

ROBERT T. MASON AWARD FOR DEPOT MAINTENANCE EXCELLENCE



F-22 RAPTOR DEPOT MAINTENANCE TEAM
OGDEN AIR LOGISTICS COMPLEX
HILL AIR FORCE BASE, UTAH

F-22 RAPTOR DEPOT MAINTENANCE TEAM



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SECTION 1A: DEPOT-LEVEL NOMINATION PACKAGE INFO SHEET

1. Military Service and/or Command
 - United States Air Force; Air Force Materiel Command
2. Major Depot Maintenance Facility
 - Ogden Air Logistics Complex (OO-ALC)
3. Identification of nominated program
 - F-22 Raptor Depot Maintenance Team
4. Depot Activity Commander's name and nominee's mailing address:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

5. Points of Contact for nominated unit:

Primary Point of Contact:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Alternate Point of Contact:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

6. Points of Contact at Higher Headquarters:

Primary Point of Contact:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Alternate Point of Contact:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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7. Background information for nominated program:

The 574th Aircraft Maintenance Squadron's F-22 Programmed Depot Maintenance Team distinguished itself by superior performance in accomplishing aircraft maintenance during the period of 1 October 2012 through 30 September 2013. During this fiscal year, the team directly and significantly increased F-22 aircraft availability through the return of 11 aircraft to operating units, achieving 100 percent on time delivery by the end of the fiscal year with zero defects reported by the customer. These extraordinary achievements were accomplished through aggressive initiatives, visionary leadership, and key process changes centered on full implementation of the tenets of the Air Force Sustainment Center (AFSC) Way.

8. Program size:

323 personnel (307 government civilians, 2 military and 14 contractors).

9. Mission Statement:

The 574th Aircraft Maintenance Squadron provides scheduled modifications and unscheduled depot level maintenance for the United States Air Force fleet of F-22 aircraft.



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SECTION 1B: WORDS FROM OUR COMPLEX COMMANDER



The F-22 Raptor Depot Maintenance Team provides scheduled and unscheduled depot-level maintenance in support of global combat capability for Air Combat Command, Pacific Air Forces, Air Education and Training Command and the Air National Guard. Ensuring excellence in our F-22 mission is one of our most important and critical priorities. We consider the standard to be perfection when it comes to our contributions to the combat mission around the globe. The 574th Aircraft Maintenance Squadron (AMXS) continues to achieve this excellence by recognizing opportunities, understanding and eliminating true constraints, improving processes and maximizing available resources. The team has created an environment for success by developing their people, managing their resources and improving their processes focusing on the tenets of speed, quality, safety and cost effectiveness.

Through their efforts, the 574 AMXS generated 242,557 man-hours and executed \$34.8 million in depot maintenance requirements for FY13.

I am extremely proud of the dedication and accomplishments of the entire F-22 Raptor Depot Maintenance Team and the impact they have had on our nation's ability to project combat capability. By empowering the workforce and creating continuous process improvement teams, the 574th Aircraft Maintenance Squadron excelled at **reducing flow days for the depot flow of an F-22 Raptor through the factory and back to the warfighter, while ensuring the highest quality product was produced.** Their efforts are further validated by the recent Air Force decision to close a contractor facility and move 284,875 hours of work on the F-22 fleet to our Complex. This decision is expected to generate savings of \$41 million per year and over \$747 million throughout the F-22's planned life cycle, freeing critical resources for other Air Force priorities. The 574th's unparalleled accomplishments, dedication to process improvement, and selfless dedication to the mission and their people make them the ideal selection for the Robert T. Mason Award for Depot Maintenance Excellence.

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SECTION 2A: MISSION ACCOMPLISHMENTS

a. Overview

The 574th Aircraft Maintenance Squadron (AMXS) performs depot-level maintenance and repairs for a fleet of 187 F-22 Raptor aircraft. The F-22 Raptor is the world's most technologically advanced, low observable Air Superiority fighter in active service today. This achievement remains eclipsed only by the maintenance and support system necessary to sustain combat & trainings operations while also increasing its lethality and overall effectiveness through depot-level modification.

In its relatively short time in the Air Force inventory, the F-22 has experienced significant structural challenges requiring intense structural depot-level maintenance activity. As with most newly developed aircraft, a block of the F-22 fleet required post-production modifications directly after rolling off the production line to bring them to a common configuration. Following this effort, discovery of corrosion in unexpected areas drove depot-level inspections and repairs to correct the defects. As of today, two separate depot locations provide this support: one managed by the Original Equipment Manufacturer (OEM) Lockheed Martin in Palmdale, California; the second location is operated by an Air Force organic depot at Hill Air Force Base, Utah. Both provide the necessary depot modifications, heavy maintenance, and repair and overhaul capabilities to enable current and future flying operations worldwide. Ogden ALC's initial entry into F-22 depot operations began with military support directly to Lockheed's Palmdale operation, provided by the 649th Combat Logistics Support Squadron in 2004. Eight person teams operated on-site at the OEM facility and executed over 165 depot-level time compliance technical orders (TCTOs) to bring the earliest block of the fleet to the full-rate production configuration. Following the success of this operation, the 309th Aircraft Maintenance Group began accepting its first aircraft at Ogden in 2006, nearly 15 months early, to perform the Night-Air-to-Air Refueling modification. This new team proved highly successful and delivered the first 18 aircraft on-time or ahead of schedule. This first depot repair effort was quickly followed by the initial Structural Retrofit Plan (SRP-I) modification to combat cracking in several key areas of the aircraft. This was accomplished by enhancing the structural integrity of the aircraft through the treatment of several areas of the aircraft with a glass shot peening process. In addition to SRP-I, the team also established a speed-line operation to mitigate corrosion identified on aluminum panels on both upper and lower surfaces of the aircraft.

Since the stand-up and initial modification efforts, the F-22 workload continues to increase and stands at a current average work package of 21,000 hours per aircraft with 12 aircraft in various phases of depot modification at any given time- six aircraft at Palmdale and six at Ogden. The process at Ogden (Hill AFB) has evolved from an initial SRP-I workload to a more in-depth Structures Retrofit Plan (SRP-II) package, followed

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by complex and intensive low-observable material restoration efforts. In total, our Private-Public Partnership (PPP) contract drives to 114 man-days.

Using Continuous Process Improvement (CPI) Teams, Air Force Smart Operations for the 21st Century (AFSO21), **Lean** Logistics, and Theory of Constraints, the 574 AMXS has continued strengthening its relationships with the owning activities by reducing flow days, increasing throughput, identifying and eliminating bottlenecks and improving on-time delivery rates. The focus on quality and the dedication to process improvement from the men and women of the 574 AMXS has directly supported the warfighter by increasing Fully Mission Capable rates of F-22 Raptor aircraft. This is evidenced by such programs as SRP-1 and SRP-2. Additionally, the F-22 Raptor Depot Maintenance Team has been selected as the provider of choice for an upcoming inlet disbond repair required on all F-22s, which came to light after an inspection of Tyndall AFB's F-22 fleet found 22 of 31 aircraft affected. As a result, the depot was tasked to create a permanent repair that would be used as the aircraft cycled through the depot, starting in 2016. However, in 2013 it was noted by Air Combat Command that the disbond issue was being seen in the field and asked the 574 AMXS team to push up their timeline for beginning repairs by two years. In 2013, the F-22 Raptor Depot Maintenance team devised a permanent repair and conducted the validation & verification within one month of receiving the task. This level of effort shows the true **customer focus of the F-22 Raptor Depot Maintenance team in sustaining the F-22 weapon system for many years to come.**

Partnerships



The F-22 Raptor Depot Maintenance Team participates in a Private-Public Partnership. As a result of moving away from SAF/AQ's initial acquisition strategy of "Contractor for Life," Air Force leaders at AFMC and OO-ALC established separate partnership agreements with both Lockheed Martin Aero (LMA) and Boeing. The F-22 System

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Program Office (SPO) acts as the central oversight for this sustainment contract ensuring LMA, as the Prime, provides engineering support, supply chain management and depot modifications & heavy maintenance for the F-22. The SPO provided contractual direction to LMA that fifty percent of the touch-labor for the F-22 fleet would be supplied by an Air Force organic repair operation. LMA subcontracted the 309th Aircraft Maintenance Group, through a direct sales partnership agreement, to provide touch-labor for half of the depot work to fulfill this requirement. This arrangement is a significant departure from most other weapons systems across the Air Force depot enterprise, adding another level of complexity and necessitating a great deal of communication, time and effort to execute F-22 depot maintenance.

With this in mind, the squadron's journey with the AFSC Production Machine and Leadership models began near the close-out of the FY12 production year. In FY12, the 574 AMXS fulfilled its contract with LMA by producing 12 planned SRP-II modified aircraft and one unplanned drop-in aircraft for low-observable material issues. They accomplished this with a total of six aircraft maintenance production/compression reports (AMREP) extensions and three late aircraft for the year. Overall, the 574th produced aircraft on an average of 142 days which represents 28 days slower than the SPO/LMA workload contract stipulated. Squadron leadership knew this overage had to be eliminated with a subsequent increase in speed.

For FY13, the Squadron established an aggressive "Art of the Possible" goal of 100 days. This goal not only meets the 114-man day requirement, but reflects an approach that, when successful, provides the ability to cover all over-and-above work discovered throughout the flow of maintenance operations. This will ensure the warfighter receives their aircraft back to home station on-time, airworthy and combat-ready. Compounding the level of difficulty is the warfighter's Aircraft Availability (AA) requirement, which includes a fixed number of depot-possessed aircraft, drives a nose-to-tail induction schedule. Due to the flying-hour and calendar-driven grounding corrosion control requirements, the importance of meeting the yearly workload contract is paramount. Consequently, the philosophy and application of the AFSC Production Machine methodology came at the perfect time for the F-22 fleet. In FY13, the F-22 Raptor Depot Maintenance Team produced 11 aircraft, on-time and with **zero** defects reported by the customer.

Initial Implementation/Execution:

The Squadron's leadership rapidly initiated a targeted education campaign on the Air Force Sustainment Center's Production Machine Science. This science focuses on both the leadership and the workforce to provide a basic understanding of the basic premise of "the machine". The theory that was used was that all maintenance methodologies center on a critical path to getting that maintenance done. Through the process of determining where that critical path lies for pushing F-22 aircraft through the "factory", i.e. the

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maintenance facility, leadership was able to determine where to invest critical resources to get the best return on investment. In other words, leadership could target those processes that lie on the critical path to affect significant changes that would ultimately affect how fast aircraft could be produced or the quality of those aircraft once they are produced. However, the specifics of how to actually design and execute the factory and the machine proved more elusive for the Squadron than initially thought. Ultimately, the 574th wasted no time in building and molding its production machine model for FY13 operations. This process was started with receiving the annual induction requirement from the SPO. The requirement was then communicated through LMA, from which the 574th shifted from the previously used 'phased approach' of managing production to the rigorous, disciplined and accountable AFSC Production Machine methodology. With the customer requirement of 12 aircraft inductions clearly understood and the initial set of production gates established, the Squadron applied Little's Law and the Production Machine math to determine the necessary Takt time, gate work in process (WIP) determination and specific gate durations for the FY13 SRP-II modification requirement.

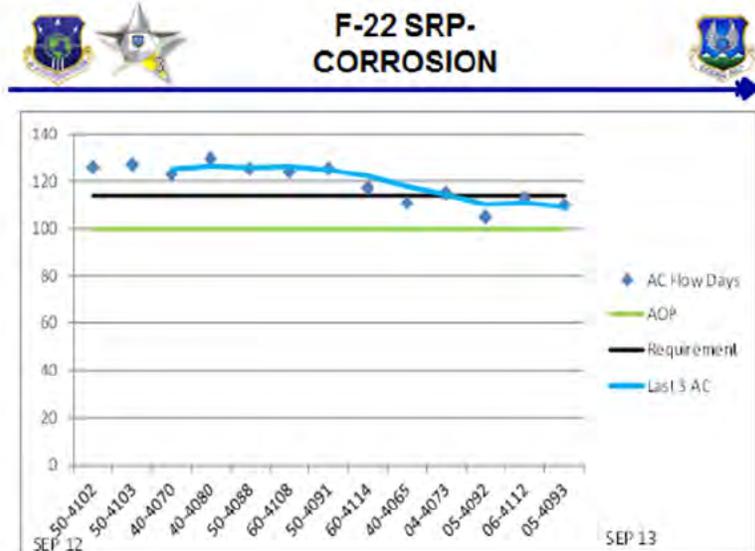
Additionally, in late fall of 2012, the Squadron used the 8-step approach to problem solving to relook and take a second run at establishing the optimum critical path and gate construct. Through this second and more experienced effort, the 574th revised the machine to seven gates in the SRP II Modification program to enable optimal production and throughput. Once the critical path was understood and agreed upon by the enterprise and partnership stakeholders, they established their gates and restructured the data networks to support the Production Machine. They also developed protocols for Gate Transfer processes and "A to Z" checklists to ensure complete task closure and no travelling work from gate to gate. Visual management boards were developed and produced for every production dock to clearly illustrate the SRP-II gates, current status of each aircraft within the flow, Andon's and non-critical path constraints, quality, safety, cost and wingman engagement. The F-22 production boards continue to shine as top-of-the-class within the 309th Aircraft Maintenance Group's six weapons systems. These production boards, along with a series of squadron Goal Boards, enable each member of the 574 AMXS Team to understand and articulate whether the organization is "having a good day." As a true testament to the utility of these boards, they have been benchmarked as the standard for organizations throughout the Complex.

Performance:

After nine months of FY13 production machine execution, despite six weeks of furloughed operations limiting the organization to a 32 hour work-week and zero overtime, the 574 AMXS surpassed the F-22 machine requirement for the fiscal year. The F-22 Raptor Depot Maintenance Team managed to achieve a 109 man-day average for the last six FY13 aircraft through the gates—a program milestone. This achievement allowed the Squadron to handle 25,940 hours of "over and above" workload without having to request any AMREP extensions, delayed deliveries to the warfighter or

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having to slow the next scheduled input. The scatter diagram in the table below illustrates a marked improvement between the first and second halves of FY13. Similarly, the graph below clearly illustrates the turbulence in the first two quarters of Production Machine implementation as compared to the last two quarters of FY13 in each gate.



By the end of FY13, the squadron produced 11 of 12 aircraft with the 12th aircraft producing on 1 October due to a TCTO dropped after induction of the aircraft into the factory. The FY13 increase in speed and improvement in due date performance represents a very positive start to the AFSC Way journey.

Depot Consolidation

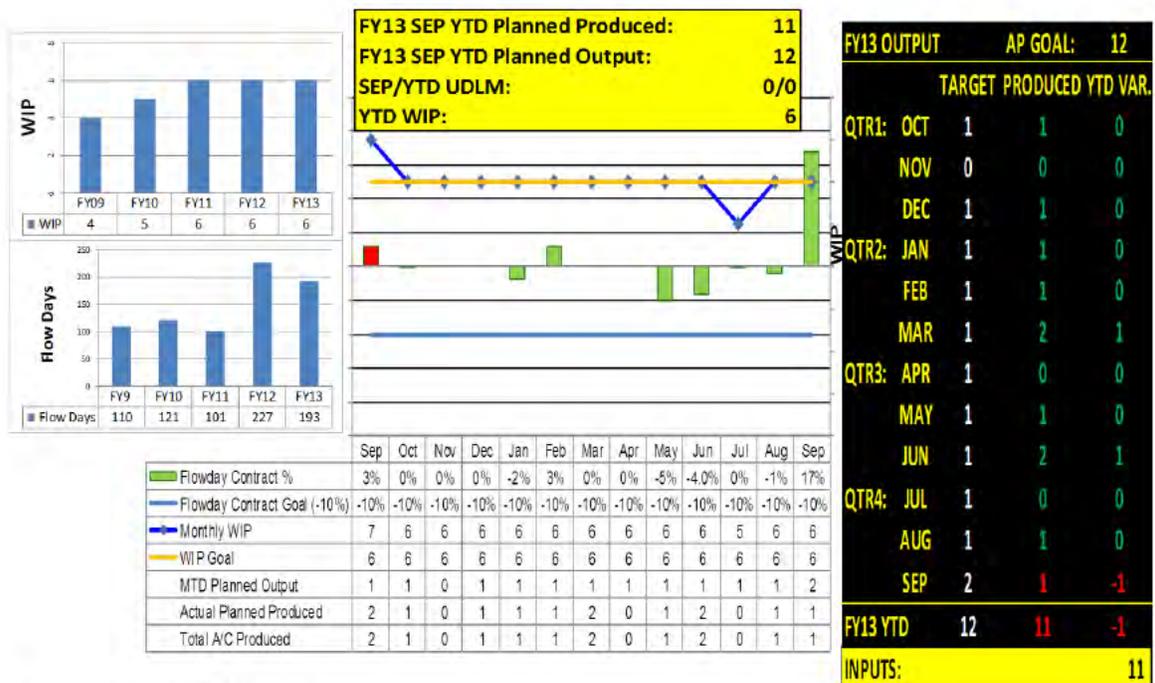
Currently, the F-22 Raptor depot requirement is split between LMA Palmdale and the 574 AMXS at Ogden. In recent years, AF leadership at SAF/IE and AFMC has stated the desire to consolidate all F-22 depot operations at Ogden to harvest cost savings. In 2012, the government budget crisis and the declining FYDP budget spurred the Air Force into action. With all F-22 MILCON projects complete at Hill AFB and the 574 AMXS producing aircraft faster, significantly cheaper and with higher quality than LMA Palmdale, the time proved right for a consolidation study. After an initial study in the fall of 2012, the F-22 Raptor Sustainment Council directed the F-22 SPO to conduct a Business Case Analysis (BCA) for consolidating all F-22 depot operations at the Ogden ALC.

Following this direction, the 309 AMXG, OO-ALC and AFSC, in concert with the SPO and AFLCMC, began developing the Business Case Analysis (BCA). AFSC sent several key members from the 76 AMXG's Visioneering staff from Tinker AFB, OK, to the 309

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AMXG to help develop a comprehensive business case and consolidation implementation plan. In 2 weeks, the BCA was completed and ready for executive review. As the plan matured, all involved found it clearly apparent that consolidation would net a cost savings of up to \$41 million per year and over \$747 million throughout the F-22's planned life cycle to 2033. With performance at an all-time low at LMA Palmdale and the 574 AMXS at Ogden using the AFSC Production Machine to reduce flow days and stay on the yearly plan, the Assistant Secretary of the Air Force for Installations & Environment (SAF/IE), Commander - Air Force Materiel Command, Deputy Chief of Staff for Logistics, Installations and Mission Support (AF/A4/7), and the Assistant Secretary of the Air Force for Acquisition (SAF/AQ) approved the Ogden consolidation plan on 8 May 2013.

Over a 21 month period beginning September 2014, an additional six WIP from Palmdale will begin transferring to Ogden Air Logistics Complex. In addition, the 574th is posturing to successfully capture an anticipated FY16 increase of approximately four WIP due to an emerging "low observable coatings reversion recovery" requirement. This massive savings to the taxpayer and workload gain at OO-ALC would not have been possible without the disciplined approach to produce aircraft on-time for the warfighter and the implementation of the AFSC Production Machine methodology. The snapshot below highlights the means of tracking, showing the 193 flow/calendar days (119 man days) and vectored efforts that led to the 109 man-day performance for the last 6 aircraft.



The Leadership Model

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The 574 AMXS instilled the Air Force Sustainment Center’s Leadership Model to ensure an environment of success. The leadership model provided enduring principles to equip leaders with a holistic approach to gaining effectiveness and efficiency. The model drove the Squadron to meet common goals through three collective components: developing people, managing resources and improving processes, by focusing around the tenets of speed, quality, safety and cost effectiveness. By creating a leadership construct where teamwork, accountability, respect, transparency, credibility and engagement were paramount, the 574 AMXS created an environment where they achieved the “Art of the Possible.” In FY13, the 574 AMXS generated **242,557 man-hours** and **executed \$34.8 million** in depot maintenance, a production **increase of 12% from FY12**.

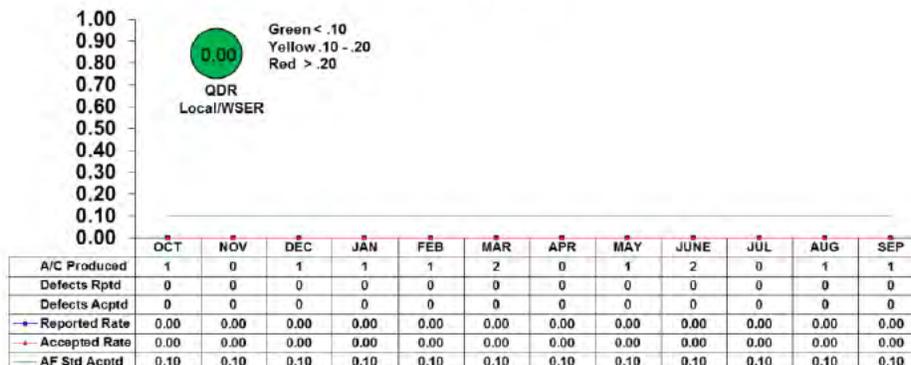


SECTION 2B: EFFECTIVE SUPPORT TO WARFIGHTERS

Through lean initiatives, effective planning and scheduling, the 574 AMXS provided unsurpassed depot maintenance support to the five operational wings flying the F-22 Raptor aircraft. This support directly contributed to the warfighter executing on alert, exercise and in providing combat ready F-22 aircraft.

Quality

The F-22 Raptor Depot Maintenance Team delivers unmatched results to its customers, the warfighters operating and maintaining the F-22 Raptor in the field. The 574th Aircraft Maintenance Squadron is currently **on a run of two years with zero defective aircraft reported by the owning organizations**. This level of quality ensures that the world’s preeminent fighter is available to meet whatever task the nation asks of the fleet! FY13 quality performance is depicted in graph below.



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SECTION 2C: LOGISTICS PROCESS INNOVATION

Continuous Process Improvement—Bedrock for Success:

With the new machine built, the Squadron started executing its plan and through this process revealed a number of constraints requiring immediate attention. These constraints included everything from an inefficient engineering disposition process to a security clearance process for new employees riddled with delays. Additionally, they discovered inadequate standardization within the structured on-the-job training program and further challenges with effective horizontal integration of critical back-shop support functions all negatively impacting progress on the critical path. The Squadron continues to address and confront each of these issues alongside the identification of new constraints that demand immediate resolution.

In 2013, the squadron worked with the OO-ALC Transformation Team and conducted an Enterprise Value Stream Analysis (EVSA). This week-long event was precipitated by a 30-day prep period and included participation from all stakeholders to include the System Program Office, LMA, Boeing, supply chain, 75 Air Base Wing, OO-ALC/OB & EN, 309 Component Maintenance Group and 309 Maintenance Support Group as well as multiple functions within the 309 AMXG and 574 AMXS. This event was highly successful and revealed 92 opportunities for improved efficiency in the form of 62 Rapid Improvement Events (RIEs) and 30 Go Do-its (GDIs) thus teeing-up multiple prioritized Continuous Process Improvement (CPI) opportunities for FY13 and FY14.

The Lean Enterprise

Along with the CPI teams, leadership implemented multiple tools for transparency and visual controls to aid in production performance. Among those were gate charts and visual management boards.

The gated monitoring system breaks the production process down into major tasks or gates. This provides increased transparency in the production process by enabling more time constraint identification-elevation-resolution. In other words, work is accomplished in a regimented manner that facilitates problem identification and resolution in a timely manner versus an adhoc approach that allows problems to fester until just before the aircraft is set to be finished.

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F-22 SRP 2/Corrosion



SRP-II Modification Gate Chart

Another tool the 574 AMXS is utilizing is the visual management board. These visual management boards enable everyone, from technicians to leadership, to see every step in the production process, to include such items as quality, safety, gate performance, Andons, financial information and action items. Furthermore, the boards provide instant feedback to employees making improvements on the production floor as to the current status of that suggestion.

SECTION 2D: PERSONNEL QUALITY OF LIFE PROGRAMS

From workplace safety initiatives to a leadership sponsored Thanksgiving feast, the 574th Aircraft Maintenance Squadron strives for improvement to the morale of their most valuable resource--PEOPLE. Due to the potential carcinogenic hazards of the chemicals and solvents required for use on the F-22 Raptor, the 574th has invested many hours and dollars into ensuring the constant presence of "breathable air." This focus is embodied in the introduction of portable breathing apparatuses, the use of over-pressurization in the paint booths used to apply low observable coatings and paint, and the pursuit of new technological breakthroughs. It is the stated policy of the 574th Squadron Commander to go to whatever extent necessary to ensure the safety and continued well-being of all

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employees of the Squadron, not just today but years in the future. **The 574 AMXS is a world-class facility in terms of protecting its employees from the carcinogenic materials present in the F-22 Raptor and will continue to be for as long as the F-22 is in service.**

During FY13, the Squadron advanced the Voluntary Protection Program (VPP) to ensure safe and healthy working conditions. VPP encourages employers and employees to



Thanksgiving Feast

reduce the number of occupational safety and health hazards at their places of employment through management, leadership, employee involvement, worksite analysis, hazard prevention and control, and safety and health training.

The 574 AMXS continually strives to integrate VPP in every area. Before FY13, the Squadron had not been certified as a VPP site. **By the end of FY13, the Squadron obtained Bronze certification for VPP.** From installing lights to painting floors, VPP radiated throughout the 309th Aircraft Maintenance Group, identifying 16 near misses and fixing 23 potential safety problems. Additionally, the Squadron has begun its march to VPP Silver certification and anticipates reaching it in FY14.

Lastly, the group's robust morale committee planned and executed a holiday party that included food, games, and prizes to boost teambuilding and morale. Throughout the year, the morale committee offered **weekly events and raised \$9,700** to make the holiday party **free for all military, civilian and contractor personnel from the F-22 community.**

Throughout Fiscal Year 2013, the 574th Aircraft Maintenance Squadron consistently provided reliable depot maintenance to fulfill the Air Force's requirement for its front line, fifth-generation fighter ultimately providing the United States with a capability unmatched throughout the world. By focusing on the tenants of speed, safety, quality and cost effectiveness, **the 574th has reduced flow days for critical F-22 modifications and allowed the recapitalization of funds previously used to operate a commercial facility. With a dedicated workforce and game-changing leadership, the 574th produced 11 aircraft and have paved the way for \$41 million in savings per year and over \$747 million in savings throughout the F-22's planned life cycle in program costs by reducing the need for a duplicated facility.** Their efforts were validated by the warfighter being in a position to exceed the **aircraft availability rate requirement** for Air Combat Command, Pacific Air Forces, Air Education and Training Command, and the Air National Guard.

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CITATION TO ACCOMPANY THE AWARD OF

ROBERT T. MASON AWARD FOR DEPOT

MAINTENANCE EXCELLENCE

TO

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The F-22 Raptor Depot Maintenance Team distinguished themselves by the accomplishment of superior depot maintenance during the period of 1 October 2012 through 30 September 2013. With meticulous management, the F-22 Raptor Depot Maintenance Team repatriated a 41 million dollar workload to Air Force oversight, generating 242,557 man-hours of critical maintenance activities supporting units across the world. Despite a challenging 32-hour work-week during the mandatory government furlough, the F-22 Raptor Depot Maintenance Team's dedication to velocity and forward progress enabled a 109 day average per aircraft, setting a program milestone for the first 6 aircraft of the fiscal year and beat the contracted average by 5 days. Finally, the F-22 Raptor Depot Maintenance Team spearheaded workplace quality-of-life and safety efforts, starting Voluntary Protection Program efforts and securing "Bronze" status in 2013. The professionalism and commitment to excellence demonstrated by the men and women of the 309th Aircraft Maintenance Group reflect great credit upon themselves, Air Force Materiel Command, and the United States Air Force.