



LUKE AIR FORCE BASE

FY06 SECRETARY OF DEFENSE ENVIRONMENTAL AWARD

POLLUTION PREVENTION—NON-INDUSTRIAL INSTALLATION



***Our Mission:** Protect our people, preserve our planet, promise our purpose.*

Environmentally, Luke is a leader! Luke actively models its policy to be the best environmental stewards, through Conservation, Preservation and Restoration initiatives, for the Air Force, the state and local communities. This commitment, stemming from the leadership down and branching to all levels, goes beyond compliance to encompass a model Environmental, Safety and Occupational Health Management System (ESOHMS).

PROGRAM SUMMARY

Luke is a forerunner in achieving Pollution Prevention (P2) excellence. Implementation of innovative P2 measures not only protects the people and the environment, but has become a way of doing business.

The hard work and accomplishments of the P2 Team are, in a large part, due to the contributing efforts and energy of the Luke Air Force Base workforce. These accomplishments include:

- Reducing 47 tons of air emissions through innovative product substitution. The base is now an ozone depleting substance free installation and has a zero VOC interior painting program.
- Fully integrating ESOHMS into every environmental program. Luke trained 8,000 base personnel while closing two significant aspects.
- Saving over \$1M by reducing energy consumption by 11.9MWh/year.
- Reducing 44 percent of hazardous waste streams, saving Luke \$57K annually.

- Garnering 23 active partnerships within the local community and continuing to pursue more.
- Hosting, facilitating, and coordinating the award winning Tres Rios Nature and Earth Festival. Combined activities have impacted over 250,000 people nation wide.
- Successfully managing the Qualified Recycling Program increasing revenue by 300 percent for a \$380K net profit. This program funds all P2 projects and recycling programs.
- Diverting 68 percent of solid waste (6,678 tons) resulting in a \$5M net cost avoidance.



BACKGROUND

The 56th Fighter Wing, Luke Air Force Base is home to the largest and only active duty Air Force F-16 training wing. Luke has more than 188 aircraft, 27 squadrons, over 6,500 military and civilian personnel, and stewardship of the 1.7 million acre Barry M. Goldwater Range. All encompassed within Luke's mission: To train the world's greatest F-16 fighter pilots and maintainers, while deploying mission-ready warfighters. A strategic mission that has trained over 15,200 F-16 fighter pilots and 7,500 F-16 crew chiefs since 1994. In 2005-2006, Luke flew over 74K sorties for a total of 101K flying hours.

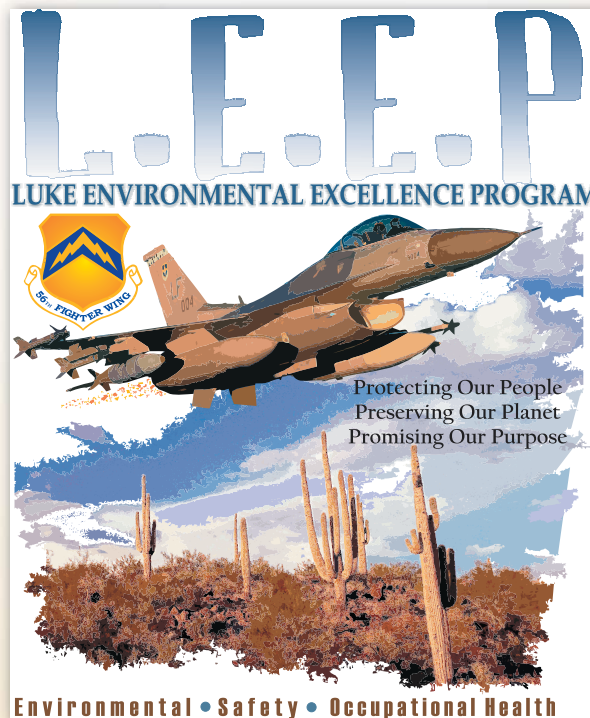
Nestled in the "Valley of the Sun," Luke is located approximately 25 miles northwest of downtown Phoenix, Arizona and is no stranger to local businesses, providing an annual \$1.7 billion economic impact on the ten Phoenix suburbs surrounding the installation.

On December 1, 2005, Luke "LEEP"ed beyond the ordinary compliance management systems by self-declaring to a conforming Environmental Management System (EMS). Luke met all 45 Air Force steps and metrics and took it one step further, creating an all encompassing ESOHMS. This solid program makes certain over 8,000 environmental aspects are continually evaluated to Ensure Mission Sustainability by 1) Protecting our People, 2) Preserving Our Planet, and 3) Promising Our Purpose.

These three components are the heart of Luke's operational focus and ESOH stewardship design. From the top down, the ESOH Council (ESOH) and subcommittees engage over 100 dynamic

Unit Environmental Coordinators, winning the commitment of the entire workforce in managing ten significant aspects and their environmental management plans (EMPs), two of which have been closed. From the Prevention Pollution (P2) Council, to the 20-member commander appointed ESOHMS Cross Functional Team (CFT), every ESOH issue is voiced and creative solutions are developed.

Beyond the fence line, Luke is known; not only for the F-16, but for its tenacious commitment to innovative recycling alliances, local and national educational programs; community outreach partnerships, waste minimization/diversion projects, green purchasing, LEAN initiatives and the Luke Environmental Excellence Program (LEEP), putting Luke in a league of its own.



"The outgoing, energetic people that volunteer from the base bring so much excitement and motivation with them that they are worth a lot more than any amount of money they donate."
Terry Gellenbeck, Chairman, Valleywide Recycling Partnership

SIGNIFICANT ACCOMPLISHMENTS

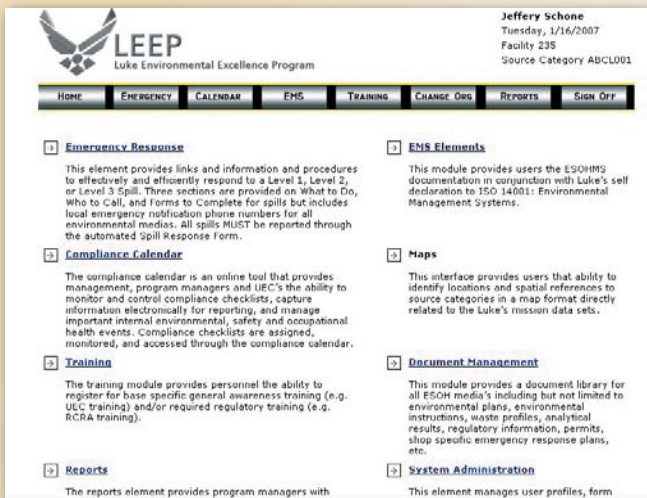
Luke continually redefines and sets new standards for its P2 Program and waste minimization. The major overhaul includes a fresh and new marketing campaign, a focus on education, research and innovation, that is driven by four key components:

- ESOH Benefits/Impacts
- Procurement Flexibility
- Strategic Partnerships
- Short and Long Range Economic Force

As prescribed in the Commander's ESOH Policy Statement, Luke is committed to ensuring P2 compliance with applicable regulations, a healthy and safe workforce, stewardship of resources, and seeking continual improvement. Upon evaluation of the 8,000 aspects, Luke identified seven significant aspects in the areas of hazardous waste, solid waste, hazardous materials, water quality, affirmative procurement, and air quality. In addition to the seven, three additional "on the cusp" aspects were added to include Spill Prevention, Control and Countermeasure goals, recycling, and a much needed Underground Storage Tank replacement, all driven by Luke's ESOHMS.

By October 2006, Luke closed two significant aspects and met or exceeded 80% of the targets of remaining EMPs. With a driven ESOH

team, goal attainment was made possible through public awareness, and LEEP. This simple, yet comprehensive solution serves as



the community hub for information exchanges and houses all necessary ESOH information. Shops now have direct reporting and compliance monitoring for emergency response, in-house regulatory inspections, and access to thousands of environmental records that interact with the local GeoDatabase. Spurred by state-of-the-art web based ESOHMS specific training, a new wave of thinking and results have made personnel innovatively inspired—prompting process changes and improvements, material substitutions, and overwhelming waste reductions!

MATERIAL SUBSTITUTION

The Luke P2 Program is serious about improving the installation's overall mission efficiency and welcomes P2 challenges which has resulted in several improvements.

Zero-VOC Architectural Coatings

56 CES/CEV made going “green” in the desert easy from contracting and self-help, to the procurement official on the flightline, through an interactive concept room and recycled content product displays. As a significant aspect, individuals take an active role to make the right purchasing decisions, while addressing all ESOH concerns from paints to office products.

Luke's self help store stands out from the rest. All interior and exterior paints are now voc-free. The base color schemes were matched to include Government Procurement Card paint purchases. Every ESOH impact from disposal, personal protective equipment (PPE), and quantitative reporting is minimized. With additional intense research and testing, the P2 Program subsequently replaced all the traditional paints, adhesives and solvents to soy-based alternatives. The benefits:

- No Volatile Organic Compounds (VOC's)
- Eliminates any harmful air pollutants
- Eliminated \$2.2K in hazardous waste (HW) disposal costs
- Eliminate 35% of HAZMAT Hazardous Material authorizations

Safety in Sanding

Luke takes pride in its P2 candidate process review system. In 2005, in collaboration with painting personnel, aircraft technicians, and ESOH functions, a comprehensive analysis was undertaken to evaluate and potentially eliminate chromium from F-16 aircraft primers to reduce chromium exposure and waste, and eliminate the existing Alodine process and its associated

wastes. Through the evaluation and testing of the PreKote system, success was achieved. Luke added the chemical to Technical Orders resulting in high-performance surface finishes, increasing the integrity of the primer application process with improved corrosion prevention while posing no short or long term health risks and eliminated two HW streams.

Drastic Reductions!

Luke worked diligently to significantly reduce hazardous waste accumulation points by over 48% in 2005. By taking a holistic waste generation approach for all existing hazardous waste generating processes, Luke evaluated each waste stream from a perspective of complete elimination, re-use in another process or function, recycling of hazardous components, or waste minimization. The thoroughness resulted in an elimination of 12 hazardous waste streams; three of which substituted non-hazardous products in the process, four were removed by changing the process matrix, and five were completely eliminated by internal sampling and analysis. Incredibly, this resulted in a direct savings of \$16K in disposal costs for 2005-2006 and five year projected disposal savings of over \$100K.

EO 13149–FEDERAL FLEET AND TRANSPORTATION EFFICIENCY

Luke operates a model Trip Reduction Program for the Air Force while functioning in a non-attainment area. It is critical to maintain air quality integrity for our future generations. In 2005-2006, through education and the right personnel initiative, Luke deployed over 450 electric vehicles. Utilization eliminated 3.5M

fossil fuel trips and over 600K commuting miles. As a leading partner with Valley Metro, carpooling of commuters, van-pools and available bus routes increased 30% and eliminated 72K single occupancy vehicle trips. These initiatives reduced regulated pollutants, CO, NOx, and PM10, by 79 tons.

PROCESS MODIFICATION OR IMPROVEMENT

Pancake Waste

Luke dramatically reduced its largest waste stream, Paint Gun Cleaning solvent waste, by 99%. Investigating emerging technology and testing the equipment before purchase, the solvent can now be regenerated in-house and all hazardous constituents are removed by filtration and compacted into a 3-inch by 2-inch circular cake. The technology worked so well, all painting facilities now use this system and three solvent cleaning units have been adapted with this technology with tremendous benefits: 1) in less than four months disposal costs reduced from \$34K to a mere \$4K in 2005-2006 2) the new process reduced service costs by 82% and increased productivity of work-centers by 85%, and 3) streamlined the management of thinner and solvent waste basewide.



Down to the “Nuts & Bolts”

The Luke P2 Program is always looking for ways to improve mission effectiveness. An opportunity provided itself when the installation’s maintenance personnel requested a material substitution. An ineffective process used to replace the F-16’s Davis Nut was replaced with the TukLok retooling kit. This new tool removed all PPE requirements, eliminated the need for all sealants and sealant primers used along with the associated waste, while saving 96 man-hours per Davis Nut replacement. With a payback of less than 2 years, the annual savings in material and man-hours totaled over \$27,000.



Water Hygiene for the Dental Clinic

Mercury has long been a problem in the navigable waterways of America and the world. In October 2004, Luke installed two mercury dental recovery systems to capture 99% of the fine particulates that are typically aspirated by marine species. Prior to installation, the dental clinic captured larger particles through dental traps from amalgam restorations, but was not effective in confining the finer particulates, which

pose the greatest threat. The measure was so successful that Luke aided several other military installations. Implementing these measures provides an inexpensive solution to comply with new wastewater regulations being promulgated. Closing the circle, the mercury detained in the filters is then recycled. In two years, Luke mitigated over 160 lbs. of mercury from entering Arizona’s precious water system.

Green Fluorescence

In a further effort to prevent mercury contamination in landfills, Luke tackled toxic waste generated from fluorescent lamps. Luke is a large quantity generator and disposed of over 15,000 hazardous fluorescent lamps in 2004. Although the lamps are managed as Universal Waste (UW) and recycled, Luke mandated that all internal procurement agencies stock “green tipped,” environmentally friendly lamps. By incorporating this initiative into business practice, Luke streamlined all UW handling procedures, eliminated all regulatory vulnerability through time, and reduced any associated safety and health hazards through replacement.

EO 13148—LEADERSHIP IN ENVIRONMENTAL MANAGEMENT

CFC Free!

In 2005, Luke volunteered to test a new Oxygen Equipment Cleaning System (OECS) to clean the F-16’s oxygen distribution tubing. The standard process prior to testing the new system was expending an ozone depleting substance; CFC-113. Utilization of the new system allowed OECS to use a nontoxic, nonflammable, non-corrosive, non-ozone depleting substance. The

simple solution has tremendous benefits and makes the mission and pilot safety priority one.

EMS Implementation

Luke developed an EMS implementation plan in accordance with ISO 14001 EMS, prior to the December 31, 2005 deadline. Base CFT members actively identify, manage and prioritize all environmental impacts associated with the aspects with superior leadership involvement through the ESOHC. Coupled with Luke's aggressive state P2 Plan with 59 goals, Luke is always on top of the EMS game.

Compliance monitoring and assessment is essential to Luke's success and leads to successfully mitigating any notice of violations through stringent ESOHCAMPs, internal assessments, and hands on education; all of which are incorporated into a comprehensive ESOHMS. With these successes, Luke teams with fellow ISO 14001 certified facilities through the Arizona Strategic Alliance and is in the process of entering into the U.S. Environmental Protection Agency Region 9 Performance Track program.

Compliance Reporting

Luke is one of a kind. Through foresight, process modifications, and material substitutions, Luke has had no Toxic Release Inventory reports since 2003. Luke reduced toxic chemicals and hazardous chemical usage by over 80%, far exceeding the required 50% reduction by the December 31, 2006 deadline. Subsequently, Luke has had no Emergency Planning and Community Right to Know Act releases to report in 4 years!

EO 13123-EFFICIENT ENERGY MANAGEMENT

Solar Shopping and More

Active duty and retirees shopping at the Base Exchange (BX) now enter into a comfortable conditioned environment using the sun's energy. Through partnerships with Honeywell and Arizona Public Service, multiple integrated photo voltaic panels now supplement power for heating and cooling at the BX. The result was a savings of \$3M; a project that should have cost over \$5M in capital expenses was achieved for less than \$2M. A savings realized from energy rebates, immediate utilization reductions, and energy credits paid to the contractor over time. Included in the project was full replacement of all T-12 ballasts to T-8 fluorescent lighting systems basewide, for a net energy savings of 11.9MWh/yr. This cut utility costs by \$500K annually.

RECYCLING PROGRAM

Luke generates very creative solutions for recycling. The Phoenix West Valley has increased in population by 170,000 residents in three years. At one point, Luke was the only "city" recycling and aspired to grow this concern. As a result, Luke created the "Thunderbolt Recycling" marketing program which distributes brochures and quarterly newsletters, "The Recycler," to base personnel. The effort has led to a solid waste diversion increase of 18% at Luke in 2005 and a further increase by 8% in 2006.

Helping this effort, Luke was selected for a \$25.5K Waste Reduction Initiative recycling



education grant in August 2004. Over 300 local Arizona corporate giants competed for the chance to promote Earth-911 and 1-800-Clean-Up. Luke beat the competition! With implementation from November 2004 to August 2005, Luke developed an exceptional and thriving program that has been adopted by several local cities.

Luke completed two full waste characterizations by quantifying several solid waste streams from every group and tenant unit operating on the installation. With the results in hand, 56 CES/CEV commissioned an aggressive desk side recycling campaign, issued over 700 units, implemented a "cash for cans" unit for direct organizational profitability, trained over 160

“Recycling Captains,” and developed several unique tools for convenient recycling.



It's all in the Bag!

Realizing the lack of participation by dorm residents, Luke designed and manufactured “The Good Stewards” recycling bag; a custom machine washable bag imprinted with the “How To’s” of recycling for residents to hang on their door knob. Triumph at Luke was only the beginning. The bag was also a success at the community level and is used by over 10,000 residents and 52 local schools with future outreach implementation scheduled in 2007.

Show Me the Money!

With over \$430K in Qualified Recycling Program (QRP) profits in the last two years, Luke’s P2 Program operates self sufficiently. By going direct to market with all the commodities, and creating value added local partnerships, Luke captures market price for products such as paper, cardboard, brass, aluminum, scrap metals, pallets, toner cartridges, and petroleum, oil and lubricants (POL’s); all revenues are used to fund every P2 initiative brought to the table. These diversions alone avoided \$5M in total net costs!

You Want to Recycle What?

In two years, Luke instituted five new programs to reduce or reuse industrial solid waste. Luke, in addition to many public agencies has to deal with POL sorbent waste. Partnering with Safety Kleen in October 2004, Luke developed a management process that redefines innovation for problematic solid waste. Sorbent pads are now used for energy recovery to increase solid waste diversion efforts. The impact is significant; 130,000 pounds were utilized for bulk energy recovery in six months. As an added bonus, all diesel, jet fuel, oil, and hydraulic fluid filters, once thrown away as municipal solid waste, are commingled with soaked sorbent pads and shipped for recycling. Over 16,000 pounds of designated filters have been recycled to date. The program was cross-fed to other military and airport agencies statewide and was highlighted in the Airman’s quarterly magazine in 2006.

GREEN PROCUREMENT

The True Costs of Printing

Although toner recycling is common, Luke’s program is distinct. The units Luke use are completely remanufactured to exceed Original Equipment Manufacturer standards. In an effort to close the loop, our partnership with LaserMasters, Inc. made these same units available for organizations after reproduction. Ironically, Luke sells the used cartridges for a profit while organizations repurchase at a 57% discount versus buying new. Through the association, Luke base units saved over \$15K in equipment costs and closed the loop on 450 cartridges since March 2006. Luke is truly unique!

Content Management

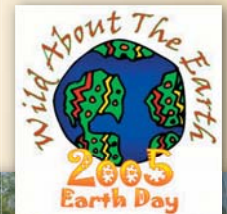
In 2004, Luke went above expectations to raise understanding of affirmative procurement (AP) and EO 13101. Over 950 government credit card holders were trained on a new AP program. The education has affected over \$1M in recycled content purchasing decisions. To make it easy, procurement officials now know what products are “green” through online databases and search engines available at their fingertips. Local supply agency buyers were educated to carry products with recycled content, making base personnel buying decisions effortless and ensuring 100% participation.

EDUCATION, OUTREACH, AND PARTNERING

Luke places an emphasis on public awareness programs to foster future environmental leaders at the installation and within the surrounding communities.

Tres Rios Nature and Earth Festival

“Wild About the Earth” debuted to an audience of 3,600 Earth Day celebrants in April 2005. The event included a “recycling fashion show” where 38 contestants



modeled apparel made of recyclable goods, a button and poster contest, and 30 exhibitors presented their interpretation on how to “Live to the Xtreme,” while incorporating an element of fun! Five mayors, over 200 local volunteers, and several civic environmentalists participated.

The event was so successful, Luke’s Earth Day Protection Committee was asked to partner with the Tres Rios Nature Festival. The goal: combine nature and environmental education into one event. Sealing our partnership, the name was changed to the Tres Rios Nature and Earth Festival. The free community event, “Into the Wild,” featured live wildlife, fishing, canoeing, hiking, and environmental living. Additionally over 50 sponsors, \$150K in donations and 75 exhibits wowed a crowd of 8K. The overwhelming response forecast participation for the 2007 event in excess of 20K.



It’s an EarthFest!

Luke’s support of the education system extends beyond Arizona to the national level. Recognizing that teachers face challenges in the classroom with limited time and resources, Luke partnered with Valley Forward’s EarthFest Educator’s night to bring environmental education into the classroom. Luke donated a recycling bag and a locally developed educator resource toolkit CD. With this partnership, environmental education resources were presented to more than 300 K-12 teachers throughout Arizona, featuring more than 50 exhibits on environmental education curricula, field trips, and related activities.

21st Century Learning

In collaboration with 21st Century Learning, Luke broadcasts live educational seminars to 3rd and 4th grade private school students via the web, at the national level. Webcasts have been accessed from Arizona to Massachusetts and have provided toolkits for every teacher. Wanting continual education year round for adults and kids, Luke designed www.LivetotheXtreme.com.



Globally, anyone can explore the website to obtain resources and learn the Conserve-Preserve-Restore (C.P.R.) model. To date, the web site has been visited by over 20K surfers!

GREEN BUILDINGS

Luke’s efforts towards building green are earth-moving. All new construction projects are now required to meet Leadership in Energy and Environmental Design (LEED)TM 2.2 standards.

56 CES/CEV along with the 56 CES/CECC architect, interior designers and contractors, are in the final phases of design of Luke’s first gold certified green building. The new 944th Fighter Wing Civil Engineering Headquarters

will be completed in July 2007 with sustainable design concepts including innovative rainwater harvesting to recycled carpet. This is the first sustainable building project to go green from cradle to cradle. Deconstruction materials will be recycled or reused by the contractor, a metal recycler, or Habitat for Humanity. In the future, Luke will be partnering with the housing contractor to build Eco-homes—meeting LEEDTM criteria in the military family housing area.

Reductions and Milestone Highlights

The efforts of the environmental team at Luke have resulted in astonishing outcomes!

Air Quality Emissions	ODS Free! Criteria Pollutant reduction of 47 tons! Zero VOC interior painting program
EMS	Fully integrated ESOHMS; 8,000 trained; Closed 2 significant aspects.
Energy Reductions	11.9MWh/yr in energy reductions; Savings of over \$1M
Hazardous Waste Reductions	Reduced waste streams by 44%. \$57K annual savings
New Partnerships	23 active partnerships within the local community and rising
Outreach	Award winning Tres Rios Nature and Earth Festival. Combined activities have impacted over 250,000 people nation-wide
QRP Profits	Increased revenue by 300%, for \$380K net; funds all P2 projects and recycling programs
Solid Waste Diversion	Overall increase of 68%. 6,678 tons diverted; \$5M net cost avoidance



LUKE AIR FORCE BASE

FY06 SECRETARY OF DEFENSE ENVIRONMENTAL AWARD POLLUTION PREVENTION—NON-INDUSTRIAL INSTALLATION



Award Category: Pollution Prevention—Non-Industrial Installation

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