Effectively Adapting and Utilizing the MRL Criteria

22 Sept 15

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Payback on MRLs

- **Driven manufacturing earlier in the acquisition process: a Key DoD/Congressional Strategic Objective**
  - **DoDD 5000.02**
  - **DAG Language for Manufacturing Assessments**
  - **P.L. 111-383 & 112-81, "Management of Manufacturing Risk in Major Defense Acquisition Programs"**
- **MRLs provide superior process to address transition to production – being used by a variety of customers**
  - **S&T Community (AFRL)**
  - **Tri-Service on major acquisitions**
  - **Industry Implementing as SOP**
- **Recognized as an excellent tool outside DoD**
  - **GAO**
  - **Congress**
  - **Industry Best Practice (foreign and domestic)**

The Rational

- MRL Criteria was originally created to apply to all programs.
- Not all MRL Criteria Apply equally to every product or acquisition. Some examples:
  - Commercial products
  - Special Acquisitions (e.g., spacecraft, ships)
  - S&T efforts
  - Sustainment
- Terms such as “production relevant”, “production representative”, “pilot line”, and “rate tooling” have different meanings for different programs

The Approach

- Add new paragraph to Deskbook – as guidance
- Adapting MRL criteria to the program being assessed
- Need to obtain SME input with experience adapting criteria
  - Wide range of experience desired in doing MRAs with variety of technologies
- The basic MRL criteria will support most applications with only minor adaptions
- Adapting the criteria is key to effectively and efficiently assessing various programs
  - But not everyone knows how to adapt these criteria

Need to preserve the basic MRL matrix framework

Adapting MRL for S&T

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The Appraoch

- Adapting MRL criteria is more effective when assessing S&T programs to unique contractor operations
  - Little or no linkage to a product (MRL 1-4)
  - Technology Demo with no guaranteed follow-on (MRL 4-6)
- Need to obtain SME input with experience adapting criteria
  - Wide range of experience desired in doing MRAs with variety of technologies
- The basic MRL criteria will support most applications with only minor adaptions

Need to preserve the basic MRL matrix framework

Example 1

- **Advanced Technology Development Programs**
  - **C.3 for MRL 6 can be N/A**

Version 11.3	14-Jun-12			
		DoD Manufacturing Readiness Leve		
Acquisition Phase		**Technology Development (TD)**		**Engineering & Mfg D**
Technical Reviews		**SRR/SFR**	**PDR** B	**CDR**
Thread	**Sub-Thread**	**MRL 5**	**MRL 6**	**MRL 7**
	Technology Maturity	Should be assessed at TRL 5.	Should be assessed at TRL 6.	Should be assessed at TRL 7
	C.3 - Manufacturing Investment Budget	Program has updated budget estimate for reaching MRL 6 by MS B. All outstanding MRL 5 risk areas understood with approved mitigation plans in place.	Program has reasonable budget estimate for reaching MRL 8 by MS C. Estimate includes capital investment for production-representative equipment by CDR and pilot line equipment by MS C. All outstanding MRL 6 risk areas understood with approved mitigation plans in place.	Program has updated budget estimate for reaching MRL 8 by MS C. All outstanding MRL 7 risk areas understood with approved mitigation plans in place.
Sub-assemblies and Sub-	D.1 - Maturity	Materials have been manufactured or produced in a prototype environment (may be in a similar application/program). Maturation efforts in place to address new material production risks for technology demonstration.	Material maturity verified through technology demonstration articles. Preliminary material specifications in place and material properties have been adequately characterized.	Material maturity sufficient for pilot line build. Material specifications approved.
	D.2 - Availability	Availability issues addressed for prototype build. Significant material risks identified for all materials. Planning has begun to address scale-up issues.	Availability issues addressed to meet EMD build. Long-lead items identified. Components assessed for future DMSMS risk.	Availability issues addressed to meet LRIP builds. Long lead procurement identified and mitigated. DMSMS mitigation strategies for components in place.

Example 2

- **Assessing a sub tier supplier (Ma and Pa)**
  - **E.1 – perhaps modeling and simulation is not needed or not a part of the process , i.e., N/A?**

	A	B	G	H	I
1	Version 11.3	14-Jun-12			
2			DoD Manufacturing Readiness Levels (MRLs)		
3	Acquisition Phase		Technology Development (TD)		Engineering & Mfg
4	Technical Reviews		SRR/SFR	PDR B	CDR
5	Thread	Sub-Thread	MRL 5	MRL 6	MRL 7
6		Technology Maturity	Should be assessed at TRL 5.	Should be assessed at TRL 6.	Should be assessed at TRL 7
18	ss Capability & Control	E.1 - Modeling & Simulation (Product & Process)	Initial models/simulation (product or process) developed at the component level and used to determine constraints.	Initial models/simulation developed at the sub-system or system level, and used to determine system constraints.	Models/simulation used to determine system constraints and identify improvement opportunities.
19		E.2 - Manufacturing Process Maturity	Maturity has been assessed on similar processes in production. Process capability requirements have been identified for pilot line, LRIP and FRP.	Manufacturing processes demonstrated in production relevant environment. Begin collecting or estimating process capability data from prototype build and refine process capability requirements.	Manufacturing processes demonstrated in a production representative environment. Continue collecting or estimating process capability data and refine process capability requirements.

Example 3

- Production Relevant Environment
  - E.2 – Manufacturing processes demonstrated in a production relevant environment (PRE)
    - Define PRE prior to or during MRA
    - Definition in Deskbook
    - In some cases a laboratory environment is acceptable
- Some MRL threads or sub-threads have multiple criteria to address
  - Some may apply and some may not
  - Do not ignore those that apply

Conclusion

- **MRLs need to be adapted for S&T programs**
  - **Keys:**
    - ***Preserving the basic MRL matrix framework***
    - ***Making it relevant to your situation***
    - ***Ensuring the adaptions have adequate rationale and traceability to MRL Matrix***
- **Goal - Providing instructions and best practices for adapting MRLs to more effectively and efficiently implement MRLs for S&T**
- **Note – basic MRL Matrix should handle most situations with only minor adaptions**