

DRAFT WHITE PAPER



LEAN SUPPLY CHAIN NOW

PROPOSED CONCEPT DEMONSTRATION INITIATIVE

An Activity of the Lean Aerospace Initiative Supplier Networks Working Group

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April 13, 2006

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ACKNOWLEDGMENTS

This white paper is prepared on behalf of the Supplier Networks Working Group of the Lean Aerospace Initiative. The contributions of individual members of the group are gratefully acknowledged. Special thanks are owed to members of a small team on methodology, consisting of the following: Kirk Bozdogan (MIT – Lead), Don Chappell (MEP Management Services Inc.), Kerry Frey* (Lockheed Martin Aeronautics, Fort Worth), Jim Gilbert (California Manufacturing Technology Center – CMTC), Rob Goetz* (Northrop Grumman, Global Hawk Program), Chris Hayter* (National Coalition for Advanced Manufacturing – NACFAM), Teri Hogan* (Boeing Integrated Defense Systems, C-17 Program, Long Beach, CA), Susan Moehring (TechSolve, Inc.), Bob Reifenberg (US Air Force, Aeronautical Systems Center, Global Hawk System Program Office, Wright-Patterson Air Force Base, OH), Mike Schneider* (Boeing Integrated Defense Systems, St. Louis), Tom Shaw (Accenture, Executive Action Council; Government Electronics and Information Technology Association – GEIA), and Mike Trent (US Army Aviation and Missile Command, Command Group – AMCOM). Those noted with an asterisk (*) served as reviewers. The comments and encouragements of many others within the Lean Aerospace Initiative community are very much appreciated.

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EXECUTIVE SUMMARY

Overview

The aerospace supplier base is characterized by complex interfaces that represent a significant source of waste, delay and defects. This is seriously undermining the achievement of affordability targets in current acquisition programs and blocking the development of an agile logistics capability supporting the operational forces. Interfaces in the multi-tiered supply chain cut across multiple companies, affecting both commercial and military development, production and sustainment programs. Many programs or companies share a large and deep common supplier base. Individual suppliers often support multiple customer companies and may call upon different sets of their own lower-tier suppliers to serve their different customers. No one, in particular, "owns" these interfaces. Yet everyone involved – commercial customers, government agencies, primes (system integrators), individual programs, major subcontractors and lower-tier suppliers – have a big stake in streamlining these complex supplier interfaces in order to evolve an efficient, flexible and responsive aerospace supplier base. Traditionally, the challenge of streamlining supplier interfaces has been narrowly approached by individual companies pursuing their own supplier development activities to address their own particular needs. These "go-it-alone" efforts have proven highly fragmented, limited, slow and ultimately ineffective. There is an urgent need for fresh thinking and action, particularly in view of the imperative to deliver effects-based capabilities to the warfighters and to enhance the competitiveness of the U.S. aerospace industry.

A logical first step in working towards this larger vision is to develop an organized implementation framework for streamlining the supplier interfaces. This concept development initiative proposes to develop such an action-oriented framework that can serve as a "model" structured process that can be deployed on a wide scale to help accelerate the streamlining of the supplier interfaces.

The main idea behind the proposed initiative is that a practical "change model" can be developed as a service to the aerospace community. Such an effort would involve conducting a number of pilot projects by pursuing collaborative action bringing together key stakeholders, capturing best practices and lessons learned, and documenting the results in the form of a deliverable end-product. Accordingly, the scope of the proposed project is very limited and realistic. The objective is not to undertake a massive project to streamline aerospace supplier interfaces but rather, at a more modest level, to conduct a number of pilot projects that can serve as test-beds, serving as a learning laboratory but also deriving direct and tangible benefits, for developing a common implementation framework. The resulting product – structured methodology, best practices, and tools and techniques, training and educational materials – can be used by many organizations to pursue collaborative action, to validate their existing processes, and to deploy as needed in particular situations. The framework is not intended as a roadmap or a set of directions that enterprises must follow. Over time, the resulting product, as it is further validated, can become a best practice framework benefiting the entire aerospace community.

Expected End-Product and Benefits

The "hard" *near term* objective of the proposed initiative is to develop a validated "lean-intervention" framework that is expected to have the following key features:

- (1) *Provide hard data on immediate improvements on specific performance metrics achieved in each pilot project (e.g., cycle time, first pass yield, cost reduction, improved delivery to schedule, improved customer satisfaction and communications).* For example, the expected benefits for an organization (e.g., the C-17 acquisition program) participating in this concept demonstration effort as a pilot project host site would encompass cost reduction, quality improvement and shorter lead time for a well-defined subsystem or component selected for pilot project intervention, such that the lessons learned can be widely and quickly disseminated to derive similar benefits for other parts of the entire aircraft production process. An immediate process-related benefit would be to validate already existing methods and tools used to address interface issues in the supply chain.
- (2) *Encompass structured processes, best practices, lessons learned, tools and methods, metrics, educational and training materials and related aids for "hands on" streamlining of supplier interfaces and for achieving continuous improvement.* These deliverables are expected to include documentation of a number of intermediate steps, such as current state value stream mapping and analysis, definition of the desired future state, and specific action steps for achieving the desired future state. The pilot projects will cover identification of interface attributes that cause and prevent quality escapes, definition of rework cycles, before-and-after performance metrics, resource utilization patterns, cost and schedule data, capturing the voice of the customer, subcontracting management practices, and concrete going-forward action plans for continuous improvement.
- (3) *Demonstrate the workability and tangible benefits of collaborative action by bringing together key stakeholders.* The stakeholders are expected to include the host organization for the pilot project, specific suppliers, third-party providers of lean, six-sigma and related continuous improvement services focusing on supplier development and interface issues,

external funding organizations with material interest in improving the vitality of the aerospace supplier base, worker training and industrial competitiveness, the LAI Supplier Networks Working Group providing technical support and guidance).

The resulting framework product will provide an integrated suite of such continuous improvement approaches as lean thinking, six sigma, theory of constraints, total quality management and business process reengineering. The product will be in the form of a web-enabled electronic repository consisting of a suite of implementation modules that will be made available and easily accessible for wide-scale deployment. The resulting product will be sufficiently robust across the aerospace community but also capable of being easily tailored to address specific program or company needs. Moreover, an integral part of the resulting product will be the demonstration of the power of creating workable collaborative arrangements to address difficult supplier interface issues.

The *longer-term* objective of the initiative, expected to be achieved through the wide-scale and accelerated deployment of the resulting product, is to help speed up the process of building seamlessly integrated aerospace supplier networks.

Implementation Process

Structured Approach: The overall initiative will follow a four-phase approach: Phase 1 (Baseline) – involving initial benchmarking of case studies and supplier portals to develop an improved understanding of supplier interface issues; Phase 2 (Prototype) – conducting one or more alpha-test pilot projects to test out the implementation process and capture lessons-learned; Phase 3 (Validate) – execute a number of pilot projects to validate the implementation approach; and Phase 4 (Institutionalize) – making the documented implementation framework widely available for on-going deployment and improvement throughout the aerospace community.

Pilot Projects: The pilot projects will be selected to cover a spectrum of operational settings, such as acquisition (development), production and sustainment. A strictly notional list of potential pilot projects include the C-17 Globemaster, Global Hawk, F-16 Falcon Block 60 Upgrade & F-16 avionics maintenance and repair, F-35 Joint Strike Fighter, C-5 Galaxy maintenance and repair, F/A-18 E/F Super Hornet, Boeing 787. Nomination of other pilot project candidates is encouraged and would be welcome.

Scope and Focus: The execution of the individual pilot projects will follow a structured approach and will concentrate on specific high-priority systems or components. The pilot projects will directly focus on technical interfaces encompassing requirements flowdown and configuration change management. More specifically, the primary focus will be placed on the technical data package (TDP) flowdown process, from customer' handoff to commodity level in the supply chain. Such an emphasis is expected to provide a very important leverage point for gaining visibility into many other types of supplier interfaces (e.g., business-related, engineering-related, production-related, supply management-related interfaces) that are often significant sources of waste, quality escapes, and barriers to supplier flexibility and responsiveness.

It is not the intent of the *Lean Supply Chain Now* initiative to seek solutions to complex supplier interface issues solely in terms of the application of state-of-the-art information technologies and systems (IT/IS). However, the initiative will examine the potential applicability of various technologies, tools and techniques by which primes and their suppliers can work together to employ IT/IS systems and services (e.g., supplier portals, robust suite of enterprise IT/IS architectures, products and capabilities enabling lean supplier interfaces) to ensure interoperability, engage in secure collaboration, and move from transaction-based relationships to trust-driven, reliable, and information-based relationships.

Execution: In each pilot project, initial analyses will scope out the nature and dimensions of the supplier-interface problems, taking a "wide-lens" approach, before concentrating on critical interface issues requiring a vertical examination of supplier interfaces. The entire supply chain associated with the selected system or component will be mapped vertically to provide visibility into supplier interfaces at multiple levels. Before and after metrics will be constructed to evaluate the system-wide impact of the lean-intervention process. The lean-intervention process will address both the *interfaces* (e.g., interactions or links connecting two or more companies) and the critical supplier *nodes* (i.e., specific suppliers that are found to be "choke points" along specific multi-level chains connecting the customer company to the lower-tier or commodity suppliers). The design and implementation of a typical pilot project is expected to take about a year.

The execution of the individual pilot projects will consist of the following generic implementation process:

- Stage 1: Definition (expected duration: 4-6 weeks)
- Stage 2: Assessment (8 weeks)
- Stage 3: Redesign (8 weeks)
- Stage 4: Implementation (12 weeks)
- Stage 5: Continuous improvement (on-going)

Stage 6: Documentation (8 weeks).

The various stages of implementation can be undertaken concurrently, rather than linearly. Also, in general, these various implementation stages will, in fact, overlap to some extent to provide for backward and forward feedback effects.

Collaborative Action: Key stakeholders will be brought together under the umbrella of a shared vision and value proposition to execute the pilot projects. These stakeholders, depending on the specific pilot project, would include some combination of the following: the pilot project host organization (e.g., C-17 Long Beach), key suppliers, the overall contractor organization receiving external funds and managing the execution of the pilot projects, third-party lean-enabler "contractor" organizations (s) providing lean implementation services teamed up with the overall contractor, other pertinent nationwide lean-enabler organizations (e.g., U.S. Department of Commerce, National Institute of Standards and Technology (NIST), Manufacturing Extension Partnership; Aerospace Industries Association; Supplier Excellence Alliance), appropriate government agencies and organizations, external funding organizations, and the Supplier Networks Working Group of the Lean Aerospace Initiative (LAI) facilitated by the Massachusetts Institute of Technology (MIT), and other academic partner universities associated with LAI's Educational Network nationwide.

Link to Other Initiatives

This initiative supports the supplier development and integration efforts of both military and commercial aerospace companies, including prime contractors (system integrators) and their major suppliers, while also benefiting lower-tier suppliers. It also supports the efforts of government agencies with a direct interest in enabling the development of an efficient, flexible, responsive and innovative domestic aerospace supplier base. For example, it supports the Air Force Smart Ops for the 21st Century (AFSO21) initiatives, including those pursued by the Air Force Materiel Command (AFMC). It also supports other major initiatives addressing supply chain integration issues, such as the subcontracting management initiative of the Defense Contract Management Agency (DCMA) and the Depot Maintenance Transformation *and* Procurement Supply Chain Management efforts of AFMC. The results of the *Lean Supply Chain Now* initiative are expected to provide wider benefits to the other federal government agencies as well (e.g., U.S. Army Aviation and Missile Command, U.S. Naval Aviation Command, U.S. Missile Command).

This proposed project builds upon the earlier success of the Lean Now initiative launched by the U.S. Air Force Materiel Command (AFMC), in a teaming arrangement with LAI consortium industry member organizations, to provide on-time, effects-based, capability to warfighters through the deployment of lean principles and practices in a number of pilot projects and enterprise transformation efforts.

Role of the Lean Aerospace Initiative (LAI) Supplier Networks Working Group

The *Lean Supply Chain Now* Concept Demonstration Initiative is a new planned activity of the Supplier Networks Working Group of the Lean Aerospace Initiative (LAI), which is an active knowledge-sharing and implementation-oriented team. The team's membership consists of representatives from the LAI stakeholder member organizations (industry, government, MIT) actively engaged in supply chain issues, as well as invited members from "lean-enabler" organizations facilitating or providing supplier development, lean training and education, and related lean transformation services to help improve the performance of the U.S. aerospace supplier base. The mission of the Supplier Networks Working Group is to "enable the development of adaptive, efficient, flexible and innovative aerospace supplier networks creating value for multiple enterprise stakeholders."

The role of the Supplier Networks Working Group would be to enable the launching and execution of the pilot projects, provide technical guidance and support, help capture lessons learned, integrate the results, and provide the final implementation template in the form of an easily-accessible electronic repository. The Lean Aerospace Initiative will serve as the longer-run custodian of the resulting model implementation framework and best practices package and will retain intellectual property rights, under the provisions of the LAI consortium agreement.

Current Activities and Next Steps

A number of activities are currently under way to develop a more detailed understanding of key supplier interface issues, define effective intervention strategies, identify useful educational and training modules in conjunction with the pilot projects, and raise the general awareness of the initiative as part of a larger effort to obtain support for a number of pilot projects. An alpha-test pilot project focusing on the C-17 Globemaster was launched in January 2006. A detailed implementation plan for this pilot project was developed at the November 16-17 meeting of the Supplier Networks Working Group. Efforts are also under way to identify additional pilot projects, obtain the support of host organizations, obtain the support of host organizations, create collaborative frameworks, and secure external funding for the pilot projects.

Help Needed

All those interested in ensuring the successful outcome of the Lean Supply Chain Now initiative can help by raising the general level of awareness of the initiative, by helping to secure championship for it by top-leadership in industry and government, by serving as the host site for a pilot project, by providing financial as well as in-kind support for implementing the pilot projects, and by providing technical assistance in the form of tools, techniques and educational and training modules.

INTRODUCTION

This draft white paper outlines the *Lean Supply Chain Now* Concept Demonstration Initiative, which is a new planned activity of the Supplier Networks Working Group of the Lean Aerospace Initiative (LAI). LAI is a collaborative learning community dedicated to the transformation of the greater U.S. aerospace enterprise. It is organized as a consortium of major U.S. aerospace companies, U.S. government agencies led by the Air Force, national labor organizations, and the Massachusetts Institute of Technology (MIT) and provides a neutral forum mediated by MIT for knowledge creation and implementation. The program enables focused and accelerated transformation of complex enterprises through the collaborative engagement of all stakeholders to develop and institutionalize principles, processes, behaviors and tools for enterprise excellence.

The Supplier Networks Working Group is an active knowledge-sharing and implementation-oriented team. Its mission is to “enable the development of lean, value-creating, U.S. aerospace supplier networks.” The team’s membership consists of representatives from the LAI stakeholder member organizations (industry, government, MIT) actively engaged in supply chain issues, as well as invited members from “lean-enabler” organizations facilitating or providing supplier development, lean training and education, and related lean transformation services to help improve the performance of the U.S. aerospace supplier base.

MOTIVATION

Many enterprises engaged in the development, production and sustainment of aerospace systems have adopted lean principles, six sigma and related continuous improvement initiatives – “lean principles” or “lean enterprise thinking” -- during the past decade to achieve greater efficiency and effectiveness. These enterprises encompass military acquisition program enterprises, divisions of defense and commercial aerospace companies, large-scale multi-divisional companies, and government organizations providing maintenance, repair and overhaul (MRO) as well as logistics services. Many aerospace enterprises are increasingly recognizing that, although necessary, adopting lean principles to improve their performance “within their own four walls” (i.e., within the core enterprise alone), although clearly necessary, is hardly sufficient. The reason is that, to evolve lean enterprises, they must focus not narrowly on the focal enterprise alone (e.g., a division, program, company) but on the entire enterprise value stream, covering the supplier network supporting the focal enterprise. Major aerospace enterprises typically have sizeable supplier networks consisting of hundreds and in some cases thousands of suppliers. As much as 65%-80% of the final cost of aerospace products and systems consist of materials, parts, components and services provided by suppliers. This means aerospace enterprises can be only as lean as their supplier networks.

Consequently, many enterprises have launched programs focused on supplier development, often by augmenting their own internal capabilities by retaining the services of outside organizations specializing in supplier training and development. However, there are limited resources available for supplier development and a large number of suppliers still remain outside the reach of individual enterprises earnestly trying to evolve lean supplier networks. The suppliers themselves are even more resource constrained in terms of being able to invest in developing lean capabilities. Besides, many among them may not even know much about lean principles. Some may not care. Others, for various reasons, are known to reject any help offered to them.

Many supplier training and development efforts have typically concentrated on improving the performance of individual suppliers, through Kaizen events and similar efforts. Meanwhile, the interfaces between the *core enterprise* (original equipment producer, system integrator, principal sustainment organization) and its numerous suppliers often represent the source of significant waste (e.g., excessive inventories, overproduction, defects, wasteful activity, delays, inefficient transportation, etc.), undermining affordability targets, blocking flexibility and impeding responsiveness. Consequently, the traditional “point-centric” supplier development approach, concentrating on improving the performance of individual suppliers, must be significantly modified and broadened. Instead of seeking “point-centric” efficiency gains, efforts must concentrate on achieving “network-centric” efficiency, focusing on both the suppliers (as nodes in a network) and on the interfaces connecting them (as links in the network).

Typically, the interfaces linking a customer enterprise with its first-tier, as well as its lower-tier, suppliers remain outside the focus of many enterprises pursuing supplier development efforts. In the large, no one “owns” these interfaces. It is not at all unusual currently for a customer enterprise not having visibility into its lower-tier suppliers where quality escapes may well originate and cause substantial problems, not only for itself but also its own downstream customers. This is why focusing on supplier interfaces is critically important.

The traditional approach to supplier development suffers from other problems as well. For example, many of the major aerospace companies share a common pool of suppliers. This could mean considerable duplication of effort on their part as they separately focus on improving the performance of the suppliers they have in common. Ironically, the very fact of having common suppliers can also spell significant underinvestment in supplier development. This may seem a paradox, but can be explained simply by noting that having a common pool of suppliers is naturally rife for what is known as the free-rider behavior. In other words, individual companies may be reluctant to invest in improving the performance of these common suppliers, hoping instead to benefit from the improvement efforts of others. Such behavior, of course, could easily lead to collective underinvestment in supplier development, which is an undesirable outcome from the standpoint of ensuring a healthy and vibrant U.S. aerospace supplier base. Normally, such a classic “market failure” situation would necessitate government intervention through enlightened public policy, but this is not yet in evidence.

In sum, the traditional approach to supplier development in the aerospace industry has focused primarily on improving the performance of individual suppliers (i.e., “point-solution” approach). It has been limited, duplicative, uneven and slow. Government response has been piecemeal and ineffective. Creative collaborative arrangements to find common solutions have been slow to materialize. Those that have been tried have basically followed the traditional model of improving the performance of individual suppliers (point-solutions). There is a serious and deepening mismatch between the traditional approach

to supplier development and the growing sense of urgency to deliver effect-based capabilities to warfighters as well as to enhance the competitiveness of the U.S. aerospace industry. Consequently, there is an urgent need for fresh thinking.

DEFINITION

The *Lean Supply Chain Now* initiative is a “proof-of-concept” demonstration effort to validate a fundamentally new and different approach to an urgent problem – streamlining and transforming aerospace supplier interfaces. By conducting a number of pilot projects, this effort is aimed at showing that a supplier network with streamlined vertical interfaces between customer enterprises and suppliers in the multi-tiered aerospace supplier base, enabled through “lean intervention,” provides superior performance in terms of cost, quality and delivery. In these pilot projects, major emphasis is placed on demonstrating real and sustainable gains by focusing on the entire multi-tiered interface process involving many “hand-offs” in the supply chain (including operational improvements *within* selected suppliers, as necessary). This is in contrast with the traditional approach focusing almost exclusively on improving the *internal* operations of individual suppliers.

The implementation of the pilot projects is expected to result in a “lean-intervention” framework – consisting of a structured process, effective lean practices, methods and tools as well as educational modules – that can be widely deployed throughout the aerospace community to achieve accelerated streamlining and transformation of vertical supplier interfaces in the multi-tiered aerospace supply chain supporting individual programs or companies. Both the execution of the proposed demonstration effort itself and the subsequent wide-scale implementation of the resulting “lean-intervention” framework are expected to accelerate the process of transforming supplier interfaces. This process is expected to quicken the pace of eliminating waste, reducing lead time, and improving quality throughout the U.S. aerospace supplier base. This is in sharp contrast with the *point-centric* localized improvements typically pursued by the traditional approach.

The *Lean Supply Chain Now* initiative is moving from the planning stage into the pilot project implementation stage. The proposed initiative builds upon the earlier success of the Lean Now initiative launched by the U.S. Air Force Materiel Command (AFMC), in a teaming arrangement with LAI consortium industry member organizations, to provide on-time, effects-based, capability to warfighters through the deployment of lean principles and practices in a number of pilot projects and enterprise transformation efforts. The Lean Now initiative concentrated on critical government-industry interfaces. The initial prototype projects focused on accelerating process improvements in selected Air Force acquisition programs, while the subsequent projects concentrated on large-scale enterprise transformation efforts. Some of the Lean Now pilot projects included the following, yielding significant benefits:

- o F/A-22 Raptor Operational Flight Program (OFP) Preparation and Load process at Edwards AFB Combined Test Force (CTF);
- o F-16 Falcon Contract Closeout;
- o Global Hawk Alpha Contracting;
- o Arnold Engineering Development Center (AEDC) Turbine Engine Development and Sustainment Process (Test and Evaluation Support Focus).

The *Lean Supply Chain Now* initiative, in addition to building on the earlier Lean Now effort, extends the Supplier Networks Working Group's earlier activities concentrating on the development of the Supplier Networks Transformation Toolset, an integrated implementation toolset for building lean supplier networks (see <http://lean.mit.edu/>).

The proposed initiative directly addresses three areas identified in a recent survey of the LAI value proposition that offer a significant new opportunity for creating greater and more balanced value for the LAI stakeholder member organizations. These three areas were defined in the survey as follows:

- o *Improving prime-supplier interfaces* – providing assistance to help streamline transactions, defining methods for capturing lessons-learned, sharing data, and facilitating networking opportunities, for example by helping to develop standardized tools, implementation methods, processes and metrics that primes (system-integrators) and major suppliers can use as they interface with their lower-tier suppliers;
- o *Helping with deployment of tools within the aerospace industry* – providing assistance with the use of tools (e.g., facilitating access to them, helping with their deployment), as well as with their wider deployment across the industry;
- o *Establishing collaborative relationships with third-party “lean-enabler” organizations* – providing assistance with supplier transformation efforts by helping to improve supplier processes and capabilities (e.g., through supplier training).

Broadly speaking, the *Lean Supply Chain Now* initiative represents a timely response to emerging problems in terms of quality escapes, schedule surprises and unanticipated budget overruns having an adverse effect on both military and commercial aerospace development, production and sustainment efforts. It supports military prime contractors and many major aerospace companies that have, under *privity of contract*, primary responsibility for managing their supplier networks.

This initiative supports the supplier development and integration efforts of both military and commercial aerospace companies, including prime contractors (system integrators) and their major suppliers, while also benefiting lower-tier suppliers. It also supports the efforts of government agencies with a direct interest in enabling the development of an efficient, flexible, responsive and innovative domestic aerospace supplier base. For example, it supports the Air Force Smart Ops for the 21st Century (AFSO21) initiatives, including those pursued by the Air Force Materiel Command (AFMC). It also supports other major initiatives addressing supply chain integration issues, such as the subcontracting management initiative of the Defense Contract Management Agency (DCMA) and the Depot Maintenance Transformation and Procurement Supply Chain Management efforts of AFMC. The results of the *Lean Supply Chain Now* initiative are expected to provide wider benefits to the other federal government agencies as well (e.g., U.S. Army Aviation and Missile Command, U.S. Naval Aviation Command, U.S. Missile Command).

OBJECTIVE

The *near-term* objective of the initiative is to design, test and develop a model implementation framework (“lean-intervention” template) that can be used widely throughout the aerospace community to achieve accelerated streamlining and transformation of vertical interfaces in the multi-tiered aerospace supply

chain supporting individual programs or companies to eliminate waste, reduce lead time, and improve quality. This model implementation framework represents a validated, repeatable, portable and deployment-ready template that can be tailored to address interface issues in a variety of settings (e.g., acquisition, production, sustainment). The expected benefits – *network-centric* performance improvements (e.g., in terms of cost, quality and delivery) – are in sharp contrast with the *point-centric* localized improvements typically pursued by the traditional approach.

The *longer-term* objective of the initiative – expected to be achieved through the wide-scale and accelerated deployment of the resulting product – will include:

- o Accelerated reduction in waste and inefficiency across the multi-level aerospace supply chain supporting new acquisition (development) programs, production programs, and sustainment (maintenance, repair and overhaul) operations;
- o More flexible, responsive and resilient U.S. aerospace supplier base;
- o Better trained aerospace workforce;
- o Keeping and even increasing productive domestic aerospace jobs;
- o Increased U.S. aerospace competitiveness;
- o Improved domestic capacity to provide effects-based capabilities to warfighters and commercial customers.

Removing the obstacles to unfettered requirements flowdown will shorten the total span time and increase the supplier network's responsiveness. Enterprise assets will be utilized more efficiently and profitably, which will free-up scarce resources that can be re-invested to achieve greater enterprise efficiency and flexibility. Streamlined and synchronized interfaces will help reduce risk in program management through significantly better-controlled and more predictable processes.

The *Lean Supply Chain Now* initiative will contribute to the development of a stronger aerospace industrial base, encompassing both the original equipment manufacturers (OEMs, including prime contractors and system integrators) and suppliers. A stronger aerospace industrial base will provide the customers (e.g., the government) greater value – more affordable systems, enhanced delivery of effects-based capabilities, increased system availability.

The cost of inaction can be enormous. Not seizing the opportunity to address supplier interfaces could mean continued cost overruns, delays in delivery, inadequate supplier performance, potential for increased offshoring of domestic aerospace capabilities, inability to source diminishing parts and obsolete materiel, inability to meet a surge in demand, failure in meeting growing warfighter needs, and potential weakening and even loss of the domestic aerospace industrial base.

The execution of the *Lean Supply Chain Now* initiative will involve a number of pilot projects, as detailed below. These pilot projects will be selected to cover a spectrum of operational settings, such as acquisition (development), production and sustainment. The main hypothesis to be tested through the pilot projects is that a supplier network with streamlined vertical interfaces between the customer enterprise and its supplier network, enabled through "lean-intervention," provides superior performance in terms of cost, quality and delivery. Accordingly, benchmarking will be conducted in each pilot project to test for significant differences, in terms of key performance metrics, both before and after the planned

“lean-intervention” (treatment), where the observed performance differences can be directly attributed to the “lean-intervention” process, after controlling for various confounding factors.

EXPECTED END-PRODUCT AND BENEFITS

The expected “hard” end-product of the proposed initiative is a validated “lean-intervention” framework that will have the following key features:

(1) *Provide hard data on immediate improvements on specific performance metrics achieved in each pilot project.* This will include quantitative data on such metrics as cycle time, first pass yield, cost reduction, improved delivery to schedule, and improved customer satisfaction and communications. For a specific pilot project organization, such as the C-17 program enterprise, the expected benefits will encompass cost reduction, quality improvement and shorter lead time for a well-defined subsystem or component selected for pilot project intervention, such that the lessons learned can be widely and quickly disseminated to derive similar benefits for other parts of the entire aircraft production process. An immediate process-related benefit would be to validate already existing methods and tools used to address interface issues in the supply chain.

(2) *Encompass structured processes, best practices, lessons learned, tools and methods, metrics, educational and training materials and related aids for “hands on” streamlining of supplier interfaces and for achieving continuous improvement.* These deliverables are expected to include documentation of a number of intermediate steps, such as current state value stream mapping and analysis, definition of the desired future state, and specific action steps for achieving the desired future state. The pilot projects will cover identification of interface attributes that cause and prevent quality escapes, definition of rework cycles, before-and-after performance metrics, resource utilization patterns, cost and schedule data, capturing the voice of the customer, subcontracting management practices, and concrete going-forward action plans for continuous improvement.

(3) *Demonstrate the workability and tangible benefits of collaborative action by bringing together key stakeholders.* They are expected to include the host organization for the pilot project, specific suppliers, third-party providers of lean, six-sigma and related continuous improvement services focusing on supplier development and interface issues, external funding organizations with material interest in improving the vitality of the aerospace supplier base, worker training and industrial competitiveness, the LAI Supplier Networks Working Group providing technical support and guidance).

The resulting framework product will provide an integrated suite of such continuous improvement approaches as lean thinking, six sigma, theory of constraints, total quality management, business process reengineering. The product will be in the form of a web-enabled electronic repository consisting of a suite of implementation modules that will be made available and easily accessible for wide-scale deployment. The resulting product will be sufficiently robust across the aerospace community but also capable of being easily tailored to address specific program or company needs. Moreover, an integral part of the resulting product will be the demonstration of the power of creating workable collaborative arrangements to address difficult supplier interface issues.

The resulting model implementation framework is expected to have the following key characteristics:

- o *Systematic* – will contain a systematic methodology for streamlining vertical interfaces;
- o *Actionable* -- Deployment-ready; can be used with minimal up-front preparation;
- o *Flexible* – can be tailored to address a variety of interface problems in different contexts (acquisition, production, sustainment);
- o *User-friendly* – organized for easy use by enterprises interested in streamlining their supplier interfaces;
- o *Accessible* – Internet-based; widely available to the entire aerospace community;
- o *Free* – available for free to all interested in using it.

The lean-intervention framework will contain a documentation of structured implementation processes, best practices, tools and methods, and “before-and-after” benchmarking metrics. It will be in the form of an easily accessible electronic repository that will be made available for use widely throughout the U.S. aerospace community. The framework is expected to serve as a practical and useful template for building value-creating supply chain interfaces across the aerospace community. The targeted potential users are prime contractors (system integrators), major supplier companies, government organizations (e.g., Defense Contracts Management Agency (DCMA), system program offices (SPOs), air logistics centers (ALCs), operating military bases (e.g., Dover Air Force Base), “lean-enabler” organizations, industry associations and public-private partnerships interested in improving the performance of the U.S. aerospace supplier base, and any collaborative combination of these organizations.

Although it is clearly not the intent of the *Lean Supply Chain Now* initiative to seek solutions to complex supplier interface issues solely in terms of the application of state-of-the-art information technologies and systems (IT/IS), it is well to consider possible future states where the supplier base can be seamlessly integrated to operate much more efficiently and responsively through the deep application of such technologies and systems. The initiative will, accordingly, consider the potential applicability of a comprehensive set of tools, techniques, and methods by which primes and system integrators can work together with their supplier networks to employ IT/IS systems and services – supplier portals, robust suite of enterprise IT/IS architectures, products and capabilities enabling lean supplier interfaces – to evolve lean supplier networks.

SCOPE AND FOCUS

A number of selected pilots will be conducted to implement the *Lean Supply Chain Now* concept. These pilots will be designed and executed as controlled experiments. Both BEFORE and AFTER performance metrics will be developed and measured to quantify the system-wide benefits that can be directly traced to the specific “lean-intervention” efforts and build a business case capturing both costs and benefits.

A two-level perspective will be taken for scoping and focusing the proposed initiative-- *horizontal* and *vertical* – in order to “bound” and sharply focus the individual pilot projects:

- o *Horizontal scoping*: At the inception of each pilot project, a “horizontal” view will be taken, encompassing key aspects of the host enterprise. This initial reconnaissance work will concentrate on developing a clear understanding of the enterprise’s overall mission, goals and objectives, as well as its strategies, organizational structure, operating policies, and particularly its supply chain management processes and systems. Particular emphasis will be placed on the enterprise’s interfaces with its supplier network to identify critical interface issues, to explore how these issues

affect the enterprise's performance, and to examine how these issues themselves are related to each other. The main objective will be to identify critical, high-leverage, interface improvement opportunities. The reconnaissance work may also unearth key "intra-enterprise" process improvement opportunities, as well as "customer-facing" improvement opportunities, which may be important to address concurrently by the host enterprise.

- o *Vertical focusing:* It will be important to "drill-down" into the supply chain through various tiers down to the commodity level for the purpose of mapping and assessing critical interface issues, defining the current-state as well as the desired future-state, identifying key improvement opportunities, and deploying "lean-intervention" strategies, methods and tools to help achieve those improvements. Since such an effort can quickly become unmanageable because of the sheer number of branching processes in the supply chain, it will be crucial to focus the analysis, for instance, by concentrating on major quality escape paths.

The vertical perspective will follow a number of focusing steps, such as those listed below:

- *First*, a specific physical system, subsystem, component or part will be selected for focusing the effort. The selection will be made jointly with the host enterprise, with the expectation that the selected "item" offers the best opportunity for achieving maximum potential system-wide benefits from the pilot. The selection will be made on the basis of a number of factors (e.g., quality escapes), which would help define a path in each program that can be traced down to the source of the problem.
- *Second*, the multi-tiered supply chain supporting the development, production or sustainment of the selected "item" will be identified and mapped down to the lower-tiers, perhaps even down to the commodity level, depending on the potential root causes of the interface problem being addressed.
- *Third*, primary attention will be placed on key interface issues (e.g., quality escapes, engineering design change process management, requirements flowdown, producibility) that are judged to be causing major supplier performance problems, where direct interventions can generate significant cost-savings, quality improvements and lead time benefits, as detailed below. More detail on the focusing process is provided below under "Key Interfaces."

APPROACH

The implementation of the *Lean Supply Chain Now* concept involves a four-phase approach:

- o *PHASE 1: Baseline* -- Conduct an initial benchmarking of case studies and projects both within and outside aerospace providing a more detailed understanding of salient interface issues, barriers and enablers, tools and methods, and success stories related to streamlining of supplier interfaces. This phase is currently in-progress. Expected completion date: November 2005.
- o *PHASE 2: Prototype* -- Select, design and execute a "test-bed" quick-prototype pilot as a "proof-of-concept" project (alpha-test); capture lessons-learned and develop generic pilot project implementation plan. This initial pilot project will be conducted without seeking external funding. This

alpha-test pilot is expected to be continued into the next phase and is anticipated to be conducted under external funding. Additional alpha-test pilots may be considered. Expected duration: 4-5 months.

- o *PHASE 3: Validate* – Select, design and execute a number of pilot projects concurrently, with external funding. These pilot projects may span both defense and commercial programs. They may also cover both acquisition (development, production) and sustainment programs. Expected duration: 6-12 months.
- o *PHASE 4: Institutionalize* – Document and widely disseminate the results of the pilot project engagements to institutionalize the use of the “lean-intervention” framework for streamlining supplier interfaces. The results will be consolidated and presented in the form of an electronic repository for easy access by the aerospace community. The documentation will contain “lean-intervention” best practices, structured methodology, tools and methods, training and education materials, metrics benchmarking and related material organized in an action-oriented format. Expected duration: 2-3 years.

The methodology involves the design and execution of action-oriented pilot projects to streamline vertical supplier interfaces. Benchmarking will be conducted in each pilot project to test for significant differences, in terms of key performance metrics, both BEFORE and AFTER the planned “lean-intervention” (treatment. The “lean-intervention” process in each pilot will thus be designed as a controlled experiment in order to quantify the system-wide benefits that can be directly traced to the specific lean interventions and build a business case capturing both costs and benefits.

POTENTIAL PILOT DEMONSTRATION PROJECTS

Listed below is a notional list of potential candidates from which a small number of pilot demonstration projects will be selected. This list is illustrative and in no case purports to represent any commitment on the part of either the principal organizations involved or the Supplier Networks Working Group. Some of these are currently being actively explored, but no decisions have yet been reached concerning their potentially serving as pilot projects. Other nominations are encouraged.

- o Global Hawk (Low Rate Initial Production – LRIP)
- o C-17 Globemaster (production phase)
- o F-35 Joint Strike Fighter (development phase)
- o F/A-18 E/F Super Hornet
- o Army helicopter repair and maintenance (for a selected helicopter fleet)
- o F-16 Falcon Block 60 Upgrade
- o F-16 Falcon avionics repair and maintenance (both base-level and depot-level. Example: the 388th Fighter Wing at Ogden Air Logistics Center *and* the F-16 avionics maintenance, repair and overhaul (MRO) operations at the Ogden Air Logistics Center, both located at the Hill Air Force Base, Utah.
- o C-5 Galaxy maintenance, repair and overhaul (MRO) activities (both base-level and depot-level). Example: base-level MRO operations at the Dover AFB and depot-level MRO operations at the Warner Robins ALC, Georgia.
- o Boeing 787 Dreamliner (development phase).

KEY INTERFACES

Supplier interfaces refer to *interactions* between a core enterprise and its individual suppliers, as well as between (among) the suppliers across the core enterprise's supplier network, that typically arise as a result of *dependencies* among the functions performed by the core enterprise itself and its supporting supplier organizations where these dependencies require some degree of *coordination*. These interactions may originate in the context of specific enterprise operations (business, engineering, production, supply chain management), assume various forms (formal, informal; contractual, noncontractual), involve various types exchanges or flows (information, materials, financial), entail many specific types of activities (technical requirements flowdown, engineering change management, risk management, part qualification, schedule communication and integration, audits), and display a number of directional characteristics (one-way, two-way, multilateral; single channel, multichannel). These interactions can be, and often are, very complex, multifaceted and multidirectional.

The Supplier Networks Working Group has conducted a mapping, assessment and prioritization of generic supplier interfaces as part of a deliberative process to sharpen the focus of the *Lean Supply Chain Now* pilot projects. As a first-approximation, the team has considered supplier interfaces in terms of four principal categories of interactions linking a given core customer enterprise with a particular supplier:

- *Business-related Interfaces* – These define interactions pertaining to business decisions, processes and relationships (e.g., request for proposal (RFP), request for quotation (RFQ), proposal evaluation and negotiation, cost and price analysis, contract award, long- term agreements, order placement, business forecasting, management of payments, marketing, customer support requiring interactions with suppliers, management of contractor furnished equipment or material (CFE, CFM) provided to suppliers, management of government furnished equipment or material (GFE, GFM), business forecasting, intellectual property, contract closeout).
- *Engineering-related Interfaces* – These define technical and engineering interactions, arising mostly but not exclusively in connection with product development activities (e.g., requirements definition, system architecture, configuration management, technical communications, producibility analysis, engineering change process, risk management, integrated product teams, technical data packages, procurement specifications, material specifications, part qualification, test and evaluation, sharing of technology forecasts, technology and know-how sharing, joint problem solving, packaging)
- *Production-related Interfaces* – These define interactions in connection with on-going production operations (e.g., contract turn-on, sharing of demand forecasts, production schedule communication and integration, long-lead time management, material availability, source and incoming inspection, quality audits, transportation, logistics and materials management, offsite production support, diminishing sources and parts obsolescence, customer acceptance – DD250).
- *Supply management-related interfaces* - These define interactions that arise in connection with supply chain design, development and management (e.g., strategic make-buy, supplier qualification, source selection, flowdown of contractual requirements, order placement, supplier training and development, supplier certification, part qualification, transportation and shipping, source and incoming inspection, synchronization of production and delivery schedules, inventory management, reverse auctions, monitoring and evaluation of supplier performance).

Using such a rough typology, and only as a first step to develop a general understanding of supplier interfaces within the context of a specific pilot project, interactions between a customer company and a specific supplier can be mapped in the form of a four-by-four matrix. In such a matrix, each *cell* would help define major interfaces between a particular defined operation of the customer company (e.g., engineering) and a defined operation of a given supplier (e.g., production). For example, focusing on the interactions between the customer company's *engineering operations* and the supplier's *production operations* would draw attention specific types of interfaces involving producibility and engineering change issues. Production-to-production interfaces would draw attention to such specific interface issues as quality escapes, lead time, and delivery performance.

Quickly "populating" each *cell* in such a four-by-four matrix with specific sets of interactions falling within that *cell* and assessing the results at a fairly top level, for example by color-coding them, would provide a first-order diagnosis of where the critical interface issues may reside. Moreover, examining possible linkages between a particular "problem" interface and all others may provide a rapid assessment of whether the particular interface problem may be a part of larger, interrelated, problem that needs to be addressed.

The Supplier Networks Working Group has also examined and prioritized specific sets of interfaces in terms of the potential severity of the problems they could cause. This process has resulted in an identification of specific sets of interfaces where "lean-intervention" efforts would be expected to provide the greatest system-wide benefits. More specifically, the team has considered, in detail, contractual interfaces, technical data interfaces, physical parts interfaces, and other interfaces (e.g., business systems, audits, supplier performance ratings). The team has reached the conclusion that the pilot projects should concentrate on two key specific types of technical interfaces:

- o *Requirements flowdown* -- engineering specifications, material specifications, audits, delivery requirements, packaging, and part qualification process (e.g., testing requirements, first article inspection);
- o *Configuration change management* -- engineering change orders (ECO), manufacturing requirements changes.

Considering these two types of interfaces further, the team has concluded that primary focus should be placed on the technical data package (TDP) flowdown process, from customer handoff to commodity level in the supply chain, since such a focus would provide a very important leverage point for gaining visibility into critical sources of waste, quality escapes, and barriers to supplier flexibility and responsiveness.

GENERIC PILOT PROJECT ENGAGEMENT PLAN

A major contribution of the *Lean Supply Chain Now* initiative will be the development and validation of an implementation model that can be used for streamlining supplier interfaces and transforming the performance of aerospace supplier networks to maximize system-wide benefits. The Supplier Networks Working Group is in the process of developing a generic pilot project engagement plan, defining an actionable structured process, by blending key principles and practices involving lean enterprise thinking, six sigma, business process reengineering, and theory of constraints.

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The generic implementation model will encompass a number of distinct stages:

Stage 1: Definition – Teaming structure, design of the pilot project, identification of key stakeholders, value proposition, leadership commitment and support, business model, team charter, training and education of key personnel, reconnaissance analysis of the host organization's (and the pilot project's) key characteristics (context, customer expectations, strategy, organization, operations, processes, practices, infrastructure support systems, performance metrics, etc.) impacting supplier interfaces. Expected duration: 4-6 weeks.

Stage 2: Assessment – Mapping and analysis of current-state interfaces (contexts, forms, types, processes), developing interface process flow maps, identifying key causal factors, first-order diagnosis of critical supplier interface issues and problems offering “low hanging fruit” improvements, defining desired future-state supplier interfaces and metrics, defining the gap between the current-state and desired future-state characteristics, identifying high-leverage improvement opportunities and priorities, identifying enablers and barriers, assessing host organization's current capabilities to make the necessary changes, identifying priority “lean-intervention” requirements under the auspices of the pilot project, assessing the costs and benefits of the priority change opportunities, recommending needed complementary change opportunities (outside the boundaries of the pilot project, to be performed by the host organization). Expected duration: 8 weeks.

Stage 3: Redesign – Examining priority change opportunities in light of the desired future-state characteristics and metrics; determining opportunities for tactical improvement (specific, narrowly-defined problems), focused improvement (simplifying existing processes through root cause analysis and other tools), process redesign (major organizational or process changes), and process innovation (radical change at the organization-level, employing new technologies, particularly information technologies); identifying change enablers and effective ways of overcoming barriers (with emphasis on deploying people enablers to build the required support, foster behavioral change, instill a new culture, and enhance existing competencies); define educational and training requirements to bring about the needed changes; develop a schedule and critical paths for bringing about the required changes; build a business case for the required changes. Expected duration: 8 weeks.

Stage 4: Implementation – Developing team structure (identifying people critical to success – process owner and change agents from the host organization, key supplier personnel, third-party “lean-enabling” organization, etc.); designing a detailed implementation plan (activities, milestones, resource plan, training plan, communication plan, performance metrics); selecting and training implementation teams; executing the implementation plan; tracking progress against the plan; making adjustments as necessary; achieving change objectives; documenting the implementation process. Expected duration: 12 weeks.

Stage 5: Continuous Improvement – Establishing a documented monitoring and continuous improvement process (policies and procedures, reporting requirements, metrics, training programs, feedback loops for cycling back to previous stages and recalibrating the change process, adjustments in performance metrics and change processes to meet changing enterprise goals and objectives, contingency strategies and plans to meet emerging needs. Expected duration: on-going, after completion of the pilot project.

Stage 6: Documentation – Documenting the pilot project implementation process, from beginning to end, for the purpose of consolidating the results of the implementation experiences across all pilot projects into a common deployment model (framework, package, template) for use widely by the aerospace community; summarizing lessons-learned; describing the structured processes, tools and methods, and training programs deployed; providing quantitative as well as qualitative measures of both BEFORE and AFTER performance metrics; demonstrating the business case, showing both costs and benefits. Expected duration: 8 months.

The resulting methodology will be tailored to the particular circumstances of the specific pilot projects and will be augmented by integrating tools and methods used by the host pilot project organization and the principal “lean-enabler” organizations that will be involved in the execution of the individual pilot projects.

A pilot project implementation guide has been prepared by the Supplier Networks Working Group to serve as a guide in connection with specific pilot projects. This guide will be made available to all pilot projects upon their selection.

FRAMEWORK FOR COLLABORATION

In pursuance of LAI's vision and mission, a collaborative framework is envisioned for the execution of the *Lean Supply Chain Now* initiative, bringing together the complementary capabilities of the pilot project host organization, key suppliers, various third-party “lean-enabler” organizations, cognizant government agencies and organizations, the Supplier Networks Working Group of the Lean Aerospace Initiative (LAI), and the “contractor” lean-enabler organization. A “lean-enabler” organization is defined as a public or private, for-profit or nonprofit organization, or a group of organizations working together (including public-private partnerships) that help facilitate the deployment of lean principles and related continuous improvement approaches (e.g., six sigma, theory of constraints, total quality management, business process reengineering) or actually deliver hands-on lean implementation services to transform processes and enterprises.

For such a collaborative framework to work successfully, it is necessary to define and agree upon a value proposition spelling out both the value delivery and the value expectation on the part of all collaborating partners. The configuration of the collaborative arrangements will be tailored to the specific needs of the selected pilot projects, to bring the greatest benefit to each pilot project.

At present, a partial and illustrative list of the various organizations that could, in principle, collaborate on this initiative include the following:

- o Government organizations
 - U.S. Air Force
 - ⇒ Acquisition (USAF SAF/AQ)
 - ⇒ Air Force Materiel Command (AFMC) – Transformation (AFMC/TR); Logistics and Sustainment (AFMC/LG), including Air Logistics Centers (ALCs)
 - ⇒ Air Force Research Laboratory (AFRL), Materials and Manufacturing Directorate, Manufacturing Technology Division
 - ⇒ Air Force Transportation Command

- ⇒ Air Combat Command
- U.S. Army Aviation and Missile Command (AMCOM)
- U.S. Naval Aviation Command (NAVAIR)
- Defense Contract Management Agency (DCMA)
- Defense Logistics Agency (DLA)
- Missile Defense Agency (MDA)
- Environmental Protection Agency (EPA)
- U.S. Department of Commerce, National Institute of Standards (NIST), Manufacturing Extension Partnership (MEP)
- State agencies (e.g., economic development, workforce training)
- Prime contractors (original equipment manufacturers – OEMs, system integrators):
 - Lockheed Martin
 - The Boeing Company
 - Northrop Grumman
 - Raytheon
 - United Technologies.
- Lean-enabler organizations
 - Lean-enabler organizations providing lean-delivery services
 - ⇒ 360vu Research and Education Foundation
 - ⇒ NIST MEP centers (e.g., California Manufacturing Technology Center – CMTC; TechSolve, Inc.; other individual MEP centers (e.g., Arizona MEP, Florida MEP)
 - ⇒ Supplier Excellence Alliance (SEA)
 - ⇒ MEP Management Services, Inc.
 - ⇒ Doyle Center for Advanced Manufacturing
 - ⇒ Government Electronics and Information Technology Association (GEIA)
 - ⇒ Altarum Institute
 - ⇒ Dynamics Research Corporation.
 - Industry associations
 - ⇒ Aerospace Industries Association (AIA)
 - ⇒ National Association of Manufacturers
 - ⇒ National Council for Advanced Manufacturing (NACFAM)
 - Lean Aerospace Initiative (LAI) Supplier Networks Working Group, facilitated by Massachusetts Institute of Technology (MIT)
 - Other academic partners: Academic partners participating in the MIT-led Education Network, facilitated by the Lean Aerospace Initiative (LAI) – Examples include: University of Alabama in Huntsville, University of Missouri – Rolla; Arizona State University; Loyola Marymount University; Wright State University; University of Michigan; Purdue University; Georgia Institute of Technology; University of Tennessee.

VALUE PROPOSITION

A “working” value proposition for the *Lean Supply Chain Now* initiative is shown in the attached table. This table lists four primary “stakeholder” categories: the host organization for the respective pilot projects, the external funding organization, the contractor organization (representing the lean-enabler team of organizations), and the Supplier Networks Working Group of the Lean Aerospace Initiative. For each participating organizational category, the table gives a sufficiently detailed description of what

benefits each one of the participating organizations can expect to receive from the initiative, what they are expected to contribute in return, and what their primary responsibility is expected to be.

As this table demonstrates, the *Lean Supply Chain Now* initiative represents a significant opportunity for mutually-beneficial engagement that would deliver significant benefits to all participating organizations. The value proposition can be translated into an operational engagement plan that is both workable and practical.

A number of the points made in the value proposition table are worth highlighting here.

First, the initial alpha-test pilot project (in Phase 1, as indicated earlier) represents an accelerated prototyping project to quickly test-out the lean-intervention process methodology. External funding is not expected to be available for this project. The host organization is expected to provide the needed financial and in-kind support (e.g., by providing dedicated staff) for its execution. This would include in-kind contribution by the selected suppliers as well. The financial support will help pay for the services of the selected lean-enabler contractor organization team. The lean-enabler team is expected to make in-kind contribution as well, in return for the valuable learning experience to be derived from the pilot project. The alpha-test pilot project will be continued as part of the Phase 3 pilot projects, under external funding.

Second, it is expected that external funding will be secured from federal and state government agencies. It is not known at this time whether such external funding will cover internally-incurred (in-kind) costs by the host organizations and by the key participating suppliers. Hence, an operating assumption is that the execution of the Phase 3 pilot projects will require in-kind contribution by the host organizations and the participating suppliers.

Third, the specific contractor organization designated or created to receive and manage external funding from various government agencies or other sources for the purpose of executing the pilot projects will have the responsibility for selecting one or more lean-enabler organizations, in collaboration with the pilot project host organizations, to deliver the services required under the respective pilot projects. The contractor organization will be the point-of-contact with the host organizations, as well as with the external funding organization (s). The design and execution of the pilot projects will be conducted by adopting a collaborative framework bringing together the best talents of the respective individual lean-enabler organizations. The role of the Lean Aerospace Initiative Supplier Networks Working Group will be to provide technical guidance and assistance to the contractor organization, the assembled lean-enabler organizations and the respective host organizations for the various pilot projects.

Fourth, the contractor organization should ensure complete transparency and contract management integrity to avoid any potential conflict of interest or even the appearance of any conflict of interest. The contractor organization is expected to have nationwide capability and reach.

CURRENT ACTIVITIES AND NEXT STEPS

The following specific action items together define current activities and planned next steps:

- o Complete benchmarking of interface-related case studies and projects within and outside aerospace to document best practices in streamlining supplier interfaces. Status: In-progress.

- o Examine supplier portals created and maintained by selected aerospace companies to assess how they are using portals to interface with their suppliers. Status: In-progress.
- o Communicate the initiative more broadly to raise awareness and elicit support (e.g., Lean Aerospace Initiative Executive Board and Steering Council, Air Force leadership, Defense Contract Management Agency (DCMA), Air Force Materiel Command (AFMC), Naval Aviation Command (NAVAIR), Army Aviation and Missile Command (AMCOM), other government agencies; Aerospace Industries Association (AIA) and other industry associations; and major aerospace prime contractors (system integrators) and key suppliers). Status: In-progress.
- o Develop a detailed pilot project implementation framework for deployment in conjunction with the alpha-test pilot project(s). Status: Accomplished at the November 16-17, 2005 team meeting of the Supplier Networks Working Group at MIT.
- o Kick-off the alpha-test pilot (C-17 Globemaster – Boeing Long Beach and the C-17 System Program Office) to test the pilot project implementation framework. Status: Pilot project initiated in January 2006; in-progress).
- o Identify additional pilot projects and obtain the support of host organizations, create collaborative framework, and secure external funding for the pilot projects. Status: In-progress.

HELP NEEDED

Ensuring the successful outcome of the Lean Supply Chain Now initiative requires the following types of help and support:

- o *Awareness* – Raise the general level of awareness of the initiative by communicating its vision, goals, approach and expected outcomes.
- o *Championship* – Help secure the endorsement and support of top-level leadership (within the Lean Aerospace Initiative [in process], government and industry).
- o *Hosting a pilot project* – Step forward to serve as the host site for one of the pilot projects.
- o *Financial resources* – Provide funding support for implementing the pilot projects (e.g., by host organizations, government agencies).
- o *In-kind resources* – Provide dedicated technical personnel and assistance for executing the pilot projects (e.g., by host organizations, key suppliers, lean-enabler organizations).
- o *Technical assistance* – Provide tools, methods and educational modules.

ROLE OF THE SUPPLIER NETWORKS WORKING GROUP

The primary role of the Supplier Networks Working Group will be to:

- o Enable the launching and execution of the *Supply Chain Now* initiative;
- o Provide guidance, review and feedback;
- o Provide technical support, including the design of the pilot projects, educational and training materials, and implementation tools and methods;
- o Help capture the lessons-learned from the pilot projects and consolidate the pilot project documentation materials into a “model” implementation framework.
- o Integrate the results, present them in the form of an electronic repository, and make it available through the Internet for wide deployment by the aerospace community to accelerate the streamlining of supplier interfaces.

The Lean Aerospace Initiative (LAI) will serve as the longer-term custodian of the resulting “model” implementation framework and best practices package and will retain intellectual property rights, consistent with the provisions of the LAI consortium agreement.

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(04/13/06)

LEAN SUPPLY CHAIN NOW
 CONCEPT DEMONSTRATION INITIATIVE
 PROPOSED “WORKING” VALUE PROPOSITION

Stakeholder Type ↓	Expected Value from the Lean Supply Chain Now Initiative	Expected Value Contribution	Primary Role	NOTES
Host organization (Prime or OEM, SPO, ALC) (Includes key suppliers; see NOTES)	<ul style="list-style-type: none"> • Achieve lower supplier cost, improved quality & delivery, and shorter lead time – not “point-centric” but network-wide benefits • Gain much improved visibility into the supply chain • Make further progress towards building lean supplier network • Gain access to independent professional expertise • Obtain access to best practices to address supplier interface issues • Benefit from using proven methodology, training & implementation toolset • Benefit from training & education of key personnel • Achieve greater customer satisfaction • Benefit from the availability of external funding for supplier interface process improvement (Phase 3) 	<ul style="list-style-type: none"> • Provide support & commitment • Obtain buy-in from key suppliers • Dedicate key staff to pilot project (in-kind contribution) • Provide funding support for alpha-test pilot project (for lean-enabler organization team) • Facilitate in-kind support from key suppliers • Host project meetings • Invest in process improvements (including joint initiatives with selected suppliers under cost-sharing arrangements) 	<ul style="list-style-type: none"> • Champion pilot project & serve as host organization • Ensure support & commitment of key suppliers • Provide financial & in-kind support (Phase 2) • Invest in process improvements (e.g., through cost-sharing arrangements with suppliers) 	<ul style="list-style-type: none"> • Financial support required for alpha-test pilot project only (since no external funding is anticipated for alpha-test pilot) for the selected lean-enabler organization team • In-kind support needed for both alpha-test pilot project (Phase 2) & Phase 3 pilots (it is not known whether external funding, which will cover Phase 3 costs, will actually cover internal in-kind costs incurred by host organization & key suppliers) • Pilot project selected for alpha-testing in Phase 2 will most likely continue into Phase 3 • Key suppliers are not explicitly shown, but should be noted as active participants working through the host organization
External funding organization (Phase 3)	<ul style="list-style-type: none"> • Help evolve healthy, efficient, competitive U.S. aerospace supplier base • Provide improved support of warfighters • Provide training & education for aerospace workforce • Retain & expand U.S. aerospace jobs 	<ul style="list-style-type: none"> • Provide funding support • Select neutral lean-enabler contractor team to deploy initiative • Ensure collaborative approach • Monitor performance of contractor team 	<ul style="list-style-type: none"> • Champion initiative • Provide financial resources • Foster collaborative framework • Ensure effective use of resources • Communicate success 	<ul style="list-style-type: none"> • External funding organizations may include federal and state government agencies • Funding may cover individual pilots or all pilot projects in Phase 3 • Funding may be in the form of grants or contracts

<p>Contractor organization (representing lean-enabler organizations working together within a collaborative framework -- Phase 2; Phase 3)</p>	<ul style="list-style-type: none"> • Benefit from a unique learning opportunity to develop new capabilities • Obtain new contract with an important mission, objective & potential future benefits • Benefit from an opportunity for testing & validating new training methods, tools and methods focusing on supplier interfaces • Fulfill the desire to make an important contribution (warfighters, aerospace industry) 	<ul style="list-style-type: none"> • Serve as main contractor for the initiative (with host organization in alpha-test pilot (Phase 2) and/or with external funding organization in conducting Phase 3 pilots) • Plan and execute pilots (alpha-test pilot in Phase 2 and/or Phase 3 pilots) • Bring together & manage collaborative team of lean-enabler organizations • Assume financial responsibility for initiative 	<ul style="list-style-type: none"> • Take primary responsibility for entire initiative • Represent Lean Supply Chain Now initiative to both host organization & external funding organization • Foster collaborative framework • Coordinate all participating lean-enabler organizations • Design, Implement & document pilot projects 	<ul style="list-style-type: none"> • Lean-enabler contractor organization engaged in the initial alpha-test pilot may or may not be the same as that engaged in Phase 3 pilot projects • Lean-enabler contractor will ensure complete visibility & contract management integrity to avoid any conflict of interest problems or appearance of any conflict of interest • Lean-enabler contractor is expected to have nationwide reach and capability
<p>Lean Aerospace Initiative (LAI) Supplier Networks Working Group</p>	<ul style="list-style-type: none"> • Derive the unique satisfaction of making an important contribution to the development of efficient, flexible & responsive U.S. aerospace supplier networks • Develop an improved understanding of critical supplier interface issues and questions • Benefit from a shared opportunity to develop effective training & educational approaches, change management methodology & tools that could provide real-time benefits to all participating organizations • Derive research and educational benefits through a "learning-by-doing" process 	<ul style="list-style-type: none"> • Enable the launching & execution of the Lean Supply Chain Now initiative • Provide guidance for the design and execution of the pilots, development of educational materials, a structured implementation process, performance metrics, and tools & methods • Help capture lessons-learned and documentation of the entire process into a consolidated report that can serve as the basis for developing a "model" implementation package • Serve as the longer-term custodian of the resulting documentation; provide an electronic repository for wide dissemination to the aerospace community 	<ul style="list-style-type: none"> • Provide primarily an enabling role, not a hands-on implementation role • Provide review and guidance • Serve as longer-term custodian of results – provide electronic repository for a "model" implementation package for streamlining supplier interfaces • Retain intellectual property rights (at MIT), under the provisions of the LAI Consortium Agreement 	<ul style="list-style-type: none"> • The Supplier Networks Working Group is a voluntary-membership LAI team engaged in advancing LAI's vision and mission. • LAI's scope and resources limit its role in improving the performance of the aerospace supplier base. • Consequently, the Working Group provides an enabling and educational role only, not a "hands-on" implementation role • The Working Group has no legal standing as an independent or separate entity and cannot engage in contractual relationships • MIIT's engagement in this initiative through LAI represents primarily a public service • MIT would choose not to engage in a contractual relationship in connection with this initiative since it is mostly implementation-oriented, albeit with potential research and educational benefits