

Comprehensive Framework for Addressing Civil Critical Infrastructure Resilience

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The application of rigorous systems engineering and mission assurance disciplines used in acquiring national security space systems offers a unique perspective for addressing civil critical infrastructure resilience. In this space domain, rigorous system engineering tools and processes used in complex system acquisitions result in system designs that are robust to threats, capable of recovery of critical functionality, and support real-time sensing, decision-making, and forward actions. These systems engineering and mission assurance tools, methodologies, processes and metrics can be adapted and extended to civil systems.

Analogous resilient civil critical infrastructure technology needs may include command and control of distributed assets, robust communications networks, early warning systems, geospatial remote sensing and monitoring using a diversity of observation platforms, and data fusion and predictive analytics. Emergent technology solutions must be considered in terms of complex critical infrastructure sector and lifeline interdependencies – as between energy, transportation, water and food supply, and even banking and finance – and these interdependencies must be thoroughly understood for successfully building in resilience. Assessing emergent capabilities against these other factors is critical to ensuring system resilience, operability and affordability – including also enabling rapid socioeconomic recovery from disruption.

The presentation will discuss a framework to illustrate the end-to-end process of building in resilience into civil critical infrastructure systems through the capture of operational requirements, identification of potential events or threats – natural, technological and deliberate – assessment of vulnerabilities, cascading impacts and sector interdependencies, integration of geospatial and information technologies and emergent capabilities, with consideration of affordability and operational realities.