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Carrington Events: are you prepared?

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CARRINGTON EVENTS: ARE YOU PREPARED FOR THE PERFECT STORM?

by Philip Baum

It's 11.33am. Your mobile rings. For now, at least, it can! The news is troubling. A solar storm. To be more specific, a coronal mass ejection. Time to call upon the contingency plan. I presume you have one which specifically addresses a Carrington Event.

Much of our work in the aviation security arena revolves around preparing for events which are simply not going to happen. Incidents so infrequent that one stands a far better chance of winning the lottery big time! But prepare we do, as if disaster strikes our resilience, both physical and commercial, will depend upon the investment made ahead of time to train staff, develop security and communication protocols and test both our own responses and those of others.

There are threats out there which, if and when they become a reality, will impact upon us all. There will be no airline which is immune, no airport which will not feel the effect and no government which will not have to deal with the economic fallout. And a Carrington Event is one natural event which could have catastrophic consequences. But, like other disasters, be they natural or man-made, we can mitigate the degree of devastation by adopting the Boy Scouts motto of 'Be Prepared'.

It would appear that the British government regards the possibility of a severe coronal mass ejection as being a significant concern. In the conclusion to a Cabinet Office report, entitled 'Space Weather Preparedness Strategy', published in July this year it says, "Considerable progress building resilience to severe space weather has been achieved since the risk was first added to the National Risk Assessment in 2011" which is, in itself, of interest. But it goes on to specify that the resilience in question requires "the Department for Transport, Civil Aviation Authority and National Air Traffic Service to improve understanding of the potential impacts for aviation."

So what is a coronal mass ejection and what would the impact be? Who better to turn to for a definition than the National Aeronautics & Space Administration (NASA) of the United States? "Coronal mass ejections (or CMEs) are huge bubbles of gas threaded with magnetic field lines that are ejected from the Sun over the course of several hours," resulting in the release of huge quantities of matter and electromagnetic radiation into space above the Sun's surface. "Coronal Mass Ejections disrupt the flow of the solar wind and produce disturbances that strike the Earth with sometimes catastrophic results."

The most famous incident took place on 1st September 1859 and was named the 'Carrington Event' (or the 'Solar Storm of 1859') after the British astronomer who witnessed the event. According to Frank Morring, Jr., Senior Editor of Space, Aviation Week & Space Technology, "That storm took down parts of the growing U.S. telegraph network, starting fires in the process and subjecting some telegraph operators to electric shock." That, however, was in an era which pre-dated power grids, computers, GPS systems, satellites and mass communication; cars had yet to be invented and aircraft were science fiction.

Solar scientists are reporting an increasing level of solar activity which could be indicative of a serious incident being imminent – the 'perfect storm' could be one devoid of rain. In 1989 a space storm disrupted

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electricity networks in Quebec, Canada, resulting in a 9-hour power cut across the Province. A closer shave occurred in July 2012 when we were all saved by the position of planet Earth at the time of the event; a week earlier and we would have experienced a direct hit. One research scientist, Pete Riley, wrote in 2012 that, "the probability of another Carrington Event occurring within the next decade is ~12%."

NASA warns that, "Extreme solar storms pose a threat to all forms of high-technology. They begin with an explosion - a 'solar flare' - in the magnetic canopy of a sunspot. X-rays and extreme UV radiation reach Earth at light speed, ionising the upper layers of our atmosphere; side-effects of this 'solar EMP' include radio blackouts and GPS navigation errors. Minutes to hours later, the energetic particles arrive. Moving only slightly slower than light itself, electrons and protons accelerated by the blast can electrify satellites and damage their electronics. Then come the CMEs, billion-tonne clouds of magnetised plasma that take a day or more to cross the Sun-Earth divide. Analysts believe that a direct hit by an extreme CME such as the one that missed Earth in July 2012 could cause widespread power blackouts, disabling everything that plugs into a wall socket. Most people wouldn't even be able to flush their toilet because urban water supplies largely rely on electric pumps."

The aviation industry had not even been conceived of the last time a Carrington Event had a significant impact upon planet Earth. For an industry which is completely reliant on the very technologies which would first suffer the impact of the 'perfect storm', we need to start drafting our contingency plans, recognising that aside from the loss of power, all our normal communication systems and those of every other defence and security agency will have been impacted by the event and those with criminal intent may wish to exploit the window of opportunity afforded them by an Act of God.

Some responses will have to be immediate. For example, grounding aircraft. Many will recall the havoc that created in the US post-9/11. A significant Carrington Event would result in the temporary global shut-down of the aviation industry. To start with, the health risk posed to aircrew and passengers would be severe due to the increased radiation which would be experienced by aircrew and passengers in flight. Yet even landing aircraft with air traffic control systems also exposed to the threat would be a challenge.

The UK Cabinet Office report states that, "Procedures for airlines to follow will be an important aspect of response, and should be agreed nationally, as well as bilaterally and multilaterally with international partners."

What steps have you taken? ■

