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DOCUMENTED BRIEFING

Identifying and Managing Air Force Sustainment Supply Chain Risks

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Prepared for the United States Air Force

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Summary

In recent years, the Air Force and, particularly, its suppliers have pursued various means to improve performance, reduce costs, and otherwise adopt best industry practices. Such practices include outsourcing, global sourcing, supply-base rationalization, single sourcing, just-in-time deliveries, and lean inventories.

While these practices offer many benefits in efficiency and effectiveness, they can also make supply chains more brittle and increase risks of supply disruption. For example, having fewer sources of supply means a disruption at any one of them is more likely to affect overall performance. Similarly, just-in-time deliveries and lean inventories mean fewer days of operating capacity should a supply disruption halt deliveries of raw materials or components.

To help the Air Force better identify and manage supply chain risks, the Deputy Chief of Staff for Logistics, Installations, and Mission Support asked RAND Project AIR FORCE to develop a strategy for managing supply chain risks during sustainment. The Air Force also requested a follow-on project focused on the manufacturing supply chain. This documented briefing focuses on the supply chain risks during sustainment. To do this, RAND researchers reviewed literature on supply chain risk management (SCRM) and interviewed Air Force personnel in the sustainment and acquisition communities and supply chain managers from commercial firms responsible for managing supply chain risks. The RAND team identified risks that are and are not being managed and developed recommendations for future risk management. We summarize below our key findings on prevailing practices, current Air Force and Department of Defense (DoD) guidance, and risks the Air Force may wish to address.

Supply Chain Risks Vary by Industry

There are many events that, if realized, could lead to a disruption of a company's supply chain, such as earthquakes and floods; see Appendix E for a comprehensive list of supply chain risks. The significance of the risk varies by industry. For example, "supplier failure" and "strategic risk" were among the greatest reported concerns of "high-tech" and "aerospace and defense" firms.¹ Natural disasters and other singular events were of lesser concern. Nevertheless, recent events—such as the March 2011 earthquake, tsunami, and radiation leaks in Japan, which affected automotive and electronics supply chains throughout the globe, and Hurricanes Katrina and Rita in 2005, which disrupted petroleum production—have raised awareness of how disruptive and costly such events can be. In light of the unpredictability of such events,

¹ Examples of strategic risk include loss of manufacturing capacity or overreliance on one supplier.

some leading firms are recognizing the importance of responding quickly; while many events cannot be foreseen or avoided, their effect on the bottom line can be mitigated.

Prevailing Practices in Supply Chain Risk Management

We define supply chain risk as the effect of uncertainty at any point in the end-to-end supply chain on its objectives. The magnitude of supply chain risk may be measured along three dimensions: likelihood of occurrence, expected consequences, and duration. Risks of the highest likelihood, greatest consequence, and greatest duration would require first attention.

Traditional approaches to SCRM have included such strategies as multiple sources of supply, extensive competition, expediting, increased order quantities, development of inventory safety stocks, and well-stocked supply pipelines. Each of these strategies has its own risks. For instance, expediting orders, developing inventory safety stocks, and having a well-stocked supply pipeline can increase total costs. Qualifying and managing multiple sources of supply increases complexity. There are often limits on the number of capable suppliers, and the benefits of multiple supply sources can be outweighed by limited price leverage and increased variance in quality and delivery for the same good or service.

Even with the growing realization of supply chain vulnerability, few managers report they are well prepared for supply chain disruptions; SCRM is an emerging discipline.

Emerging Best Practices in Supply Chain Risk Management

We concluded from our company interviews and review of the literature that proactive SCRM requires the development of guidance and policies for identifying and managing supply chain risks. Some firms place less emphasis on calculating the probability of an event and more on reducing the response time to the realization of an event. That is, while one particular event may have a low probability of occurrence, if all the potential risks are examined as a whole, there is a good likelihood that one will occur; which one is not as important as having a strategy in place to detect and react. For example, Cisco Corporation lists four key elements in its SCRM program:

1. Business Continuity Planning, which works closely with internal and external partners “to document recovery plans and times and drive resiliency standards.”
2. Crisis Management, which is responsible for continuous global monitoring of and response to disruptions.
3. Product Resiliency, which helps Cisco’s business units address supply chain vulnerabilities during product design and to prioritize and reduce the costs of risk mitigation strategies.
4. Supply Chain Resiliency, which identifies points in the supply chain where time to recovery would be unacceptably high and develops resiliency plans for them.

Proactive SCRM also requires that an enterprise have a supply chain risk assessment and management process. Often supporting the process are tools for supply chain risk identifica-

tion, assessment, and monitoring. From a review of the relevant literature, we compiled a list of processes commonly involved in SCRM. We combine these into a proposed nine-step process:

- Step 1: Recognize the existence of a potential risk.
- Step 2: Identify the exposure of the supply base to the risk.
- Step 3: Estimate the likelihood.
- Step 4: Estimate the severity of realization of the risk.
- Step 5: Prioritize risks by potential costs to allocate scarce resources appropriately.
- Step 6: Develop, assess, and execute a risk management strategy for the prioritized list.
- Step 7: Develop contingency plans.
- Step 8: Monitor the risk environment to respond to changes and re-prioritize responses to risk.
- Step 9: Continuously integrate lessons learned and improve risk and supplier management policies.

Current Department of Defense and Air Force Guidance

Several DoD and Air Force documents, including the *Defense Acquisition Handbook*, cite the need to deal with risk. However, risk identification and mitigation strategies in these documents primarily focus on the acquisition phase and risks in reference to cost, technical performance, or schedule of a weapon-system acquisition program. Altogether, DoD guidance identifies some, but not all, of the risks identified in the business literature.

The Air Force commodity councils have a process for managing risk, but it is geared toward managing contract risk, not supply chain risk.

One prominent category of supply chain risks identified in the business literature but not DoD guidance is natural disasters. The Federal Acquisition Regulation, through a force majeure clause, absolves suppliers of risks associated with natural disasters or with “acts of God or the public enemy.” This clause transfers these risks from many suppliers, especially those located in high-risk areas, to the Air Force. Force majeure clauses are also prevalent in commercial contracts and are necessary to ensure that suppliers are not unduly penalized for acts they cannot control. Awareness of the force majeure assignment of certain risks to the Air Force is critical to managing those risks.

Interviews of Air Force Supply Management Personnel Reveal Gaps in Supply Chain Risk Management

We interviewed a cross-section of representatives from organizations involved with managing suppliers or who are affected by supply chain disruptions during sustainment.

A questionnaire listing supply chain risks and asking how often they were considered was administered to each group. Commodity council members that we interviewed reported considering many of the same supply chain risks identified in DoD guidance. They often or always consider a relatively small number of risks, such as those related to supplier certification or qualification, demand uncertainty, overall quality, and technical competency. They consider about half the time such risks as long cycle times, poor training of supplier personnel,

and insufficient equipment and personnel at supplier facilities; risks resulting from uncertain demand and poor communications; and internal risks, such as poor forecasting and inadequate availability of resources. They rarely or never consider risks whose investigation would require investment in a supply chain risk assessment program or force majeure events for which the Federal Acquisition Regulation absolves suppliers. It may be logical for Air Force personnel not to consider these risks if they believe that the Federal Acquisition Regulation leaves them little leverage over suppliers regarding them. Nevertheless, the effects of such events could be catastrophic. Consequently, even if the Air Force cannot change the likelihood of a risk, it should take steps to minimize its consequence and duration.

We examined sustainment approaches for two Air Force weapon systems to determine when and how supply chain risks were managed. We found that the F-16 sustainment approach lacks a comprehensive process for SCRM, raising the question of whether organic weapon support more generally may lack an SCRM process. Boeing management of C-17 aircraft sustainment has some elements of SCRM based on corporate policies, but it is not clear whether these policies are meant to identify risks beyond those relating to financial, quality, or timeliness issues.

Implications

The results of this research suggest that many supply chain risks are not considered directly within the Air Force sustainment community and that, while others are acknowledged, there is little or no strategy in place to mitigate them. The primary recommendation from this research is that the Air Force establish an enterprise-level SCRM organization. This organization should oversee supply chain risk as part of supplier relationship management and should set policy on how to manage supply chain risk for both organic and contractor-managed sustainment, develop standard processes and metrics for risk management, expand the types of risk managed, develop tools for risk assessment, and establish metrics and incentives for mitigating risk. Commercial practices offer some guidance on this, but the Air Force will need to develop practices that reflect the Air Force's unique requirements and organization. For example, one challenge for the Air Force is managing risk over the entire life cycle of the weapon system. The Air Force Materiel Command's recent reorganization created an Air Force Life Cycle Management Center (AFLCMC) and an Air Force Sustainment Center (AFSC). This new structure consolidates product development and support system design under AFLCMC and integrates depot maintenance and Air Force supply chain activities under AFSC. Supply chain risk cuts across these areas. In this document, we do not explicitly address SCRM during acquisition, but we contend that many supply chain risks are common to acquisition and sustainment and are often shaped by decisions made during acquisition. At the time of this writing, the new structure is taking shape, but it is too early to determine how the Air Force intends to conduct SCRM or supplier relationship management. We recommend that the new organizational structure provide a mechanism to integrate supplier relationship management and SCRM across AFLCMC and AFSC.