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SOLAR INDUCED SPACE WEATHER RISK MANAGEMENT FOR COMMUNICATIONS
SATELLITES.**Abstract**

This paper details the current risk management strategies regarding the hazards which extreme solar weather can present to communications satellites and the associated industry sectors, and presents recommendations designed to mitigate or transfer the risk where feasible. The consequences of coronal mass ejections (CME) on space systems can range from reduced performance to overall spacecraft failure. The probabilities of spacecraft failure caused by off-nominal sub-system events are calculated by standard testing methods. The probability of solar weather events such as CME causing system failure is considered small, based on historical data. However, space weather modelling and prediction techniques show that this hazard is a continuing threat to electronic and photo-voltaic components of space systems, especially on spacecraft in orbits external to the Van Allen belts. This paper details estimates of the effects on the communications infrastructure of the loss of satellite systems, which could vary from the moderate to the extreme. The calculations of the socio-economic consequences are also approximated, and could be catastrophic to remote or isolated communities. One of the hazards caused by a communications satellite which has been rendered inoperable is the increase in space debris, given that the spacecraft can no longer de-orbit, and this could affect the ability to replace it. This consequence and the cost of replacing a satellite should be factored in to a risk management strategy. These strategies include various technological mitigation strategies, risk eradication or reduction strategies and policy approaches. The main focus is on the current risk strategies offered by insurance which include risk retention as an economically sound technique. This paper argues that identification and quantification of the risk of CME damage can be developed further and that this process could lead to improvements in risk management strategies which would ensure the sustainability of the communications satellite industry.