
RESEARCH STUDY FINDINGS

*Identifying Areas of Supply Needs Within
The United States Air Force and
The Department of Defense Supply Chain*

**The Manufacturing Technical Assistance
Production Program (MTAPP)**



March 25, 2004

The Asaba Group, Inc.

(As Edited by the MTAPP Program Office)

**REMARKS FROM THE AIR FORCE OFFICE OF SMALL AND
DISADVANTAGED BUSINESS UTILIZATION**



The Manufacturing Technical Assistance Production Program (MTAPP) seeks to create a network of small business suppliers that enhances the Air Force's ability to deliver on its mission and increase our nation's defense capabilities.

This research study represents a shift in the direction of the Manufacturing Technical Assistance Production Program (MTAPP). It represents our new focus on identifying current and future requirements where small business manufacturers can provide valuable solutions. This new focus will guide MTAPP's technical assistance efforts with small businesses and will ensure a Return on Investment (ROI) to the Air Force. This research study is the cornerstone of our ongoing supplier development

efforts. It defines the needs that will guide the selection process for the next class of MTAPP participating small businesses ensuring that we select companies with the capabilities to meet specific requirements of the Department of Defense, the Air Force and the commercial sector. It is important to note that small businesses represent a critical component of our defense industrial base and that their continued growth will contribute to the economic health of our nation. MTAPP's technical assistance to small businesses continues to play a critical role in the development and long-term viability of small businesses in the industrial base.

I applaud the efforts of the Air Force Outreach Program Office (AFOPO) with leading this effort and look forward to the success of MTAPP's new focus.

Mr. Joseph G. Diamond, SES
Director,
Air Force Office of Small and Disadvantaged Business Utilization

AKNOWLEDGEMENT

In recognition of the evolving needs of the Air Force supply chain, the Air Force Office of Small and Disadvantaged Business Utilization (SAF/SB) in collaboration with The Asaba Group has worked to redefine the focus of the Manufacturing Technical Assistance Production Program (MTAPP). The process of developing a new focus for the program has begun with this research study. The research study will provide the data and information essential to defining in what areas the program can create value for its key stakeholders: the Air Force, participating small businesses and the commercial sector. In defining the areas where MTAPP can add value, we conducted a significant number of interviews and sought data from both the Air Force and commercial sector. During this process, we have been privileged to have the participation of individuals representing a broad array of constituencies. (A list of the contributors can be found in the appendix.) We are very grateful to all of our contributors.

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EXECUTIVE SUMMARY

I. PURPOSE AND METHODOLOGY

The primary objective of the research study is to identify problems and areas of need in the supply chain of the Air Force, the Department of Defense, and their supporting prime contractors. These “areas of need” represent the best opportunity for the MTAPP program to add value and provide a demonstrable Return on Investment (ROI) for resource expenditures. The findings contained in this study provide direction for the new participant identification process based upon actual Air Force supply needs.

Findings within this study resulted from interviews with Air Force weapons systems managers and logistics support personnel, as well as prime contractors to identify critical supply issues impacting the Air Force. In addition, secondary research on publicly available data sources coupled with a comprehensive analysis of proprietary data provided by various participants was accomplished in an attempt to quantify opportunities and the dollar impact(s) of solving supply chain problems.

II. PROGRAM OVERVIEW AND HISTORY

The Air Force established the Manufacturing Technical Assistance Pilot Program (MTAPP) five years ago. The pilot program focused on improving the capabilities of small manufacturing firms in support of the Air Force (AF) and Department of Defense (DoD) missions by providing individualized technical and managerial assistance to enhance their capabilities to provide products at higher levels of quality and lower costs. Fifty seven (57) companies are now part of the MTAPP program with expertise in machining, aircraft

subassembly, wire harness and PCB, avionics, composites and textile manufacturing capability.

Beginning in June 2003, MTAPP transitioned from pilot program status into the Manufacturing Technical Assistance Production Program. To achieve maximum value for program resource expenditures, the production program intends to solicit company membership from small business¹ manufacturers that can meet specific Air Force/DoD supply chain needs.

III. KEY FINDINGS

A. Current MTAPP Participants

Current MTAPP participants have improved their internal operations and manufacturing capabilities through the program but have not, as an aggregate, provided measurable or quantifiable value to the Air Force and DoD. Analysis shows this was because they 1) have not altered their offerings to focus on meeting Air Force needs, 2) have had low visibility of Air Force requirements or 3) the Air Force contracting community has had low visibility of MTAPP company capabilities. MTAPP participants that leveraged their technical assistance with increased awareness of Air Force needs and created marketable changes in their offerings achieved strong revenue gains.

While it is not the program goal to provide contracts to the small businesses, it remains essential that participating companies see benefits from being in the program. Despite the fact that companies do not incur any cost for the technical assistance they receive, the companies invest a significant amount of time and resources related to MTAPP training etc. and it is important that these companies view MTAPP as enhancing their overall long-term sustainability, growth and competitiveness. Improved focus on selecting companies that are

¹ The term small business (SB) includes woman-owned businesses (WOB), businesses in historically underutilized zones (HUB), small disadvantage business (SDB), service disabled veteran-owned businesses (SDVB), and veteran-owned small business (VOSB).

more likely to provide solutions to identified problems should ensure this value recognition and inherent opportunity.

B. Air Force and the Manufacturing Business Environment

Observations and financial trend analysis suggest that the current MTAPP company mix is not optimized to support current Air Force requirements. Defense related spending, DoD and Air Force procurement levels in the manufacturing sector have grown significantly over the last three years. This increase is forecasted to rise 7.4% annually through 2007².

Two major problem areas identified in this study were a lack of spare parts at the Air Logistics Centers³ and diminishing manufacturing sources and material shortages for ³aging aircrafts. Analysis of procurement data from Air Force Materiel Command (AFMC) and the Air Logistic Centers (ALCs) show obligated funding to support aging aircrafts grew annually at a 10.6% Compound Annual Growth Rate (CAGR) from FY2001 to FY2003 (Exhibit 16).

In 2003, the Air Force began instituting strategic sourcing initiatives across its buying commands. The Air Force created commodity councils or cross-functional sourcing groups to identify clusters of commodities where the Air Force can leverage its buying power to achieve significant cost savings in acquisitions and higher quality products. In this report, we have identified \$554M in forecasted requirements where MTAPP could bring to the table small manufacturing businesses with capabilities to meet these requirements and provide increased competition during the sourcing process. This study has identified \$143M of near-term requirements, for which MTAPP companies could potentially become qualified sources of supply. Small business¹ program goals should also be taken into consideration in selecting participating MTAPP companies.

² June 2001 GAO Report “Air Force Inventory”

³Identified as KC-135, B-52, B-1, A-10, C-5 and E-3

The research effort uncovered a number of programs and initiatives in place within the Air Force and Department of Defense that are focused on solving specific supply problems. Of particular relevance to MTAPP are the Defense Logistics Agency's Aging System Sustainment and Enabling Technologies (ASSET) program, the Air Force Diminishing Manufacturing Sources and Material Shortages (DMSMS), and the Aeronautical Enterprise Program Office's Aging Aircraft Division (ASC/AAA). MTAPP needs to establish relationships with these organizations. The benefit will be a reduction in the amount of effort expended by each group in implementation and will result in better utilization of Air Force resources.

IV. IDENTIFIED SUPPLY NEEDS

The Air Force's prime vendor suppliers identified needs for 1) Machining companies that provided the next higher level assemblies or are capable of machining special metals (Beryllium, etc.), 2) Composites fabricators with emphasis on fiber placement, and 3) Companies capable of doing investment castings.

Prime vendor suppliers also identified a potential MTAPP concentration around commodity suppliers for: Optical Equipment, Pyrotechnics, Missile Batteries (Thermal and Reserve), Radio Frequency Microwave Devices, Radar Equipment and Parts, Non – mission Related Avionics, Power Supplies, Rocket Motors, Antennae and Space Qualified Bearings.

Many of the commodities identified by the commercial sector require a significant amount of time to develop a product line and large capital investments to develop the needed capabilities and competencies.

The Defense Logistics Agency (DLA) in support of Air Force requirements has identified potential assistance areas for MTAPP involvement. These are: 1) the WR-ALC One Step Loading Adapter, 2) Ogden ALC's Paveway Weapon Systems and Support Equipment and the Atmospheric Early Warning System Circuit Board Extenders , 3) OC-ALC's Ruggedized

Keyboard for the Atmospheric Early Warning System, 4) AEWS A/B Selector Card for the Atmospheric Early Warning Radar Sets, and 5) WR-ALC's AIM-120 Wing Removal Tool.

The Air Logistics Centers identified the E-3 air switches, wave guides, landing gear components, gearboxes and bearings for the KC-135 and F-15 aircrafts as cited below.

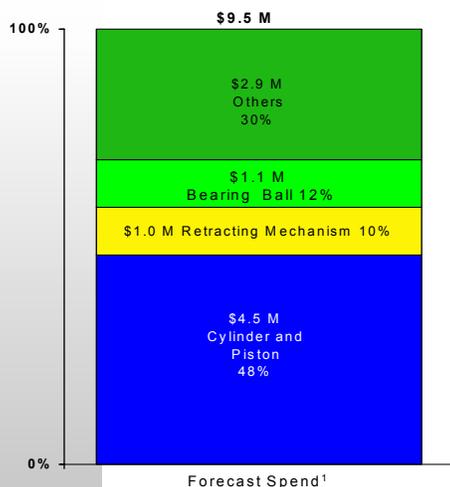
Selected Part Numbers To Develop Alternative Sources of Supply (KC-135 Aircraft)

National Stock Numbers	Part Description	Forecast Spend ¹	Available SB ²	Suggested Action/Task for MTAPP
2840 01420654	Nozzle Assembly	\$6.4 M	1	Engineering Source Approval
2840 013131813	Nozzle Augmenter	\$19.9 M	1	Engineering Source Approval
2840 014509478	Compressor Case	\$4.8 M	1	Reverse Engineering
2840 014548470	Synchronizing Ring	\$18.5 M	1	Engineering Source Approval
2840 012844013	Cold Section Module	\$33.5 M	1	Engineering Source Approval
2840 012112059	Fan Case	\$5.6 M	1	Reverse Engineering
1620 013085467	Combustion Liner	\$8.3 M	1	Reverse Engineering
1620 004463776	Retractable Landing Gear	\$14.9 M	1	Reverse Engineering
1620 001753939	Landing Gear Yoke	\$4.1 M	1	Reverse Engineering
5841 004853752	Receiver/Transmitter	\$4.8 M	2	Reverse Engineering
1680 001491319	Electronic Control Panel	\$16.1 M	2	Reverse Engineering
1680 01101772	Electronic Control Panel	\$0.5 M	2	Reverse Engineering
1680 014528500	Ball Screw Assembly	\$2.1 M	1	Reverse Engineering
1680 011664022	Hose Reel Assembly	\$1.8 M	1	Collaboration with Prime Contractor
5998 010912108	Hose Reel Assembly	\$0.9 M	1	Re-engineering opportunity
5998 014101095	Backplane Assembly	\$1.0 M	1	Collaboration with Prime Contractor
Total		\$143.2 M		

Source: U.S. Air Force; Asaba Group Analysis

1- 3 year forecast spend based on ALC requirements
2 - Identified Small Business From Contract History

Solving F-15 Landing Gear Problem Represents a \$9.5 M Opportunity



Source: AFMC Contracting: F-15 System Program Office; Warner Robbins ALC; Asaba Group Analysis

1 - Estimated Spending Over Three Years 2- Function of Acquisition Method Code and Suffix provided by AFMC Contracting

Parts Constraints For F-15 Landing Gear			
National Stock Number	ALC	Acquisition Approach ²	
a) 1620 003486485	Ogden	Source approval and suitable for competitive acquisition	
1620 003486495	Ogden		
1620 010753562	Ogden		
1620 010760547	Ogden	Competitive acquisition	
b) 5310 003464801	Tinker		
		Reverse engineering required	
c) 3120 012056336	Ogden	Not classified	

Opportunities for MTAPP to solve Diminishing Manufacturing Source (DMS) issues have been identified within the B-2 program office. B-2 has 189 un-funded DMS solutions, 142 of which are required multi-year procurements and 47 are new engineering solutions.

V. RECOMMENDATIONS AND NEXT STEPS

The MTAPP program must identify 25 companies for participation this year. Those selections must align with identified supply problems to the greatest extent possible to provide “quick wins” and show a quantifiable Return on Investment (ROI) to the Air Force. MTAPP will prioritize the selection of new MTAPP companies toward those commodities directly in support of Air Logistic Centers needs.

The identification process for new small MTAPP businesses will begin with a search for companies that have capabilities to address the identified issues with the E-3 air switches and wave guides, the landing gear of the F-15, and gearboxes and bearings etc. of the KC-135 and by working closely with the AFMC Weapons Systems Supply Chain Management (WSSCM), the commodity councils, and the Directors of Small Business at the Air Logistics Centers to obtain concurrence/nominations of companies for fulfillment of these requirements and participation in MTAPP.

Companies identified as being a potential supplier for one of the items or commodity groups listed must meet the minimum MTAPP eligibility requirements: stable business footing (in business at least 2 years), have at least 10 full time employees or do \$2M in business per year, and have some type of quality program in place. Criteria was crafted to ensure the MTAPP investment would be secure for the long term. Additionally, MTAPP personnel will continue to work with the prime contractors that support sustainment programs.

The above recommendations place emphasis on addressing sustainment issues with sunset programs and providing acquisition cost benefits to the Air Force. We believe that this

represents the best near-term opportunities for MTAPP success. To capitalize on these opportunities, MTAPP must evolve its technical capabilities in supplier development to include solution development from concept through to implementation. An update of this study to look at identification of potential suppliers to solve new and different Air Force supply issues is planned for January 2005.

INTRODUCTION

I. RESEARCH OBJECTIVES AND METHODOLOGY

A. Purpose

The objective of this research study is to identify areas of need or specific commodity categories with an absence of adequate suppliers (or having a non-competitive supplier) to fulfill requirements within the Air Force, the Department of Defense (AF/DoD), and their large prime contractors. These areas of need were defined as:

1. Commodity categories with no or limited available sources of supply
2. Commodity categories or situations where new suppliers are needed to meet increased capacity (surge demand) requirements
3. Situations where suppliers are needed to help address technology migration and obsolescence issues
4. Procurement situations where increased competition is desired to reduce commodity acquisition cost(s)
5. Situations where re-engineering parts in sunset platforms can provide better functional performance and lower cost
6. Situations where small businesses can provide viable options for “make versus buy” decisions within the commercial sector manufacturing processes

7. Supply chain situations where small manufacturing businesses can provide optimum solutions that leverage small business advantages (i.e. lower overhead, lower breakeven volumes, willingness to take on small production runs, etc.)

B. Methodology

The study was conducted during the period of May 27, 2003 through 22 March 2004. It focused on the Aerospace and Defense Industry with particular emphasis on commodity categories relevant to the Air Force. The data gathering effort required to achieve the study's objectives was made difficult by the participants' perception that the data and information required were confidential, proprietary, unavailable, or too sensitive to be shared in the public domain. Even efforts to work through MTAPP Program Management personnel did not yield requisite data access due to security sensitivities around the information. The data collection process was complicated by organizational shifts at the Air Force Materiel Command (AFMC) including the move toward instituting commodity councils across the enterprise. These councils will be responsible for developing "enterprise-wide procurement strategies."

The research efforts consisted of primary interviews and secondary data gathering approaches. The primary interviews were conducted with thought leaders and individuals from a broad array of constituencies in the industry. The interviewees represented the following constituencies:

- Air Force officials from the following offices: Small Business, Air Logistics Centers, Contracting, and Headquarters Materiel Command
- Department of Defense Small Business and Department of Defense Industrial Base
- Large and small corporations, which include prime and lower tiered suppliers
- Industry trade groups and associations
- Small manufacturing businesses

(A list of individuals interviewed for this study and research methodology illustration can be found in the appendix.) Secondary research consisted of desk research from both publicly available and private proprietary sources of information. Access was denied to a significant amount of requested Air Force data or commercial sector data.

A roundtable with representatives from the DoD, the Air Force, the commercial sector, and industry associations was held on September 4, 2003 in Arlington, VA. The objective of the roundtable was to accomplish the following:

1. Review the initial research draft document that presented early hypotheses of commodity opportunities and supplier capability requirements
2. Provide input on preliminary findings and capability requirements
3. Provide input on approaches MTAPP should consider to increase small business participation in the identified categories
4. Provide ideas on ways to increase capabilities and competencies of small businesses in the identified commodity categories
5. Review the initial research draft document that presented early hypotheses of commodity opportunities and supplier capability requirements
6. Provide input on preliminary findings and capability requirements
7. Provide input on approaches MTAPP should consider to increase small business participation in the identified categories
8. Play a role in the process of identifying new MTAPP companies

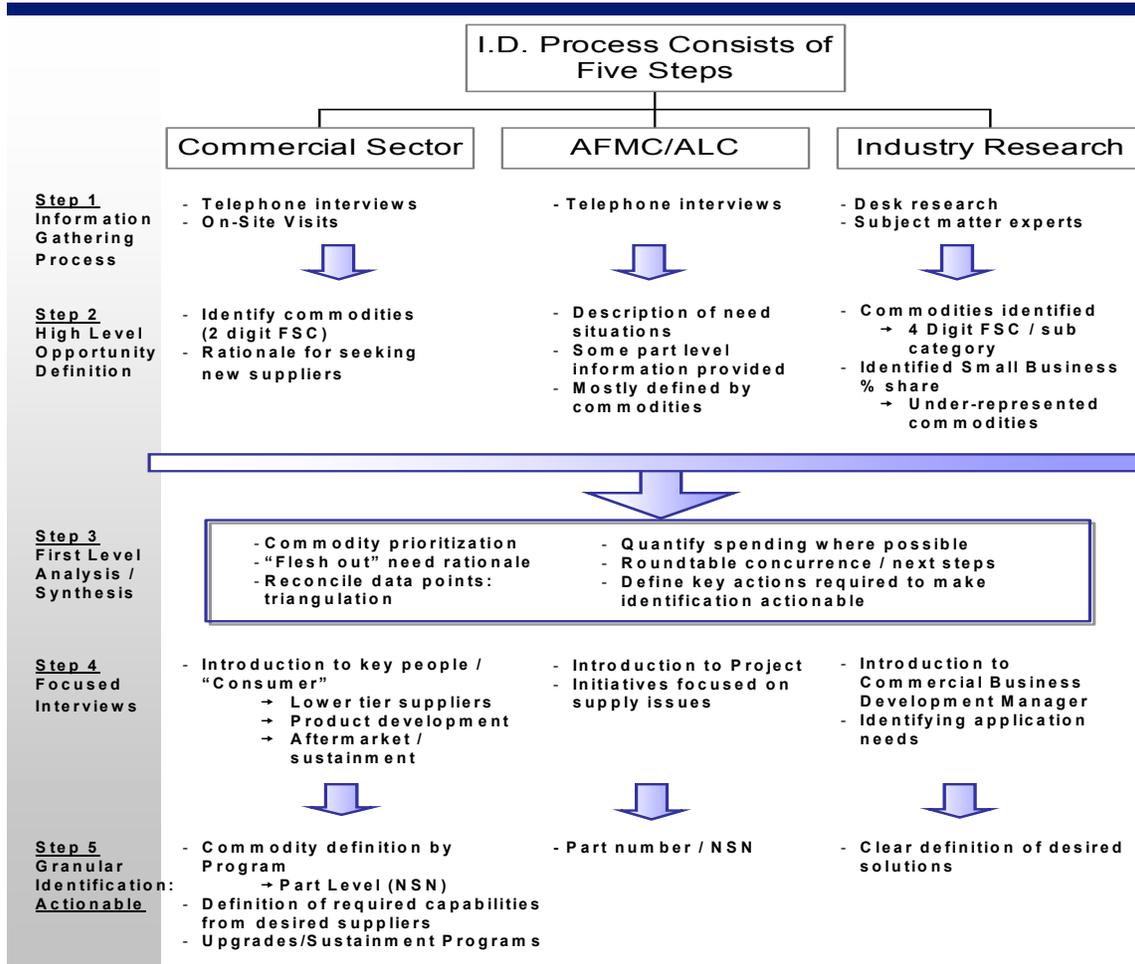
The difficulty and challenges associated with the data gathering effort may require us to conduct the future (2005 and beyond) identification of new participating companies to

correspond with phases of a weapon system's program lifecycle⁴. These phases may be tied to the annual updates of the research study. Each phase will be linked to a particular focus area or a commodity grouping.

⁴ Program lifecycle refers to different stages of a product evolution from initial concept development through disposal. The stages are Research and Development, Engineering Manufacturing Development, Low-Rate Initial Production, Full-Rate Production, and Sustainment.

Exhibit 1

Research Study Methodology



II. PROGRAM BACKGROUND

The Air Force Office of Small and Disadvantaged Business Utilization (SAF/SB) developed the Manufacturing and Technical Assistance Pilot Program in 1997 to assist with increasing the capabilities and enhancing the competitiveness of small business manufacturers to support the missions of the Air Force (AF) and the Department of Defense (DoD). The five-year pilot program executed the following:

1. Identified and networked designated small businesses in the manufacturing industry as potential suppliers for AF and DoD programs and requirements
2. Assessed these designated small businesses on their capacity and capability to contract with AF, DoD, and the prime contractors
3. Provided individualized technical assistance and resource support to the participating companies to expand their capacities, enhance their capabilities, and address identified deficiencies

The Manufacturing Technical Assistance Production Program (MTAPP) has now transitioned from this pilot phase to become a full production program. In this production phase, MTAPP seeks to identify and develop a broad array of small business manufacturers that can address specific supply chain needs and requirements of the Air Force, the Department of Defense, and the commercial sector.

III. POSSIBLE SUPPLY NEED SITUATIONS FOR MTAPP

The areas of needs to identify MTAPP future companies were based on seven distinct scenarios discovered from the research effort and the roundtable. They are as follows:

1. Migration up the value chain: The commercial sector expressed a strong desire to see small manufacturing businesses with capabilities to take on more roles in the supply chain. Some of these roles include active management of lower tiered suppliers and taking on design and engineering responsibility for subsystems and intermediate assemblies.
 2. Creation of an alternative source of supply: The creation of alternative sources of supply meets the needs of the Air Force, particularly those of the Air Logistic Centers and the commercial sector. The Air Force Materiel Command is focused on reducing acquisition cost and improving overall performance. The commercial sector
-

-
- requirements, while focused on cost reduction, place less emphasis on achieving competitive acquisitions. They would like alternative sources of supply to be able to do the following:
- a. Fulfill niche product/technology specialization needs
 - b. Manage supply chain risks with having a viable source of supply
 - c. Become a source for innovative product opportunities with new materials and technologies.
3. Development of new products or enhanced components: Both commercial sector and the Air Force community identified with this need. For the Air Force, it was focused on addressing the issue of Diminishing Manufacturing Sources (DMS) and reengineering components in order to achieve lower cost and improved performance.
 4. Addressing spares shortages: Addressing the supply related problems that inhibit mission readiness of some aircrafts, especially those aircrafts that are operating beyond the originally designed lifecycle.
 5. Development of Defense industry applications with non-defense commercial available technologies: The commercial sector viewed this as a way to address the barriers of integrating commercial off the shelf (COTS) products and applications into the defense sector.
 6. Development of new operational processes (surge capacity): The Department of Defense supply chain is faced with the challenges associated with surge demand and fluctuating product mix. These new processes are built around capabilities rather than increasing buffer (safety) stocks which are more expensive.
 7. Implementation platforms: The Air Force has created a number of initiatives focused on defining solutions to specific supply problems, which impact its mission readiness. Some of these initiatives are the Aging Aircraft (ASC/AAA), Diminishing

Manufacturing Sources and Material Shortages (DMSMS). Most of these initiatives create solutions but depend on end use customers (SPOs or ALCs) to adopt and implement the solutions. Some potential solutions were identified in which MTAPP companies could implement the solutions for the end customer.

In the seven scenarios mentioned above, we identified specific problem areas (needs) that exist in the Air Force and the commercial sector supply chains. Prioritization of these scenarios will be based on overall mission impact, total dollar returns, and the ability of small businesses to deliver rapid solutions.

PROGRAM PROFILE AND REASON FOR CHANGE

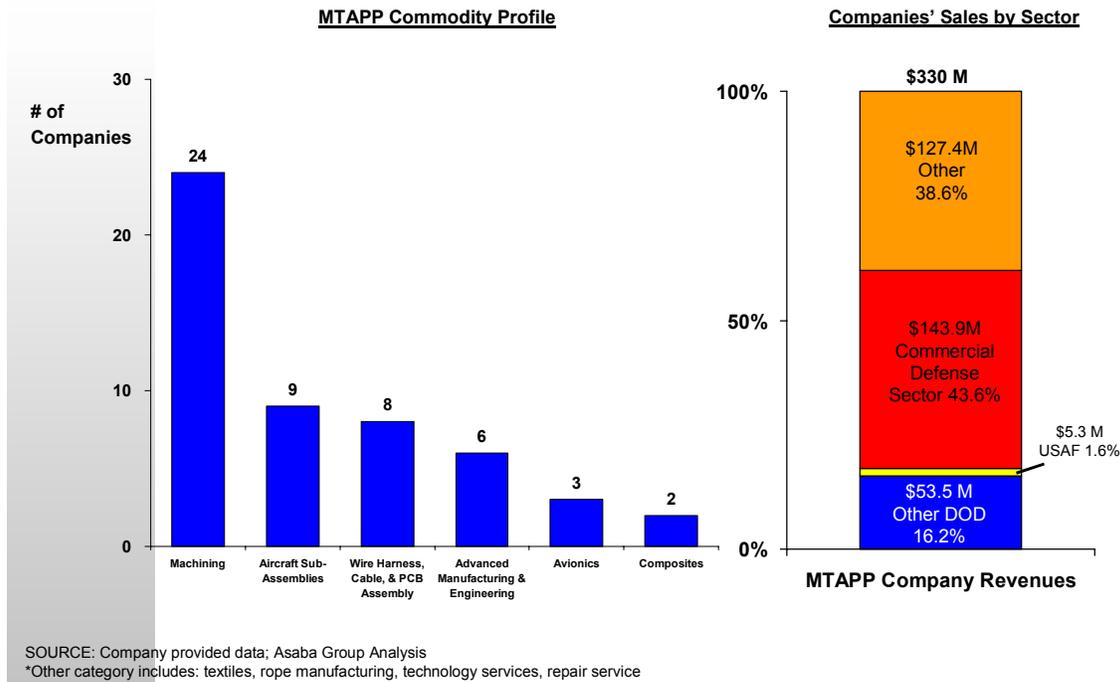
I. PROGRAM PARTICIPANTS

The MTAPP program began five years ago and today has a total of 57 companies in the program. The pilot program ended with 59 participating companies, however two participants opted out when MTAPP moved to a production program. The selection process in the pilot phase began with self-nominations by the small businesses.

Self-nomination allowed many small business manufacturers to be qualified and accepted into the program without the benefit of knowing exactly how they might assist the Air Force with supply issues and created a pool with a disproportionate number of suppliers in the machining category. In Exhibit 2, we see a distribution of the participating companies by commodity group.

Exhibit 2

Profile of Current MTAPP Participating Small Businesses High Concentration in Machining and Little Direct Spending With the Air Force



The concentration within these commodities is not evenly distributed. More than 50% of the companies provide precision machined parts and components. From financial data provided by the companies and data from Pro-Net, we developed an aggregate revenue distribution by sector (defined as end customer). The result illustrated that the companies conducted very little direct business with the Air Force. 16.2% of revenues came from the Department of Defense (DoD), 43.6% with the commercial defense sector, 38.6% with other non-defense customers, and less than 2% with the Air Force (see Exhibit 2).

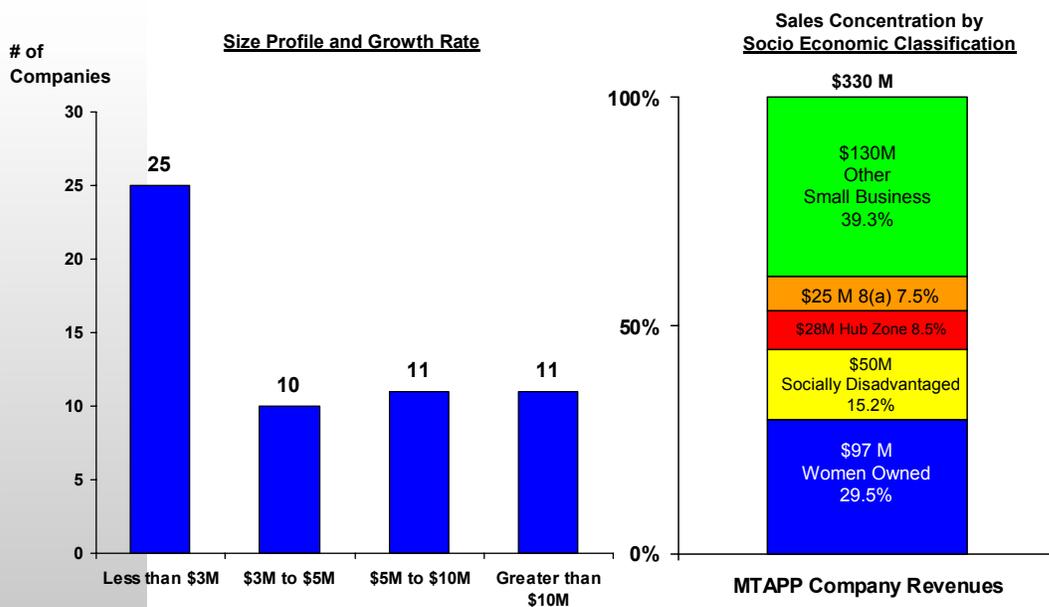
A second aggregate revenue distribution was conducted by size and socio-economic classification (Exhibit 3). It shows over 50% of the businesses with revenues less than \$5M. Women-owned small businesses account for over 40% of current MTAPP participants. The

high concentration of women-owned businesses may be explained by the fact that MTAPP began as a program focused on women-owned manufacturers.

Exhibit 3

Profile of Current MTAPP Participating Small Businesses

Hub zones, SDBs and 8(a) Companies Account for Less than 50% of Sales



SOURCE: Company provided data; Asaba Group Analysis

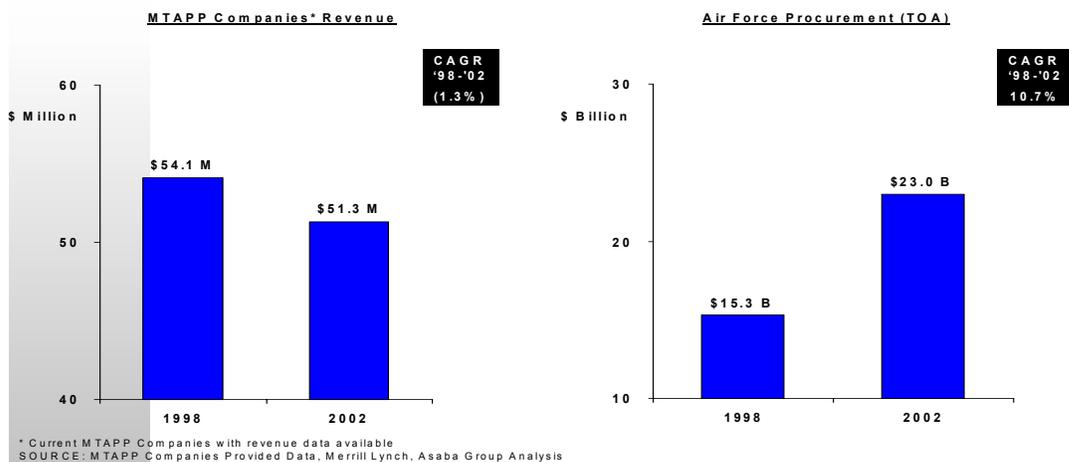
II. STAKEHOLDER DISSATISFACTION

The result of less than 2% in aggregate revenues from the Air Force is indicative that the companies have not directly provided goods or services to the Air Force buying commands. This shows that MTAPP although managed by the Air Force has not benefited the Air Force to the extent originally envisioned. The current environment within the DoD demands a clear articulation of benefits for expenditures and an ROI to determine the payback.

A satisfaction survey conducted for MTAPP participating companies in June, 2003 revealed that most of the current program participants were satisfied with the breadth and quality of technical assistance provided to them. However, the participants wanted to see an increase in sales opportunities as a result of the technical assistance. Analysis of aggregate company revenues for initial MTAPP participants showed a sales decline from 1998 to 2002 of (1.3%) CAGR. During this same period, Air Force procurements grew 10.7% CAGR. Clearly, growth in Air Force expenditures did not benefit the MTAPP companies (see Exhibit 4)

Exhibit 4

MTAPP Companies Revenues Declined Whereas AF procurements increased over the same period



Survey feedback from most of the companies expressed a strong desire to see increased marketing and sales opportunities from participation in the program. As some of the participants explained⁵:

“We invest a considerable amount of time and management resources to utilize the technical assistance provided by MTAPP. I would like to see that as we get better, we have opportunities to demonstrate our improved capabilities.”

⁵ MTAPP Effectiveness Analysis and interviews with participants at onsite visits

“What we need are opportunities to bid for solicitations from the Air Force or Primes. In these times, it gets difficult to improve operations without growing the revenue line.”

“Technical assistance without bidding opportunities is similar to training athletes without opportunities to get into a race.”

The above remarks reveal real concerns by the MTAPP companies. The MTAPP program does not include providing contracts as its goal. However, MTAPP can assist in creating situations that increase the likelihood for the MTAPP companies to acquire incremental opportunities.

During the industry interviews, the commercial sector observed that very little differentiating capabilities exist among the MTAPP companies. In fact, the industry segment of machining companies is highly fragmented and there is an over-abundance of these types of suppliers in the aerospace and defense industry.

III. RATIONALE FOR A DIFFERENT APPROACH

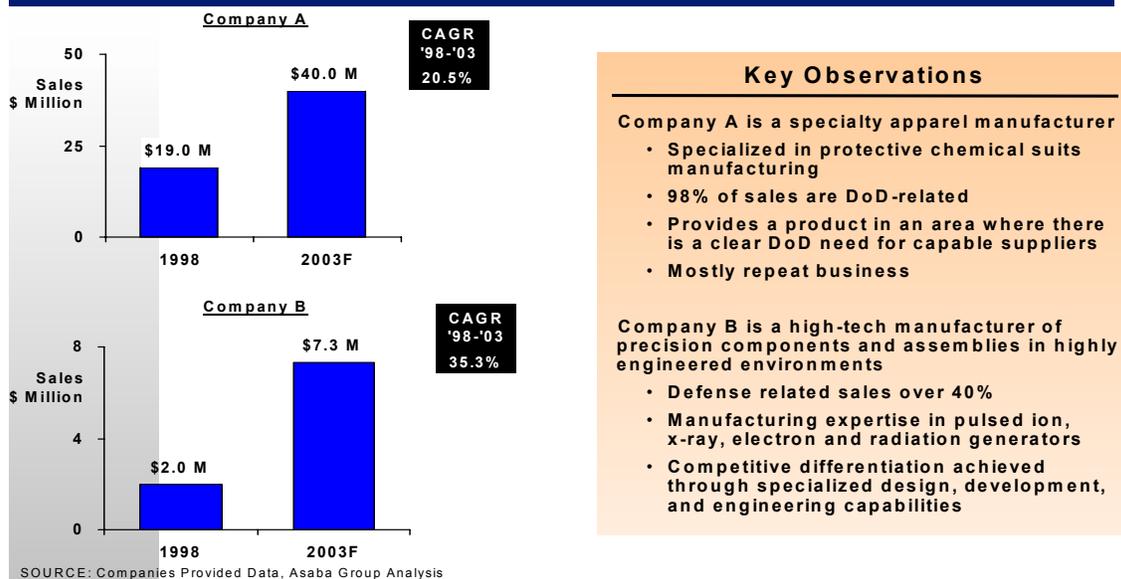
The MTAPP program has three primary stakeholders that it must satisfy by adding “value”. Value, in this context, is defined as solving problems, improving performance (cost, delivery, schedule, quality, etc), or satisfying a pressing requirement. Each stakeholder has its own approach and metric to measure MTAPP’s added value. For MTAPP companies, value is a function of sales growth and increased profitability. For the Air Force and the commercial sector, it is about performance improvement in cost, delivery, schedule, and supply chain risk reduction.

Linking the needs of the Air Force, the Department of Defense, and the commercial sector to the identification process for a new group of MTAPP participants will help ensure that value is created. Exhibit 5 presents some anecdotal evidence on why this approach is likely

to be more effective. In the Exhibit we see the growth of two MTAPP companies that currently provide goods that meet specific Air Force and Department of Defense needs. These companies grew at double-digit rates from 1998 to 2003, compared to modest to flat growth of most MTAPP companies. The difference in growth rates can be explained by the fact that these companies provide products that address needs of the Air Force and the Department of Defense.

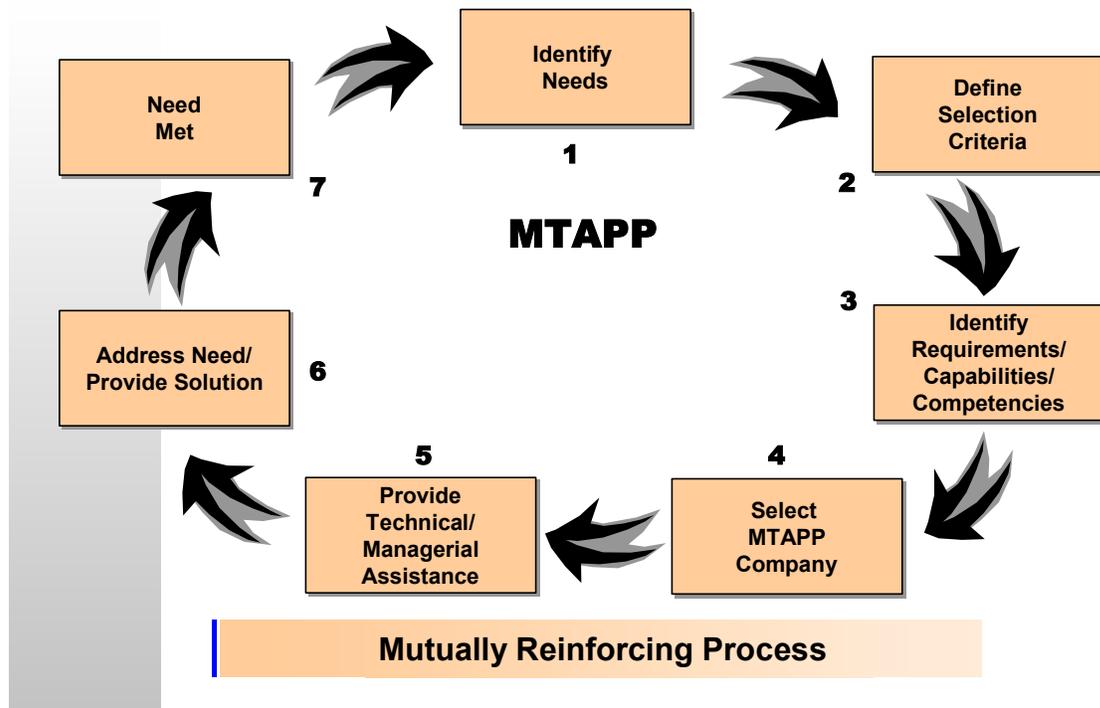
Exhibit 5

A Better Return On Investment Address AF / DoD Needs Illustrates The Importance Of Using The Study To Drive The Selection Process



Another reason why it is important to identify needs before deploying technical assistance is the business proposition that drives the supplier development activities of the industry's leading corporations. This proposition is that proactive development of supplier capabilities, which is one of MTAPP's goals, provides a measurable impact and Return on Investment (ROI) to all participants: end users (customer/war fighter), prime contractors, and small manufacturing suppliers.

Exhibit 6

Conceptual Framework - Illustration

As Exhibit 6 illustrates, the identification of the Air Force and DoD needs is both the first step and the ongoing cornerstone for the MTAPP program. Identifying the needs defines the criteria for the selection of the new MTAPP participants.

INDUSTRY CHANGES AND IMPACT ON THE SUPPLY CHAIN

I. OVERVIEW

As a result of the ongoing war on terrorism and the rapidly evolving needs of the DoD, the aerospace and defense industry is going through unprecedented changes that will have profound impact on the Air Force supply chain. It is essential to understand these changes in order to determine and prepare for the impact on MTAPP and its small manufacturing businesses. This understanding will provide the necessary insights to determine the best way MTAPP can provide meaningful assistance to these small businesses.

II. DEFENSE RELATED SPENDING

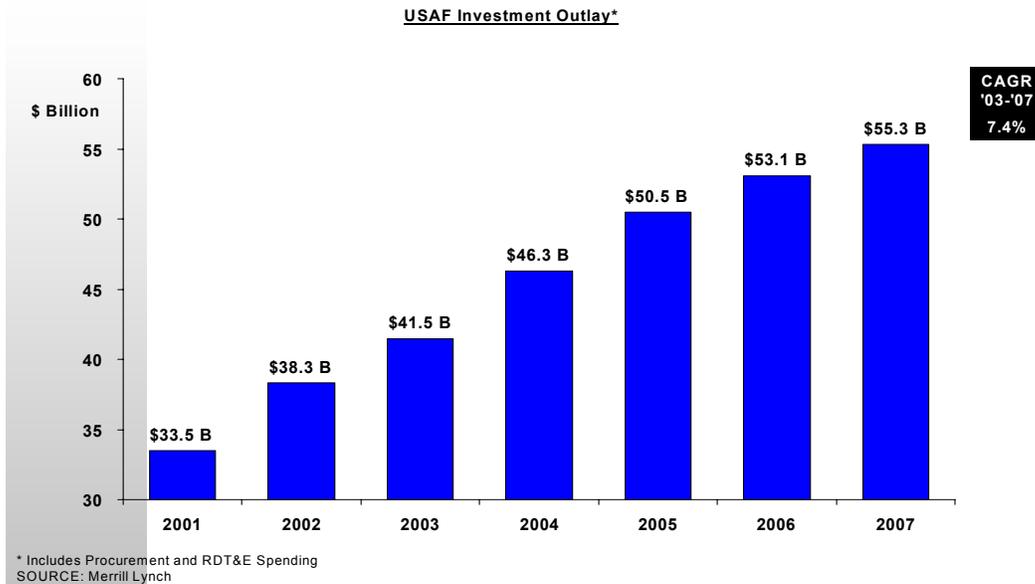
After a decade of flat to modest growth in defense related spending, the DoD and Air Force procurement levels have grown significantly over the last three years. This increase is forecasted to continue in the coming years with Air Force procurement spending expected to rise 7.4% annually through 2007. (See Exhibit 7).⁷

Our research indicates that this increase in overall spending will not be distributed evenly across traditional procurement categories. The composition and nature of this spending will be determined based on the new requirements of the DoD and Air Force supply chains. These new requirements are being created both by external factors, terrorism, and internal factors, new procurement initiatives.

⁷ Merrill Lynch, Defense and Aerospace report, May 2003

Exhibit 7

Air Force Spending Expected To Grow Over Next Few Years



III. CHANGE IN THE DEPARTMENT OF DEFENSE ACQUISITION APPROACH:

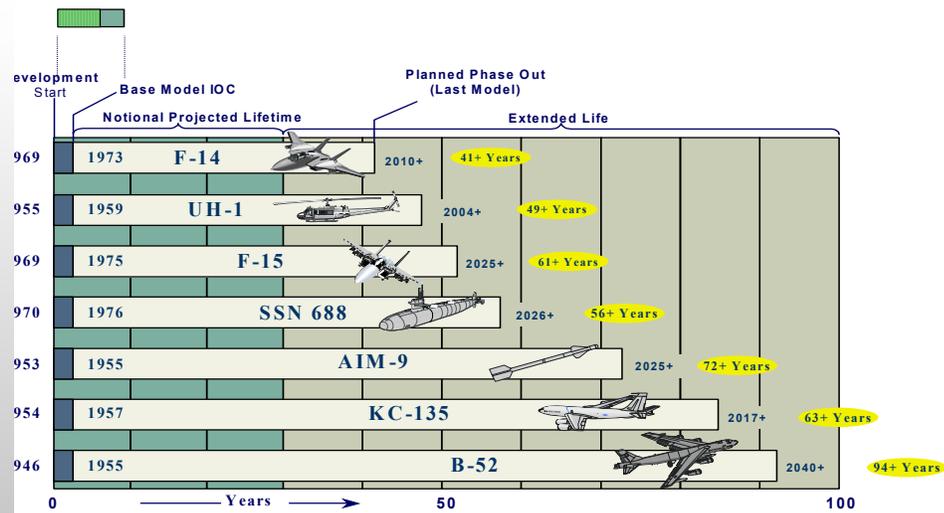
Over the last decade, the Department of Defense has focused on modernizing weapons, which emphasizes upgrading current weapons rather than creating new programs. With transformation, the Pentagon favors upgrading the capabilities of existing weapons systems, sometimes referred to as platform enhancement, to transform their war fighting capabilities.⁸ An immediate result is the extension of the useful life of weapons platforms (See Exhibit 9). The transformation of the Department of Defense will increase the level of electronic integration within current platforms. Weapons systems spending will focus on communications, sensors, precision (guidance and navigation), and system networking enhancements. According to a recent CIBC Defense and Industry analysis, expenditures in

⁸ Stephen's Inc. Aerospace & Defense Report 2003

defense electronics are forecasted to an 11% CAGR through 2006 – from \$52B to \$88B⁹ (See Exhibit 9). Small businesses with capabilities to support electronic content will benefit from this trend. In the previous chapter, we discussed the commodity and revenue profile of the MTAPP companies. Currently fewer than five companies in the program have capabilities in electronics. To ensure the long-term viability of the program, future selection of MTAPP companies should also align with future DoD spending priorities.

Exhibit 8

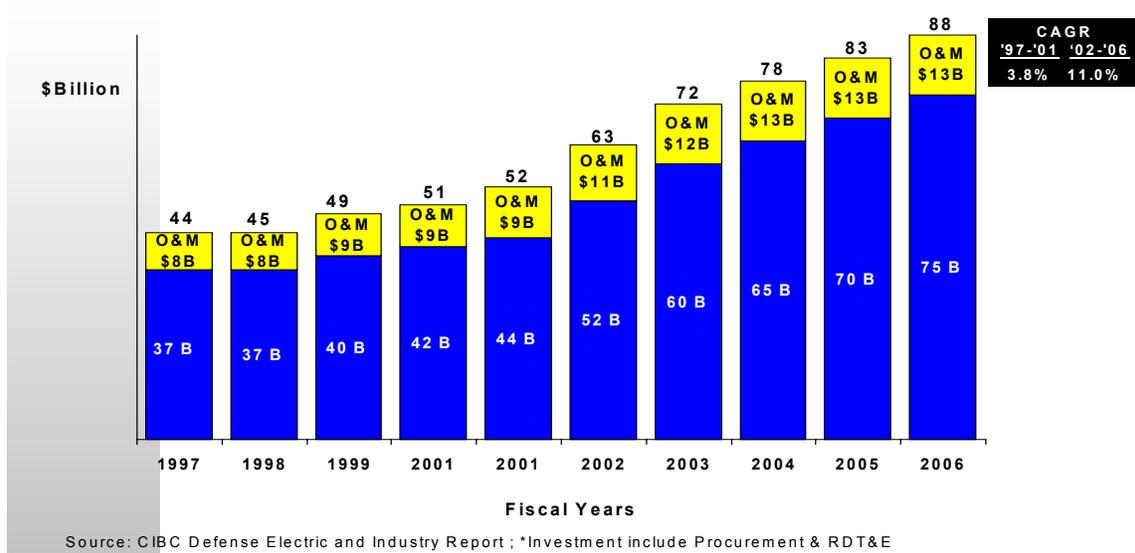
Weapons Platforms Useful Life Extension



⁹ CIBC Defense Electronic Report, February 2002

Exhibit 9

Platform Enhancement Will Drive Spending In Defense Electronics



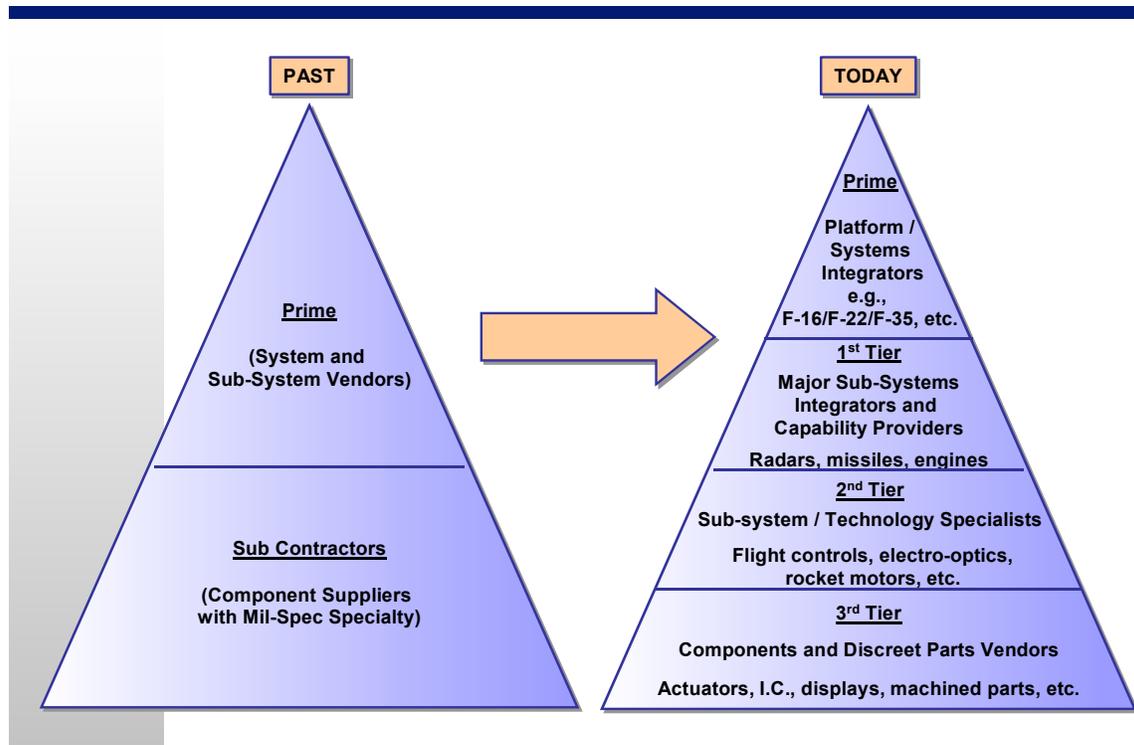
IV. SUPPLY CHAIN EVOLUTION:

The transformation of the Department of Defense and resulting impact of new acquisition methods has led to an evolution in the supply chain. New roles are emerging, as prime contractors take on the responsibility of total system and platform performance. Prime contractors' roles are lead systems integrators: responsible for systems integration, project management of production, and delivery. Also, first and second tier suppliers are taking on responsibilities for larger modules and sub-systems. This trend is very similar to modularity in the automotive industry – Tier one, Tier two, and Tier three suppliers are giving more responsibility for program content – modules and subsystems. With modularity and the Department of Defense's emphasis on modernization, the Prime contractors will increasingly depend on the lower tiered suppliers to take responsibility for technology evolution in their respective modules. Small manufacturing businesses will need to do more

and take on additional responsibilities to survive and prosper in the value chain. Small manufacturing businesses may see a shift of their position to lower tiers and supplying to a new set of suppliers at the sub-system and assembly level (See Exhibit 10). MTAPP will evaluate potential new suppliers' capabilities to perform at this level.

Exhibit 10

Defense Industry Supply Base Evolving: Suppliers Taking On Different Roles And Responsibilities



V. AIR FORCE BUYING CHANGES:

In response to the Department of Defense transformation objectives and the need to create a more responsive and adaptive supply chain, the Air Force Materiel Command (AFMC) has begun the process of instituting commodity councils. These councils are cross functional

groups made up of officials from logistics, maintenance, contracting, procurement, small business offices, and customer support. The councils are charged with developing strategic sourcing initiatives (leveraging spending, minimizing cost, improving service levels, and developing suppliers) across the enterprise with the Air Logistic Centers executing locally. Along with commodity councils, the AFMC has created a Weapon Systems Supply Chain Management (WSSCM) initiative. This involves the creation of a supply chain management office that is responsible for ensuring the supply chain meets the goals of planned weapon system availability. This initiative will identify the risks and weak links in the supply chain.

Exhibit 11 shows a description of the WSSCM initiative. These ongoing changes at AFMC provide opportunities for MTAPP to define a role and a value proposition to both initiatives. For the commodity council, MTAPP can provide credible small businesses with capabilities to meet requirements. MTAPP should consider proactively seeking out requirements where small businesses have advantages over large firms. For the WSSCM, MTAPP can determine which supply problems impact weapons systems availability and then define a role for MTAPP as a potential source to solve the problems. For long-term program viability, MTAPP must position its value proposition that both AFMC initiatives view collaborating with MTAPP as beneficial to meeting their objectives.

In the long-term, MTAPP will need to define where in the program lifecycle it should focus resources. Each phase of the lifecycle, (from System Development & Design (SDD) to Low Rate Initial production (LRIP), High Rate Production, and Sustainment) the Air Force and DoD procurement approaches and priorities are different. These differences drive supply chain characteristics. In turn, identifying needs and problems to solve will require very different approaches. MTAPP focusing on a particular phase in the lifecycle increases overall efficiencies and effectiveness.

Exhibit 11

Weapon System Supply Chain Management (WSSCM)

WSSCMs are:

- **Dual-facing**
 - Represents supply chain issues to SPO and War Fighter
 - Negotiate WS requirements with support community

WSSCMs do:

- Provide a central point for collecting analyzing and surfacing information that affects Weapon System Availability (WSA)
- Manage risk and mitigate constraints and risk factors
- Develops and supports robust, lean supply chains
- Provide financial and process visibility

WSSCM value-add:

- **Greater WSA, fewer surprises**
 - Earlier coordinated response to threats
 - Accurate portrayal of supply factors impacting WSA
 - Significantly reduce "Fire-fighting"

Initial focus areas are the F-15, F-16, and KC 135

Source: Presentation by KC-135 Weapon System Supply Chain Manager, Oct 2003

IDENTIFYING NEEDS

I. DEFINING THE NEEDS

During the roundtable, we discovered that the Air Force and the commercial sectors approached the identification of needs in different ways. The Air Force community defined most of the identified supply chain problems to specific parts and components, or unique situations that are not part of normal operating processes. These problems require a specific supplier to address specific requirements. The commercial sector described their supply needs in areas where they need new suppliers with broader capabilities (such as subsystem integration) compared to their current suppliers. Also, the commercial sector looked for alternative sources of supply in specialized (niche) commodities where they are dissatisfied

with the current supplier. In situations where small businesses were mentioned, the needs are in areas where the corporations had a shortfall in meeting the mandated small business socio-economic goals.

II. THE AIR FORCE AND THE DEPARTMENT OF DEFENSE NEEDS

Interviews with the Air Force officials at the Air Logistic Centers and Small Business offices revealed the following issues and problem areas that need to be addressed in the supply chain:

A. Critical Shortages of Spare Parts

According to a report by the National Coalition for Advanced Manufacturing (NACFAM), over 11,000 products used by the Department of Defense have no known source of supply and 227 of these products are in need of immediate re-supply. Spare parts of the Air Force aircrafts and engines are frequently unavailable and the U.S. General Accounting Office (GAO) cites lack of manufacturers as the reason for these shortages in about one-third of the time in recent studies.¹⁰ A review of a June 2001 GAO report on Air Force inventory looked at the E-3, C-5, and F100-220 engines that power the F-15 and F-16 fighter aircrafts. The report quotes a Secretary of the Air Force report to the President and Congress that the percentage of aircrafts that were not mission capable due to supply problems rose from fiscal year 1996 to 2001. Analysis of the E-3, C-5, and F100-220 revealed that the Air Force did not achieve its mission capable goals for these aircraft systems from 1996 to 2000. The reasons cited for the vendor related issues accounted for 42% of the supply problems. An example of the vendor related issues were part production problems. An example cited in the report was a sole source contractor for a C-5 part could not deliver the needed aircraft turbines in the time specified in the contract. Another situation involved a single source for dual ignition igniters, which failed quality inspection, leaving insufficient quantities to meet F100-220 engine needs. A more recent report published in June 2003 by the GAO identified

¹⁰ GAO-01-587 Air force Inventory

9,500 items where the same Air Logistics Center (ALC) served as both the supply manager and repair depot. A survey conducted with the Item managers revealed that the reasons of parts shortages were very similar to that of the 2001 report - lack of component parts, which was rated the highest as a primary reason for shortages. A review of the Air Force Working Capital Fund FY2005 budget indicates that supply issues continue to impact mission availability of weapon systems. Exhibit 12 shows Not Mission Capable Supply Rates (NMCSR) for A-10, B-1B, B-52, C-5, C-130, KC-135, E-3, F-16, and F-15.

Exhibit 12

Parts Availability Impact Weapon Systems Availability

Greater than 10% increase in NMCSR since 2002

<u>Not Mission Capable Supply Rates (NMCSR)</u>			
<u>Weapon System</u>	<u>2002</u>	<u>2005</u>	<u>% Change</u>
1. A-10	12.9%	14.9%	15.5%
2. B-1B	21.2%	23.2%	10.0%
3. B-52	10.7%	12.3%	15.0%
4. C-5	17.5%	19.4%	10.9%
5. C-130	13.0%	14.9%	14.6%
6. KC-135	9.8%	11.5%	17.3%
7. E-3	9.4%	12.8%	14.9%
8. F-15	9.6%	11.2%	16.7%
9. F-16	12.0%	13.7%	14.2%

Source: Air Force Working Capital Fund FY2005 Budget Summary.

During our visit to Oklahoma Air Logistics Center, Item managers for KC-135 mentioned bearings and gearboxes as their most urgent priority parts where they needed vendors. The E-3 avionics manager indicated his urgent needs were to find vendors with capabilities to

produce wave-guides and air speed switches. These items were considered as problem parts impacting the mission readiness of both aircrafts. Exhibit 13 shows a list of identified stock classes impacting E-3, B-52, B-2, B-1, and KC-135.

Exhibit 13

Oklahoma Air Logistic Center Identified Problem Parts

Fed Supply Code	Part Description	Impacted Weapons Platform					Problem/Issue
		E-3	B-52	B-2	B-1	KC-135	
5985	Wave guides	X		X			Obsolete Technology and Lack of Supply
3110/3120/3130	Non-engine Bearings		X	X		X	Lack of Supply/Vendors
1620	Landing Gear			X		X	Lack of Supply/Vendors
1680	Actuators			X		X	Material Shortage Lack of Supply/Vendors
1680	Windshield/Grids				X	X	Lack of Supply/Vendors
1560/1680	Fuel Bladder					X	Lack of Supply/Vendors
2840	Gear Boxes					X	Diminishing Manufacturing Sources
5930	Air Speed Switches	X				X	Obsolete Technology and Lack of Supply/Vendors
1560	Wing Fitting		X				Lack of Supply Vendors

Source: Interviews with item managers and engineers at Tinker AFB Oklahoma

During our visits to the F-15 Systems Program Office (SPO) at Warner Robbins Air Force Base, Engineers and Contracting managers indicated that the landing gears were their most urgent priority to be dealt with, as it was affecting mission capability of the aircraft. Vendor problems ranging from bad parts, long lead-times, and delinquent contracts were cited as

reasons, which affected part availability. Exhibit 14 shows the issues identified by the SPO for the affected landing gear subsystems.

Exhibit 14

F-15 Landing Gear Identified As A Problem At WR-ALC

<u>Subsystem/End Item</u>	<u>Issue Identified By System Program Office</u>
1. Main Wheel and Nose Wheel	<ul style="list-style-type: none">• Desired Delivery Date and Schedule not met by current vendor
2. Brake System	<ul style="list-style-type: none">• Unavailability of safety stock; desired delivery schedule not met
3. Shimmy Damper	<ul style="list-style-type: none">• Contract going delinquent
4. Main Gear	<ul style="list-style-type: none">• Work stoppage by contractor• Parts on hand were made wrong• Contract going delinquent• Delivery Date and Schedule not met
5. Nose Gear	<ul style="list-style-type: none">• Long-term Contract cancelled with incumbent supplier

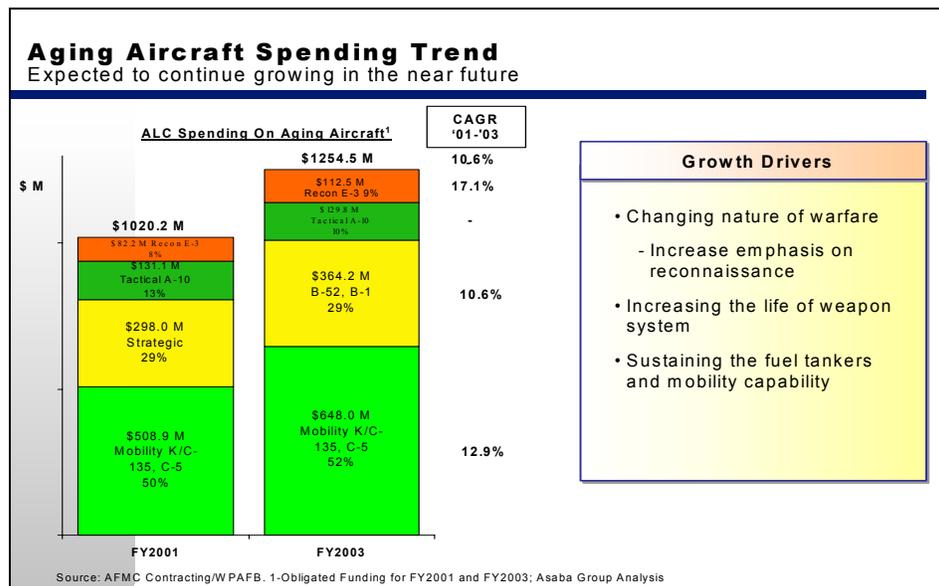
Source: Interview with Engineers and Contracting Official at the F-15 Systems Program Office

B. Sustainment Support For Aging Weapons Systems (Aircraft)

The new focus on enhancement of weapons platforms compared to major weapons acquisitions programs implies that aircraft will continue to age (See Exhibit 15). An aging weapon or aircraft is defined as remaining in service past the originally intended designed lifecycle. In 1999, about three quarters of Air Force aircraft were over 20 years old, and by 2020 it is projected that the average age will exceed 30 years.¹¹ An example is KC-135. With over 400 in operation, the youngest KC-135 is 36 years old and the fleet's average age is 40 years. The Air Force initiative to meet the aging aircraft challenge is taken through the Aging Aircraft division of the Aeronautical Systems Center office (ASC/AA). The program's office mandate is to ensure that existing aircraft possess the required characteristics to affordably remain in service well beyond their originally designed lifecycle. The Aging Aircraft Division (ASC/AAA), working with the Joint Council on Aging Aircraft (JCAA), primarily sees its role as developing and defining strategies in the aircraft's structures, subsystems, dynamic components, and avionics to affordably extend the aircraft's useful life. The program office does not get involved with manufacturing and implementing the solutions. MTAPP can potentially become a platform to bridge the ASC/AAA initiatives and implement the identified solutions. Given that the solutions will have broad applicability in the military and the commercial sector, MTAPP's ability to identify companies for ASC/AAA solutions will be an added value to both the Air Force and the commercial sector. Our analysis of AFMC sustainment support spending data on KC-135, C-5, B-52, B-1, A-10, and E-3 show 10.6% CAGR from FY2001 to FY2003.

¹¹ Component Obsolescence, by ARINC, Inc. (Michael Howard)

Exhibit 15



C. Maintaining Adequate Surge Production Capability

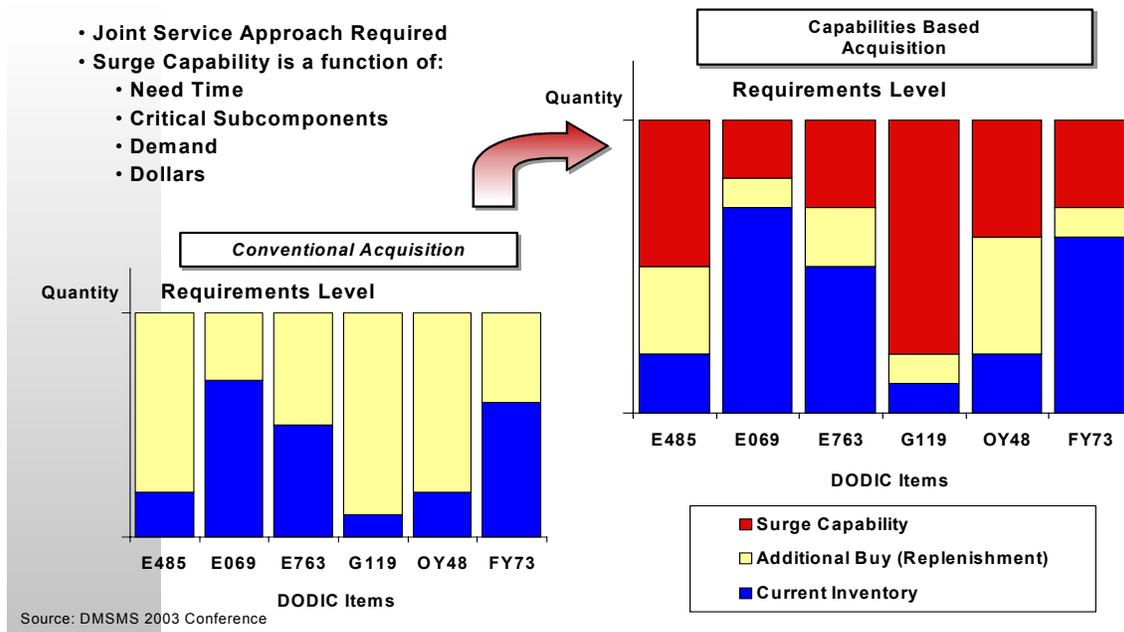
Production surge is an abrupt increase in demand for a product at any level in the supply chain. The symptoms of surge disruptions are situations where safety stocks are drawn down to unacceptable levels to meet demand. The bottlenecks associated with responding to peak demands on sudden rise in orders are typically within the lower tiers of the supply chain. Surge capacity for any product or weapons systems is a combination of the prime contractors' capacity, supply chain work-in-process inventory levels, and the capabilities and

capacity of lower tiered suppliers. A more cost effective approach is an industrial base approach,¹² which requires working on building surge capabilities within the industrial base.

Exhibit 16

Capabilities Based Approach For Surge Demand Production

Tying IB to Acquisition - Capabilities Based Approach



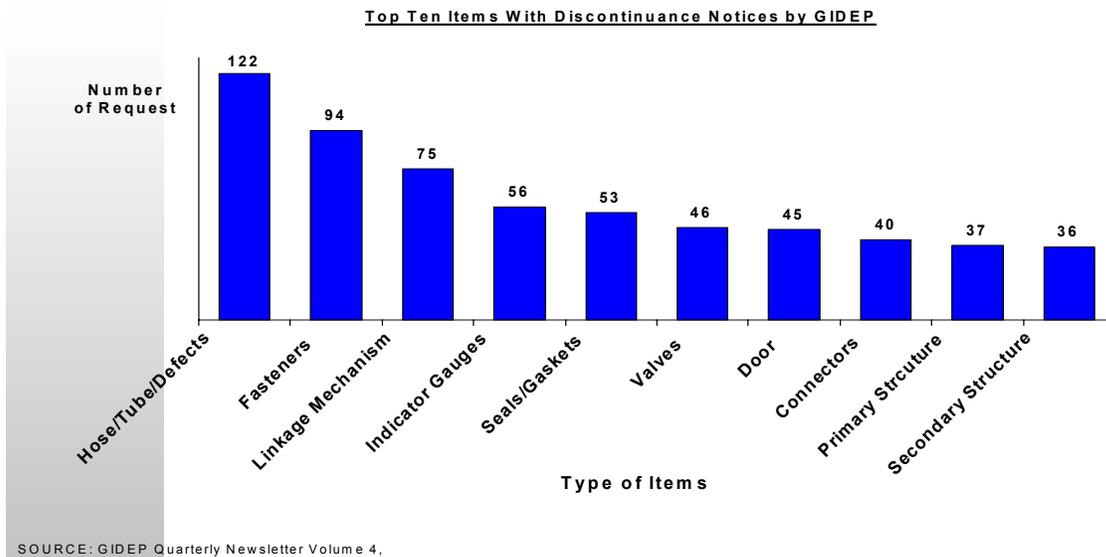
¹² DMSMS 2003, Joint Capabilities Approach

D. Diminishing Manufacturing Sources and Material Shortage (DMSMS)

Diminishing Manufacturing Sources and Material Shortage (DMSMS) are situations where there is a loss or impending loss of the last known manufacturer or supplier of an item or the shortage of raw materials needed to support a weapons system. This may be attributable to discontinued production by one or more manufacturers, or by manufacturers exiting the business. With the occurring trends of extending the lifecycle of weapons systems, decreasing demand for new systems, and rapid advances in technology, component lifecycles are dropping much faster with fewer manufacturers willing to support older generations (legacy parts) at reduced volumes. The reduced volume of orders makes it economically unfavorable to produce these parts. The Air Force program office, which is in charge of addressing DMSMS problems, collecting data, and identifying plausible solutions is the Air Force Materiel Command Diminishing Manufacturing Sources and Material Shortage (AFMC DMSMS).

Exhibit 17

Mechanical and Structural Obsolete Components



DMS situations occur at any phase of a program's lifecycle and can potentially impact a weapons system's lifecycle costs and mission readiness. As weapons systems' product life gets extended, DMSMS situations are expected to increase. The AFMC DMSMS initiatives are principally focused on electronic components since these parts have a much faster rate of obsolescence compared with non-electronic components. AFMC DMSMS stresses the proactive management of DMS rather than costly reactive management when the part or sub-assembly request cannot be filled. A proactive solution for solving the electronic DMS problem utilizes a parts tracking database of electronic components within a weapons' platform. The database contains critical data such as inventory spares, logistic options, part characteristics, and linked bills of material. The second part of the DMS solution consists of determining engineering substitutes or building the component through the General Emulation of Microcircuits (GEM) program. This program is subsidized by the Defense Logistics Agency (DLA). It focuses on building electronic components abandoned by the manufacturers.

Mechanical and structural DMSMS situations are rising with the extension of platform useful life. However, a DMSMS solution for non-electronic parts is non-existent and MTAPP companies can potentially fill the void.

A report from ARINC's Aviparts database identifies the most common DMSMS request for non-electronic parts as: (See Exhibit 19):

- a) Hoses, tubes, and ducting from landing gears, engines, and environmental control systems
- b) Mechanical fasteners that are typically high-strength bolts with uncommon dimensions
- c) Mechanical linkages such as gear boxes, bell cranks, pins, pulleys, assembly latches, and connecting links
- d) Indicators and gages such as caution light panels, fuel flow transmitters, and navigation lights

Exhibit 18

Most Requested DMS Non Electronic Obsolete Components

Item	
#	Part Name
1	Valves
2	Packing and Gaskets
3	Nuts and Washers

4	Connectors
5	Antennas and Wave guides
6	Springs
7	Airframe Structural Components
8	Pumps and Compressors
9	Pressure and Temperature instruments

Source: DMSMS 2003 Conference, ARINC, and GIDEP database

Opportunities for MTAPP to solve DMS issues have been identified within the B-2 program office. B-2 has 189 un-funded DMS solutions, 142 of which are required multi-year procurements and 47 are new engineering solutions. In addition, MTAPP companies can work with AFMC DMSMS office and become a pool of manufacturers capable of solving a host of non-electronic DMSMS problems.

DMSMS issues that are ignored or discovered late in a program cycle have significant effects on lifecycle costs and mission readiness. As aircraft useful life continues to be stretched and non-electronic DMSMS issues grow, identifying the sub-assemblies and part numbers at risk and including them in the MTAPP identification process is important. While a short-term fix requires buying more safety stock, this does not solve the underlying DMS issue. MTAPP can potentially become the added value in this situation.

E. Increase Competition

We analyzed procurement spend data from the AFMC Air Logistics Centers (ALCs) to determine areas of the AF procurement that provide competition opportunities for additional suppliers. The data represented spending for spares and repairs at the ALCs. The spend data were cumulative over a three year period representing fiscal years 2000, 2001, and

2002 which totaled \$8.8B. Along with the spend data, we had access to forecast spending for the next three years. The forecast of parts from the AFMC is a continuous process and can vary widely. These forecasts are done at various levels (item managers to weapons systems program managers) and can be impacted by various factors such as change in orders, mission readiness, and battlefield situations that are not very predictable. While we recognize these variances, we believe that the data still provides insights into Air Force future requirements.

Our analysis of the above data and input from the Small Business Office at Oklahoma Air Logistics Center enabled us to identify opportunity areas with forecasted requirements over the next three years, which totals \$556M (Part number list can be found in the appendix). These opportunities were based on four situations where MTAPP can provide small manufacturing businesses as an alternative source of supply. The situations are as follows:

1. Small business source development where the pool of qualified vendors does not contain more than one small business as a qualified source. MTAPP will identify small manufacturing businesses and work with getting them approved as valid engineering sources.
2. Reverse engineering situations where the government has the rights to the data but is not in possession of sufficient, accurate or legible data. MTAPP will prioritize parts on sunset platforms and particularly those parts impacting weapons systems availability. MTAPP will identify small businesses that have capabilities to re-engineer parts.
3. Teaming and collaboration with large businesses. These were situations where the government does not currently have rights to the data. However, in these situations, data availability is expected to improve.
4. Reengineering opportunities on items the government considers unstable.

Based on input provided from the Oklahoma Air Logistics Center, we identified 16 part numbers with forecasted requirements in the next three years. These requirements totaling \$143M were vetted to determine the number of qualified small businesses as source approved vendors. In all cases, we found one or no small businesses as approved sources. MTAPP will work on identifying small businesses for these parts and assist them with the engineering source approval process. Exhibit 19 shows a listing of the identified parts.

Exhibit 19

Selected Part Numbers To Develop Alternative Sources of Supply (Immediate Focus Areas)

National Stock Numbers	Part Description	Forecast Spend¹	Available SB²	Suggested Action/Task for MTAPP
2840 01420654	Nozzle Assembly	\$6.4 M	1	Engineering Source Approval
2840 013131813	Nozzle Augmenter	\$19.9 M	1	Engineering Source Approval
2840 014509478	Compressor Case	\$4.8 M	1	Reverse Engineering
2840 014548470	Synchronizing Ring	\$18.5 M	1	Engineering Source Approval
2840 012844013	Cold Section Module	\$33.5 M	1	Engineering Source Approval
2840 012112059	Fan Case	\$5.6 M	1	Reverse Engineering
1620 013085467	Combustion Liner	\$8.3 M	1	Reverse Engineering
1620 004463776	Retractable Landing Gear	\$14.9 M	1	Reverse Engineering
1620 001753939	Landing Gear Yoke	\$4.1 M	1	Reverse Engineering
5841 004853752	Receiver/Transmitter	\$4.8 M	2	Reverse Engineering
1680 001491319	Electronic Control Panel	\$16.1 M	2	Reverse Engineering
1680 01101772	Electronic Control Panel	\$0.5 M	2	Reverse Engineering
1680 014528500	Ball Screw Assembly	\$2.1 M	1	Reverse Engineering
1680 011664022	Hose Reel Assembly	\$1.8 M	1	Collaboration with Prime Contractor
5998 010912108	Hose Reel Assembly	\$0.9 M	1	Re-engineering opportunity
5998 014101095	Backplane Assembly	\$1.0 M	1	Collaboration with Prime Contractor
Total		\$143.2 M		

Source: U.S. Air Force; Asaba Group Analysis

1- 3 year forecast spend based on ALC requirements
 2 - Identified Small Business From Contract History

 Exhibit 20

<i>Opportunity Areas Identified</i>	Forecast Spending FY03, FY04, FY05 Spend (\$M)
1 Source development - Engineering source approval required	\$281.5
2 Reverse Engineering - Government has data right but no Technical Data Package (TDP) Available	\$217.9
3 Teaming/Collaboration potential - TDP rights owned not owned by government but achievable	\$15.3
4 Reengineering opportunity - Current item design unstable	\$41.9
5 Alternate source development opportunity - TDP rights owned not owned by govt.	\$0.60
Total Identified Opportunity	\$556.6M

Source: Asaba Group Analysis of AFMC, and other proprietary data sources

III. THE COMMERCIAL SECTOR IDENTIFIED NEEDS

During our interviews with the commercial sector, identification of needs tended to fall into two broad categories – desired capabilities and niche commodity specialization. This differs from the Air Force, which sought solutions at the item or part number level. The desired capabilities requested by the commercial sector were as follows:

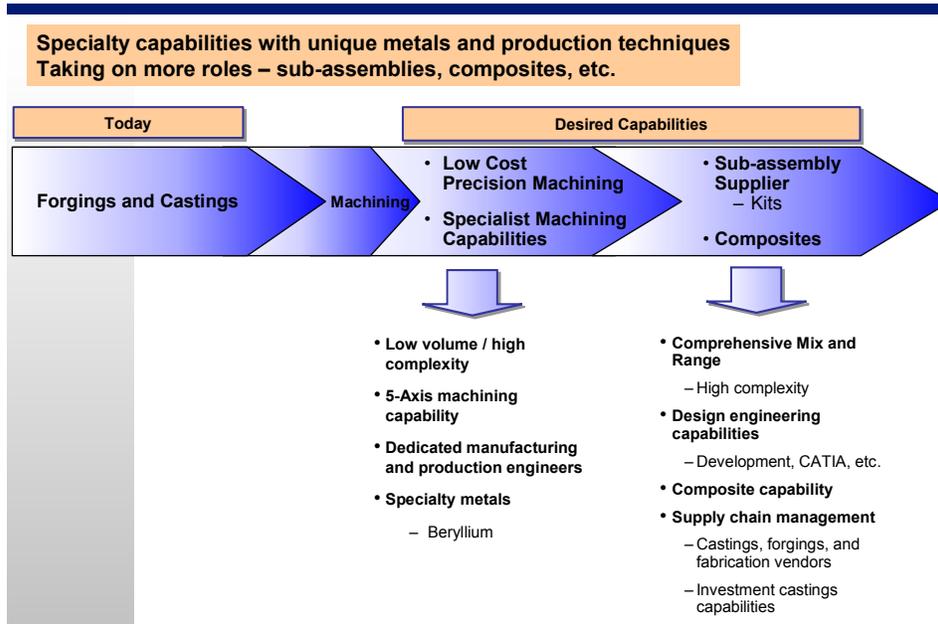
- Machining companies that provided the next higher level assemblies or subsystem

- Companies capable of machining special metals (Beryllium, etc.)
- Composites
- Investment castings

The commercial sector expressed a strong desire to see small business manufacturers migrate up the value chain by being able to do more. As we mentioned in earlier sections of this paper, the Department of Defense acquisition trends are driving modularity and tiering in the supply chain. The commercial sector expects all suppliers to take on new roles from having design and engineering capabilities that deliver subsystem solutions to being a subsystem integrator (next higher level of Bill of Material) in the value chain. Most of the identified new roles are likely to become critical in new programs rather than current programs in sustainment. In the figure below, it shows the current and desired state of migrating the capabilities of machining companies (See Exhibit 21).

Exhibit 21

Strong Desire For Small Business With Additional Capabilities

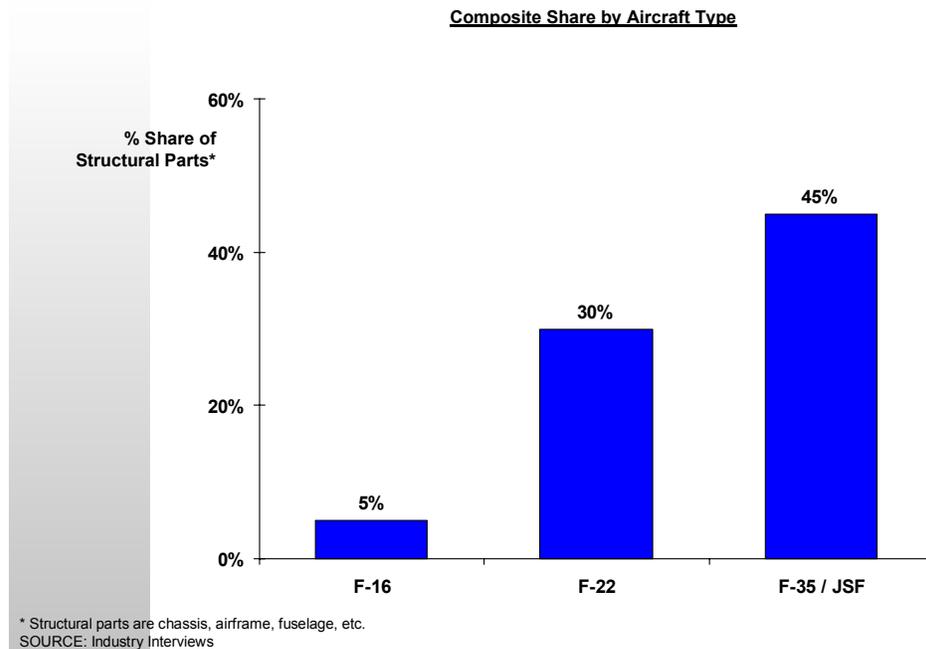


This migration in capabilities is also applicable to companies providing wire harnesses, cabling, and circuit cards.

Composite materials are reinforcing fibers in a resin matrix that provide superior properties and performance compared to individual materials. Composites are expected to grow and increase in share of the metallic structural parts of new aircrafts. In the Exhibit 22, it shows the gaining share of composites in structural components for three different aircrafts: F-16, F-22, and F-35 (JSF) from the year of 1991 to 2001. This trend is expected to grow and the addressable market opportunities for machining are expected to decline. This trend towards composites is also occurring in the commercial and civil aviation sectors.

Exhibit 22

Composites Expected To Grow An Increasing Share Of Metallic Structural Parts



Investment casting is a manufacturing method for alloy-based parts that allows casting of parts in a singular piece. It is considered to be an alternative to fabrication or forgings. The investment casting needs are to provide the commercial sector with similar benefits as composites. The flexibility, versatility, and cost savings with investment casting make it a compelling process to replace traditional casting approaches (such as die casting, forgings, and sand casting) on high precision and complex parts. Investment castings provide dimensional tolerances that are so precise that they eliminate the need for additional machining, welding, and tooling setup. Other benefits are the versatility of using a wide array of alloys and the ability to make several parts as one casting.

The domestic defense industrial base for investment casting is quite limited and the industry depends on foreign suppliers for materials such as ceramic shell making, additives, wax, and

wax blending materials. Low volumes associated with defense parts present a barrier to companies willing to support defense industry needs.

The commercial sector identified a number of products for which they desire alternative suppliers or increased competition. Some of these situations are driven by a lack of adequate competition to improve service levels and delivery performance, but in other situations there are areas where the commercial sector believes that product specialization, particularly in defense oriented applications, is needed to increase breadth and scope of available products and to produce solutions. The rationale behind this is simple: defense sector procurement volume may not present compelling economics to a large corporation where scale is an essential factor in determining profitability. Small manufacturers have low breakeven volumes and can achieve sustainable economics in the long-run. Another driver is the desire to leverage commercial off the shelf (COTS) parts and applications for dual use opportunities. While this may make sense on the surface, the military applications tend to require a high level of performance – tighter tolerances, harsh environment endurance, longer shelf life, etc. As defense procurements come in lower volume compared to commercial sector procurements, the issues of breakeven volumes and sustainable economics prevent large businesses from achieving sustainable economics in the long-term. Small manufacturers can build specialized applications for the defense industry based on COTS technology and applications. The identified commodities for niche suppliers are as follows:

1. Optical Equipment
2. Pyrotechnics
3. Missile Batteries (Thermal and Reserve)
4. Radio Frequency microwave devices
5. Radar equipment and parts
6. Non – mission avionics

7. Power supplies
8. Rocket motors
9. Antennae
10. Space qualified bearings

Our ability to provide a richer level of granularity and specifics (item or part level view) was hindered by the reluctance of the commercial sector and the Air Force to share vital information that they consider proprietary or classified.

Lastly, as more prime contractors take on more aftermarket and sustainment responsibilities for weapons platforms, they encounter similar vendor issues to those that are experienced by the AFMC Air Logistic Centers and DLA. Finding suppliers that can build low volume spares for prime contractors continues to be a challenge. It is even more challenging to find suppliers, which can produce at a low cost, have consistent delivery performance, and hold quality processes and procedures that are certified AS9100 or ISO9XXX. MTAPP can provide prime contractors with small businesses that can meet their requirements. The Lockheed Martin Hercules Certified Parts program licenses small business manufacturers to produce certified parts for Hercules C-130 aircraft. Our research indicates that the “Hercules Type Certified Programs” – is the trend for the future and many more prime contractors will begin similar programs. By having a pool of qualified and competent suppliers, MTAPP can ensure position itself as a valued partner to prime contractors.

NEXT STEPS

I. DEFINING PRIORITIES

The research has provided a direction to identify where the problems and needs are in the supply chain. The next step in the process is to determine how best to link these findings to the identification of the next class of MTAPP companies. The framework for the next step

should be based on the program's need to show some immediate (near term) return on investment or "early points on the board". To accomplish this, MTAPP must focus on areas where we have identified very specific part level requirements and with relatively few barriers for implementation. An example is working on the F-15 landing gear problem or the air speed switch of the E-3 aircraft. Given the wide array of needs, our prioritization is based on the following tradeoff decisions:

1. Program orientation: Sustainment (sunset) versus New Programs (Current, LRIP, etc)
2. Segment focus: Air Force direct (AFMC and DLA) versus Indirect or subcontract (Commercial sector)
3. Assistance required: Technical/Managerial versus building new competencies

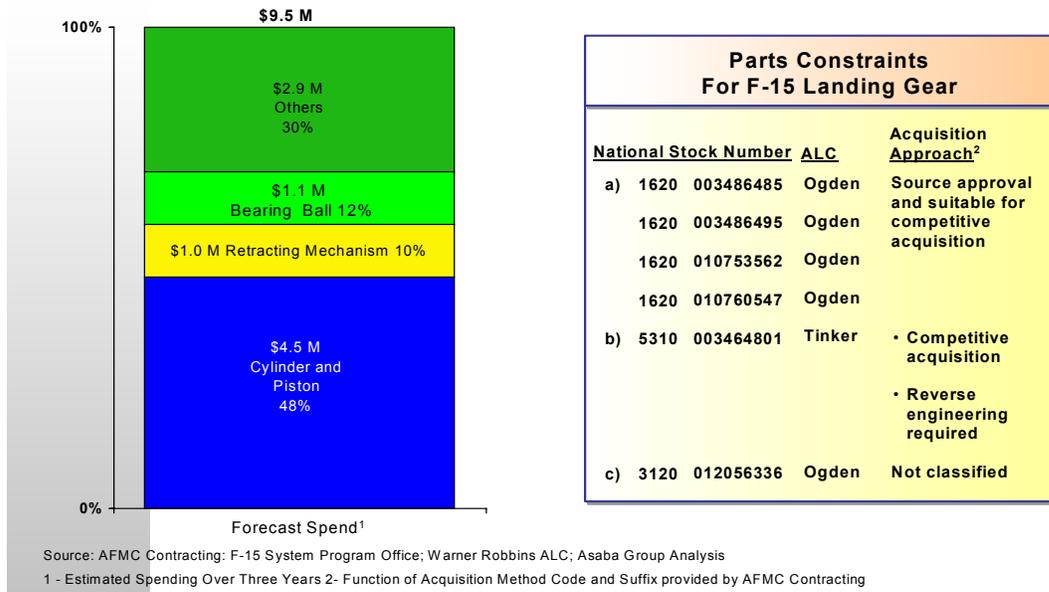
Given the options, MTAPP's initial focus will be on addressing issues with sunset programs, working with the AFMC Weapons Systems Supply Chain Management (WSSCM), the commodity councils, and F-15 Systems Program Office. This focus will enable MTAPP to try for easily obtainable opportunities and achieve early wins.

A. F-15 Problem Parts and NMCSRs

The F-15 landing gear issue we identified is an urgent priority for the SPO. The engineers believe the issue with the F-15 may be a leading indicator of likely problems with other aircrafts such as the F-16. From requirements received from the SPO and AFMC, the forecasted opportunity is \$9.6M. The required part numbers are classified as suitable for competitive acquisitions but require source approval. Identifying small businesses for this issue will be MTAPP's top priority.

Exhibit 23

Solving F-15 Landing Gear Problem Represents a \$9.5 M Opportunity



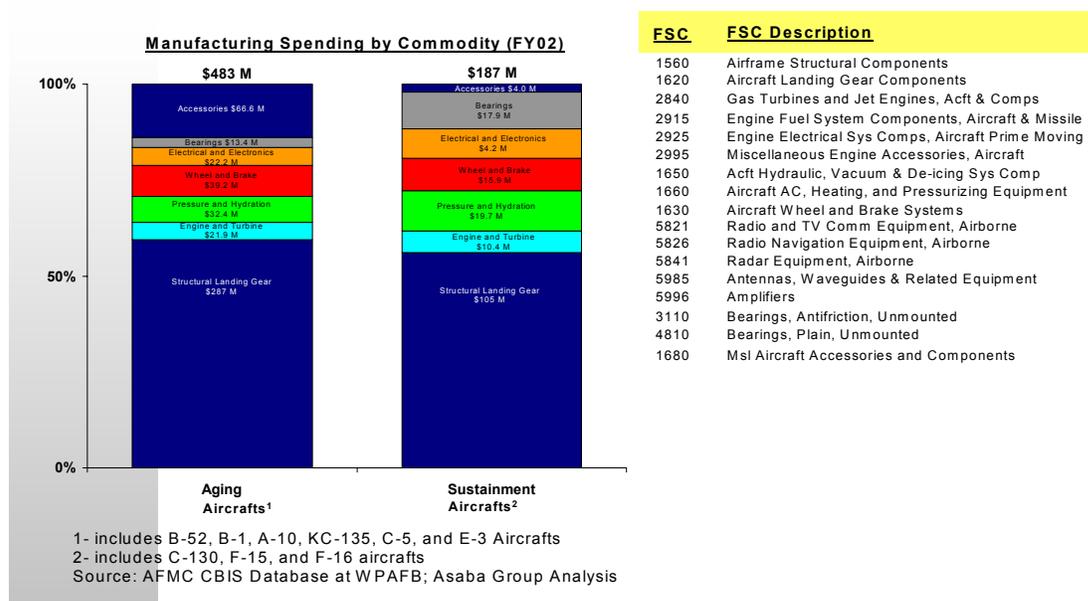
B. Air Force Materiel Command Commodity Councils

AFMC has begun instituting commercial strategic sourcing best practices across the various buying commands. The stated objective is to leverage the spending volume to reduce cost (acquisition and lifecycle) and work proactively with suppliers to improve delivery performance within its supply base. We have identified some key national stock numbers and associated spending that MTAPP can target in providing alternative suppliers and create competitive acquisitions. This will require collaborating with AFMC contracting organizations, the ALC Logistics Management, and the WSSCMs because MTAPP companies will need to re-engineer and obtain source qualification/approval. The commodity councils are currently being established at the AFMC Logistics Management Directorate. Over the next few months, plans are in place to establish the following councils:

- Joint Accessories (gear boxes, actuators, accumulators, etc) Federal Supply Code 1680 with an estimated FY00 – FY02 spend of \$164M
- Landing gear components (wheel, brakes, pneumatic, tubes, etc.) federal Supply Codes 1620, 1630, 2620 with estimated FY00 – FY02 spend of \$163M, \$80.5M, and \$45.7M respectively
- Support equipment. Federal Supply Code 4920 with a total FY00 – FY02 spend of \$118M

Exhibit 24

Structural and Landing Gear Components Account For Greater than 50% of ALC Spending



MTAPP will seek membership or observer status on these councils. In Exhibit 24, over 70% of manufacturing related spending on aging and sustainment aircraft occur in landing gears, structural components, and accessories. MTAPP membership on these commodity councils will provide full visibility on current and emerging requirements. These commodities

correlate well with the capabilities needed to solve the F-15 problems and similar identified needs. Lastly, MTAPP will need the support of the small business source development specialist to support engineering source approvals for the 19 parts numbers identified.

C. DLA Aging System Sustainment and Enabling Technologies (ASSET) Initiative

MTAPP will seek a partnership with the DLA's Aging System Sustainment and Enabling Technologies (ASSET) program to understand requirements and integrate them into the new MTAPP company identification process. The Asaba Group's desk study research identified the following ALC requirements that ASSET has identified as priorities. They are as follows:

1. **One Step Loading Adapter:** Also referred to as a One Step loading Adapter, this is a Warner Robbins (WR) ALC's urgent requirement that has been plagued with problems. ASSET has conducted initial engineering analysis and suggested new designs to the major commands and WR-ALC management.
2. **Paveway Weapon Systems and Support Equipment:** This has been identified by Ogden ALC (OG-ALC) as a requirement. The support equipment includes a tester, digital test set, weapon tooling and equipment for the Paveway II weapons.
3. **Atmospheric Early Warning System Circuit Board Extenders:** This has been identified by Ogden ALC as a needed item to support over-the-horizon early warning radar systems.
4. **Ruggedized Keyboard for the Atmospheric Early Warning System:** This has been identified by the Oklahoma Tinker ALC (OO-ALC) as a highly, critical item. Operators at fielded locations use the ruggedized keyboards on the Atmospheric Early Warning System 7 days per week, 24 hours per day. The ruggedized keyboard was previously managed by DLA through Defense Supply Center Philadelphia but is no longer available through DLA. The keyboards currently require upgrades and modifications and must meet form, fit, and function requirements of the original equipment and be compatible with the current operational console. Several attempts over the years to update these

units have failed. The form, fit, and function requirements will meet or exceed the original equipment specifications with technology insertion.

5. **The AEWs A/B Selector Card for the Atmospheric Early Warning Radar Sets** has been identified by the Ogden ALC as a highly, critical item. The A/B Selector switch is a 20-year-old design and required for operation of the control panel for the Atmospheric Early Warning Radar Sets.
6. **AIM-120 Wing Removal Tool:** This was identified by the Warner Robbins ALC. The AIM-120 wing tool was designed and developed for the specific task of removing the wings and fins of the AIM-120 missile. The tool is considered very expensive and the material used is also expensive. The wing tool is considered a good candidate for re-engineering to allow CNC (Computer Numeric Control) machining.

Most of the above-identified parts will require working collaboration and further discussions with the directors at AFMC contracting and the ALCs logistic management.

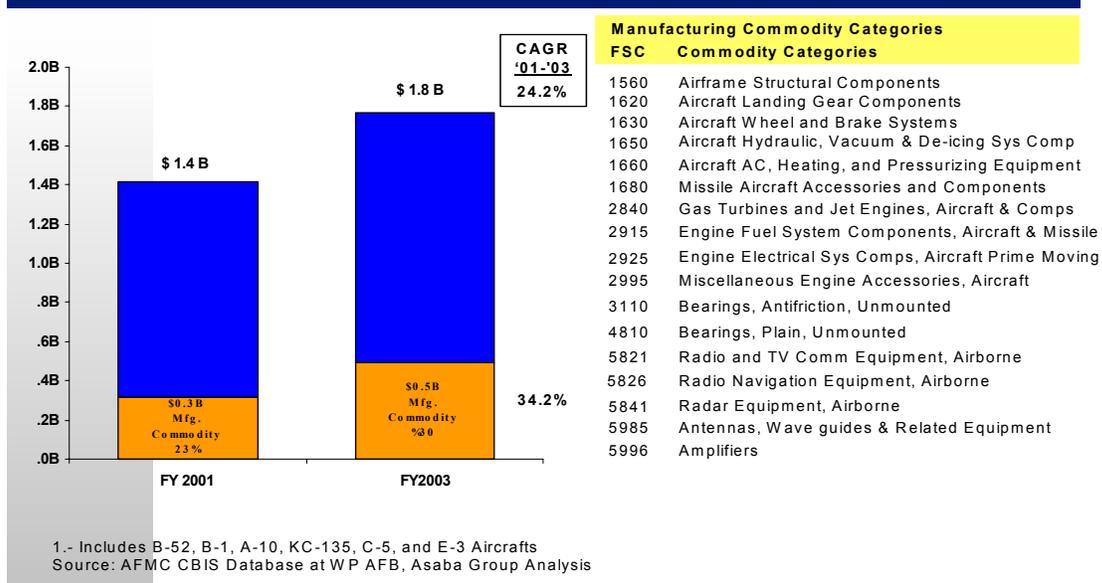
D. AFMC's Aging Aircraft Initiatives

In Exhibit 25, it shows spending on aging aircraft growing at a 10.6% and manufacturing related commodities at 24.2%. MTAPP support of aging aircrafts within the Air Force needs to be a priority in the next year. These support programs are the best opportunities for small businesses to win prime contracts from the Air Force. In addition, MTAPP will need to work with the Aeronautical Systems Center Aging Aircraft Division (ASC/AAA). MTAPP can include their identified solutions into the company identification criteria. Early engagement with the ASC/AAA is essential to be effectively integrated in the commodity council. The more issues that can be adapted to small business solutions, the more value MTAPP will be able to add to the councils.

Exhibit 25

Spending On Aging Aircraft Has Grown 24% Between FY2001 and FY2003

Manufacturing Related Commodities Has Outpaced Total Spending



E. Commercial Sector

Identified commercial sector requirements appear to require longer times to create the applicable solution because the solutions require enterprise and competency development. In most instances, this requires much higher levels of investment and in turn a larger impact on solving particular problems. In the near term, MTAPP should focus on working with the Prime contractors with two approaches. First approach is assistance with providing suppliers to support their aftermarket service contracts on sunset programs – similar to providing potential licensees to the Lockheed Martin Hercules Certified Parts Program. Second is to have prime contractors nominate suppliers within their supply base for MTAPP technical assistance program. The nominated companies will be sponsored by the primes and ensure incremental bidding opportunities for these companies. This will reinforce the link between the providing of technical assistance and potential revenue growth.

F. Diminishing Manufacturing Sources and Material Shortage (DMSMS)

Diminishing Manufacturing Sources issues, especially those related to non-electronic parts are addressed by the SPO's working with the AFMC DMSMS office. The WSSCM would have a DMS planning grid, similar to the one in Exhibit 26, which shows the components at risk of diminishing or absence of future manufacturing sources.

Exhibit 26 DMS Planning Grid (Illustrative)

Red=No Supply, Yellow=Neutral, Green=Existing Supply

LRU Name	Qty LRU Spares	Year										
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fire Warning Control Unit (FWCU)	8	G 8	G 8	G 8	G 8	G 8	G 7	G 7	G 7	G 7	G 7	G 6
Conditioned Air System Controller	5	G 5	G 5	G 4	G 3	G 3	G 2	G 2	G 2	G 1	G 1	Y 0
Flight Data Recorder Processor	5	G 4	G 4	G 4	G 4	G 4	G 3	G 3	G 3	G 3	G 3	G 3
Memory Unit, Flight Data	4	G 4	G 4	G 3	G 2	Y 0	Y 0	R-1	R-2	R-4	R-5	R-7
Pressure Transmitter Unit	53	G 48	G 45	G 41	G 38	G 35	G 32	G 29	G 26	G 22	G 17	G 12
Disk Drive Unit	4	G 3	G 3	G 3	G 2	G 2	G 2	G 2	G 1	G 1	G 1	Y 0
Control Unit, Power	8	G 5	G 2	Y 0	R-3	R-5	R-7	R-9	R-11	R-14	R-18	R-21
Switch, RF Transmitter	2	G 2	G 2	G 2	G 2	G 2	G 1	G 1	G 1	G 1	Y 0	Y 0
Switch, RF Transmitter	11	G 11	G 11	G 11	G 11	G 11	G 10	G 10	G 10	G 10	G 9	G 9
Radar Altimeter	4	G 3	G 3	G 3	G 2	G 2	G 1	G 1	G 1	Y 0	Y 0	R-1
Electronic Control Panel	5	G 5	G 4	G 4	G 4	G 4	G 4	G 4	G 4	G 3	G 3	G 2
HF Receiver/Transmitter	4	G 3	G 3	G 3	G 3	G 3	G 3	G 3	G 3	G 2	G 2	G 2
Antenna Coupler	8	G 7	G 7	G 7	G 7	G 7	G 7	G 6	G 6	G 6	G 6	G 6
UF Receiver-Transmitter	5	G 5	G 4	G 4	G 4	G 4	G 4	G 3	G 3	G 3	G 3	G 3
Audio Control Distribution Unit (ACDU)	3	G 3	G 3	G 2	G 2	G 2	G 1	G 1	G 1	G 1	Y 0	Y 0
Intercomm Control	5	G 4	G 4	G 4	G 3	G 3	G 3	G 3	G 2	G 2	G 2	G 2
UHF Receiver/Transmitter	7	G 7	G 6	G 6	G 6	G 6	G 6	G 6	G 6	G 5	G 5	G 5
Preamplifier Switch, RF	4	G 4	G 4	G 4	G 4	G 4	G 4	G 3	G 3	G 3	G 3	G 3
Battery Charger	9	G 9	G 8	G 8	G 7	G 6	G 6	G 5	G 4	G 3	G 3	G 2
Power Supply Controller	5	G 5	G 5	G 4	G 4	G 4	G 4	G 3	G 3	G 3	G 3	G 3
Generator Control Unit	7	G 7	G 7	G 6	G 6	G 5	G 5	G 4	G 4	G 3	G 3	G 2
Flight Control Computer	24	G 23	G 22	G 21	G 21	G 20	G 20	G 19	G 18	G 18	G 17	G 17
Actuator Remote Terminal	17	G 15	G 14	G 13	G 12	G 11	G 10	G 9	G 8	G 7	G 6	R-5
Altitude Motion Sensor Set (AMSS)	27	G 27	G 26	G 26	G 25	G 25	G 24	G 24	G 23	G 22	G 22	G 21
Valve Assembly Manifold	4	G 2	G 1	Y 0	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8
Electronic Component Assembly	9	G 8	G 5	G 2	R-1	R-4	R-7	R-0	R-12	R-16	R-21	R-26
FM/MS Computer	1	Y 0	Y 0	R-1	R-1	R-1	R-2	R-2	R-2	R-3	R-3	R-4
Load Select Indicator Panel	3	G 2	G 1	Y 0	R-1	R-2	R-2	R-3	R-4	R-5	R-6	R-7
Load Select Indicator Panel	2	G 1	Y 0	R-1	R-1	R-2	R-3	R-4	R-4	R-5	R-6	R-7

Optical Assembly, Laser	0	Y 0	Y 0	R-1	R-2								
Laser Energy Monitor	1												

II. NEXT STEPS

MTAPP emphasis will be to create “quick wins” and show a quantifiable Return on Investment (ROI) to the Air Force. To accomplish this, the areas of immediate impact must have a direct impact on Air Force identified problems and with prime contract awards. In addition, MTAPP provided technical assistance has to focus on improving the small business manufacturing, managerial, and business processes (not building new competencies and capabilities). With this backdrop, MTAPP will prioritize the next selection of MTAPP participating companies to work with the Air Logistic Centers. This will involve working closely with the AFMC Weapons Systems Supply Chain Management (WSSCM), the commodity councils, and the Directors of Small Business at the Air Logistics Centers.

The recommended next steps in the identification of new small manufacturing businesses for MTAPP are as follows:

1. MTAPP program management needs to coordinate the relationships with different organizations (both within the Air Force and in the commercial sector) that are essential for the program success.
2. MTAPP needs to have representation on the newly formed commodity councils. MTAPP has asked for and received permission to participate on the Joint Accessories and Landing Gears commodity councils. Representation will provide MTAPP full visibility on all emerging requirements. SAF/SB and MTAPP program management will need to communicate to AFMC HQ to determine the best process and allocate resources to reflect this representation.
3. MTAPP integration into the Weapons System Supply Chain Management (WSSCM) process for the following programs KC-135, F-15, and F-16 must occur. Integration will enable MTAPP to work with the WSSCM to solve specific supply problems as they are

identified. Small Business Directors at the Air Logistic Centers should insure that all emerging requirements from the WSSCMs are shared with MTAPP program management.

4. MTAPP program management must seek to create a partnership with the Defense Logistics Agency (DLA). This partnership will provide MTAPP program management access to the requirements from the DLA Aging Aircraft initiative called Aging Systems Sustainment and Enabling Technologies (ASSET). Defense Supply Center – Richmond has program management responsibilities for the ASSET program.
5. The Air Logistic Centers, through the DLA ASSET program have identified six parts for which it urgently requires a source of supply. Some of the parts are loading adapters, paveway missile support equipment, circuit board extenders and keyboards for atmospheric early warning systems, and AIM-120 wing removal tool. MTAPP program management must work with the ALC logistics directorate and the DLA to determine the technical data requirements and include this as an input into the identification process for new MTAPP companies.
6. MTAPP will work with the prime contractors that support sustainment programs, such as Lockheed Martin's Hercules program or Northrop Grumman's support of the A-10 program. Both programs continue to seek suppliers that can address spare part availability problems. MTAPP program management working with the representative on the MTAPP steering committee will need to visit both companies to integrate their requirements into the identification process. In addition, the MTAPP program needs to determine how supplier certification requirements can be integrated into the MTAPP technical assistance program. The objective is to ensure that when an MTAPP company achieves program Alumni status, they also become certified suppliers to these companies.
7. Begin the identification process for new small businesses that have capabilities to address the identified issues with the E-3 air switches and wave guides, the landing gear of the F-15, and gearboxes and bearings of the KC-135

8. MTAPP will distribute selection requirements to members of the MTAPP steering committee and seek nominations for small manufacturing businesses they would like to see participate in the MTAPP program. These nominations are expected to be small manufacturing businesses that are currently or can potentially become suppliers to the nominating corporation. MTAPP selection process will ensure that a cross fit occurs between the nominated companies capabilities to meet the identified Air Force requirements and small business certification. The process of seeking nomination from the steering committee members is to ensure proactive engagement of the commercial sector, especially in an environment where the future of small business opportunities will occur at lower tiers in the supply chain.

MTAPP program management will work with Air Force Diminishing Manufacturing Sources and Material Shortages (DMSMS) and the SPOs (System Program Offices) to identify DMSMS problem parts and future requirements. These requirements will be communicated to current MTAPP companies and become inputs in the identification process.

CONCLUSIONS

I. MEASURING SUCCESS

As the program moves forward, the need to determine its return on investment is dependent upon identifying and developing the right set of measures and metrics. The measures will need to provide early indicators that allow for program correction as required. The early indicators are known as performance drivers, which are leading indicators that provide a predictor to future performance. The return on investment metric is a lagging indicator. These are indicators, which are determined at the end of the period or program. The selected indicators will have to be simple to measure and facilitate easy reporting, and the relevant data will have to be easy to gather.

The suggested leading indicators are as follows:

1. Percent share of identified or nominated small businesses by business segment (e.g. machining, electrical, etc.)
2. Percent of nominated business that match the identified needs areas
3. Share of identified small business from government, commercial, and The Asaba Group's initiatives

The suggested lagging indicators are as follows:

1. Ratio of technical assistance dollars to dollar value of solved problems by MTAPP companies
2. Air Force dollar value share of solved problems by MTAPP
3. Dollar ratio of solved issues versus identified issues
4. Air Force share of MTAPP company aggregated revenues
5. Growth in MTAPP company revenues and profitability
6. Change in annual effective survey rating from the MTAPP companies

The leading indicator data will be collected quarterly and the lagging indicator annually. This will begin at the same time with the small business identification process and will be reviewed annually.

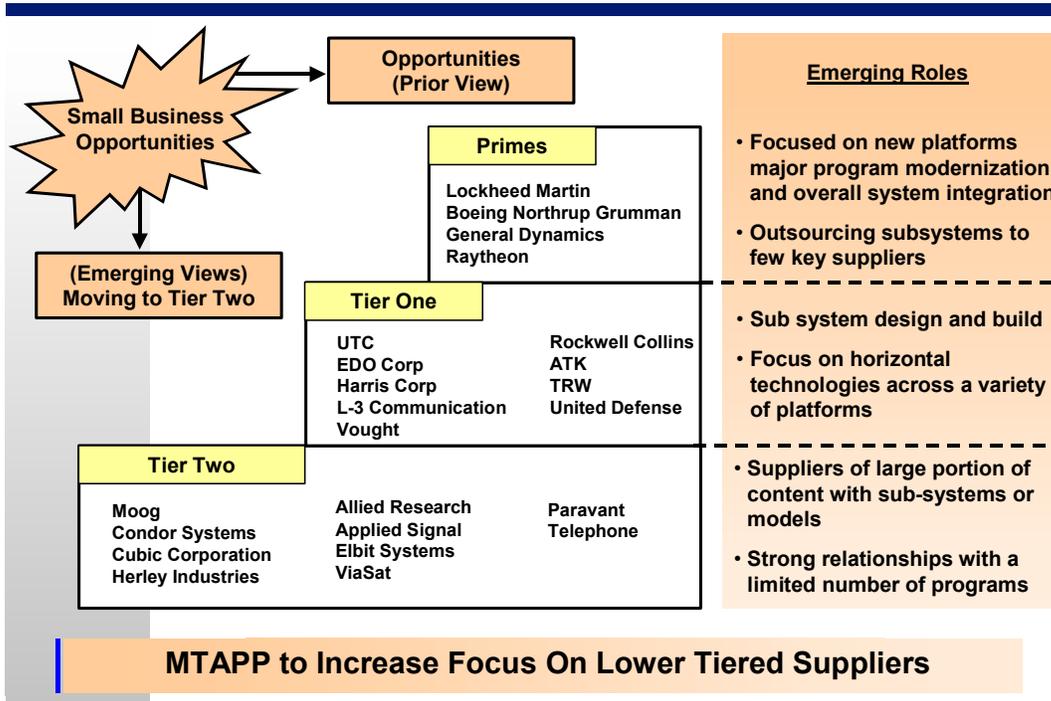
II. SUMMARY OF ACTION

One objective of this report is to chart a course over the next 90 to 120 days for the MTAPP program. The information outlined in the previous chapters represents the new focus of MTAPP - addressing the problems and needs of the Air Force and the commercial sector. In an effort to show a quick return on investment to the Air Force, the Next Steps chapter lays out the required activities for the MTAPP program. The identification of the next class of MTAPP participants will be based on fixing the identified issues on aging aircrafts such as

the KC-135 and the E-3; working on supply issues on the F-15 landing gear, and developing alternative sources of supply for the top priority parts identified in this report.

Exhibit 27

A Shift In Small Manufacturing Business Opportunities



As the Exhibit 27 shows, small business opportunities will move to the lower tiers, which means a proactive engagement with the commercial sector (Primes and first tiers). The suggested approach of requesting nominations from them will ensure MTAPP's continued engagement with the commercial sector. In the next update of the research study, more emphasis will be placed on addressing more difficult supply chain needs of the commercial



sector. We believe that the MTAPP program is on a stronger footing, postured to provide the kind of technical assistance that focuses on competency and enterprise development.

SPENDING BY CATEGORY AT THE ALCS

Exhibit 29

Code	Description	Total of Spare and Repair \$	Total Spare and Repair Forecast \$
14xx	Guided Missiles	\$8,955,132	\$42,920,920
1560	Airframe Structural Components	\$426,204,313	\$872,071,285
1610	Aircraft Propellers and Components	\$10,703,933	\$106,659,752
1615	Helicopter Rotor Blades, Drive Mechanisms and Components	\$65,491,106	\$181,165,037
1620	Aircraft Landing Gear Components	\$206,622,975	\$275,941,835
1630	Aircraft Wheel and Brake Systems	\$234,107,733	\$169,708,578
1650	Aircraft Hydraulic, Vacuum, and De- icing System Components	\$292,671,506	\$85,777,198
1660	Aircraft Air Conditioning, Heating, and Pressurizing Equipment	\$37,020,633	\$70,189,674
1670	Parachutes; Aerial pick Up, Delivery, Recovery Systems; and Cargo Tie Down Equipment	\$2,262,475	\$3,392,747
1680	Miscellaneous Aircraft Accessories and Components	\$166,095,040	\$260,163,902
1710	Aircraft Landing Equipment	\$9,817,925	\$3,883,714
2840	Gas Turbines and Jet Engines, Aircraft, Prime Moving; and Components	\$3,698,168,661	\$4,697,660,063
2915	Engine Fuel System Components, Aircraft and Missile Prime Movers	\$197,564,783	\$254,054,807

2925	Engine Electrical System Components, Aircraft Prime Moving	\$22,642,629	\$19,975,360
2935	Engine System Cooling Components, Air Craft Prime Moving	\$11,738,101	\$8,180,760
2995	Miscellaneous Engine Accessories, Aircraft	\$73,670,830	\$110,110,024
3110	Bearings, Airfriction, Unmounted	\$17,863,088	\$25,976,418
3120	Bearings, Plain, Unmounted	\$20,959,688	\$13,319,659
5820	Radio and Television Communication Equipment, Except Airborne	\$14,114,875	\$19,191,112
5821	Radio and Television Communication Equipment, Airborne	\$58,627,824	\$49,351,146
5826	Radio Navigation Equipment, Except Airborne	\$39,001,848	\$43,161,533
5841	Repair Equipment, Airborne	\$108,654,154	\$141,927,895

GLOSSARY OF TERMS

AF	Air Force
AFML	The Air Force Materiel Command
AFOPPO	The Air Force Outreach Program Office
ALC	Air Logistics Center
ASC/AA	Aeronautical Enterprise Program Office
ASC/AAA	Aeronautical Enterprise Program Office, Aging Aircraft
B	Billions
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CAGR	Compounded Annual Growth Rate
CIBC	Canadian Imperial Bank of Commerce
COTS	Commercial off-the-shelf
DMS	Diminish Manufacturing Sources
DIOR	Directorate for Information Operations and Report
DoD	Department of Defense
GAO	U.S. General Accounting Office
JDAM	Joint Direct Attack Munitions
K	Thousands
LSI	Lead Systems Integrator
M	Millions
MS	Material Shortage
OO-ALC	Ogden ALC
OC-ALC	Oklahoma City ALC
SPO	System Program Office
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Vehicles

WR-ALC Warner Robbins – ALC
WS Weapons Systems
WSA Weapons Systems Availability
WSSCM Weapons Systems Supply Chain Management

APPENDIX

CONTENTS

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List of Organizations That Participated In The Study

Exhibit A1

Organizations Participated In The Research Study
Interviews And Site Visits

Large Systems Integrators	First Tier Suppliers	Industry Associations
<p>The Boeing Company</p> <p>Northrop Grumman</p> <p>General Dynamics</p> <p>BAE Systems</p> <p>Lockheed Martin</p> <p>Raytheon Company</p>	<p>EDO Corporation</p> <p>Honeywell, Inc.</p> <p>Textron, Inc.</p> <p>Rockwell Collins</p> <p>Ball Aerospace</p> <p>SAIC</p> <p>Goodrich Corporation</p> <p>Meggitt PLC</p> <p>Harris Corporation</p> <p>Aerospace Corporation</p> <p>ESCO Technologies</p> <p>Teledyne Brown Engineering</p>	<p>National Defense Industry Association</p> <p>Government Electronics and Information Technology Assoc.</p> <p>Aerospace Industry Association</p> <p>USAF / DoD</p> <p>Air Force Materiel Command</p> <p>Air Force Research Laboratory</p> <p>DoD Small Business Office</p>

LIST OF INTERVIEWEES

Exhibit A2

Aeronautical Systems Center/Aging Aircraft

Jerry Duke Deputy Director

Aerospace Corporation

Michael Cryderman Small Business Liaison Officer

AIA

Bill Lewandowsky Vice President, Supplier Mgmt Council

BAE Systems

Ira Brand Small Business Liaison Officer

Ball Aerospace

Bettysue Jarding Small Business Liaison Officer

Bema Electronics, Inc.

Helen Kwong President

DoD Small Business Office

Victor Ciardello Director, Industrial Base Transformation

EDO Corporation

Randy Olson Operations Manager
Sandy Poll Purchasing Manager

GEIA

Dan Heinemeier President

General Dynamics Decision Systems

Ron Steele Small Business Liaison Officer

Goodrich Electro-Optical Systems

Thomas E. Kiely Manager, Subcontracts

Harris Corporation

Fred Seyboth Small Business Office Senior Manager

Honeywell, Inc.

William Spofford

Procurement Compliance Leader

HQ AFMC

Wing Commander David Orr

John Pamplin

William Mynor

Col Jeffery Parsons

Antony Lander

Lt. Col Scott Savoie

Thomas s. Wells, SES

Transformation Initiatives

Logistics Support

Deputy Director, Logistics

Director of Contracting

Director of Small Business

Technical Director

Deputy Director of Contracting

Lockheed Martin

Samuel Evans

Mike Bush

John Hatch

Jim Randle

Gerry Cartwright

G.L. Bailey

Mike Navaria

Mark Miller

Director, Small Business & Non Production

Procurement Material Mgmt

Director Supplier Diversity

VP Global Supply Chain

Business Manager

Small Business Site Administrator

Director, Major Procurement - Material
Management

Procurement Quality Assurance

Director of Procurement, Material
Management

Meggitt Safety Systems

Alan Mann

Senior Buyer and SBLO

NDIA

Lt. Gen. L. P. Farrell, Jr.

President & CEO

Northrop Grumman

Dawn Feest

Chris Hayes

Vicky Harper-Hall

Procurement Manager, Integrated Systems,
Airborne Ground Surveillance & Battle Mgmt

Director, Integrated Systems, Air Combat
Systems Materiel Integration

Small Business Liaison Officer

PTI Technologies

Kathy Heid

Contracts Manager

Raytheon Company

Tim Wholey
Stephen J. Ogg
Jaime Bohnke, Ph. D.
Christine E. Collins

Shirley J. Patterson
Ronald E. Lyman
Dr. Bei-dwo Chang
Gerry Zimmerman
Benita Fortner

Vice President, Supply Chain Management
Vice President, Supply Chain Management
Director, Supply Chain, Missile Systems
Director, Supply Chain, Missile Systems
Manager, Supplier Diversity Supply Chain
Mgmt
Manager, Contracts-Major programs
Senior Director & General manager
Vice President, Quality
Director, Supplier Diversity Program

Rockwell Collins

Daniel Schneider

Manager, Small Business Program

Science Applications Intl Corporation

George Otchere

SVP for Corporate Development

Teledyne Brown Engineering

Harry Chaffee

Director of Contract Administration

Textron, Inc.

Holly Pare

Compliance & Audit Manager

The Boeing Company

Carrie L. Hill

Director, Supplier Diversity
Director, Supplier Diversity, Integrated Defense
Systems
Manager, Supplier Diversity (Anaheim)
Vice President, Integrated Defense Systems
Supplier Management

Liz Riede

Raul Alvorado, Jr.

William L. Stowers

Tinker AFB Air Logistics Center

Pat Frederick

Weapons System Supply Chain Manager
Director of Small Business & Source
Development

Michael Yort

Donna Dillahunty

Chief, Material Support Branch

Jim Dooley

Chief, WSSCM Analysis Branch

Don Holland	Avionics Team Lead
RJ Hamilton	Avionics Engineer
Yolanda Barker	JACC Inventory Management Specialist
Mel Black	Logistics Management Specialists Logistics Management Specialists, Team Coordinator
Ron Magby	Small Business Specialist
Carole J. Wanish	Source Development Specialist
Joe Roop	

United Technologies

Cassandra Charles Gerst	Manager, Global Supplier Diversity Commodity Manager, Small Machined Parts, Aerospace Supply Management
Alton Moss	

United Technologies Sikorsky

David H. Vargas	Purchasing Manager, Supply Management Small Business Liaison Officer, Material Development
Lawrence Wooten	

United Technologies Pratt and Whitney

Tim Blaisdell	ME Business Development
---------------	-------------------------

Warner Robbins AFB

Ken Burke	Small Business Specialist
Tom Yentzer	Metallurgist
Larry Kutay	F-15 International Logistics
Gregory Custer	F-15 Analysis Branch
Randy Ivey	F-15 Technical Specialist
Hugh Foskey	Chief, Contracting Division
Dave West	
Steve Manning	
Jerry Mobley	



ROUNDTABLE ATTENDEES

Name	Title / Organization
Matt Benavides	Deputy Director, Office of Small and Disadvantaged Business Utilization
Jaime Bohnke	Director, Supply Chain, Raytheon
Michael Bush	Director, Lockheed Martin
Tom Christensen	Consultant, The Asaba Group
Victor Ciardello	Director of Industrial Base Transformation, Office of the Secretary of Defense
Courtland Cox	Senior Advisor, The Asaba Group Director, Air Force Office of Small and Disadvantaged Business Utilization
Joseph Diamond	
Col Paul Dunbar	Air Force Integrated Logistics Support Office(USAF/ILI)
Victor Edozien	Principal, The Asaba Group Director, Small Business & Non-Production Procurement, Lockheed Martin
Samuel Evans	
Ken Feeser	Deputy Chief, Integration & Technology Branch, Air Force Manufacturing Technology Division
Dawn Feest	Manager, Northrop Grumman
Jerry Gomer	Associate Consultant, The Asaba Group
David Jackson	MTAPP Program Manager, Air Force Outreach Program Office
Bill Lewandowsky	Aerospace Industries Association
George Otchere	Director, Science Applications International Corporation Manager, Supplier Diversity Supply Chain
Shirley Patterson	Management Space & Airborne Systems, Raytheon
Liz Riede	Director, Supplier Diversity Integrated Defense Systems, Boeing
Fred Seyboth	Senior Manager, Harris Corporation MTAPP Assistant Program Manager, Air Force Outreach Program Office
Mallie Vann	
Renee Wesley-Case	Director, US Air Force Outreach Program Office

LIST OF RESEARCH SOURCES

1. Aerospace & Defense research - Stephens Inc. Investment Bankers
2. Aerospace Supply Chain Study - Cap Gemini Ernst & Young
3. Aging System Sustainment and Enabling Technologies (ASSET)
4. AT Kearney
5. Avionic Magazine
6. Banc of America securities; Aerospace and Defense research
7. Booz Allen Hamilton
8. CIBC Defense Electronics & Defense industry analysis
9. Council of Advanced Purchasing Studies (CAPS)
10. Defender Journal
11. Diminishing Manufacturing Sources and Material Shortage conference (1999 – 2003)
12. Directorate for Information Operations and Reports (DIOR)
13. General Aviation Manufacturers Association
14. GIDEP database
15. Goldman Sachs Research
16. Harvard Business School knowledge database
17. Lockheed Martin
18. Mckinsey Consulting supply chain management practice
19. Mckinsey Quarterly
20. Merrill Lynch Defense and Aerospace industry research
21. National Association of Manufacturing
22. National Coalition for Advanced Manufacturing (NACFAM)
23. National Defense Journal
24. Northrop Grumman Industry Analysis center
25. Office of Deputy Under Secretary of Defense (Industrial Policy)
26. Office of the Under Secretary of Defense (Acquisition, Technology, & Logistics)



-
27. Prudential Financial Defense and Aerospace research
 28. Purchasing and Supply Chain Management (PSCM) presentation - Mr. Thomas S. Wells Deputy Director of Contracting (March 12th, 2003)
 29. Raytheon Investment presentation
 30. S. G. Cowen defense and Aerospace industry research
 31. Securities and Exchange Commission (SEC) Edgar database
 32. Supply Chain Management - A Strategic Lever for Business Success
 33. The Economist Intelligence Unit
 34. U.S. Bureau of Industry and Security
 35. U.S. General Accounting Office

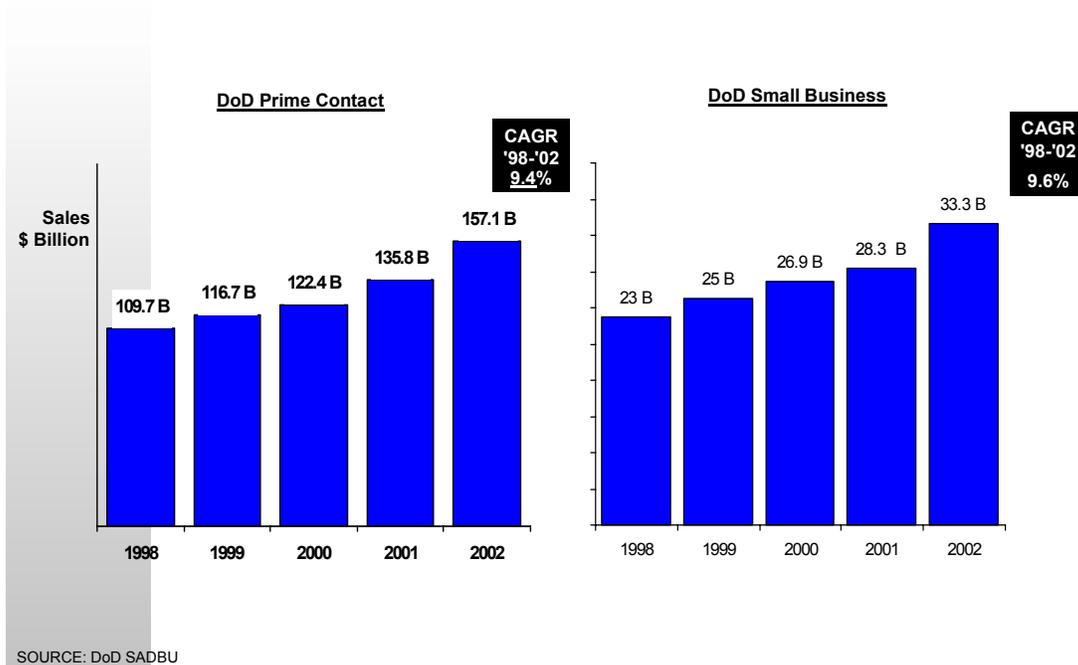
SMALL BUSINESS PARTICIPATION AND IDENTIFYING NEEDS

Small Business Participation Rates

The most recent Department of Defense data we had available for this study was for fiscal year 2002. In fiscal 2002, small business captured 14.4% of the \$41.6B in total Air Force procurements and 26.7% of \$14.6B in the procurements from the Defense Logistics Agency (DLA). We concluded that the difference was a result of the majority of prime small business contract awards occurring in supporting the DLA Sustainment activities.

Exhibit A3

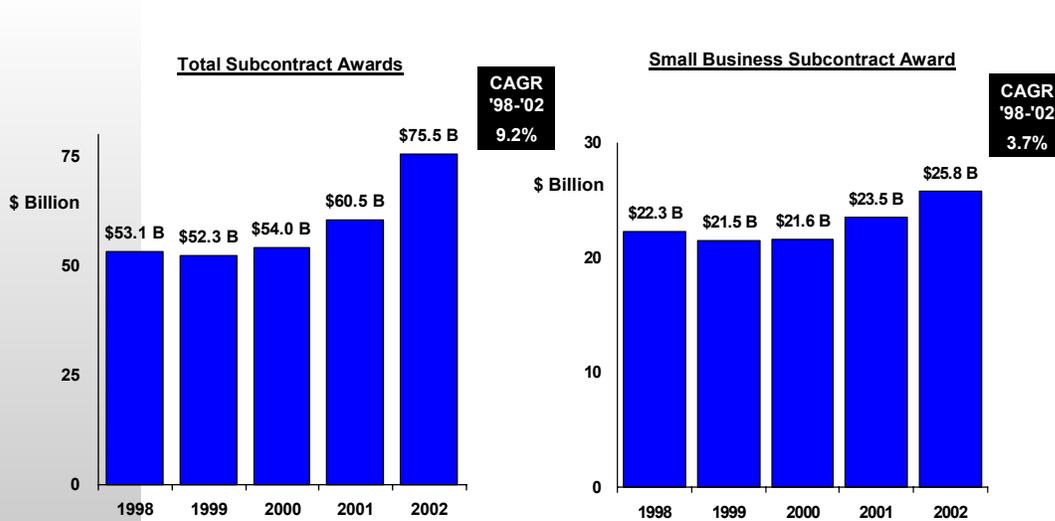
Small Business Award Has Kept Pace With DoD Prime Awards



When viewed as a trend, we found that small businesses have kept pace with the growth in prime contractor awards (See Exhibit A3). From 1998 to 2002, the Department of Defense prime contract awards grew at a CAGR of 9.4%. During the same period, small business awards grew at a 9.6% rate, from \$23B to \$33.3B. However, at the subcontracting level, small business awards did not keep pace. During the period from 1998 to 2002, subcontract awards grew from at a 9.2% CAGR, from \$53.1B to \$75.5B, while small business subcontract awards at the prime and subcontractor levels grew at a 3.2% CAGR, from \$22.3B to \$25.8B.

Exhibit A4

Small Business Subcontract Awards Not Kept Pace With Subcontracts



SOURCE: DoD SADB

A possible explanation of the sub contract awards share loss is the changing structure of the military supply chain. This is seen in the creation of a tiered structure of suppliers with small business opportunities at second and third tiers of the supply chain. We requested commodity level data for small business participation from the commercial sector and Air Force Materiel Command, but were not given access to this information. We believe, based on our experience from other industries, that if the data exist, the level of accuracy will be marginal at best.

Exhibit A5

Small Business Deficient Categories Don't Equal Opportunity

2-Digit		2002	
FSC	2-Digit FSC Name	Total \$	SB %
12	Fire Control Equipment	93,886,521	6.8%
13	Ammunition & Explosives	1,006,650,751	2.5%
14	Guided Missiles	637,238,230	5.6%
15	Aircraft & Airframe Structural Components	12,086,056,039	2.6%
16	Aircraft Components & Accessories	1,377,337,183	23.4%
28	Engines, Turbines, and Components	2,642,484,370	6.3%
29	Engine Accessories	224,274,334	27.5%
58	Communication, Detection, and Coherent Radiation Equipment	1,634,874,814	8.4%

4-Digit		2002	
FSC	4-Digit FSC Description	Total \$	SB %
1240	Optical Sighting and Ranging Equipment	16,509,786	8.5%
1265	Fire Control Transmitting & Receiving Eq	193,055	79.2%
1285	Fire Control Radar Equip, Except Airborne	1,105,137	73.5%
1290	Miscellaneous Fire Control Equipment	3,996,167	12.7%
1305	Ammunition, through 30 mm	790,985	0.0%



1310	Ammunition, over 30 mm up to 75 mm	0	-
1338	Guide Msl and Sp Veh Inert Un, Fuel, Comp	84,496	100.0%
1370	Pyrotechnics	9,062,119	0.0%
1377	Cartridge & Propellant Actuated Dv & Comps	38,211,225	39.7%
1420	Guided Missile Components	43,746,885	3.2%
1427	Guided Missile Subsystems	0	-
1560	Airframe Structural Components	1,416,243,980	17.2%
1620	Aircraft Landing Gear Components	103,520,901	42.5%
1630	Aircraft Wheel and Brake Systems	194,399,997	9.3%
1650	Acft Hydraulic, Vacuum & De-icing Sys Comp	126,210,415	22.9%
1680	Msl Aircraft Accessories and Components	772,131,904	21.4%
2845	Rocket Engines and Components	0	-
2915	Engine Fuel System Components, Aircraft & Missile	105,651,436	12.3%
2925	Engine Electrical Sys Comps, Aircraft Prime Moving	17,643,439	12.3%
5825	Radio Navigation Equip, Except Airborne	28,761,688	0.2%
5826	Radio Navigation Equipment, Airborne	43,764,207	3.6%
5840	Radar Equipment, Except Airborne	195,330,268	5.0%
5841	Radar Equipment, Airborne	420,718,926	1.6%

Exhibit A5 shows selected commodity categories that require significant manufacturing activities to supply the products. For the selected manufacturing related categories, small business share of total spending ranges from 1.5% to 33.2%. To determine the areas of deficiencies or low participation, we selected commodity categories where the small business share was below the 14.4% average of the Air Force procurement community. The deficient commodity categories were as follows:

1. Weapons
2. Fire Control
3. Ammunition and Explosives
4. Guided Missiles
5. Aircraft and Airframe components

6. Engine turbines and components
7. Communication, detection and radiation equipment
8. Electrical and electronic equipment components

A second analysis was done to determine the small business participation levels within the sub-categories. Our observation from the data revealed participation deficiencies in some of the commodities. A channel procurement analysis was done to help inform where the acquisition decisions were made. In most instances, if the spending did not occur at the Air Logistics Center or the Defense Logistics Agency (DLA) we made an assumption that it occurred at a product center. Most product center spending is with large businesses that possess broad systems integration capabilities. We determined that the commodities such as non-airborne radar equipment, guided missile components, and airframe structural components had a large share of spending at the DLA or ALC with very low small business participation. These commodity categories were flagged as potential opportunities for small businesses to expand their participation. Based on our experience, we must caution that minimal participation in a commodity does not necessarily equate to small business opportunities. In most instances, there is a rational economic reason why the category has minimal participation. This can be due to barriers such as:

- Economies of size/scale
- Technology intensity/diversification risks
- Economies of scope
- Proprietary intellectual assets

During our interviews with industry participants, when asked to provide commodities with minimal small business participation, they validated these concerns providing commodities such as microwave devices, semiconductors, and electro-magnetic components. These are commodities that require significant size and scale to achieve sustainable profits. The opportunities that are identified by the minimal participation approach will not be effective



in meeting the AFOPPO near-term objective, which is to provide value quickly to the MTAPP stakeholders.

CONCLUSIONS

Based on the insights yielded through the MTAPP Research Study analysis detailed above, we concluded that this approach was flawed. We believe that the only approach to the study that would yield the required road map to measurable benefit for the Air Force is the approach, which begins by identifying quantifiable opportunities for small manufacturing businesses to address problem areas or supply chain needs. These needs may occur in commodities with or without an abundance of small manufacturing businesses. In most instances, these commodity groups have weak correlations to participation rates of small manufacturing businesses. Following this conclusion, we shifted the focus of our efforts to identify these quantifiable needs.