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THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
Research Institute/Office for Enterprise Innovation & Sustainability

Assessing the Development and Maturity of the Enterprise Supply Chain Throughout the Lifecycle

Defense Industrial Base Workshop

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Fort McNair

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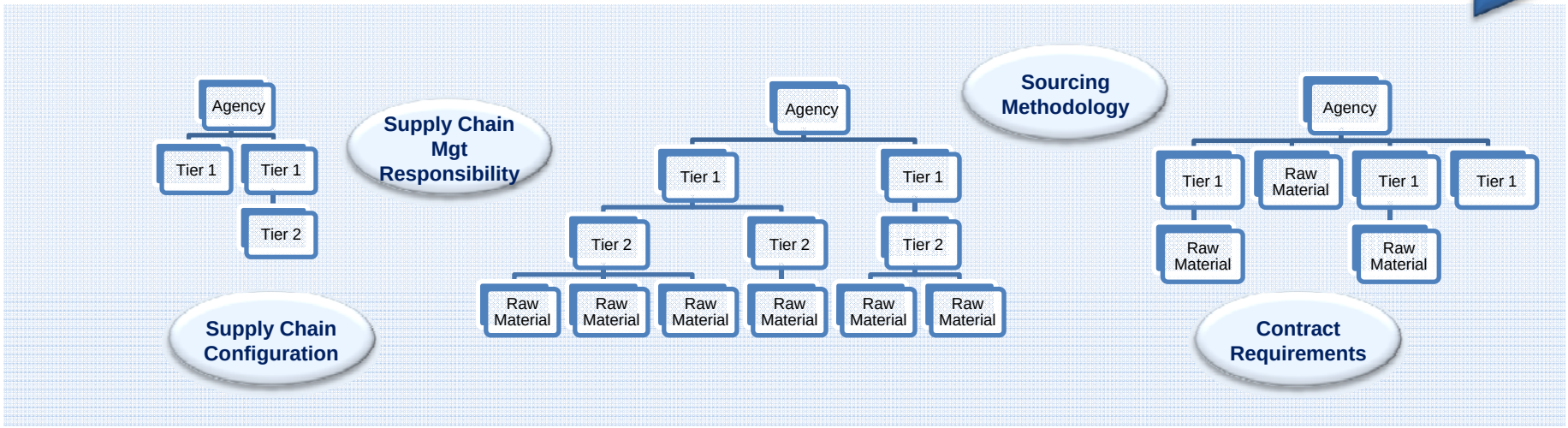
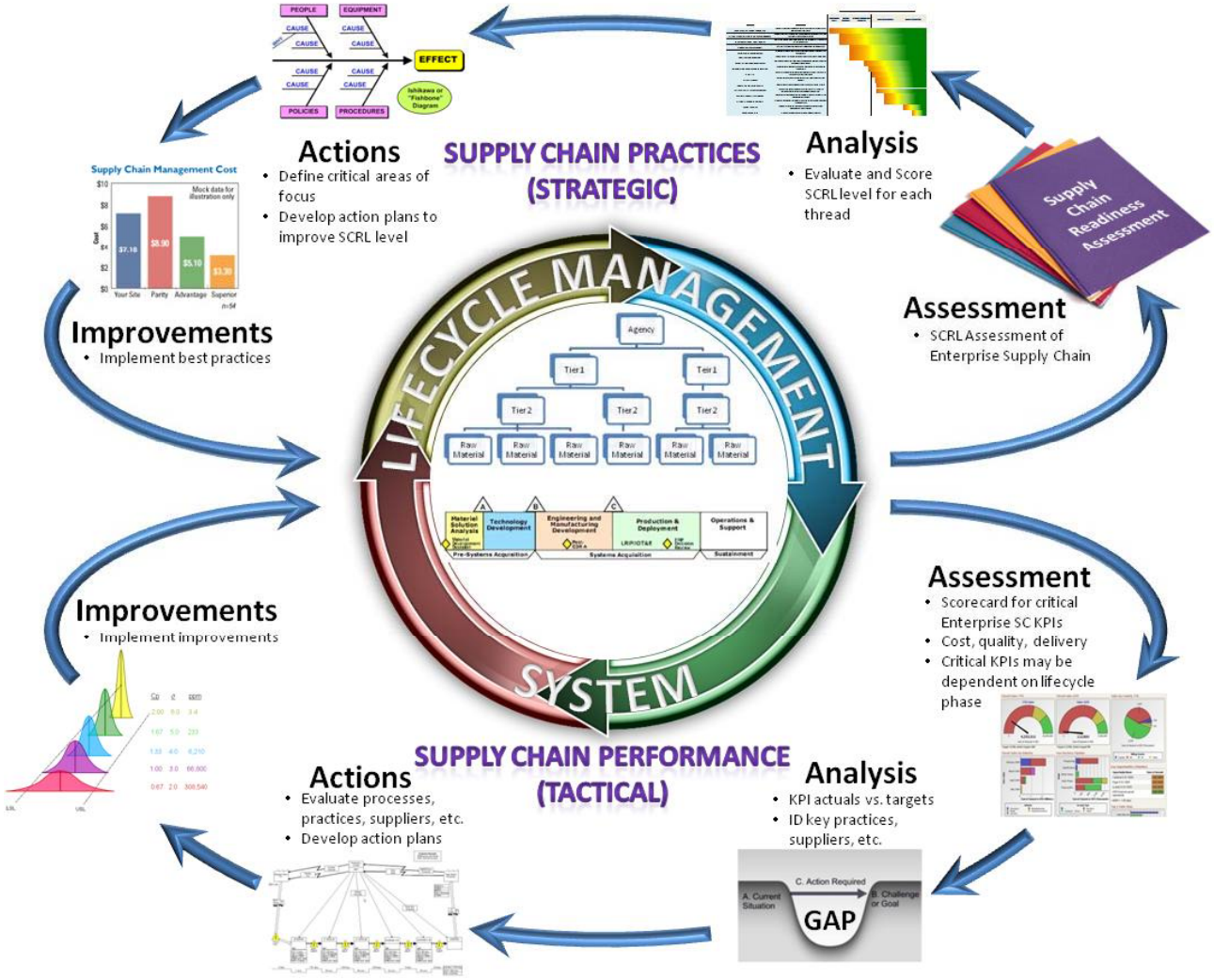
Agenda

- Objectives
- Enterprise Supply Chain
- Model Overview
  - Objectives
  - Benefits
  - Structure
- Progress To-Date
- Next Steps

Dynamics of Enterprise Supply Chains



Enterprise Supply Chain Assessment and Improvement Cycle



The Key Is Assessing Both Practices & Performance

Model Development

Systems Engineering and Manufacturing

TRL
Technology Readiness

MRL
Manufacturing Readiness

MRA
Manufacturing Readiness Assessment

Life Cycle Framework
Acquisition Life Cycle
Project Life Cycle

PDM / PLM
Product Life Cycle Management

Enterprise Supply Chain Development

Enterprise Supply Chain
- End-to-end
- Total life cycle
- Supportability

SCM Best Practices

Industrial Base Sustainment
Risk Management
Economic Stability
Prime Supplier

Modeling and Simulation

Standard Metrics SCOR®

Model Benefits

- Standard development process
- Standard evaluation criteria
- Proactive collaboration
- Method to continually monitor and improve
- Framework for contract / data requirements

➢ Merge systems engineering project development process with enterprise supply chain development best practices and metrics (e.g. SCOR®)

➢ Correlate to current MRL, MRA and TRL standards and expand to encompass total supply chain

➢ Utilize a standardized assessment-based measurement model

Benefits of Developing Model

- **Creates standard assessment and construction**
  - **Concurrently addressing supply chain strategies in a consistent fashion**
  - **Risk mitigation can begin in the earliest phases and lifecycle costs can be assessed and controlled.**
- **Promotes proactive collaboration**
  - **All participants are encouraged to develop collaborative structures and relationships**
  - **Improved visibility and coordination throughout supply chain**
- **Enables continuous improvement**
  - **Identify opportunities for improvement**
  - **Assess and adapt supply chain as entities, conditions and customer requirements change**
- **Provides framework for creating contracts, policy and data requirements**
  - **Contract: Information needed, timing and sources; performance criteria**
  - **Policy: Need for ESCM (project, program, agency)**
- **Provides best practices, metrics and data requirements for each supply chain initiative or strategy**

Focus of Enterprise Supply Chains

GOALS

- Speed
- Cost
- Agility
- Adaptability
- Alignment

ATTRIBUTES

- Supply Chain Planning and Design
- Strategic Suppliers and Sourcing Methodology
- Supplier/Customer Relationships
- Product Data Management
- Performance Measurement
- Contracts and Incentives
- Material Flow and Process Maps
- Collaborative Planning and Forecasting
- Visibility
- Criticality Focus
- Industrial Base Sustainability
- Part Availability Risk Management
- Material and Parts Assurance
- Strategic Inventory Network
- Spares Planning
- Reverse Logistics

Concept of Supply Chain Management Maturity in Model

Low SC Management Maturity	***Developing***	***High SC Management Maturity***
High Risk High Cost Inflexible	***Moderate Risk Lower Cost Increased Flexibility***	***Risk Mitigated Lowest Costs Agile***
▪Early phases of supply chain development	***Increasing Maturity***	▪Advanced SCM practices in place and validated
▪Limited relationship between supply chain tiers		▪Relationship with all upstream entities
▪Communication and information limited to single orders		▪ Communication with all downstream entities and lifecycle phases included
▪Optimization, Modeling and Simulation technologies not used		▪Utilization of model-based design and manufacturing

Maturity Level of Management Attributes

Maturity Level	Strategic Inventory Network	Visibility	Strategic Suppliers and Sourcing Methodology	Supplier/Customer Relationships	Collaborative Planning and Forecasting	Performance Measurement	Part Availability Risk Management	Criticality Focus	Sustainability
Description	Strategic placement of raw material, WIP and finished goods throughout the supply chain	Ability to see suppliers, processes, performance and key individuals at varying levels of the supply chain	Approach to selecting suppliers, sourcing products, make-buy decisions, and supplier and SKU consolidation	Working relationships between suppliers and customers at varying levels of the supply chain	Flow of forecast, demand and delivery information up and down the supply chain	Alignment of metrics to evaluate and improve enterprise supply chain performance	Identification and mitigation of part availability risk (including obsolescence, sole-sourcing, commodity pricing, etc.)	Systems for identifying and evaluating critical items, processes and suppliers	Monitor and evaluate economic trends and industrial base viability
1	Inventory levels are not known throughout the supply chain. Inventory is not optimized even at the local level.	Only direct customers and suppliers are known	Suppliers throughout the supply chain are not visible beyond the next-level customer and no supplier or SKU consolidation efforts in place.	Supplier/customer relationship is defined only by the terms and conditions of a contract or purchase order.	Only information necessary for placing and processing orders is exchanged between supply chain entities	Supply chain performance is not measured	Risk Management is not in place at any level. Risks of obsolescence, sole-sourcing and counterfeit parts are not known	Critical items and suppliers are not known	Suppliers are not known beyond next level in the supply chain
2	Inventory levels are being monitored at the local level. Stock-outs and low inventory turns are common.	Prime contractor has knowledge of long-lead raw materials in their products and their producers	Most lower tier suppliers are identified within individual programs. Analysis of the inter-program supply base and SKUs has not yet begun.	Forecasts and production capacities are shared between next-level customers and suppliers.	Prime contractor provides multi-year demand data (updated atleast quarterly) in electronic form to first tier suppliers	Metrics are used to evaluate and improve supply chain performance at levels 1	Risk Assessments (including obsolescence, sole-sourcing and counterfeit parts) are performed. Risks are identified at level 1	Critical items and suppliers are identified to Level 1&2	Supplier viability assessment (including supplier financial liquidity) system and evaluation criteria is defined Supplier stability is known at least at level 1
3	Inventory levels are defined and managed locally in order to satisfy next-level customer demand. Efforts are being made to identify major stockpiles of inventory throughout the supply chain.	Upstream suppliers for critical/long-lead items are known	Redundant suppliers and SKUs are identified.	Suppliers and next-level customers share production and delivery issues. Responsibility of resolution of the issues remains within the affected organization.	Web based system exist that displays only demand data for first tier suppliers	Metrics are used to evaluate and improve supply chain performance at levels 1 & 2	Risk Assessments are performed and risks are identified at levels 1 & 2. Risk Analysis is performed.	Risks associated with critical parts and suppliers are defined at levels 1&2	Assessment system and evaluation criteria is in place. Information infrastructure is operating and assessment completed at levels 1 & 2
4	Inventory is distributed throughout the supply chain with managed buffers at supply chain node interfaces. VMI may be in place at some locations.	All upstream supply chain entities and the parts they produce are known with the exception of distributors	Performance of suppliers of non-critical items is being analyzed to identify smaller set of suppliers and SKUs to target for consolidation. Impact of sourcing decisions on enterprise is estimated.	Improvement events are conducted to resolve problems. Participants from affected and influential supply chain entities are invited to participate on the team.	Web based system exist that displays only demand data for all suppliers	Metrics are used to evaluate and improve supply chain performance at levels 1 -3	Risk Assessments are performed and risks are identified at level 3+ Risk Analysis is performed. Risk Mitigation plan is drafted.	Risks associated with critical items and suppliers are defined at level 3+ Contingency plans defined. Method to monitor critical items and suppliers is defined.	Assessment system and evaluation criteria is in place Information infrastructure in operating and assessment completed at level 3+ Risk mitigation plan is drafted
5	Inventory is strategically placed throughout the supply chain to minimize total supply chain inventory costs while still satisfying the readiness demands of the system	All upstream supply chain entities (and the parts they produce) and distributors are known as needed to maximize enterprise performance.	All sourcing decisions are made to optimize benefit to the enterprise. Programs in place to regularly monitor and reduce unnecessary redundancy of suppliers and SKUs to standardize products, quality and cost.	Supplier/customer relationships allow for teamwork to improve the supply chain. Multi-organization improvement events are ongoing.	Collaborative system is utilized to provide real-time demand and other pertinent information to the lowest level of the supply chain	SCOR metrics and best practices utilized at all levels of the supply chain to provide standard measure of performance and these metrics are routinely used to improve supply chain performace	Risk Assessments are performed to Level 3+ and down to raw material for critical parts / suppliers. Risk Mitigation Plan is approved and implemented - Triggers defined - Action steps and timing is clearly defined. Risk monitoring and cross functional team review is scheduled.	Contingency plans for critical items / suppliers is in place down to raw material. Contingency plans in place with clear trigger, actions steps and timing. Critical item and supplier monitoring is implemented Risk monitoring and cross functional team review is scheduled.	Supplier viability assessments complete to level 3+ and to raw material for critical items and suppliers. Proactive monitoring in place and scoring method defined. Suppliers are regularly monitored and future assessments are scheduled with triggers defined throughout lifecycle. Modeling is used to perform what if analysis of industrial base.

Not all threads shown here

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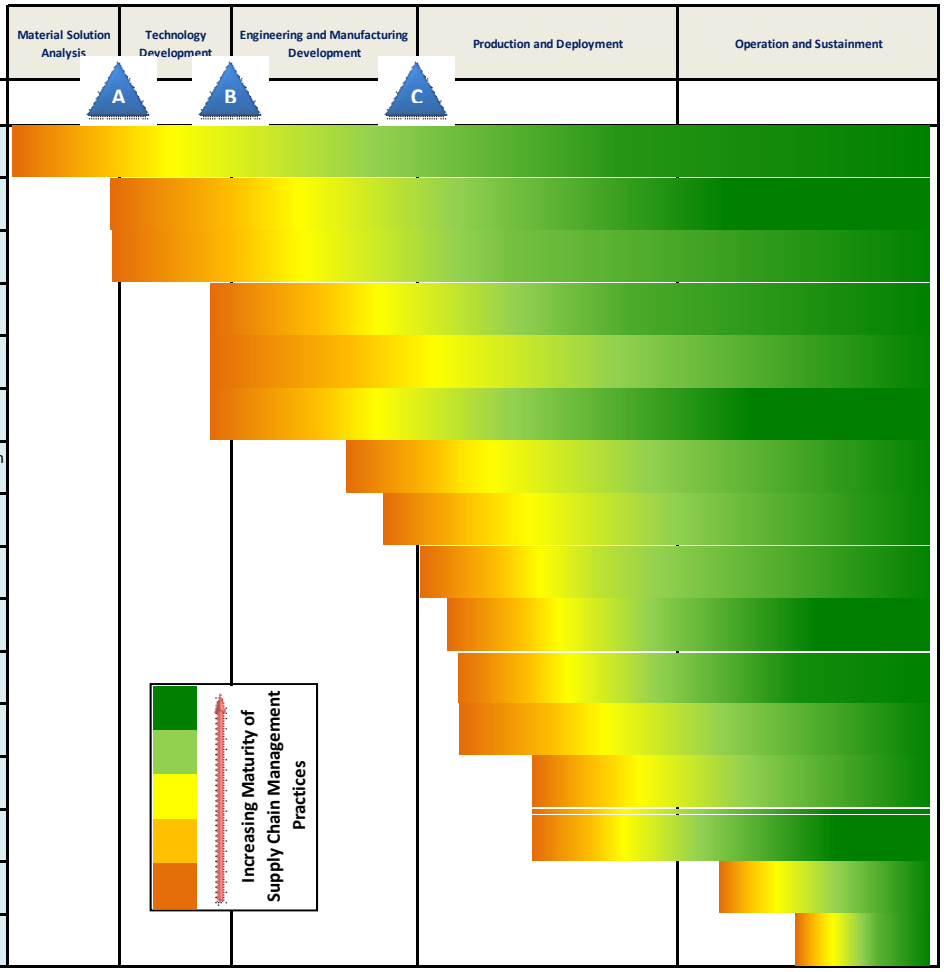
Gold-Standard **Supply Chain Management Maturity through Lifecycle (DoD Lifecycle Phases)**

Defense Acquisition, Technology, and Logistics Life Cycle Phases

Thread	Description
Supply Chain Planning and Design	Enterprise approach to designing, evaluating, adapting and continually improving the supply chain
Strategic Suppliers and Sourcing Methodology	Approach to selecting suppliers, sourcing products, make-buy decisions, and supplier and SKU consolidation
Supplier/Customer Relationships	Working relationships between suppliers and customers at varying levels of the supply chain
Product Data Management	Availability of relevant technical data throughout the supply chain
Performance Measurement	Alignment of metrics to evaluate and improve enterprise supply chain performance
Contracts and Incentives	Contract flexibility, type selection, duration and incentive formulation
Material Flow and Process Maps	Application of modeling, simulation and mapping to improve supply chain performance and planning
Collaborative Planning and Forecasting	Flow of forecast, demand and delivery information up and down the supply chain
Visibility	Ability to see suppliers, processes, performance and key individuals at varying levels of the supply chain
Criticality Focus	Systems for identifying and evaluating critical items, processes and suppliers
Industrial Base Sustainability	Monitor and evaluate economic trends and industrial base viability
Part Availability Risk Management	Identification and mitigation of part availability risk (including obsolescence, sole-sourcing, commodity pricing, etc.)
Material and Parts Assurance	Processes and technologies to assure material and part traceability and non-counterfeit content
Strategic Inventory Network	Strategic placement of raw material, WIP and finished goods throughout the supply chain
Spares Planning	Systems for planning, scheduling and producing recurring and programmatic spares demand
Reverse Logistics	Planning and processing of systems returned for MRO



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Supply Chain Management Maturity through Lifecycle
Sample Assessment Results (DoD Lifecycle Phases)

Current Lifecycle Milestone

Defense Acquisition, Technology, and Logistics Life Cycle Phases

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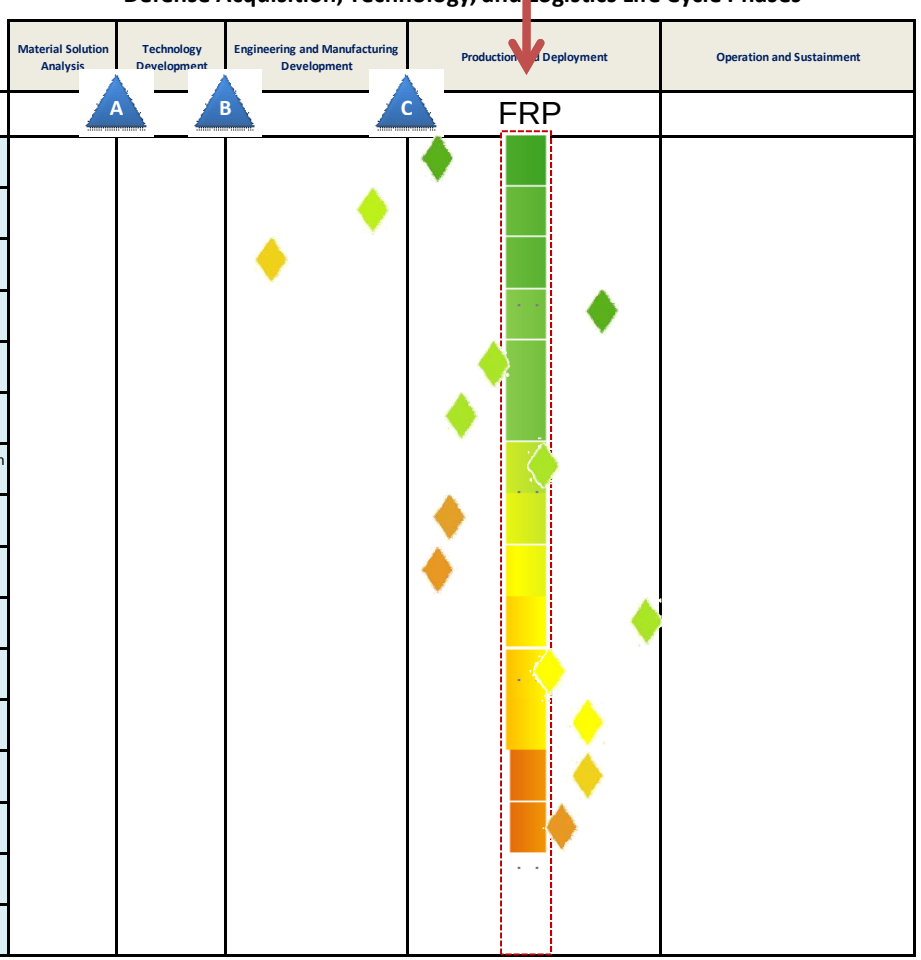

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Expected Typical* Supply Chain Management Maturity through Lifecycle (DoD Lifecycle Phases)

Defense Acquisition, Technology, and Logistics Life Cycle Phases

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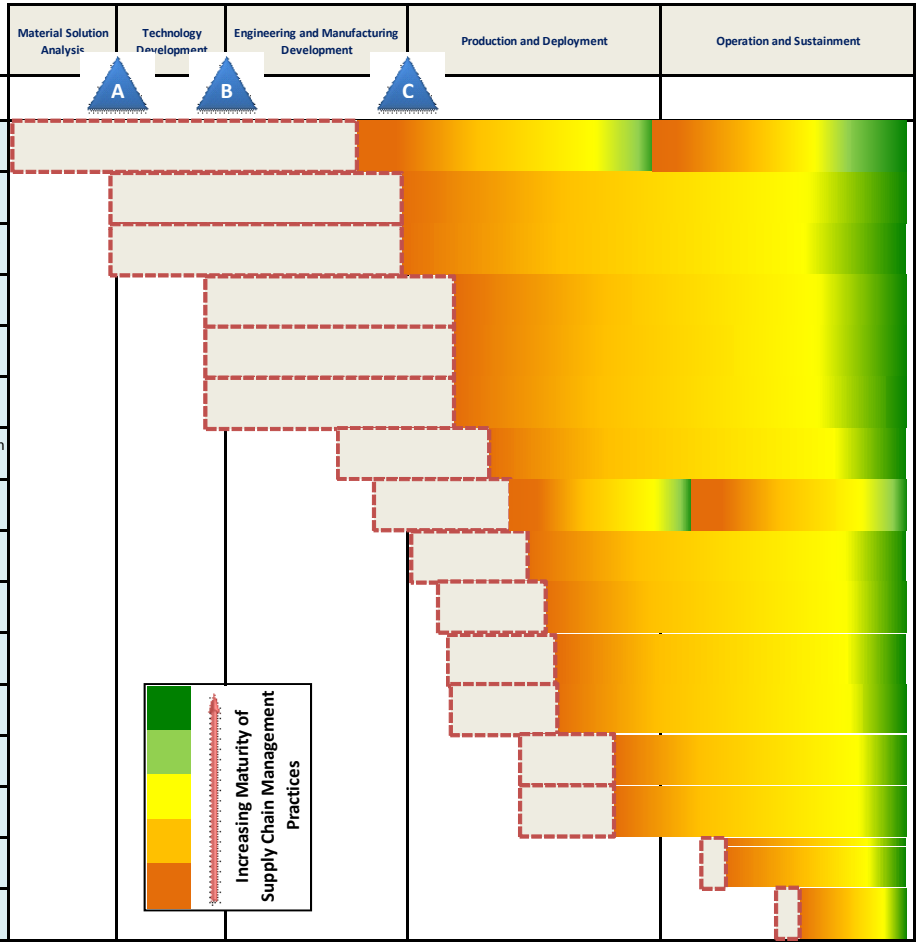

**Based on GAO reports and experience with aerospace and defense supply chains*

Progress To-Date

- Draft SCRL matrix developed
- SCRL language being incorporated into NASA NPR SCM
- Concept presented at IEEE Aerospace Conference 2010 – Human Spaceflight Operations Session
- Initial participation in Supply Chain Operations Reference (SCOR) Aerospace and Defense Industry Working Group
- Inter-Agency efforts
  - Initial coordination with MRL Working Group (Joint Defense Manufacturing Technology Panel)
  - Collaborating with National Defense Industrial Association (NDIA) Supply Chain Network Committee

Next Steps

- Complete detail and documentation
- Peer review supply chain readiness model
- Develop assessment tools
- Validate model through pilot assessment(s)
- Refine model
- Develop materials for deployment