

Munro
&
Associates, Inc.



MRL
Manufacturing
Readiness Level



Munro & Associates has been part of the development of the MRL definitions and deskbook and is pleased to provide services and products to help companies benefit from efficient and accurate MRL assessments.

Munro Provides MRL Training Assessments Software

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Design Profit® MRL (**DP MRL**) assessment tool combines the power of 22 years of Affordability and Producibility (AP) modeling and analyses experience with the latest DOD MRL definitions for structured, consistent assessments to drive affordable readiness.

DP MRL is a ready-to-use tool that easily manages multiple evaluators, multiple assessments, and real time team consensus seamlessly. It provides a framework to standardize the MRL assessment process throughout an organization and its extended enterprise.

The DP MRL collaborative environment enables capturing and analyzing design complexity, affordability, producibility and quality along with readiness assessments for identified key critical components for a complete system or an individual part, material, or process. Analyses are performed early in the architecting phase and matured throughout the acquisition lifecycle.

DP MRL is the most comprehensive, robust, easy-to-use MRL tool on the market today that guides the team to develop right-first-time capability with accuracy, confidence and transparency.

Single Point, Collaborative Modeling Environment for Complete Balanced Trades

Lean Design®

- Reduced Complexity
- Balanced Performance
- Rapid Trades

Quality Report Card®

- Right First Time Manufacturing
- Rolled Yield Prediction
- RAM & Lifecycle Implications

Cost Estimating

- Part & Component Should Cost
- Total Accounted Costs
- Total Ownership Costing

DOD MRL

- Standardized Definitions
- Comprehensive Threads
- 5000.02 Acquisition Compliance

AFFORDABLE READINESS



DP MRL Enables

- Multiple Evaluators
- Rapid Trade Studies
- System Level Roll-ups
- Collaborative Assessments
- Robust Reporting Capability
- Official DOD MRL Definitions
- More Revealing Assessments
- Alternative Risk Mitigation Plans
- Evaluation of Competing Metrics
- Attachment of Files for Traceability

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MRL – Manufacturing Readiness Level

How ready are you to produce the product you are developing? Time to market, total development costs and quality costs depend on your readiness state. The DOD has developed a set of comprehensive criteria to assess manufacturing readiness including; technology & industrial base, design, cost & funding, materials, process capability & control, quality management, manufacturing personnel, facilities, and manufacturing management.

Manufacturing Readiness Level (MRL) is a standardized measurement of manufacturing maturity and risk for a given technology solution. MRL assessments are critical to ensuring that technology can be produced at the best value and on-time. These specific definitions and threads have been created in standardized language and format.

MRLs are a set of definitions that allows an assessment of manufacturing risk against a given technology, component or subsystem. MRLs were created because defense programs are typically over budget and late; some by billions of dollars and years overdue. When studied why, lack of manufacturing knowledge during the design development was a key contributor. Therefore, a joint DoD/industry working group under the sponsorship of the Joint Defense Manufacturing Technology Panel (JDMTP) was formed to study the issue; resulting in the MRL definitions and guidebook.

While MRL's were created for defense programs, they warrant a look from commercial manufacturers as well. The MRL system employs a comprehensive matrix of threads and sub-threads that encompass what is required to have achieved a specific level of manufacturing readiness. The objective is to minimize risk while bringing forth transparent knowledge.

Munro Provides MRL

- **Training**
- **Assessments**
- **Software**

Manufacturing Readiness Level – DP MRL

Munro & Associates, Inc. and Design Profit, Inc. have collaborated through an Internal Research and Development (IRAD) to embed the MRL definitions in our commercially available Design Profit (DP) software tool. MRL was a natural addition to the DP software. DP reveals and rolls up critical metrics for any given design concept. Competing designs can be rapidly compared to determine the lowest



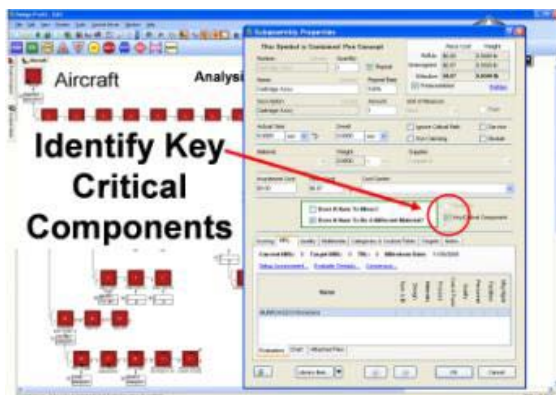
risk, highest value solution. It was created to bring downstream consideration into the picture earlier in program development. The great part about the DP MRL tool is that it combines the power of the existing DP tool with the latest MRL definitions. DP MRL goes beyond the standard MRL spreadsheets as it enables multiple evaluators, anywhere around the globe, to perform assessments simultaneously. DP MRL tracks the assessments and combines and rolls up results in an organized, transparent fashion.

Design Profit® EXECUTIVE SUMMARY

DoDI 5000.02 Analysis of Alternatives (AoA)

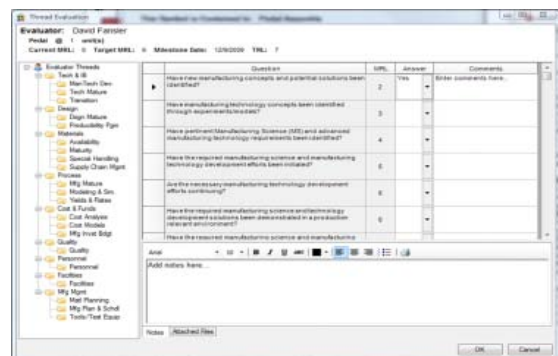
	Pre-Concept	AoA - Design 1	AoA - Design 2	AoA - Design 3
TRL	4	4	5	2
MRL	3	3	3	2
Parts	142	94	104	85
Steps	930	748	818	680
Actual Time (min)	397.87	339.96	361.08	231.60
No. of Operators	77.861	66.723	69.539	44.641
Fasteners	51	33	39	26
Ergo Dangers	77	63	57	62
Poka Yoke Issues	68	44	34	46
Total Weight	1.89 lb	1.77 lb	1.80 lb	0.90 lb
Piece Cost	\$5,098.22	\$4,974.24	\$4,781.98	\$3,488.29
Total Labor Cost	\$551.06	\$479.00	\$505.47	\$329.38
Q Burden	\$1,066.69	\$1,066.69	\$1,057.84	\$883.15
Total Cost	\$6,715.97	\$6,519.92	\$6,345.29	\$4,700.83
Investment Cost	\$83,925	\$56,000	\$70,925	\$120,500
Annual Savings	N/A	\$4,705,054	\$8,896,231	\$48,363,432

Design Profit® MRL is a robust tool for executing a manufacturing readiness assessment using the DOD MRL definitions. DP MRL is easy to use and captures traceable, supporting evidence. It combines MRL's with other standardized metrics that expose, quantify and predict cost drivers and risks from early concept, analyses of alternatives (AoA), all the way through full rate production (FRP).



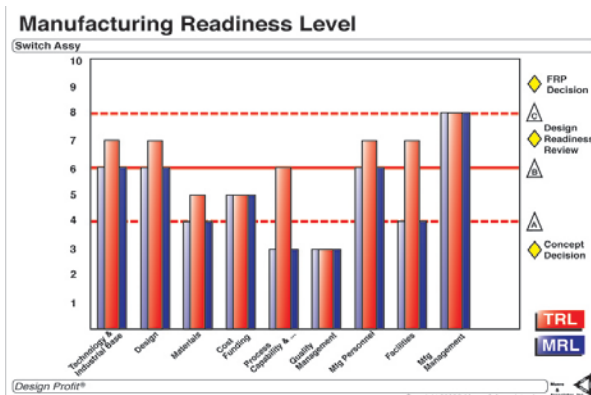
All key critical components and operations can be identified and tracked for their MRL. Standard forms and DOD MRL definitions and threads are built into the DP software structure to guide the users through the evaluation.

Flexibility is built in to allow multiple evaluators to be simultaneously assigned to multiple systems and threads.



All threads are evaluated based on the current level of information available. DP MRL provides detailed queries to help the user define the readiness level.

DP MRL provides customization for unique company requirements and allows for assessment teams to attach files to support TRL/MRL levels.



The model will roll-up and identify offending components and operations. MRL will build confidence in your ability to perform, identify weaknesses and demonstrate risk versus other key program metrics.