



2023 Secretary of Defense

Environmental Awards

Sustainability Installation
Kadena Air Base

Introduction

Kadena Air Base (AB) is located on the Japanese island of Okinawa, often referred to as the “Keystone of the Pacific.” It is the largest base in the Pacific region at 11,017 acres and home to the Department of the Air Force (DAF)’s largest combat Air Wing, the 18th Wing. Kadena AB is comprised of 7,500 active-duty personnel, civilians, contractors, and dependents which brings the total population to a staggering 24,000 residents. Kadena AB also oversees all Military Family Housing (MFH) on the island of Okinawa and has two geographically separated units (GSUs): Okuma Recreation Center in northern Okinawa, and Bellows Air Force Station (AFS) in Hawaii, bringing the total acreage to 11,638-acres. The mission of the 18th Wing is to deliver unmatched combat

airpower and a forward-staging base to provide sovereign options that promote peace and stability in the Asia-Pacific region, ensure the common defense of our allies, and enhance the United States’ unparalleled global engagement capability. The 18th Wing supports 5th Air Force and Pacific Air Forces (PACAF) in the deployment, planning, and coordination of requirements for future DAF operations. Kadena AB supports a composite force of combat-ready fighters, air refueling, airborne warning and control, and rescue aircraft. Kadena AB is home to two wings (the 18th Wing and the 353rd Special Operations Wing), six Groups, and several associated units from all services totaling nearly 40 tenant units. Kadena’s total economic impact to the area exceeds \$700M annually.

Background

With the full support of the 18th Wing, Kadena AB implements sustainability practices and principles across the installation, as well as its GSUs on Okinawa and Hawaii to ensure long-term availability of training areas, improve the quality of life for military and civilian personnel and their families, preserve the natural environment, and protect the relationship with the host nation of Japan. The installation maintains a robust Environmental Management System (EMS) and exceeds Department of Defense (DoD) requirements through the successful integration of the regional EMS and incorporation of two different countries' regulations. This high level of command support increases the visibility of sustainability objectives and targets throughout the Pacific, and promotes continual improvement through shared challenges, successes, and lessons learned.

Accomplishments

Energy Savings Performance Contract

Energy availability and resiliency is essential for Kadena AB to perform its critical mission. Kadena AB has contracted a private energy company, NORESKO, in November 2019 to implement a four-part Energy Savings Performance Contract (ESPC) to boost the installation's mission-critical energy resiliency. The work was completed from 2020 to 2022. This contract aligns with Executive Order 13834 of May 17, 2018, *Efficient Federal Operations*, and upgraded systems throughout Kadena AB and MFH. The project, contracted through Defense Logistics Agency (DLA) Energy, in collaboration with the Air Force Civil Engineer Center, requires no upfront capital from DAF and will generate more than \$153M in guaranteed cost savings over the performance period. The keystone of the \$85.7M project is a new 10-Megawatt generator and microgrid utility system that will enable Kadena AB to sustain operations and meet critical mission requirements during

utility outages and disruptions more effectively. While the microgrid will produce only modest energy savings, it enhances resiliency and enables islanding from the Okinawa Electric Power Company for extended periods of time. In the event of a utility outage, the microgrid control system will execute prioritized islanding sequences of operations to disconnect from the utility grid, dispatch distributed generation assets, and align the electrical distribution system to energize critical loads.

As the second part of the ESPC, nearly 200,000 existing fluorescent, incandescent, and high-intensity discharge luminaires have been upgraded with new current-generation energy-efficient LED components and luminaires to enhance light levels, visibility, and control in and out of facilities. Changing fluorescent lighting to LED has reduced lighting energy consumption by over 65% and reduced maintenance costs by increasing the life of each fixture. The lighting upgrades reduce the wattage needed for operation, which in turn decreases the amount of heat the system produces. Since cooling systems have less heat to remove, air conditioning costs are also reduced. Based on the post-installation measurement and verification activities and as-built quantities, the expected savings for operations, maintenance, and housing is expected to be over \$4M per year beginning in 2021.

Kadena AB resides on an island where drinking water availability is always a concern. The third part of the project focused to reduce the amount of water the installation consumes. Currently existing inefficient flow devices such as urinals, faucets, and showerheads were replaced with low-flow units to reduce water consumption. Over 25,000 water fixtures were upgraded, reducing consumption of water, wastewater, and energy to produce heated water. Based on the post-installation measurement and verification activities and as-built quantities, the expected

savings for operations, maintenance, and housing is estimated at \$1.5M per year.

The fourth part of the contract included an innovative cooling technology; a 40-ton solar-assisted air conditioning unit, at a 718th Civil Engineering Squadron office building. This portion of the project improves cooling efficiency, supports renewable energy goals, and potentially demonstrates innovative technologies that can be evaluated for large-scale deployment across the base. The system installation was completed in May 2022 and will be assessed as a pilot for a year to determine if the technology can be deployed to the rest of the installation.



Installation of SolX at Civil Engineering Building
Contractors installing the solar assisted air conditioning unit. This innovative technology is serving as a pilot to evaluate potential application across the rest of the installation.

Reduction of HAZMAT/Procurement of Green Materials

After a fire that occurred on Kadena AB in 2020 caused by improper storage of hazardous materials (HAZMAT), the 18th Wing re-evaluated the entire HAZMAT program. Additional resources were allocated to support the HAZMAT program and conduct compliance inspections of all facilities that use and maintain HAZMAT through the Enterprise Environmental, Safety and Occupational Health Management Information System (EESOH-MIS). Overall compliance across the installation has increased over the past two years by 17% and

several programs were implemented to reduce the amount of HAZMAT ordered. While elimination of HAZMAT is not possible, reduction in the quantity of purchased HAZMAT has been emphasized. Kadena AB's Free Issue Program has taken any serviceable material and placed it back at HAZMART, the installation HAZMAT and control point, to re-issue that material to another shop, free of charge. This reduces the amount of hazardous waste generated and saves ordering costs for shops across the installation needing the same product. This program also expands to other local installations and deployed units to support those who need HAZMAT and reduce the production, ordering, and transportation of new HAZMAT. The Free Issue Program has resulted in a cost reduction of \$79K by not purchasing new products.

The Kadena AB Environmental Office has also emphasized the importance and procedures on how to extend the shelf-life of HAZMAT with the Shelf-Life Extension Program. EESOH-MIS sends notifications to shops when their materials are set to expire in 90, 60, and 30 days. Once notification has been received, the shops can contact HAZMART to see how the specific HAZMAT can be tested and potentially extend the expiration date of that material. Once the process is complete, HAZMART will update the shelf-life data in EESOH-MIS and provide the shop with a shelf-life extension sticker to be placed on the container. While the expiration date cannot be extended on all materials, HAZMAT monitors are encouraged to order materials with shelf-life extension capabilities. The Shelf-Life Extension Program has saved over \$46K in product replacement costs and approximately \$203K in disposal costs.

Another program that the Kadena AB has implemented is the prioritization of the procurement of Green Materials. HAZMAT monitors, personnel appointed with additional

duties to maintain and order HAZMAT for their respective units, are trained and required to review technical orders, or other documents, that dictate the materials permitted to be used for the processes in their shops and choose the least hazardous of the options. The materials classified as Green have reduced hazards associated with them, including physical, health, and environmental hazards. Since 2020, the total cost of purchasing Green Materials has steadily increased from \$75K to \$113K.

Greenhouse Gas Reduction Efforts

Kadena AB has recently completed its Air Emissions Inventory (AEI) in 2022 by coordinating with 27 DoD organizations to complete a comprehensive review of over 1,300 emission sources and associated consumption data. This effort ensures that all air emission sources are being tracked, consumption data is accurate, and determines if any sources need to be more frequently tested in accordance with the Japan Environmental Governing Standards (JEGS) and/or DAF environmental regulations. Simultaneously, Bellows AFS has completed its AEI and maintains its status as being below the significant threshold; allowing Bellows AFS to remain permit free for air quality.

Kadena also completes the Ambient Air Quality Monitoring Plan and the air emission monitoring of boilers and paint booth exhaust systems across Kadena AB and MFH on an annual or biannual basis. These plans protect the quality of the air within the installation boundary by identifying any exceedances of JEGS of volatile organic compounds, nitrogen oxides, sulfur oxides, or particulate matter. By ensuring compliance, Kadena strives to remain environmental stewards to the host nation by monitoring and controlling the production of greenhouse gases during our mission and maintaining the air quality of the local communities.

Impressively in 2022, Kadena facilitated the removal of 18,000 lbs of Halon 1211, Class I

ozone-depleting substance (ODS), and 5,000 lbs of R-22, Class II ODS. By turning in excess ODS products to the DLA Aviation Reserve, this effort supports the environmental mission by removing the possibility of accidental releases to the atmosphere while aiding the DoD mission for reutilization. The environmental office supports the removal of existing refrigeration equipment containing Class II ODS by early identification in the construction planning process and recommending replacement of refrigeration equipment containing refrigerants with low global warming potentials.



Packaging Halon Fire Extinguishers for Shipment
Kadena AB Fire Department personnel move 1 of 118 cylinders of halon fire extinguishers for turn in to the Defense Logistics Agency Aviation Reserve. Their work ensured proper disposal and recycling of unserviceable cylinders.

Solid Waste and Diversion

The responsibility of managing all MFH on the island of Okinawa has posed a unique challenge when implementing an integrated solid waste policy. The qualified recycling program (QRP) on Kadena AB aims to ensure maximum recycling and DoD diversion goals are met. Through recycling programs, Kadena's QRP has earned an average of

\$300K per year, diverted 8,200 tons (43%) of municipal solid waste (MSW) and 1,320 tons (98%) of construction and demolition waste from landfill and incineration; exceeding DoD’s diversion goals of 40% and 60%, respectively. Additionally, MSW disposal weights have decreased nearly 2,000 tons in the last year. Green waste and used oil recycling programs have saved the installation \$1.3M and \$300,000 per year, respectively.

The 18th Wing worked closely with local service providers to rectify an eight-month gap in service for the disposal of electronic waste and plastics. Since service resumed, 17.6 tons of electronic waste and 11 tons of plastics were disposed in accordance with local regulations. The 18th WG also teamed with the Defense Commissary Agency, the on-base supermarket for DoD members, and the Army and Air Force Exchange Service, the military/government retailer, to stop selling colored trash bags at on-base retail locations to be in line with the Japanese disposal regulations. This helped enforce a local policy since Japanese contractors can only accept waste in clear plastic bags.

Natural/Cultural Resources

Kadena AB and its GSUs harbor a rich variety of cultural resources including tombs, shrines, village sites, and WWII related sites. These assets are located throughout the installation, and it is the installation’s responsibility to safeguard many of the historical and cultural assets for future generations. Their preservation is a priority to the U.S. and Okinawan authorities and plays an integral part in maintaining a strong relationship between Kadena AB and host communities. The installation budgets for \$3.3M worth of cultural and natural resource management programs every year. The archaeological data recovery effort has been completed throughout sites across the installation with artifacts dating from the Shellmound (12th Century) to Jōmon periods (14,500 – 1000 BC). The installation maintains

compliance with the JEGS, Japanese Cultural Properties Protection law [1950 Law No. 214], Articles 93 and 94, Paragraph 1 and guidelines under the Installation Cultural Resources Management Plan to include a historic preservation plan. The cultural and natural resource programs have successfully ensured compliance without hindrance to the installation’s mission.

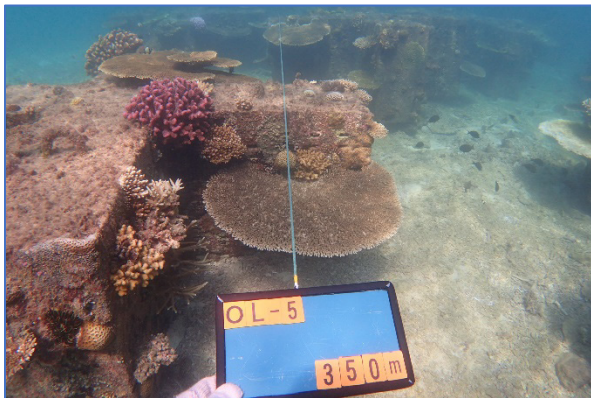
An initial cultural asset survey conducted at the proposed Chibana Industrial complex area has uncovered an old village site that is a rare finding due to its relatively intact condition after island wide development occurred post WWII. This village site is named “Daikujyaku Yatoukuru Village” and the recovery effort has recorded significant historical artifacts. A fully intact feature, called a “fuuru”, has been uncovered that shows how human waste was processed using pigs. Artifact findings are shared with the local Okinawan Prefectural Government (OPG) and the local municipal Board of Education to ensure that findings are properly preserved to pass down to the next generation of the Okinawan population. OPG has been inviting the local communities to view the village as it stands in its completeness before it is preserved at an alternate location.



Historical Artifact: “Fuuru”

The “fuuru” found at the Daikujyaku Yatoukuru Village site is an intact system of the modern-day toilet. Pigs were placed into these containments to feed on the waste produced by the residents. All recorded materials are provided to the local municipal Board of Education for educational awareness to the public.

To ensure the protection of the native species found on the island of Okinawa, a survey has been conducted that identified 704 species of plants, corals, and wildlife in both the Kadena installation boundaries and the Okuma Recreation Center, 219 of which are Government of Japan protected species. Okuma includes pristine coral reefs where over 90 species of fish and 21 species of non-coral invertebrates, including giant clams. The survey report is used to guide current and future projects to help restore and/or protect the natural habitats unique to Okinawa. Since 2021, Kadena AB has been actively planting coral at Okuma Recreational Center to enhance the marine wildlife and educate the public on the importance of a thriving reef. Planting corals improves fishing grounds to restore a sustainable food source and increase tourism for the local economy. The reef restoration project coordinates with the Kunigami municipality and local fisheries to ensure the preservation of the marine environment surrounding the island of Okinawa.



Preserving the Reef at Okuma Recreational Center
To restore and protect the coral reef, Kadena has partnered with the local community to plant coral around Okuma Recreational Center. These reefs will enhance the marine wildlife and increase tourism by encouraging snorkeling excursions.

Adaptation and Resilience Planning

Okinawa's tropical climate, heavy rain seasons, and frequent impacts from typhoons causes the infrastructure to deteriorate at a higher rate than other installations. To further

the resilience of the installation, an erosion control and wetland study was completed in 2022 to assess sites where erosion and flooding have been causing negative impact to the environment, public relations, and the Wing's mission. The information from the study has been used to plan future developments for minimal impact to installation assets.

Kadena AB is generating a comprehensive Installation Development Plan (IDP) to elevate the functions within 26 distinct districts. The IDP allows for detailed planning to ensure that all assets are appropriately utilized and receive appropriate investment to be effective and meet mission requirements. Individual district plans within the IDP align mission functions to areas that efficiently support operations with minimal impact on the existing infrastructure and natural environments without compromising the ability to meet future mission requirements. Identified deficiencies on Kadena AB have helped the installation improve to meet long-range planning goals by incorporating adaptive, resilient, appropriately sized, and fiscally sustainable assets.

Nine districts have been completed out of the 26. Each district has its own functions while incorporating quality of life aspects including recreational trails and landscapes with native plant species. Due to the unique historical assets found within Kadena, the plans have also incorporated the preservation of tombs, stone alignments, a historic bridge, a defensive structure, historically significant buildings, and numerous Chinese Banyan Trees. The district plans intentionally preserve the assets and use them to connect the installation's population to the natural and historical features while ensuring efficient use of space for mission capabilities.

Bellows Air Force Station

The coastal ecosystems in Hawaii exhibit some of the most interesting, attractive, and rare habitats in the world. Because of these

unique properties, the shoreline areas have become one of Hawaii's most valuable commodities. On Bellows AFS in Hawaii, a plan to stabilize and restore the dunes and shoreline of Bellows Beach from erosion through the removal of invasive species and the restoration of native plant assemblages began in 2020 with anticipated completion in 2023. Currently, restoration has been completed on over 3,200 out of 3,600 linear feet of shoreline, and the removal of the invasive Ironwood trees is 85% complete. The dunes have been planted with stable native vegetation to mitigate storm surge effects to protect recreation and infrastructure.



Peace in the Wetlands

A restored wetland at Bellows Air Force Station enables endangered birds to return and breed in the area. Invasive species have been removed and replaced with native vegetation to protect and preserve the wetlands.

Restoration programs for the shoreline and the wetlands at Bellows AFS have resulted in endangered species, such as the Ae'o (Hawaiian stilt), 'Alae Ke'oke'o (Hawaiian

Coot), Koloa Maoli (Hawaiian Duck), 'Ōpe'ape'a (Hawaiian Hoary Bat), and Pueo (Short-eared Owl), returning to the area to breed or nest. Kadena AB spends over \$1.5M per year just on the natural resource program at Bellows AFS to support its mission of "affordable aloha and peace in paradise."

Innovation

The 18th Wing has a dedicated Innovation Office that leverages projects that have the potential to bring new technology to the DAF. These projects propel current mission methodologies and procedures into the 21st Century, reducing the amount of materials needed to complete the mission. The Wing Innovation Office is presented with current concerns, ranging from improving refuse diversion rates to becoming pilot sites for new technology. Since fiscal year 2021, 21 projects were developed, three of which were scaled across PACAF and other Air Force Major Commands. A contemporary method has been adapted to reduce cargo deployment time by digitizing the process from start to finish using commercial off-the-shelf technology. Another project, Project Viper, helped expedite Agile Combat Employment missions by cutting fueling response times while increasing austere location sustainment and joint warfighting capabilities. The creative ideas produced by the Wing Innovation Office has garnered five separate awards and recognition from the Air Force Chief Scientist, PACAF Deputy Commander, and the PACAF Finance Manager Director.