starts rising, and the ice starts melting and falls down and/or;

ii) During cruise the ice lump becomes too heavy (of the order of 50 to 100 kg or more) and ultimately falls on account of its own weight.

Therefore, while analysing a case of ice fall, the important aspect that is taken into consideration is whether the place of occurrence is either located on an established air-route or close to it. If there were two independent and separate paths for incoming and outgoing aircraft at an airport, the place would be located on the incoming path. In case the aircraft is not found at the airport but on an established air-route, this will show that the ice might have fallen due to its own weight during cruising. In such a condition, the weight of the falling ice should be very heavy, say about 50 kg or more.

Rare Case in India

Now, how do we co-relate the above-mentioned incident in a village of Haryana in 2008 with that of blue ice from an aircraft? Well, the location of the incident was compared vis-à-vis the routes followed by aircraft and phases of flight.

Village Hajibas is situated near Pinangwan (Latitude 27^{0}53'37"N, Longitude 77^{0}07'30"E.), which is located in District. Gurgaon (Haryana) at a distance of about 75 km (aerial distance) from the Indira Gandhi International (IGI) Airport, Delhi exactly towards south (on a bearing of 180^0). This place lies below the Air Traffic Services (ATS) route known as W-20N (Bhopal-Delhi Sector) and when over this place, the aircraft are approximately 15 to 20 minutes from land at IGI airport. This route is normally used by aircraft arriving from the South (Bhopal, Nagpur, Hyderabad, or Chennai) and the distance matches with the area where commercial airliners are descending from their cruising level of about 30,000 feet down to 15,000 feet, where temperatures are comparatively higher than the cruising level.

Combining all these facts and figures, the incident definitely deserved to be categorized as one of the rarest phenomena of blue aircraft ice falling to the ground. The matter was also reported to the Director General of Civil Aviation, New Delhi. It is understood from DGCA that though there had been many incidents of leakage of toilet drains, this was the first reported fall of blue ice in India.

Another incident of fall of blue ice in India was reported near Mount Abu in Rajasthan on 6 October 2009. A large lump of blue ice weighing about 25 kg fell from the sky in a farmhouse in Tokra Village near Mount Abu (24^{0}40'25" N, 72^{0}42'40" E) at around 0515 hrs, damaging some branches of trees. The pieces of ice scattered all over the place. Once again it was taken as a mysterious case, since there were no rains and the sky was clear with temperatures touching around 38^0 C in that area. The incident was witnessed by a 40-year-old Guard who had come out to feed the cattle.

The case was examined by Dr. (Prof) K.K. Sharma, Head of the Department of Geology at the Government College, Sirohi, who also consulted Jesus Martinez-Frias, a planetary geologist at the Centre for Astrobiology in Madrid, and a pioneer researcher of large-sized ice lumps. And

INCIDENTS OF ICE FALL IN INDIA

■ **Churu & Jhunjhnu areas of Rajasthan between October 2010 to December 2010.** There were three reported cases of fall of ice at Village Dandu (20 km from Churu), Village Sultana Ka Bas (Near Jhunjhunu) and at Village Haripura (Near Chidwa town of Jhunjhunu) between October to December 2010. The ice lumps weighed between 5 to 25 kg and were dirty or yellow in colour. The areas lie at about a distance 250 to 300 km to the west of IGI Airport, New Delhi on Air-Route G-450 from Europe to Delhi, and aircraft flying on that route commence their descent at that point. Repetition of incidents indicates high probability of ice being detached from the passenger aircraft.

■ **Mongshangei Maning Leika area in Imphal on 31 January 2010.** A block of ice about 5 kg in weight fell down in Mongshangei Maning Leika area in Imphal breaking the roof and falling into the kitchen. It melted into a blue coloured smelly liquid. The place is located at a distance of only 1.5 km from Imphal Airport, and thus most likely it was from an aircraft landing there at that time.

■ **Village Chhaman Ka Purwa, Tikarmafi, Amethi (UP) on 13 February 2009.** There was a case of fall of piece of green ice weighing about 4 kg near a house in Village Chhaman Ka Purwa, Tikarmafi, Amethi (UP). This place is located below the ATS Route R-460 (Varanasi-Lucknow), at a distance of 125 km from Lucknow towards Southeast.

■ **Borana, Surendranagar (Gujarat) on 8 October 2010.** There was a case of fall of a piece of blue ice over a house in Village Borana, Surendranagar (Gujarat) breaking the roof of the house. The place lies 145 km from Ahmedabad Airport on a bearing of 233 Deg on Air route-W-63. International flights fly on this route to Ahmedabad.

■ **Village Tetvali (Dist. Ratnagiri, Maharashtra) on 3 October 2010.** There was a case of fall of piece of blue ice in Village Tetvali (Dist. Ratnagiri, Maharashtra) weighing

about 40 to 50 kg. The place lies on the Mumbai-Goa Route (R461-S) at 265 km from Goa Airport towards Northwest.

■ **Village Dorhatte, Shahganj, Agra (UP) on 29 October 2007.** A block of ice about 15 kg in weight fell on the roof of a house breaking the roof and falling inside the house in Village Dorhatte, Shahganj, Agra (UP). The place is located just one kilometre away from Agra Airport and it may be possible that an aircraft approaching to land at Agra Airport might have dropped the ice lump.

■ **Village Suryapura, Beruarbari, Ballia (UP) on 23 September 2008.** A smelling block of ice fell near a field in Village Suryapura near Surha Tal in Beruarbari (Dist. Ballia, UP). The place lies on Delhi-Lucknow-Patna Air Route (A201) about 100 km from Patna Airport towards Northwest. The ice might have been fallen from an aircraft approaching to land at Patna.

■ **Jashpur (Jharkhand) on 19 August 2010.** A 100 kg heavy ice lump fell here. The place lies on Kolkata-Kararchi route where international aircraft cruise at high altitude.

■ **Village Padampur in Kharsanwan (Jharkhand) on 15 August 2010.** A 30 kg heavy ice lump fell here. The place lies at a distance of about 272 km from Kolkata airport, where aircraft are in cruising phase.

■ **Village Tiloi (Rai Bareilly, UP) on 13 September 2009.** Village Tiloi (Rae Bareilly), UP is located on the approach path on Air Route R-460 (Varanasi-Lucknow) at a distance of 70 km from Lucknow towards Southeast.

■ **Village Dauki, Agra (UP) on 25 April 2008.** Ice fell on the ground when the outside air temperature was 42°C. The place lies 14 km from Agra Airport towards Southeast. It may be possible that an aircraft approaching to land might have dropped the ice.

■ **Village Belwari, Motigarpur (Dist. Sultanpur, UP) on 4 June 2007.** A huge block of ice about 100 kg in weight fell on the ground and broke into pieces. The place is located 30 km away from Lucknow-Varanasi route at 100 km from Varanasi towards Northwest. Reasons for fall of ice are not known.

■ **Village Ramnagar (Latori), Dist. Surguja on 10 October 2010.** Huge blocks of ice fell in four fields (one was reported as weighing about 150 kg) and broke into pieces. The place lies close to Air Route A791 (Karachi-Kolkata) where international flights operate. Possibility of fall during cruise.

■ **Village Sita Garhi, Mant, Mathura (UP) on 3 March 2008.** Place lies on the Agra-Delhi Route (L759-N) at 120 km from Delhi Airport towards Southeast.

■ **Village Maheba (Dist. Orai, UP) on 7 February 2007.** Ice block 10 kg in weight fell inside an enclosure for sheltering animals in a village. The place lies at a distance of 90 km from Khajuraho towards Northwest close to ATS Route W-33 (Delhi-Agra-Khajuraho), where aircraft are descending for landing at Khajuraho.

■ **Village Dariyabad, Morna (Mujaffarnagar, UP) on 7 February 2007.** A lump of Ice 10 kg in weight fell on a mango tree near a Shiv Temple and broke its branches. The place lies on the Delhi-Dehradun Air Route 130 km from Dehradun Airport towards Northeast. An aircraft descending to land at Dehradun might be involved.

■ **Lohat (Badli) in Haryana on 16 March 2011.** A heavy lump of ice 50 kg in weight landed here, which is located just 21 km away from the Indira Gandhi International Airport. It is presumed that the ice must have got separated from an aircraft descending to land at IGI Airport, Delhi.

With so many possible cases of ice fall from passenger airliners, it is evident that such cases which were hitherto taken as "Rare of Rarest", can no longer be treated as the rarest.

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then, in consultation with Professors Dr. Ritesh Purohit (Lecturer, Geology) and Dr. Sanjay Purohit (Lecturer, Biotechnology) from the same college, declared the ice to have come from the lavatory of an aircraft.

It may be mentioned that Air Route "A-791W (Westbound)" from Kolkata to Karachi (which is an international air route) passes through that area. Aircraft normally cruise at an altitude of 10 km or above over such air routes and atmospheric temperatures at that altitude are quite low (in the range of -30^{0}C to -150^{0}C). So, the ice from aircraft at such high altitudes would normally remain frozen unless and until it becomes abnormally heavy and may drop because of its own weight. It is therefore possible that an airliner cruising at a high altitude over the route might have dropped the ice lump.

Reports from other Countries

The phenomenon of fall of ice from aircraft is extremely rare and normally may not be experienced at all. However, in USA between 1979 and 2003, a total of 27 incidents of fall of aircraft lavatory ice were reported and investigated by FAA (Federal Aviation Administration, USA).

On 28 November 2004 in Lynn (MA, USA) a huge chunk of ice fell on the house of a lady that damaged the roof making a hole of 2 ft X 4 ft. smashing her bedroom floor. Aircraft Accident Investigators from Federal Aviation Administration were called to the lady's house who suspected that the ice might have fallen from a low-flying jet heading into Logan Airport.

Similarly, on 28 January 2007, a 50-pound heavy ice fell on a Mustang car in USA damaging it totally. The above incident was also reported in the prestigious *New Scientist* magazine of U.K. Some more events of this nature have been reported all over the world from other countries.

In 2003, the HBO channel showed a serial named "Six-feet-under" on this topic in which an ice chunk of the size of about one foot drops on an innocent bystander. Similarly, in 1992 a Hollywood film named "Blue Ice" was also made on such incidents, where Michael Caine's character describes the concept of blue ice. A US TV show "MANswers" also described the phenomenon.

On 1 January 2005, the Federal Aviation Agency (FAA), which is a regulatory Government body for civil aviation in USA, issued a fact sheet on the subject for the consumption of the general public, which clarified that not every strange looking and smelly object found around their neighbourhood was from the lavatories of the airliners. However, they advised the public to bring such matters to the notice of FAA for further investigation.

Megacryometeors

It is true that not every piece of ice falling from the sky is from aircraft. It could be from other sources; it could also be a weather related phenomenon. In scientific jargon (mainly in Meteorological circles), the phenomenon of abnormally large chunks of ice falling from a clear sky is known as "Megacryometeor". The term "Megacryometeors" however covers various types of phenomenon of fall of ice from the sky due to meteorological reasons under unusual atmospheric conditions.

More than 50 megacryometeors have been recorded since the year 2000. Analysis of megacryometeors shows that their composition matches normal rainwater for the areas in which they fell, thereby categorising them as weather related. Thus, for all practical purposes, the fall of "Blue Ice" from aircraft does not come under the purview of "Megacryometeors". So, aircraft should be implicated only if other evidences also point to the possible role of an airliner.

With so many possible cases of ice fall from passenger airliners, it is evident that such cases which were hitherto taken as "Rare of Rarest", can no longer be treated as the rarest. It is high time that the airlines and regulatory authorities probe deeper and take necessary preventive measures to combat cases of ice fall from the sky.

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