

**DEPARTMENT OF THE AIR FORCE**

**STATEMENT BY**

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**BEFORE THE**

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## **Introduction**

The United States faces an increasingly complex global security environment, characterized by overt challenges to the free and open international order and the re-emergence of great power competition. As we prepare for near-peer conflict, we must continue projecting power to meet our nation's national security needs. The Air Force fights from its bases; thus, ready and resilient installations are the foundation to a lethal and ready Air Force. Securing this foundation sends a powerful strategic message to our adversaries and allies.

Over a decade of challenging fiscal constraints and important competing priorities associated with critical readiness and modernization shortfalls have forced the Air Force to assume managed risk across its infrastructure, resulting in a backlog of deferred maintenance. This backlog is currently estimated at \$33 billion, and it could triple in 30 years if spending levels and business practices do not change. Although infrastructure readiness decays slowly, it also recovers slowly; and restoration requires long-term commitment. Now is the time to take responsible actions to address this backlog, cutting the risk of adverse readiness impacts to joint warfighting operations. We recently codified these responsible actions in our new Infrastructure Investment Strategy (I2S). The I2S provides the framework for securing necessary investment and implementing process improvements, cost effective modernization, and innovation across our facilities sustainment, restoration, modernization, recapitalization, and military construction portfolio. Its implementation will ensure a lethal force ready to compete and win in the present and future era of great power competition.

The total Air Force Fiscal Year 2020 President's Budget (FY20 PB) request for infrastructure totals \$11,340M. This funds military construction (MILCON), facility sustainment, restoration and modernization (FSRM), housing, legacy Base Realignment and Closure (BRAC) cleanup, facility operations, and our environmental programs, including remediation of Perfluorooctane Sulfonate (PFOS)/Perfluorooctanoic Acid (PFOA). In preparing the FY20 PB request, the Air Force deliberately evaluated both today's needs and the capabilities demanded by future threats, including a rapidly growing China and resurgent Russia, rogue nations, and violent extremist organizations. The result is a budget aligned with the five priority missions of the National Defense Strategy, one that will prepare the Air Force for the high-end

fight. It balances installation readiness, capability, and capacity with the need to maintain and field a credible and affordable force today, and into the future.

### **Infrastructure Investment Strategy (I2S)**

The Air Force fights from its installations. Its ability to generate combat power is explicitly linked to not only the readiness of Air Force buildings and pavement, but also their strategic location, surge capacity, airspace, and ranges. All are aspects of the vast Air Force infrastructure portfolio, and all are critical to Air Force readiness and lethality in support of the National Defense Strategy.

To stabilize, sustain, and strengthen our installations, we recently introduced our Infrastructure Investment Strategy (I2S). The I2S provides the framework for securing necessary investment and implementing process improvements, cost effective modernization, and innovation across our facilities sustainment, restoration, modernization, recapitalization, and military construction portfolio. Its implementation will ensure a lethal force ready to compete and win in the present and future era of great power competition.

The I2S is being executed along three primary lines of effort:

- **Restore Readiness to Power Projection Platforms** – Resilient and ready Air Force installations demonstrate strength to our adversaries and commitment to our allies
- **Cost Effective Modernization of Infrastructure** – Improving Air Force installation readiness requires targeted, informed and optimized investment in modernization and sustainment
- **Drive Innovation in Installation Management** – Restoring Air Force installations requires state-of-the-art business and operations analytics, contemporary acquisition tools and techniques, innovative asset management, and strong relationships with communities and private sector partners

Four imperatives align and unify these I2S lines of effort: (1) adequate and stable funding, (2) informed and intelligent business management practices, (3) unity of effort across the enterprise, and (4) revitalized squadrons. The I2S ensures infrastructure investment is aligned with the highest mission critical priorities and timed to optimize lifecycle costs by upgrading facilities before they are too expensive to repair, and it optimizes the Air Force

infrastructure footprint, increasing facility utilization rates across the enterprise and demolishing or divesting from facilities that are not cost effective to sustain or repair.

The I2S leverages private sector best practices to the maximum extent possible. Examples include acquiring and managing facilities sustainment, restoration, and modernization materials and services as a single, efficient enterprise, developing 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 reduce design cost and achieve economies of scale. These efforts will improve enterprise-wide cost efficiency, an increasingly critical objective as highly technological, fifth generation fighter aircraft requiring larger logistical and sustainment footprints arrive at various locations.

The I2S also capitalizes on the Air Force's nearly decade-long initiative to vastly improve asset visibility through in-depth facility condition assessments integrated with progressively more robust sustainment management and geospatial information systems. As of October 2018, we completed and captured in our sustainment management system Facility Condition Assessments for 75% of all facilities. This data enables unprecedented levels of insight into present and future requirements. We can "see" current requirements and "predict" future requirements through data-driven life-cycle degradation analysis. By leveraging asset visibility, in conjunction with operations research analysis, we are able to run multiple scenarios that include varying investment levels and policy decisions. These scenarios inform strategic investment trades and shape future planning to ensure our installations remain mission-ready.

### **Military Construction**

The I2S focuses on mission-driven, well-timed investment, but the foundation is a recommitment to adequate, stable resourcing for Air Force infrastructure through our military construction (MILCON) and facility sustainment, restoration and modernization (FSRM) accounts. To support a dynamic global posture and increase lethality, our military construction (MILCON) budget has increased by \$400 million from FY19, bringing the FY20 request to \$2.72 billion. Aligned with the National Defense Strategy, the MILCON program prioritizes resources to the high-end fight, demonstrates strength to our adversaries and commitment to our allies, and supports global posture through new weapon system bed-downs and aging infrastructure recapitalization.

### Combatant Command Infrastructure

Our FY20 MILCON request supports combatant commander requirements in Europe, the Indo-Pacific, the Middle East, and North America. We remain committed to efforts initiated by European Command (EUCOM) in FY15 to reassure North Atlantic Treaty Organization allies and European partners of the United States' commitment to our collective security and territorial integrity. The FY20 European Deterrence Initiative (EDI) MILCON program builds on FY19 efforts to set deterrence conditions in the theater and enable the joint team and our allies to respond quickly to aggressive regional actors. FY20 EDI MILCON investment enhances EUCOM's materiel prepositioning options and improves airfield capacity, fuel systems, and munitions storage at bases in Iceland and across mainland Europe.

The Air Force recognizes that a rapidly growing China aims to undermine long-standing alliances and displace American influence in the Indo-Pacific region. Our FY20 budget request includes several infrastructure investments in the Pacific to enhance our partnerships and regional resilience. Our FY20 budget request also enhances global reach and military cooperation between the United States and Australia through expansion of tanker capacity at RAAF Tindal, Australia.

In support of Central Command, our budget request also includes two projects to continue the development of Muwaffaq-Salti Air Base in Jordan. These projects strengthen the resilience of logistics infrastructure needed to rapidly support operations in the Levant. Lastly, in support of Northern Command, our budget request includes funding for Air National Guard fighter alert shelters at Truax Field, Wisconsin.

### New Mission Infrastructure

The FY20 President's Budget request supports continuing modernization of our aging aircraft fleet. The request includes facilities supporting Air Force weapons system acquisition and modernization programs including the F-35A, KC-46A, T-X, Presidential Aircraft Recapitalization, and UH-1 replacement. Achieving full operational capacity for new weapons systems depends not only on the aircraft acquisition, but on the delivery of necessary hangars, maintenance and training facilities, airfields, and fuel infrastructure.

Major elements of our MILCON request supporting fleet modernization include KC-46A flight training facilities at Travis Air Force Base, California; and infrastructure enabling continued beddown of F-35A aircraft at Eielson Air Force Base, Alaska, Nellis Air Force Base, Nevada, and Royal Air Force (RAF) Lakenheath, United Kingdom. Additionally, this year's budget requests funding for the final increment of the Presidential Aircraft Recapitalization hangar and maintenance complex at Joint Base Andrews, Maryland. Lastly, our request includes projects at Joint Base San Antonio, Texas, for the planned T-X replacement of the T-38C, and a project at Kirtland Air Force Base, New Mexico, supporting replacement of the UH-1.

### Existing Mission Infrastructure

Our budget request substantially increases funding for urgently needed existing mission recapitalization compared to FY19. Recapitalization efforts focus on two mission critical areas: (1) the nuclear enterprise, and (2) research, development, test, and evaluation infrastructure. The FY20 budget funds construction of a Weapons Storage Facility at Malmstrom Air Force Base, Montana, and the Ground Based Strategic Deterrent Mission Integration Facility at Hill Air Force Base, Utah. The weapons storage facility will replace an array of 24 facilities averaging over 50 years old with a modern consolidated facility, while the Ground Based Strategic Deterrent facility will provide a central hub for the research, development, and acquisition efforts necessary to replace the Minuteman III intercontinental ballistic missile. The FY20 request also funds the second increment of construction for a new, state-of-the art laboratory space at the Massachusetts Institute of Technology's Lincoln Laboratory, a federally funded research and development center focused on solving problems with direct national security implications.

### **Facility Sustainment, Restoration and Modernization**

Facility sustainment, restoration, and modernization (FSRM) funds are equally as vital as the Air Force MILCON budget, providing a non-MILCON pathway for mission-critical projects. The two funding streams work together to deliver ready, resilient installations. This year's proposed FSRM budget represents a considerable increase over the previous year. Coupled with our MILCON spending, the FSRM budget will enable our Infrastructure Investment Strategy to provide adaptive infrastructure that assures combat readiness and lethality. The FY20

President's Budget request includes \$4.1 billion in funding for Air Force FSRM, a 40% increase in funding over the FY19 President's Budget request.

The Air Force measures FSRM investment as a percentage of plant replacement value (PRV), which is the estimated cost to design and construct replacement facilities, utilities, and infrastructure to meet modern standards. FY19 represented a low point for FSRM spending, reducing our infrastructure investment level to 1.5% of PRV. This investment level fell significantly below the Air Force minimum target of 2% and the industry standard of 4-6%. In FY20, the Air Force will begin a substantial infrastructure investment increase to restore the health of our installations. The FY20 President's Budget invests in FSRM at 2% of PRV, which represents a marked increase from last year. This correction sets the stage for consistent, stable, and predictable funding for Air Force installations and underpins the readiness and lethality those installations provide in support of the National Defense Strategy.

### **Base Realignment and Closure (BRAC)**

The Department of Defense is not currently considering any base closures. If authorized and funded by Congress to study BRAC, we would use the authority to develop realignment options to better support the National Defense Strategy. Under our current authorities, the Air Force is focused on efficient management of facilities through its comprehensive Infrastructure Investment Strategy (I2S). The I2S directs Air Force commanders to divest unneeded infrastructure, optimize strategic basing posture to improve readiness, and invest proactively to ensure fiscal stewardship of every dollar spent on installations.

The FY20 PB request (\$54M) funds environmental restoration and property transfer at 35 former Air Force installations closed through prior BRAC initiatives. Our BRAC cleanup program focuses on protecting human health and the environment, as well as projects that transfer acreage and achieve beneficial reuse of property. The Air Force transferred more than 98% of the property from 40 formerly closed installations back to communities for beneficial use, producing \$2.9B in annual savings. We expect complete transfer from all previous BRAC rounds by 2027. While property transfer is complete at 34 of the 40 BRAC locations, the remaining property transfers are delayed for at least six years because of the need to divert resources to address emerging contaminants, primarily PFOS/PFOA used in legacy firefighting foam. From fiscal years 2013 to 2018, the BRAC program originally budgeted \$64.9 million for

perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) related requirements. However, due to additional requirements to protect public health and drinking water, we have to date spent \$129.9 million in BRAC funds for PFOS and PFOA identification, investigation, and remediation. The additional \$65 million was funded by deferring other environmental requirements. The FY20 budget request funds BRAC program activities associated with the highest environmental risk requirements, such as protection of drinking water.

## **Environmental Stewardship**

The safety and health of our Airmen, their families, and our community partners is a top priority. To meet our obligations to protect human health and the environment, the FY20 PB request includes \$303M in funding for Environmental Restoration activities associated with the cleanup of current installations, including munitions sites, and \$428M for Environmental Quality programs including environmental compliance, environmental conservation, and pollution prevention. These funds ensure all aspects of natural resources management are successfully integrated into the Air Force mission.

### *Environmental Restoration*

The Air Force remains focused on completing investigations and establishing remedial actions to reduce risk to human health and the environment in a prioritized manner. We currently have more than 13,200 restoration sites at our active and closed installations. Recently, much of our Restoration program focus has been on emerging contaminants, most notably, PFOS and PFOA.

The safety and health of our Airmen, their families, and our community partners is our priority and we are committed to addressing PFOS and PFOA contamination caused by Air Force activities. In accordance with fiscal law, we can fund and execute environmental actions where Congress has provided specific statutory authority (e.g., via the Comprehensive Environmental Response Compensation and Liability (CERCLA) framework, Safe Drinking Water Act, NDAA, etc.) to do so. We currently follow the CERCLA process to address PFOS and PFOA releases attributable to Air Force activities, and we will continue to partner in good faith with local communities, state regulatory authorities, federal interagency partners, and Congress to comply with environmental protection law.



### *Air Force PFOS and PFOA Strategy*

There are no National Primary Drinking Water Regulations for PFOS and PFOA, but the Environmental Protection Agency (EPA) has established drinking water Health Advisories (HAs). Thus, the Air Force has focused its PFOS and PFOA strategy on protecting human health and ensuring mission activities do not affect installation and supporting communities' access to safe drinking water. Three strategic lines of effort (protect human health, communication, and whole of government initiatives) provide a new, expanded framework to guide the Air Force response to issues associated with past PFOS and PFOA releases.

The first line of effort, protect human health, involves a three-pronged approach, "Identify, Respond, and Prevent," to address two related but separate aspects to responding to environmental releases of PFOS and PFOA, assuring access to safe drinking water and environmental restoration, or clean-up, of sites. The second line of effort focuses on open and transparent collaboration and communication with federal, state, and community stakeholders. The third line recognizes the necessity for a whole of government approach to addressing the national PFOS and PFOA issue by partnering with stakeholders to include the Office of the Secretary of Defense (OSD), interagency partners, and Congress. These three parallel lines of effort form a transparent, consistent, and repeatable strategy, with the understanding that each affected site is unique and may result in a range of mitigation and clean-up actions.

The first line of effort has the largest budget impact. This line of effort entails the Air Force using authorities granted under the Comprehensive Environmental Response Compensation Liability Act (CERCLA, 42 USC 9601 et seq.) and the Defense Environmental Restoration Program (DERP, 10 USC 2700-2710) to conduct off base drinking water and cleanup actions related to PFOS and PFOA. CERCLA takes an average of eight years to complete the first four phases that result in a documented decision, the "Record of Decision" (ROD). This includes efforts to coordinate with the regulators the actions the Air Force will take to address the contamination. Once action begins, it can take decades to reduce soil and groundwater contamination to acceptable levels, in order to achieve final site closure. In prioritizing CERCLA environmental cleanup actions, the Air Force uses a risk-based decision making process with protection of drinking water as a top priority. Emerging requirements to address PFOS and PFOA have significantly increased the scope of the Air Force-wide

restoration program. Moreover, due to the scope and scale of PFOS and PFOA related restoration activities, we expect this issue to continue to have an impact on future budget requests for the next decade or more.

### Environmental Quality

With this request, the Air Force ensures a resilient natural infrastructure and maintains sound environmental stewardship by funding compliance with environmental laws. The environmental compliance program focuses on regulatory compliance for our air, water, and land assets. Examples of compliance efforts include more detailed air quality assessments to analyze environmental impacts from Air Force activities, protecting our groundwater by improving 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, while avoiding contamination of our natural infrastructure, 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 and the environment by making investments to minimize hazardous materials usage and hazardous waste disposal through the demonstration and validation of new technologies.

We remain firmly committed to a robust environmental conservation program. Prior appropriations have allowed the Air Force to invest in conservation activities on our training ranges and provide direct support to mission readiness. The conservation program in FY20 supports ongoing habitat and species management efforts for 125 threatened and endangered species on 53 Air Force installations. This year's budget request also provides for continued cooperation and collaboration with other government agencies, like the U.S. Fish and Wildlife Service. These partnerships help us to provide effective ecosystem and habitat management, which includes wildland fire management, while also avoiding any losses in our capability to support the military mission due to the presence of endangered species on our installations. Furthermore, the FY20 budget will further the Air Force's implementation of tribal relations policy to ensure the unique trust relationship that the U.S. government currently shares with

tribes continues, and it will provide opportunities to communicate aspects of the Air Force's mission that have the potential to affect tribal communities.

The Air Force remains firmly committed to responsible environmental restoration and quality. As trustee for more than 9 million acres of land including forests, prairies, deserts, wetlands, and coastal habitats, the Air Force is very aware of the important role natural resources play in maintaining our mission capability. To maintain military readiness the Air Force needs realistic test and training environments, which themselves are ecosystems. Quite simply, if we don't maintain the ecosystems we use to test and train and clean up the impacts of past mission activities, we will not be able to maintain military readiness.

## **Housing**

Ready and resilient Airmen are a critical component of a lethal, powerful Air Force. The Air Force remains committed to providing Airmen and their families with quality housing and a sense of community on our installations. To better understand the scope of potential health and safety problems in our housing inventory, the Secretary and Chief of Staff of the Air Force directed a 100% review of our homes. The initial results are driving immediate fixes and will guide long term actions to ensure our families are living in healthy and safe homes.

The FY20 President's Budget seeks \$398.6 million for both military family housing construction and military family housing operations and maintenance. These funds will support our continued focus on eliminating inadequate housing from our inventory and correcting health and safety deficiencies.

Our military family housing construction request of \$103.6 million will fund construction of 76 homes and supporting neighborhood infrastructure at Spangdahlem Air Base, Germany; whole house improvement of 12 government-owned homes on Yokota Air Base, Japan; and whole house improvement of 29 government-owned historic homes at Wright-Patterson Air Force Base, Ohio. Our military family housing operations and maintenance request of \$295 million will fund efforts to sustain, improve and modernize our government-owned inventory of approximately 15,200 family housing units. Combined, these funds will ensure we continue to support the housing needs of Airmen, their families, and our Army, Navy and Marine Corps teammates housed in our government-owned inventory.

In 2013, the Air Force met our goal of privatizing family housing at all stateside locations, including Alaska and Hawaii, through 32 housing projects at 63 installations with an end-state of 53,237 homes. Our focus in the United States is now on the long-term oversight of this portfolio of privatized homes.

We are also committed to ensuring unaccompanied Airmen are provided quality housing on our dormitory campuses. Funded out of the Air Force FSRM account, our investment strategy for dormitories focuses on restoration and modernization of these facilities in their existing configurations. This strategy will meet the Department of Defense goal of 90% adequate dormitory rooms for permanent party unaccompanied Airmen and reduce the requirement for replacement construction. This enables us to focus MILCON funds on modern, formal training facilities for our newly recruited Airmen, such as the Airman Training Center at Joint Base San Antonio, Texas included in the FY20 President's Budget.

#### *Challenges in Privatized Housing*

We share the concerns of our Airmen as well as the concerns of this Committee when we are confronted with instances where our housing objectives have not been met. The health and safety of our Airmen and their families is a leadership imperative and when there are challenges, Air Force leadership owns it. We have intervened with the project owners, advocated for our residents, and supported installation commanders in our mission to take care of our Airmen and their families.

The Air Force has taken a number of near-term actions to address these challenges, including the recently completed Inspector General assessment of policies, procedures, and best practices for handling resident complaints and protecting residents from potential health and safety hazards. We also released a letter to all commanders from the Secretary of the Air Force and Chief of Staff of the Air Force reiterating chain of command responsibilities with regard to the health and safety of residents in privatized housing. Lastly, we are conducting a review of the staff size and authorities in the housing management offices which are so important in supporting our residents and keeping the chain of command informed of challenges.

Also, we are taking steps to improve our communication and expand the resources available to Airmen and their families. We established a toll-free call center where residents can report concerns with privatized housing, and we are crafting policy to implement a tenant council

for both privatized and government-run housing across the Air Force enterprise. The Air Force Judge Advocate General has provided guidance to legal offices to educate tenants about the services available through military legal assistance, tenants' rights under leases and state law, and the process for filing claims. Finally, we are working in coordination with the Office of the Secretary of Defense, the other military services, our project owners, and stakeholders on a joint service Resident Bill of Rights and common Military Housing Privatization Initiative tenant lease which will inform military families living in privatized housing of their rights and establish consistent expectations with the landlord-tenant relationship and responsibilities.

We have also initiated a number of medium and long-term efforts to address shortcomings in privatized housing, which include automated systems to improve maintenance work order visibility, maintenance quality assurance, performance incentive fee structure, and enhancement of the Air Force Civil Engineer Center annual site visits to include additional feedback from commanders and residents.

Air Force leadership at every level is committed to rectifying the poor conditions that exist in some privatized homes. Senior Air Force leaders have conducted multiple privatized housing site visits in the last month and I will continue inspecting base housing projects during each installation visit I make.

### **Air Force Community Partnership Program (AFCP)**

In an effort to drive innovation to secure our future, we continue to leverage our highly successful AFCP. This program taps into the intellectual capital and innovative spirit of installation and community leaders to find creative ways to accomplish the Air Force mission by cultivating "win-win" partnerships between our installations and local communities. With 62 installations and communities participating in the program, we have implemented more than 350 partnership agreements that have generated more than \$57 million in Air Force benefits and \$25 million in community benefits. This year, we plan to further expand the program by supporting more installations and focusing on initiatives with enterprise-wide applicability. While focus on the mission is always our number one priority, we also strive to facilitate collaboration with civic leaders to encourage consideration of the quality of schools and professional licensure reciprocity for military spouses in an effort to help ease the stress that comes with transferring duty stations. Community partnerships function as an important tool to help minimize the cost of

our installations, enhance mission effectiveness, and promote quality of life for Airmen and their families.

### **Supporting Military Families Through Optimized Basing**

The Air Force recruits Airmen, but we retain families. While the Air Force We Need calls for growing the force by 40,000 people, we must not lose the Airmen we have. Military members report that educational opportunities for their children and the ability of their spouses to sustain careers influence their continued service decisions. Each member relocation stresses both of these aspects in their lives. The Air Force, through its strategic basing process, is developing criteria to inform decisions for future missions that recognize those communities that support the needs of military families. We are evaluating kindergarten through high school quality education metrics, the school's ability to assist and support military children, and the state's accommodation of spousal out-of-state licenses. Placing missions in locations considered best for Air Force operations, as well as Airmen families, will increase retention rates and allow military members to focus on their service.

### **Installation Energy and Water Resilience**

Energy and water are finite resources that often require long, complex, interdependent, and vulnerable logistics tails. The Air Force must have 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 its 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, a third factor considered in evaluating energy sources is whether the source is clean.

### 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 all times, no matter what circumstances are encountered. 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, identifying 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), notable outages defined as greater than or equal to 8 hours. This represents a 33 percent decrease from FY17. This decrease is believed to be partly attributed to increased investment in, and improved maintenance of, energy systems on Air Force installations, better situational awareness, and more accurate reporting of outages.

One way the Air Force is mitigating the risk of power outages is through the use of third-party financing to develop on-base generation assets. One example is the 28-megawatt solar photovoltaic array at Vandenberg Air Force Base (AFB), CA. This array began operating in January 2018; the power it generated will be used exclusively by the base, providing about 35 percent of Vandenberg AFB's annual energy usage. In another example, in August 2018, the Air Force cut the ribbon on the DoD's first wind-powered microgrid capable of powering the 24/7 Intelligence, Surveillance and Reconnaissance mission of the 102nd Intelligence Wing. The Wing is located at Otis Air National Guard Base in Massachusetts. This new microgrid provides energy almost exclusively from renewable energy sources, offering a high-level of energy resilience.

### Water Resource Management

Recognizing the constantly changing 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, potentially the consequence of a variety of factors, including changes in precipitation patterns, water quality issues, or encroachment. The Air Force is in the nascent stages of establishing a water resource 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, aiding efforts to strategically direct infrastructure investments based on mission requirements.

The Air Force also recently started to conduct 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 describe both how a system is planning for crisis in advance and how the system performs in event of crises.

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 22 installation energy plans by the end of FY19, 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.

### *Financing Energy and Water Infrastructure*

The Air Force energy program relies on both direct investment and third-party financing. Direct investment typically comes through FSRM funding, and third-party financing vehicles include Energy Savings Performance Contracts (ESPC) and Utility Energy Service Contracts (UESC). In total, the Air Force awarded 10 ESPC and UESC projects totaling \$358.6 million in calendar year 2018; and we expect these performance contracts will result in close to 1 million MBTU/year in annual energy savings.

The Air Force is also continuing to explore innovative funding solutions and is piloting the development of an Energy-as-a-Service business model to better support Air Force installations in meeting their energy requirements. Through the Energy-as-a-Service business model, the Air Force envisions realigning Air Force energy procurement and management functions through a single, comprehensive contract to deliver holistic energy solutions to meet the electricity and energy resilience requirements at an installation. The Air Force named Altus AFB in Oklahoma and Hanscom AFB in Massachusetts as pilot sites. These locations, which represent different geographic, mission, and energy profiles, provide a unique opportunity to understand how Energy-as-a-Service may apply at other Air Force installations across the enterprise. In late 2018, the Defense Logistics Agency, working with the Air Force, published a sole source justification and approval to work with Western Farmers Electric Cooperative at Altus AFB.

## **Operational Energy**

The Air Force Operational Energy program seeks to enhance combat capability for the Air Force by developing and championing smart energy solutions through new technologies, data solutions, and innovative process improvements. With operational energy comprising approximately 81 percent of the overall \$6B Air Force energy bill in 2018, improving how aircraft and aircrews use aviation fuel can fund more combat power and training opportunities for the warfighter, whether in permissive or constrained environments.

To achieve our vision of maximizing combat capability through optimized aviation fuel use, the Air Force Operational Energy office is organized along four lines of effort: Current Operations, Logistics and Sustainment, Future Operations, and Strategic Engagement.

### *Current Operations*

Our Current Operations division focuses on maximizing combat capability by improving enterprise-wide data collection, and conducting analysis to identify areas where existing mission operations can be conducted more effectively with fewer resources. The division works with stakeholders across the Air Force enterprise to implement the FY18 fuel data collection strategy, and to develop modernized information systems and software applications to address outdated aerial refueling planning tools.

For example, we are continuing development of the tanker planning tool “Jigsaw,” which transitioned tanker scheduling for the Al Udeid Combined Air Operations Center (CAOC) from whiteboards to a digital planning system. The next stage of development will introduce an “auto-pairing” capability to optimize matching tankers to receivers, on interfaces between Jigsaw and other CAOC systems.

Additionally, the Current Operations division is working on a project to improve global tanker operations with the continuation of Magellan (formerly Galactic), a tool that would optimize tanker allocations and maximize the combat and training effectiveness of each tanker aircraft. Other initiatives include modelling fighter training requirements to support aircraft basing decisions and conducting Line Operations Efficiency Analyses (LOEA), where subject-matter experts visit and observe the operation and maintenance of aircraft to identify best practices and recommend changes for optimizing fuel use while maximizing capability and

readiness. LOEAs have been completed for the E-3, RC-135, C-5 and C-17 platforms, resulting in significant efficiency opportunities, while the KC-135 LOEA is currently underway.

### Logistics and Sustainment

Our Logistics and Sustainment division focuses on improving Integrated Life Cycle Management processes and fuel supply logistics across the Air Force enterprise. For example, by leveraging 21st century technologies like infrared imaging, laser scanning methods, and advanced manufacturing techniques for the inspection, rework, and coatings of engine compressor blades, we are ensuring overhauled legacy engines deliver optimized engine performance. In another example, research and analysis of conventional and alternative fuel certification processes, fuel additives, fuel transfer and storage equipment is helping identify and solve problem areas, improving the resiliency of the jet fuel supply chain in energy constrained environments. Comprehensive fuel logistics supply chain modeling in wargame scenarios ensures adequate consideration of shortfalls, and the 2nd and 3rd order operational effects of adversaries' efforts to target fuel supply chains. All of these efforts support the Air Force and U.S. Government energy system postures to optimize system demand, improve throughput of supplies, and enable assessments on the adequacy of current and forecast posture configurations.

### Future Operations

Our Future Operations division provides data-informed decisions needed to leverage technological advances and innovative concepts for our legacy and future fleets. Additionally, the Future Operations team guides acquisition policy to ensure Air Force acquisition stakeholders address operational energy requirements associated with new and major modification programs, via the Energy Key Performance Parameter requirement and the Energy Sustainability Analysis study. Working closely with the Air Force Research Laboratory, future operations analysis meets current and anticipated operational needs, and expands the art of the possible by advancing key technologies and enablers.

For example, supporting advanced unmanned aircraft systems (UAS) development and fielding not only reduces energy demand within theater, but also displaces intelligence, surveillance, and reconnaissance (ISR) and strike missions traditionally flown by exquisite aircraft, with advanced unmanned systems able to stay on station for several days unrefueled.

Future Operations efforts with the Air Force Research Laboratory (AFRL) to employ cutting edge computational fluid dynamics tools are being employed to help refine the aerodynamics of legacy aircraft, improving efficiency and increasing the range/payload/loiter trade space. The secondary effects of specific fuel consumption improvement will increase readiness through increased aircraft availability, since lower required engine operating temps for these more aerodynamically efficient aircraft will reduce maintenance and improve engine lifespan.

Future Operations analysis also involves developing and implementing software applications for modeling and simulation of theater energy “ecosystems” – i.e. fuel logistic supply chains. Recently, Future Operations developed software supported the Global Engagement 18 and Long Duration Logistics wargames, for the first time supporting realistic fuel constraints in these events. The results highlighted the criticality of the energy infrastructure and the necessity for energy planning within all phases of an operation. In aggregate, optimizing operational energy across our legacy and future fleets is paramount to projecting U.S. military power and maintaining our warfighting edge.

### Strategic Engagement

Our Strategic Engagement division capitalizes on education and training opportunities, and a comprehensive strategic communications strategy, to promote smart operational energy initiatives and to build an energy-aware culture across the Air Force. Through multi-channel digital communications and content development, awareness campaigns, leadership engagement, training courses, and targeted and consistent messaging, we help inform Airmen about smart energy practices and the impact these practices have on maximizing combat capability and mission readiness.

### **Conclusion**

The Air Force We Need requires that we sustain ready and resilient Air Force installations, as our installations serve as the power projection platforms for our Nation’s Air Force. Air and Space power, and the installations, ranges, airspace, and energy required to propel it, is critical to the success of advanced generation, multi-domain joint warfighting operations. To remain mission capable, the modern battlefield demands 21<sup>st</sup> century technologies, streamlined operations, and advanced energy logistics. The foundation of Air

Force readiness and lethality is an integrated network of air bases that enable our Airmen to fly, fight, and win, generate combat readiness, and provide safe and healthy communities for our families. The strategic importance of our Air Force requires us to focus infrastructure investments to ensure bases provide the resilient capability and capacity that we need now, and 50 years from now.

Prior years' fiscal challenges have led the Air Force to accept managed risk in infrastructure. The FY20 PB request increases infrastructure investment to strengthen the Air Force's global network of installations, focusing on innovative, cost-effective installation management and facility sustainment, restoration, and modernization. The military construction portion of the budget will support combatant command priorities, new weapon system beddowns, and recapitalization of aging facilities. The military family housing portion of the budget will sustain and improve our inventory of government-owned homes. Together, these investments will secure our global power projection platforms and provide safe communities for our Airmen and their families. The FY20 PB also provides funds to meet our environmental stewardship obligations, including cleanup of current installations and those closed during previous BRAC rounds, as well as environmental compliance, conservation, and pollution prevention.

In an era of great power competition, the Air Force must prioritize enabling a lethal force to compete and win in today's and tomorrow's fights. This FY20 PB request prioritizes investment in the ready and resilient Airmen and installations that our nation's high-end fights demand.