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Surrey University balloon study of solar flares informs current air safety concerns

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New balloon-mounted radiation probes developed by the Surrey Space Centre at the University of Surrey have captured their first readings of a major solar storm, confirming that levels of cosmic radiation at typical cruising altitude briefly surged to their highest point in almost two decades. The findings come as aviation authorities worldwide are responding to unrelated but highly publicised technical concerns affecting a small number of long-haul aircraft, prompting the UK Transport Secretary to offer public reassurance.

The powerful X5-class solar flare recorded on 11 November 2025 triggered a rare Ground Level Enhancement (GLE), in which solar energetic particles penetrated unusually deep into the atmosphere. Within an hour, the UK Met Office and the Dutch meteorological agency KNMI launched rapid-response weather balloons equipped with Surrey's newly developed sensors, sending them through commercial-aircraft altitudes and far higher.

Early analysis shows that radiation at 40,000 feet briefly reached almost ten times normal background levels. Scientists stress that the spike posed no immediate health risk to passengers or crew, but they note the potential for temporary pressure on aircraft electronics. Surrey researchers estimate that during the storm's peak, "single-event upsets" — tiny, unpredictable bit-flips in onboard computer memory caused by energetic particles — may have reached around 60 errors per hour per gigabyte.

Clive Dyer of the Surrey Space Centre said the November surge was the strongest event of its kind since December 2006, with new UK neutron monitors at Guildford, Lerwick and Camborne helping to map the storm's radiation footprint across global airspace. Researchers emphasise that while far larger historical events are known — including the record 1956 radiation storm and the ancient "Miyake Events" revealed through tree rings — such extremes have never struck during the modern aviation era.

The renewed scientific focus on space weather arrives during a period of public sensitivity around flight safety. In recent days, several international carriers have reported technical issues affecting specific aircraft types, prompting precautionary inspections and, in some jurisdictions, temporary operational restrictions. Although no link has been made between these aircraft issues and solar activity, the incidents have heightened passenger concern.

Transport Secretary Heidi Alexander, responding to the situation, said: "I am aware of the technical issue impacting certain aircraft and concerns over how this will affect passengers and flights this evening. Passengers who are due to fly this weekend should check with their carriers for the latest information. The good news is it seems the impact on UK airlines seems limited with a smaller number of aircraft requiring more complex software and hardware changes. I would really like to thank the experts, staff and airlines who are working at pace to address this and reassure passengers that work is ongoing. It is heartening this issue has been identified and will be addressed so swiftly, demonstrating the high aviation safety standards globally."

The Surrey sensors, engineered to withstand near-vacuum conditions and temperatures down to –70°C, stream real-time radiation data up to 100,000 feet. Their results will be used to refine models at the Met Office Space Weather Operations Centre, improving forecasting for sectors reliant on high-altitude electronics, including aviation.

Keith Ryden, Director of Surrey Space Centre, said the 11 November flare provided the team's first opportunity to use the rapid-launch sensors in a live event, producing a "3D picture" of radiation patterns across UK airspace. Met Office Space Weather Manager Krista Hammond added

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that this is the first time radiation has been measured across such a broad range of altitudes during a solar storm, describing the new data as “a big leap forward” for forecasting capability.

Further launches are planned from Met Office sites in Lerwick and Camborne, and from KNMI in the Netherlands, as the current solar cycle moves into a more active phase. Aviation regulators say the Surrey results will help inform future operational guidance during solar storms, while the Transport Secretary emphasised that UK passenger safety remains “of the highest priority”.

Sam Jones – Reporter