

DEPARTMENT OF THE AIR FORCE PRESENTATION
TO THE SUBCOMMITTEE ON READINESS
COMMITTEE ON ARMED SERVICES
UNITED STATES HOUSE OF REPRESENTATIVES

SUBJECT: DEPARTMENT OF THE AIR FORCE ACTING ASSISTANT SECRETARY OF
THE AIR FORCE FOR ENERGY, INSTALLATIONS, AND ENVIRONMENT WRITTEN
TESTIMONY FOR AN ENERGY, INSTALLATIONS, AND ENVIRONMENT PROGRAM
UPDATE

STATEMENT OF:

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Introduction

Chairman Garamendi, Ranking Member Waltz, and distinguished members of the Subcommittee. Thank you for the opportunity to discuss Department of the Air Force (DAF) energy, installations, and environment programs. Installations are platforms to enable and project combat power. Every DAF mission starts and ends on an installation. We train and equip for joint operations, project power, generate readiness, test new weapon systems, and provide safe and healthy communities at our Air and Space Force installations. DAF installations also serve as key nodes in a global network of operating locations enabling Joint Force mission success around the world. Additionally, for a significant number of our 500,000 Airmen, Guardians, and their families, DAF installations are “home.” Hence, the readiness, resiliency, and sustainability of installations are matters of strategic importance.

Our Nation faces the nexus of complex challenges: the rise of great power competition with China and Russia; the increasing complexity of multi-domain threats; fiscal pressures; the competition for access to resources in the Global Commons; and the increasing rate of technology change. Finally, we continue to experience the effects of changing climate, exemplified by the growing strength and frequency of extreme weather events, wildfires and droughts. Unmitigated, these endanger not only our Airmen and Guardians, and the places where they live and work, but our weapon systems, infrastructure, and water and power networks.

In the face of these challenges, the DAF has made hard choices to prioritize decisions focused on integrated deterrence in an environment of shrinking advantage against aggressive competitors, operating in an evolving natural environment. The DAF Military Construction (MILCON) program prioritizes nuclear enterprise modernization and Combatant Command (CCMD) infrastructure support in the European and Pacific theaters. We also fund high return-on-investment operational energy initiatives, which increase our readiness and provide more combat capability for every gallon of fuel consumed while simultaneously reducing greenhouse gas (GHG) emissions. Furthermore, we preserve the well-being and quality of life of our service members and their families through investments in housing, dormitories, child development centers (CDCs), and community support facilities. We remain committed to sustaining the DAF’s power projection and enabling platforms—our installations—and appreciate the continued partnership with Congress to ensure Air and Space Forces are well-postured to compete, deter and

win.

Installations

The DAF continues to balance risk in installation investment in order to prioritize resources to our most mission-critical needs, ensuring the Department can continue to deliver combat capability to the Joint Force. The DAF is performing installation investment through implementation of our Infrastructure Investment Strategy (I2S), increased senior leader oversight of the portfolio, and reforms within our MILCON program. First introduced in 2019, the I2S is the Department's long-term strategy to cost-effectively modernize and restore infrastructure readiness, improve the resiliency of mission-critical nodes, and drive innovation in installation management practices.

In an effort to leverage advanced infrastructure risk analytics, the DAF continues to develop predictive models which use current building condition information to advance requirements. As a result, the DAF developed our first five-year Integrated Priority List (IPL) for Facilities Sustainment, and Restoration and Modernization (FSRM) projects for the FY21-25 program and continues it this year. It is a key step in our intentional shifting from a "worst-first" prioritization approach to investing at the optimal time of the lifecycle for a facility.

DAF senior leaders oversee I2S implementation efforts through the biannual Infrastructure Program Management Review, where we review and provide guidance on the direction of I2S initiatives. In order to assess the impact of funding and asset management practices on infrastructure readiness, the DAF developed a series of metrics. These metrics quantify the impact of I2S policies on infrastructure condition, investment decisions, facility space use, and MILCON cost growth. Assessing the impact of I2S initiatives on a regular basis allows senior leaders to make timely decisions that affect not only execution of the program but future budget decisions as well.

Operational Energy

Our Joint Force wargames have highlighted the critical need to defend our energy networks at home and abroad, from our bases to forward deployed locations. Contested and competitive operating environments and the changing geopolitical landscape threaten our fuel and power supplies like never before. The DAF does not—and will not—have undisputed access to the substantial energy resources we require to operate around the world. In order to achieve our global mission, warfighters must have assured access to energy resilient to all hazards and threats.

In light of this, the DAF infuses energy considerations into the strategic planning process while investing in energy Research, Development, Test, and Evaluation (RDT&E). We aim to ensure the acquisition system values and enhances the energy supportability of future platforms and operations, considering a full range of resilient, cyber-secure, and sustainable energy solutions to meet the needs of mission critical functions while decreasing energy demand where possible. Through exercises, wargames, and modeling and simulation, we are incorporating energy resilience into emerging joint operational concepts to better identify and mitigate risk.

Tackling the Climate Crisis

Last fall, the Secretary of Defense released the DOD Climate Adaptation Plan and DOD Climate Risk Analysis, emphasizing climate as a national security priority. Over the past several years, we have seen first-hand the impacts climate and severe weather can have on our installations and operations. Increasing temperatures, changing precipitation patterns, and more extreme and unpredictable weather conditions pose new risks to DAF operations, readiness, installations, and facilities. The effects of climate change on the DAF are accelerating; the time for action is now. As the largest fuel consumer in the DOD, the DAF is not only addressing the need for climate adaptation to improve our resilience, but introducing climate mitigation efforts to optimize fuel consumption and reduce our logistics burden, while simultaneously reducing greenhouse gas emissions. Additionally, the DAF is developing a comprehensive Climate Action Plan aligned with our national security imperatives that lays out our climate priorities and actionable goals to address the complex threat of climate change.

In recent years, Congress has included numerous provisions in legislation to enhance installation resilience efforts across the Department of Defense. The DAF, in conjunction with the Office of the Secretary of Defense (OSD), is implementing these provisions. We are incorporating climate and energy resiliency considerations into Installation Development Plans (IDPs), while over 90 locations completed the hazard screening and risk assessment portions of the *DAF Severe Weather and Climate Hazard Screening and Risk Assessment Playbook*. The *Playbook* gives installation-level planners a consistent and systematic framework to screen for severe weather and climate hazards and assess current and future risks. We will include these results into Installation Climate Resilience Plans (ICRPs), serving as the military installation resilience component of our major military installation master plans by the end of FY25. Additionally, we completed 52 Installation Energy Plans in 2021 to identify risks and track and adjust requirements to advance

energy and water resilience goals.

The DAF is integrating resiliency considerations into MILCON and other construction projects as well. We assess all projects to determine if the planned facility could be impacted by current or future mean sea level fluctuations or if it is located in a 100-year floodplain for non-critical facilities and a 500-year flood plain for critical facilities. We implement resiliency actions when required by the mission or when feasible and cost-effective. The DAF drives changes to the Unified Facilities Criteria (UFCs) and then applies those revised building codes to all MILCON projects. Many of these UFCs have been updated to specifically incorporate resilience considerations, such as sea level rise scenario planning and updated structural engineering criteria to address wind, seismic, and flood threats.

The DAF is also incorporating operational energy efficiency initiatives to reduce risk to the warfighter, increase lethality, and reduce our climate impact. We are working to implement a number of energy-informed solutions into operations that will increase aircraft range, streamline mission execution, and improve readiness, while also mitigating greenhouse gas emissions.

To help address these challenges, the DAF is prioritizing the development of a climate-informed workforce, and leveraging data and analytics to make climate-informed decisions. Creating a climate literate workforce is fundamental to finding solutions to the climate crisis. The DAF must educate the force, including senior leaders, to create a culture where Airmen and Guardians understand the implications of climate change and are capable of making climate-informed decisions. Climate considerations will continue to be incorporated into our guidance, plans, and policies to ensure our Air Force and Space Force investments in facilities, infrastructure, and installation energy promote resilience to more frequent and severe weather events, while maximizing our readiness with a reduced energy footprint.

Special Interest Items

Winter Storms of 2021

Winter storms in early 2021 throughout much of the Midwest and southern United States had a considerable impact on DAF installations, with damage amounting to \$330 million at 24 installations. A majority of the damage resulted from burst water and fire suppression lines due to freezing. Our personnel prepared our installations admirably, but numerous factors—including

sustained periods of extreme cold, degraded facilities and infrastructure, and off-base power and water supply issues—led to damage and temporary interruptions. Several installations experienced limited power or water interruptions consistent with interruptions experienced in their local communities. Back-up energy sources and contingency plans, as well as effective coordination with commercial power and water suppliers, were generally effective in minimizing the length and impact of utility interruptions. In some cases, such as at Offutt AFB, installations used on-base power plants and generators to supply their own power. These efforts were instrumental in helping the utility provider stabilize the power grid and minimize rolling blackouts in the community.

Natural Disaster Recovery Efforts

Through the Natural Disaster Recovery program, the DAF will rebuild Tyndall AFB, FL, and Offutt AFB, NE, in a more efficient and resilient manner. We are designing and constructing facilities using the latest UFCs. To buttress Tyndall AFB from future effects of climate change, the DAF made a policy decision to design beyond the minimum UFC criteria for civil and structural engineering. We used a minimum design wind speed of 165 miles per hour for all new facilities, exceeding the highest wind speed captured during Hurricane Michael, and incorporated best practices from the Florida Building Code’s High Velocity Hurricane Zone for Miami-Dade, Broward, and coastal Palm Beach Counties. Facilities are also being designed 14 to 19 feet above today’s mean sea level, which incorporates a 7-foot projected sea level rise scenario through the year 2100.

Additionally, we emphasized coastal resiliency in the plan for Tyndall AFB. This partnered approach includes cost-shared investments, which combine with DAF investments to attenuate storm energy through natural infrastructure before it reaches built infrastructure. Key partners such as the Defense Advanced Research Projects Agency, Fish and Wildlife Service, Bay County, the Florida Department of Environmental Protection, and the University of Florida are working together as part of OSD’s Readiness and Environmental Protection Integration Program. We are exploring several low life-cycle cost “Engineering with Nature” initiatives, to include sand fencing, submerged shoreline stabilization, living shorelines, oyster reefs, and marsh and seagrass enhancements.

At Offutt AFB, we are consolidating facilities to higher ground—out of the 100-year floodplain. Where relocation is not possible due to mission requirements, we are raising the

finished floor elevation above the floodplain and building in a way to minimize clean-up should flooding occur again.

Taking Care of People

In early 2020, the DAF established a cross-functional Child Care Capacity Initiative Working Group to address unmet child care needs. This team prioritized child development and school age care facility projects based on unmet child care demand, staffing, and building conditions. We issued a Strategic Enterprise Executive Decision memo directing installations to initiate planning actions for 14 projects identified on the prioritized list. The DAF is using the \$11 million in MILCON P&D funds provided in FY20 to initiate designs and posture these projects for future execution. Five of our top priority child development centers (CDCs)—Sheppard AFB, TX; Joint Base San Antonio (JBSA)-Lackland, TX; JBSA-Fort Sam Houston, TX; Wright-Patterson AFB, OH; and Royal Air Force (RAF) Lakenheath, in the United Kingdom—were authorized in the FY22 NDAA. Construction of a new CDC at Tyndall AFB is scheduled to be complete by December 2022, and construction of a new CDC at Joint Base Andrews, MD, is expected to be ready to award in the summer of 2022. Because CDCs have not historically competed well against other mission-related priorities in the MILCON program, we have turned to FSRM resources to address childcare facility concerns while we posture MILCON projects for future execution. We will have 10 FSRM projects, valued at \$38 million, ready to award in FY22, pending appropriations.

The DAF is also committed to ensuring unaccompanied service members are provided quality housing on our dormitory campuses. The Department has underscored the roles and responsibilities of Commanders in protecting the health and safety of unaccompanied Airmen and Guardians. Commanders enforce inspection criteria to identify and report conditions requiring immediate and future maintenance, as well as adequately resource maintenance and repair programs to effectively address requirements. Funded from the DAF FSRM account, the investment strategy for dormitories focuses on restoration and modernization of these facilities in their existing configurations. This enables the DAF to focus MILCON funds on modern, formal training facilities for newly recruited Airmen, such as the Airman Training Center at JBSA-Lackland.

Space Force

In accordance with Department of Defense direction that the Space Force be established as a lean, agile, mission-focused military Service, the Space Force will rely on the Air Force for infrastructure, logistics, security, medical services, and a host of other support functions at their bases. Formal agreements and implementation plans are in place to codify all stakeholder roles and responsibilities. In FY22, the DAF will transfer FSRM, unaccompanied housing, and facilities operations funds to the Space Force for execution. The Space Force also developed a separate governance process for their infrastructure investments, leveraging current DAF processes, to ensure strategic alignment of investments to Space Force priorities.

FY22 MILCON Program

In FY22, the DAF MILCON request was \$2.38 billion, approximately double the FY21 enacted amount. This return to previous funding levels will support the DAF's commitment to fulfilling 2018 National Defense Strategy (NDS) requirements, posturing for the future high-end fight, and taking care of our Airmen, Guardians, and their families.

The program supports Combatant Commanders with a focus on the Pacific and European theaters and modernizing the nuclear enterprise. Our request also focused on P&D to reinforce the Department's MILCON program stability and consistency. Additionally, the MILCON program continues efforts to bed down new weapons systems and seeks to recapitalize facilities that have outlived their useable life or no longer meet mission requirements.

Combatant Commander Infrastructure

The FY22 MILCON program prioritized Combatant Commander requirements with a particular emphasis on the Pacific and European theaters. Support to U.S. Indo-Pacific Command will enhance the United States defensive posture in the region, reassure allies and partners, and increase readiness capabilities. The request included \$545 million for projects in Alaska, Guam, Japan, and Australia to recapitalize key facilities, disperse resources, and construct operational facilities as well as Pacific-focused P&D. The request also included construction of three warehouses to store pre-positioned Airfield Damage Repair equipment and materials in Guam and Japan, aircraft operations and maintenance facilities in Australia and Japan, munitions storage structures in Guam and Japan, and a runway extension to increase airfield capacity in Alaska.

The DAF remains committed to European Defense Initiative (EDI) efforts to reassure North Atlantic Treaty Organization (NATO) allies and other European partners of United States commitment to collective security and territorial integrity. In FY22, the DAF requested \$184.4 million for EDI and other European theater projects to include support for the prepositioning of equipment in the United Kingdom, as well as airfield upgrades in Hungary and Spain. These projects will further improve deterrence efforts in the theater and enable joint and coalition forces to quickly respond to aggressive regional actors. The DAF request also included support to Combatant Commands within the United States to include a continued focus on Weapons Generation Facilities and Joint Air Defense Operations which directly supports U.S. Strategic Command and U.S. Northern Command, respectively.

New Mission Bed Downs

The FY22 budget request also supported the bed down of new weapons systems and missions, with a heavy focus on modernizing the nuclear enterprise. The request included six projects at Ellsworth AFB, SD, to bed down the first B-21 Raiders, and three projects at Hill AFB, UT, and Vandenberg Space Force Base (SFB), CA, to support transition from the Minuteman III intercontinental ballistic missile weapon system to the Ground Based Strategic Deterrent (GBSD). The 2018 NDS directs the Department of Defense to build a more lethal force by modernizing key capabilities, the first of which are nuclear forces. Once on-line, these weapons systems will ensure the DAF can effectively supply two-thirds of the nation's nuclear triad well into the future.

The DAF appreciates the legislative authorities which posture the GBSD program for success. The FY21 NDAA provided significant flexibility for the Launch Facility/Launch Center conversion under MILCON authorization, authorized \$15 million of MILCON P&D for GBSD, enabled all GBSD construction to be carried out under direction and supervision by the Secretary of the Air Force, and allowed a single prime contractor to plan, design, and construct all GBSD projects. The DAF will continue to inform Congress on the Department's progress during design, construction, and commissioning of GBSD facilities.

The FY22 President's Budget also requested funding for two projects at RAF Lakenheath to construct operational facilities for the F-35A bed down. Additionally, the request reinserted two F-35A project at Luke AFB, AZ to provide flight training and planning space and additional maintenance capacity. Lastly, the budget request included a three-bay depot maintenance hangar

at Tinker AFB, Oklahoma to directly support reliable and responsive infrastructure for the KC-46A weapons system depot maintenance.

Existing Mission Recapitalization

The FY22 budget request also sought \$447.4 million to recapitalize facilities that surpassed their useable life or no longer met mission requirements. This request included additional funding for our Basic Military Trainee Recruit Dormitory modernization, to include reinserting Dormitory 7 back into the program at JBSA-Lackland. The Air Force previously cancelled Dormitory 7 to cover funding disconnects with the other dormitories in the program, but in FY22, the time was right to bring this requirement back into the budget to construct the final dormitory required for bringing new Airmen and Guardians into the Service. Other recapitalization projects included the Nuclear Command Control and Communications Acquisitions Management Facility at Hanscom AFB, MA, which provides a critical facility for the Air Force Nuclear Weapons Center, a crash fire rescue station at Joint Base Andrews, MD, and a gate project at Davis-Monthan AFB, AZ.

Planning and Design

P&D remains a central focus of the DAF MILCON program to reinforce program stability and consistency. Sufficient P&D enables projects to progress rapidly through design and meet maturity criteria for admissibility into the program, provides more accurate cost estimates, and maximizes opportunity to award projects in the year of appropriation. Without sufficient P&D, the DAF must award designs by design phase, which adds risk associated with costs and timely delivery of design. With the FY22 P&D request of \$229.3 million, the DAF intends to complete remaining design requirements for our FY22 program, fully fund designs for our planned FY23 and FY24 projects, and initiate design for FY25. The outcome of our two year budget lock policy is a stable MILCON program allowing us to efficiently use P&D for future projects.

Facilities Sustainment, Restoration, and Modernization (FSRM)

We view the FSRM and MILCON programs as interdependent; together, these two funding streams serve as the foundation of sustainable DAF installations. FSRM provides a non-MILCON pathway to repair facilities and infrastructure, maximizing their lifespan. The FY22 budget request of \$4.55 billion in FSRM funding was a 20% increase from FY21-enacted levels.

Our I2S drove changes in how we execute the FSRM program by prioritizing projects based on mission risk and timing investments at the optimal point in the asset lifecycle. The centralized FSRM scoring model targets investments at an asset’s “sweet spot” in its life cycle rather than at end-of-life failure, which is significantly more expensive. FSRM funding distributed directly to installations (considered decentralized FSRM), empowers Commanders to make the right local investment decisions, including day-to-day maintenance and smaller scale repair and sustainment projects, based on mission requirements and I2S guidance.

The DAF will continue to utilize I2S principles to restore the health of our installations by refining business processes and implementing private sector best practices. These include implementing cost management strategies specific to different spending categories, leveraging data to improve the timing of sustainment and recapitalization actions, and establishing standards of services and equipment to achieve economies of scale. In order to maximize the near-term impact of current funding levels, the DAF will also continue to assess mission thread vulnerabilities and prioritize infrastructure repair requirements which directly affect an installation’s primary mission.

Housing Construction and Operation and Maintenance

The DAF prioritizes providing safe and healthy homes to our families. The DAF Housing program provides for housing construction, P&D, and operations and maintenance. These funds will support a continued focus on eliminating inadequate housing from the DAF inventory and correcting health and safety deficiencies. The military family housing construction program enables planning studies and design for future construction projects, renovation of existing homes, and support the restructures of privatized housing projects.

The high cost of construction continues to present challenges to improvements of DAF-owned family housing. The increased cost of construction requires solutions within the DAF family housing construction program to include cancelling projects as a result of significant cost increases and using existing resources to achieve full scope on other projects. The DAF continues to focus investment in the DAF housing inventory to provide adequate housing for all service members and their families.

Our military family housing operation and maintenance enables us to sustain, improve, and modernize our Government-owned inventory of approximately 15,200 family housing units and provide enhanced oversight of over 55,000 privatized homes. Combined, the family housing operations and maintenance and construction programs will ensure continued support for the housing needs of Airmen, Guardians, their families, and our Army, Navy, and Marine Corps teammates housed in government-owned and privatized inventory.

Privatized Housing

The DAF is committed to ensuring that Military Housing Privatization Initiative (MHPI) projects provide safe, quality, well-maintained housing where military members and their families will want and choose to live. We remain focused on improving our privatized housing portfolio and addressing the remaining elements of the MHPI reforms set out in the FY 2020, FY2021 and FY2022 National Defense Authorizations Acts (NDAA). The DAF has made significant progress implementing reforms to enhance our oversight of privatized housing and hold MHPI companies accountable for delivering quality housing that provides a positive living experience for tenants.. An important effort is the DOD MHPI Tenant Bill of Rights. On August 1, 2021, DOD issued a revised and updated MHPI Tenant Bill of Rights that includes all 18 rights set out in 10 U.S.C. 2890. Applying many of these rights at existing MHPI housing projects requires voluntary agreement by the private companies who own, operate, and maintain the projects. Most DAF companies have agreed to implement all 18 rights at their existing projects. With few exceptions, all rights are fully available at all installations with DAF MHPI housing.

The DAF has improved oversight by adding 218 government positions across the privatized housing program, increasing inspections, providing additional training to housing personnel and revamping housing governance placing more structure to housing policy and management. Resident Councils have been established at DAF sites to provide two-way communication between the residents and installation and project owner leadership. Additionally, the feedback from tenant satisfaction surveys (work order and annual) are used to develop action plans for improving the resident experience. The DAF has also established Resident Advocates at DAF sites to engage with residents, installation leadership and MHPI companies and its property management representative to help resolve any disputes at the lowest level and improve

communications with all stakeholders. In addition, the DAF established a toll free housing call center where tenants have 24-hour access to elevate concerns.

The DAF has expanded its metrics for assessing the health of the privatized housing portfolio, particularly with regards to resident satisfaction, maintenance quality and responsiveness, and property management operations. Many of these business health metrics are now also included in the new Performance Incentive Fee (PIF) agreements DAF has negotiated with its largest private partners giving them a financial incentive to meet or exceed the standards established for our MHPI program.

Timeliness and thoroughness of repairs continues to be a challenge, compounded by the national labor shortage and complications posed by COVID; however, indications are that maintenance quality is holding steady or improving, as evidenced by work order survey data and Military Housing Office change of occupancy maintenance inspections. The DAF has implemented a Portfolio Assessment Program that places increased emphasis on maintenance performance and change of occupancy maintenance, driving engagement at all levels with the project owners to improve performance.

The DAF continues to remain focused on improved oversight, long-term project health, and sustainment of the housing inventory to provide military families access to safe, quality, affordable, and well-maintained housing communities where they choose to live. Some privatized housing projects will require financial restructuring to continue to remain financially stable and market comparable. The restructure goals are to fully fund operational expenses, debt servicing, and sustainment of the homes for the life of the lease and to fund reinvestment needs during the mid-term reinvestment period.

Environmental Stewardship

The safety and health of the Airmen and Guardians who work and live on our installations, their families, and the surrounding communities are DAF priorities. The FY22 budget request included \$302 million in funding for Environmental Restoration activities associated with the cleanup of active installations, including munitions sites, to meet our obligations to protect human health and the environment. The FY22 budget request also included \$445 million for Environmental Quality programs such as environmental compliance, environmental conservation,

and pollution prevention, and ensures environmental considerations are successfully integrated into the DAF mission and planning. The DAF greatly appreciates Congressional support for our efforts to address per- and polyfluoroalkyl substances (PFAS) and continue Environmental Restoration Program progress.

Environmental Restoration

The DAF currently has approximately 13,000 restoration sites at our active and closed installations. We remain focused on meeting our restoration obligations under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and under the Resource Conservation and Recovery Act (RCRA). The objectives of the investigations and environmental response actions performed under these statutes are to reduce risk to human health and the environment in a risk-based, prioritized manner. Recently, much of our restoration program focus has been on chemicals of emerging concern, most notably, PFAS. The DAF PFAS strategy is summarized below.

DAF PFAS Strategy

DAF began using aqueous film forming foam (AFFF) in accordance with the DOD MILSPEC, published in 1969. This legacy AFFF contained perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). Evolving science has identified risks to human health after PFOS and PFOA exposure and regulatory standards are under consideration by the Environmental Protection Agency (EPA) and a number of states. The DAF PFAS Strategy has focused on PFOS and PFOA based on the EPA lifetime drinking water Lifetime Health Advisories (LHAs) for these compounds. Our primary objective under the DAF PFAS strategy continues to be ensuring that no one, on or off our installations, is drinking water with PFOS/PFOA concentrations above EPA's 70 parts per trillion LHA attributable to the DAF. The DAF PFAS strategy focuses on using CERCLA authorities to investigate, define, and, as necessary, ultimately remediate groundwater and soil impacted by DAF activities. The DAF also conducts a robust effort to communicate and collaborate with local communities, State and Federal agencies, and elected officials at all levels. Recognizing the DOD is only one source of PFAS, we are actively engaged with other government agencies working to identify and address other sources, exposure pathways for humans and the environment, and health effects of PFAS. The DAF framework guiding our response to PFAS issues is built on these themes: Protect Human Health; Communication and Collaboration; and a Whole of Government Approach.

In prioritizing CERCLA environmental response actions, the DAF uses a risk-based decision-making process with protection of drinking water as a top priority. Although the DAF does not program restoration funds by chemical, the DAF has obligated \$724 million as of the end of fiscal year 2021 identifying, investigating, and responding to PFAS releases, completing drinking water response actions at 38 installations (including implementing bottled water, point-of-use filtration, whole-house filtration, and municipal water supply hookups), and completing initial PFAS CERCLA Site Inspections at 92 installations. The FY22 NDAA authorized \$175 million to allow DAF to continue to address PFAS impacts at installation across enterprise. As of December 2021, the DAF had awarded CERCLA Remedial Investigation contracts for 79 DAF installations. While the DAF takes quick actions under CERCLA to address drinking water impacts, the remaining cleanup efforts are intended primarily to address PFAS in groundwater and soil, which can be technically complex and take a long time to complete.

The complex nature of the challenges posed by PFAS remediation and the evolving regulatory environment require the use of a Whole of Government Approach. To facilitate inter-Service coordination, DAF is an active member of the DOD PFAS Task Force, which works toward finding ways to mitigate and eliminate use of AFFF as currently formulated, understanding the impacts of PFAS on human health, and fulfilling cleanup responsibilities related to PFAS. The DAF also conducts a robust effort to communicate and collaborate with local communities, State and Federal agencies and elected officials.

Environmental Quality

The DAF ensures a resilient natural infrastructure and maintains sound environmental stewardship by funding compliance with applicable environmental laws. The environmental compliance program focuses on regulatory compliance for our air, water, and land assets. Examples of compliance efforts include detailed air quality assessments to analyze environmental impacts from DAF activities, sound management of our underground and above ground storage tanks, hazardous waste management and disposal, and ensuring environmental plans and permits are compliant and up-to-date.

Efforts in pollution prevention include maximizing the diversion of solid waste from landfills to reduce the volume and cost of disposal, recycling used oil, fluorescent light bulbs, and

spent solvents, and supporting our hazardous materials pharmacies to effectively reduce and safely manage the use of hazardous materials. We also continue to protect the health of our Airmen, Guardians, and the environment by making investments to minimize hazardous waste disposal through the demonstration and validation of new technologies.

We remain firmly committed to a robust program of conservation management covering a full suite of environmental, natural, and cultural issues. Prior appropriations have allowed the DAF to invest in conservation activities on and around our training ranges that provide direct support to mission readiness. The conservation program in FY22 supports ongoing habitat and species management efforts for 123 threatened and endangered species found across 54 DAF installations, and provides for continued cooperation and collaboration with the other military Services and with other federal government agencies such as the United States Fish and Wildlife Service. The DAF Cultural Resources Program supports mission needs through 119 Integrated Cultural Resources Management Plans. These plans work to preserve 7,066 historic buildings and structures and protect 22,559 archaeological sites. Recent efforts carried out at Eglin AFB, FL, is one such example of integrated conservation management. Archaeologists at Eglin teamed with biologists and conservationists from the Choctawhatchee Basin Alliance to construct a series of “Living Shorelines” to protect sensitive archaeological sites from shoreline erosion while also enhancing natural habitat and water quality.

Partnerships like these help us preserve cultural resources and provide effective ecosystem and habitat management, including wildland fire and invasive species management. These partnerships also support ongoing natural resource management efforts that focus on addressing imperiled and invasive species, critical habitats, and other key natural resources on installations to avoid or minimize mission impacts. Working collaboratively with the United States Fish and Wildlife Service through the DOD Recovery and Sustainment Partnership, the DAF enhanced mission operations and increased range access while protecting at-risk species leading to the proposed down-listing of one threatened and endangered species and the delisting of another.

The DAF remains committed to responsible environmental restoration and quality. As trustee for more than 8.3 million acres of land including forests, prairies, deserts, wetlands, and coastal habitats, the DAF understands the important role natural resources plays in maintaining our mission capability. To maintain military readiness the DAF needs realistic test and training environments, which themselves are ecosystems. Quite simply, if we do not maintain the

ecosystems we rely upon to continue our test and training mission, and clean up the impacts of past mission activities, we understand we will not be able to achieve or maintain military readiness.

Base Realignment and Closure (BRAC)

The BRAC cleanup program funds environmental restoration and property transfer activities at 34 former DAF installations closed through prior BRAC initiatives. Our BRAC cleanup program focuses on protecting human health and the environment, projects that transfer acreage and achieve beneficial reuse of property, and investigations and response actions associated with PFAS. Through the BRAC process the DAF has closed 40 installations and sites and transferred more than 98% of the property back to communities for beneficial use, producing \$2.9 billion in annual savings. Property transfer is complete for 35 former installations, and we expect to complete transfer of the remaining 1,840 acres at five former installations by 2027. The DAF greatly appreciates Congressional support for our efforts to address PFAS contamination and continue the cleanup and transfer of BRAC properties.

Installation Energy and Water Resilience

Reliable access to both quality power and water enables the DAF to continue its operational and training missions. The DAF views energy and water as both essential and linked resources, so any energy initiative implies consideration to water as well. Accordingly, the DAF established the vision of “Mission Assurance through Energy and Water Assurance.” This vision focuses on sustaining warfighting capabilities despite potential disruptions to enabling systems, like energy and water, while simultaneously optimizing the use of those resources through enhanced planning, technology, and process improvements.

The DAF assesses near- and long-term energy and water needs based on resilience, cost considerations, and the opportunity to leverage clean sources. Resilience is at the core of DAF’s assessments because the DAF seeks continual operations in the face of challenges and the ability to bounce back from adversity. All DAF installation energy and water projects must improve resilience in some capacity across the key attributes (the “5Rs”): robustness, resourcefulness, redundancy, response, and recovery. Qualifying resiliency projects include, but are not limited to microgrids, clean energy generation and storage, and energy conservation efforts.

Installation Energy Resilience

Energy enables DAF missions, so the DAF Installation Energy Program focuses on ensuring Air Force and Space Force installations have the requisite energy. The DAF applies the “5Rs” to assess gaps, prioritize energy projects, and ensure enabling system investments are effective in supporting mission needs in order to reduce potential vulnerabilities from energy and water. The “5Rs” help describe how a system plans for crises, with the preventative attributes of robustness, redundancy, and resourcefulness, as well as how the system functions during crises, with the performance attributes of response and recovery.

Natural hazards and adversarial threats pose a growing risk for prolonged power outages for installations. Using a mission thread perspective, the DAF is working to identify key nodes on and off installations that, in a denial-of-service scenario, may result in a significant impact on the DAF’s ability to deliver key capabilities. A comprehensive understanding of mission requirements, current system operations, accurate reporting, and historical outage data assist in identifying possible service vulnerabilities. Through increased investment in, and improved maintenance of, these energy systems, the DAF is striving to decrease the number of outages on installations.

The DAF is conducting Energy Resilience Readiness Exercises (ERREs) to help installations assess mission readiness during a controlled denial of service. Under an ERRE, also referred to as “pull-the-plug” and “black start” exercises, an installation intentionally shuts down its primary power for as long as 12 hours to test its onsite backup power systems and identify how infrastructure, mission interdependencies and enabling system capability will react during a denial of service. Through FY21, the DAF has completed six ERREs, including the DOD’s first joint base ERRE, the first concurrent exercise, and the first Control System Readiness Exercise. Future ERRE efforts could focus on carrying out the first regional exercise, as well as the creation of supplemental guidance highlighting lessons learned and best practices to enable more installations to conduct ERREs and enhance energy resilience.

Water Resource Management

The DAF is placing greater emphasis on water resilience, recognizing that water resources are finite yet essential to sustained mission capabilities. Water availability faces many threats

including aging infrastructure, scarcity, malicious attacks, natural hazards, changes in climate, rising costs of supply, quality issues, and encroachment. The DAF takes a risk-based approach to water management and linking water security more directly to mission assurance.

Current water initiatives include increasing transparency into mission needs and readiness, comprehensively identifying and assessing water risks, expanding external stakeholder engagement, analyzing capability gaps, and developing mitigation strategies. The DAF is currently developing its Installation Water Dashboard, an interactive data repository for all installations—Active, Guard, and Reserve—to streamline water data and reporting, is supporting the DAF’s goal of determining water vulnerabilities and supporting future water resilience planning. This Dashboard will enhance the DAF’s efforts to assess water risk and resilience and support mission assurance for all installations.

Installation Energy and Water Planning

Installation Energy Plans (IEPs) utilize a standardized framework based on the “5Rs” to integrate strategic guidance, plans, and policies into a holistic roadmap for each installation to advance mission critical energy and water goals. The DAF has completed 52 Installation Energy Plans through the end of FY21 and has approximately 150 resilience initiatives in development across the enterprise to address installation energy and water vulnerabilities identified through IEPs, ERREs, and mission thread analyses. By June 2022, all outside the continental United States priority installations and the top 75% of energy-consuming installations within the continental United States will complete IEPs to improve installation energy and water resilience.

Financing Energy and Water Infrastructure

The DAF Installation Energy Program does not have a dedicated budget line; rather, it relies on direct investment, third-party financing, and innovative funding solutions. Direct investment typically comes from FSRM, MILCON, or the Energy Resilience and Conservation Investment Fund (ERCIP). Third-party financing and other contracts include vehicles such as Energy Savings Performance Contracts (ESPCs), Utility Energy Service Contracts (UESCs), and Utilities Privatization contracts (UP).

Control Systems Cybersecurity & Resilience

Underpinning our installations are increasingly automated and interconnected control systems that, when vulnerable, open our multi-domain operations to adversarial cyber threats. In compliance with the FY17 NDAA, we have conducted assessments of critical infrastructure to

identify vulnerabilities. These assessments have exposed risks to missions we unknowingly accepted and validated the mitigation measures we were already pursuing to increase control systems' cybersecurity and resiliency. In March 2021, we published our DAF Strategic Plan for Control Systems, detailing a dynamic, unified, and enduring approach to protecting and defending these control systems, which assure our critical infrastructure and mission capabilities. Additionally, we published implementation guidance to strengthen energy and water control systems cybersecurity.

Climate Responsive Infrastructure

With renewed focus on climate impacts to mission, the Installation Energy Program is updating DAF policy, projects, and assessments to address climate response and support the Administration's current climate initiatives. The DAF continues to assess and manage risks associated with climate change. To ensure resilient, mission-critical facilities, the DAF is mitigating risks to vulnerable installation energy and water infrastructure, prioritizing efficient renewable energy technologies, and reducing greenhouse gas emissions where possible. Recently, the DAF announced a micro-reactor pilot project at Eielson AFB, AK, and Zero Emissions Vehicle pilot programs at Joint Base Andrews, MD, and Joint Base McGuire-Dix-Lakehurst, NJ, to deliver an alternative energy supply and support federal fleet electrification.

Operational Energy

As a critical enabler to our global mission, operational energy (aviation fuel and energy to power aircraft) comprised over 82% of the \$4.6 billion Air Force energy bill in 2020. To remain ahead of our adversaries in a complex and ever-changing battlespace, the DAF continues to develop a more agile and optimized approach to powering our aircraft and providing Airmen with fuel when and where they need it. Our FY22 budget requested \$49 million in funding for the research, development, acquisition, and operation of modern technologies, data analysis, and innovative process improvements that will enhance our combat capability, mitigate operational risk to the warfighter, and work to reduce our climate impact.

Optimal Operations Planning and Data Collection

The DAF is improving enterprise-wide fuel use data collection and conducting analyses to identify areas where existing missions can be performed more effectively with fewer resources.

We work with stakeholders across the DAF and DOD to implement efficiency best practices, support modernized information systems and software applications, and optimize mission planning and execution to maximize combat capability.

Our real-time data analysis capabilities have facilitated greater visibility into Air Force fuel use and have uncovered numerous opportunities to enhance operations through the efficient application of resources. For example, our analysis of C-17, KC-135, and B-52 data models correlates precision fuel planning (optimized fuel loads specific to each mission) with reduced maintenance costs and improvements in readiness metrics such as aircraft availability. Data analysis also allows us to assess the effects of energy optimization on combat capability in warfighting scenarios and demonstrates that more efficient air refueling not only decreases fuel demand and sortie requirements, but enables greater fuel offload, effectively doubling the efficiency gain.

Through 21st century tools and software, the DAF has established a pipeline to record and collect flight and fuel use data from multiple sources, enabling us to work with stakeholders across platforms and datasets. The collaborative environment allows us to better analyze operations, optimize aircraft fuel and load planning, and identify efficiency best practices to maximize aircraft reach and readiness. The recently developed software application “Magellan,” a long-range allocation and scheduling tool, now serves as Air Mobility Command’s (AMC) system of record for the Readiness Driven Allocation Process. The tool provides a single source and secure collaborative platform for the allocation of global mobility assets at AMC, optimizing processes and increasing the combat and training effectiveness of each aircraft.

The DAF anticipates the active fielding of an auto-planning capability within the tanker planning tool Jigsaw, to further optimize resource allocation and improve asset availability for the Combined Air Operations Center at Al Udeid Air Base, Qatar. Testing indicates the supplementary feature will improve the fuel efficiency of tanker plans by an additional 10% from Jigsaw’s baseline—the equivalent of removing up to five tankers from the average Air Tasking Order, which would enable crew reallocation and save approximately 400,000 gallons of fuel per week.

The remote, collaborative scheduling platform Puckboard is available to over 15,000 service members around the globe, supporting immediate forecasting decisions. The tool streamlines the aircrew scheduling process through secure remote access and will incorporate machine learning to automate and optimize a manually intensive process.

The DAF identified inefficient cargo load planning to be a recurring problem that hinders optimization of global airlift missions. We worked with stakeholders at AMC and Air Force Institute of Technology to identify elements of cargo planning that could be improved across the Air Force. With optimized cargo load plans, comes more efficient flight operations, and the possibility to decrease fuel use by increasing allowable cargo loads using fewer aircraft.

Additionally, the DAF is creating an incentive for planners and operators to use fuel more efficiently. We created the Mission Execution Excellence Program (MEEP) to promote a DAF culture of energy-awareness by incentivizing energy-optimized best practices, often utilized in the commercial aviation sector. This competitive, voluntary pilot program will encourage Airmen to apply fuel efficiency processes and behaviors during their day-to-day operations to save the DAF millions of dollars per year in unnecessary aviation fuel costs. Additionally, the decreased fuel use has a secondary benefit of mitigating an estimated 267,000 metric tons of greenhouse gas emissions per year. Future savings will be reinvested in tools and programs that enable efficient and resilient operations.

Finally, under the authority provided by Congress in Title 10 U.S.C. 2912, the DAF is implementing the Operational Energy Savings Account (OESA) program to further incentivize energy-aware behavior and processes. By documenting fuel savings from previous operational energy initiatives, the OESA allows those funds to be re-invested in other optimization efforts making it a self-sustaining program.

Weapon System Sustainment

The DAF depends on the readiness of our weapon systems to maintain global reach and power. Through partnerships with the aviation and commercial industries, we identify innovative solutions to modernize legacy aircraft and weapon systems while maintaining our lethality. We research and test 21st century technologies utilized by commercial airlines, such as infrared imaging, laser scanning of engine components, engine foam washing, and advanced manufacturing techniques for the cleaning, inspection, rework, and coating of engine compressor blades to determine whether these innovations can be applied to the DAF to optimize legacy engine performance.

Fuel Logistics and Alternative Fuels

The Air Force Operational Energy Office, the Air Force Petroleum Office, and the Air Force Research Laboratory (AFRL) continue to monitor and study advances in renewable and

alternative fuels to better understand their benefits and how they can potentially reduce the DAF fuel logistics footprint. Our research and analysis of conventional and alternative fuel certification processes, fuel additives, fuel transfer equipment, and fuel storage capacity, allows us to better identify logistical gaps and propose resiliency improvements to the jet fuel supply chain in energy-constrained environments, mitigating risk to the warfighter.

Energy-Informed Wargaming

We support the development and execution of DAF and joint-service wargames to analyze the jet fuel supply network in an energy-constrained environment and reduce operational risk to joint logistics. Through modeling and simulation tools, we increased our awareness of future energy requirements and the potential for fuel supply gaps, disruptions, and adversarial threats.

The results of the Air Force's Global Engagement and Long Duration Logistics Wargames, as well as the Joint Forces Energy Wargame, highlighted the criticality of energy distribution infrastructure and the necessity for energy planning across all phases of an operation. We continue to develop methods to analyze our strategic energy posture and the unique challenges in the Western Pacific and European theaters to inform infrastructure and capability investments.

Acquisitions and Capability Development

The DAF actively works to test, develop and field modern aerodynamic technologies on our legacy aircraft to reduce Department fuel costs. C-17 Microvanes, small fins placed on the aft fuselage of the aircraft to streamline airflow, reduce drag by 1%, saving roughly \$10 million per year in fuel costs. Additionally, simply adjusting the static orientation of windshield wiper blades on the KC-135 from horizontal to vertical is expected to save approximately \$7 million per year. Other technologies present opportunities to reap fuel savings and maximize tax-dollar utility.

Finally, the DAF guides acquisition policy to address operational energy requirements associated with new and major modification programs through the Energy Key Performance Parameter and Energy Supportability Analysis. We work closely with AFRL and Air Force Futures to push the technology envelope and help advance key disruptive technologies to maximize operational energy efficacy and outpace our competitors.

Conclusion

The DAF supported the President's Interim National Security Strategic Guidance and laid out a plan to modernize our military capabilities while taking care of our Airmen, Guardians, and families. The I2S continues to guide MILCON and FSRM budget decisions and business practices as we endeavor to deliver ready, resilient installations as cost effectively as possible. The MILCON program prioritizes nuclear enterprise modernization and supports Combatant Commanders, with particular focus on the European and Pacific theaters. The housing program provides the resources needed to sustain and improve the DAF's inventory of government-owned homes, and oversight of privatized housing project owners. The Department remains committed to overcoming challenges affecting this portfolio and delivering effective, efficient installation engineering services. The operational energy team is leveraging existing technologies to improve fuel efficiency of the legacy fleet, and advocating for advanced technologies to modernize the force and reduce greenhouse gas emissions. DAF energy, installation, and environment priorities ensure that our Airmen, Guardians, aircraft, and installations continue to be ready to defend American interests now and in the future.

Thank you for the opportunity to discuss DAF's programs supporting energy, installations, and environment. We appreciate Congress' continued support for our enterprise and look forward to working with you.