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RESEARCH SUMMARY

Grounded: An Enterprise-Wide Look at Department of the Air Force Installation Exposure to Natural Hazards

Implications for Infrastructure Investment Decisionmaking and Continuity of Operations Planning

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ISSUE

In 2018, a hurricane directly hit Tyndall Air Force Base (AFB), causing $4 billion in damage. Flooding at Offutt AFB in 2019 caused an estimated $420 million in damage to buildings, runways, and other assets. Although there was no notable physical damage to the base, a wildfire at Vandenberg AFB in 2016 delayed a scheduled rocket launch and came dangerously close to two space launch pads. Events such as these have raised questions about how the Department of the Air Force (DAF) could better position itself to become more resilient to natural hazards. To better understand its exposure to these and other natural hazards, the DAF has typically taken a bottom-up approach, soliciting inputs at the installation level to understand the scale of the problem and to develop installation-specific solutions. This report illustrates an alternative approach, by highlighting data sources and approaches that the DAF could take to develop an enterprise-wide view of installation exposure to natural hazards and develop policies targeted at improving installation resilience to natural hazards.

APPROACH

Our approach combines data on base boundaries, geospatial data on the location of airfield and select electric power infrastructure on and near a base, and publicly available data on national hazard exposure. The granularity of available data governs the extent to which we were able to characterize exposure, and, as such, the analysis presented in this report should be viewed as a first step toward more thoroughly cataloging installation exposure to natural hazards. We characterize installation-level exposure in Chapter 2. In Chapter 3, we extend the unit of study in two ways. First, we consider specific assets that compose the base (e.g., runways, taxiways, electric power infrastructure, etc.) to provide a more granular, asset-level assessment of exposure to flood and wildfire. Second, we expand the unit of study for wildfires to include critical infrastructure assets that lie outside the base perimeter but whose exposure to fires would affect operations on the base. In Chapter 4, we compare the costs of preemptively hardening a set of ten installations to high wind events against the potential costs of rebuilding post-disaster. The analysis aims to highlight and compare a set of policy choices that the DAF faces in

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making investments to preempt or mitigate the effects of natural disasters. Finally, in Chapter 5, we use hazard seasonality data to examine how the DAF might select sites for continuity of operations.

CONCLUSIONS

The uneven exposure of installations and the presence of multiple hazards mean that for the DAF to get the most out of its resilience resources, it should look critically at the entire enterprise. Some installations face high levels of exposure to the natural hazards considered in our analysis. We also find that for some hazards (such as flooding), although only a relatively small fraction of an installation might be exposed to the hazard, this exposure could have a disproportionate effect on mission performance because the exposure area intersects key mission-enabling assets. A few installations facing multiple hazards deserve special attention because it will be difficult to formulate policies that effectively address this multi-hazard exposure. Of the installations and hazards we analyzed, the following coastal installations stand out as facing multiple hazards: Eglin, Hurlburt, Keesler, Langley, MacDill, Patrick, and Tyndall.

Enterprise-wide views such as those presented in this report are particularly useful from a strategic decisionmaking standpoint because they provide the DAF with information needed to decide how to allocate resilience resources across the enterprise in such a way that reduces risk to key missions. Although we argue that the DAF should be able to improve decisionmaking by taking some decisions at the enterprise level, we stress that the uncertainties surrounding these decisions will be great, and there is no substitute for deeper-dive assessments conducted locally.

For instance, although we estimate costs of future damage in our Chapter 4 case study and discuss historical frequency of severe wind events, in reality, the actual future costs from storm damage are highly uncertain. Furthermore, the frequency and scale of these natural hazards could change in the coming years because of climate change. As a result, the process and inputs that the DAF selects for making investment decisions regarding natural hazard resilience should be flexible, allowing for updates as new information becomes available. The combination of potentially large investment costs, coupled with uncertainty about their efficacy and the magnitude and scale of future hazards, makes for an extremely complex environment for policy choices.

RECOMMENDATIONS

- Ensure that the data needed to implement policies aimed at reducing flood risk are available.
- Assess whether building standards are suited to historic and possible future wind exposure for each installation.
- Work with communities to address regional flooding and wildfire concerns.
- Pay special attention to installations that are exposed to multiple hazards.
- Develop a capability to assess installation exposure to natural hazards, and establish requisite funding mechanisms and resources at the enterprise level to address identified problems—a prerequisite is to develop a system that tracks the frequency, severity, and costs of hazards.
- Consider ways to incorporate natural hazard–related risks into key DAF decisions, such as new construction, major renovations, installation design, and mission assignment.

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