# Joint Strike Fighter – Lightning II Monthly Assessment Report

**Prepared by DCMA Lockheed Martin Fort Worth** 





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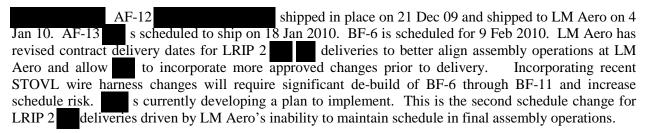
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#### **DCMA Monthly Summary of Activities and Events**

**Flight Test:** AF-1 will continue calibration of the loads instrumentation strain gauges – flights are planned to resume in March 2010. AF-2 continued out of station build activity, SCOP execution and flight test instrumentation installation and checkout. BF-2 ferried to PAX on 29 Dec 09. BF-3 first flight previously scheduled for the fourth week of December slipped to Jan 10 due to replacement of HMD harness and roll post door actuator.

Schedule / DD-250 Deliveries: Aircraft delivery schedule is rated Red with the trend projecting continued degradation. is projected for mid-CY2010. This will be the Program's sixth schedule revision. For month-end November, AF-6 and AF-7 are ~5.8 months late to their DD-250 dates. LRIP 2 aircraft are averaging ~6.9 months late, and LRIP 3 aircraft that have passed their baseline start dates are averaging ~1 month late to their DD-250 dates in this early stage of build. The On-Time LRIP Aircraft Delivery section of this report provides more detail of LRIP build activities.



completed 6 assemblies in December; the for BF7 and BF8, the for AF8, and the for AF7, AF8 and AF9. For calendar year 2009, 22 major assemblies were completed in the last four months while only 20 were completed in the first 8 months of the year. The pending incorporation of the CR addressing for AF7, AF8 and AF9 are being held pending installation of the AASU Switch. The 6 deliveries in December averaged 19 days behind their contract dues dates. This improvement is significant enough to change the rating for the Manufacturing Performance metric from RED to YELLOW for the month of December 2009.

**Earned Value**: On 8 December 2009, the EV Center Director issued the EVMS Compliance Report and a EVMS Non-Compliance Letter to the ACO for formal issuance to submitted the subject EVMS report and letter to on 11 December 2009. The Non-Compliance rating is based on EV Center Compliance Reviews performed in CY2008. The Non-Compliant (N) rating is a concern to DCMA, and will be reviewed by the EV Center for possible inclusion in their EVMS Review Schedule. The EV Center is tentatively scheduled to conduct a followup EV System Review at n March/April 2010. has established a comprehensive corrective action plan and detailed schedule to prepare for the upcoming EV Center review in order to achieve anticipates the EVM Center's Report and Letter will have no negative EVMS accreditation. DCMAday-to-day operations. impact on

Maintenance and Quality Verification Stand-Down: DCMA completed its independent review of LM Aero's Maintenance and Quality Verification Stand-Down analysis. DCMA will draft a report for internal review with a target ECD of 1QTR CY2010. DCMA will report the status of this activity monthly in the JSF MAR until completed.

## **Component Summaries**

Contractor has experienced several delays in delivering LRIP 1 due to the required S/W Qualification Testing (SWQT) of the upgraded test
equipment and subcomponent failures. The which is used for sensor acceptance testing,
requires periodic S/W updates. It completed December 4 <sup>th</sup> 2009 - two weeks late. The
in the critical path for production because it can currently test only one sensor at a time.
the following mitigation strategies 1) incorporate facility when on-site machine
is being upgraded and 2) accelerate funding for second from LRIP 5 to LRIP 3. In addition,
three sensors failed testing at due to
The supplier of the currently conducting RCCA.
able to fix the problem on-site by adjusting a variable resistor. Another
another was rejected at alignment. delivered three LRIP 1 sensors on December 23,
2009 with two more scheduled before the end of the year. The contractual due date for LRIP 1 sensors is
six on 11/30/09 and the remaining six on 2/28/10.
Several sets of each item have already exceeded their completion dates and
subsequent dock delivery. Overall delivery schedule is considered moderate risk for the parts identified
above and their associated ship-sets. However, is implementing process improvements
which DCMA predicts can result in a positive trend within the next three months.

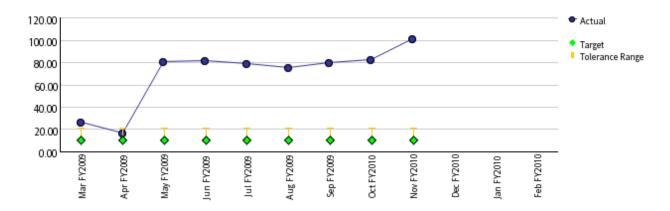
#### Report Scope

DCMA is conducting a process improvement initiative on the Monthly Assessment Report (MAR) therefore the content and format will be changing.

Metrics matrix in development.

#### **On-Time LRIP Aircraft Delivery**

The On-Time LRIP Aircraft Delivery Indicator is an Integrated Master Schedule (IMS) based indicator of the monthly average (+/-) float manufacturing days (M-days) of all reported LRIP aircraft to their contract delivery schedule (DD-250). Goal is to deliver LRIP aircraft within 10 M-days of contract delivery date. **Note: Float M-days are entered as positive values, but represent behind schedule status.** Monthly IMS LRIP CDRL data is directly used as data source. Data shall be updated NLT the 20th of each month. Total Float of all reported aircraft that have passed their baseline start date will be averaged monthly for indicator. Green: ≤10 M-day variance to delivery date, Yellow: 11 − 21 M-day variance, Red: >21 M-day variance to contract delivery date.



Indicator Status: Red

Trend: Degrading

Summary of Indicator Status: Indicator is -102 Mdays for month end November. This month's average consists of all LRIP 1 and 2 aircraft, and six LRIP 3 aircraft that have passed their baseline start dates.

LRIP 1 – AF-6 critical path driver is power-on. AF-7 critical path driver is Structural Mate Although not part of this month's CDRL, AF-6 moved from the EMAS to the final assembly area on 10 Dec 09. This is approximately a six month variance to the 19 Jun 09 baseline EMAS finish date.

LM Aero Schedule Risk Assessment – LRIP team leads have added risk to their individual tasks. As a result, AF-6 and AF-7 duration increases have been realized and a new Shop Operating Plan has been incorporated into the IMS. AF-6 current probability assessment regressed as a result of aircraft held in the EMAS longer to reduce out-of-station work to improve efficiencies in an effort to meet future forecast dates. ISR Engine Flight Certification from SDD is required prior to DD-250. This dependency has not modeled into the critical path or SRA, but is expected to be modeled by month-end December 2009.

For month-end November, AF-6 and AF-7 are now averaging ~5.8 months late to their DD-250 dates.

LRIP 2 – All LRIP 2 Forward Fuselages, Wings, Centers and Aft Fuselages are in work. AF-8 (first CTOL) critical path has -115 M-day's total slack to DD-250. BF-6 (first STOVL) has -131 days total slack to DD-250. Concerns continue to be timely availability of tooling (EMAS units completing on time) and late part deliveries to various SWBS's.

LM Aero Schedule Risk Assessment – The primary drivers impacting the LRIP 2 IMS have been part shortages and EMAS availability. and modules have been the current part shortage drivers to date. The added visibility of supplier shortages in the IMS has proven helpful and late supplier deliveries are being mitigated as soon as they become apparent. As of 10 Dec 09 the EMAS stations are loaded with LRIP 1 and LRIP 2 aircraft (AF-7, AF-8, AF-9, AF-10, & AF-11).

AF-12 is projected to load in January 2010 versus its September 2009 baseline load. Current probability assessment indicates AF-8 could be 92 M-days late to DD-250 and BF-6 could be 118 M-days late.

AF-11 and AF-12 Forward Fuselages show complete in the IMS (J200-1) as of this month's data. AF-11 finished on 9 Nov 09, a 78 day variance to the baseline. AF-12 finished on 18 Nov 09, a 65 day variance. The completion of LRIP 2 Forward Fuselages continues to average ~3.5 months late to as of month-end November. This is a slight improvement over AF-6 and AF-7 builds that were ~3.75 months late. BF-9 Forward completed Autodrill activities on 30 Oct 09 and showed a slight improvement over BF-8 Autodrill completion. BF-10 Forward finished PMM activities on 3 Nov 09 versus the 16 Sep 09 baseline.

AF-12 Wing on 4 Nov 09, a 46 day variance to the baseline. The completion of LRIP 2 Wings continues to average ~2 months late to MS 6.1. This is a slight degradation compared to AF-6 and AF-7 Wing moves.

AF-10 was loaded into the EMAS on 18 Nov 09 (baseline was 4 Aug 09), after AF-4 (last SDD aircraft) left EMAS and moved to final assembly. AF-10 EMAS load represents the largest variance to the baseline for LRIP aircraft to date.

For month-end November, LRIP 2 aircraft are averaging ~6.9 months late to their DD-250 dates.

LRIP 3 – Forward Fuselage's for BF-12, AF-14 and BF-13 are in work. Wing work continues on BF-12, AF-14, BF-13, AF-15, and BF-14. has begun work on the eighth LRIP 3 Center Fuselage (AF-17). BF-12 (first STOVL) critical path has -35 M-day's total slack to DD-250 due to projected late delivery of mitigation is being explored. AF-14 (first CTOL) critical path has -15 M-day's total slack to DD-250 due to EMAS availability. Concerns continue to be GFE deliveries – mitigation efforts continue, modules (CAM is working with supplier to mitigate deliveries) and availability of tooling as a result of LRIP 2 delays.

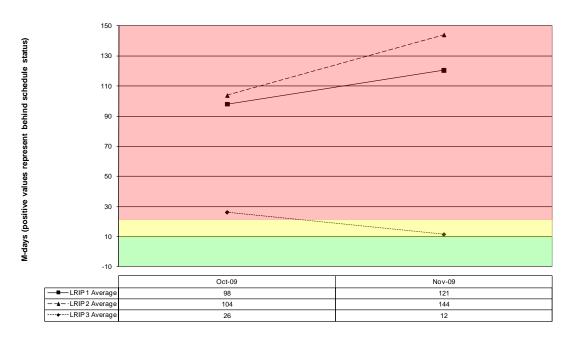
LM Aero Schedule Risk Assessment – LRIP 3 installs software. While the critical paths for software indicate negative total slack, the IPT projects that this will not affect the release of the software to the aircraft. New tooling in the Wing area could cause some initial start up problems. is normally a 3 day task – an additional 15 M-day span was added to the first four units to correct any potential problems. EMAS is another area of concern. LRIP 1 and 2 will impact the load of LRIP 3 aircraft. An additional 20 M-day span was added to the first five units as a result. GFE Deliveries – have surfaced on the LRIP 3 critical paths. LM Aero has had some success mitigating issues, but continues to be concerned with supplier performance.

For month-end November, the LRIP 3 aircraft that have passed their baseline start dates are averaging less than 1 month late to their DD-250 dates in this early stage of build.

#### LRIP Breakdown - DD-250 Performance (M-Days) FY2009 CDRLs



## LRIP Breakdown - DD-250 Performance (M-Days) FY2010 CDRLs



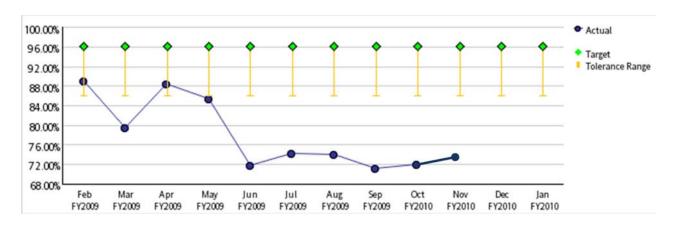
Contractor Actions: Mitigation activities such as the use of overtime, span adjustments, and out of station installations for late parts continues. Another revised Program schedule (currently called occur. This will be the sixth schedule revision since Program inception.

DCMA Actions: DCMA LMFW Production and Team members will continue to monitor contractor performance to contractual baseline and results of implemented mitigation activities.



#### Improve Supplier Delivery Rate

**NSF198AJ21:** Description: JSF Key Suppliers have an average delivery rating of greater than or equal to 96 percent. JSF Key Suppliers are determined by analyzing category 3 and 4 shortages to jig load. JSF Key Suppliers may be adjusted on a quarterly basis as new issues emerge. This indicator is a monthly average percent of lots delivered on-time for JSF Key Suppliers. The goal is to achieve an average of 96 percent or greater on-time lot delivery rate. Supplier delivery data is obtained from LM Aero's Supplier Quality Management and Procurement Quality Network databases. These databases are updated on approximately the 15th of each month. The monthly data from each database is reflective of the previous month's performance. This indicator will be updated within one week of the LM Aero database updates. Green: 100.0 to 96.0%, Yellow: 95.9 to 87.0%, Red: ≤86.9%.



Indicator Status: Red

Trend: Overall negative Slope with recent improvement.

Summary of Indicator Status: DCMA assessment of 53 F-35 Key Suppliers shows an average the November 2009 data.

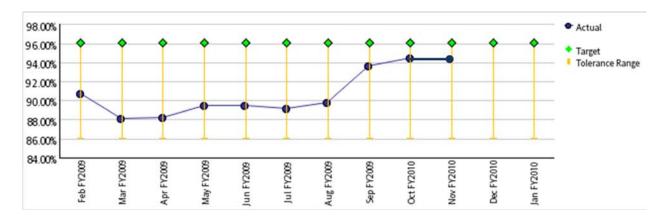
Root Causes: Some of the noteworthy drivers contributing to the assessed delivery rate, are system related units such as:

Component (Contractor)	<b>Delivery Rate</b>	Component (Contractor)	Delivery Rate
			<del></del>

Estimate when PC will achieve goal: LRIP 3 to LRIP 4 (2011 to 2013).

#### Improve Supplier Quality Rate

NSF198AJ10: Description: Each delegated supplier has quality ratings greater than 96 percent. The total LM Aero Quality rating for key suppliers (areas of consideration are: cost, issues, technical, criticality). The top suppliers are summed and divided by quantity which gives an average QA rating per month. The goal is to achieve an average of greater than 96%. Supplier quality data is obtained from LM Aero's Procurement Quality Assurance database and indicator updated no later than the 20th of each month. Green: ≥96%, Yellow: 87 to 95%, Red: <87%.



Indicator Status: Yellow

Trend: Improving

Summary of Indicator Status: DCMA assessment of 53 F-35 Key Suppliers shows an average for the October 2009 data. Supplier quality trend has demonstrated an improving trend, for the last six months.

Root Causes: Current contributing drivers for the assessed rating of are due to the lower quality ratings of:

Quality Rating	Component (Contractor)	Quality Rating
	Quality Rating	Quality Rating Component (Contractor)

Note: The supplier Quality Rating for and and and is attributed to calculation weights in the formula for assessing supplier quality.

#### **Maintain Cost and Schedule**

NSF198AJ08: Description: Resource requirements are aligned in support of funding and budget allocations. IEAC data and projections match actual performance within + / - 10% of contractors budget at completion. DCMA Independent EAC is measured against the prime contractor's BAC. DCMA includes risk, pressures, cost and schedule variances as compared to LM Aero BAC. The source of EV data comes from the monthly JSF SDD Cost Performance Report which lags by 1 month. Indicator is updated in Indicators Manager as soon as data is received from contractor (approximately 45-60 days after end-of-month). This is represented as the contractor's BAC as the Numerator divided by DCMA's IEAC as the Denominator - with a 10 percent tolerance band. Green: 1.0 to 0.95 variance (5%), Yellow: 0.95 to 0.90 variance (5% to 10%), Red: 0.90 or greater variance (>10%).

Lockheed is now reporting to an Over Target Baseline of reported in the November 2009 Cost Performance Report (CPR). The November 2009 SDD cost summary and program status are as follows:

As a result of non-compliances found by the DCMA Earned Value Center, LM has been issued a Level 3 CAR. With the results of the August 2009 Self-Assessment, LM submitted a revised Corrective Action Plan to DCMA this month. LM is meeting weekly with DCMA to discuss progress and issues. The Systemic and Baseline Indicators continue to be rated Red. The EV Center is also reviewing the CAP n response to eight DRs that the Center issued in October 2008. The EV Center proposes to conduct a Verification Review (VR) of operations in specific areas in yr 2010.

DCMA IEAC is for the SDD contract. This DCMA IEAC is based upon the November 2009 CPR report. LM has expended an average of per month over the last 6 months. Assuming a continuance of this expenditure rate, DCMA projects the existing SDD budget with OTB will be depleted in FY2011,

Using the Standard formula based on cumulative SPI and CPI (since replan) yields an SDD increase of over current LM Aero BAC. With the addition of risk factors such as, Suppliers' cost growth, late to Need parts, Schedule Impacts, Production Delays, etc DCMA's EAC is against LM Aero BAC of Thus the DCMA's IEAC is higher than LMs BAC or higher than LM's EAC. DCMA's IEAC includes the threats and pressures at replacement of BF-4 STOVL lift door, repairs and/or replacement of WB Doors and LF Exhaust Doors. Based on limited available data, the repair/replacement costs been estimated roughly as dollars.

The graphs below illustrate the DCMA's past projections of IEAC against LM's BAC and LRE.





The October 2009 SDD/LRIP cost summary and Program status is as follows:

SDD	BAC	LM I	EAC CPR	DCMA IEA	AC_
Performance					
Measurement		_			
Baseline (PMB)					
Management Reserve					
(MR)					_
Total:					

LRIP 1	BAC	LM EAC	CPR D	CMA IEAC
Performance				
Measurement				
Baseline (PMB)				
Management Reserve				
(MR)				
Total:				

LRIP 2	BAC	LM EAC CPR	DCMA IEAC
Performance			
Measurement			
Baseline (PMB)			
Management Reserve			
(MR)			
Total:			

LRIP 3	BAC	LM EAC CPR	DCMA IEAC
Performance			
Measurement			

Baseline (PMB)					
Management Reserve					
(MR)					
Total:					

Budget Baseline and EAC Summaries

Contract Data	KT 1	KT 2	KT 3	KT 4
Contract #	N00019-02-C-3002	N00019-06-C-0291	N00019-07-C-0097	N00019-08-C-0028
	JSF Sys Devmpt &			
Name	Demo	LRIP 1	LRIP 2	LRIP 3
Contract Type	Cost Plus Award Fee			
Obligated Amount				
ULO				
Performance				
Start/End	Oct 2001/Oct 2014	May 2007/Feb2010	Apr 2010/Feb 2011	Mar 2011-Dec 2011

Primary 7	Trip Wires	Secondary Trip Wires						
System Indicator	Baseline Indicator	Cum BEI	SPI	Cum CPLI	СРІ	CPI/TCPI 10%	Contract Mods 10%	Baseline Revs 5%
						9.7%		N/A

#### **Primary Trip Wires**

- (a) System Indicator: See System Surveillance Section of EV Report (embedded).
- (b) Baseline Indicators: A baseline assessment shows the contractors BAC and EAC to be optimistic. To complete the contract within the CBB, the contractor needs to be about 9.2 per cent more efficient. The BAC has increased by 40% since the start up in Oct 2001. The cost growth is likely to increase due to inherent flight test risks in the early versions of CTOL, STOVL and CV aircraft.

#### **Secondary Trip Wires**

- SDD Baseline Execution Index (BEI): Cumulative tasks from October 2001 thru December 2009: Cum BEI = 146,797 Completed Tasks / 150,852 Planned Tasks = 0.97
- SDD Monthly (December 2009) Tasks: 412 Completed Tasks vs. 1067 Baselined to Complete Tasks

The Critical Path Length Index (CPLI) indicates whether or not the program schedule can be completed on time. This is an Integrated Master Schedule (IMS) based metric that utilizes the critical path methodology definition being: the longest, continuous sequence of tasks through the network schedule with the least amount of float from contract start to contract completion. After contract start, the critical path is always measured from "time now" until contract completion. An index of 1.0 indicates the program will finish on-time.

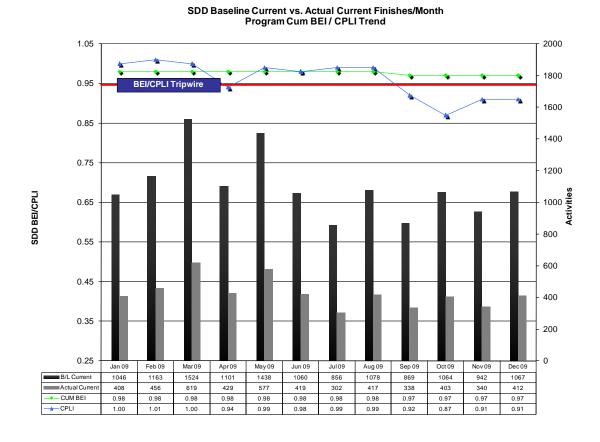
SDD CPLI= (1202 + (103)/1202 = 0.91) (Time Now = 29 Dec 09)

The DCMA Risk Rating for EVMS at the program level is green - using the agreed to parameter of VAC (-4.991%). Compare this to the Lockheed's EAC-close to the BAC - and one can see this difference of 4.379%.

Similarly, the TCPI<sub>EAC</sub> is different when using the DCMA IEAC versus the contractor's EAC:

TCPI<sub>DCMA IEAC</sub> = 0.870TCPI<sub>LM EAC</sub> = 1.030 NSF198AJ08 Sub-Indicators: The SDD Baseline Execution Index (BEI) indicator is an Integrated Master Schedule (IMS) based indicator that calculates the efficiency with which actual work has been accomplished when measured against the baseline. The BEI provides insight into the realism of Program cost, resource, and schedule estimates. For BEI, an index of <.95 is used as a warning indication of schedule execution underperformance. Goal is to achieve BEE.95Iu@umulative BEI equals actual tasks/activities completed divided by the baseline total tasks/activities.

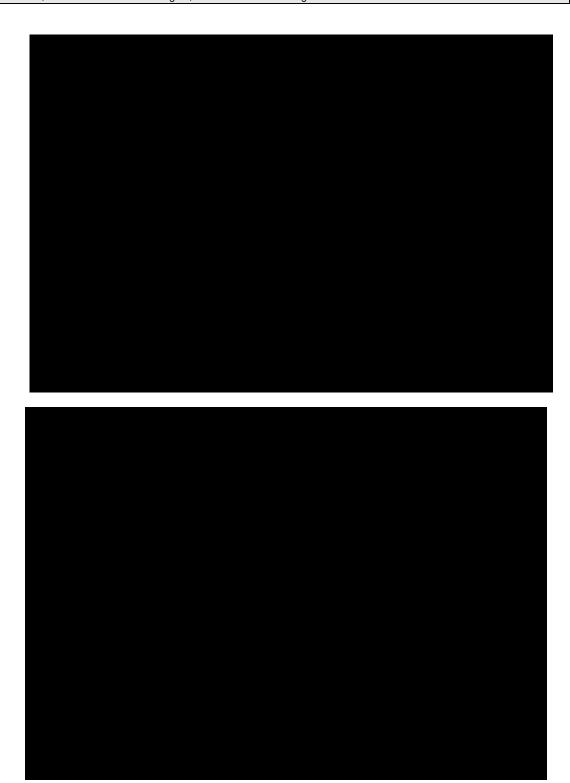
The SDD Critical Path Length Index (CPLI) indicates whether or not the Program schedule can be completed on time. This is an Integrated Master Schedule (IMS) based indicator that utilizes the critical path methodology definition being: the longest, continuous sequence of tasks through the network schedule with the least amount of float, from contract start to contract completion. After contract start, the critical path is always measured from "time now" until contract completion. For CPLI, an index of <.95 is used as a warning indication that the Program will not complete on time. Goal is to maintain CPLI value 95. Critical Path Length Index (CPLI) equals the Critical Path Length (CPL) plus or minus the Total Float (TF) divided by the Critical Path Length (CPL). The target efficiency ratio for both indicators is 1.00. An index greater than 1.00 is favorable, and an index less than 1.00 is unfavorable. ≥.95 = Green .90 to <.95 = Yellow <.90 = Red



Cumulative SDD Program BEI is at 0.97, while Cum CPLI is at .91 for month end December 2009. Monthly planned finishes versus actual performance continues to average an approximate 40% completion rate. MS 6.1 baseline replan dates were incorporated into the IMS month-end May 2008. Master Schedule 6.2 is currently projected for mid-CY2010.

#### **Non-Conformance Reduction**

Defects per 1000 actual manufacturing hours by 10% per year. Metric is based on contractor provided data that is collected updated in metrics manager NLT the 20th of each month and averaged against all prior months to illustrate normalized trend. Green: <goal of 18.90, Yellow: within 10% of the goal, Red: >10% above the goal of 18.90.



**Data as of:** 11 Jan 2010 Lower metric shows top five defect drivers overall for the past 6 months.

Metric Status (Green – Yellow – Red): Green

Trend:

Summary of Metric Status: Metric illustrates improving trend that has been maintained for the last 12 months period.

**Root Causes:** N/A

Contractor Actions: They have reduced their goal for MR actions for CY 2009 they have exceeded that

**DCMA Actions:** Reducing the goal to reflect an effort to further reduce the amount of MRB actions for this year. We are evaluating the new contractor goal to see if a more than 10% reduction in MRB actions is warranted.

Estimate when PC will achieve goal: PC has achieved goal as set last year.

#### Estimate when indicator will achieve goal:

Annual reduction goal will likely be achieved; however delivery is slipped due to MRB activities. Additional efforts on nonconformance prevention will benefit the program.

#### **Earned Value**

The complete EV report is attached:



### Appendix A – EV Assessment Criteria

Rating Criteria is based on the DCMA VAC% and when possible should include MR in the DCMA IEAC

Green -VAC%>-5%

Yellow --10%<VAC%<-5%

Red -VAC%<-10%

N/R -Not Rated or Not Reported