



## Supply Chain Council Award for Excellence in

US Air Force  
 Oklahoma City Air Logistics Center  
 Sustainment Transformation through Supply Chain Operations Reference  
 (SCOR), Model, Lean and Six Sigma

*Workforce +*



*Workplace +*

*Workloads =*

***WARFIGHTER SUPERIORITY***



## EXECUTIVE SUMMARY

The art of business and the art of war have changed, causing the Air Force to paint a new canvas in meeting the challenges of the 21<sup>st</sup> Century. In order to meet new threats and embrace new operational concepts, the Air Force is transforming itself into an expeditionary force able to provide a full spectrum of air and space capabilities that can reach anywhere in the world at anytime.

**TINKER AFB IS A NATIONAL ASSET** critical to the Air Force and Navy achieving global air and space dominance. Our mission is to acquire and sustain the world's best aviation systems, in partnership with our warfighters and suppliers, to ensure America's aerospace power is ready for war, contingencies and peacekeeping operations. This mission is varied and complex, involving a multitude of organizations that provide the warfighter the best bomber, tanker, AWACS, airborne accessories, software and engine support available.



In order to manage and sustain the world's best aviation systems, Tinker's operational focus is split into three main areas: Depot Maintenance (MX), Combat Sustainment (CS) and Aircraft Sustainment (AS). Each of these vital areas is continually exploring transformational initiatives to improve support to our nation's warfighters. In addition, our engineering, financial and environmental organizations, as well as the operational Air Base Wing provide the essential support and expert analysis that ensures transformational success.

Overall, READINESS is the completed canvas. Through partnerships and new ways of doing business in the art of war and the art of business, Tinker is transforming to world-class operations. Our submission for the DoD Supply Chain Operational Excellence Award for 2004 focuses on our significant improvements to the most critical segment of our end-to-end supply chain: our maintenance, repair and overhaul (MRO) processes and facilities. Under the umbrella of sustainment transformation, we are creating world-class logistics support consisting of reliable, flexible and responsive depot level repair and overhaul, unparalleled program management and innovative supply chain management solutions that will reduce total ownership costs and offer total system support to the warfighter.

TERRY L. GABRESKI  
Major General, USAF  
Commander



# Warriors Supporting Warriors



**OKLAHOMA CITY AIR LOGISTICS CENTER**  
**Supply Chain Council Award for Excellence in Supply Chain Operations and**  
**Management (DoD) Submission**

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## INTRODUCTION

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Tinker Air Force Base is one of the world's largest maintenance, repair and overhaul (MRO) organizations. We excel in all phases of integrated logistics support. We offer unequaled program management of numerous weapon systems, including aircraft structural, engines and accessories.

The Air Force is currently implementing an overarching transformation effort titled Expeditionary Logistics for the 21st century (eLOG21). Transformation is a process that shapes the changing nature of military competition and cooperation through new combinations of concepts, capabilities, people and organizations that exploit our nation's advantages and protect against our asymmetric vulnerabilities to sustain our strategic position, which helps underpin peace and stability in the world. (*DoD Transformation Planning Guidance Apr 03*) Transformation of the Air Force will aid in developing forces and capabilities that can adapt quickly to new challenges or unexpected challenges. Transformation will bring improved processes, new capabilities and operational concepts that are innovative, adaptive and responsive to warfighter readiness.

ELOG21 consists of two focus areas within the Air Force Materiel Command (AFMC) called Depot Maintenance Transformation (DMT) and Purchasing and Supply Chain Transformation (PSCM). These major transformations will offer unprecedented support to the warfighter. DMT is leaning out and modernizing the entire organic maintenance infrastructure at Tinker AFB, reducing flow times and cost, and increasing the warfighter's weapon system availability. To support both the warfighter and the organic shops, we are implementing tenets of PSCM into our supply chain. All transformation initiatives in both areas are headed by one centralized organization, both at the depot level and our headquarters. We have teamed with the University of Oklahoma on the establishment of a Lean Institute, which is teaching our workforce how to use the Supply Chain Operational Reference (SCOR) Model, Lean techniques and Six Sigma.

Oklahoma City Air Logistics Center's transformation vision is to move rapidly to implement lean cellular production processes, state-of-the art production planning, tailored supply chain management and overall process improvement to achieve "World-Class Logistics Support."

## SECTION 1: GENERAL INFORMATION AND PROJECT COMPLEXITY:

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### 1-1). Name of Submitting Organization:

Oklahoma City Air Logistics Center

### 1-2). Name of the Responding Organization:

Oklahoma City Air Logistics Center, Maintenance Wing, Combat Sustainment Wing

### 1-3). Brief Mission Description:



U.S. AIR FORCE

## *The Logistics Mission*

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### ■ What We Do:

- Get the force to the fight
- Keep the force in the fight
- Prepare the force for the next fight

### ■ The Effect We Produce

- Providing the right stuff, at the right time and place—*every time*

**Global Expeditionary Operations for the  
21<sup>st</sup> Century**



The Oklahoma City Air Logistics Center is a key provider of logistical support to the United States Air Force. Sustainment of the warfighter is our purpose for existing, and we do an excellent job of supporting our fighting forces. Our supply chain includes all facets of the SCOR model, especially the return process. All of the aircraft and engine parts we send to the warfighter cycle back to us. We repair or overhaul as required, and cycle the item back out for use. Our program managers and supply chain managers ensure the supply chain is agile and responsive, providing the right part at the right time at the right place in the right condition for use by the customer.

### **Tinker Capabilities and Assigned Workloads:**

The Oklahoma City Air Logistics Center is the center of industrial and technical excellence for bomber/tanker/engine workloads and the technology repair center (TRC) for the following technologies as indicated by numeric and alpha designators:

|     |       |   |
|-----|-------|---|
| # 9 | TRC J | Hydraulics, Pneudraulics/Pneumatics (Transmission & Air Driven Accessories)   |
| #10 | TRC K | Oxygen/Gas Generating Equipment   |
| #18 | TRC T | Instruments and Displays (Automated Flight Control & Engines)   |
| #19 | TRC U | Aircraft Related  |
| #20 | TRC V | Engine Related  |
| #23 |       | Aircraft (KC-135, B-1, E-3, B-52, B-2)  |
| #24 |       | Software  |
| #26 |       | Harness Cable   |
| #28 |       | Machine Manufacturing   |
| #30 |       | Propulsion Engines  |
| #33 |       | Paint/Depaint, Cleaning, Machine Repair, Inspection, Sheetmetal Mfg, Plating, Labs, Precision Measurement Equipment Laboratory PMEL, etc. |

The center commander is responsible for the following weapon systems, programs, Accessories, and aircraft/missile engines:

#### **Aircraft:**

B-52  
C/KC-135  
B-1B and E-3

**CLS:** KC-10, C-9, C-20, T/CT-43A, C-137, C-22, VC-25, EC/TC-18, C-12, C-38, C-21, C-26, E-9, T-3, E-4B and USAF Academy aircraft

### **High Frequency Global Communications System**

#### **Airborne Accessories:**

pneudraulics/hydraulics systems, breathable oxygen systems, environmental control systems, engine starting systems, inertial navigation systems, automatic flight control systems, flight recording systems, power generating systems, common accessories and other test equipment for prime weapon systems

**Engines:** F100, F101, F107, F108, F110, F112, F118, TF30, TF33, TF34, TF39, T56, T400, T700, J69 and J85

#### **1-4). Category of Submission:**

Supply Chain Operational Excellence Award (DoD)

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

The Air Force supply chain is a set of linked and integrated processes critical to satisfying customer orders from raw material to finished product. In 2002, the F100 Purchasing and Supply Management (PSM) team used the SCOR process model revolving around the five distinct management processes of plan, source, make, deliver and return to map the F100 supply chain.

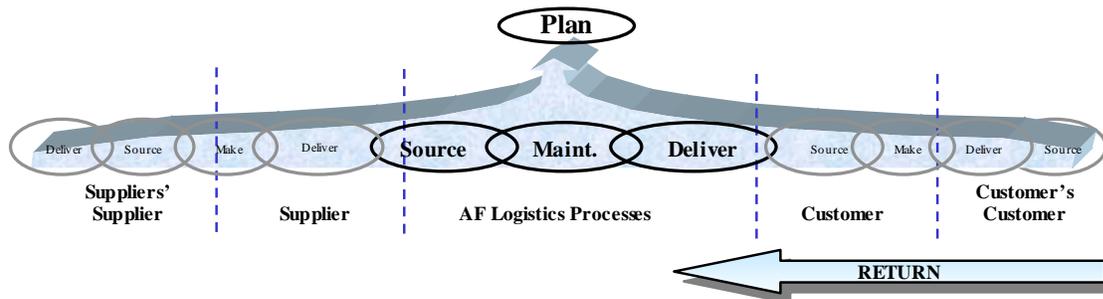


## F100 Engine Supply Chain



AFMCO

**The F100 supply chain includes all facilities, functions, and activities involved in producing and delivering a product or service.**



**A supply chain is the series of “links” in the logistical process**

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SCOR spans all supplier/customer interactions, physical material transactions, market interactions and serviceable/reparable returns functions of the supply chain (end-to-end visibility). This effort identified many areas for improvement, but our prioritized top target was improving the “make” processes in the production shops. This submission concentrates on the MRO processes, but we also provide adequate data to show that all supply chain processes at OC-ALC are being targeted for process improvement through our sustainment transformation initiative.

### 1-6). Supply Chain External Partner Organizations:

- Defense Logistics Agency (DLA) (2)
- Dynamics Research Corporation (DRC) (2)
- International Business Machines (IBM) (1)
- Small Business Administration (SBA) (1)
- Defense Contract Management Agency (DCMA) (1)

### 1-7). Internal Partners and Organizations:

- HQ AF/IL
- HQ AF/DPX (1)
- HQ AF/SAF (1)
- HQ AFMC/LG (3)
- OC-ALC/CC/CD (2)
- Maintenance Wing(s) (11)
- Combat Sustainment Wing (3)
- Acquisition Center of Excellence (1)
- Judge Advocate (1)
- Maintenance Materiel Support Division (1)

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

- Mr. Tim Beyland, AF/DPX, Air Force Program Executive Officer for Services, HQ AF, 1040 Air Force, Pentagon, Washington DC, 20330-1040  
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## SECTION 2: IMPLEMENTATION:

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

Sustainment transformation was undertaken to achieve a step-change in the performance of our end-to-end supply chain without a corresponding increase in costs. Our stated goals from HQ AF are to increase weapon system availability (i.e. planes available to fly missions) by 20%, with zero cost growth in the sustainment area for the next five fiscal years. This will require redesign of most of our existing processes, and close collaboration between all members of the supply chain.



# Overarching Goals for eLOG21 - Availability

**TAI (Total Aircraft Inventory)**

|                 | Actual Depot | Program Depot |   | Programmed | Actual | Interim Goal* | Stretch Goal** |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
|-----------------|--------------|---------------|---|------------|--------|---------------|----------------|--|-------|----|----|---|-----|---|------|-----|----|--|------|---|----|-------|---|----|--|--|-----------------|----|----|----|----|--|--|--|
| PAA             |              | NMCM          | <table border="1" style="border-collapse: collapse;"> <tr><td>TAI</td><td>100</td><td></td><td></td><td></td></tr> <tr><td>Depot</td><td>10</td><td>12</td><td rowspan="3" style="font-size: 2em;">}</td><td rowspan="3" style="font-size: 2em;">+9%</td><td rowspan="3" style="font-size: 2em;">}</td><td rowspan="3" style="font-size: 2em;">+20%</td></tr> <tr><td>PAA</td><td>90</td><td></td></tr> <tr><td>NMCM</td><td>9</td><td>11</td></tr> <tr><td>TNMCS</td><td>9</td><td>11</td><td></td><td></td></tr> <tr><td>AA Target @ 80%</td><td>72</td><td>66</td><td>72</td><td>79</td></tr> </table> | TAI        | 100    |               |                |  | Depot | 10 | 12 | } | +9% | } | +20% | PAA | 90 |  | NMCM | 9 | 11 | TNMCS | 9 | 11 |  |  | AA Target @ 80% | 72 | 66 | 72 | 79 |  |  |  |
| TAI             | 100          |               |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| Depot           | 10           | 12            |   | }          | +9%    | }             | +20%           |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| PAA             | 90           |               |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| NMCM            | 9            | 11            |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| TNMCS           | 9            | 11            |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| AA Target @ 80% | 72           | 66            | 72  | 79         |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
|                 | NMCM         | TNMCS         |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
| AA Target       | TNMCS        |               |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |
|                 | MC           | MC            |   |            |        |               |                |  |       |    |    |   |     |   |      |     |    |  |      |   |    |       |   |    |  |  |                 |    |    |    |    |  |  |  |

Baseline = FY02  
 \* End FY04  
 \*\* End FY06

20% Increase in Availability in 3 Years

Integrity - Service - Excellence



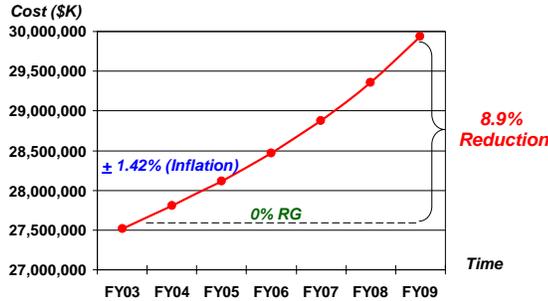
U.S. AIR FORCE

# Overarching Goals for eLOG21 - Affordability

## FY03 Overall Aircraft O&S Costs (Budgeted Amts)

|                            |              |
|----------------------------|--------------|
| DPEM                       | \$2,796,083K |
| DLR                        | \$4,862,180K |
| Fuel                       | \$2,125,119K |
| Supplies                   | \$865,237K   |
| Sust Eng                   | \$205,489K   |
| CLS                        | \$2,436,791K |
| Other                      | \$5,066,660K |
| Mil Pers                   | \$9,161,289K |
| <b>Total \$27,518,847K</b> |              |

(Source: AFTOC - AFCAA)



## Zero Real Cost Growth FY 04 - 09

*Integrity - Service - Excellence*

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Bottom line – we have reached the point at which we need to significantly change (i.e. transform) the way we think, act and operate if we are going to support a global expeditionary doctrine.

Our current batch and queue system of doing business is antiquated and an out-dated means of managing an MRO environment. Under our current system, we have pushed our processes, systems and people to the limit of their ability to meet customer demands. In the current competitive market, it has become necessary to be increasingly responsive to the customer's (the warfighter's) needs. In order to meet the requirements of the future, a whole new production system will be required. We have to fundamentally change the model we are using, which requires us to do the really hard things—crossing organizational boundaries and crossing functional boundaries (within and without logistics).

The good news is that there are benchmarks within the AF, within other services and within industry, which give us confidence that we can get to where we need to be.

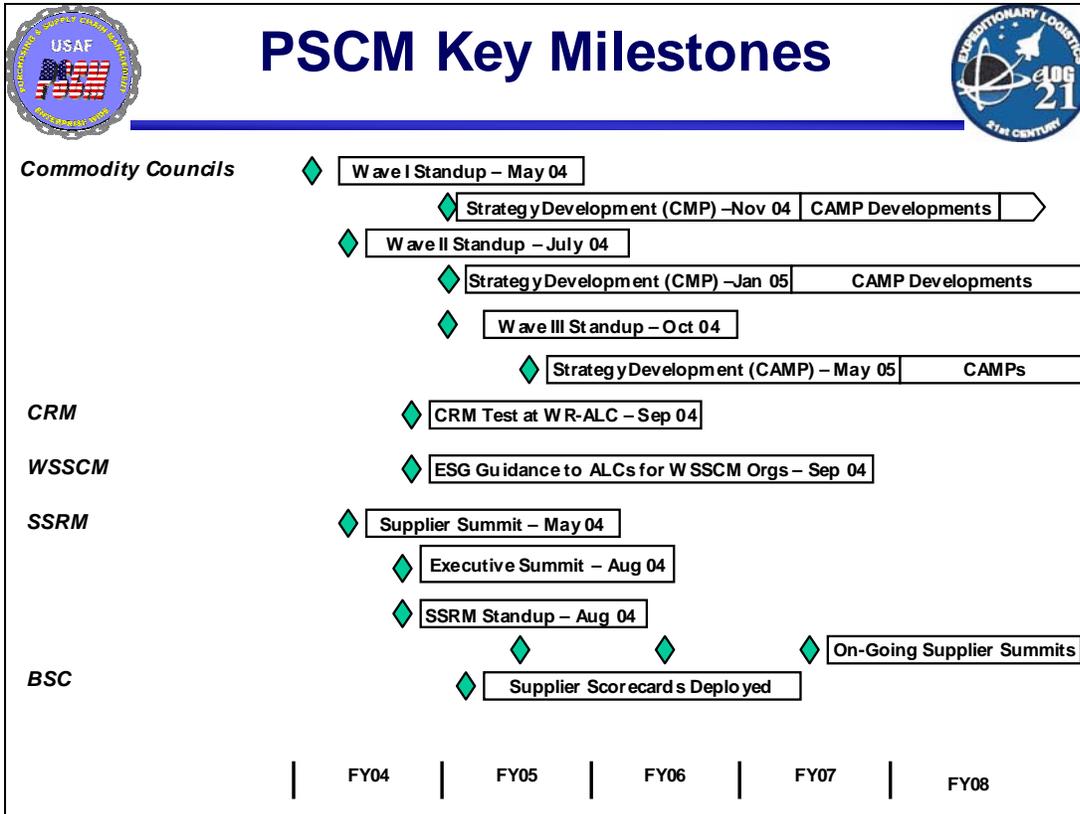
**2-2) Indicate the duration of the project. Note if the project was a pilot that is being rolled out. Note if the project is ongoing/still in progress.**

This is a multi-year/multi-phased lean/cellular process improvement project within the OC-ALC MRO Transformation Program that will dramatically improve MRO processes/operations for aircraft, engines and commodities.

This project is based on several previous successes, which were accomplished across the center in different organizations. Leaning out the F100 Inlet Fan shop and mapping out the F100 supply chain from end-to-end occurred in FY02. The C/KC-135 PDM lean events took place in the Aircraft Maintenance Division throughout FY02-04. The CSD lean/cellular initiative had its ribbon cutting in FY04. The DMT and PSCM initiatives kicked off in FY03 and are ongoing. However, the main efforts being described in this submission, the MRO initiative, will start in FY05 and go through FY09. The following inserts provide the details of activities for MRO and PSCM:

### Depot Maintenance Lean Redesign Master Plan

| Perc Com | TASK                      | Start Date | End Date | 2003                 | 2004       | 2005               | 2006       | 2007       | 2008       | 2009 |
|----------|---------------------------|------------|----------|----------------------|------------|--------------------|------------|------------|------------|------|
| 66%      | Bldg 3001 Renovation Ph 1 | 10/1/03    | 8/1/05   | ▶──────────────────▶ |            |                    |            |            |            |      |
| 100 %    | Bldg 3001 Equipment       | 10/1/03    | 9/30/04  | ▶────────▶           |            |                    |            |            |            |      |
| 32%      | F100 Lean Redesign Ph 1   | 10/1/04    | 9/30/05  |                      | ▶────────▶ |                    |            |            |            |      |
| 0%       | Bldg 3001 Renovation Ph 2 | 10/1/05    | 8/1/07   |                      |            | ▶────────────────▶ |            |            |            |      |
| 0%       | F100 Lean Redesign Ph 2   | 10/1/05    | 9/30/06  |                      |            | ▶────────▶         |            |            |            |      |
| 0%       | GE Engines Redesign Ph 1  | 10/1/05    | 9/30/06  |                      |            | ▶────────▶         |            |            |            |      |
| 0%       | GE Engines Redesign Ph 2  | 10/1/06    | 9/30/07  |                      |            |                    | ▶────────▶ |            |            |      |
| 0%       | TF33 Redesign Ph 1        | 10/1/06    | 9/30/07  |                      |            |                    | ▶────────▶ |            |            |      |
| 0%       | TF33 Redesign Ph 2        | 10/1/07    | 9/30/08  |                      |            |                    |            | ▶────────▶ |            |      |
| 0%       | C/KC-135 Redesign Ph 1    | 10/1/07    | 9/30/08  |                      |            |                    |            | ▶────────▶ |            |      |
| 0%       | C/KC-135 Redesign Ph 2    | 10/1/08    | 9/30/09  |                      |            |                    |            |            | ▶────────▶ |      |



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

Over the past year, extensive benchmarking has occurred with DoD and commercial MRO activities. The conclusion of the benchmarking effort was that lean/cellular efforts are occurring throughout the MRO industry and significant improvements are achievable and being realized. We then looked to academia for validation of the best approach. What we found was that lean/cellular was the answer. The next question which had to be answered was: Are sources available which possess the capabilities required to undertake such a large project as leaning our entire industrial complex? Sources sought indicated sufficient, capable large businesses/teams to support a competitive acquisition. There was no indication that any small business could satisfy the total requirement. To maximize small business participation at the subcontractor level, subcontracting plans will be received, reviewed and approved, and exceeding small business goals will be part of the award fee criteria.

Now we have a clear vision and confidence in obtaining help in implementing the plan. OC-ALC contracted with Standard Aero to conduct a feasibility study for the transformation of building 3001 into a state-of-the-art MRO facility using lean/cellular manufacturing concepts and methodologies. The result of the feasibility study was the delivery of a master plan that documented the current production system as well as a cost/benefit analysis to support the transformation activities. The feasibility study provided a proof-of-concept for initiating industry best practices. It also documented a

number of issues and risk drivers in the transformation that OC-ALC had to consider in developing the acquisition and implementation strategies for the transformation.

Before a Request for Proposal (RFP) was released, multiple Industry Days were held. The intent of Industry Days was to open a dialogue between the government and potential suppliers to better understand industry's capabilities and government's requirements. As part of Industry Days, ten teams/firms engaged in one-on-one sessions, which resulted in 111 questions and answers. Industry Days and the question-and-answer responses demonstrate that there exists a market expertise for depot transformation in five broad categories: AF logistics contractors, IT professionals, aerospace/engine manufacturers, maintenance contractors and academia.

Subsequent to Industry Days, a questionnaire was issued by OC-ALC asking for specific information from the Industry Days' attendees regarding proposed contractual issues. Responses were received from five firms and institutions. The feedback received from the questionnaire indicated that incentives were appropriate for this effort in the areas of cost, schedule and performance. Further, a delivery-order type contract with a long-term relationship was desirable.

The statement of work for the program consisted of five elements. First: Program management will develop/maintain an Integrated Master Plan/Integrated Master Schedule (IMP/IMS), coordinate and schedule with base support organizations (OC-ALC/EM, OC-ALC/CE, etc.), exercise/manage associate contractor agreements and monitor cell/business unit performance. Second: The development of an overarching transformation plan, which will cover the entire industrial MRO operations, identify number and type of business units, schedule/sequence of events and identify required equipment/people/skills. Third: The development of business unit plans (F100 being first). The business unit plans will cover such issues as IPTs (contractor and government), define cells that comprise the business unit, identify sequencing/choreography and swing space, identify equipment to be purchased and refurbished, identify skill levels and quantity of personnel required, identify unit specific training requirements and identify an approach for minimizing the disruption of production. Fourth: The design of each cell. Cell design will include such tasks as IPT (contract and government) and detailed blueprints. Fifth, and final, will be implementation of the plans.

To ensure the vision becomes reality, this center established the Transformation and Integration Program Office (TIPO) within the Plans & Programs Directorate. The TIPO will support DoD, Air Force and AFMC transformation strategies by integrating all OC-ALC transformation initiatives under the umbrella of sustainment transformation.

To meet our Air Force goals, we are utilizing SCOR, Lean and Six Sigma tools to improve our processes throughout the Air Logistics Center. We have benchmarked the top performers from the commercial sector, collaborated with key academia and are now transferring the knowledge to our business.



## Benchmarking



- **Benchmarking**
  - GE
  - Boeing (St. Louis)
  - Nordam
  - United (Indianapolis)
  - Smith Industries
  - PEMCO
  - Northrop-Grumman
  - Dynamic-Gunver Tech
  - Rolls Royce
  - WR-ALC
  - BASC
  - Standard Aero
  - Caterpillar
  - Pratt & Whitney
  - Curtis-Wright
- **Academia**
  - MIT, Harvard, Georgia Tech, University of Tennessee, University of Oklahoma
- **Industry Days (3)**
  - 100 Attendees Representing 50 Companies

3

We have embarked upon a multi-year/multi-phased lean/cellular process improvement projects within the OC-ALC MRO Transformation Program that will dramatically improve MRO processes/operations for aircraft, engines and commodities.



## Lean/Cellular



- **Lean**
  - **Processes and Methods to Eliminate Non-Value Added Activities and Waste Along the Enterprise Value Stream Using Lean Principles**
- **Cellular Manufacturing**
  - **Design Methodologies for Production Systems that Integrate People, Machines, and Controls; and the Processes Binding Them Together Within Cells that Reduce Costs, Material Scrap, Manpower, Lead Times, Rework, Flow Times, and that Optimize Floor Space**

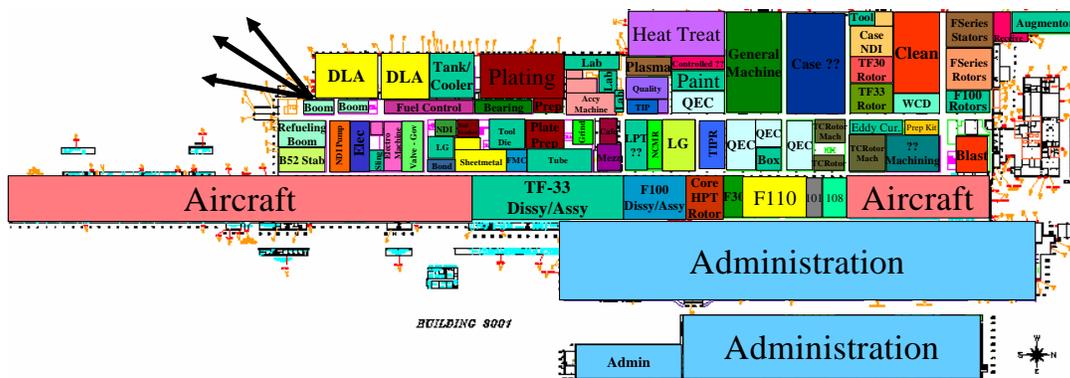
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The entire program incorporates a holistic/system approach using lean/cellular process improvement manufacturing principles, combined with other expeditionary logistics for the 21st Century (eLog21) transformation initiatives, including tailored supply chain management, total component management and the IT systems necessary for complete visibility and control of production operations. The program benchmarks to best commercial MRO business practices, production processes and facilities. The program and its master plan/schedule are fully integrated with OC-ALC and AFMC's long-term depot strategy plan.

The objective is to dramatically decrease production flow time, flow days, movement of parts, work-in-progress, inventory levels/costs and increase throughput to meet current and forecasted customer requirements. The driving force behind these activities is the desire to enhance the AF's ability to support the warfighter in an environment that provides the most cost-effective and efficient core depot-level capability within existing facilities. In particular, these enhancements will increase the pipeline throughput, which will significantly decrease the assets required to support the warfighter. Additionally, a highly efficient operation will allow OC-ALC to repatriate currently off-loaded core workload, capture new workload—above core—and be postured to accept additional multi-service workload as DoD's depot environment structure is realigned.

The existing MRO facility was designed/built in the 1940s as a C-47 aircraft manufacturing plant. Over the past 60 years, distinctively different maintenance workloads (commodities, engines, larger aircraft, etc.) were shoe-horned into available space using a functionally aligned, batch/queue, process-orientated factory concept (i.e. Heat Treat shop, Plasma Spray shop, Case shop Gear Box shop, etc.). Therefore, existing MRO facility layout and workflow processes are inefficient, antiquated and behind industry standards and customer cost expectations.

## TODAY



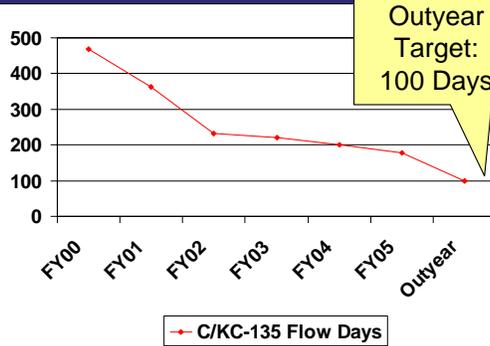




# C/KC-135 Lean Demonstration



- Apply LEAN Principles
- Flowdays Reduced from 413 to 207
  - Reduced # of Docks from 12 to 9
  - On Time Delivery: up 48%



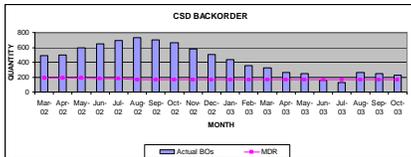
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# Constant Speed Drive Lean Demonstration



- Convert from Functional to Lean/Cellular
  - Reduced Flow Days from 58 to 30 Days
  - Reduced Backorders from 700 to 130





# TF33 Engine Demonstration



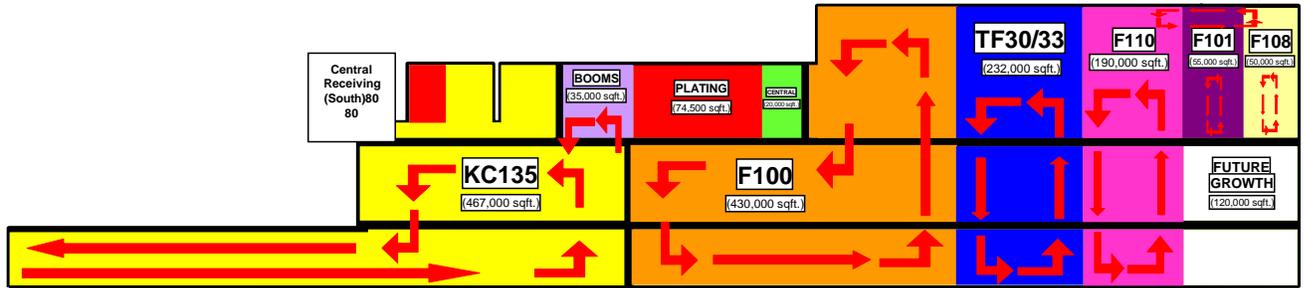
- Combining Assembly/Disassembly “Front Shops” with “Back Shops”
- Benefits Projected
  - Parts Movement Reduced 61%
  - Ownership Changes Reduced 54%
  - Flow Days Reduced 34%
  - Material in Process Reduced 44%
- Actual Benefits To Be Verified by 30 Nov 04



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New MRO technologies/methodologies/processes are available to produce products faster, cheaper and better than currently employed. This project is transformational because it will convert the existing process-oriented batch and queue operations into a Lean/Cellular design operation. The design is product-focused and produces families of similar parts within the confines of the cells that house most or all of the required people and equipment necessary to complete the repair and overhaul. The new design facilitates the rapid flow and efficient processing of material and information. As a result, each business unit maintains control of the entire MRO process from end to end. Additionally, shop floor mechanics will be trained on several tasks within the individual cell and the team concept will foster employee involvement and create an environment for continuous improvement.

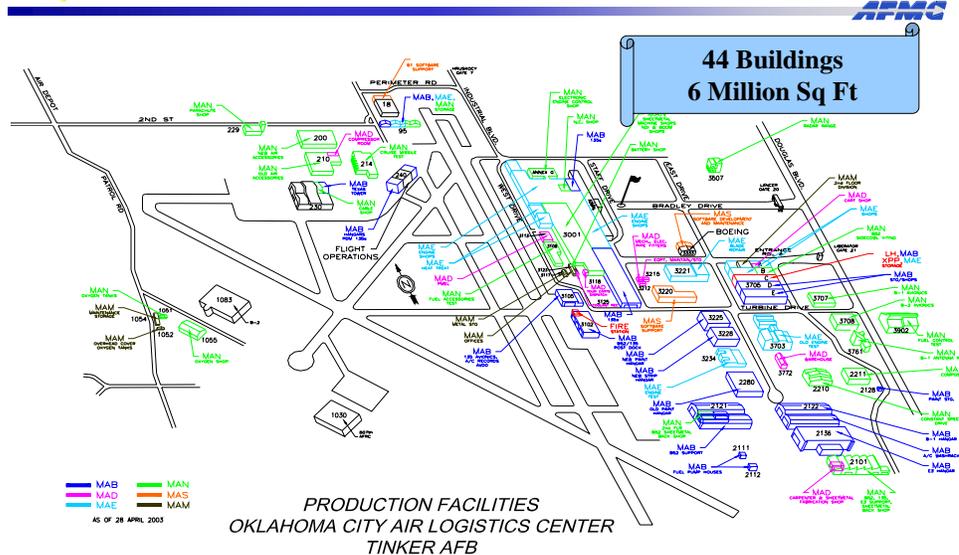
## POSSIBLE FUTURE LEAN/CELLULAR LAYOUT



Our long range goal, which goes out farther than the next seven years, is to transform all 44 maintenance facilities, over 6 million square feet of production space, and all associated processes, using the techniques of lean/cellular, SCOR and Six Sigma.



## OC-ALC MRO Facilities



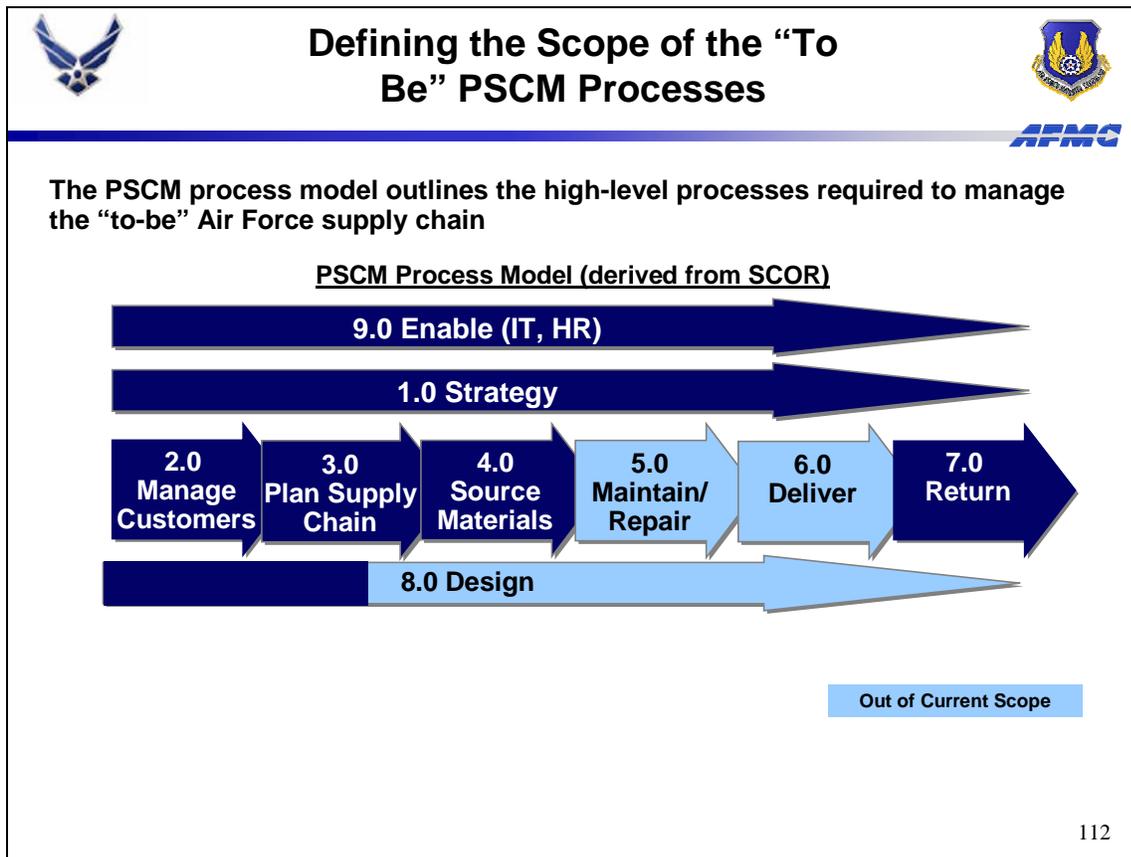
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To support the lean cellular process, we are also implementing significant changes to our supply chain processes that provide the necessary material to the production shops.

The PSCM transformation is a major Air Force initiative to improve and integrate AFMC's purchasing and supply processes. This transformation has the same goal to increase the availability of parts to the warfighter, and reduce our cost of doing

business. The PSCM transformation is eliminating waste, streamlining processes and integrating purchasing and supply chain responsibilities.

The PSCM transformation is an “enterprise-wide” effort, which means collaboration between the three Air Logistics Centers (ALCs), HQ AFMC, customers and suppliers. PSCM adapted the basic SCOR model as shown in the next three inserts to accomplish our transformation:





# Why Adapt the SCOR Model?



AFMC

With an expanded scope, PSCM added processes to include:

- Creation of Strategic Business Plans in 1.0 Strategy
- Support for Customer Relationship Management (CRM) in 2.0 Manage Customers
- Implementation of Commodity Councils in 4.0 Source Materials
- Control of asset configurations in 8.0 Design

In its native state, SCOR does not have processes for the development of strategic plans. The SCOR "Plan" process covers the development of plans for executing the components of the supply chain: source, make, deliver and return. While SCOR covers order fulfillment in the "Deliver" process, it does not have enterprise specific processes to cover the customer relationship process (CRM). PSCM added these processes in 2.0 Manage Customers. While Commodity Councils are a leading practice, SCOR does not attempt to identify how they will be implemented. The use of Commodity Councils is covered in the 4.0 Source Materials process. Finally, while engineering and configuration control is mentioned in the SCOR model, it is really outside of the scope of the model. PSCM added configuration management in 8.0 Design to ensure that the demand and supply planning processes (in 3.0 Plan Supply Chain) would be integrated and updated with configuration data.

## PSCM Process Model



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A number of industry best practices and business concepts underlie the PSCM transformation. Here are just a few:

**Supply Chain:** The Defense Department defines supply chain as: “the linked activities associated with providing materiel from a raw materiel stage to an end user as a finished product.”

We can think of the supply chain as the links in the logistical process, stretching from acquisition of raw materials to delivery of finished products to the end user. Everything that is needed to create and deliver products and services to customers is considered part of the supply chain.

The supply chain includes all the players who have a stake in this complex process. For AFMC, the supply chain includes commercial and organic maintenance facilities, testing facilities, distribution depots, reutilization and marketing offices (DRMO), weapon system program offices, transportation networks (including contract carriers), military service and Defense Logistics Agency (DLA) integrated materiel managers, commercial distributors and suppliers (including manufacturers), weapon system support contractors, cataloging services, retail supply chain activities, engineering support activities, and most importantly, our customers.

**Supply Chain Management:** Tangible benefit comes when an organization can manage the supply chain to achieve bottom line results.

Supply chain management is a cross-functional approach to procuring, producing and delivering products and services to customers. The objective of supply chain design is to weave each of the process stakeholders into a seamless fabric of information flow, physical distribution flow and cash flow for the benefit of the end customer and our suppliers.

The idea of managing the supply chain is a relatively new idea. In the past, we had separate functions that were each responsible for a major part of the process. Leaders in industry and the Air Force are now recognizing the power of linking the activities of these separate departments into a fully integrated process.

The potential results of redesigning our purchasing and supply chain processes are significant. Commercial firms adopting streamlined supply chain management practices have realized a significant increase in quality of goods and services, improvement in customer support and reduction in total supply chain costs. By incorporating more flexible, strategic supply chain management practices in our own AF sustainment processes, we expect to achieve similar results.

PSCM transformation will apply industry best practices. The PSCM transformation represents a fundamental change to the way we do purchasing and supply for the Air Force. The PSCM transformation is:

- Strategically linking demand planning, purchasing, inventory management, suppliers, supply base management and our customers.
- Creating continuous improvement in supplier performance (including quality, responsiveness, flexibility and technology) stimulating lower cost of purchased goods, services and our total ownership costs.
- Providing an “enterprise-wide” perspective. PSCM focuses on interrelationships across the entire supply chain from the supplier’s supplier to the customer’s customer.
- Commodity councils are providing a more strategic focus on purchasing and supply activities to ensure acquisition and materiel management strategies are focused on the goals of the organization.

**A New Approach to Purchasing.** The PSCM transformation is changing our approach to planning and purchasing. Our new mechanism for sourcing goods and services will be characterized by:

- *Strategic Approach to Purchasing*—We are moving from contracting with small, short-term contracts to larger, longer-term contracts with the plan of improving our relationships with key and best suppliers.
- *Continuous External Market Intelligence*—On a continuous basis, we gather and analyze external market intelligence (e.g., market trends, financial positions of market players, etc.). This information enables us to develop better purchasing strategies.

- *Performance-Based Contracts*—We are increasing our use of performance-based contracts. In other words, we use performance work statements that set forth contract requirements in clear, specific and objective terms with measurable performance standards. We include performance incentives where appropriate.
- *Proactive Supply Base Management*—We are more involved in looking at the market, supplier capacities and changes in the industry. This allows us to react to the expansion or shrinkage of the overall base in a more timely manner.
- *Proactive Supplier Management*—We interact with our suppliers on a continuous basis, not just when it looks like something has gone wrong.

**A New Approach to Supply.** The PSCM transformation has changed our approach to supply chain management, as characterized by:

- *Requirements Definition and Integration*—We specify performance characteristics from the customer’s perspective. We provide demand analysis and forecasted requirements for supplier capacity planning and scheduling purposes. We provide actual demands to suppliers for operational purposes (for example, e-commerce).
- *Strategic Sourcing*—We develop material and sourcing strategies based on the design and characteristics of the supply chain and product. We make greater use of contract/service level agreement flexibility, demand-based support, and performance-based arrangements. For example, when demand is volatile, we may build more flexibility into our agreements with suppliers. If demand is stable, we may ask our suppliers to take on more risk by holding inventory.
- *Integration with Suppliers*—We collaborate with suppliers to better anticipate and meet customer demands. We believe that continuous sharing of our demand and forecast data dramatically reduces risks for both the Air Force and our suppliers.

OC-ALC has made great strides in implementation of PSCM during FY04. Across the enterprise, we established eight commodity councils which account for 92% of the spend for the Air Force Material Command. Three of those enterprise councils; Aircraft Accessories, Aircraft Instruments and Aircraft Engines are located at OC-ALC. We also established a Strategic Relations Management organization and identified the top 21 suppliers to AFMC. Each of those suppliers has a strategic supplier relationship manager assigned, who is at the general officer/SES level and will serve as the Air Force focal point at the corporate level for these key suppliers. AFMC has also established a pilot customer relations management initiative, which is located at WR-ALC. This customer support initiative is centered around the C-130 aircraft, and we are supporting the pilot program with all items managed at OC-ALC.

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

In an effort to avoid problems in a proactive manner, a risk work shop was held. During our risk workshop, with the assistance of OC-ALC/AE, OC-ALC/PK and OC-ALC/MA production divisions, risks were identified and assessed using Risk Radar. Technical

expertise was used to determine the probability of the risk (before and after mitigation) and the impact to the program. The team developed mitigation plans for the 15 Risks identified. Most had mitigation actions which were within our local authority to enact/control. The three risks which required the greatest control are funding stream/execution, impact to production and protest.

As with all programs, our funding is somewhat uncertain for the out-years, and may perhaps be mismatched in the year of execution to our needs. We have several mitigation actions to reduce the risks in this area. First, choosing a flexible contract vehicle, an indefinite delivery/indefinite quantity (ID/IQ) contract, allows us to make prudent purchases in the year of execution according to the funding actually available in that year. Second, we have a designated funds manager on staff. Third, as a last resort, we can request PEO assistance in reprogramming of funds by obtaining program specific funding such as a line item on the Transformational Funding P-Document.

The transformation of the production floor, while maintaining production levels, presents a serious risk that production will be impacted...our job is to minimize the negative affects to the warfighter. In an effort to mitigate this risk, we will have close coordination with OC-ALC/CS (Supply Management Activity Group) community, and OC-ALC-MA production experts. We will employ the use of IPTs so that all levels of the production team are working together to make the transformation a success. As areas are affected by the lean implementation, it may be necessary to utilize mitigation plans such as pre-surge, post-surge, off-load or alternate production sites. The disruptions to production will be minimized utilizing IMP/IMS so schedule slips can be monitored, understood, mitigated and controlled. We will also require the contractor to demonstrate, via modeling, that cellular designs are actually capable of delivery as expected.

There is always a risk of protest. Industry Days' questions seemed to center on "unfair competitive advantage." This is based on the fact that some contractors have had previous access and knowledge of our maintenance processes and plant. To mitigate the loss of such a protest, we have endeavored to level the playing field. This was done by holding Industry Days to clarify program objectives, providing information to all interested parties and continuing to provide all releasable data via FedBizOps. We included legal and acquisition experts on our team. Most importantly, we are proposing the adoption of an acquisition approach that includes a down select/"fly-off" phase.

We recommend a down select/"fly-off" approach because it mitigates risk of losing a protest based on unfair competitive advantage and provides the center demonstrated capabilities when making our final selection. Here is how it will work. We expected to get approx 7-10 bidders. We would chose approximately 3 to go into the down select/"fly-off" phase (use a natural break to determine the exact number of bidders passed to the next phase). Nothing will limit the number of down select competitors. Experience leads us to believe there will be 2-4. In fact, there were two teams that entered the "fly-off" stage.

The two bidders which were selected to go into the down select/"fly-off" phase have been asked to take the next six months to develop an overarching plan and an F100 Business Unit Plan. At the half-way point, a program management review meeting was held so that the team would evaluate progress on our plan, to date. At the end of the six months, the contractor will deliver both plans for final evaluation and make an oral presentation to the source selection evaluation team.

During transformation, there is always a challenge in managing change. We are employing the tenets of change management to facilitate the process improvements that are being implemented. The change management team is at the same level as the lead for sustainment transformation, covering both the DMT and PSCM transformation efforts. We have integrated the PSCM and DMT change management teams, identified PSCM and DMT site coordinators at each ALC and launched a joint Sustainment Change Management Advisory Council in July 2004. Getting the senior leaders is critical, so we have concentrated heavily on change leadership/sponsorship. The senior leadership from HQ AF/ILI, HQ AFMC and each of the Air Logistics Centers met face-to-face in September 2004. The change management team conducted initial sponsors' assessment and feedback, and mobilized sponsors and change agents at HQ and the ALCs. We have delivered education on PSCM initiatives and processes to sponsors, change/transformation agents, and supervisors. Finally, we identified individual change agents for both the PSCM and DMT initiatives.

We have also concentrated heavily on communication, and here are the milestones achieved:

- Commitment Declaration Posters
- Coverage in Leading Edge, AFMC News Service, AF Radio, LG News, PK Quarterly News
- Launched ST, PSCM and DMT websites
- Gen Martin memo to AFMC workforce

The goal is to have a plan and execute a "Relentless Communications" program, which creates a sense of urgency, addresses workforce concerns/fears and calls for action.

The path forward is to:

- Increase senior leaders' and executive sponsors' involvement
- Engage and support sponsors for personal communication
- Advertise successes, provide personal recognition
- Diversify communications vehicles, target workforce segments
- Assess effectiveness of our communications

To support the Sustainment Transformation initiative, there will be resulting organization transition. Change Management is assisting with the following actions:

- Identify new roles & jobs; develop position descriptions (Workforce Brief)
- Workforce strategy for supply chain professionals
- Developing transition roadmap for Sustainment Mission Area workforce
- Continuing to engage union representatives

Another required set of action deals with change deployment planning:

- Developing cluster survey for workforce-level change assessment
- Maintaining integrated risks, issues, tasks log; conducting risk mitigation activities
- Updating change management plans to reflect PSCM/DMT integration; incorporating change management in project plans

Finally, there will be a requirement for training and education:

- Established the Lean Institute with the University of Oklahoma to deliver executive and worker training in SCOR, Lean and Six Sigma
- Developed training for Commodity Council Wave I, II and III launch
- Delivered PSCM sponsors/change agents training modules (19 modules)
- Developing two-year training plan for supply personnel
- Delivered over 5,000 man-hours of awareness and job training since PSCM inception

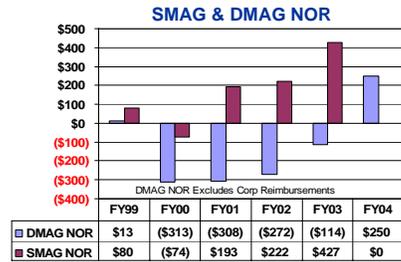
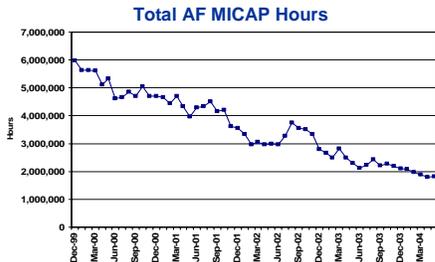
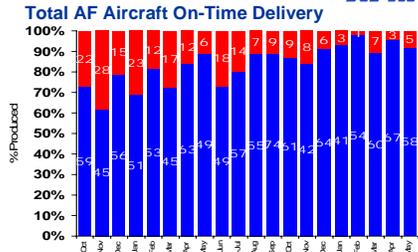
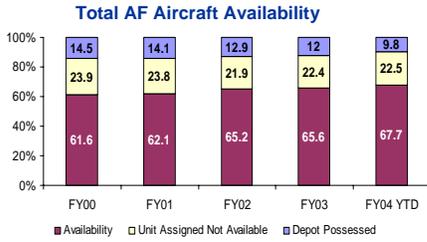
## **2-5) Identify the metrics used to measure progress and success:**

The primary metrics that support our progress and success will be tabulated at the Headquarters Air Force level. Here they measure total aircraft availability, total aircraft on time delivery, total hours of Mission Incapable (MICAP) and our Supply Chain and Maintenance operating results.

The Air Force Materiel Command, including OC-ALC, has adopted the Balanced Scorecard approach to measure progress and success at all levels. It covers the entire sustainment mission area enterprise, and ensures all metrics utilized drive the right behavior and support our goals.



# Sustainment Performance



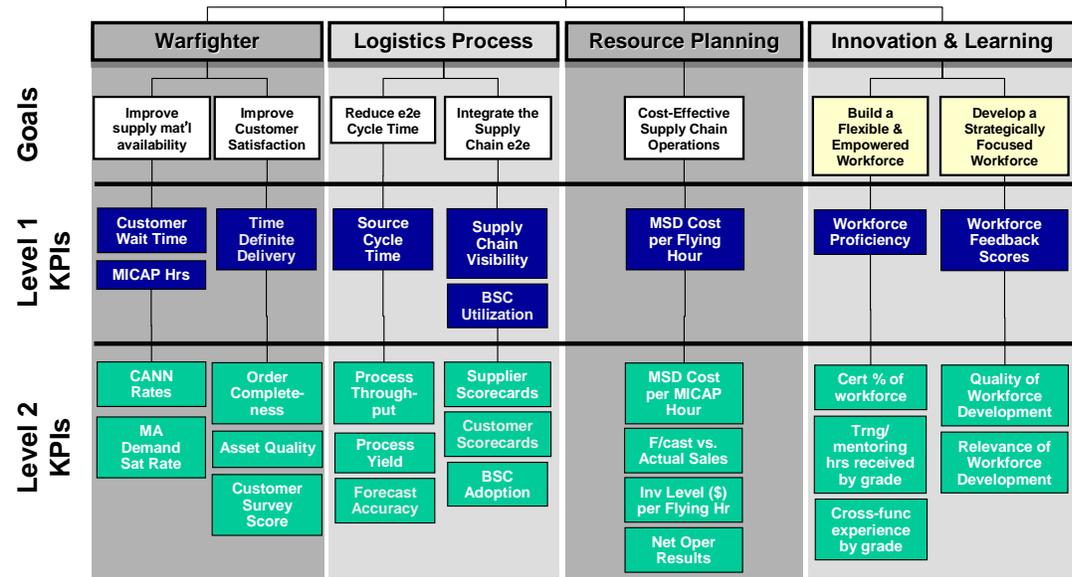
**War-winning capabilities...On Time, On Cost**



## Refined SMA Balanced Scorecard aka Performance Metrics



### Sustainment Mission Area (SMA) Balanced Scorecard



In addition to the Balanced Scorecard approach, organizations may have specific metrics which will be measured to measure success. For instance, the F100 Business

Unit has established the following metrics that will determine if they are meeting their specific goals:

**Measures of success include:**

- Reduced flow days by 60%
  - Whole engine from 113 to 45 days
  - Other reductions for each specific module
    - Inlet Fan from 85 to 35 days
    - Fan Drive 67 to 25 days
    - Core Module from 113 to 35 days
- Increased Quality
  - 85% First Pass Test Rate
  - 3% or less for engines rejected for workmanship errors
  - Reduced deficiencies in the field
- Reduced Customer Wait Time (Mechanic Request to Receipt of Part) to 48 Hours
- Repatriated Work (Goal: \$85M)
- Reduced Labor and Material Costs (Estimated: \$35.1M annually)

The success of each project will also be verified in a post-economic analysis performed one year after the project is fully operational.

**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.**

The implementation of this project will transform the AF's F100 organic repair into a world-class MRO. Benefits over the 10-year useful life include:

- **Savings in Direct Labor of \$20.8M** - Improved labor productivity, efficiency and reduced overtime levels
- **Savings in Direct Material of \$260M** - Improved ability to manage material replacement factors and usage
- **Reduced Production Overhead Costs of \$61.1M** – Primarily from repatriated workload, which will spread costs over greater number of production hours
- **Reduced Flow Time of 60%** - In FY02, the average flow time for the F100 engine was 113 days. The goal is to reduce flow time to 45 days, **a 60% reduction.**
- **Increase in Production Capability of 50%** - Primarily from reduction in Flow Time of 60%. Additional productive capacity is designed into the facility to allow for the repatriation of subcontracted F100 workloads.
- **Improved Annual Working Capital Fund (WCF) Cash Flow of \$90.2M**

Other intangible benefits include: reduced work in process (WIP), increase in war readiness levels, streamlined operations, increased quality and a phased recapitalization of the DoD's largest MRO operation.

This project creates a “step change” in OC-ALC’s performance against AF measures of success within the AFMC, including engine throughput, war readiness levels and at the same time significantly reducing the organic production-costs of doing business.

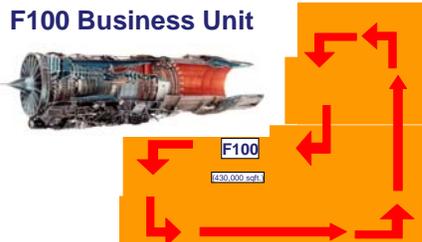
The completion of the F100 Business Unit (a \$70.2M investment across FY05 & FY06) is expected to result in benefits to the WCF of approximately \$433.9M and a total return of 6.1 to 1. The Depot Maintenance Activity Group portion of the savings investment ratio is 4.81 to 1, with payback achieved in 3.3 years.

The following quad-charts document the expected returns on investment through FY08.



## FY05/06 - F100 Phase I & II



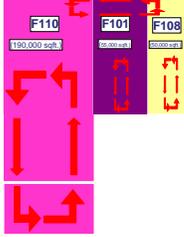
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| <p><b>F100 Business Unit</b></p>   | <p><b>Lean/Cellular Redesign of F100 MRO</b></p> <ul style="list-style-type: none"> <li>- Holistic/System Engineering Approach</li> <li>- Includes design, modeling, implementation, equipment &amp; training</li> <li>- Totally Transforms F100 MRO</li> </ul>   |
| <p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>• Direct Labor \$20.8M ↓</li> <li>• Direct Material \$260M ↓</li> <li>• Production Overhead \$61M ↓</li> <li>• Flow time 60% ↓</li> <li>• Production Capability 50% ↑</li> <li>• WCF Cash Flow \$90M ↑</li> <li>• Increased WREs, Reduced MICAPS, Parts on Shelf</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Why necessary?</b> <ul style="list-style-type: none"> <li>- Completes Business Unit</li> <li>- ROI 3.3 Yrs</li> <li>- Allows \$85M Repatriation</li> </ul> </li> <li>• <b>Impact if not funded</b> <ul style="list-style-type: none"> <li>- Incomplete Business Unit</li> <li>- Total Savings Not Realized</li> </ul> </li> </ul> |

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## FY06/07 - GE Phase I & II



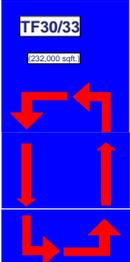
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| <p><b>GE Engine Business Unit</b></p>    | <p><b>Lean/Cellular Redesign of GE MRO</b></p> <ul style="list-style-type: none"> <li>- Holistic/System Engineering Approach</li> <li>- Includes design, modeling, implementation, equipment &amp; training</li> </ul>   |
| <p><b>Benefits (Phase I &amp; II):</b></p> <ul style="list-style-type: none"> <li>• Direct Labor \$9.1M ↓</li> <li>• Direct Material \$232.2M ↓</li> <li>• Production Overhead \$18.8M ↓</li> <li>• Flow time 69% ↓</li> <li>• Production Capability 12% ↑</li> <li>• WCF Cash Flow \$75M ↑</li> <li>• Increased WREs, Reduced MICAPS, Parts on Shelf</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Why necessary?</b> <ul style="list-style-type: none"> <li>- Completes Business Unit</li> <li>- ROI 3.2 Yrs</li> </ul> </li> <li>• <b>Impact if not funded</b> <ul style="list-style-type: none"> <li>- Incomplete Business Unit</li> <li>- Total Savings Not Realized</li> </ul> </li> </ul> |

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## FY07/08 - TF33 Phase I & II



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| <p><b>TF33 Business Unit</b></p>     | <p><b>Lean/Cellular Redesign of TF33 MRO</b></p> <ul style="list-style-type: none"> <li>- Holistic/System Engineering Approach</li> <li>- Includes design, modeling, implementation, equipment &amp; training</li> <li>- Transforms TF33 MRO</li> </ul>  |
| <p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>• Direct Labor \$8.6M ↓</li> <li>• Direct Material \$111.6M ↓</li> <li>• Production Overhead \$17.7M ↓</li> <li>• Flow time 54% ↓</li> <li>• Production Capability 20% ↑</li> <li>• WCF Cash Flow \$126.4M ↑</li> <li>• Increased WREs, Reduced MICAPS, Parts on Shelf</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Why necessary?</b> <ul style="list-style-type: none"> <li>- Completes Business Unit</li> <li>- ROI 3.4 Yrs</li> <li>- Allows \$3.2M Repatriation</li> </ul> </li> <li>• <b>Impact if not funded</b> <ul style="list-style-type: none"> <li>- Incomplete Business Unit</li> <li>- Total Savings Not Realized</li> </ul> </li> </ul> |

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

Our success directly relates to improved capability of our warfighters and the safety of our country. As we meet our first goal of improving weapon system availability, every time our forces need to fly a sortie, the weapon system is ready to go. As we meet our goal of reducing costs for sustainment, the Air Force can shift funding from the spiraling cost of keeping old weapons systems flying to investing in new weapon systems.

### **SECTION 3: KNOWLEDGE TRANSFER:**

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#### **3-1) Describe the efforts to share lessons from this effort with other internal organizations.**

The status of our sustainment transformation is being shared with all senior management at OC-ALC through the change management sponsor workshop. Additional 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. OC-ALC mid-level management and the workforce are being made aware of the transformation through a variety of communications and training classes. There is a vested interest by everyone, because essentially, every process at OC-ALC is being impacted by the Sustainment Transformation initiative. On the enterprise scale, lessons learned from this initiative are being shared with key leaders at HQ AFMC and HQ AF/ILI. DMT and PSCM have established extensive Communities of Practice (COP) on the Air Force Knowledge Now website, which allow each organization at each depot to share knowledge and lessons learned.

#### **3-2) Explain how this initiative can be transferred to other organizations and specify the likely candidates for transference.**

To make our supply chain world-class, we will need to transfer the knowledge, processes and expectations to our suppliers and our customers. End-to-end supply chain management is our goal, and collaboration and seamless integration must be achieved with all parties. We have established our various goals for implementing DMT, PSCM and the MRO project, and it essentially covers all major logistics and supply chain activities at OC-ALC.

### **SECTION 3: CONCLUSION:**

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In FY04, the policies, practices, procedures and tools developed over the last three years have culminated in the best support to the warfighter in over a decade. OC-ALC was able to sustain a steady improvement in supply supportability while the country fought two wars. OC-ALC has benefited from numerous initiatives such as supply chain mapping using SCOR, lean events in the shop environment, as well as supply chain activities, Six Sigma projects and incorporating tenets of PSCM. We have reduced shop flow days, increased the reliability of Air Force managed items to reduce field maintenance and significantly improved our collaboration and joint forecasting with our key suppliers to reduce supply chain problems. We have delivered a continuous flow of dependable and logistically supportable weapons systems and components that have allowed the warfighter to accomplish all assigned missions.

Under sustainment transformation, we are expanding these proven concepts across the center. DMT and the MRO project will dramatically decrease production flow time, movement of parts, work-in-progress, inventory levels/costs center-wide, and increase throughput to meet current and forecasted customer requirements. PSCM is establishing strategic relationships with our suppliers and customers, improving collaborative efforts and improving demand planning. The Advanced Planning System (APS) has now been exported to all three Air Logistics Centers. Seven of the eight enterprise wide commodity councils have been established, and are currently developing both an expertise for their commodities and strategic relationships with key suppliers. Implementation of these initiatives enhances the AF's ability to support the warfighter in an environment that provides the most cost-effective and efficient core depot-level capability within existing facilities.

Clearly, our efforts contribute to the shaping of the nature of military competition and cooperation. By combining the concepts of lean/cellular design, we are able to exploit our nation's advantages and protect against our asymmetric vulnerabilities to sustain our strategic position. This effort is the cornerstone of OC-ALC's contribution to peace and stability in the world.