

DEPARTMENT OF THE AIR FORCE

STATEMENT BY

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BEFORE THE

SUBCOMMITTEE ON READINESS

AND

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CAPABILITIES**

**COMMITTEE ON ARMED SERVICES
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**SUBJECT: RESILIENCY OF MILITARY INSTALLATIONS TO EMERGING
THREATS**

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Introduction

The Air Force fights from our bases. We project power, generate readiness, test new platforms, train to support joint operations, and provide safe and healthy communities for our families at our bases. A global network of interdependent air bases enables the Air Force to deliver air, space, and cyberspace capabilities for joint warfighting operations. Therefore, the readiness and resiliency of our installations is a matter of strategic importance to our Nation and a necessity to meet the National Defense Strategy's call for a more lethal force.

The Air Force views installation resilience as the capability of a base to sustain the projection of combat power by protecting against, responding to, and recovering from deliberate, accidental, or naturally occurring events that impede air, space, or cyberspace operations. To meet mission requirements the Air Force must continually adapt to meet current and future threats, including severe weather, climate, energy and water disruption, and direct physical or cyber-attacks.

Through a holistic, deliberate, and proactive planning process, the Air Force incorporates resiliency measures in the development of the policy, guidance, and tools necessary to ensure our installations remain resilient in the face of threats. Leveraging our long-term Infrastructure Investment Strategy (I2S), the Air Force enhances resiliency by proactively upgrading facilities through targeted facility investments informed by powerful analytics, increased funding, evolving building codes, and improved processes.

Maintaining a resilient posture is a continual process of assessing threats and prioritizing available resources to mitigate the evolving risks to our missions created by these threats. The Air Force is taking the necessary steps to build resilient installations that are ready to withstand and quickly recover from man-made and natural events which could potentially impact our missions.

Installation Energy and Water Resilience

Energy and water are finite resources that often require long, complex, interdependent, and vulnerable logistics tails. The Air Force requires reliable power and water to accomplish both operational and training missions. The overarching vision for the Air Force's installation energy and water program is "Mission Assurance through Energy Assurance." This vision is

focused on securing the ability to perform the warfighting mission, in the face of disruptions to traditional sources, while simultaneously optimizing energy and water productivity through technology and process improvements.

When assessing energy and water infrastructure requirements, the Air Force carefully considers resilience and cost, with emphasis placed on resilience, or the ability to plan for and respond to a denial of service. From the Air Force perspective, all energy and water projects must improve resilience in some capacity. Cost, the second factor, focuses on meeting requirements in the most cost effective manner. Finally, in recognition of the supply chain value associated with renewable energy, the third factor considered in evaluating energy sources is whether the source is clean or renewable

Installation Energy Resilience

Energy enables Air Force missions; without it, our ability to project power would be halted or severely hindered. Thus, the Air Force Installation Energy program focuses on ensuring Air Force installations have the energy required to fight from our bases, at any time and in the face of any circumstance. One key focus area addresses the growing threat associated with natural or nefarious events or activities that result in a denial of service, such as missions being separated from access to the national electrical grid and the increasing potential for long duration power outages. Using mission thread analyses, the Air Force is working to identify key nodes on and off installations, pinpointing critical vulnerabilities through denial of service scenarios that begin with a comprehensive understanding of mission requirements and current system operations.

One aspect of this approach involves detailed insight into historical data associated with past power outages. In FY18, Air Force installations reported 239 notable outage incidents to their basic energy commodities (i.e. electricity, water, steam, natural gas, and waste water), with notable outages defined as greater than or equal to 8 hours. This represents a 33 percent decrease from FY17. This decrease can be partly attributed to increased investment in, and improved maintenance of energy systems on Air Force installations as well as better situational awareness, and more accurate reporting of outages.

In addition, the Air Force has partnered with the Office of the Assistant Secretary of Defense for Sustainment and the Massachusetts Institute of Technology Lincoln Laboratory in

the development of a comprehensive “pull-the-plug” exercise framework to baseline our installation power resilience capabilities and to validate vulnerabilities, requirements and system enhancements. To date the Air Force has completed one table top and one “pull-the-plug” exercise using the aforementioned framework with one more “pull-the-plug” exercise scheduled this calendar year and three proposed for next year.

Water Resource Management

Recognizing the dynamic threat environment, the Air Force is placing a renewed emphasis on water resilience. Threats to water availability range from aging water infrastructure, vulnerable utilities, or malicious attacks to water scarcity or consequential impacts from changes in precipitation patterns, water quality issues, or encroachment. The Air Force is in the nascent stages of establishing a water resources management program that moves away from managing water based primarily on conservation and condition assessments toward a risk-based approach, which more directly supports mission assurance. This shift will be in concert with an increased focus on the Air Force’s installation development and activity management planning processes. It will help provide greater transparency at the enterprise level while aiding efforts to strategically direct infrastructure investments based on mission requirements.

In addition, the Air Force recently began conducting enterprise-level threat reviews, regional analyses on water stress, and installation-level water needs assessments, as well as increased engagement with external stakeholders, such as water utilities and regional water management agencies. These efforts will drive dialogue between mission owners, installation planners, and water suppliers in anticipation of a self-assessment and data collection phase of program development. Sophisticated water stress forecasting models from the public and private sectors will provide the technical basis for the analysis.

Installation Energy and Water Planning

As the Air Force shifts its thinking away from single point solutions with fixed time horizons to more dynamic solutions for variable time lines, we are committed to reducing installation vulnerability through the incorporation of holistic resiliency measures in installation master plans. The Air Force utilizes five key resilience attributes, the 5Rs, to prioritize energy

projects and ensure targeted enabling system investments are effective in supporting mission needs. The 5Rs help describe how a system plans for crises (preventative attributes) and how the system performs in event of crises; dependent on risk, events, and time (performance attributes); the 5Rs are:

- Preventative Attributes:
 - Robustness: incorporates concept of reliability and the ability to withstand disturbances
 - Redundancy: having excess capacity and back-up systems, which enable the maintenance of core functionality in the event of disturbances
 - Resourcefulness: ability to adapt to crises, respond flexibly, and neutralize negative impacts
- Performance Attributes:
 - Response: ability to mobilize quickly in the face of crises
 - Recovery: ability to regain a degree of normality after event, including ability of a system to be flexible and to evolve to deal with new circumstances

The Air Force is developing a standardized framework for all Air Force installations to identify, track, and adjust requirements to advance the energy and water resilience goals of the installation. The Air Force intends to complete installation energy plans at seven installations by the end of Calendar Year 2019, with a target of finalizing plans for 70 major Air Force installations by the end of FY22.

In 2017, the Air Force established the Office of Energy Assurance (OEA) to balance the objectives of an installation's energy initiatives while optimizing cost and providing resilient energy solutions in support of the Air Force mission. In its role as the Energy Storefront for all Air Force energy resilience initiatives, OEA serves as the single point of entry for all installation energy requirements, and integrates energy assurance into the Air Force installation energy project portfolio by leveraging public, private, and community partnerships.

Industrial Control Systems Cyber Resilience

Industrial control systems are essential to Air Force core missions as they support critical infrastructure which enables mission capabilities across Air Force installations. Technological advancements have created more efficient control systems but have also opened up additional

avenues for adversaries to attack. Increasing threats to control systems have the potential to degrade Air Force missions. They can physically damage critical infrastructure and serve as a new attack vector to target the broader Air Force network.

In compliance with the National Defense Authorization Act (FY) 2017, Section 1650, we are conducting assessments of critical infrastructure to identify vulnerabilities. These assessments are exposing risks to missions that the Air Force was unknowingly accepting while also validating the mitigation measures we were already pursuing to increase control systems' cybersecurity and resiliency. One such mitigation is installing enclaves for network segmentation that logically isolate the infrastructure network traffic.

In effort to address some of the cross-functional challenges inherent to improving infrastructure cyber resilience, the Air Force is developing a strategy which synthesizes the technical expertise and authorities of several functional communities to enhance existing processes and develop comprehensive, integrated solutions. This strategy will complement defensive cyber operations focused on critical infrastructure. Our facility experts have been actively assisting our cyber partners as they develop Mission Defense Teams to focus on defending our infrastructure in cyberspace.

The Air Force is actively changing its culture to emphasize cyber resilience. Next year we will institute a workforce development program that, in supplement to existing general awareness training required for all Airmen, will provide tailored training and education to all Civil Engineer Airmen who are responsible for the sustainment of our facilities and infrastructure systems.

Natural Disasters and Severe Weather

The Air Force recognizes that our installations and infrastructure are vulnerable to a wide variety of threats, including those from weather, climate, and natural events. Changing climate and severe weather effects have the potential to catastrophically damage or degrade the Air Force's warfighting readiness. To ensure the Air Force is prepared to effectively combat the significant mission and readiness impacts incurred from recent severe weather events around the globe, the Secretary and Chief of Staff of the Air Force directed the stand-up of an Air Force Severe Weather Readiness Assessment (SWRA) Team.

The SWRA Team was tasked to conduct a full-spectrum assessment of recent and relevant Air Force severe weather event response readiness and identify optimized ways and means for combating risk to mission caused by future severe weather events. The SWRA Team presented their findings in spring 2019. In response, our headquarters created a Severe Weather Assessment Tiger Team who continue to work diligently to implement the SWRA's recommendations and conduct cost benefit analysis of the more complex action items. A large number of the more than 100 recommendations from the SWRA will be implemented, many of which drive new facility standards to be implemented as facilities are recapitalized.

To mitigate risk and assure mission accomplishment, the Air Force incorporates resiliency attributes into our facility projects when constructing new facilities with Military Construction (MILCON) funds and through Facility Sustainment, Restoration and Modernization (FSRM) funded repair projects. The Unified Facility Criteria, which provide design and construction standards for all Department of Defense facility projects, are routinely reviewed and updated, some as often as yearly, to ensure the latest design standards, industry practices, and lessons learned are incorporated.

For example, the Air Force is applying lessons learned from past severe weather events in the Tyndall Air Force Base (AFB) rebuild effort by leveraging adaptation opportunities which will increase installation resiliency after the impacts of Hurricane Michael. Informed by historic and projected flood elevations, we developed design flood criteria for new construction at Tyndall AFB. Additionally, we are incorporating best practices used in Florida's High Velocity Hurricane Zone, which is applicable to Miami-Dade County. These and other resiliency measures ensure Tyndall AFB is rebuilt with agile, flexible, smart facilities that are resilient to future severe weather events.

On the policy front, the Air Force continues to update relevant policies as they evolve to enhance our risk management framework, most recently by including consideration of climate and severe weather as potential hazards within our mission sustainment, integrated installation planning, and environmental management portfolios. Generally, the Air Force takes a base-by-base approach to building resilience to climate and severe weather impacts, as every installation location is affected by different local weather and geography.

The Air Force is collaborating with OSD and other Component Services to conduct a more robust exposure analysis of selected installations via a tool currently under development. Future

site-specific studies may build on the exposure results to estimate overall vulnerability and risk and help assess where best to apply resources to improve adaptation and resiliency and maintain mission capability.

Climate adaptation and resilience is critical to Air Force mission assurance and the sustainability of our installations as our power projection platforms. It is essential the Air Force continues to integrate climate adaptation and resiliency into our processes and decisions and to invest, as necessary, to minimize risk and ensure we retain the ability to operate. Continued cross-feed of lessons learned and success stories, as well as partnering with communities and host nations, enhances our abilities to meet common climate threats while delivering capabilities.

Infrastructure Investment Strategy

Building readiness and resiliency into our Air Force installations requires a long-term vision, understanding of the foundational components which support our missions, proactive investment practices, and a well-resourced strategy with predictable funding levels. Foundational to the success of Air Force resilience efforts is the Infrastructure Investment Strategy (I2S). Signed into policy in January 2019, the Air Force I2S is a proactive, long-term plan to restore our infrastructure readiness, improve resiliency for mission critical nodes, and reduce the backlog of deferred maintenance at the lowest life cycle cost.

Deteriorating components of our infrastructure introduce vulnerabilities that increase the risk of damage during routine or severe weather events. For example, the separation of roofing materials on a facility can render its interior vulnerable to environmental conditions that could accelerate deterioration. A strong wind storm could easily lead the weakened roof to collapse, undermining the facility's structural integrity and causing catastrophic failure.

Notably, I2S strives to cost-effectively modernize our infrastructure, implement innovations in installation management, and stabilize funding levels to reduce the risk we have assumed due to decades of challenging fiscal conditions. In order to maximize impact in a short period of time, we will assess mission thread vulnerabilities and prioritize infrastructure repair requirements that directly affect the primary mission of an installation.

Ultimately, I2S provides a feasible remedy to preserve the health of our facilities and infrastructure. By embracing a cost-effective infrastructure investment approach, the Air Force intends to save billions of dollars over the next 30 years through targeted infrastructure

investments, and reinvest these savings back into our bases to buy-down our maintenance backlog and improve installation resilience.

Emergency Management and Disaster Response

Equally vital to resiliency as proactive planning and investments, is our emergency management and disaster response capabilities. Using the National Incident Management System as its foundation, the Air Force Incident Management System unifies Air Force programs with interagency, state, and local communities across the emergency management mission areas of prevention, protection, mitigation, response, and recovery. The Air Force mandates every installation worldwide to have an Installation Emergency Management Plan. Each Air Force installation has an all-hazards response planning team that identifies the greatest threats to that installation and ensures they are addressed in the Installation Emergency Management Plan. An emergency management “all-hazards” assessment includes any incident, natural or manmade, that warrants action to protect life, property, health, and safety.

Through annual exercises of the Installation Emergency Management Plans, our installations are ready to face any disaster. Two days before Hurricane Michael hit Tyndall AFB it went from a Category 2 with no sights on the installation to a Category 4 with direct line of sight on the installation. Due to emergency management preparedness, emergency management exercises, and installation emergency management plans, Tyndall AFB evacuated all mission capable aircraft, military members, and families in less than 48 hours. The result: *no loss of life or aircraft*.

Additionally, smart investments in infrastructure after each disaster result in future cost avoidance, increased mission effectiveness (requiring less time to open the installation and airfield), and safety for Airmen, civilians, and families. In 2003, Hurricane Isabel hit Joint Base Langley-Eustis (Langley AFB) with a 7.9-foot storm surge and 62 mph winds causing \$146 million in damage. Fast-forward to 2011, Hurricane Irene struck Joint Base Langley-Eustis with a 7.5-foot storm surge and 85 mph winds. Post-Isabel investment decisions and updated preparation procedures contributed to personnel reopening the airfield and installation in less than 24 hours. Additionally, the storm only caused \$1.5M in damage versus the \$146M in 2003. The Air Force will continue to learn from past events in preparing for future disasters, with a focus on ensuring

the safety of our military personnel and their families while mitigating threats to effective mission generation capabilities.

Conclusion

The Air Force We Need requires sustainment of ready and resilient Air Force installations. Prudent planning, underpinned by the Infrastructure Investment Strategy, ensures the resilience of our installations as power projection platforms and maintains strategic alignment with the National Defense Strategy to enhance combat capability. The strategic importance of our Air Force installations requires us to focus on infrastructure investments to ensure bases provide the resilient capability and capacity that we need for both today and tomorrow's fight.