



# SCRL-Model for Human Space Flight Operations Enterprise Supply Chain

**2010 IEEE Aerospace Conference**  
**Big Sky, Montana**  
**March 6-13, 2010**

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This work was performed under  
subcontract to Jacobs ESTS Group

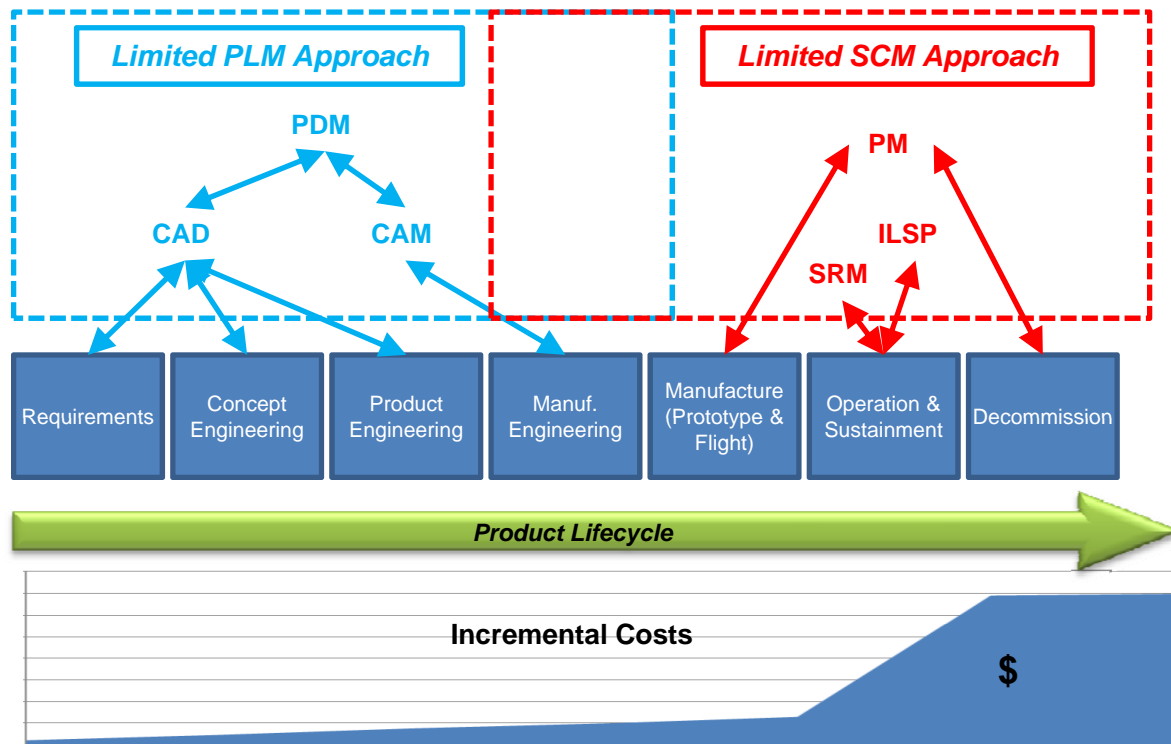


## The Need

- **Standard approach to evaluate and configure adaptable and sustainable program and mission supply chains at an enterprise level**
  - End-to-end view
  - Total Lifecycle
- **Evaluate the readiness of the supply chain during the supply chain development phases**



# Enterprise Supply Chain Management

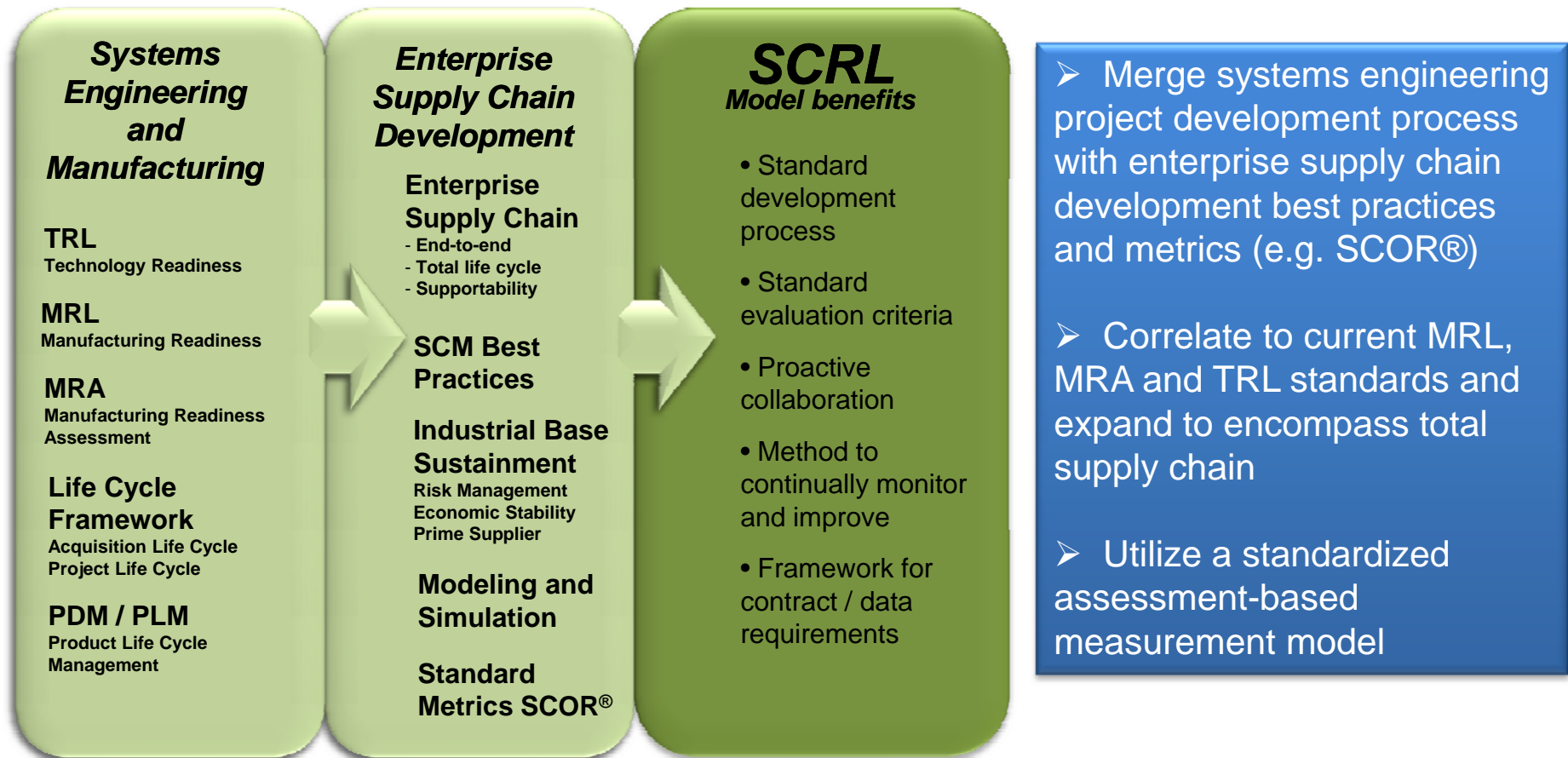


- Total Visibility
- Total Lifecycle
- Meeting Mission Requirements
- On time & at cost
- Sustainable
- Adaptable
- Optimized
- Mitigated Risks
- Continuous Improvement
- Viable Suppliers

*How do we measure SC readiness?  
 How do we construct this type of SC?*

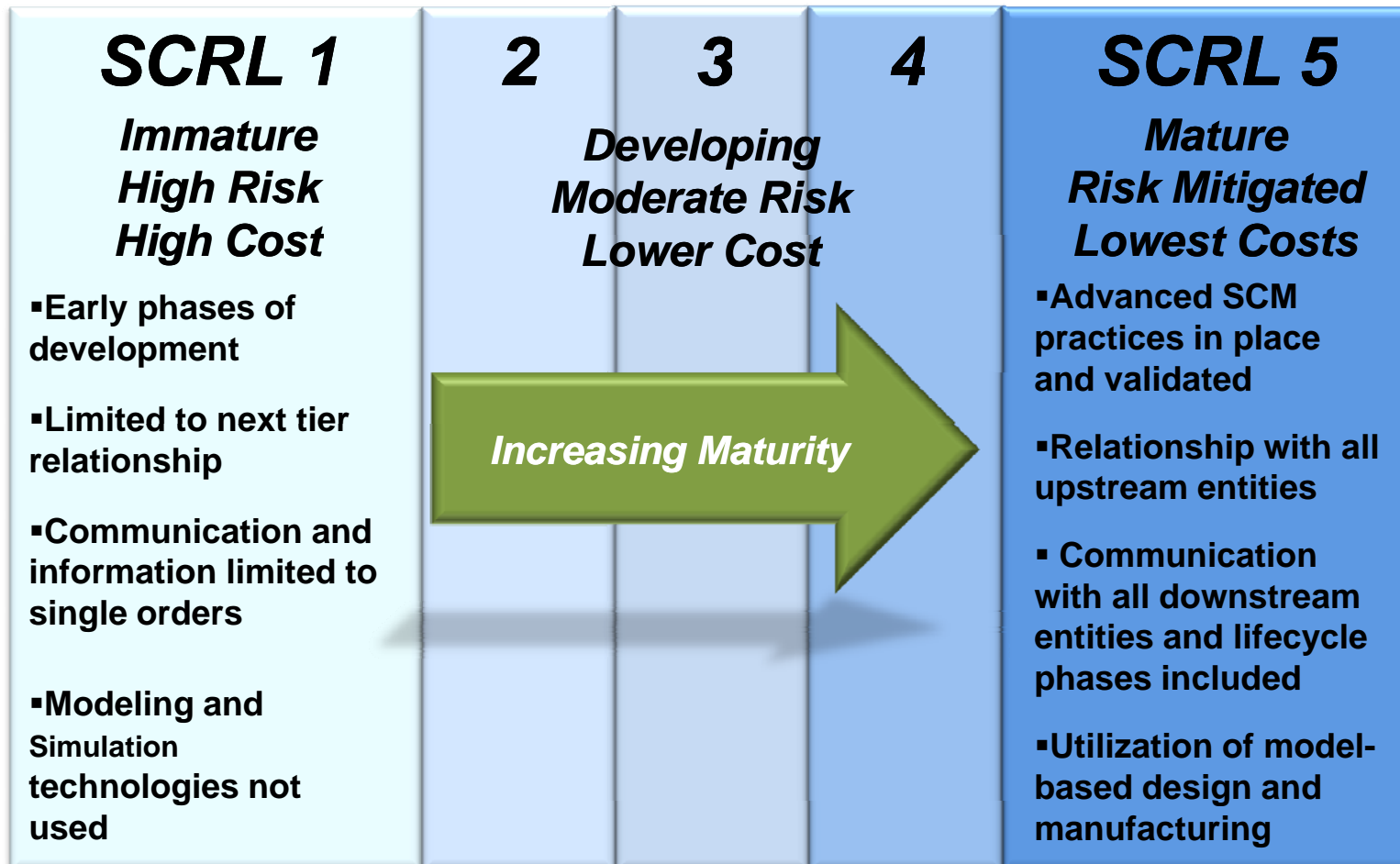


# SCRL Model Development





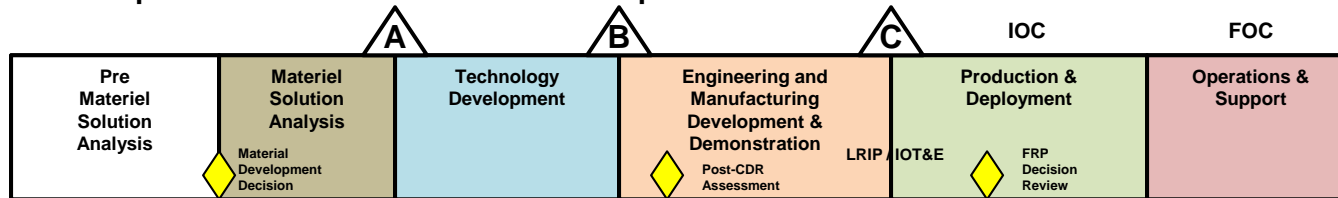
# SCRL Model





# Utilize SCRL with TRL & MRL

## Defense Acquisition Framework and Relationship to TRL and MRL

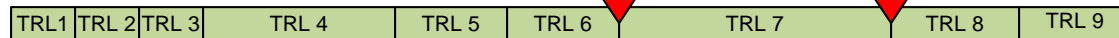


➤ Supply Chain developed in conjunction with technology and manufacturing

### Review and Audits



### Technology Readiness Levels



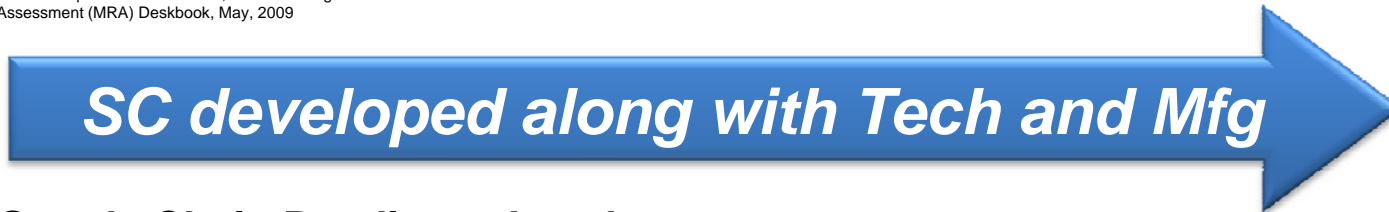
➤ Established reviews and audits trigger evaluation of supply chain

### Manufacturing Readiness Levels



Source: Department of Defense, Manufacturing Readiness Assessment (MRA) Deskbook, May, 2009

➤ Levels in technology and manufacturing readiness are considered from a SC perspective



## Supply Chain Readiness Levels



SCRL alignment shown is notional.



# SCRL: Supply Chain Characteristics

<b>Inventory</b>	Strategic raw material, WIP and FG placement in SC
<b>Strategic Sourcing</b>	Sourcing decisions benefit enterprise, optimum number of SKUs & supp.
<b>Visibility</b>	Ability to see varying levels of the SC
<b>Supplier /Cust Relationships</b>	Working relationships at varying levels of the SC, Improvement focus
<b>Price Adaptability</b>	Impact of variation in the price of commodities
<b>Collaboration</b>	Flow of information up and down the supply chain
<b>Lifecycle Awareness</b>	SC visibility and awareness of the current lifecycle phase
<b>Modeling &amp; Simulation</b>	Apply modeling and simulation to improve SC
<b>Performance Measurement</b>	Metrics used to measure and improve supply chain
<b>Risk Management</b>	Including obsolescence, sole-sourcing, counterfeit parts
<b>Criticality Focus</b>	Focus level on critical parts, path and suppliers
<b>Sustainability</b>	Long term viability of the industrial base
<b>Manufacturing Readiness</b>	Monitoring manufacturing readiness of the SC
<b>Technology Readiness</b>	Monitoring technology readiness of the SC
<b>Sub-Tier Management</b>	All levels of SC adhere to SCRL standards

**Total of 15  
Threads**



# SCRL: Supply Chain Characteristics

Inventory	SCRL	Requirement
Visibility	SCRL 1	Inventory levels not known throughout the SC. Inventory is not optimized even at the local level.
Supplier /Cust Re	SCRL 2	Inventory levels are being monitored at the local level. Stock-outs and low inventory turns are common.
Price Adaptability	SCRL 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.
Collaboration	SCRL 4	Inventory is distributed throughout the supply chain with managed buffers at supply chain node interfaces. VMI may be in place at some locations.
Lifecycle Aware	SCRL 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
Modeling & Sim		
Performance Me		
Risk Managemen		
Criticality Focus		
Sustainability		
Manufacturing R		
Technology Rea		
Sub-Tier Manage		





# SCRL: Supply Chain Characteristics

Inventory	SCRL	Requirement
Strategic Sourcing		
Visibility	SCRL 1	Supply chain performance is not measured
Supplier /Cust Relationship		
Price Adaptability	SCRL 2	Metrics are used to evaluate and improve supply chain performance at levels 1
Collaboration		
Lifecycle Awareness	SCRL 3	Metrics are used to evaluate and improve supply chain performance at levels 1 & 2
Risk Management		
Criticality Focus	SCRL 4	Metrics are used to evaluate and improve supply chain performance at levels 1 -3
Sustainability		
Manufacturing Readiness		
Technology Readiness	SCRL 5	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 performance
Sub-Tier Management		

**Performance Measurement**



# SCRL: Level & Assessment

Inventory	<h2>SCRL Assessment</h2> <ul style="list-style-type: none"><li>❑ An Assessment will be used to evaluate the SC readiness</li><li>❑ Assessment questions and performance criteria established for each characteristic to define SCRL</li><li>❑ Overall SCRL for the supply chain being evaluated will be determined by the minimum SCRL.</li><li>❑ The assessment results could then be used to identify the specific supply chain characteristics and practices that should be addressed to increase the SCRL and reduce the risk and cost before moving to the next development phase.</li></ul>
Strategic Sourcing	
Visibility	
Supplier /Cust Relationships	
Price Adaptability	
Collaboration	
Lifecycle Awareness	
Modeling & Simulation	
Performance Measurement	
Risk Management	
Criticality Focus	
Sustainability	
Manufacturing Readiness	
Technology Readiness	
Sub-Tier Management	



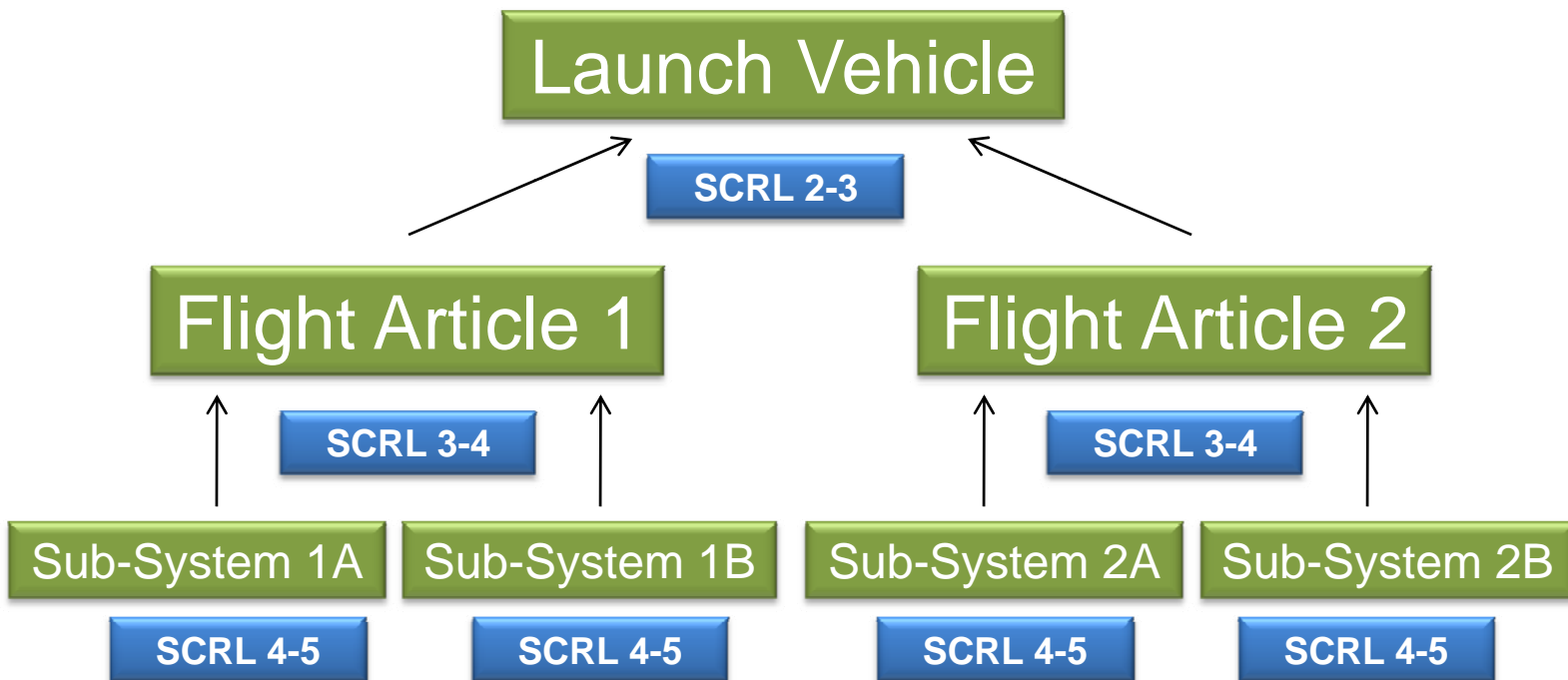
# SCRL: Levels by Characteristic

Inventory	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Strategic Sourcing	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Visibility	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Supplier /Cust Relationships	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Price Adaptability	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Collaboration	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Lifecycle Awareness	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Modeling & Simulation	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Performance Measurement	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Risk Management	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Criticality Focus	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Sustainability	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Manufacturing Readiness	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Technology Readiness	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5
Sub-Tier Management	SCRL 1	SCRL 2	SCRL 3	SCRL 4	SCRL 5

*Example*



# SCRL & the Extended Supply Chain



It is anticipated that the Supply Chain Readiness Level required will increase with the depth of the supply chain level assessed.



## Benefits of using SCRL

- **Standard Assessment and Construction Model**
  - Concurrently addressing SCM issues in the same manner
  - Risk mitigation can begin in the earliest phases and accurate lifecycle costs can be assessed and controlled.
- **Proactive Collaboration**
  - SC entities develop collaborative structures and relationships
  - Improved visibility throughout SC
- **Continuous Improvement**
  - Identify opportunities for improvement
  - Monitor as SC entities and conditions change
- **Framework for Contracts and Data Requirements**



## Path Forward

- **Complete development of matrix**
  - Refine levels and threads
  - SCRLs are in early stage of development
  - Develop body of knowledge/references to support development
- **Peer review of SCRL SC characteristic matrix**
  - Acceptance by government agency
  - Acceptance by industry
- **Develop SCRL Assessment**
- **Perform pilot projects to validate**
  - Good, Bad, OK