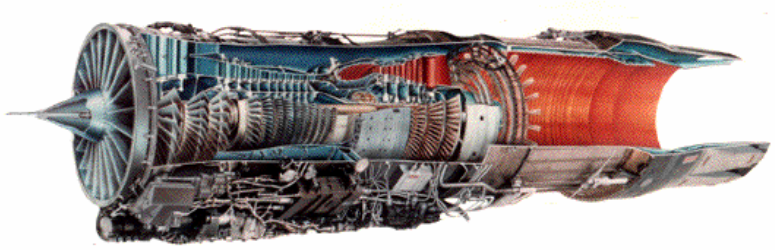
Supply Chain Council Award for Excellence in Supply Chain Operations and Management (DoD)

U.S. Air Force
Oklahoma City Air Logistics Center
F100 Engine Supply Chain Process Improvement Team



OC-ALC/LP
POC: John F. Thompson, Colonel, USAF
DSN 884-8642
Comm: (405) 734-8642
Email: john.f.thompson@tinker.af.mil

2003 SUBMISSION

FEBRUARY 2004

This package can be made publicly available

EXECUTIVE SUMMARY

In FY03, the F100 engine program was facing a multitude of challenges; the war in Iraq was fast approaching, FY02 had seen multiple quality escapes from our Original Equipment Manufacturer (OEM) that impacted production targets, material supportability and our ability to accurately determine and forecast future requirements. Effective quality production by our principle suppliers was a major concern as a result of the multiple quality escapes that occurred in FY02 and continued into FY03. Depot production was critical to the war effort.
A cross-functional organizational team was put together with representatives from the Major Commands (MAJCOM), OC-ALC/LPF (F100 Fighter Propulsion Division, Supply Chain Manager (SCM) for the F100 fleet), organic and contract depot production, Defense Logistics Agency (DLA), OEM and F100 Contracting. Team members were trained in the systems and decision criteria used by each organization and tasked with improving both the processes and warfighter support. The primary mission was to sustain depot production, overcome the impacts of the quality escapes, ensure a lack of component parts would not constrain depot production and improve support for field-consumed parts.

Execution focused on improving the overall quality of products being received, reducing Mission Capable (MICAP) backorders and hours and improving our War Readiness Engine (WRE) levels. Commercial and government best practices were evaluated and modified to fit the needs of the F100 engine program. The Deep Look and Engine Supportability Asset Management Plan (ESAMP) concepts were enhanced and expanded to track and forecast component part usage rates and to ensure component parts availability through buying the right parts in the needed quantities, lead time out, to support depot and field operations. Weekly, monthly and quarterly status meetings were held with all stakeholders. The Inventory Sustainment Corporate Contract with Pratt & Whitney (P&W) was fully implemented to share risk with vendors, reduce administrative lead time (ALT) and ensure P&W would sustain a minimum inventory quantity that is always on hand, even with a possible +/- 20% variance in demand in the execution year.

A systematic review of the internal quality programs of multiple suppliers has resulted in continuous improvements in received parts, as well as consistent process controls and systematic reviews and standardization of critical processes. Major suppliers cooperated with the studies and investigations and assisted in the resolution of multiple technical data problems and inconsistencies. In addition, the principles and practices expounded by OC-ALC/LPF engineering have been driven down into sub-level suppliers. While these efforts must continue, significant progress has been made in the implementation of a consistent and effective quality program. Suppliers that had not demonstrated or validated their quality control programs were removed from the qualified source lists until they complied with all quality control requirements.

Fleet MICAPs were reduced over 105,000 hours from December 2002 through December 2003, a 21% reduction in total MICAPs resulting in a 10 year low while previous backorder reductions were sustained. WRE levels increased from 82 to 185. The F100-100 engine met the Engine Not Mission Capable Supply (ENMCS) 10% goal and exceeded the WRE goal for the first time in over a decade. DLA managed production impacting parts on the ESAMP review were reduced from over 287 to a low of 112 potential impacts for all 175 end items produced at the depot with no production impacting parts in over eight months and a supply availability in excess of 98%. Emergency Purchase Requests were reduced by over 25%. ALT was reduced to one

week on the corporate contract. The inlet fan module has zero MICAP backorders with no flight safety issues. The core MICAPs have reduced from 112 to a low of 49, a 55% reduction in the most critical and complex module in the F100 engine. F100-220 engine average time on wing (ATOW) has increased by over 185 hours; a 55% increase in reliability and durability for every engine in the fleet. The increase in ATOW equates to a .7% reduction in total removals per 1000 flight hours. This equates to a reduction of about 200+ engine removals saving the United States Air Force (USAF) between 20,000 and 30,000 man-hours. This is a significant man-hour savings on an already overworked career field.

TABLE OF CONTENTS

Section 1: General Information and Project Complexity

1-1: Name of Submitting Organization

1-2: Name of the Responding Organization

1-3: Brief Mission Description

1-4: Category of Submission

1-5: Description of the Proposed Supply Chain and Processes

1-6: Supply Chain External Partner Organizations

1-7: Supply Chain Internal Partners and Organizations

1-8: POC information for Each Supply Chain Partner

Section 2: Implementation

2-1: Why this Supply Chain Initiative?

2-2: Project Guidelines, Scope

2-3: The Process

2-4: The Challenges

2-5: Metrics

2-6: Performance Benefits

2-7: Support of Organizational Objectives

Section 3: Knowledge Transfer

3-1: Sharing the Lessons

3-2: Transferring the Benefits

Conclusion

SECTION 1: GENERAL INFORMATION AND PROJECT COMPLEXITY

1-1). Name of Submitting Organization:

Oklahoma City Air Logistics Center, Propulsion Directorate

1-2). Name of the Responding Organization:

Oklahoma City Air Logistics Center, Propulsion Directorate, F100 Fighter Propulsion Division

1-3). Brief Mission Description:

The mission essential tasks of the F100 engine program are to provide logistical and technical support to the family of F100 engines that power the F-15 and F-16 aircraft. This encompasses over 6800 engines worldwide of which 3200 power USAF F-15 & F-16 fighter aircraft. The F100 engine program is responsible for the largest sustainment program in the Air Force, consisting of a buy and repair budget of over one billion dollars annually. The logistical function entails ensuring component parts are available to meet field needs and depot production levels. Technical support is comprised of engineering support to field and depot operations to ensure safety and reliability of the engine fleet.

The F100 engine was fielded in 1974 with a life expectancy of 16 years. However, this original life expectancy has been extended to 2030 or over three times the planned life. Technical challenges, safety issues and tired iron did not allow us to rely on past history to predict and support future requirements. The normal budgeting and forecasting methods were not adequate and new tools had to be developed and implemented to ensure timely and cost effective support.

1-4). Category of Submission:

Award for Supply Chain Operational Excellence (DoD)

1-5). Description of the Proposed Supply Chain and Processes:

The tools, procedures and policies described below represent a mature set of integrated processes that have demonstrated over time a sustained improvement in weapon systems reliability, supply chain supportability and partnership with suppliers.

1-6). Supply Chain External Partner Organizations:

- Defense Logistics Agency (DLA) (7)
- Pratt & Whitney (P&W) (14)
- Science Applications International Corporation (SACI) (4)
- CACI, Inc (6)

1-7). Internal Partners and Organizations:

- Fighter Propulsion Division OC-ALC/LPF (23)

- Maintenance Engine Production Division OC-ALC/MAE (11)
- Maintenance Material Support Division OC-ALC/MAN (6)
- Major Command Logistics Liaison Officers (5)

1-8). POC information for Each Supply Chain Partner:

- Mr. Craig Eaton, Defense Logistics Agency (DLA), Defense Supply Center Richmond, DSCR-XBA, 8000 Jefferson Davis Highway, Richmond, VA 23297-5762, DSN: 695-4605;Craig.Eaton@dla.mil
- Mr. Larry Jones, Pratt & Whitney (P&W), 400 Main St. East Hartford, CT 06108, Commercial Duty Telephone: (860) 557-1355, mailto:Joneslw@pweh.com
- Mr. Ed Lee, Science Applications International Corporation (SACI), 4242 Woodcock Dr. Ste. 150, San Antonio, TX 78228, Commercial Duty Telephone (210) 731-2227, Edward.W.Lee@cpmx.saic.com
- Mrs. Glenda Pruitt, CACI, Inc, Logistics Analyst, 8001 Mid America Blvd, Suite 500, Oklahoma City OK 73135, Commercial Duty Telephone: (405) 610-2667, glenda.pruitt@tinker.af.mil
- Mr. Larry M. Williams, GS-14 Fighter Propulsion Division, Propulsion Directorate, Oklahoma City Air Logistics Center, Bldg 3001, Tinker AFB, OK 73145, DSN: 884-8729, larry.m.williams@tinker.af.mil
- Col James F. Diehl, Maintenance Engine Production Division Chief, Directorate of Maintenance, Oklahoma City Air Logistics Center, Bldg 3001, Tinker AFB, OK, 73145, DSN: 336-2041, james.diehl@tinker.af.mil
- Ms. Elaine Dockray, Maintenance Material Support Division Chief, Directorate of Maintenance, Oklahoma City Air Logistics Center, Bldg 3705, Tinker AFB, OK 73145, DSN: 339-7041, elaine.dockray@tinker.af.mil
- CMSgt Michael D. Vaughan, MAJCOM Logistics Liaison Officer, Bldg 3001/1AC4115, Tinker AFB, OK 73145, DSN: 884-8797, michael.vaughan@tinker.af.mil, mailto:Edward.W.Lee@cpmx.saic.com

SECTION 2. IMPLEMENTATION

2-1). Explain why the supply chain initiative was undertaken and how it was selected.

Starting with the transfer of the depot workload from Kelly AFB, San Antonio, TX, to Tinker AFB, OK, in 2000 it became readily apparent that a better job had to be done in supporting the F100 engine fleet: WRE levels were at record lows, backorders at record highs, safety problems plagued the inlet fan and low pressure turbines and overall depot production was below mission requirements. F100 leadership tasked a group of stakeholders to meet the logistical and technical mission-essential tasks through improving major engine module (core, inlet fan, low pressure turbine) production levels and resolving safety issues to improve overall engine supportability to the Air Force.

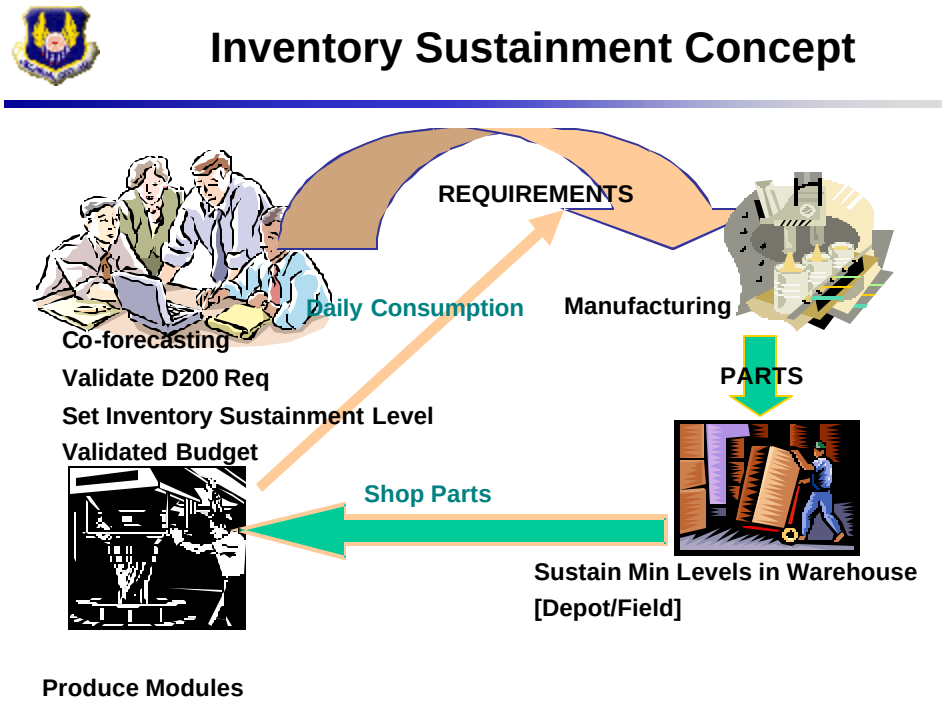
As the stakeholders began to meet, it became readily apparent that the inability to accurately forecast requirements resulted in constant parts shortages which led to weekly work stoppages at the depot. There was no process in place to identify parts problems far enough into the future to resolve them before production was impacted. This directly impacted our ability to keep our fighter aircraft flying.

The team's goal was to identify and resolve the problems plaguing the supply chain process and implement a solution that eliminated work stoppages.

The solution had to consist of a long-range planning and budgeting tool that ensured we spent the right money on the right parts to keep jets flying. It needed to be supplemented with a mid-range tool to work the disconnects that might arise with any of our 1400 plus suppliers and it had to integrate with weekly management reviews designed to address last-minute, real-time issues. The solution had to apply to all 175 unique depot repaired items and all 12,000 parts required to repair them. It had to ensure that every stakeholder worked in harmony to guarantee total warfighter support. Anything less was unacceptable.

2-2). Indicate the duration of the project. Note if the project was a pilot that is being rolled out. Note if the project is ongoing/still in progress.

The project was initiated as an internal test program on selected components using manual tools and processes in FY00 and had matured into multiple integrated semi-automatic procedures that analyze potential problems, prioritize required actions and justify financial investments for the repair and purchase of critical components. Improved tools were introduced in late FY02 and fully employed in FY03. This is now how F100 does business and will remain as our core process until better practices are developed and implemented.



The team incorporated the new practices and procedures into the office instructions and updated the ISO 9000 process sheets. But the biggest measure of sustainment is that their efforts have become an integral part of the organization; it's part of the way business is done. Other organizations at OC-ALC/LP are adopting similar approaches.

2-3). Describe in detail the process used to complete the evaluation.

Team members were selected based on level of experience, their current roles and their abilities to affect the logistical and technical processes. The diverse group had expertise in management of piece parts, technical oversight, production control, contracts, workflows and forecasting.

Training consisted of systems and organizational training. Each team member was required to learn the roles and relationships of the organizations involved in the entire process. Additionally, training enabled each member to fully understand their role and importance in meeting the team's goals. Organizational training allowed the team to establish timelines to identify problems and develop solutions. Another part of the training involved learning systems that could potentially help in managing the processes, such as the Reparability Forecast Model (RFM), ISO 9000 Process Development, Work Breakdown Structures, legacy systems (D200, GWO5W) and Microsoft Access.

Leadership ensured the right people were on the job - proven performers that were knowledgeable, dedicated and innovative. The team was empowered and provided the financial resources to find solutions and implement them. A series of regular meetings (weekly, monthly, quarterly, yearly) were established to track progress, give guidance and resolve issues. Various meetings were held to resolve technical, legacy systems data problems and ensure coordination in all stages of the supply chain from raw material ordering to product delivery to the warfighter.

Possible solutions were evaluated on their ease of implementation, the amount of new resources required, cost and the benefits derived as measured in reduction of backorders and improvement in WRE. The flow of each potential process improvement was charted and evaluated in terms of process improvement, reduced effort and impact on readiness. Shortfalls in existing tools were identified and turned into exit criteria for potential solutions.

Initiatives being tried by other SCMs were evaluated in terms of total impact on improving response and reliability of the supply chain process.

The first duties of the team were to identify the problems, chart their controlling relationships and implement actions to improve the process. The following problems were identified:

- Low WRE translated to low availability of serviceable modules and modules with reliability/safety lower than the thresholds.
- The root causes of low module availability and low depot production levels were inconsistent parts deliveries and lack of early identification of production constraints, which led to late buy and repair contracts.

Low depot production was a result of work stoppages due to unavailability of component parts from both DLA and depot managed items. The unavailability of individual parts both at depot and the field was reflected in the record high level of backorders. Backorders had peaked at over 220,000 in FY00.

Lack of piece parts was driven by lack of forecasting, procurement actions within lead time, lack of experienced personnel, lack of communication between key parties and lack of contract coverage. In short, adequate systems and controls were not in place to identify potential parts problems sufficiently far into the future to allow time to resolve the issue before it impacted production/support levels.

The team developed a long-range forecasting tool called Deep Look and incorporated it with mid- and short-range tools called Engine Supportability Asset Management Plan (ESAMP) and Depot Repair Enhancement Program (DREP). This interlocking triangle of tools works together to forecast requirements and ensure supportability by buying and repairing the right parts at the right time.

The Deep Look process was chosen to address long-term supportability and technical issues because it required all personnel for each engine module to meet together semiannually, discuss the long-term needs and establish plans to meet the requirements. Deep Look is a recurring six-month review of all major end items. It is used to validate the bills of material (BOM), review past usage rates and forecast future usage rates. It gives all stakeholders a forum to meet and discuss the long-term health of every individual part on the engine and provides validation of our budget requirements. Management reviews are held monthly to track progress and ensure compliance with all tasks.

For the short term, a semi-automated process was developed to track depot production needs out to 120 days; giving personnel the opportunity to prevent work slow downs or stoppages due to part unavailability before the crisis rather than after. Mid-term supportability is addressed by ESAMP, a process developed to track depot support shortfalls at 30-day intervals. Monthly

ESAMP reviews are held to place emphasis on proactive rather than reactive measures, which prevent work slow downs or stoppages.

The third tool used to complete the supply chain process is the weekly DREP meeting. Senior managers and their teams meet to resolve any real-time issues constraining production. Over the past two years Deep Look and ESAMP tools have reduced the number of DREP parts constraints from an average of 32 per week to only four.

Timely and accurate communication between stakeholders was deemed as critical to the overall success of the team. As part of the plan, regular meetings, e-mail groups and working relations were established to track progress, work solutions and to place emphasis on being proactive and preventing future problems and not just on fighting today's fires. Twice per year a 12-month forecast is generated to ensure procurement and budget inputs are both accurate and timely.

The key measures used to track the success of the supply chain process were total number of backorders, WRE levels, number of depot production pacing items, risk mitigation and depot production levels.

Total F100 MICAPs: Weekly and monthly meetings were held with all stakeholders to combine the backorder efforts with the most critical shortages impacting the warfighter. Actions with DLA were focused to solve interrelated constraints and to ensure the supply chain made the best use of limited resources to meet their needs.

Total F100 backorders: Weekly and monthly meetings were held at the section and division levels to ensure timely procurement actions and requirements were provided to the manufacturing sources. Administrative and manufacturing lead times were reduced on critical parts and monthly delivery rates were increased for each source of supply (SOS).

Depot Production Pacing Items: As previously discussed, ESAMP was developed, as part of the solution, to track the number of pacing national stock numbers (NSNs) by SOS for 30-day intervals out to 120 days. This tool incorporated the forecasting tools in the RFM. It helped ensure the most critical depot limiters were being addressed and resolved by the responsible stakeholders. The first step to using the tool was to ensure the accuracy of the BOM for each of the engine modules and that contractor; depot production and depot material management were all working off the same list. The results of the ESAMP process are updated, tracked and e-mailed out weekly. The Deep Look process was developed in conjunction with the ESAMP. The Deep Look is a recurring six-month validation of the BOM, the past usage rates and forecast usage rates; it gives program managers, item managers, equipment specialists, engineers and contractors a forum to meet together and discuss the health of every individual item on the engine module. The list is prioritized by those items that do not match up with the forecast rates.

Risk mitigation: In addition to tracking completion status, depot personnel were empowered to use depot resources to help offset impacts to the field. Depot production support was used to supplement field-level repair operations to take some of the load off the field, keep the risk-reduction efforts on schedule and ensure quicker resolution of safety problems.

Depot production: Production levels and forecasts were tied to risk mitigation goals, ESAMP, Deep Look and WRE recovery programs. Weekly DREP status meetings are held at the senior

management level with all team members to discuss the key production limiters facing module production and to ensure that the team has the resources to resolve the problems.

The health of the engine modules and the team's progress were tracked and communicated via weekly meetings, engine summits, e-mail status reports, ESAMP, Deep Look, DREP and other forums, as needed. As our processes improved, we went from monthly summits with MAJCOM, SOS and SCM participation to quarterly meetings with the same results.

2-4). Identify significant challenges encountered, the process for resolution, and the solutions. Identify any best practices employed or developed.

Comparisons were made with each of the other two engine management divisions, with AF and DLA SCM organizations and HQ AFMC/LGS for forecasting and material supportability tools.

Inquiries were made with commercial manufactures (P&W, Tech Space Aero, DGT, Honeywell and others) to improve accuracy of BOM, data collection methods and improve depot operations. A joint demand planning and forecasting of technical changes process, dubbed Deep Look, was developed by OC-ALC/LPF with assistance from P&W to analyze material consumption rates for each part number by module and extend that analysis to a future forecast of component requirements. This is now recognized as a best practice within the engine community and has been exported to the other management divisions and is being evaluated by other services.

HQ USAF/IL (International Logistics), the Boeing Company and the KPMG Consulting firm were contacted to analyze commercial practices to reduce procurement lead times, means to share risks with vendors and to establish long-term relationships with the same vendors.

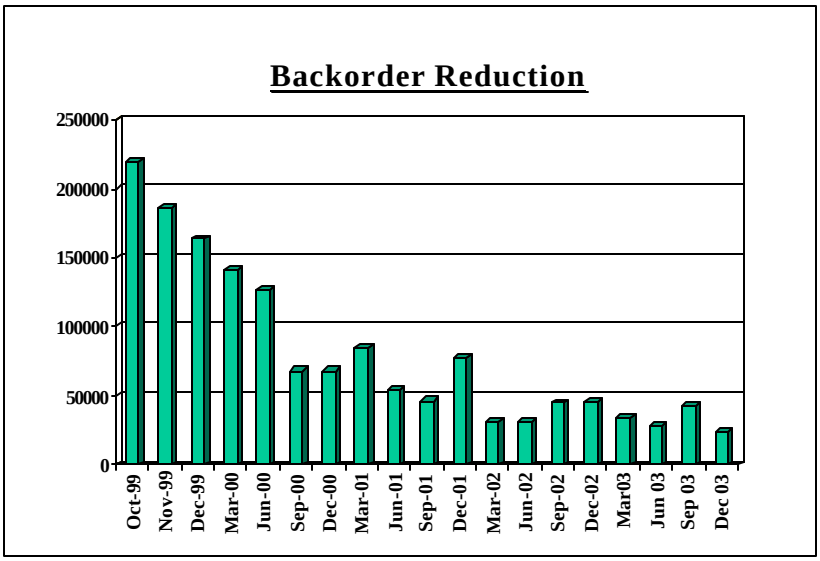
A highly successful contracting strategy developed by Boeing Wichita was the catalyst for a unique risk-sharing inventory sustaining contract methodology developed and awarded in June 2002. This analysis generated an Inventory Sustainment (IS) contracting concept that has been implemented by OC-ALC/LPF with P&W for sole-source components and will be tested later this year with competitive parts. The following chart shows how both the Deep Look and co-forecasting work. Twice per year, net changes in requirements by NSN are determined for each module during the Deep Look sessions; the results are transformed into future requirements and budget submittals by NSN. As part of the IS corporate contract with P&W, the usage/forecast data is used to determine the minimum inventory quantity (MIQ) needed to meet requirements and the total annual demand (buy) required (ADR) by NSN. Estimates on whether or not the past condemnation rates will increase by +/- 5, 10, or 20% are used to establish the ranges between which P&W must provide parts and the AF must procure from them on an annual basis. If Air Force (AF) inventory is below MIQ, P&W will lose the award fee by NSN until the inventory is again above the MIQ threshold. If a stock-out condition occurs, P&W will lose the planned profit on all deliveries until the stock level in the AF warehouse is above the MIQ. Actual demand data is provided to P&W daily from the D035 Supply system. An automated award fee tracking system was designed and implemented to track the performance of each of the 220 current delivery orders worth $480M.

2-5). Identify the metrics used to measure progress and success.

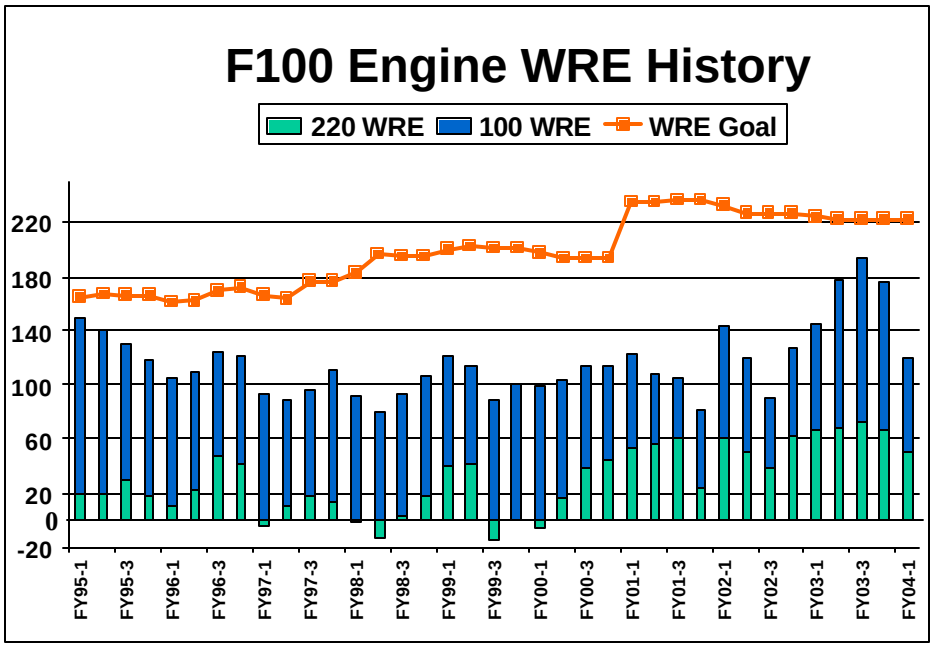
Three main metrics were used to analyze improvement before, during and after the process improvement. The key metrics used to measure progress and success are MICAP hours, backorder quantities and the WRE levels for the F100 engines. Additional tools were developed to track potential depot production parts limiters at 30-day intervals out to 120 days. The listing was broken out by SOS and detailed the extent of impact on production goals of each NSN identified, as well as what actions are required to resolve the supportability issue. Based on consistent application of these measures, a good tool/method will provide consistent decrease in the backorder level and increase in the WRE level. Both WRE and backorder levels have ample past history from which to evaluate future performance and are easily calculated with current systems.

Total MICAP Hours: Quantity of MICAP hours by SOS and the impacted MAJCOM with special focus on major module MICAPs

Total Backorders: The following chart shows the reduction in backorders for all F100 items managed by OC-ALC/LPF. There has been a huge drop in the overall number of backorders that has made tremendous improvement in the level of support to the warfighter.

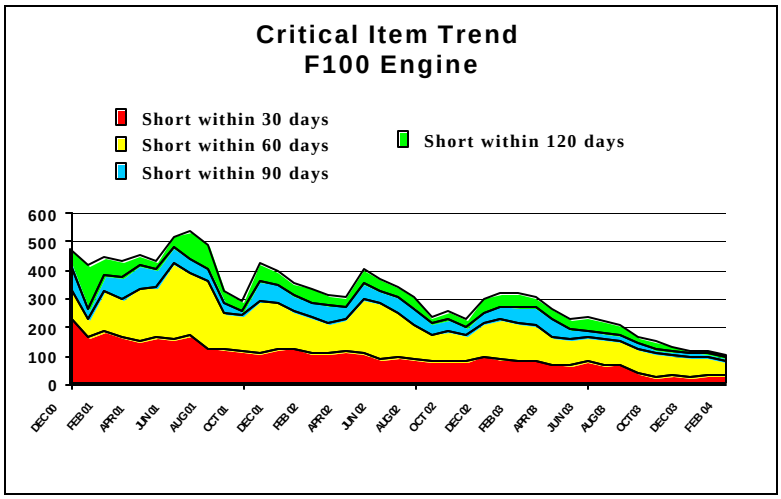


WRE Levels: Spare engine levels broken out by engine type. This chart shows the F100 engine fleet status versus allocated goals for net serviceable engines. The F100-220 was in negative numbers in FY00, but peaked at 73 prior to the Iraq war. The temporary reduction in WRE is a direct result of the 4th blade quality escape, which is now under control, and WRE levels are again on the rise. The F100-100 has exceeded its allocated goal of 104 with a peak of 110 serviceable spares. The efforts of this team have increased net spare engines from 45% of the goal in FY00 to 83% of that goal in January 2003. The 4th blade quality escape impact will be resolved in FY04-2.



Depot Production Pacing Items: Those parts, by NSN, that are currently limiting depot production or that will potentially impact depot production

Critical Item Reductions: The ESAMP process tracks potential production limiting parts from both DLA and OC-ALC-managed items. The initial critical list only included parts associated with the major modules, seven end items and about 200+ parts; however, it was expanded by June 2002 to include all 175 depot-produced end items and over 7200 parts. The chart reflects the number of parts that potentially will impact depot production for all 175 end items, not just the modules. The most significant part of this chart is the bottom line: the steady decrease of parts problems within the 30-day window. Early identification of problems allows resolution before production is impacted negatively.



Risk Mitigation: Planned versus completion of risked mitigation tasks were tracked by module, fleet component and airframe (F-16 or F-15)

Depot Production: Monthly module production versus production targets

2-6). Document and quantify cost and performance benefits, including the project's return on investment and changes in the value of one or more of the SCOR Level 1 metrics.

Increased overall readiness of the F-15 and F-16 fleets' WRE by 103 additional engines and reduced backorders by over 170,000! The reduction of backorders enabled the field to perform timely maintenance on the engines and reduce the number of unserviceable engines that were down for supply problems. F100-100 Engines Not Mission Capable Supply (ENMCS) met the 10% standard in January 2003 for the first time in recent memory. Since June 2002, there have been 52 additional engines made serviceable.

The increased availability of parts drove down the level of work required by field units, as they no longer had to rely as much on cannibalization of other engines to meet their flying hour programs. As of January 2003, there were zero MICAP backorders for both the inlet fan and low pressure turbine (LPT). The core engine module, our number one readiness issue, has seen the MICAPs reduced from 236 to a low of 118 for the fleet.

Improved reliability demonstrated by increasing ATOW. The ATOW for the F-16s' -220 fleet has increased by 68 hours per engine while the F-15s' -220 fleet has increased by 62 hours. This means fewer maintenance man-hours since the engine is removed less often for field level maintenance. Additionally, the nonrecoverable in-flight shut down risk associated with both the inlet fan and LPT are now below threshold.

The Deep Look and ESAMP processes enabled a quicker recovery for LPT high risk, safety problems. The LPT experienced a problem with 3rd blade tips curl that required risk mitigation, including 35 events dating back to January 1998. The root cause of the problem was stress rupture cracks in the blades and shroud fillet. Corrective actions to mitigate risk included new inspection intervals for –100, and –200 blades, awareness training to field units, and incorporating new Reliability Enhancement Program (REP) hardware into F100-220 low pressure turbines. The F100-220 module REP upgrade was completed September 2001 on all F-16 aircraft. The upgrade is 95% complete on all F-15 aircraft as of February 2004. The management process allowed greater acceleration without impacting other depot production lines; team members utilized the newly formed processes and communication channels to find solutions.

Inlet fans were experiencing a high risk of the 3rd stage disks cracking while in flight. The cracked disks would result in fan blade liberation and non-recoverable in-flight shutdown of engines. Depot speed line maintenance production was increased by 30 modules/month to replace old disks with zero time disks that eliminated risk of operational failure. The increase of parts through depot limited the need for labor-intensive inspections in the field. The field cost per inspection for the inlet fan, 3rd stage disk ultrasonic inspection is $8,550 and 140 maintenance man-hours, required as often as every 175 cycles. Acceleration of risk mitigation began in January 2000 and is complete for the F-16. F-15 efforts are continuing, but risk levels are under safety thresholds. The Deep Look and ESAMP management processes greatly aided

the recovery effort by ensuring that the needed parts were at the right place at the right time for the increased depot production levels.

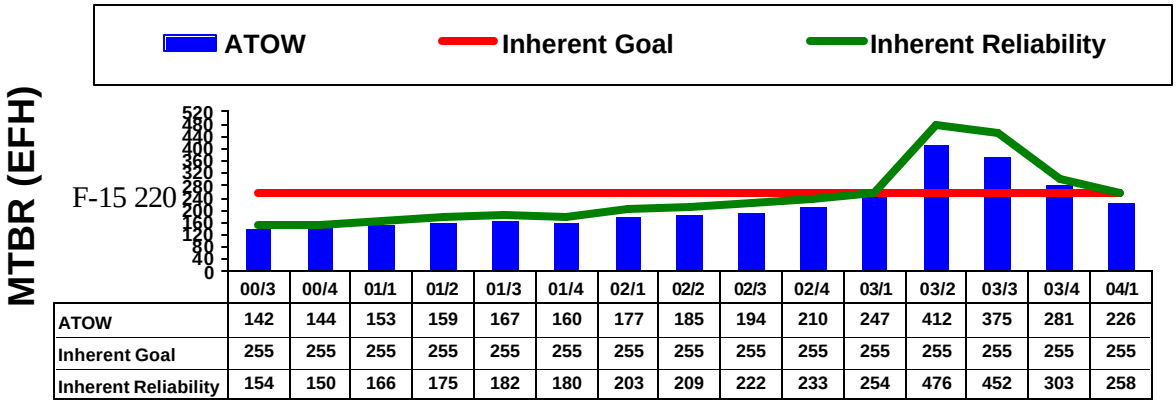
There were very few direct costs associated with the program; it wasn't so much the buying of new systems and hiring more personnel as it was redirecting and organizing the efforts of existing personnel and better utilizing current systems. The return on the minimal dollar investment, however, has been extraordinary! WRE has increased by 103 engines. Since January 2000, backorders have been reduced by 170,000 and are stabilized at about 25,000. The inlet fan has no backorders and the low-pressure turbine 4th blade problems are now under control. While the fleet will be impacted with the mandatory re-blade to offset the design problems, sufficient new blades are being delivered to recover WRE levels and comply with the mandatory 50 F-16 and 30 F-15 re-blades per month until the entire fleet meets safety standards. Yearly core module production increased from 327 in FY00 to 450 in FY02, and 451 in CY03.

Thousands of man-hours have been saved at the field through improving part reliability and elimination of removals and inspections. By installing more robust augmentor ducts, over 600 inspections were eliminated, saving 31,000 man-hours. By replacing disks on over 300 inlet fan modules, we saved 810,000 hours of scheduled engine removals and non-destructive inspections, and eliminated over 500 third blade inspections on the low pressure turbine, and saved 92,000 field hours by increasing reliability of replacement parts at depot overhaul.

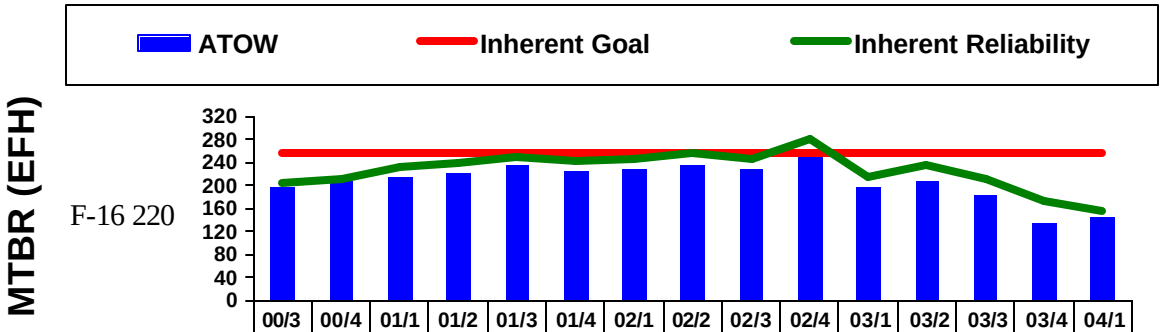
Savings have not been validated with dollar figures, but the increased support levels of 103 additional F100 engines for F-15/16 aircraft are dramatic improvements.

Field and Foreign Military Sales (FMS) backorders were reduced by 175,000 units and can depend on a steady and dependable flow of critical components from the depot. The reliability of the engine has also improved as technical problems were identified and resolved during this effort. The ATOW, as shown on the following slide, for the F100-220 has increased by 68 hours per engine for the F15 and by 62 hours per engine for the F-16 fleets in the last two years. The reductions in late FY03 for both engines were caused by risk mitigation inspections that drove engines off wing to ensure a vendor quality escape on a blade and a disk were not creating a safety of flight risk. In each case, the true improvement in ATOW and reliability is best represented by the FY03/2-3 time frames for both engines. The quality problems have been addressed and in the case of the –220 will impact the fleet for another 2.5 years as we implement a mandatory re-blade of every LPT module in the fleet. This safety issue should not detract from the improvements made and documented in early FY03.

AVERAGE TIME ON WING



	00/3	00/4	01/1	01/2	01/3	01/4	02/1	02/2	02/3	02/4	03/1	03/2	03/3	03/4	04/1
ATOW	142	144	153	159	167	160	177	185	194	210	247	412	375	281	226
Inherent Goal	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
Inherent Reliability	154	150	166	175	182	180	203	209	222	233	254	476	452	303	258



	00/3	00/4	01/1	01/2	01/3	01/4	02/1	02/2	02/3	02/4	03/1	03/2	03/3	03/4	04/1
ATOW	197	207	216	223	234	227	230	235	228	259	197	208	183	136	145
Inherent Goal	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
Inherent Reliability	205	212	232	238	250	243	246	256	247	282	215	234	212	172	155

Depot: Dependable delivery of component parts has eliminated work stoppages due to lack of these parts.

Suppliers: As we improved forecast accuracy, emergency buys have been reduced by over 25%, allowing level loading of their supply chain and establishing more long term contracts.

Supply Chain Management: The combination of the Deep Look and ESAMP processes has allowed OC-ALC/LPF to clearly identify and prioritize, based on the potential impact, which problems to resolve first.

2-7**). Outline how the success of the organization supports the organization's objectives described in Section 1, Item 3.**

Our long-term goals and objectives for the Fighter Propulsion Division are to ensure continuous improvement in the support and reliability of the F100 engine so the warfighter and our FMS partners can know they have a dependable and cost effective platform to accomplish their missions. In addition, we strive to provide the best possible data and requirements to our sources of supply to both get the best possible prices as well as to ensure the parts are there when they are needed.

These tools and procedures have increased material supportability, reduced stock outages and delays in depot production as well as reduced the man-hour impacts on the field. The overall reduction in backorders alone is a tremendous boost to the ability of the field maintenance units to perform their maintenance functions knowing the parts will be there when needed. In addition, we have reduced, or at least not increased, the cost of repair efforts by ensuring effective parts flows and availability at the depots. The data forecasts and long-term predictions have enabled key suppliers to level load their manufacturing programs, increased capacity in advance of orders and allowed them to deliver the required parts on time.

SECTION III. KNOWLEDGE TRANSFER

3.1). Describe the efforts to share lessons from this effort with other internal organizations.

Workshops have been held with other vendors, USAF organizations and with engine managers in the US Army and Navy to share the techniques and benefits of these integrated tools and processes. As part of the Strategic Supply Alliances between the F100 & DLA we are actively trying to export the process to other commodities. The basic practices have been slightly modified by the Aircraft directorates at OC-ALC to improve their supportability and sustainment programs with excellent results.

3.2). Explain how this initiative can be transferred to other organizations and specify the likely candidates for transference.

Each of the stakeholders is seeking to have other customers use the same process. For example, DLA took the process to the Army and Navy. OC-ALC/LPF and OC-ALC/MAE have shared it with the other materiel management and production divisions and they are implementing similar approaches for depot support of other engines and aircraft overhaul efforts. Since the overall process has worked well and doesn't require a huge learning curve, other organizations have naturally looked at it to help them improve.

CONCLUSION:

The policies, practices, procedures and tools developed over the last three years culminated in the best support to the warfighter in over a decade in FY03. OC-ALC/LPF was able to sustain a steady improvement in supply supportability while the country fought two wars, increase the reliability of the engine to reduce field maintenance and significantly improve data forecasting techniques and accuracy to reduce supply chain problems. LPF has delivered a continuous flow of dependable and logistically supportable engines and components that have allowed the warfighter to accomplish all assigned missions. Not a single sortie was lost in either of the two conflicts in FY02/FY03 due to a F100 engine constraint. In addition, the $1B in sales in FY03 met or exceeded all customer needs and placed critical parts on the shelf to meet future emergency requirements.

These tools are and have been exported to other organizations and can provide the same level of improvement in support as they are implemented.

The program is a rousing success.