



MTAPP POSITION PAPER

Becoming an Agile Small Business Manufacturer

**The Case for a New Approach to Support the
Dynamic Needs of the Air Force Supply Chain**





Small Business Agile Manufacturing

What MTAPP found:

MTAPP In Focus Report: *Business Agility* *What Small Business Should Know*

As the Air Force continues to transform to address emerging military threats and persistent supply chain challenges, ripple effects across defense supply chains are changing the roles and requirements of small business (SB) manufacturers. New warfighter support concepts such as "Agile Combat Support" are changing the competitive landscape for MTAPP member suppliers and understanding the need to become more agile within your own business is imperative.

The MTAPP Research Study Update detailed three examples of opportunities for agile small business manufacturers:

- Unanticipated surges in demand for parts
- Consolidation initiatives within the AFMC commodity councils
- The need for commercialization of new technologies through the Small Business Innovation Research (SBIR) program

The objective of this report is to use these three examples to provide MTAPP member companies with context for change efforts within their own organizations. As the DoD and Air Force continue to transform their own supply chains, SB manufacturers cannot simply maintain the status quo within their businesses.

For this paper, we have used a working definition of SB agility as follows¹:

"An Agile SB is a fast moving, adaptable and robust enterprise capable of rapid reconfiguration in response to market opportunities. Such a corporation maintains appropriate processes and structures and integrates technology, organization and people into a coordinated system in order to achieve competitive advantage by delivering capabilities that continue to surpass those obtained from current enterprise practices."

¹ Paul T. Kidd : AGILE MANUFACTURING: A STRATEGY FOR THE 21st CENTURY

- The rate of change within the DoD and Air Force transformation efforts is increasing as a combination of warfighter feedback from the Global War on Terror (GWOT) and increased visibility across DoD supply chains brings a new urgency to the efforts.
- The unanticipated drain on assets caused by both the intensity and length of current military operations has stressed the DoD/Air Force supply chains causing symptomatic constraints that have highlighted weaknesses not yet addressed by the small business manufacturing base.
- These dynamic changes based on military operations are occurring during a time of massive change across DoD supply chains with each service acting on the directive of President Bush to transform the physical structure and culture of DoD logistics.
- Air Force Materiel Command (AFMC) is aiming to implement a system with multiple purchasing and supply processes into a single end-to-end process throughout the Air Force supply system.
- The Small Business Innovation Research (SBIR) Program is supporting urgent needs for new battle field technologies.
- Surges in demand for critical spare parts, ammunition, and batteries, have caused delays in action and reduced efficiency for the warfighter.
- These dynamic challenges and increased demands on the DoD/Air Force supply chains present opportunities to SB manufacturers able to adjust their own business models to meet these new demands.
- Agile SB manufacturing is a concept that addresses the obstacles to realizing these opportunities.



Transformation – Changes in the Structure and Requirements of Supply Chains

The working definition of transformation used within this research effort, defined as: “A process by which the military achieves and maintains advantage through changes in operational concepts, organization, and/or technologies that significantly improve its war fighting capabilities or ability to meet the demands of a changing security environment”² was adopted from *The US Air Force Transformation Flight Plan 2004*. The Flight Plan offers a road map of future Air Force strategy and activities and makes the critical distinction between two interrelated ongoing transformations:

- The Air Force is transforming first from a force built to win in the industrial-age to one focused on winning in the information-age.
- The second transformation includes all efforts to shift military advantage from capabilities built to address a Cold War landscape to capabilities that address the asymmetric threats of the post-Cold War battlefield. It is the prioritization and execution of changes designed to provide the services with the capabilities to “see first, act first, and win decisively”³ that defines what impact transformation will have on small business manufacturers.

Along with these changes in the strategic context for military advantage, come changes in performance perspectives for supporting warfighter success. Shifts in expectations as specific as evolving from “sorties per target” to “targets per sortie”⁴ and as broad as decreasing the Air Force’s mobility footprint are changing the requirements placed on an aging aircraft fleet. These changes dramatically increase the demand for new capabilities and innovation from small businesses. To ensure that the warfighter is able to accomplish these objectives, the DoD has shifted its basis for defense planning from a threat-based model to a capabilities- or effects-based model.⁵

² US Air Force, *The US Air Force Transformation Flight Plan 2004*, Future Concepts and Transformation Division

³ Dr. A. M. Andrews “Army S&T Transformation Strategy” NDIA Conference (February 2005)

⁴ Gen John P. Jumper, “Global Strike Task Force A Transforming Concept” (Spring 2001)

⁵ Ibid.



A successful shift to an effects-based acquisition strategy requires dramatic changes in the structure and execution principles of the industrial base.⁶ Changes to DoD concepts of organization, operational practices, and capabilities will all impact the role of small business. Virtually all aspects of the military are changing to ensure that it can fight unpredictable threats while sustaining the infrastructure needed to train and support forces. One area that has seen changes is the acquisition process and philosophy. The philosophy is now centered around the “commander’s intent: - define the vision, objectives, and timing and let the contractors figure out “the how”. This philosophy is reflected in the acquisition mantra of seeking “best value”, not necessarily lowest cost. Companies now compete on qualifications, supply chain capabilities, and past performance.

AFMC Commodity Councils

Air Force Materiel Command (AFMC) has embarked on an enterprise-wide Business Transformation aimed at integrating multiple purchasing and supply processes into a single end-to-end process that spans the Air Force supply system. The goals of this transformation include increasing materiel availability by 20%, reducing sourcing cycle times by 50%, and reducing total purchase and repair costs by 20%⁷. A cornerstone within this effort is the implementation of an integrated PSCM Business Model that utilizes cross-functional commodity councils to formulate AFMC wide purchasing strategies. Air Force Contracting is adopting the commodity council concept to better leverage its spend and improve its customer responsiveness. Commodity councils’ objective is to identify crucial commodities for centralized management. The rewards of implementing the commodity council’s concepts are in eliminating duplication of effort, and in minimizing supply chain cost through integration / collaboration. Eight commodity councils were chartered across the three Air Logistics Centers. They are in landing gears, power systems, instruments, communications, aircraft structural components, support equipment, and aircraft accessories. Our analysis of the participation rates of small business for each of the commodity councils shows small business range from 8.8% to as high as 49%.

⁶ Ibid.

⁷ Kim Powell, AFMC presentation, “*Sustainment Transformation Awareness*” (November 8, 2005)



Supply Chain Agility Defined

While much of the current supply chain transformation underway within the DoD focuses heavily on the concepts of Lean Manufacturing and Six Sigma, the continued occurrence of constraints within these chains leads to the question of what is it that limits the ability of the supply base to adjust to DoD requirements. While lean management emphasizes the pursuit of process efficiency – generating the greatest outcome from the least input through the minimization of wastes, agility refers to effective, flexible accommodation of unique customer demands suggest that the agile company is one that “[uses] market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace⁸”. Instead of relying on speculative notions of *what* might be demanded, the *quantity* of demand, and the *location* of that demand, agility employs a “wait-and-see” approach to demand, not committing to products until demand becomes known.

Therefore, while lean management typically calls for make-to-stock replenishment driven by short-term forecasts, agile supply chains employ make-to-order provisions, producing only what has already been sold or committed in the marketplace. Key to providing agile response is flexibility throughout the supply chain. In manufacturing, this would call for the ability to produce in large or small batches, minimizing the “pain” associated with setups and product changeovers, often cited as a critical component of lean manufacturing. Agility might also call for a flexible workforce with members cross-trained, or able to fulfill a variety of tasks as dictated by the demand situation. Product designs should also reflect an ease of assembly that provides for quick conversion of materials from a raw to completed state. Beyond the capabilities of the focal firm, the rest of the supply chain must be responsive as well for agile market accommodation. In fact, response-based supply chains are often characterized as “short,” with few or no intermediaries. Supply should be located nearby, and information sharing among the parties must be open and frequent.

As is the case with lean management, advocates for agility have established a strong voice in practice and research. Many companies are realizing that the costs and risks associated with

⁸ (Christopher 2000). Naylor, Naim, and Berry (1997)



holding speculative inventories are too great. This is particularly true with products that have short life cycles (such as personal electronics) or erratic demand (like fashion apparel), where the risks of obsolescence are high. Toyota's supply chain represents a lean strategy in its production of high-quality, affordable automobiles, but there are few, if any, agile manufacturers of automobiles who would employ true make-to-order (MTO) accommodation of customer demand on a large scale. However, other product categories – both complex and simple in product composition – do employ agile, MTO response to the market.

Agile Supply Chain Management – DoD Perspective

In October 2005, Kenneth Krieg, Under Secretary of Defense (Acquisition, Technology and Logistics) laid out the expectations for the new and agile DoD supply chain as follows:

“Recent and current world events have demonstrated the challenges that will face our national security structure for the foreseeable future. These challenges present an increasing operational need for speed and agility in our military response to threats and disasters. This need dictates that we have logistics processes that are as rapid and agile as our maneuver forces. . . . the Department has clearly heard the call for action from this Committee and other members of Congress. We are in the final stages of issuing revised guidance on Contractors Accompanying the Force; we are pursuing leading-edge commercial procurement practices through efforts to integrate supply procurement; we are actively developing an integrated logistics transformation strategy; and we are improving our support to deployed forces to include improved supply availability, reduced re-supply times, and smaller, more agile operational supply lines.”

Defense Logistics Agencies (DLA)

In the 1990s, in response to lessons learned from a logistics debacle in the first Gulf War and the changing demands of the DLA's most challenging customer, the modern soldier, the agency began a transformation. It streamlined operations to become a leaner, more flexible support organization for the military. "It became very clear that we had to become



competitive. And for us to become competitive we had to be agile," explains Director of Supply Corps Vice Adm. Keith W. Lippert, U. S. Navy.

For the DLA, agility is measured in terms of getting the right supplies to the right troops at the right place and time. Since streamlining its operations, there's been a dramatic reduction in back orders of weapons system hardware—from 450,000 in October 2001 to an all-time low of 280,000 this March. The DLA projects that back orders will drop to 275,000 by year's end and continue to decline in 2005. The number of back orders of more than 180 days have plummeted from nearly 100,000 in October 2001 to just over 40,000 this May. And in fiscal year 2004, the DLA says it will report its lowest cost recovery rate (operating costs as a percentage of total sales) ever of 15.5 percent, down from a high of 35 percent in 1992. The increased emphasis on affordability and the pursuit of a best value has led to a number of new initiatives and processes both within the AF and DoD acquisition community, which will set the future rules of engagement for small business manufacturers.

Air Force Agility – Purchasing and Supply Chain Management (PSCM)

Senior AF leadership identified AFMC as the lead MAJCOM on this effort and initiated the PSCM transformation to rapidly reduce costs, improve performance, and address the following concerns:

- *Sustainment processes do not meet the needs of the Air Expeditionary Force (AEF)* – The AEF war fighting mission demands agility in PSCM processes at affordable costs.
- *Weapons System sustainment costs are impeding modernization* – Reducing total supply chain costs can potentially free up funds for modernization.
- *Competition from external sources* – Rising costs are opening the door for increased competition from external sources to provide Air Force supply chain management and parts support. Improving performance encourages customers to select Air Force supply operations as their supplier of choice for sustainment.
- *Increasing pressure to reduce costs and improve availability* – Senior leaders emphasize the need to significantly reduce costs while improving weapons system availability.



- *Loss of Intellectual Capital* – Near-term retirements create the need to enhance workforce skills and provide an opportunity to facilitate process change and multi-skilling.

Examples of Air Force Supply Chain Areas Requiring Agile SB Manufacturers

Meeting the Needs of the Air Force Commodity Councils

The Air Force is also looking at its internal processes to identify ways to optimize cost, and gain efficiencies. The Air Force Materiel Command (AFMC) has instituted two key supply chain initiatives targeted at achieving cost reduction and weapon system availability goals.

The initiatives are:

1. Purchasing and Supply Chain Management (PSCM). PSCM objective is to integrate the purchasing and supply processes of the Air Force supply chain and help reduce operational support cost thereby improving the sustainment of weapon system parts and equipment. PSCM has led to the creation of teams with cross functional representation called commodity councils. These councils are tasked with finding ways to leverage Air Force spending in particular commodities to achieve PSCM goals - cost savings and best value to the Air Force.
2. Weapon System Supply Chain Management (WS SCM). WS SCM is a companion initiative to PSCM. It ensures effective coordination with vertically integrated functions such as commodity procurement, engineering, and manufacturing to achieve weapon system availability goals of the Air Force. WS SCM is a central point for collecting, analyzing, and addressing issues that affect particular weapons systems availability.

For small business manufacturers operating as prime vendors for the DoD, industry trends described above will have a material impact on the long-term viability of this component of their business. Our interviews with the AFMC commodity councils indicated that their strategies could result in significantly fewer small business prime contract opportunities. The ALC lean initiatives and increases in inventory visibility throughout the supply chain could also limit overall inventory requirements decreasing the number of buy opportunities in the



short-term. Slowing growth in DoD budgets and further competition from foreign suppliers could place greater cost pressure on small businesses forcing them to either become more efficient to reduce costs, or exit the direct to DoD market. Despite these potential challenges, each of these trends will also present opportunities for proactive small businesses to adapt their business models to target new sources of contracts. Changes in procurement responsibilities and sources of contract origination should present new marketing opportunities. In the long-term, the defense market and the DoD supply chain will continue to be a source of business growth and sustained viability for small business manufacturing firms. These suppliers will be responsible for the following commodity management activities:⁹

1. Commodity Management and Program Management
2. Sustainment of the Aircraft to extend the service life to 2022
3. Systems Engineering
4. Modifications: Structural, Avionics, Engines and Mechanical
5. Test and Evaluation
6. System Integration Laboratory

Surge Requirements for Critical Spare Parts

During the Iraq war, a number of crisis situations resulted from a lack of surge capability in the industrial base. There is a significant gap between potential capacity utilization and available capacity. Ammunitions, batteries, chemical biological warfare suits are examples where the industrial base could not meet the surge in demand. While systems integrators have maintained the excess capacity, the sub-tier suppliers have not. The ability to surge will depend on the availability and the desire of the sub-tier suppliers. The ability to rapidly expand production of platform systems, components, and munitions is constrained not only by the surge capacity of the prime contractor, but also by the capabilities of the supply base.

When these surges in demand cause the supply of critical parts to slow, often the DLA and Air Force Depots look to creative solutions to solve these challenges. The need for SB manufacturers to be able to adjust to take advantage of these opportunities is enormous.

⁹ Based on a review of the RFQ documents for the Landing Gear and Support Commodity Councils



As an example, the DLA is pursuing the following opportunities:

- Expanding or Exploring Direct Sales Relationships with OEMs
- Partnering with 2nd Tier Aviation providers for Direct Sales
 - Heroux-Devtec (C-130/KC-135/E-3 Landing Gear)
- Tailoring Solutions for the Joint Warfighter
 - Kitting/Contracting Solutions
 - Chemical Management Services

A second example comes from the constraint of the landing gear supply chain due to a combination of increased weapons system life-cycle, corrosion of existing inventory, and material shortages through the forgings market.

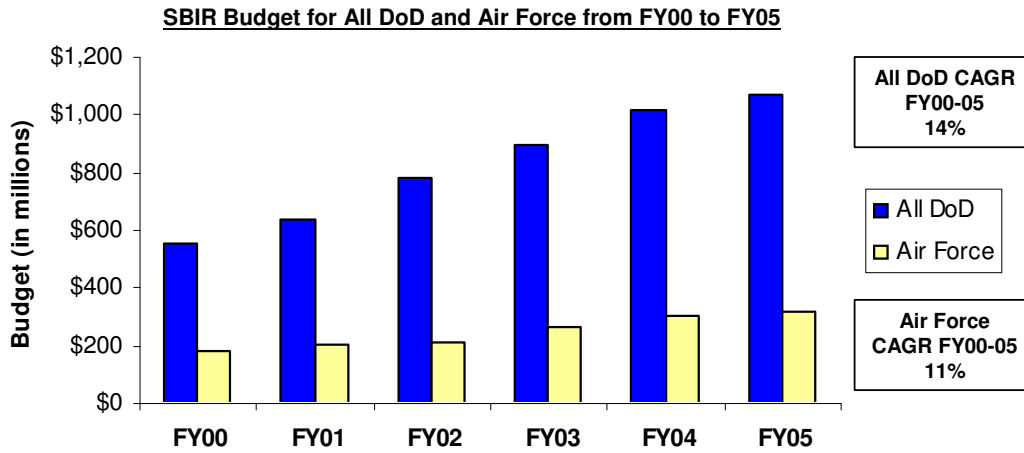
SBIR Technology Commercialization

Managed by the Air Force Research Laboratory (AFRL), Wright-Patterson AFB, Ohio, the Air Force Small Business Innovation Research (SBIR) Program is designed to stimulate technology research by small businesses while providing the government with cost-effective technical and scientific solutions to challenging problems. SBIR also encourages small businesses to market SBIR technology in the private sector, and foster participation by minority and disadvantaged firms in technological innovation. SBIR program funds early-stage R&D at small technology companies (U.S. for-profit small businesses of 500 or fewer employees). The DoD SBIR program, funded at approximately \$1.16 billion in FY06, is made up of 10 participating components: Army, Navy, Air Force, Missile Defense Agency (MDA), Defense Advanced Research Projects Agency (DARPA), Chemical Biological Defense (CBD), Special Operations Command (SOCOM), Defense Threat Reduction Agency (DTRA), National Geospatial-Intelligence Agency (NGA), and the Office of Secretary of Defense (OSD). SBIR overall budget has grown with CAGR of 14 % from FY00 to FY05, respectively the Air Force component budget has grown with CAGR of 11% for the same time period (Exhibit One).



EXHIBIT 1

SBIR Budget Has Grown Steadily in The Past Five Years



Source: Small Business Innovation Research, DoD, Resource Center

SBIR is a three-phase process: In Phase I technology feasibility is determined and contracts are valued up to \$100,000, lasting from six to nine months. Phase I proposal format should include proposed commercialization strategy. SBIR technology commercialization is the process of developing marketable products or services and delivering products and services for sale (whether by the original party or others) to Government or commercial markets.¹⁰ Small businesses should have clear strategy for commercializing this technology in DoD, other Federal Agencies, and/or private sector markets and provide specific information on the market need the technology will address and the size of the market, and also include a schedule showing the quantitative commercialization results from this SBIR project that the applicant company expects to achieve and when. The evaluation of candidates for the SBIR award is based on their ability to develop and apply successful commercialization strategy.

In Phase II, (awarded to successful Phase I contract winners) the necessary R&D is accomplished to produce a well-defined product/process. These awards typically span 2 years to accomplish the primary research effort and are valued up to \$750,000. Phase III is the commercialization of the technology using private sector or federal agency (non-SBIR) funding to commercialize a Phase II project result. The number of Phase I awards is usually

¹⁰ Definition of Commercialization, DoD Program Solicitation for SBIR



consistent with the agency's RDT&E budget, the number of anticipated awards for interim Phase I modifications, and the number of anticipated Phase II contracts. The Asaba Group's analysis of the number of SBIR awards in FY05 shows that only 17 percent of all DoD proposals are awarded in Phase I, and even lower number – 7 percent reach Phase II (out of 13,480 proposals in Phase I, 2,344 were awarded, and only 998 received awards in Phase II). In the Air Force component this ratio is higher (out of 3,256 proposals in Phase I, 608 were awarded, and 339 received awards in Phase II). Analysis of the award data for the past five years shows that despite of the substantial growth of the SBIR budget (see Exhibit 1) and the number of proposals in Phase I, the percentage of proposals that reach the commercialization stage of project results has not increased and remained within 7% to 10% of all DoD proposals. In order to successfully support SBIR commercialization efforts, small businesses should develop their abilities to apply effective marketing strategy and logistics management.

MTAPP Conclusions

Strong domain expertise and/or cross-commodity capabilities are highly valued by the large contractors and the Air Force acquisition community. MTAPP has adopted an approach to addressing these requirements utilizing “Agile Manufacturing Business” concepts proven to assist companies serious about change.

MTAPP will ensure that technical assistance to our member companies reinforce these concepts through activities that are in sync with the industry trends and enhances the capabilities of MTAPP companies. This means implementing initiatives that enable the program to create small business teams that can meet both DoD/AF and industry emerging opportunities. Also it may demand that the MTAPP program provides a search capability which enables teaming between the MTAPP participating companies and provides to the prime contractors small business teams that can provide the required competencies. Another consideration is the fact that the large Defense contractors are competing on two fronts – system integration capabilities and expertise in specific knowledge domain. For small business to succeed in the second and third tiers of the supply chain, they will need to have greater capability specialization and become experts in a particular knowledge domain. This



will be an essential component of a compelling value proposition to the Air Force/DoD and large defense contractors. Purchasing and Supply Chain Management initiatives led to the creation of commodity councils and MTAPP is already working closely with these councils to provide small business solutions to some of their supply problems. The ultimate goal of the commodity council is to leverage the Air Force spend and achieve cost and delivery performance. For MTAPP to provide the kinds of solutions that will be needed by the commodity council, it is important that the participating small businesses have the breadth of capabilities that will be required. MTAPP is currently involved with the activities of a number of commodity councils and based on the needed requirements will assist with developing the required capabilities of its member companies.

MTAPP should investigate the virtual manufacturing network model to help address demand surge. These are virtual manufacturing enterprises—integrated, collaborative virtual supply chains—that facilitate productive working relationships between small business manufacturers and the large prime contractor. Virtual manufacturing enterprises are well positioned to respond to the demand surges that war often brings and to realign supply chains as circumstances dictate. These are teaming arrangements that are enabled by advances in collaboration internet tools. Participating MTAPP manufacturers would not necessarily play a role in every contract the network is awarded. Participation would be project-driven, with suppliers selected for their project-related capabilities, capacities and strengths. MTAPP can facilitate the formation of the network with one or two of the MTAPP companies as the contract lead and working with one or two prime contractors as sponsors of the network. The network will target situation were a surge in demand continues to be a challenge for the industrial base. A first step is the establishment of collaborative tools such as blogs, net meeting capabilities, and a file sharing portal. The virtual model could build an internet capability through a blend of off-the-shelf software and customized technology. The costs for the necessary hardware, software and integration resources are significant, but given the scope and volume of the potential contracts involved, this investment will indeed be justified. MTAPP should consider benchmarking some existing models and determine which model or hybrid approach will be most effective and applicable to the program. The Doyle Center for Manufacturing Technology located in Pennsylvania is a virtual manufacturing project involving a branch of the armed forces and a



tactical aircraft manufacturer to develop a virtual supply chain for components of a new jet engine.

MTAPP action items on SBIRs commercialization should be treated on an opportunistic, case-by-case basis. The challenge with MTAPP is that the program is not geared to drive technology commercialization. However, MTAPP can play a role where it seeks to improve the manufacturing capabilities of companies that have identified a path to commercializing their technology. The ideal way to identify these types of situations will be working in conjunction with the Air Force Office of Small Business Programs, Air Force Outreach Program Office (program manager for the AF mentor-protégé program) and prime contractors. The goal will be to identify SBIR phase three efforts where MTAPP can help accelerate the process to get the product manufactured and delivered at the optimal cost and delivery expectations.