On the Resiliency of Supply Chains after Extreme Events

John E. Mitchell Thomas C. Sharkey William A. Wallace

**Scope of the Research:** The objective of this research is to provide optimization models and algorithms in order to better understand the resiliency of supply chains with respect to extreme events. This will be accomplished by modeling the reliance of supply chains on civil infrastructure systems and examining the key operational characteristics associated with restoring a supply chain to a desired operational level.

**The Role of Boeing:** This project will build upon recent research of the investigators in the area of infrastructure restoration after extreme events.[[1]](#footnote-1) A potential collaboration with Boeing will be critical in our understanding of the unique effects that a post-event environment has on its supply chains. This collaboration will focus on the recent events in Japan and include: (i) data collection efforts in order to understand how damage to the infrastructure in Japan affects the supply chains of Boeing and its partners and (ii) discussions focused on the types of operational resources and constraints associated with restoring components of the supply chains or building ‘temporary’ components of the supply chain in order to regain functionality in the post-event environment. We will seek funding to support this collaboration through the RAPID program of the National Science Foundation whose focus is to provide funding for ‘quick-response research’ after natural disasters.

**Research Approaches and Outcomes:** This research proposes a novel class of optimization models that include the temporal aspects associated with allocating resources to restore (or build) components of the supply chain in order to recover from the extreme event. These models will specifically account for the fact that the infrastructure (e.g., power or transportation systems) to support the operations of the supply chain may be unavailable due to the extreme event. The examination of the reliance on supply chains on infrastructure systems will deepen our understanding of how disruptions to the infrastructure systems spread to supply chains. This will help design more resilient supply chains in the future. Our optimization models will further enhance the resiliency of supply chains since they will better determine resource allocation decisions in order to return the supply chain to its desired level of performance.

**Impacts:** We hope to apply our models to the supply chains of Boeing and its partners and also to create a realistic data set (one that closely models a real disrupted supply chain without violating confidentiality) that can be used by researchers in the future studying the resiliency of supply chains. By enhancing the resiliency of supply chains, this research will help society to more effectively recover from extreme events since the supply chain will be down for a shorter period of time after the event.

1. Nurre, S.G., Cavdaroglu, B., Mitchell, J.E., Sharkey, T.C., and Wallace, W.A. Restoring infrastructure systems: An integrated network design and scheduling problem. Technical report available at www.rpi.edu/~sharkt/RIS.pdf. [↑](#footnote-ref-1)