

ES SEMINAR SERIES

12:30-1:30 pm
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Daniel Eisenberg

*Combating Surprise for Critical
Infrastructure Resilience*



Abstract: Despite best practices for robust design, critical infrastructure remains vulnerable to natural disasters, extreme weather, and hybrid attacks. Standard planning, engineering, construction, and operations guidance promote high-performance, high-reliability systems that provide critical services (e.g., energy, mobility, and water). However, acute impacts of natural disasters like hurricanes and floods pose a constant threat to civilian and military communities alike. One reason infrastructure remains vulnerable to unexpected climate events is there is no single agreed-upon definition of resilience to guide system analysis and design. Still, one of the key commonalities across many resilience definitions is a need for the system to respond or adapt when challenged by unanticipated and extreme events. I refer to these events broadly as surprises and treat resilience as a capacity to adapt to surprise. In this work, I discuss the need to understand, study, and learn from surprise events to improve the resilience of critical infrastructure systems. I present a simple framework for characterizing surprise and the related decision-making contexts infrastructure operators and emergency managers must face. Importantly, case studies on large-scale infrastructure failures and natural disasters present counter examples to prevailing notions of infrastructure resilience and demonstrate the benefits of matching adaptive response to surprise context.

Bio: *Daniel Eisenberg* is a Research Assistant Professor of Operations Research at the Naval Postgraduate School (NPS) and Deputy Director of the NPS Center for Infrastructure Defense. Dan's research focuses on the design, operation, and adaptation of resilient infrastructure systems with emphasis on applying resilience engineering theory to improve system design and emergency operations. He uses tools from operations research, engineering, and public administration to link built and social systems together and identify fragilities in existing practices. He currently leads projects on the design and management of resilient island and military installation infrastructure systems. Dan is also an educator and helps advance critical infrastructure knowledge worldwide through in-residence classes at NPS and the delivery of NATO short courses across Europe and the Middle East.

Dan received his Ph.D. in Civil, Environmental, and Sustainable Engineering from Arizona State University (ASU) and a B.S. in Chemical Engineering from University of California, Davis. Prior to joining NPS, he was a research engineer with the US Army Engineer Research and Development Center. He has received several prestigious fellowships to lead international research projects, including a Fulbright Fellowship and National Science Foundation Graduate Research Fellowship.

