



UCL INSIGHTS: RESEARCH BRIEFING

Building space weather resilience in the finance sector

This briefing discusses space weather risks and their likely impact on different aspects of financial organisations, including investment and retail banks, exchanges, investment funds, and insurance and real estate companies, with a view to developing business continuity and resiliency capabilities

Space weather can disrupt a wide range of technological systems upon which the financial sector relies, including power networks, communications and global navigation satellite systems.

The risks of space weather range from travel and service disruption for a single institution to a widespread systemic event impacting several market participants. Severe geomagnetic and solar radiation storms are 1 in 10 year events. They have a serious enough impact and frequency to be considered by financial risks and business continuity professionals.

The loss of systematically important operations could have a serious knock-on effect on the UK economy and economies around the world.

What is space weather?

The eruptions and explosions produced by the Sun create stormy conditions known as space weather – that is, disturbances in the Earth's upper atmosphere and local space environment.

RECOMMENDATIONS FOR BUSINESS CONTINUITY PLANNING

- Firms should consider activities in-house to understand and evaluate the global impact of space weather risk for their business and build or extend their business resilience and crisis management processes accordingly
- Consideration should be given to using a space weather scenario in a market-wide business resilience test, e.g. the Bank of England's financial sector exercises

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Space weather risks to the finance sector

Space weather is capable of disrupting a wide range of technological systems, including electricity distribution networks, communications and global navigation satellite systems (GNSS). These are all technologies that underpin the finance sector, which relies on accurate timing information, communications, continuity of high-tech systems, and power supply. Particular vulnerabilities include:

- use of **mobile phones**, which is prevalent and imperative for many aspects of business
- **large processing or technology centres**
- execution and process of extremely high volumes of **transactions between organisations**, which is reliant on technology systems and synchronized timing, increasingly via GNSS
- essential reliance on **continuous uninterrupted power**
- disruption to **flights** that rely on GNSS technology.

Key considerations for building resilience to space weather

A space weather plan should be considered a natural extension of existing business continuity plans (such as those for technology, process, location, travel and vendor disruptions arrangements). Increased awareness, monitoring and interpretation of space weather data are important first steps. We suggest five key considerations.

1. Monitoring

Financial services businesses and people and technology concentrations are inter-connected. Financial sector business response plans should include:

- monitoring of space weather events by crisis management centres
- planning responses to space weather events by business continuity planners.

2. Technology and facilities risk assessments

Technology and facilities professionals should consider **risk assessments for the most critical application and power infrastructure**. Monitoring equipment and having backup for critical infrastructure are important.

Summary of space weather impacts

Space weather events	Time to affect Earth	Potential impact
<p>Coronal mass ejections</p> <p>A ejection of electrically charged gas and magnetic field</p>	12 hours to three days	<ul style="list-style-type: none"> • damage to high voltage transformers on the electricity transmission network • voltage fluctuations, leading to widespread blackouts • damage to satellites
<p>Solar flares</p> <p>A sudden burst of radiation, including X-rays and UV, from a localised region in the Sun's atmosphere</p>	Will have already happened by the time a solar flare is detected	<ul style="list-style-type: none"> • high-frequency radio blackout • jamming signals from communication and navigation systems
<p>Solar energetic particles</p> <p>High-energy electrically charged particles that travel close to the speed of light</p>	30 minutes	<ul style="list-style-type: none"> • damage to spacecraft electronics • loss of high frequency radio communications

3. Education and awareness

Education and awareness of space weather risk should be undertaken by **internal risk teams and business continuity planners**. This could be through crisis management drills or as part of other training.

Corporate communication teams could also consider their response to space weather events and their implications from a social media perspective.

A firm could also consider their response to client requests for space weather preparedness as monitoring becomes more mainstream.

4. Vendor risk assessments

Questions relating to a **vendor's exposure to space weather** could be added to that due diligence and assessment of vendor risks undertaken during vendor on-boarding processes.

5. Space weather response plans

Businesses could use geomagnetic and solar radiation scales to **determine 'trigger' events to assist them in space weather planning**, considering the scope of the events (local / multi-regional / global) and the impact on their own business and supply chain.

Travel services teams could inform travelling staff of forthcoming disruption as a result of space weather.

Business should also consider the **impact of space weather on multiple systems**, with the possibility of cascading failures in the most extreme cases.

For the most serious storms, a plan to leverage a firm's global footprint to move work and processes around the globe as and when a space weather event might occur could be undertaken.

For the most severe space weather events, a coordinated response may be required, particularly where more than one firm is affected and there is potential for systemic risk. **Coordinated market-wide testing** could be considered by authorities and inter-bank organisations to prepare the sector for such an event.

Background

Space weather was included in the UK National Risk Assessment in 2011 and the UK National Risk Register in 2012. The Met Office Space Weather Operations Centre

has been established to provide twice-daily space weather forecasts for up to four days ahead.

Resilience planning is based around reasonable worst-case scenarios, which requires an understanding and assessment of the risks across a broad range of sectors.

UCL hosted a symposium on the theme of space weather risk and resilience in the financial sector, which brought together those involved in the study of space weather with stakeholders in the London offices of investment banks, regulatory authorities and Government to identify realistic space weather scenarios and evaluate their probability and impact. See the UCL Public Policy website for the full report of the symposium, *Building Space Weather Resilience in the Finance Sector*, and a trigger-based impact-planning chart.

RECOMMENDATIONS FOR FURTHER RESEARCH

Business: Historical data on system 'glitches' or downtime should be used to investigate the impact of space weather activity and determine at what scale of event the sector could be impacted.

Business and academia: Financial companies should start gathering information on component and data failures for future analysis.

The Met Office: More tailored forecasting services for the finance industry should be developed based on the additional data gathered.

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