Supply Chain Council Awards for Excellence in Supply Chain Operation and Management

U.S. Air Force
Oklahoma City Air Logistics Center Supply Chain Transformation Team
Purchasing and Supply Chain Management Initiatives:
Advanced Planning and Scheduling (APS) Pathfinder
F100 Engine Purchasing and Supply Management (PSM) Pilot

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EXECUTIVE SUMMARY

Oklahoma City Air Logistics Center (OC-ALC) has a varied and complex mission involving a multitude of organizations that provide the warfighter the best bomber, tanker, AWACs, and engine support. In the post-Cold War environment, OC-ALC is looking for opportunities to improve the readiness and reliability of its equipment and services as well as actively seeking savings, to pay for force modernization. One of the key areas includes strategies to improve maintenance management processes/metrics, and strive toward a world-class depot maintenance organization. In order to optimize existing capabilities and make smart investment decisions regarding new or modernized capabilities, we must evaluate the potential for improving the efficiency and effectiveness of our current business processes.

OC-ALC's Supply Chain Management community is directly involved in the evaluation and execution of two initiatives to improve material support across the Command. The **Advanced Planning System (APS)** and the **F100 Engine Purchasing and Supply Management (PSM)** teams, produced dramatic results last year and built the foundation for a successful transformation of our current supply chain and enhanced depot performance.

Advanced Planning System (APS)

APS is a commercial off-the-shelf technology used for supply chain planning and decision support functions. The F101 APS Pathfinder team successfully evaluated APS capabilities and limitations in the depot environment by successfully implementing strategies and solutions on the F101 engine for the B-1B "Lancer" bomber aircraft. The APS Pathfinder team provided an integrated, near real-time, responsive approach to planning and assessment of feasible execution plans through an enterprise-wide view of all related Air Force logistical organizations. The APS Pathfinder effort demonstrated the capability to provide an automated, alerts-based capability to identify, examine and resolve potential supply chain issues by exception (demand variability, parts availability, physical capacity, financial restrictions) before impacting daily execution. The Pathfinder also established a mechanism for sharing information and supporting collaborative planning capabilities across the extended supply chain (for example, Defense Logistics Agency (DLA) and Original Equipment Manufacturer's (OEM's)). This fully integrated functionality enabled the rapid and repetitive modeling and collaboration of supply chain related functions inside and outside an enterprise e.g., forecasting, inventory & distribution planning, rough-cut capacity planning, etc. APS technology, as demonstrated by the Pathfinder, provided increased speed and functionality through the integration of industry developed best business practices.

Because of the impressive results of the APS team, the Command will invest $53M over the next three years for Command wide implementation. The phased approach will begin with engines, followed by the aircraft and then commodities repair. Depot operations will experience enhanced communication and responsiveness to DLA, supporting bases and the Jet Engine Intermediate Maintenance (JEIMs) in the future.

F100 Engine Purchasing and Supply Management (PSM)

The F100 PSM team identified new opportunities to improve savings by demonstrating industry best practices on the AF's F100 engine. Purchased goods and services offer a large and growing target area for the AF in which to seek improved performance and cost savings. PSM strategically links demand planning, purchasing, inventory management, supply chain, supplier and supply base management to create continuous improvement in performance (i.e., quality, responsiveness, flexibility) and cost of purchased goods and services. The result of applying improved PSM practices is more effective and efficient supply chain integration and a higher quality and more responsive, reliable and robust supplier base.

The F100 engine powers the F-15 and F-16 fighter aircraft. The F100 engine is an AF priority sustainment program with an annual budget of over $1B. The F100 is a critical asset to our nation's wartime readiness posture supporting seven Commands, 34 AF bases worldwide, and 17 foreign governments. There are currently 3,293 engines in the inventory, valued at $11.6B. Many of these engines and major modules are entering the depot for a third visit. With each subsequent depot visit, rising maintenance costs and unanticipated parts shortages create significant challenges to the continued sustainment of this vital defense asset. Primarily due to these reasons, in February 2002, OC-ALC recommended the F100 as the AF Pathfinder candidate to apply PSM techniques.

The F100 PSM project successfully employed a phased approach to baseline current processes, design future processes, and implement and institutionalize the PSM tenets across the AF. The results of the team's effort demonstrated the value of institutionalizing these practices across the Command. The team identified numerous best practices in spend analysis, leveraging valuable funds to maximize purchasing power, as well as new strategies to support the warfighter. Their best practice efforts are now considered the Command's blueprint for the realignment of its maintenance support and future purchasing strategies.

The combined efforts of these two OC-ALC teams are recognized as the template for the successful transformation of our logistics support.

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SECTION 1: GENERAL INFORMATION AND PROJECT COMPLEXITY:

1-1). Name of Submitting Organization:

Oklahoma City Air Logistics Center, Logistics Management Directorate

1-2). Name of the Responding Organization:

Oklahoma City Air Logistics Center, Logistics Management Directorate, Chief Propulsion Contracting Division

1-3). Brief Mission Description:

The F100 Engine PSM project is the pilot project for the AF to adopt progressive purchasing and supply chain management best practices from industry in order to improve spares delivery and product quality at reduced costs. To enable these processes, APS systems were identified as one means of providing Information Technology (IT) support to the reengineered Demand Planning process. This off-the-shelf technology is used for supply chain planning and decision support functions in a wide variety of commercial manufacturing, maintenance and repair environments, and has resulted in significant improvements to supply chain order fulfillment, cycle time and cost efficiency. Market research and software demonstration events highlighted the potential use of APS by the Air Force.

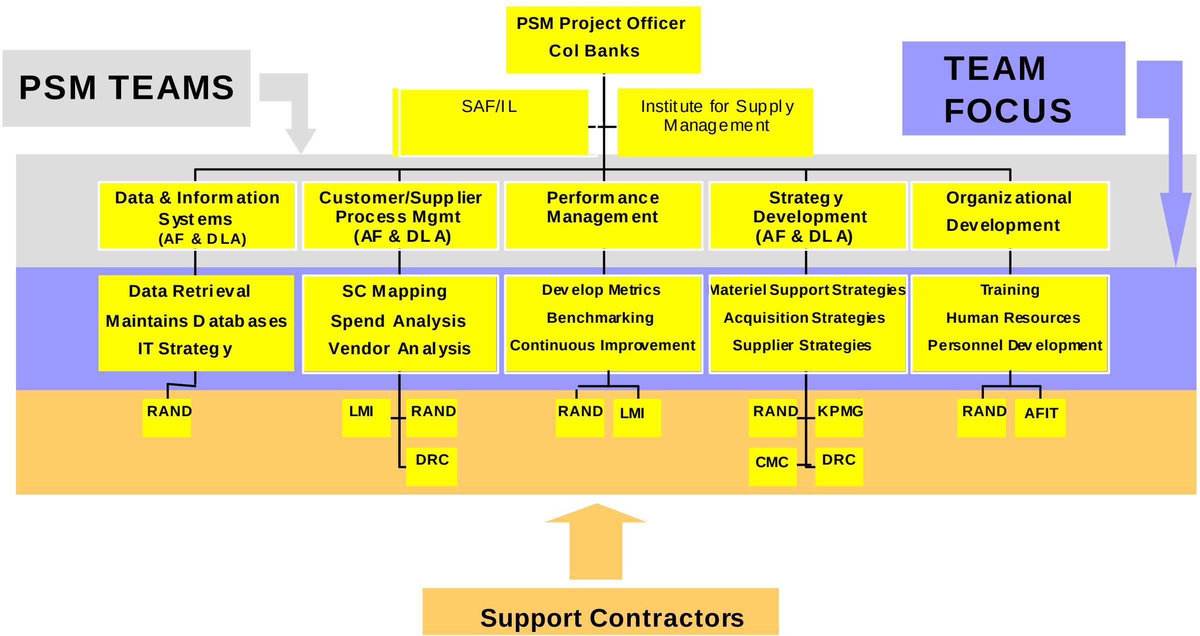
The PSM philosophy incorporates the following 15 tenets that list the processes that smooth incorporation of an APS:

- Knowledge of Where the Enterprise Money is Spent
- Knowledge of the Supply Chain
- Tailor Sourcing Strategies Depending on Value and Risk to Enterprise Operations
- Actively Manage the Supply Base
- Rationalize the Supply Base
- Move from Tactical to Strategic Sourcing
- Manage Key Suppliers Strategically
- Link Demand Planning and Replenishment Planning
- Realign Supply Chain for Optimal Efficiency
- Supply Chain Visibility
- An Integrated Organizational Construct
- Align Purchasing and Supply Goals with Operational Goals
- Automate Routine Activities
- A More Strategically Focused Workforce
- Continuous Improvement

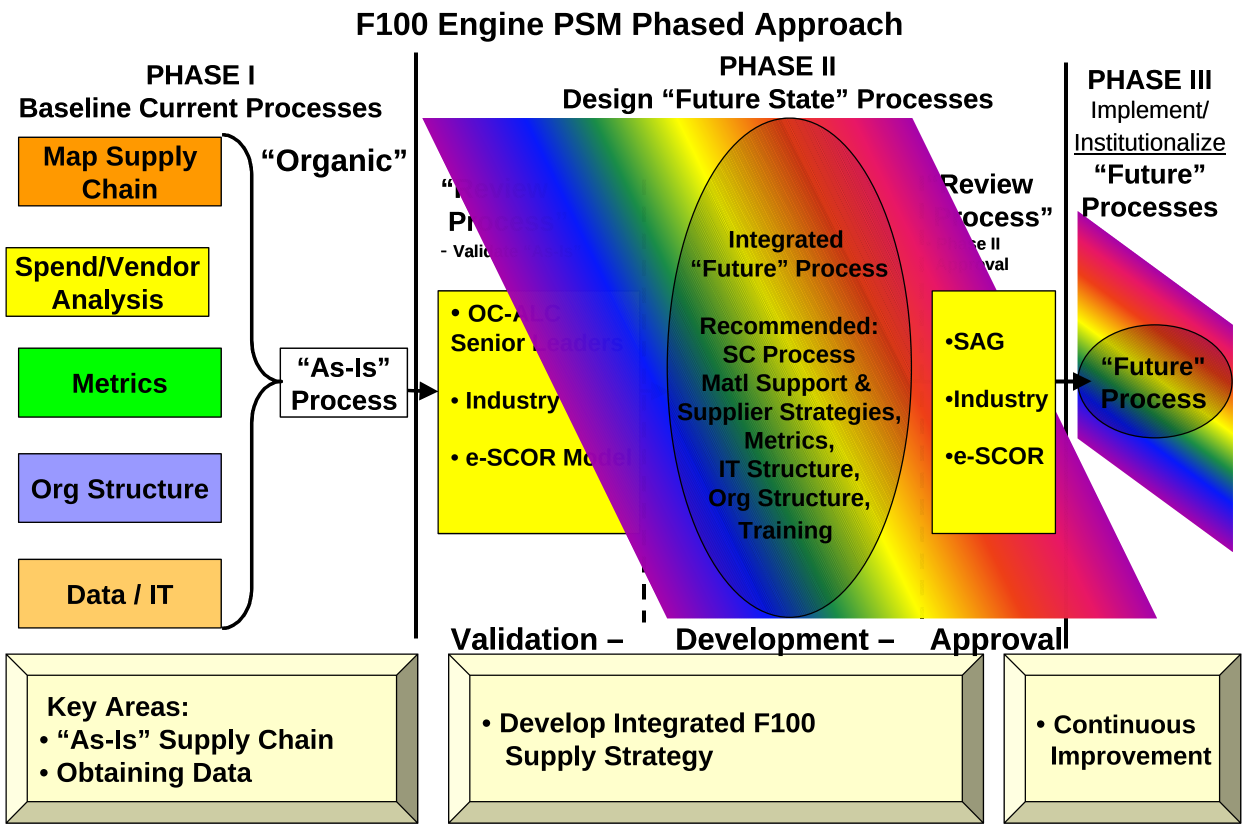
As two of eight Spares Campaign initiatives, the F100 Engine PSM and APS teams set about to fundamentally reshape the entire spare parts process and incorporate the latest IT, in an APS solution, to better support expeditionary AF operations and to provide sufficient spares to the warfighter. The challenge to the F100 PSM and APS teams was to determine how to successfully implement PSM tenets and simultaneously test the functionality of an APS solution in the AF environment.

The PSM team identified five focus areas and divided into cross-functional sub-teams, each targeting the tenets.

F100 Engine PSM Team Structure



The F100 PSM team determined that a phased approach was necessary to complete the project. During Phase I, the emphasis was placed on accurately documenting the current "As-Is" state. During Phase II, currently nearing completion, the team is developing the "To-Be" PSM state. Phase III of the project will develop plans for implementing and institutionalizing recommended PSM improvements.



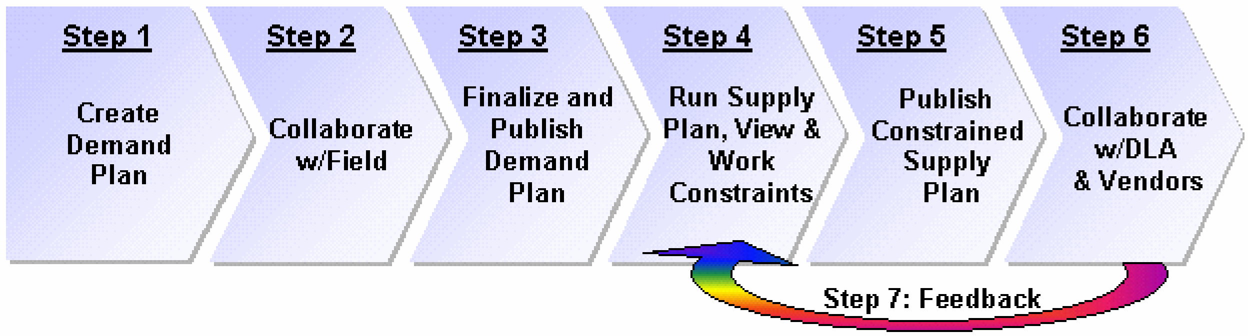
1-4). Category of Submission:

Supply Chain Operational Excellence Award

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

The F100 supply chain is a set of linked and integrated processes critical to satisfying customer orders from raw material to finished product. The F100 PSM Team used the Supply Chain Operations Reference (SCOR) process model revolving around the five distinct management processes of Plan, Source, Make, Deliver and Return to map the F100 supply chain. SCOR spans all supplier/customer interactions, physical material transactions, market interactions and serviceable/reparable returns functions of the supply chain (end-to-end visibility).

When the processes outlined by the PSM team are used in the supply chain cycle envisioned by the AF Pathfinder team, the cycle begins with the creation of an unconstrained forecast of demand at the Shop Replaceable Unit (SRU) level, and ends with a constrained piece part requirement that has been validated by the Original Equipment Manufacturer (OEM) and DLA. The following is a visual depiction of the flow:



Step	Description
1. Create Demand Plan:	AF Item Manager creates an unconstrained demand plan at the SRU level based on historical consumption.
2. Collaborate w/Field:	Use the NetWORKS Collaborate application to adjust the demand plan w/Engine Manager input.
3. Publish Demand Plan:	AF Item Manager finalizes / publishes Demand Plan. Forecast made available to Supply Planning.
4. Run Supply Plan:	AF Item Manager create an unconstrained requirement by exploding demand plan against the Bill of Material. Capacity, supply and financial constraints identified and applied.
5. Publish Supply Plan:	AF Item Manager publishes constrained Supply Plan; made available to the NetWORKS Collaborate application.
6. Collaborate w/DLA & OEM:	Use the NetWORKS Collaborate application to adjust the Supply Plan w/DLA or OEM input.
7. Feedback:	DLA / OEM support constraints identified; iterative application to planning.

1-6). Supply Chain External Partner Organizations:

- Office of Secretary of Defense (OSD)(1)
- Defense Logistics Agency (DLA)(3)
- General Electric Aircraft Engines (GEAE)(3)
- BearingPoint Consulting (7)
- RAND (5)
- Defense Logistics Agency (DLA) (7)
- Dynamics Research Corporation (DRC) (3)
- Logistics Management Institute (LMI) (2)
- International Business Machines (IBM) (6)
- General Atomics (GA) (4)
- Pratt & Whitney (P&W) (4)
- Small Business Administration (SBA) (2)
- Defense Contract Management Agency (DCMA) (3)
- Defense Finance and Accounting Service (DFAS) (1)

1-7). Internal Partners and Organizations:

- SAF/AQC (2)

- HQ USAF/IL-I (4)
- HQ AFMC/LG (5)
- OC-ALC/CD (1)
- OO-ALC/CD (4)
- WR-ALC/CD (4)
- Propulsion Directorate (30)
- Logistics Management Directorate (16)
- Information Technology Directorate (3)
- Maintenance Directorate (10)
- Propulsion Product Group Manager and staff (5)
- Acquisition Center of Excellence (2)
- Comptroller Directorate (2)
- Maintenance Material Support Division (10)
- Maintenance Engine Division (15)
- Command Headquarters Points of Contact (8)
- Command Logistics Liaison Officers (5)
- Command Wing Points of Contact (6)

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

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- MSgt Matthew Wood, Propulsion Flight Chief, Maintenance Group, 28th Bomb Wing, Ellsworth AFB, SD 57706, Matthew.Wood@ellworth.af.mil, DSN: 675-1145

- MSgt James Beard, Propulsion Intermediate Superintendent, Maintenance Group, 184th Air Refueling Wing, Kansas Air National Guard, McConnell AFB, KS, James.Beard@ksmcco.ang.af.mil, DSN: 743-7717

- Wing Cmdr Mark Leatham, HQ USAF/IL-I, Tyson's Tower, 1676 International Drive Suite 6105, McLean, VA 22102, mark.leatham@pentagon.af.mil, (703) 747-3160

- Nancy Moore, RAND, 1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138, nancy@rand.org, (310) 451-6928

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- Linda Goodrich, Dynamics Research Corporation (DRC), 1390 S. Douglas Boulevard, Midwest City, OK 73130, lgoodrich@drc.com, (405) 741-7775

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- Larry W. Jones, Pratt & Whitney, 400 Main Street M/S 181-42, East Hartford, CT 06108, larry.w.jones@pw.utc.com, (860) 557-0430

- Lori Michaelson, BearingPoint, Tyson's Tower, 1676 International Drive Suite 6105, McLean VA 22102, lmichaelson@bearingpoint.com, (703) 747-4680

- Gerry Silke, General Atomics, 3550 General Atomics Court, P.O. Box 85608, San Diego, CA 92121-1122, SILKEGW@GAT.COM, (858) 455-2270

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SECTION 2. IMPLEMENTATION

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

This initiative was staffed with a Logistics Transformation Team (LTT) comprised of both government and contractor support personnel, and follows a structured methodology designed to identify “pathfinder” opportunities to improve logistics system performance. Once identified, the LTT develops and evaluates strategy, process and technology solutions for these opportunities, supports leadership decisions on implementation, and facilitates the transition of approved solutions throughout the AF. At the same time, but as separate projects, the AF embarked upon the Advanced Planning and Scheduling (APS) and Purchasing and Supply Management (PSM) initiatives in an effort to streamline processes and provide an automated long range planning tool.

When assessing areas of greatest impact, the F100 Engine was selected for PSM. The F100 engine is an AF priority sustainment program with an annual budget of over $1B. The engine powers F-15 and F-16 fighter aircraft and is a critical asset to our nation’s wartime readiness posture supporting seven Commands, 34 AF bases worldwide, and 17 foreign governments. There are currently 3,293 engines in the inventory, valued at $11.6B. Many of these engines and major modules are entering the depot for a third visit. With each subsequent depot visit, rising maintenance costs and unanticipated parts shortages create significant challenges to the continued sustainment of this vital defense asset.

As a continuing effort and part of the Logistics Transformation effort, the LTT developed and prototyped a reengineered Demand Planning process. Demand Planning is defined as “the process of translating the Warfighter’s needs for parts, products and services into executable logistics support plans”. Accordingly, Demand Planning has a significant impact on the supply chain’s ability to respond to workload and was identified as an area of interest for Logistics Transformation. Team efforts in this Demand Planning Pathfinder focused on the overhaul of existing Demand Planning processes, and the creation of a reengineered approach to:

- Develop accurate, consensus forecasts of expected workload;

- Translate these forecasts into integrated functional plans (e.g., maintenance plans and schedules, inventory plans, distribution plans, etc.);

- Use these integrated plans to identify and address operational constraints before they impact shop floor production; and,

- Apply performance data as a feedback loop into the planning process.

Results achieved during the test period were impressive; low pressure turbine (LPT) rotor throughput increased significantly, logistics response times were reduced from 89 days to 44 days, shop flow times decreased from 59 days to 45 days, and there were no production stoppages for spare parts identified as supportability constraints thirty days out.

In achieving these results, over two-dozen discrete recommendations for improving supply chain collaboration, forecasting accuracy, data integrity, and demand planning metrics were generated and evaluated. Central to these recommendations was the observation that broad implementation of the reengineered demand planning process across the AF could not be achieved without appropriate technology support. AF legacy systems were developed to support individual functions and planning activities. As a result, many are unable to incorporate information from other systems and are limited in their ability to create integrated plans that span multiple functions. As a result, personnel must spend time compensating for the limitations of the legacy system environment via manual intervention. Legacy information systems designed to support "As-Is" planning processes proved unable to support the integrated planning techniques utilized in the Demand Planning Pathfinder. Similarly, manual workarounds applied in the test environment proved to be too labor intensive to apply to broader Air Force operations.

The F101 engine environment was selected because of the shortfalls it was experiencing and the potential impacts of these shortfalls on the General Electric (GE) family of engines. APS systems were identified as one means of providing IT support to the reengineered Demand Planning process. APS is an off-the-shelf technology used for supply chain planning and decision support functions in a wide variety of commercial manufacturing, maintenance and repair environments, and have resulted in significant improvements to supply chain order fulfillment, cycle time and cost efficiency. Market research and software demonstration events highlighted the potential use of APS by AF logisticians. The APS Pathfinder Team was tasked with exploring this potential.

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 APS and PSM projects kicked off at OC-ALC in February 2002. In an effort to determine the most suitable candidate for the APS and PSM pilot programs, OC-ALC management considered several options. In addition to the F100 Engine, consideration was also given to the F101 Engine, and to item categories such as bearings, blades and tubes. The F100 engine was selected for the PSM pilot project and the F101 for APS not only because of their significant impacts on the spares budget, but more importantly because OC-ALC managers were eager to develop an integrated strategic business solutions to address F100 and F101 readiness.

The F100 Engine PSM Team was divided into five sub-teams, each focused on specific PSM tenets. The sub-teams outlined a phased approach to develop an overall PSM strategy. During Phase I, the teams focused efforts to obtain required data and to baseline the supply chain "As-Is" state. Phase II provided recommended "To-Be" processes. Simultaneously, the APS Pathfinder was executed via a progressive and sequential methodology that addressed the technical and functional parameters needed to support an AF implementation decision. Accordingly, the Pathfinder was conducted in four phases, each representing a major milestone that builds on previous activities:

- **APS Package Assessment:** This phase focused on the selection of an APS package for use in the Pathfinder initiative. Package assessment and selection were based on a comparative analysis of leading APS products and their capabilities/limitations for Maintenance, Repair and Overhaul (MRO) environments. This phase also assisted in assembling the APS Pathfinder Team that would provide the subject matter expertise and technical knowledge required to evaluate APS capabilities.

- **APS Pathfinder Environment Set-Up:** This phase focused on setting up the functional and technical environments for the Pathfinder and finalizing the selection of appropriate APS Pathfinder Team members. The functional environment involved the creation of applicable business scenarios to be tested, while the technical environment focused on the acquisition, configuration and mapping/loading of the required hardware, software and data.

- **APS Pathfinder Basic Testing:** This phase launched the initial test and evaluation of APS functionalities. Testing activities were conducted through Application Prototype Runs that reflected high-level depot business scenarios. The APS Pathfinder Team evaluated the performance of APS capabilities against these business scenarios, documented observations and reported the test results. The test results and observations, in turn, served as guidelines for establishing the parameters of the expanded testing effort.

- **APS Pathfinder Expanded Testing:** The expanded testing phase built on the parameters and results of the basic testing efforts. In this phase, APS capabilities were evaluated in a comprehensive environment consisting of multiple sites, multiple systems and other business needs. The APS Pathfinder Team has documented the results of the expanded testing, presented its findings to HQ AF/IL-I and provided recommendations on implementation.

The core APS team was comprised of a retail Item Manager (IM), wholesale IM, program manager, Equipment Specialist (ES), maintenance planner, Materiel Systems Group (MSG) computer programmer and BearingPoint contractor support. The team configured the database by July and will deliver the final report late February 2003.

Once initiated, Phase III will consist of implementing and institutionalizing sound Purchasing and Supply Chain Management (PSCM) business practices in government procedures.

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

The Supply Chain Management effort encompassed the efforts of the APS and PSM teams. The two teams coordinated on a periodic basis to ensure their efforts were complimentary.

The F100 PSM team determined that a phased approach was necessary to complete their project. During Phase I, the emphasis was placed on accurately documenting the "As-Is" supply chain state. The PSM team developed questionnaires and interviewed government process experts in applicable functional areas, i.e., Command Logistics Liaison Officers, Maintenance Planners, Schedulers, Shop Foreman, IMs, ESs, Engineers, Production Management Specialists, Program Managers, Buyers, etc. The team gathered policy guidance, current practices, metrics, process flows, organizational charts, position descriptions, bills of material (BOM) and additional critical information to baseline the "As-Is" state.

After both teams completed their initial assessments, they coordinated and moved forward. Initially, the goal of the software evaluation process was to evaluate the suitability of commercial-off-the-shelf (COTS) APS solutions to the AF MRO environment. In order to evaluate the APS COTS solution a multi-stage process was followed.

COTS solutions were short-listed, business requirements were decomposed, commercial best practices were leveraged, demonstration scripts were developed and scripted COTS vendor demos were conducted and evaluated. The solution search began with the development of a COTS short list. This short-listing process compared high level AF MRO business and technical requirements against research of the COTS market place. This research relied not only on BearingPoint market awareness, but also incorporated the use of 3rd party advisory services provided by Gartner Group, Forrester Group, AMR Research, and the Meta Group.

The next step in the first phase of the project was the Business Requirements Decomposition Process. Activities during this phase included a diagnostic assessment of current business practices, definition of software requirements and vendor demonstration script formulation. The scripts were a summation of basic AF business practices augmented with requirements relative to commercial best practices. The scripts were the key mechanism by which the functionality of the vendor's software was assessed and selected for detailed evaluation within the AF MRO environment.

After the functional demonstration scripts and technical requirements were developed, preparations for the vendor demonstrations began. Activities in this phase focused on preparing both the AF team and the software vendors for the demonstrations. Specific process steps included script validation and rationalization, establishment of the methodology through which the market research would be conducted, brief process review workshops and training, and demonstration scheduling. The goal of the COTS Market Research process was to develop a consensus recommendation of an APS

Package and to allow the individual AF team to recommend an APS solution that best met and supported AF MRO unique business requirements.

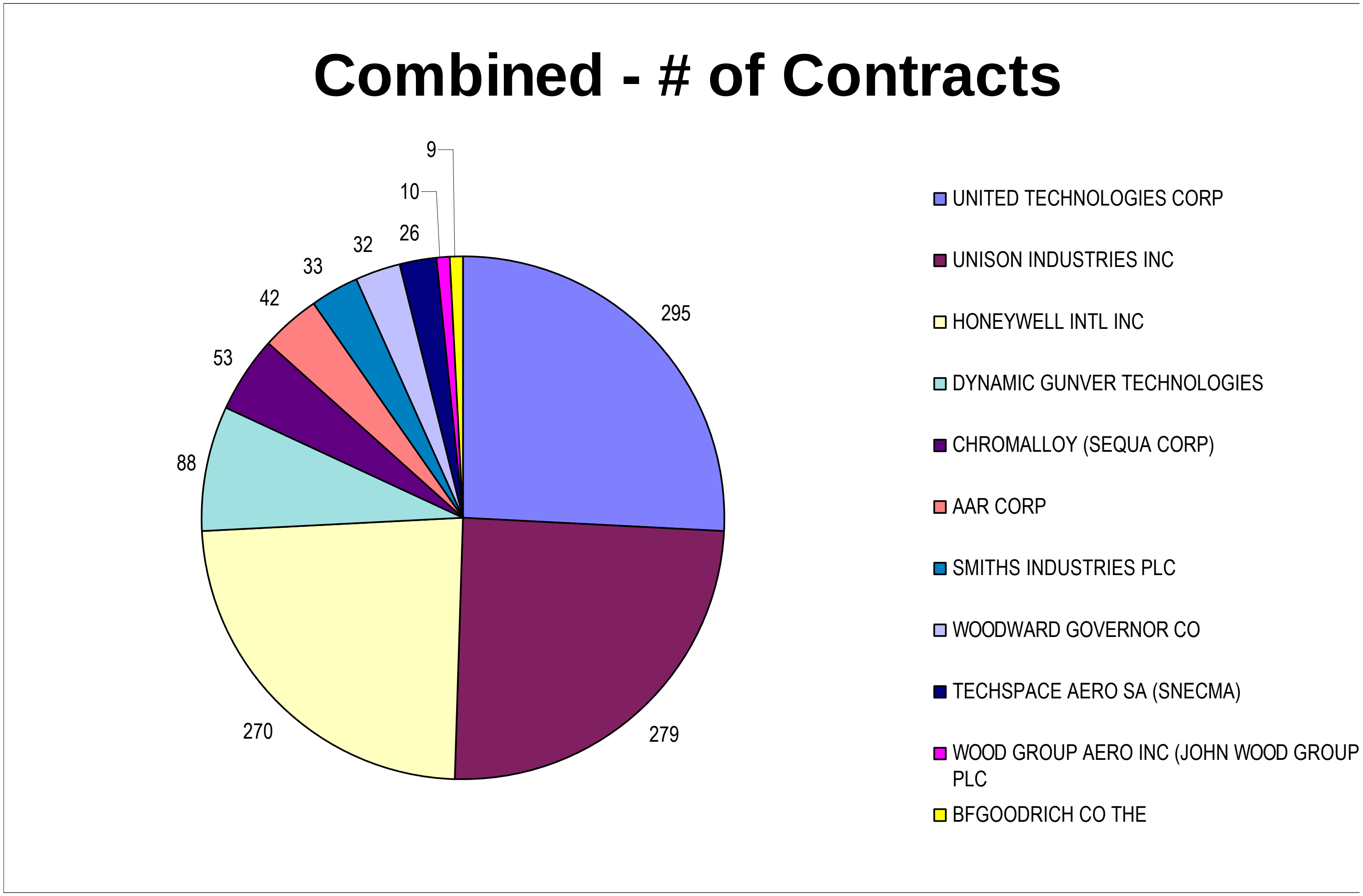
To streamline business requirements, the F100 PSM team was divided into teams to focus on Supply Chain, Performance Measurement, Organizational Learning and Development, Data and Information Technology and Strategy Development. Each team was assigned a lead to head up the research in their respective area.

The team conducted benchmarking visits with General Electric Aircraft Engines, Cincinnati, Ohio; and Delta Airlines, Atlanta, Georgia, to identify procedures these organizations used to implement SCM initiatives. These visits provided lessons learned, best practices and areas where the team could focus its analysis.

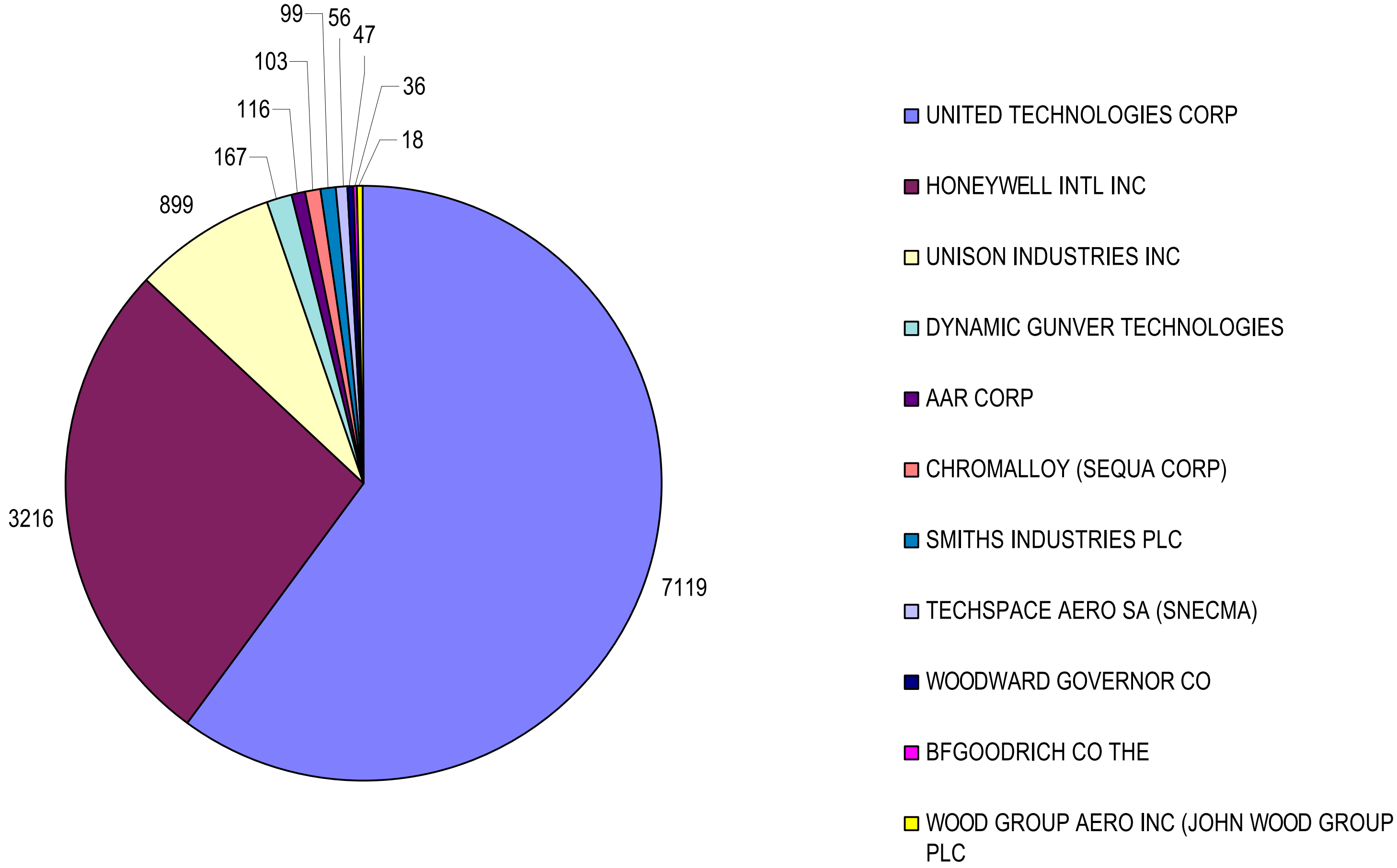
Before any recommendations for process improvements could be made, it was necessary to map the current supply chain from end-to-end, i.e., from the supplier's supplier to the customer's customer. The "As-Is" state was mapped to SCOR Level II. Using all of the information, the teams documented existing conditions in each of the focus areas.

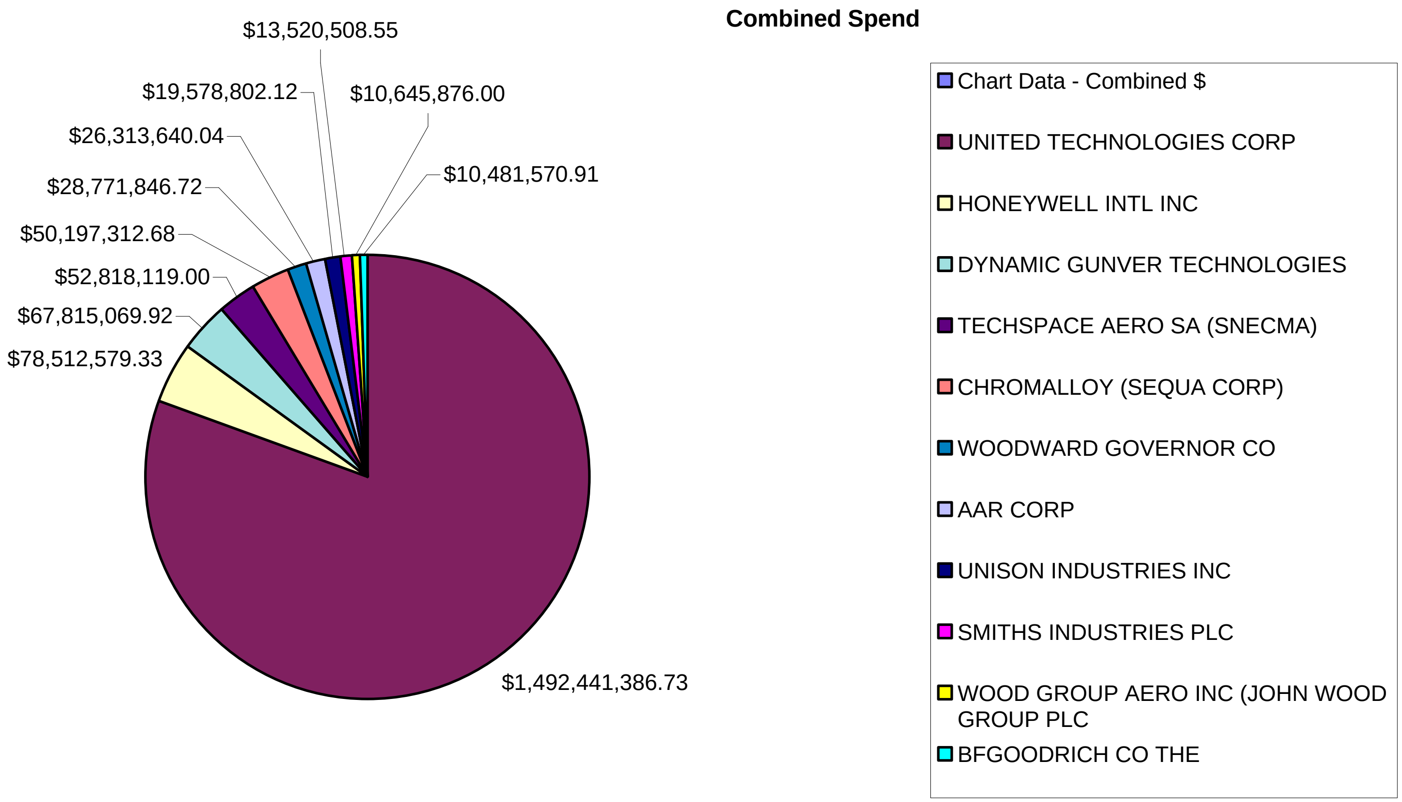
The Customer/Supplier Process Management Team utilized the SCOR process model to map the supply chain for the F100 engine to Level II. The team gathered spend and vendor data from a variety of sources. The spend and vendor analysis was accomplished to determine where the F100 money was spent in order to leverage and collaborate with suppliers. This analysis revealed that the bulk of the procurement dollars went to a small number of contractors. It also revealed that numerous one-time buys were issued for recurring requirements. This data was compared with purchasing actions by OC-ALC and DLA to see where purchasing efforts were duplicated and offered opportunities to enter into long-term supplier relationships.

F100 Spend Analysis Results



Combined - # of Transactions





Combined Spend
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$19,578,802.12
$10,645,876.00
$26,313,640.04
$10,481,570.91
$28,771,846.72
$50,197,312.68
$52,818,119.00
$67,815,069.92
$78,512,579.33
$1,492,441,386.73
Chart Data - Combined $
UNITED TECHNOLOGIES CORP
HONEYWELL INTL INC
DYNAMIC GUNVER TECHNOLOGIES
TECHSPACE AERO SA (SNECMA)
CHROMALLOY (SEQUA CORP)
WOODWARD GOVERNOR CO
AAR CORP
UNISON INDUSTRIES INC
SMITHS INDUSTRIES PLC
WOOD GROUP AERO INC (JOHN WOOD GROUP PLC
BFGOODRICH CO THE

The Organizational Learning Development Team obtained and reviewed organization charts and positions descriptions, charted communication paths and mapped functions for various positions. The F100 engine organization is functionally aligned and responsibility for each step of the process resides within different organizations.

The Performance Measurement Team gathered existing metrics charts and supporting data currently being used to measure supply chain performance. Metrics data was collected from both internal and external customers. The team catalogued historical data, data sources, metrics definitions and methodologies. Over 100 different metrics are currently used to measure various processes and points throughout the end-to-end supply chain. The team developed a metrics model to sort the current metrics into balanced scorecard categories: cost, customer satisfaction and reliability/sustainability.

The Data and Information Technology (IT) Team identified and collected data required to analyze the current F100 engine program. This was an extremely difficult task due to the fact that there is no single system today that consolidates all the required data fields without considerable cross-referencing from multiple legacy systems. Approximately ten different data systems were used to identify 25,000 parts with unique national stock numbers (NSNs) used in the production of the F100 engine. A considerable amount of cleanup was required to validate the data gathered from the legacy systems in order to develop the total spend analysis for F100 engines. Through multiple scrubs and several iterations of data pulls, the number of discrete F100 NSNs was reduced from 25,000 to 10,024. The team collaborated with DLA to build a database that contained over one million F100 transactions for FY99 – 01.

The APS team made their software package selection. Phase II APS Pathfinder Environment Set-Up was executed. The hardware and software were configured and installed within the AF MRO environment and documented within the System Configuration Document. The APS Pathfinder Configuration Report was developed to document the configuration of the hardware, software, middleware and database software packages necessary to establish the APS Pathfinder test environment. The APS Pathfinder Configuration Report provided the initial specific hardware configuration mix (e.g., server and workstation switch settings, drivers, memory, processing capabilities, etc.) and specific software configuration (switch settings, versions, etc. for database, middleware and APS applications). Additionally, the Configuration Report discussed current understanding and future configuration considerations of the hardware, software, middleware and database software packages necessary to establish the APS in a live full implementation environment. The configuration report document was considered a draft and final results were refined throughout the course of the APS Pathfinder test and incorporated into the Final Report. The information in the documentation was the technical building block for the expanded testing efforts that required enhancing the complexity of the technical environment. The final Configuration Report is contained in Section 4.

OC-ALC Metrics

Readiness/Sustainability

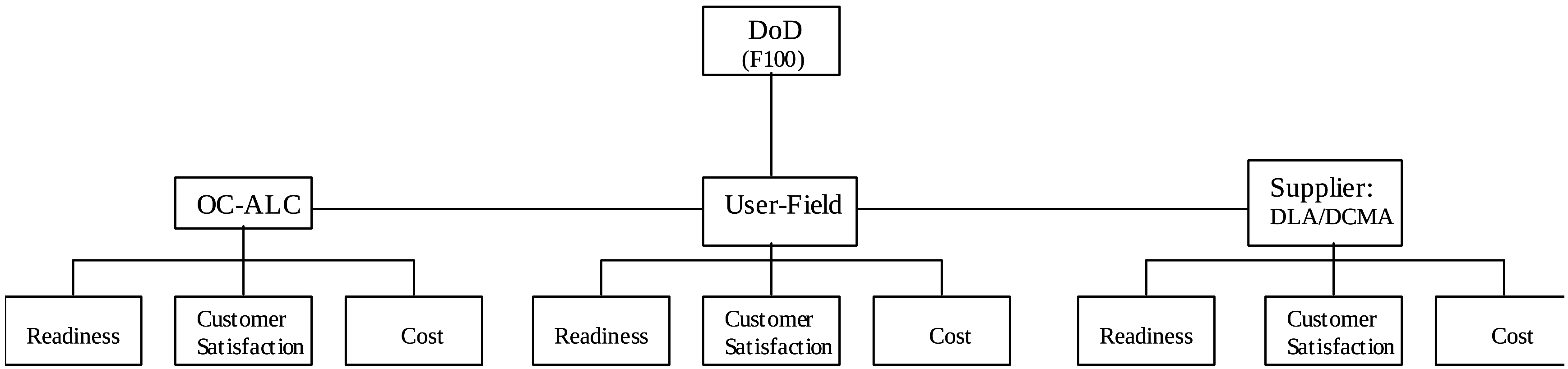
- Serviceable Spare Engines
- Engine Base Stock Level
- ENMCS
- Base Stock Level Fighter/Bomber
- War Readiness Engines (WRE)
- F100-100 Trending Data
- F100-220 Trending Data
- Fighter/Bomber Holes by TMS
- Fighter/Bomber Holes by User
- Total Engine NMCS Hours by SOS
- Total Engine NMCS Hours by TMS
- Engines Not Mission Capable Supply (ENMCS)

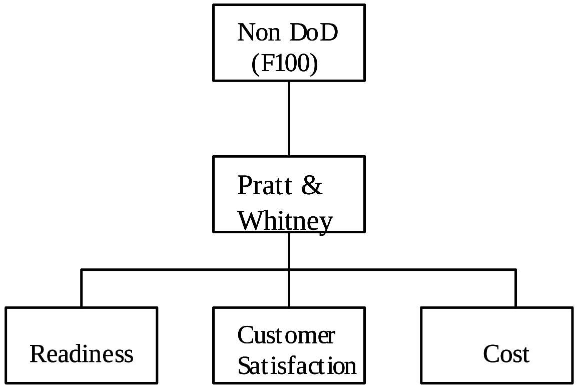
Customer Satisfaction

- Material Deficiency Reports
- Safety
- MSD Back Orders Tracking
- Backorder Reduction
- Overage Backorder Reduction
- Logistics Response Time ALC Source of Supply
- Quality Defect Rates
- Engine Production
- Module Production
- Component Repair Flowdays
- Due Date Performance
- MICAP Hours
- MICAP Incidents
- Logistics Response Time
- Stockage Effectiveness (SE)
- Issue Effectiveness (IE)
- Organic Production Hours
- Component Repair Flow days
- Net Operating Result (Organic)
- Customer Wait Time
- Organic Production Hours
- Propulsion Production
- Net Operation Result
- CPARs Cycle Times
- CPARs In Process
- Undefinitized Contracts
- (Delq Actions & $ On Hand)
- UCA Definitization Plan
- Contractiing Lead Time
- Contracting Competition
- On-Time Contract Awards
- PRs In-Process Exceeding Cycle Time
- PRs In-process Exceeding Cycle Time
- On-Time Delivery
- Contract Prior Year Carry-In (Funded Unproduced)
- Initial Spares

Cost

- Contract DMAG/SMAG Revenue
- Contract DMAG Cost of Goods Sold
- Contract DMAG Net Operating Results
- Contract DMAG Financial Condition
- SMAG Buy Obligations
- SMAG Repair Obligations
- SMAG Net Sales vs Revenue
- SMAG Unit Cost Target
- SMAG Credit & Return Average-LPF
- Other Revenue
- Total Revenue
- Expenses
- Readiness Spares Package
- Peacetime Operating Stock
- Latest Actual Contract Price
- Latest Repair Price
- Latest Acquition Price
- Estimated Price

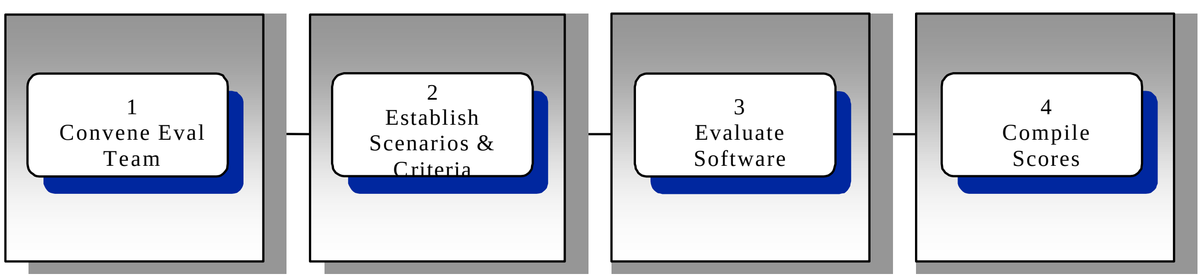

DoD
(F100)
OC-ALC
User-Field
Supplier:
DLA/DCMA
Readiness
Customer Satisfaction
Cost
Readiness
Customer Satisfaction
Cost
Readiness
Customer Satisfaction
Cost


Non DoD
(F100)
Pratt & Whitney
Readiness
Customer Satisfaction
Cost

Within Phase 2, the APS Pathfinder Data Mapping Report was developed to document the AF and DoD Legacy Systems, data warehouses and databases, OC-ALC unique localized systems and data repositories, and gaps where viable data was non-existent. The data outlined in the data map was necessary to establish the APS Pathfinder test environment and the functionality of the APS software as outlined in accordance with the Statement of Work and the APS Pathfinder Concept of Operations. A data configuration document, specific for each module, detailing the assumptions and processes behind the mapping of the AF Supply Chain data into the APS software, was created. The data configuration document, like the data mapping report, was a living document, updated as the Pathfinder proceeded and incorporated functionality. Additionally, the data map report discussed current understanding and future data considerations necessary to establish the APS in a live, full implementation environment. The Data Mapping Report was considered a draft, as final results were refined throughout the course of the APS Pathfinder test. Section 3 of this document contains the final APS Pathfinder report.

During setup and configuration of software and hardware and identification of the data elements, the business requirements were translated into functional demonstration scripts. The APS Organic team developed detailed technical requirements, (e.g., environment, architecture, GUI, management tools, support services, models and development) which were used as part of the overall assessment during Phase 3 and Phase 4 basic and expanded scenario testing.

Phase 3 and Phase 4 tested the applicability of the APS software within the AF MRO environment. A basic four-step approach was utilized to evaluate the APS functionality in the AF MRO environment.



An evaluation team was assembled with representatives from the various branches within OC-ALC/LPA. To formulate evaluation criteria, the APS Team conferred with BearingPoint technical personnel and AF subject matter experts (SME) to develop a framework for software evaluation that tested the capabilities and fit of the selected APS in an AF maintenance and repair environment. AF personnel were responsible for developing and weighting all grading factors used in the APS assessment. Rules of engagement were established to maintain integrity and validity, and the evaluation process ran between 31 October 2002 and 15 December 2002. Scores were captured and consensus scores were derived and analysis was accomplished.

Based on analysis and benchmarking visits, the PSM team's initial review indicated five problem areas to conduct SCOR Level IV analysis: core, inlet fan, high pressure turbine, fan drive turbine, and gearbox, with core being the most complicated. The Core was already being reviewed under a separate initiative, so the inlet fan was selected for Level IV mapping. The map of the current supply chain processes was used as the baseline for applying industry best practices and information obtained from benchmarking similar industries to develop process improvements to support PSM concepts. Collaboration on demand and supply plans, with buy-in from all parties, will result in common goals to refine requirements, improve support and reduce costs. The AF use of industry best practices could result in a more integrated and strategically focused workforce. Collaborating with suppliers and customers will provide improved support to the warfighter.

A comprehensive F100 sourcing strategy proved to be beyond the capability of the Strategic Sourcing team within the timeframe allotted. However, supply chain analysis indicated F100 engine bearings historically had long production lead times, diminishing manufacturing sources of supply and limited repair capability. As a result, line stoppages and fleet groundings have occurred in the past. Spend analysis provided insight and allowed the team to create a strategic vision for managing engine bearings.

The Strategic Sourcing team met with DLA procurement officials to address buy patterns and to develop a combined bearing sourcing strategy. This strategy categorized bearing purchases into three categories: sole source, restricted and fully competitive. A vendor information meeting was conducted to solicit industry feedback on government purchase methodology. Only five bearing manufacturers exist in the United States. Government purchase patterns and lack of long-range demand planning gave manufacturers little incentive to deal directly with government agencies. This forced some bearing purchases to be conducted through distributors. It was determined to conduct a joint AF-DLA acquisition of sole source and restricted items.

Commodity councils are used in industry to manage items that cross product lines. A Bearing Commodity Council was established to provide a macro-level view of government bearing requirements. This council is co-chaired by AF and DLA and consists of engineers, buyers, IMs, ESs and other stakeholders from AF and DLA. The goal of the council is to manage engine bearings on F100 engines used by all services.

Phase II activities for the Metrics team centered around collaboration with the Supply Chain Mapping Team to conduct a metrics review on the selected module from the "As-Is" baseline. The Mapping Team will drill down on F100 modules to determine those processes requiring review. The Metrics Team will clarify any applicable existing metrics and identify any additional metrics required. The objective is to minimize and standardize the metrics used for consistent measurement throughout the supply chain.

Once process improvements have been identified, the selection of the most appropriate metrics will be finalized.

The Organizational Team found that the current functional stovepipes that exist within the F100 community inhibit communications and responsiveness so that there is a lag between when changes occur and when they can be incorporated. Traditionally in the AF, the responsibility for the determination of requirements is primarily a material management function, while procuring assets falls within the contracting function. Through benchmarking and research of industry best practices, it was determined that the development of new “blended” positions within the material management functions will provide a more strategically focused and proactive workforce. Training will be required to provide these additional skills to existing AF personnel. The development of new career paths may be required to provide new paths of advancement and growth for the new positions.

Change management must occur to provide awareness of PSM tenets and goals and to educate the workforce of potential changes in processes. Resistance to change will be minimized if personnel understand the new processes, the reason for developing new operating procedures and how jobs will be revamped based on these improvements. A job satisfaction survey was developed to solicit perceived problem areas and proposed solutions prior to implementation of PSM. To measure success of PSM efforts, the survey will be given to F100 personnel now and after PSM initiatives have been implemented. A new organizational structure will be refined to better support the process integration and improvements once they are finalized.

Requirements for new IT infrastructure are being identified and evaluated to support the processes of PSM. One of the fundamental tenets of PSM is that routine tasks are automated, allowing personnel more time to develop strategic support plans and more actively manage suppliers. The IT also needs to be available to provide visibility into the supply chain at all phases. IT is also required to allow all parties to have access to the same data points, on a real-time basis, when collaborating on demand and supply decisions. Once process improvements are identified and the IT requirements are developed, an IT architecture plan will be finalized to support the PSM effort.

PSM lies at the hub of the extended supply chain network where supply meets demand, with personnel gathering information from customers and suppliers and passing it throughout the entire supply chain to ensure the flow of goods and services meet customer requirements. The objective is to optimize the performance throughout the supply chain with a goal of continuous improvement.

Phase III of the project will develop plans for implementing and institutionalizing recommended PSM improvements. Results of the Supply Chain Mapping, Bearing Strategy Developmentand Commodity Council will be used as the basis for establishing ALC, AFMC and AF policy. Further implementation will be incorporated in the F100 Engine Sustainment Program. These results will also be used to perform PSM initiatives across the Air Force.

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

The purpose of data gathering and analysis was to provide reliable relevant data to support supply chain mapping, metrics development and enterprise strategic sourcing decisions. The F100 PSM project encountered a number of significant data challenges in gathering AF and DLA vendor/spend data for the 10,024 items coded to the engine. It was imperative that the vendor/spend data be collected by NSN, type of contract (i.e., repair, spares, services), total dollar value of the contract, quantity and contractor Commerical and Government Entity (CAGE) code. No single data system contained the required data.

The Air Force contracting data system (J001) only records transactions in excess of $25,000 and gets its information from the completion of the Federal Procurement Data System (DD350) prior to the award for spares, repairs and services. J001 provides information on the contract itself and general spend characteristics, but not what is purchased at the specific item or NSN level. The drawbacks are (1) the data is input at the time of award so there is no post-award data in the system, (2) there is no NSN level or specific services detail and (3) there is no information about actions less than $25,000.

The J041 system was used to "fillin" the data not available from J001. It only provides line item and post-award data at the NSN level for spares, however that detail level is not available for repair contracts.

The Depot Maintenance Contract Production Cost System (G072D) was used for line item specific data for repair contracts. The only means of identifying which contract in J041 applied to which G072D requirements is the unit of issue and the total cost of the repair. These do not always match so manual interpretations are required.

Data was also gathered from the DLA Mechanization of Contract Administration Services (MOCAS) system. MOCAS is the system used by Administrative Contracting Officers (ACOs) and other contract administration personnel in tracking contractual transactions. Because the data gathered is from various systems that record information at different times by different people, the process of reconciling and de-conflicting the data has required a significant effort.

The PSM data spend analysis has also identified numerous instances of data inconsistencies or missing data that make it difficult to integrate data across multiple information systems. One example of data inconsistency is the Acquisition Method Codes (AMC) that indicates the ALC's assessment of the item's competitiveness. These codes can change over time; therefore, when extracting this data from multiple sources, it is important to develop business rules for which systems have the information and their relative order of reliability. Although some systems are more reliable than others, AMCs had to be extracted from seven different systems in order to locate the AMC code for 95% of the items. Missing data can also lead to records being rejected erroneously, unless the information is completed or otherwise estimated.

The first step of data analysis *must* be establishing business rules for what information is required and identifying the data requirements. Once established, these business rules may change as the program progresses. Changes in the business rules have made the continual participation of expert AF personnel in the analytical loop imperative. These kinds of data consistency issues will need to be addressed, as automated systems are developed to conduct spend analysis as required by future PSM efforts.

In analyzing what was required for the APS pilot, team members expressed concern about such things as acquiring data from source systems, training, server housing and many more relatively mundane tasks and challenges. What the team quickly found out was that the software, once populated with AF data, worked relatively easily and well. Configuring the application was tedious, but not necessarily difficult.

Take, for example, the configuration of the APS BOM. For pilot purposes, the AF team built a BOM from a collection of legacy systems, using the Applications, Programs and Indentures (API/D200F) system, which is maintained by the Equipment Specialist, as the basic building block, since it contains the indented structure required for optimal performance. Both G005M, which is maintained by maintenance planners, and requirements system (D200A) condemnations percents, as well as some Planning BOMs or planning data maintained by the Requirements Forecasting Model (RFM)/D357 personnel, were also incorporated. Looking up the data and plugging it into the application, whether manually or by flat file extraction, was not hard. On the other hand, assigning roles and responsibilities in a “To-Be” or Future environment is both complicated and intimidating. Questions, such as “Who should be in charge of maintaining an APS BOM?” can impact organizational structures, manpower allotments, policy changes, and even public law. APS technology will also provide visibility of DLA managed parts at a global level, bringing up the possibility for easier lateral support. The financial and business process ramifications of Stock Record Account Number (SRAN) A going to SRAN B instead of going to DLA for support are huge. Likewise, though APS can enhance cooperation and information sharing with both customers and vendors through use of the collaboration module, business rules may be in place that makes such sharing much more complicated or even impossible.

Policy that restricts extension and integration of the supply chain needs to be reviewed. Organizational structures, if based on functional specialization, may need to change as well. At present, the APS pathfinder has documented 37 process gaps that will impact an APS implementation. These range from something as simple as lack of a centralized repository for procurement lead times to as complex as a public law that, under certain parameters, restricts induction of reparables prior to monies being available. These gaps will be identified to management as part of the assessment.

Business roles and even position descriptions will need to be changed if an APS is implemented. For instance, commercial best practice is to have a discreet demand planner and a discreet supply planner. The demand planner develops a forecast of demand, and then a supply planner determines how best to support that demand. As such, one person is responsible for each activity. In the current environment, forecasting responsibility is split among many partners; the Equipment Specialist determines the factors which drive the computation, the item manger processes and impacts that same computation, and then a retail IM or an RFM operator will run supportability which passes piece part requirements to DLA. In such an environment, accountability is difficult if not impossible to assess. Applying commercial best practice may take certain activities away from an individual and give them to a different individual, eliminating dual responsibility.

The APS core team, comprised of five AF functionals, was obviously intimidated by such sweeping impacts; as such, the APS team has and continues to closely coordinate with the PSCM initiative. The PSCM initiative is tasked with exploring and developing an enterprise wide supply chain, assigning roles and responsibilities in a changing environment. Other supply chain initiatives, such as the Virtual Inventory Control Point or the possible acquisition of a COTS MRO tool, can also be impacted by the capabilities of an APS, and vice versa. While PSCM will ultimately develop an iterative blue print for the future supply chain organization, an understanding of APS technology is critical to that effort.

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

The Statement of Work and the APS Pathfinder CONOPS defined the objectives of the Pathfinder. The following objectives guided the developing of Critical Success Factors, creating of Test Script/Scenario, and scoring of the functionality of the software. The overarching objective was to evaluate APS capabilities along with the ability to fit into an Air Force maintenance and repair environment.

Supporting the overarching objective were three objective areas focusing on:

1. Software functionality provided to Item Managers, Weapons System Managers, Equipment Specialists and other logisticians involved in integrated planning functions;
2. Compatibility with current / planned AF logistics information systems, technology initiatives and command and control structures;
3. Identification of resource, training, process reengineering and other issues with significant potential to influence an implementation decision.

Using these relatively broad objectives, APS team members developed detailed Critical Success Factors and Business Scenarios. A core testing team was selected including both APS team members and other functionals from the LP Directorate in order to objectively evaluate the functionality of the software using these scenarios.

Two examples of a typical demand module and supply module business scenario along with the corresponding critical success factor, evaluation indicator and evaluation driver follow:

DEMAND MODULE BUSINESS SCENARIO: FORECAST ACCURACY AT MUTIPLE LAGS

Create a forecast for multiple items monthly and quarterly, store the forecast, and repeat for several months. To measure forecast accuracy at multiple lags, review the original forecast, forecast adjustment and forecast accuracy of each lag to demonstrate the ability to determine the effectiveness of the adjustments. Monitor total elapsed time taken to input data.

U.S. AIR FORCE

Evaluation Indicators – Demand Planning

Critical Success Factor:

Store historical forecasts in variable time buckets, created at different moments in time. Creates metrics based on historical forecast vs. actual demand.

Evaluation Indicators:

1) Forecasts in monthly, quarterly or broader time buckets,

2) Metrics comparing forecast vs. actual demand, 3) Forecast accuracy metrics, 4) Reduced time required to enter data.

Evaluation Drivers:

- Forecasts in monthly, quarterly or broader time buckets in telescoping fashion as defined by the demand planner
- Stores forecasts and adjustments from previous forecasting periods and allows demand planner to view these online for future comparisons
- Provides metrics and reports displaying forecast vs. actual demand
- Enables the demand planner to review the accuracy of the forecast at different intervals in advance of actual sales

Benefit: Improve War fighter readiness through ability to select most accurate forecast based on variable time buckets. Utilize metrics to compare and improve forecast.

Integrity - Service - Excellence 1

SUPPLY MODULE BUSINESS SCENARIO: GLOBAL RESOURCE CONSTRAINTS VISIBILITY

Provide ability to view worldwide assets as well as various supply plans in one system. The software should show where all assets are, who needs them, timeframes and any constraints. Managers access different systems to see overall asset visibility on a worldwide level. There is also limited access to view overall supply plans at depot and field level. Supportability would be greatly enhanced with global visibility of possible resource constraints, in future time periods, with simultaneous consideration of forecasted demand. Supply planners should be able to view all assets available at any location worldwide in one system as well as possible shortfalls. Supply planners should also be able to view resource constraints (material, capacity, etc.).

U.S. AIR FORCE

Critical Success Factors – Supply/Capacity Planning

Critical Success Factors:

Global visibility of possible resource constraints, in future time periods, with simultaneous consideration of forecasted demand

Evaluation Indicators:

1) Global visibility of material constraints for at least 2 year period, 2) Constraints consider forecasted demand from Demand Planning, 3) Capacity violations identified graphically and through reporting

Evaluation Drivers:

- Considered total demand
- Depicts visibility of available capacity and obligated capacity
- Alerts defined users when the plan would violate capacity
- Balances anticipated capacity with anticipated workload

Benefits: Maximize support for depot reparables by having future visibility to total projected demand, anticipated inventory positions and projected constraints (parts/capacity/budget) during the planning phase.

Integrity - Service - Excellence 10

After each test was completed, the Test Keeper (TK) provided the score sheets to the Independent Data Scoring Keeper (IDSK). The IDSK received an automated scoring matrix which calculated the Critical Success Factor scores, based on the predefined factor weights and Evaluation Indicator percentages. He also received a brief demonstration of the scoring matrix prior to the start of the scenario testing.

The IDSK was responsible for entering the scores for each of the factors from every score sheet. The IDSK ensured that each of the scores was entered accurately for each of the scoring sheets received. The IDSK verifed that all factors scored with an "N/A" were not included in the overall score for the scenario.

After all scores were received and entered by the IDSK, the scoring matrix was returned to the APS team.

As detailed within the rules of engagement, the scores were on the following basis:

0 - Does not address the requirement
1 - Minimally meets requirement
2 - Somewhat meets requirement
3 - Nearly meets requirement
4 - Meets requirement
5 - Exceeds requirement

The 0-5 scores were incorporated into a scoring spreadsheet and dynamically linked to Red-Yellow-Green assessments based upon the specific grade and weight of the criteria graded within an evaluation matrix.

A total of 16 business scenarios were tested using this methodology. Drilling down, of the seven Demand Planning Scenarios, six scored green and one scored yellow. Of the nine Supply Planning Scenarios, all were scored green.

Overall, the testing of the software met the majority of the requirements of the selected test scenarios. Since the APS software achieved high scores from the functional experts who would most likely be using the software, the APS team sees the scoring as indication that an APS solution as a tool will provide value in supporting the logisticians, who in turn support the warfighter.

The broad objectives of the PSM tenets meant each team had to identify distinct activities to show progress/success towards achieving specific objectives. Each activity was clearly defined and documented in the teams' Monthly Milestones Reports, as well as aggregated in the Monthly Progress Reports forwarded to SAF/IL and SAF/AQ. On-time accomplishment of specific sub-team activities for identified objectives equated to progress and success.

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.

As stated previously, the APS Pathfinder's mandate did not include live application of the software; supply actions, such as procuring parts, were not allowed or attempted. Actual return on investment has not been realized, and it would be premature to announce such benefits without the requisite experience or data. The primary reason commercial and DoD organizations are using APS systems is to save money and improve customer support. Take, for example, the Navy initiation of APS at United States Naval Supply Systems Command (NAVSUP). As part of NAVSUP's Supply Maintenance Aviation Reengineering Team (SMART) project, APS and Enterprise

Resource Planning (ERP) solutions have been put in place to enhance the Navy's inventory management, optimize asset performance and lifecycle. By improving forecasting, reducing inventory and constraining all supply actions, the Navy is estimating an annual savings of approximately $100 million.

Benchmarked cost savings from APS Implementation generally focus on four areas; inventory and cycle time reductions, plus IT System and Manpower offsets. Inventory reduction is perhaps the biggest bang for the buck. Take the engine environment as an example. Engine spare parts inventory is estimated at 4.68 Billion dollars, not including full up engines. If there is an inventory reduction of 1.25%, well under the low range of the industry benchmark of 25% associated with APS implementation, this would result in a cost avoidance of roughly $68M dollars, once handling costs and cost of capital is included.

Cycle Time reduction is the second area for significant cost savings. Initial results from the OC/ALC LP Six Sigma Study placed a value of 4.3M dollars on an Engine Directorate’s shop flow day. During the Demand Planning Pathfinder, which preceded the current APS Pathfinder, a 14-day reduction or 25% reduction in shop flow days was achieved. Again, being on the low range of commercial benchmarking, a 15% reduction would result in approximately $38M potential cost savings/avoidance.

APS is expected to have a significant impact on delivery performance and fill rates, as well. Again, from benchmarking, APS implementation is expected to increase performance from 16% to 28%. February 2002 backorder of just OC-ALC/LP were valued at roughly $612M; if APS realizes a 10% reduction in full implementation, the cost savings would be roughly $61M.

System and Manpower Offsets could also be significant. Multiple existing systems do have significant overlap with APS. Significant portions of other DoD APS implementations have been funded through system offsets. For example, portions of the Army’s Logistic Modernization (LOGMOD), Defense Logistics Agency’s Business Systems Modernization (BSM) and the Navy’s Supply Maintenance Aviation Reengineering Team (SMART) programs were funded by this methodology. Caution is required here, because much of the savings may be attributed to broader ERP initiatives replacing legacy systems, but some cost avoidance should be realized even with a narrower implementation.

Potential Manpower offsets also require careful consideration. Overall, industry benchmarks for productivity range from 10 to 16%. However, these initiatives are not designed to downsizing personnel, rather to refocus our workforce to be more proactive and strategically focused and improve support to the warfighter.

Beyond benchmarking, some specific Pathfinder benefits have been documented. Though a dollar value cannot yet be assessed because of the scope and limitations of the pilot, the potential for cost savings has been further explored. For instance, a comparison of forecast accuracy between current legacy forecasting systems and an

APS solution was completed. Though small in scale, APS did have 4% less forecast error measured year over year. Since APS gains in forecast accuracy are not normally seen until an APS has been in use for a year or more, it is expected that APS will improve upon the 4% in a full implementation. Industry benchmarks range from 5 to 25% or more improvement, but even a 6 or 7% accuracy improvement, as described above, would translate into large reductions in supply chain costs.

Precise quantification of cost and performance benefits of the F100 PSM pilot program is not possible at this time. Efforts to date have focused on the identification of long-term performance improvement opportunities. Further initiatives and implementation will yield empirical data to prove that commercial initiatives can be implemented in government processes.

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

The primary mission of the APS and PSM Teams is to improve support to the warfighter by streamlining processes and providing better long-term parts supportability.

PSM's charter was to develop a plan for the accomplishment of this improved support. The team focused on the implementation of the Spares Campaign Initiative #8: Adopt Improved Purchasing and Supply Chain Management. Improving the purchasing and supply chain management practices and procedures for the F100 Engine should lead to a reduction in total ownership costs, improvements in delivery responsiveness and an improvement in quality, all of which translate into improved support to the warfighter.

Supportability being the bottom line, the APS Pathfinder initiated a partial install of three modules representing a portion of a total APS solution. They were configured and loaded with AF data, primarily through flat file extraction. This was a time consuming process. The scope of the database included worldwide location modeling for a total of roughly 400 NSN's, both DLA and AF managed items, from the F101 Engine Program but also to include certain common items that ranged across weapons systems. These modules were the Manugistics Demand Planning Module, Networks Supply Planning Module and Networks Collaborative Services Module.

Demand Planning Module

Demand Planning is the starting point for the Supply Chain planning process. The output of the Demand Planning cycle is an unconstrained forecast for an item at a location. For the Air Force, this unconstrained forecast is based on historical issues and backorders. Statistical algorithms are used to create a forecast. Demand Planners review and modify this statistical forecast by resolving "exceptions" that are created during forecast calculation. Demand Planners also have the opportunity to modify the forecast based on knowledge of future activity that would cause the forecast to differ from historical activity. For example, a Demand Planner could adjust a forecast downwards with the knowledge that the overall B1 fleet is decreasing. In any event, the output of the demand planning process is an unconstrained forecast for an item at a location.

Supply Planning Module

The primary input to the Supply Planning is the unconstrained forecast of demand at a location. Supply Planning explodes this “independent” demand against a BOM to determine the associated “dependent” demand. Supply Planning considers current inventory balances, desired ending inventory, safety stock, current due-ins, etc. - in order to create time-phased requirements to satisfy demand. Supply Planning also considers the relationship between locations in the distribution network in order to create a requirement by location. For example, different locations in the Air Force distribution network are only authorized for certain repair actions. The Distribution Network is configured to recognize this and creates a requirement by location that places demand on the appropriate repair facility.

Supply Planning also considers capacity constraints when calculating requirements. Available capacity is considered against the requirements plan. Supply Planning adjusts the requirements in the event that the requirement exceeds available capacity. In this manner, Supply Planners can review requirements against capacity and adjust where appropriate, in some cases arranging for more capacity in the event of a bottleneck. In other cases, the requirement can be pulled forward or pushed back in order to smooth the load against production. The primary output to the Supply Planning process is a constrained requirement plan at the piece-part level.

NetWORKS Collaborative Services Module

The NetWORKS Collaborate tool is a web-enabled application that facilitates collaboration between business partners. The application is configured by the “primary” enterprise. “Secondary” enterprises access the application through a simple web-enabled interface and enter additional information relative to either the demand or the supply plan that may be unavailable to the primary business partner. For example, the primary enterprise can share their forecast of demand with a secondary enterprise. The secondary enterprise can adjust this forecast based on superior knowledge. In the event that adjustments are made, business rules can be written that create email alerts that notify both enterprises if a change has been made that is beyond normal business rules. In this manner, NetWORKS Collaborate extends the boundaries of the supply chain beyond the primary enterprise to include the secondary enterprise as well.

By populating and creating and initial configuration of these three modules, the AF team explored the pros and cons of an AF APS implementation, documenting their findings for use in a decision making process that ultimately may determine if an APS is rolled out to the entire Air Force Supply Chain.

SECTION III. KNOWLEDGE TRANSFER

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

The Pathfinder Team has taken every opportunity to expand the corporate knowledge of Supply Chain Solutions from the lessons learned in the APS effort with other DoD partners. These efforts include demonstrating the functionality of APS to over 64 different organizations. These organizations cover an extensive range of duties, from workers on the shop floor to an Under Secretary of the Air Force. Many of these demos required the Pathfinder “Road Show” Team to travel to other ALCs, AF Bases and Defense Contractor facilities.

Many of the team members have also attended industry conferences and symposiums to gain a greater understanding of the software, processes and procedures that are proving successful today. The team visited other DoD agencies that are currently using a similar technique to accomplish their mission. Those agencies include the Navy and the DLA, as well as the various other Air Force initiatives, such as the OO- and OC-ALC’s MRO initiatives.

Communication and sharing of information across the extended supply chain is key to an APS. A large benefit of the APS effort has been the use of the collaboration module. This two-way communication link over the Internet allows various participants to exchange information in a real time environment and come to an agreeable understanding. This collaboration technique was very successful in setting production forecasts between the ALC’s and the aircraft main operating bases. In addition to a possible increase in forecast accuracy, the collaboration module facilitates partnering between the depots and the field customers. This module is also very useful in the exchange of information between the supply organizations at the ALC’s and DLA, which is the major supplier of consumable items used by the Air Force.

The APS team is comprised of representatives from many of the supply disciplines including planning, scheduling, logistics, and inventory control, as well as management and computer support. The team members have been able to learn and leverage of other members experience and knowledge. This wide range of expertise has allowed the team to investigate a solution that was real world applicable and not an “ivory tower” concept.

The APS Pathfinder and F100 PSM projects have also been aided by an extensive oversight committee, comprised of individuals from many different backgrounds and commands. The numerous Program Management Reviews have advised and guided the effort toward a successful investigation of a Supply Chain Management solution that can potentially capture millions of dollars in cost savings and avoidance.

The result of many discussions surrounding the PSM effort are documented in Table 3.1

Table 3.1 – Lessons Learned

Lessons We Have Learned	Project Phase			Impact on Project
	Beginning	Middle – Between Phases I and II	End - Current	
Team members need to be well trained in the functional areas they are to review and make recommended changes to.	**X**	**X**		Teams lose collaboration, credibility and have ineffective interviews.
Provide team building training and activities at all phases of the project.	**X**	**X**	**X**	As a result of team building, the team members begin to trust each other. They then begin to communicate and cooperate. This leads to collaboration, increased productivity, effective use of resources, as well as proactive resolution to team interpersonal problems.
Provide constructive performance feedback in a consistent format.		**X**	**X**	When teammates have a clear idea of what they are doing well and what needs improvements they can share best practices between themselves and can build on their successes. Because of this, teammates are highly motivated and focused on what is important.
Colocate the entire project team through all phases of the project.	**X**	**X**	**X**	Improved communication leads to integrated decisions and awareness of cross-functional activities.
Adequately resource the team with the required technical skills either through existing personnel and/or contractor services.	**X**	**X**	**X**	This leads to increased productivity and more effective use of time/skills.

Table 3.1, continued

Lessons We Have Learned	Project Phase: Beginning	Project Phase: Middle – Between Phases	Project Phase: End - Current	Impact on Project
Clearly define both short-term and long-term goals and objectives, and ensure linkage to strategic objectives. Define the criteria for success early in the project and consistently point project activities toward clearly defined and coordinated exit criteria.	**X**	**X**	**X**	With clearly defined success criteria the project activities gain focus and direction enabling the team to meet or exceed expectations.
Allocate time at the start of the project (Phase Zero) to identify and plan all known project steps, milestones, resource requirements and deliverables prior to starting the project activities (i.e. the plan-to-plan). Match the level of funding, staffing and timelines to the scope of the project. Don't start the project activities until resources and funding have been allocated.	**X**	**X**	**X**	With adequate planning and preparation, interdependencies and constraints on project activities are identified. When activities are started before they are adequately staffed and funded, they quickly stall out, the team loses its focus, and a great deal of time is wasted trying to do things that can't be done.
The organization that sponsors the project should champion the effort to ensure appropriate resources and support.	**X**	**X**	**X**	Proactive representation leads to increased visibility that enhances project priority. Also as a result, there will be adequate resources and adequate support.

Table 3.1, continued

Lessons We Have Learned	Project Phase: Beginning	Project Phase: Middle – Between Phases	Project Phase: End - Current	Impact on Project
Designate a dedicated project lead with strong project management experience, who is responsible for coordinating the interdependencies between the team members, to manage day-to-day activities.	**X**	**X**	**X**	Clear comprehensive guidance will be given to all teams, taskings will be kept on track, and teams will operate as one cohesive group with the same goals and objectives.
Establish achievable milestones with interdependencies identified. Once a set of milestones is established, don't change them without tracking the changes to the original baseline.	**X**	**X**		By establishing realistic targets, this increases team focus and motivation. Tracking to a baseline allows for monitoring the progress and allows for issues to be identified and elevated.
Set up and maintain formal communications with stakeholders and management.	**X**	**X**	**X**	Increases project visibility, support, distribution of information and facilitates feedback.
From an enterprise level, integrate all new project work with existing projects while reducing conflicting goals and overlaps. In other words, don't re-accomplish what's already been done.	**X**	**X**	**X**	This helps to increase productivity, reduces duplication, maintains focus and leverages existing information.

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

Senior leadership throughout the AF will review the APS Pathfinder final report and the F100 PSM recommendations. The decisions will determine the future path of Supply Chain Management. We will now take a more definitive look at each effort.

Oklahoma City ALC established a Purchasing and Supply Chain Management (PSCM) Transition Office to facilitate incorporating results identified by the F100 PSM Team. The PSCM team will jointly develop AF policy and procedures with Air Force Materiel Command, Ogden ALC, and Warner Robins ALC. The objective of this critique of the AF F100 PSM project is to provide valuable input to the PSCM team that will soon take over the challenge of implementing improvements to the PSM processes. Measures will be taken to minimize or avoid the difficulties that the PSM team experienced.

The Bearing Strategy and Commodity Council approach was briefed to DLA Defense Supply Center-Richmond on 24 Jan 03. Representatives included Executive Director of Procurement, Director of Supplier Operations, Director of Business Operations and Air Force Customer Operations Liaisons for Tinker AFB, Hill AFB and Warner Robins AFB. The briefing was well received. A joint service Acquisition Strategy Panel (ASP) is anticipated for the engine bearing procurement. Bearings strategy will be briefed at the Engine Summit in April 03.

Senior leadership, including representation from the ALC's, AFMC and AF/IL, will review the APS Pathfinder final report. Should the review be favorable, one likely game plan would be for APS to become a part of the larger PSCM effort. APS could be implemented, most likely in parallel with legacy systems, in small scale in a mock or pseudo-organization developed from the larger PSCM structure.

Candidates include, but are not limited to, the F101-102 Engine Area and the Ogden KC-135 program. Business processes and procedures, new roles and responsibilities, and new position descriptions will need to be developed. Once this new organization is developed, the business model can be used as a template to refine processes. More comprehensive data and more statistical metrics can be captured if the system is allowed to go live, even on a small scale. In time, when the business case has been sufficiently assessed, the new processes, policies and job roles, as well as the software application, can be transferred back to the original organizations.

CONCLUSION:

Advanced Planning and Scheduling (APS) technology, as demonstrated by the APS Pathfinder, provides an integrated, near real-time, responsive approach to planning and assessment of feasible execution plans through an enterprise-wide view of all Air Force logistical organizations with which it was connected. The APS Pathfinder initiative, established at OC-ALC/LPA on the F101 engine, was designed to evaluate APS capabilities and limitations in this environment, and support an implementation decision by Air Force leadership. Secondary objectives of the APS Pathfinder involved the completion of functional and technical documentation (e.g., data maps, interface descriptions, process maps, training requirements, etc.) necessary to support an APS implementation if such a decision is made by Air Force leadership. The Pathfinder also established a mechanism for sharing information and supporting collaborative planning capabilities across the extended supply chain (for example, DLA and OEM's).

The team evaluated software functionality through the development of business scenarios, which assessed APS capability to provide integrated and comparative information to enable decision-making. In general, the evaluation of the Critical success factors was positive. Gaps were found and documented and will need to be addressed to utilize the full potential of the technology.

Likewise, initial findings suggest that the previously benchmarked benefits of APS implementation are in fact capturable, even if to a lesser degree than in some commercial areas. Other DoD initiatives, such as NAVSUP and the DLA BSM, lend even more credence to the possible benefits as a larger APS implementation.

During the Pathfinder, the Air Force invested significant time, manpower and financial resources to better understand APS systems. The results of this effort are significant. Lessons learned and supporting analysis should be used to support leadership decisions on APS implementation, influence logistics information systems strategy for planning functionality, establish a means of comparing organic and COTS capabilities and limitations and establish a foundation for technology support of enhanced business processes.

In conclusion, APS technology, as demonstrated by the Pathfinder, provides increased speed and functionality integrated/enabled by industry developed best business practices. Hopefully, APS technology will become the cornerstone of the entire AF Supply Chain Enterprise.

Purchasing and Supply Management (PSM) strategically links demand planning, purchasing, inventory management, supply chain, supplier and supply base management to create continuous improvement in performance and cost of purchased goods and services. Adopting improved PSM practices offered the Air Force a means of achieving significantly improved performance and support and reduced costs. The result of applying improved PSM concepts is more effective and efficient supply chain integration and a higher quality and more responsive, reliable, and robust supplier base. A more strategic focus on purchasing and supply activities ensures supplier relationships, supply chain and supply base strategies are focused on the strategic goals of the organization.

The objective is to synchronize supply to demand so that the rate of supply matches the rate of demand, along the entire supply chain, from the supplier's supplier to the customer's customer.