

High-altitude balloons: what's up there and why

The United States has shot down four flying objects over fears of spy balloons. But what else are high-altitude balloons used for?

When the US government shot down a suspected Chinese surveillance balloon off the South Carolina coast on 4 February, it ramped up geopolitical tensions with China and prompted officials to tighten their radar search for other high-flying unidentified objects. Since then, the United States has shot down three more objects — which it now seems were probably not spy balloons. How many balloons are in the skies, what are they used for, and what will the recent incidents mean for balloon users?

The suspected spy balloon was 60 metres tall, carrying a payload weighing around one tonne. The US state department says the payload carried devices to intercept sensitive communications; China says that it was a civilian research airship gone astray.

The other objects were smaller and less well-described by officials: an object “about the size of a small car” over Alaska; a small cylinder over the Yukon in Canada; and an octagonal structure with strings over Lake Huron in Michigan. All flew in commercial airspace at an altitude of around 6–12 kilometres. The US government now says the “leading explanation” is that they “could just be balloons tied to some commercial or benign purpose”.

The United States has recently started taking ‘unidentified anomalous phenomena’ (UAPs) — including flying objects — more seriously. Last year, NASA established a team of scientists, technology, flight and space experts to investigate UAPs, citing both national security and air safety. And in January, the US Office of the Director of National Intelligence revealed a dramatic uptick in UAP reporting. For the 17 years before March 2021, the agency catalogued 263 UAP reports; since that date, there have been 247, in less than 2 years. Out of 366 reports analysed, 163 were characterized as balloons, 26 as uncrewed aircraft and 6 as clutter.

Do look up

Balloons are a valuable tool for getting a good view downwards or upwards, from an altitude higher than drones or planes can reach and at a lower cost than satellites.



High-altitude balloons are used in scientific experiments.

By far the majority are weather balloons: these are launched twice a day simultaneously from almost 900 locations worldwide, according to the US National Weather Service. They transmit data about temperature, humidity, pressure and location, and are disposable. The thin balloons — typically made of biodegradable latex — expand at altitude to about 6 metres in diameter. Flights are designed to go straight up to about 30 kilometres, and last for only a few hours.

Some scientists use much larger, longer-lasting balloons, for example to get a clear view of space, or to test instruments destined for high altitudes. NASA's Wallops Flight Facility in Virginia manages the launch of about 10–15 scientific balloons each year worldwide. These can carry around 3,000 kilograms, expand to be larger than a football stadium

and fly to an altitude of 37 kilometres.

Other balloon users include science students, companies and amateur enthusiasts. Jason Krueger says his company StratoStar in Fishers, Indiana, has helped students and companies to launch more than 1,000 high-altitude balloon missions since 2006. Student projects have included investigating whether Post-it notes are still sticky after a flight to near-space and the impacts of high-altitude radiation on blood samples.

Corporate uses of balloons include providing Wi-Fi in remote regions, and some amateur enthusiasts launch picoballoons. These silver-coloured, plastic Mylar balloons typically measure less than 1 metre in size and are harmless, says Krueger, carrying amateur radios and payloads of just a few grams. But these shiny balloons would “light up radar like nobody’s business”, says Krueger, and their typical flight altitude is around 12 kilometres.

Blame game

Many balloons can be discounted from the list of those shot down: weather balloons make short flights and don’t drift at 12-kilometre altitudes, for example. But that still leaves plenty unaccounted for worldwide. “There are flights every day of research, corporate and hobbyist balloons,” says Robert Rohde, a scientist at the environmental non-profit organization Berkeley Earth, who lives in Zurich, Switzerland. “I suspect that what they shot down are related to one of those categories.”

The US Federal Aviation Administration doesn’t require tracking devices for payloads under 5.4 kilograms, or for launches or flight paths for such loads to be declared. But even small packages can use large balloons. If such objects start to attract military attention, perhaps they, too, should be tracked, says Rohde. “I don’t feel like it’s necessary from a safety point of view, but if there’s a legitimate concern about small balloons from other states, we should probably make sure these things are identified.”

Krueger doesn’t think that’s needed. Instead, he says, the US government should “get better at assessing what is a threat”.

By Nicola Jones