1. INTRODUCTION

Without superior suppliers—and without superior purchasing—no supply chain can successfully compete in today's industrial marketplace.

(Fitzgerald, 2000a)

The Air Force is under a great deal of pressure to maintain or improve performance while reducing its infrastructure costs to pay for new weapon systems, force structure, and personnel retention initiatives (e.g., pay increases). New purchasing and supply management (PSM) practices in the commercial sector have been reported to substantially improve performance and reduce the costs of purchased goods and services. The Air Force is aware of many of these “best” practices and because of their potential to help the Air Force meet its strategic goals, it asked RAND to identify how commercial firms implement these practices and then identify relevant implications for Air Force policy.
In this documented briefing, we summarize what we have learned about implementing PSM practices in the commercial sector. We also suggest ways that the Air Force can improve its implementation of PSM and other best practices to enhance its performance and reduce its costs. However, implementation of best PSM practices in the Air Force is the topic of ongoing analysis and is not specifically addressed in this report.

To assess best commercial PSM practices, we reviewed the academic and trade literatures and developed a detailed questionnaire, which we then used to collect primary data from commercial firms identified by their peers as being among the best firms pursuing new PSM practices. The practices we observed are too new and difficult to isolate from other changes under way to evaluate them with quantitative analytic tools. We have relied instead on qualitative data-collection methods designed to generate reproducible, internally consistent stories about how individual firms apply best practices. This proved to be the only way at present to collect the information that the Air Force requested; when sufficient experience has accumulated more quantitative methods will be possible.\(^1\) The nature of our findings reflects this approach. Appendix D explains in detail the methodological approach we used to organize the study.

\(^1\)The Air Force will have to decide whether to wait until there is auditable evidence of the expected rewards and risks of best PSM practices before adopting them or to proceed on the available evidence presented here.
When we examine Air Force budget expenditures for Fiscal Year 2000 (FY00) (see the figure above), we find that the category of purchased goods and services stands out as the biggest share of any activity in the budget—38 percent of $83.4 billion. Further, we expect Air Force
spending on purchased goods and services to grow, as the Air Force implements plans to competitively source many commercial activities and reengineers internal processes to make them more efficient. Purchasing outcomes can also directly affect several dimensions of performance and, thus, the Air Force's ability to perform its mission (i.e., outcomes can directly affect training, deployment, and responsiveness). The Air Force must be careful when changing the way it purchases goods and services to improve performance or generate savings. As an example, poor grounds maintenance, a service seemingly far removed from the Air Force's primary mission, can actually affect a squadron’s ability to train and deploy. If grass grows too tall near a runway because of a delinquent contractor or a poorly written statement of work, birds might gather to feed on the grass seed, creating flight hazards in the form of bird strikes.

The Air Force is not the only organization for which purchased goods and services account for a large portion of total costs. Purchased goods and services account for 50 to 80 percent of many commercial firms’ total expenditures. Purchased goods and services represent 85 percent of computer/electronics and retail firms’ total costs, 80 percent of automotive firms’ total costs, and 60 percent of utilities’ total costs (Chapman et al., 1998, p. 65). For example, 50 percent of the cost of every Boeing-nameplate jetliner is spent on purchased materials, parts, components, and systems (Stundza, 2000b). These firms are beginning to realize that reducing the costs of purchased goods and services is one of the most powerful tools they can use to increase profits. Once they understand the strategic nature of purchasing, firms often embark on a purchasing improvement program.

For a firm to deliver maximum value to its customers, it must receive maximum value from all its suppliers in the supply chain. Commercial firms are increasingly concluding that, working alone, they cannot have the lowest costs, best quality, or shortest cycle times in their industries if their suppliers do not (Lewis, 1995, p. 5). For example, Intel concluded that it could not improve the quality of its products if it did not improve major airlines. It is very unlikely that the Air Force could save any additional monies on its air travel expenditures by applying PSM practices.

4The Air Force currently plans to competitively source less than 9 percent of its personnel billets. Assuming 20 percent savings and that the cost of an average civilian and active military billet is $75,000 per year, the expected savings from competitive sourcing is likely to be less than 1 percent of the Air Force budget and only about one-third of the Air Force's 1997 Quadrennial Defense Review savings goal of $1.8 billion.
the quality of its suppliers (Morgan, 1990). Sun concluded that it could not be more responsive to its customers unless its suppliers were more responsive (Carbone, 1996). As we will discuss, many firms report that implementing best PSM practices has delivered large savings and significant performance improvements.
Once firms recognize the strategic importance of purchasing to improving their performance and profit as well as integrating their supply chains, they typically change their PSM practices to improve their competitiveness. Through our recent strategic sourcing and contracting research, we have learned how innovative commercial firms purchase goods and services. What we have observed appears to be the beginning of a revolution in PSM practices. For example, Bensaou (1999) notes that in the automotive sector, all three U.S. manufacturers and most of their European competitors have launched programs to decrease their level of vertical integration, reduce their total number of direct suppliers, and

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5 For example, Stundza (2000a) reports that to support lean manufacturing, aerospace companies are involved in programs to standardize parts, collect and analyze supplier performance data, develop cross-functional purchasing teams, consolidate the supply base and forge stronger relationships with suppliers, and integrate the supply chain with internal partners such as sales, engineering, manufacturing, and accounting. They are also involving first-tier suppliers in new-product development, expanding their outsourcing programs for major subassemblies, and creating long-term commodity contracts that guarantee stable future supply at low prices.

6 For an overview of this and additional examples see Tang (1999).
move toward publicly declared strategic partnerships. In the aerospace sector, manufacturers are making strategic efforts to consolidate their supply base and forge stronger relationships with remaining suppliers (Stundza, 1999). For example, Boeing has consolidated and standardized its supply contracts and plans to reduce its number of suppliers from 3,100 to 2,700 (Stundza, 2000b). Bowman (1998) notes that within the last year in the logistics industry shippers are increasingly bidding at the corporate level. More of them are making decisions by committee, whittling down their international provider base to a bare minimum. For example, he notes that about 40 percent of the global accounts of APL Ltd., a worldwide logistics provider, had some type of logistics council or centralized body for purchasing, strategizing, and decision making. To set the stage for PSM change, innovative customers are conducting comprehensive, corporate-wide spend analyses to better understand their primary sources of expenditures and to then target their PSM improvement initiatives (e.g., quality, speed, or cost effectiveness) on those goods and services that represent their largest and most strategic expenditures (see Owens et al., 1998, and Laseter, 1998). Customers are also stratifying their supply base by effect on results and level of strategic risk and then matching the specific management approach and type of relationship formed with particular suppliers to market and supplier conditions for the product or service.

The typical large commercial firm has many suppliers and multiple contracts with individual suppliers who supply the raw materials, logistics services, and different business units within the firm's

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7Liker and Wu (2000) compared the same supplier performance for different automakers and showed that buyers' supply-chain management policies (e.g., scheduling and shipping, lean manufacturing, and lean transportation practices) significantly affect multiple dimensions of supplier performance.

8However, Bowman (1998) also notes that rarely do shippers settle on a single provider unless the decision comes from high in the executive suite.

9Dun & Bradstreet has trademarked the D&B Spend Analysis as a tool to help firms identify supplier redundancies, benchmark suppliers, and reduce their supply base. Dun & Bradstreet claims that their spend analyses have helped many customers save an average of 5 to 15 percent.

10Appendix C provides, as an example, the results of a spend analysis and PSM improvement initiative conducted at Bristol-Meyers Squibb.

11Appendix A provides, as an example, John Deere's portfolio of supplier management strategies for different types of products, services, and markets. See also Goldfeld (1999) for a methodology for selecting PSM strategies for different types of goods and services.
organization (e.g., raw materials, logistics services, and office supplies). Thus, one initial practice many firms adopt to reduce the costs of purchased goods and services is to increase leverage within their existing supplier base by consolidating multiple contracts they have with the same supplier.12

Second, innovative firms reduce the size of their supply base, selecting a few of the best suppliers to provide key products and services.13 Trent (2001) argues that one of the fastest ways to achieve higher supply chain quality is through supply base rationalization—the process of determining the right mix and number of suppliers for a given purchase category or commodity. This usually results in a drastic reduction in the total number of suppliers. Maintaining a large supply base naturally results in increased variability (e.g., in lead times, material consistency, interpretation of specifications and requirements, transportation and delivery, and the quality of relationships) which is the greatest enemy of supply chain quality. For example, Lockheed Martin Aeronautics reports that it has recently reduced its supply base by 40 percent (Stundza, 2000a).14 Firms typically choose one or more current providers, particularly those committed to continuous improvement of the quality, reliability, responsiveness, innovation, flexibility, tailoring, cost effectiveness, etc., of their goods or services. In addition, some buyers bundle a number of related products or services into a single contract.

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12The Department of Defense’s corporate contracts are examples of this practice.
13According to a 1999 Purchasing magazine survey of readers, “Eighty percent of purchasers say they are taking steps to consolidate their purchases with fewer suppliers” (Fitzgerald, 1999b, p. 79). A 1999 cross-industry survey of supply base changes over the previous two years found that 42 percent of responding companies had trimmed their supplier base by zero to 20 percent, 13 percent had supply base reductions of 20 percent to 60 percent, 37 percent of respondents increased their supply base by up to 20 percent, and 6 percent had supply base growth of 20 to 40 percent. More important, 75 percent of respondents indicated that they made 80 percent of their purchases from fewer than 100 suppliers (KPMG Consulting, 1999). See also Chapman et al. (1998, pp. 66-67) and Latamore (1999). Some firms such as Honda of America are comfortable with a single supplier of a key good or service (Nelson et al., 1998, note that Honda does require that its single-source suppliers have dual capability to reduce risks for its just-in-time supply chain performance). Licker and Wu (2000) show that Honda of America gets better performance from the same suppliers than do U.S. automakers. Other firms, such as Intel (Morgan, 1995a), prefer multiple suppliers whenever possible.
14See Appendix E for more examples of firms that have dramatically reduced their supply base. See also Goldfeld (1999) for additional examples of supply base reductions as well as a methodology for putting together a supplier reduction plan.
thus providing a single “belly-button” or point of communication and thereby reducing the coordination costs associated with working with many different providers and allowing economies of scope and scale.\(^{15}\) For example, Microsoft recently bundled multiple individual facility support services contracts for buildings on its main campus into a single large contract for the whole campus with a single, large, full-service provider (Ouellette and Pittinger, 1997).\(^{16}\) Manufacturing programs with low annual dollar value or unit volume, high product mix, or variable demand (e.g., many DoD weapons support programs) are often particularly difficult to source.\(^{17}\) A purchasing manager at BASF gets around these difficulties by awarding manufacturers a combination of large, medium-sized, and small programs. He claims that the promise of good programs ensures that manufacturers accept the less attractive ones (Porter, 2000). To make sure that semiconductor companies continue to make needed old technology [e.g., 16 Mb extended data out (EDO) Dynamic Random Access Memory (DRAM)], even though the industry is moving to higher density (e.g., 64 Mb and 128 Mb synchronous DRAM), Cisco Systems Inc. is rewarding selected suppliers who agree to continue to make the old technology with other business (Carbone, 2000a). Some shippers have worked with their logistics providers to develop capabilities in new markets where the shippers are expanding their business.\(^{18}\) For example, when it needed someone to coordinate trucking and materials flow in Europe, Case Corp. hired Schneider Logistics Inc., an American company with no prior experience in that location. Schneider is one of Case’s three strategic logistics services providers (Bowman, 1999).

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\(^{15}\)The Small Business Reauthorization Act of 1997 allows a federal agency to bundle two or more contracts into a single solicitation that is inappropriate for award to small businesses only if the benefits associated with the bundle are measurably substantial relative to the unbundled baseline.

\(^{16}\)The Defense Logistics Agency’s Prime Vendor program bundles the distribution of groups of related products such as medical supplies or food into regional contracts with one distributor.

\(^{17}\)Robert Fried, president of Contract Manufacturing Consultants, claims that for manufacturing programs that vary along too many dimensions, it can be very difficult to find a contract manufacturer who can consistently do a good job (Porter, 2000, p. 44).

\(^{18}\)However, if an examination of the market uncovers another provider with superior performance or capabilities, the buyer may change providers, particularly if there is uncertainty about whether current providers can quickly attain the new level of performance and acquire the new capabilities.
Third, firms lengthen the terms of contracts they have with existing suppliers who have demonstrated quality performance. Trent (2001) argues that longer-term agreements can promote continuous improvement. For example, since 1989 Chrysler has increased the average length of contracts with its suppliers in the LH program from 2.1 to 4.4 years (Dyer, 1996, p. 56). However, contract continuation, renewal, or extension is tightly linked to performance.

Fourth, some innovative buyers have teams trained in performance improvement tools and techniques such as statistical process control (SPC), cellular and pull production, kaizen events, and Six Sigma quality that they send to their suppliers’ production sites to help key suppliers improve internal processes.

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19 Trent and Monczka (1998) predict that both long-term contracts as a percentage of total contracts and the dollar values of these contracts as a percentage of the total value of purchases will grow in the future. In fact, between 1990 and 1997, long-term contracts grew 50 percent, and the dollar value of these contracts increased 47 percent for the firms that they studied.

20 LH is the name of the base car platform for the Chrysler Concord, Eagle Vision, and Dodge Intrepid.

21 In “cellular production,” machines are arranged on a part or product basis rather than grouped on a process basis. Single parts move short distances in a straight line or U-shaped cell, going immediately from tool to tool. This reduces work-in-progress (WIP) inventory and cycle times and makes quality problems caused by one machine immediately evident. This contrasts to an approach where large batches of parts move from area to area within the plant, characterized by long cycle times, high WIP, and much non-value-added work. “Pull production” aligns production decisions with actual demand or current information on expected demand rather than coordinating them to optimize the efficiency of production against a planned level of production. Close alignment with actual demand compensates for any loss of local efficiency in production. In both cases, basic production processes are adjusted to accommodate the new alignment to the product and customer.

22 Kaizen events are short-term (generally one week) efforts at process improvement.

23 Six Sigma is a statistical term that measures how much a process varies (i.e., the number of standard deviations) from perfection. Achieving Six Sigma means no more than 3.4 defects per million opportunities, which effectively drives all variance out of a process.

24 Patterson and Nelson (1999) describe how one industrial equipment manufacturer’s Integrated Supplier Development group worked with selected suppliers to reduce lead times by 74 percent to 94 percent and generated annual savings of $77,000 to $164,000. The firm provided the supplier 3 week development services at no cost and split any cost savings with them. Staff time for each project ranged from 11 to 80 days and estimated savings per staff day were $2,050 to $12,495. Because of these types of reported cost...
Finally, customers form strategic partnerships with their key suppliers to both integrate and drive continuous improvement throughout the supply chain. Trent and Monczka (1998, pp. 8-9) note that these close relationships are not possible without some reduction in the size of the supply base. As strategic partners, buyers and suppliers openly share information and communicate frequently. For example, manufacturers and retailers share customer order, production, and planning information with their key suppliers. They also align their efforts by measuring progress toward meeting jointly agreed-upon goals. Strategic partners may collaborate on mutually beneficial projects. For example, Pratt & Whitney now brings suppliers into the design process very early to ensure that designs take into account the cost of manufacturing (Fitzgerald, 1999a). Innovative buyers and key suppliers sometimes form joint teams to pursue improvements throughout the supply chain. Partners also share personnel across their contractual boundaries. Some suppliers are invited to place personnel at buyer locations (e.g., to work with product design teams, to place orders as needed, or to manage supplier inventory at the buyer’s location). For example, Motorola has an engineering exchange program through which supplier personnel literally take up residence at

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savings and performance improvements, Trent and Monczka (1998, pp. 8-9) predict that firms will be increasingly willing to undertake supplier development activities.

Supply chain management (SCM) integrates purchasing, materials management, quality management, demand management, distribution planning, and manufacturing planning (Wisner and Tan, 2000)

One of the main drivers of the current trend observable in many industries towards reducing the supplier base is the recognition that high-intensity relationships can only be managed with a limited supplier and customer base” (Christopher, 1998, p. 283). These relationships require a considerable investment in time and attention by managers at the customer firm. It also takes time and resources to establish all the personal and technical data communication links required for a close working relationship. Trent (2001) argues that it is easier to pursue value-added activities with 100 suppliers than 1,500. With thousands of suppliers, the best a company can hope to do is to manage transactions efficiently.

This can be done only in an atmosphere of mutual trust, which is typically built over time.

For example, Intel needed highly reliable fabrication equipment to get sufficient yield from its chip manufacturing process. Before the alignment of incentives, its suppliers were rewarded if equipment performed poorly, because Intel would have to order more equipment, and punished if it worked better than expected, because new orders would be cancelled. Now, Intel’s suppliers reside on-site and are responsible for servicing their own equipment, and the more running time posted on their equipment (above an agreed upon target window) the more they are paid (Morgan, 1995a).
the Motorola plant (Raia, 1991, pp. 49-50). Last, innovative buyers and key suppliers often share the rewards from cost savings and product, service, or supply chain innovations with key staff and each other. For example, Chrysler’s Supplier Cost Reduction Effort (SCORE) program seeks cost-reduction suggestions from suppliers and shares any resulting savings (Stallkamp, 1998).
Anecdotal evidence suggests that as leading firms implement these new PSM practices they are reporting substantial short- and long-term savings. In many cases, implementing best PSM practices appears to allow the total cost of procured goods and services to be reduced by more than 15 percent over time (Owens et al., 1998, p.286). Further, continuous improvement in best PSM practices generates ongoing savings. As a result, 55 percent of respondents to a 1997 survey of executive managers expect annual material costs to decrease an average of 2 to 3 percent.30

29 Although Liker and Wu (2000) do not quantify total cost savings from each practice, they show substantial differences in performance indicators related to costs such as inventory turns, work-in-progress, and finished goods inventory in storage and throughout the supply chain, and emergency shipping costs suggesting real buyer cost savings associated with different practices.

30 Michigan State’s Eli Broad Graduate School of Management conducts an annual five-day seminar attended by executive managers representing a wide range of industries and locations. Before each year’s seminar, attendees are asked to complete the Purchasing and Sourcing Executive Research Survey, which covers a wide range of PSM issues. See Trent and Monczka (1998).

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### Best PSM Practices Can Produce Substantial New and Ongoing Savings

<table>
<thead>
<tr>
<th>Company</th>
<th>Time Frame</th>
<th>PSM Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford Motor</td>
<td>1997</td>
<td>3% / 1yr*</td>
</tr>
<tr>
<td>AMR</td>
<td>1993-1997</td>
<td>20% / 5yrs**</td>
</tr>
<tr>
<td>Honda</td>
<td>1994-1997</td>
<td>17% / 4yrs**</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1990-1995</td>
<td>$1.7B / 6yrs***</td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td>4% / 1yr ($1.5B)</td>
</tr>
</tbody>
</table>

* Purchased material (PM)
** PM PPI increase - savings
*** Total annual savings from SCORE
The table above summarizes self-reported PSM savings for four major companies. IBM’s Global Services division reports that in 1998 it saved over $1.5 billion on $21 billion they spent or a 7 percent savings (Carbone, 1999, pp. 38-62). Ford Motor Company used best PSM practices to reduce purchased material costs by 3 percent in 1997 (Wincel, 1998, pp. 56-64). The parent company of American Airlines, AMR, experienced a net 20 percent total savings between 1993 and 1997 through a decrease of 5 percent in its supplier prices while its PPI increased 15 percent (Avery, 1998). Honda of America’s material costs dropped by 12 percent between 1994 and 1997 while its PPI rose by five percent, representing a 17 percent overall savings (Nelson, 1998). As of December 1995, Chrysler’s SCORE program had generated more than $1.7 billion in annual savings over its first six years by implementing 5,300 supplier ideas (Dyer, 1996). Chrysler further notes that its experience has been one of increasing rather than decreasing returns from PSM. Chrysler estimates of the SCORE program’s new savings have continually met or surpassed annual goals, which grew from $250 million per year in 1990 to $1.5 billion per year for the 1998 model year. In the 1998 model year, Chrysler experienced an additional 4 percent reduction in its purchased material expenses (Stallkamp, 1998, p. 19). Chrysler reports 1999 SCORE savings of $2.3 billion and projected $2.4 billion in savings for 2000 (McCormick, 2000).

Although the Air Force has different objectives and is subject to different rules and regulations than private firms, it has reported similar types of savings using PSM practices. When the Air Combat Command (ACC) inherited the Tethered Aerostat Radar System (TARS) for counter drug interdiction, it bundled a number of separate operations, maintenance, and support contracts at different ground stations into one overarching support contract. ACC reports that total annual costs dropped by 50 percent. ACC invested some of the initial savings from contract bundling into equipment upgrades and modernization. It partnered with its new provider to standardize equipment and operations and shared the cost savings and cost avoidance through manpower reductions. As a result,

31 We have not independently verified any of the claims in the table. Participants may have a stake in justifying their PSM investments ex post. However, as we discuss below, significant portions of key participants’ salaries were linked to actual PSM benefits. Hence, many firms have developed systems to accurately collect and aggregate PSM savings. Further, because many PSM savings are based on pre- and post-contract payments (adjusted for inflation and changes in the PPI for the specific bundle of goods and services), they are in principle much easier to quantify than savings from other types of improvement initiatives such as process reengineering.
ACC reports that TARS support costs dropped an additional 25 percent (Mcfadden, 1996). We did not independently verify these reports.
Best PSM Practices Can Also Produce Performance Improvements

- Quality (e.g. 10-13% / yr)*
  - Reduction or elimination of inspections and rejections
- Delivery responsiveness (e.g. 7-10% / yr)* / reliability
  - Inventory reductions
- Product development capability / innovation
  - Faster (e.g. 22% / 8 yrs)* & cheaper
  - Product improvements
- Value / supply chain integration
  - Reduced transactions costs


"Managing supplier quality is not only desirable, it is a strategic necessity."

(Trent, 2001, p. 71)

Short- and long-term cost savings are not the only benefits firms are experiencing from successfully adopting new PSM practices. While their costs continue to fall, these firms often also realize improvements in quality, delivery performance, product development, and value/supply chain integration and management.

Trent and Monczka (1998) report that more than 92 percent of firms surveyed on new PSM practices expect average, annual product quality improvements of 10 to 13 percent. Quality improvements from adopting these new PSM practices lead to benefits in the form of reduction or elimination of inspections, rejections, repairs, and rework as well as operational downtime; such improvements obviously also affect cost. For example, by working with suppliers, Honda of America Manufacturing, Inc. (HAM) claims that it dramatically improved supplier quality levels from 7,000 defective parts per million (ppm) in 1985 to between 100 and 200 ppm in 1995. For newly designed parts, HAM initially inspects supplier production processes to ensure that, if operated to its standards,
the parts will meet HAM’s quality standards every time. Then no incoming inspection is performed at the HAM facility (Fitzgerald, 1995, pp. 32-40). Similarly, AlliedSignal said that it eliminated poor performing suppliers and trained remaining supplier partners in techniques such as SPC, Six Sigma, and other manufacturing best practices. AlliedSignal claims that these actions reduced the overall defect rate of incoming parts and materials from 35,000 ppm in 1992 to 1,902 ppm in 1996. This was projected to save the company over $1.2 billion over three years. One AlliedSignal supplier, EG&G Sealol, completely eliminated defects in 1997, compared to 9,871 defective ppm in 1996 (Minahan, 1997, pp. 38, 45).

Delivery performance improvements from adopting PSM, which include improved supplier responsiveness and reliability, allow firms to reduce their inventory levels. For example, the purchasing department at AMR worked with aircraft fuel suppliers to increase dependability of fuel delivery to planes. AMR reports that this has helped them reduce fuel inventory by more than 20 percent since 1994 and achieve near Five Sigma quality. AMR also worked with an integrated parts supplier to improve service levels approaching a 97 percent fill rate (delivery within eight hours), a reduction in part and material unit cost of about 19 percent, and a decrease of 16 percent in purchase volume. As a result, use of ground equipment increased and out-of-service equipment decreased (Avery, 1998). Trent and Monczka (1998) report that more generally approximately 90 percent of the firms in a PSM survey expect to annually improve their average delivery performance between 7 and 10 percent.

Improved capabilities for product development and innovation from adopting new PSM practices are leading to less-expensive new-product development and more innovative product improvements with faster cycle times. For example, Chrysler said it has reduced its new vehicle development cycle from an average of 234 weeks during the 1980s to about 160 weeks. In addition, the development costs for new vehicles have dropped an estimated 20 to 40 percent (See Dyer, 1996). In another example, by working with a supplier of galley carts for a new aircraft, AMR’s purchasing department reports that it helped achieve a 21 percent unit-price decrease for an 8-lb lighter cart that attendants prefer to the old carts. Fuel savings for the lighter cart are reportedly about $300,000 per cart per year (Avery, 1998). More generally, Trent and Monczka (1998) report that the average product development cycle time has dropped over 20 percent from 1990 to 1997. Further, most business units expect a 40 to 45 percent reduction over the next several years.
Adopting PSM practices also appears to enable better value/supply chain integration and improvement (e.g., eliminating steps and substantially reducing time and transactions). For example, since 1988, when Chrysler began to reduce its supply base, it reports that it has reduced the number of buyers by 30 percent and sharply increased the dollar value of goods procured by each buyer (Dyer, 1996, p. 47). As discussed above, it is very difficult to implement the close relationships required for supply-chain integration and realize all of its prospective benefits of fast, reliable, and low-cost support (e.g., inventory, warehousing, transportation, and overhead/administration) without reducing the supply base (Chapman et al., 1998, and Christopher, 1998).

Many PSM initiatives reportedly produce both cost savings and performance improvements. For example, Patterson and Nelson (1999) report that one U.S.-based industrial equipment manufacturer's various Integrated Supplier Development (ISD) projects have resulted in price reductions of up to 15 percent, lead time reductions of 75 to 95 percent, ppm defects reduction from 14,400 to 300, on-time delivery improvement from 74 to 99 percent, increases in effective capacity by 25 percent, reduction in Operational Safety and Health Administration (OSHA) reportable accidents by 90 percent, reduction in work-in-progress inventories by 67 percent, reductions in factory floor space by 45 percent, and reduction in rework by 37 percent. Lockheed Martin reports that under its recently retired vice president, material management purchasing costs were reduced $410 million, parts acceptance quality improved by 48 percent, shortages were reduced by 60 percent, and inventory turns improved by 38 percent (Stundza, 2000a).
Currently, there are considerable differences between the best commercial PSM practices and typical Air Force operational contracting practices, particularly when purchasing services. Traditional Air Force practices have grown from the complex federal acquisition regulations (FARs) that have encouraged arms-length, adversarial relationships with low-cost vendors. However, recent acquisition reform (AR) legislation that has led to major changes in the FAR enable all DoD contracting organizations to take advantage of many of the best commercial PSM practices. And although the promise of acquisition reform has not yet been fully realized, as the DoD gains more experience with it, there is likely to be

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32To be fair, as mentioned above, there are also significant disparities between the most innovative commercial PSM practices and the typical. In addition, the Air Force and DoD have not tried to follow best commercial PSM practices, nor is it obvious that they should try to do everything commercial firms do.

33One firm we interviewed that supplies the DoD as well as commercial and defense firms noted that government employees were initially slow to adopt acquisition reforms such as dropping military specifications. However, government employees are now aggressively adopting acquisition reform, while defense firms have been slower to change their purchasing practices.
additional acquisition reform legislation enabling further movement toward the best PSM practices.

A primary area in which current legislation potentially limits the ability of the DoD to take advantage of new PSM practices is in supply base reduction/management and contract bundling. Congress is a strong proponent of competition and fostering the well-being of small business concerns through participation in government contracting opportunities.

The Competition in Contracting Act of 1984, which requires “full and open competition,” may limit the ability of federal agencies to bundle requirements and reduce the supply base if bundling limits the pool of bidders so that the requirement cannot be filled at the lowest possible price. However, firms can form teams to bid for large contracts and recent acquisition reform legislation allows the down selection of suppliers based on their qualifications to perform the required work to specifications.

The Small Business Reauthorization Act (SBRA) of 1997 (Public Law 105-135, 1997) introduced new policy for federal agencies that wish to consolidate (bundle) requirements for goods and services. If a consolidated workload is likely to be unsuitable for direct award to a small business concern, an agency must now demonstrate that the consolidation is necessary and justified, based on measurably substantial benefits to the federal government. These benefits can be broadly defined to include cost savings, quality improvements, reduction in acquisition cycle times, better terms and conditions, or any other benefit. The Small Business Administration (SBA) has recently issued final regulations that spell out the criteria necessary to demonstrate “measurably substantial benefits.”

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34 Much of the relevant legislation allows for small business participation through both prime and subcontracts. However, some in the small business community (including government small business advocates) and more recently Congress strongly favor giving small businesses prime contract opportunities.

35 See Baldwin et al. (2001) for a detailed discussion of the SBRA and SBA final rule.
We began this research by reviewing the academic and business literatures and attending conferences on best PSM practices and successful implementation of change. We also reviewed Air Force and DoD acquisition reform laws, regulations, publications, and briefings to better understand what the Air Force is allowed and not allowed to do. From the information we gathered on leading PSM practices and key ingredients of successful change, we developed a prototype implementation framework and questionnaires for structured interviews. See Appendix F for our interview questions.

Because PSM encompasses a number of synergistically interrelated practices, it is difficult to perform rigorous empirical analysis to test the value firms receive from specific implementations. Indeed, Ellram and Carr (1994) report that much of the purchasing strategy literature is either conceptual or based on a small number of case studies. Some studies do base their findings on data gathered from a large number of firms, but most do not report the use of statistical analysis to support the findings of the research. That said, PSM is internally consistent and consistent with Total Quality Management (TQM), which does have some empirical support. For more on TQM, see Fernandez (1995) and George and Wänerskirch (1994). See also Liker and Wu (2000) for recent empirical evidence of the effect of buyer practices on supplier performance.
From the literature, conference presentations, and discussions with practitioners, we identified a number of private-sector purchasing organizations at large firms that had recently implemented, or were in the process of implementing, best PSM practices. We focused on those purchasing organizations recognized by their peers for their success with these PSM practices. We set up structured interviews with some of these firms to identify the methods and organizational structures they used that were successful or unsuccessful and the challenges and problems they encountered in implementing best PSM practices. To elicit accurate and sometimes sensitive data, we agreed not to identify the firms that shared information with us. The eight firms that we interviewed regarding PSM implementation represent a wide variety of markets and industries, including heavy equipment, metals, pharmaceuticals, aerospace, electronics, and automotive. Appendix D contains a detailed explanation of our approach to developing and using information about best commercial practices.

We developed a separate interview questionnaire for Air Force contracting organizations and interviewed a number of major command (MAJCOM) headquarters’ contracting organizations as well as special and operational contracting squadrons implementing acquisition reform and Performance-Based Services Acquisition (PBSA). From these interviews, we gathered information on the status of implementation of PBSA as well as on successes and problems encountered.

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37Successful PSM typically occurs in firms facing crisis and in larger firms with successful TQM experience and a successful TQM culture that values the kinds of things that PSM seeks.

38We talked with firms that were early implementers (i.e., first movers) to understand what was possible. We did not talk with firms that did not change their behavior or firms that tried to implement PSM and failed, although additional analysis of these firms would increase confidence in our findings.

39With few exceptions, we cite specific firms only when we can document their behavior with information from the open literature. We are grateful to the firms who agreed to let us share materials from some of their internal documents here.

40Three of the firms are in the Fortune 50, seven are in the Fortune 500, all are within the Fortune 1000. We got additional information about PSM implementation from over 40 firms we interviewed for related research on outsourcing and best commercial PSM practices.

41An operational contracting squadron at an installation typically handles contracts for that installation only. A special contracting squadron within a major command typically handles large, complex contractual arrangements that concern one or more installations within that command (or sometimes across commands).
Our model for implementing successful change derives from these interviews and from literature on change management in organizations. The organizations we interviewed were selected because of peer recognition for their PSM practices. Issues about their change practices were not part of the selection process, and we have no reason to believe that their change management methods were driven by or related to the specific PSM practices adopted. Hence, the lessons we have derived from these interviews about successful change implementation are not subject to a selection bias related to “selecting on the dependent variable.” We selected the firms for their particular practices, not for their methods for change, and identified much of commonality in the change strategies used by these organizations. We believe that our model of change is robust and can be used by organizations to implement a variety of change efforts above and beyond the move toward best PSM practices.
We report three key findings here. First, an ever-expanding group of innovative commercial firms is shifting from a tactical to a more strategic, goal-oriented approach to PSM. These firms recognize PSM’s potential for performance improvements and cost savings and are taking steps at the highest levels to increase the use of this approach.42

Second, because implementing new PSM practices requires significant changes throughout the organization, these firms are learning that a formal implementation process and plan helps ensure successful, permanent changes.

Last, we identified a number of specific actions that the Air Force might take to significantly improve the implementation of new PBSA and PSM practices.

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42Kraljic (1983), one of the early proponents of PSM, argues that the risks and complexities of global sourcing and the need to cope with uncertainties and supply or price disruptions call for a total change of perspective: from purchasing (an operating function) to supply management (a strategic function). He further argues that concrete changes in the organization will be required to establish effective organizational relations, provide adequate systems support, and meet the new staff and skills requirements.
practices within the Air Force. If commercial PSM practices work as well as their advocates expect, these actions could help the Air Force more fully capture the promised benefits of best PSM practices to ensure successful, permanent change.
This documented briefing is organized around our three key findings. In the next section, we discuss how innovative commercial firms are moving toward a more strategic, goal-oriented approach to PSM. After that, we lay out a formal implementation process and plan that reflect that many of these firms are institutionalizing the shift to new PSM practices. In the last section, we summarize our findings relevant to the Air Force and suggest specific actions it could take to improve the implementation of PBSA and PSM practices.