

2003 SECRETARY OF DEFENSE RESTORATION TEAM AWARD 45TH SPACE WING



PATRICK AIR FORCE BASE

CAPE CANAVERAL AIR FORCE STATION

MALABAR TRACKING ANNEX

JONATHAN DICKINSON MISSILE TRACKING ANNEX

**2003 SECRETARY OF DEFENSE
ENVIRONMENTAL RESTORATION TEAM AWARD
45TH SPACE WING, PATRICK AIR FORCE BASE, FLORIDA**

INTRODUCTION



Along Florida's Space Coast where the vast Atlantic stretches east, the journey to space began decades ago and continues today. The work of the 45th Space Wing (45SW) comes together amid the sensitive habitat of sea turtles and scrub jays.

Headquartered at Patrick Air Force Base (PAFB) and nearby Cape Canaveral Air Force Station (CCAFS), the wing has been the backbone of the nation's space program for more than 50 years. Cape Canaveral is the nation's only facility able to launch satellites into equatorial orbit. The 45SW serves as the East Coast spaceport, providing the Air Force's (AF) critical contribution to a lean, yet effective national defense force. An integral part of the nation's defense, the wing supports air and space superiority, global attack capability, rapid global mobility, precision engagement ability, information superiority and agile combat support and rescue.

The 45SW prepares satellites for launch on a variety of expendable space launch vehicles. The wing's global importance is underscored by the 3,320 space launches to date with 29 launches and 6 space shuttle landings during the last two fiscal years.

The Eastern Range supports the various space programs of the Air Force, Army, Navy, NASA's space shuttle, foreign governments, the European Space Agency and various commercial activities.

The 45SW's responsibilities are far-reaching. The wing's Eastern Range encompasses 15 million square miles and includes 15,800 acres at CCAFS, 2,108 acres at PAFB and extends more than 10,000 miles from Argentia, Newfoundland to the South Atlantic. Facilities also include 652 acres of tracking sites in Florida at the Malabar and Jonathan Dickinson Missile Tracking Annexes and 4,087 acres at downrange sites at Antigua Air Station and Ascension Auxiliary Airfield.

Coupled with the 45th Space Wing's primary mission of enhancing national strength by ensuring access to space, all 2,327 active duty, 1,555 civil servants, 6,349 contractors and more than 35 tenant units are committed to environmental excellence.

Few military installations play as significant a role in our country's defense and our national security as the 45SW. Today, this objective includes a conscientious plan to protect and restore the environment for the future. Cleaning up wastes associated with past operations is a major focus at the 45SW.

The environmental setting of the 45SW is nearly as unique and multi-faceted as its mission. Patrick AFB and Cape Canaveral AFS cover nearly 23,000 acres of sandy beaches, coastal sand dunes, wetlands, coastal strand scrub and woodlands. Located on a barrier island in central Florida between the Banana River Lagoon and the Atlantic Ocean, it is mostly undeveloped coastal land that ensures restricted access and provides a safety zone for space launches. Patrick and the Cape are home to 46 state and federally listed, threatened and endangered wildlife species. This fragile ecological setting thrives at the 45SW in part due to the dedicated efforts of the restoration team who diligently protect these resources in all remedial decisions.

BACKGROUND

Recognized as the world's busiest launch base, the wing assures access to space, while Installation Restoration Program (IRP) personnel strive to protect and restore thousands of acres of land.

The sandy soils, shallow groundwater table and flat topography of CCAFS and PAFB create a setting where environmental contamination that occurred decades ago does not readily degrade or disperse.

Contaminants from historic releases may remain relatively close to the surface, increasing the potential for them to be accessible to human and ecological receptors.

Overseeing this massive restoration program is a monumental task spearheaded by the 45SW's restoration team. This cohesive effort includes the AF, the US Environmental Protection Agency (EPA), the Florida Department of Environmental Protection (FDEP), 45SW IRP contractors and the local community joining together to get the job done while saving time and money.

The 45SW restoration team, consistently recognized as a leader in the partnering arena, focuses on common goals through trust and cooperative efforts such as better communication, consensus decision-making and problem solving. The restoration process was greatly streamlined after delegating the decision-making authority to this working level group. The team's guiding principles include standardized ground rules, specialized decision tools and customized guidance documents.

RESTORATION TEAM		
<i>Team Member</i>	<i>Position</i>	<i>Experience</i>
Greg Keefe	USAF, Chief Restoration Section	12 years
Teresa Green	USAF Former Chief, Restoration Section	15 years
Mark Kershner	USAF Project Manager	18 years
Jeff Skupien	USAF Project Manager	11 years
Ed Carver	USAF Former Project Manager	15 years
Ron Bond	USAF Engineering Assistant	9 years
Joan Albury	USAF Hazardous Waste Coordinator	25 years
Lex Stokes	USAF Environmental Flight Chief	20 years
Terri Bracher	USAF RAB Facilitator/Public Affairs	16 years
John Matthews	AFCEE, Env. Eng. Program Mgr.	8 years
Tim Woolheater	EPA, Remedial Project Manager	10 years
Jorge Caspary	FDEP, Remedial Project Manager	15 years
Regina Dixon-Butler	URS Corp., IRP Information Manager	10 years
Donn Sardella	URS Corp., IRP GIS Manager	10 years
Rena Mercadante	URS Corp., IRP Technical Support	18 years
Paul Goldsmith	BEM Systems	14 years
Dennis Theoret	Apex Env. Eng. & Compliance, Inc.	17 years
Deda Johansen	Jacobs Engineering Group	22 years
Dan Phillips	SpecPro, Inc., 45SW Support Contractor	18 years
Joe Foran	The Management Edge, Facilitator	25 years

The restoration team's diverse background and over 300 aggregate years of experience enables them to make difficult remedial decisions, formulate innovative solutions, surmount obstacles, meet Congressional goals and reach consensus on contentious and potentially divisive issues.

The team's motto provides an apt description of their mission: "Protecting the future and restoring the past." Team members are dedicated to restoring historically contaminated property while ensuring the country's continued dominance in space.

The 45SW restoration team tackles these challenges by addressing them through aggressive, innovative and intricate networks of resources and technologies. Wing readiness is enhanced while human health concerns are abated, the environment protected and mission impacts minimized.

AWARDS, RECOGNITION, SERVICES

The 45SW restoration team members are recognized throughout the environmental remediation industry as innovative leaders who continually strive to achieve the most

AWARDS AND RECOGNITION			
<i>Award</i>	<i>Year</i>	<i>Level</i>	<i>Member/Team</i>
General White Restoration, Individual Excellence	1998	AF	Edwin Worth, Former Chief, Restoration
General White Restoration, Individual Excellence	1998	AFSPC	Edwin Worth, Former Chief, Restoration
General White Restoration	1999	AFSPC	Program award
General White Restoration	2000	AFSPC	Program award
General White Restoration	2002	AFSPC	Program award
General White Restoration, Individual Excellence	2003	Air Force	Restoration Team
General White Restoration, Individual Excellence	2003	AFSPC	Restoration Team
AFCEE Technology Transfer Workshop	2003	Team Member	Mark A. Kershner, Project Mgr.

cost effective and technically sound remedial decisions. Many program aspects are routinely “exported” to other bases, other industries and the cleanup community.

During the award period, team members published nine scientific articles addressing a diverse range of topics including ecological risk, streamlined sampling techniques, Geographic Information System (GIS) innovations and groundwater cleanup. Many of these were presented at national or international scientific symposiums.

The USAF IRP personnel from PAFB routinely serve as guest speakers at the AF Institute of Technology (AFIT), Environmental Restoration Course, to share their innovative IRP management strategies and tools. Their commitment to efficient data management is exemplified by continued membership on the AF Restoration Information Management System (AFRIMS) Working Group and Focused User’s Group for Cleanup.

PROGRAM SUMMARY

The overall objective of the 45SW’s environmental program is to support the wing’s mission of assured access to space while protecting and preserving the environment.

The 45SW restoration team manages a large and diverse restoration program. From the early years as the Banana River Naval Air Station, the “race to the moon,” the cold war era and through the emergence of satellite technologies, the 45SW played an important

role in American history. However, many of these historic achievements occurred in a timeframe when environmental awareness was limited and pollution prevention was not a consideration.

The past use of industrial solvents like trichloroethylene and freon was integral to many launch operations. Early cleaning techniques required copious amounts of solvents and often concluded with their release into the environment. Hundreds of thousands of gallons of solvents may have been released as a result of launch operations at CCAFS. This resulted in more than 1,300 acres of groundwater contaminated above regulatory criteria. Additionally, the historic use of paints containing poly-chlorinated biphenyls (PCB) contributed significantly to soil contamination.

IRP sites at 45SW facilities include abandoned launch complexes and support facilities, fire-fighter training areas, fuel storage and dispensing areas and several abandoned landfills. Most sites either used hazardous materials or were used to dispose of hazardous and typical municipal wastes from the 1940’s through the early 1980’s.

To date, 166 separate IRP sites at CCAFS, PAFB and the Malabar Annex, covering 2,800 acres, were incorporated into the 45SW restoration program. Currently, 109 of the sites have been approved for no further action. There are 18 in long-term management or undergoing remediation, 8 are in remedial design or in the remedial implementation stage, while 18 are still under-going

investigation. During the award period, “remedy in place” was achieved at 10 sites, with 8 sites approved for “no further action” and the remaining 2 sites have long-term management requirements.

The 45SW IRP team executed a \$22 million budget during the award period. Each project was carefully planned, programmed and validated to ensure compliance with the Resource Conservation and Recovery Act (RCRA) permit, Government Performance and Results Act (GPRA), the DoD cleanup performance goals, mission-related milestones and Environmental Restoration Account (ERA) funds.

Throughout the entire restoration process, regular public briefings and outreach activities are held to foster an open and trusting relationship with the community. The public support earned via this process contributed directly to the restoration program’s success.

The 45SW is recognized around the world for the many and diverse remediation technologies tested and proven at CCAFS and PAFB. Embracing the wing legacy of testing cutting-edge aerospace craft and other “rocket science,” the restoration team hosted 22 different remedial technology demonstrations during the last two fiscal years.

ACCOMPLISHMENTS

Accelerating Cleanup / Reducing Risk to Human Health and the Environment

The primary goal of the restoration program is to clean up past contamination in order to protect human health and the environment from the continued impacts from historical contamination. Efficiency, flexibility and responsiveness are continually integrated into the 45SW’s restoration efforts. Although the team deals with a myriad of independent issues at many sites, the program is managed holistically. Process improvements in one project are readily integrated throughout the program. Any cost

or schedule savings at one site often trigger similar benefits at other sites throughout the program.

Streamlining the remedial process is at the forefront of the 45SW IRP. Over the last two fiscal years, the team’s diligent efforts in the long-term groundwater monitoring program resulted in cost savings of almost \$400,000. Using multi-chamber wells for vertical groundwater characterization can save up to \$5,000 per location over conventional well clusters. Passive diffusion bag samplers were used in lieu of traditional groundwater sampling methodologies for volatile organic compounds. This technique reduces labor and waste management requirements by 10-20%.

Henry’s Samplers were used to characterize hundreds of surface water locations to determine hydrologic connections with contaminated groundwater. This technology allows rapid assessment and delineation of groundwater plumes and it pinpoints specific discharge areas for corrective action.

Ingenuously employing an on-site laboratory and innovative remedial techniques saved \$30,000 and significantly accelerated the cleanup schedule at former transformer areas contaminated by PCB-laden dielectric fluids. The use of on-site gas chromatographs provided instantaneous analytical results, shortening the normal two-week timeframe to obtain results. Using a vacuum extraction truck allowed less invasive excavation that significantly reduced safety concerns and avoided disruption of underground utilities.

More than 60,000 tons of PCB-laden soils were excavated from various facilities on CCAFS over the life of the program. Paints containing PCB are the primary source of this soil



contamination. Repeated maintenance, such as sand blasting and repainting, spread PCBs throughout local surface soils. PCB field detection kits were used to fine-tune the excavation areas. These kits provide instantaneous results in the field while saving \$25 to \$50 per sample over traditional laboratory methods.

The team proactively worked to ensure immediate risks to human health and the environment were identified and mitigated. Aeration diffuser systems were installed in two canals and two air sparge systems are maintained where contaminated groundwater plumes encroach dangerously close to the Banana River Lagoon. Facility indoor air quality surveys were initiated at 10 buildings to assess potential solvent vapor intrusion. The resulting data will help both installations meet GPRA goals and ensure the aerospace work force has a safe working environment.

Conscientious integration of new management techniques and process improvements into the restoration team's library of generic workplans streamlined scheduling by documenting programmatic process decisions that otherwise were made on a project-by-project basis. These documents include field-sampling procedures, decision process documents, separate CCAFS and PAFB operating procedures, a Quality Assurance Program Plan and an Investigation Derived Waste Management Plan. This unique library ensures a consistent and efficient approach that saves tens of thousands of dollars normally spent on detailed individual project-specific work plans.

Stakeholder Involvement

Integrating the community into the 45SW restoration process is a top priority. Stakeholders involved with the restoration program include the wing commander, the general public, the

regulatory community and the aerospace industry.

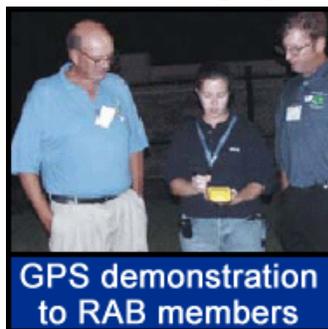
The 45SW Restoration Advisory Board (RAB) was formed in 1995. This diverse, enthusiastic group includes 23 individuals representing ten local communities surrounding the bases. This motivated group provides critical insight into community concerns, is keenly interested in restoration initiatives, contributes valuable feedback on remedial decisions and positively supports the program as liaisons with the general public.

Continually nurturing this trusting alliance, RAB meetings are held quarterly. Over the last two years, 25 presentations on a variety of topics including local geology, sampling techniques, innovative remedial technologies, overall program status, data management advances and individual projects were shared with the RAB. Two tours were conducted to all major sites at CCAFS and PAFB.

An open and trusting atmosphere defines the relationship between the 45SW and the surrounding communities. A periodic restoration newsletter provides updates on program advancements.

Restoration team members developed a "User's Guide" to the IRP Information Repository (IR) located at the Central Brevard County library. The repository contains document summaries, fact sheets for all sites, decision documents and program status summaries. It is not possible to house the program's entire official file at the local

library, so to ensure public accessibility of historic documentation, the team also developed an easy-to-use electronic archive on the Internet. The RAB was actively involved in the development of this resource and assisted with beta testing. Their valuable feedback underscores the importance of involving community stakeholders early and often.





This outstanding partnership with the local community ensured a smooth transition of the 45SWs RCRA permits from federal to state authority. This transition also involved the incorporation of Statements of Basis (SB), with final remedy decisions for 26 sites. RAB members were essential to the success of this process as they provided feedback on proposed remedies and served as a conduit for public comments. Due to the RAB's pro-active involvement and the teams' on-going awareness of public concerns, potential impediments were addressed well before the official comment period.

Regulatory Coordination

Communication, teamwork and management skills are the cornerstones on which the 45SW IRP was built. This strong foundation withstood the impact of significant personnel changes, a permit authority transition and numerous technical challenges.

While EPA and the FDEP are core restoration team members, other agencies such as the US Fish and Wildlife Service, National Marine Fisheries Service, the National Oceanic and Atmospheric Administration, St. Johns River Water Management District and the National Estuary Program participate on specific issues.

The restoration team resourcefully developed the Comprehensive Restoration Information Tracking-Electronic Repository (CRIT-ER), allowing real-time tracking of AF milestones, remedy information, documents, correspondence, photos, meeting minutes, waste management data and integration of Corrective Action Management Plan (CAMP) dates. This system manages copious amounts of information including 5,700 official

correspondence items, 1,600 official site documents, 2,000 briefing packages from 151 partnering meetings and 1,900 photos that aid in the effective management of the wing's 166 restoration sites.

IRP personnel team with their regulatory brethren and often create specialized reports in order to help the regulatory restoration project managers track agency goals. The CRIT-ER database was briefed at the annual Joint Tier I/Tier II partnering meeting to share lessons learned during its development. These database resources were also used to produce a "Program Orientation and Status Update Manual" (POSUM). Two versions of this document are maintained in accordance with the Chief Financial Officer (CFO) Act. Compliance information is integrated into the "internal" (AF only) version. The "external" version is widely disseminated to contractors, regulatory personnel and visitors. POSUM has played a pivotal role in the successful integration of eight new 45SW restoration team members over the past two years.

A cooperative team approach facilitates a willingness to extend CAMP dates when launch schedules cause delays or mission essential activities impact investigation and cleanup. An example includes the launch processing of the Hubble Space Telescope cameras. This sensitive equipment required stringent air pollution control measures throughout a large portion of the CCAFS industrial area. Three major restoration sites fell within the impacted area and had restrictions on environmental sampling and remedial actions. EPA and FDEP worked with AF personnel to revise regulatory milestones, helping ensure the success of the mission to repair the delicate Hubble Space Telescope.

Promoting and ensuring an understanding of the Environmental Restoration Account funding process and DoD cleanup goals paid big dividends for the wing's restoration program. Following the tragic events on

September 11, 2001, national security concerns, coupled with fieldwork restrictions associated with several space launches, caused lengthy schedule delays at CCAFS, potentially impacting annual 45SW restoration milestones. Regulators fast-tracked the review of two RCRA facility investigations and approved both sites for no further action, actually exceeding the wing's FY-02 Remedy In Place goal.

The team's commitment to Land Use Control (LUC) management allowed successful completion of a significant force protection counter-measure project involving underground utilities. This mission critical utility project inadvertently trenched through a former hazardous waste landfill at CCAFS. Because LUCs were in place and provided an effective means of protection, corrective remedial options including relocation of landfill contents or installation of a \$6 million, synthetic liner cap and venting system were avoided. Early coordination enabled the IRP to prepare the construction managers for the potential of encountering landfill debris. The regulatory members of the restoration team commended the AF on their exemplary handling of this situation and were impressed at the LUC's effectiveness. No regulatory violations or warnings were incurred; workers were not exposed to hazardous material; and there were only minimal impacts to the project's schedule.

Cost Avoidance

Maintaining the delicate balance between environmental excellence and cost effectiveness is at the forefront of every decision made by the 45SW restoration team. Projects are critically reviewed at inception ensuring economies are achieved and cost-cutting measures explored. Long before "Remedial Process Optimization" (RPO) was a buzz phrase, it was a way of life at the 45SW.

Going a step beyond, the restoration team conducts special RPO evaluations for major projects in addition to the day-to-day project and budget processes.

A phenomenal RPO effort involved a \$7 million final remedy implementation of a truly innovative groundwater cleanup system at Space Launch Complex (SLC) 15. The system was pilot-tested on-site for five weeks. Preliminary tests and analysis determined the optimal operational mode of the remedial system, effectively marrying several proven technologies to aggressively remove and treat the solvent contamination in the form of Dense Non-Aqueous Phase Liquids (DNAPL).

After the field test, the restoration team, along with a world-renowned group of industry experts in DNAPL treatment, reviewed operational results and performance monitoring data. This RPO team provided critical review comments and suggested optimization strategies for a full-phase implementation. One improvement included the use of in-well flux meters as a performance measurement tool for determination of changes in DNAPL mass. Another



suggestion involved ways to obtain data to improve applications of this technology to other sites. Together these ideas and actions have saved tens of thousands of dollars already while avoiding costly pump and treat techniques normally used to create a gradient for flux measurements.

Prudent RPO review conducted at SLC-17, the home of two active Delta II/III pads, avoided more than \$3 million in costs, protected workers and kept the nations space program on track. Years of use and hundreds of launches resulted in significant chlorinated

solvent contamination in the groundwater. The team carefully evaluated site characteristics, including the plume’s stability, the lack of exposure to and use of site groundwater and the inherent difficulties in safely and effectively implementing a complex groundwater remedy at an active launch complex. Based on this analysis, the regulatory community concurred with the technical impracticability of conducting a remediation project as long as the complex remains active and the final remedy decision incorporated this waiver.

The restoration team worked “smarter, cheaper, faster” to solve a massive and complex remediation problem at SLC-13 on CCAFS. Unlike other historic launch complexes, the launch tower remains in place and continues to act as a source of PCB soil contamination. The highly corrosive site conditions cause paint containing high concentrations of PCBs and metals to continually flake into the environment. Initial remedial plans indicated that most of the tower debris needed to be transported off-site to a Subtitle C landfill at significant cost. Detailed research and discussions with regulatory personnel identified an exemption for PCB-contaminated bulk product waste, allowing disposal of the debris at an on-base construction and demolition landfill at a cost savings exceeding \$1 million.

Innovative remedial technology testing has

become a way of life at the 45SW. The 45SW’s unique geophysical, hydrologic and climatologic setting, combined with the nature of contamination, makes the installation an ideal proving ground. Various government and academic institutions nationwide were involved in the demonstration of 22 separate technologies over the past two years. The restoration team researches, initiates and oversees the unproven technological demonstrations and unique remedial actions that are generally fully funded by the sponsor. The real world data gathered as a result is invaluable to the corrective measure selection process at similar sites. Future cost-savings realized through the worldwide use of these promising technologies is immeasurable.

Other Benefits

An exemplary program is marked by its ability to export successes and share lessons learned with other organizations. Many avenues exist for timely dissemination of current and future restoration. The team engages in cross feed sessions with other Florida AF partnering teams on subjects ranging from data management to land use controls. Over the past two years, nine scientific papers were presented at technical conferences. The team provided 25 separate briefings to the RAB and wrote more than 1,100 documents and 5,700 correspondence items that were all posted to the publicly

CONTAMINANTS	TECHNOLOGIES EMPLOYED
DNAPL Treatment Demonstrations at SLC-34	Bioaugmentation (KB1); Emulsified Zero Valent Iron (EZVI); In-situ Chemical Oxidation with KMnO ₄ ; 6-Phase Heating Steam
Subsurface DNAPL Assessment Technologies (Saturated Subsurface)	Multiple Geophysical Techniques to identify and quantify DNAPL in pore space; Membrane Interface Probe; Flute Membrane
DNAPL Treatment at Cape/Patrick	Large Diameter Auger (LDA) combined with steam injection, vapor extraction, and iron polishing; Cyclodextrin Injection pilot test; Pilot test of 4 different injection technologies to facilitate the delivery of EZVI
Chlorinated VOC treatment in Water	Mulch as a substrate addition; Vegetable Oil to enhance bio-attenuation; Horizontal Air Sparging; Vertical Air Sparging; Canal Aeration Diffuser; Hydrogen Sparge (gaseous phase); Monitored Natural Attenuation
Petroleum Treatment in Groundwater	In-Situ Chemical Oxidation

accessible web page. The IRP produced 217 fact sheets and created the Information Repository at the local public library.

The IRP's comprehensive data management tools allow easy assembly of detailed briefing packages used to apprise leadership of the restoration program. These tools also facilitate needs associated with compliance inspections, funding audits, IRP program reviews, command suspenses and budget planning.

A cutting edge, GIS-based, dig-permit "wizard" was ingeniously developed by 45SW restoration personnel and incorporated into the AFIT restoration curriculum. This automated tool tracks design specifications for base construction projects and other dig requests and then produces a consistent and detailed restoration response package. The wizard has proven invaluable by eliminating arduous document searches for information.

Supporting the wing mission of assured access to space and promoting current and future military readiness are primary goals of the IRP. Significant portions of CCAFS are environmentally sensitive, culturally significant or constrained by current operations. These constraints critically limit available space for new launch operations. Redevelopment opportunities for deactivated launch complexes play a significant role in future wing planning. The inaugural launches of two Evolved Expendable Launch Vehicles (EELV) occurred in FY-02. Prior to construction of these new launch facilities, more than 23,000 tons of historic PCB contamination was removed by the IRP. This \$2 million restoration effort cleared the way for the \$1 billion program, further strengthening our country's defenses and diversifying the world's premier space launch capability.

Future mission needs at the world's "Gateway to Space" are a driving force behind remedial decisions. Air Force members worked closely with the authors of the

Spaceport Florida 2050-Year Plan. This comprehensive assessment of possible future space launch activities at CCAFS confirmed that many abandoned launch complexes and previously used operational areas are likely to be redeveloped. The 45SW restoration team used this data to prioritize site cleanup actions to achieve maximum flexibility in reuse considerations. Additionally, IRP personnel assisted in the development of a \$200,000 state grant for the Space Coast Economic Development Committee designed to develop a comprehensive Environmental Baseline Study for 12 abandoned launch complexes with the highest potential for future re-use. This endeavor enhances long-term economic stability of the entire Space Coast.

COMMITMENT

The 45SW is committed to 'protecting the future and restoring the past.' The restoration team continues to seek new ways to protect, preserve and restore the environment. These exceptional stewardship programs continue to grow and expand ensuring national resources are here for generations to come.

Commitment to the environment is enhanced through outstanding program management, use of innovative technologies, community relations and the many and diverse program goals.

The 45SWs commitment to supporting the AF space mission while restoring the environment can be summed up with on phrase:

*"Our mission is space.
Our responsibility is the earth."*