CONNECTIVITY AND RESILIENCE OF REMOTE OPERATIONS: INSIGHTS FROM AIR TRAFFIC MANAGEMENT

***Matthieu Branlat*[1]**
***Per Håkon Meland*[1]**
***Tor Erik Evjemo*[1]**
***Anthony Smoker*[2]**
[1)] *Sintef Digital, Norway*
[2)] *Lund University School of Aviation, Sweden*

Abstract
Greater connectivity is transforming critical infrastructures profoundly. One specific aspect enabled by connectivity are remote operations, which allow for the provision of services difficult to provide in a direct capacity, physically (e.g., due to cost or resource availability). Domains of applications are very diverse, e.g.: industry, public services, healthcare, culture. In the domain of Air Traffic Management (ATM), increased connectivity is seen as one of the main drivers of the improvement of operations and building of capacity to handle the expected traffic increase. The concept of Remote Tower operations provides the capacity to manage tower operations remotely from a virtual tower and remote centre. It increasingly appears as a valuable alternative to traditional control towers. However, one can wonder about the risks introduced by the necessary reliance on network infrastructures and remote sensors. What happens to remote operations when these are not fully, if at all, functional? How dangerously dependent on the digital infrastructure are the capabilities introduced by remote operations? Such questions take particular significance in the face of the cyber threat: cyber-attacks on digital assets and services can impair the capacity to perform ATM safely from remote. Resilience then represents the capacity to handle two interrelated, but different, disruptions: of ATM operations; and of digital services. In the first case, the primary emergency, the system needs to adapt to mitigate the impact on operations (e.g., switch to other modes of operations or divert traffic) and return to sound operations. In the second case, challenges are associated with the system's capacity to identify, understand and address the cyber event. Re-establishing impaired digital services in a timely manner is critical because the adapted ATM operations are not sustainable. Inspired by crisis management, the paper explores challenges and strategies for resilient performance in the face of disruptions to the digital infrastructure.

Keywords: Connectivity, Cybersecurity, Remote operations, Air Traffic Management

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