

"Maximizing Program & Performance Management Through Collaboration"

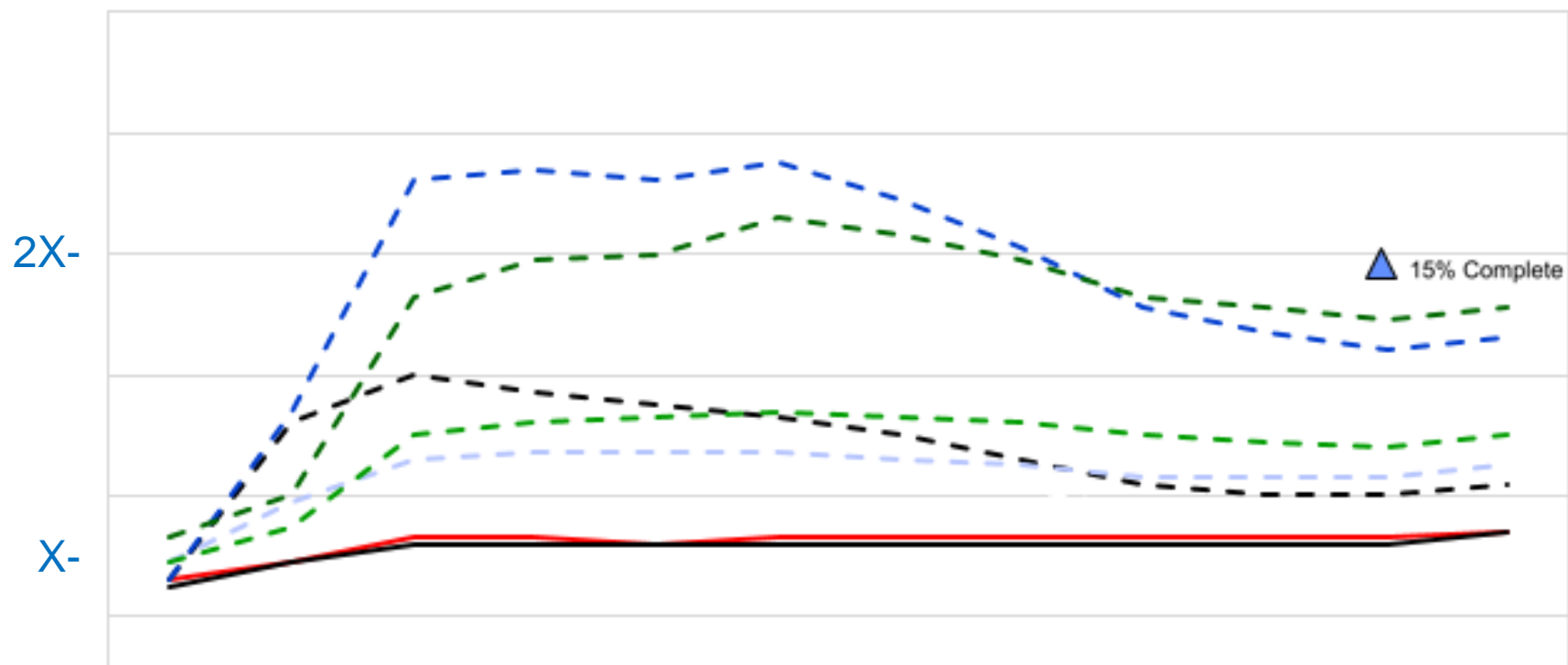
A NASA Case Study - Are EVM Estimate at Completion (EAC) Reliable?

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Agenda

- A real life example
- EAC Analysis Study
 - Answer the question: “Does EVM Work?” In particular: “Does EVM provide advance insight into a projects final cost/EAC?”
 - Tools and Data
 - Findings
- Summary

Year 1

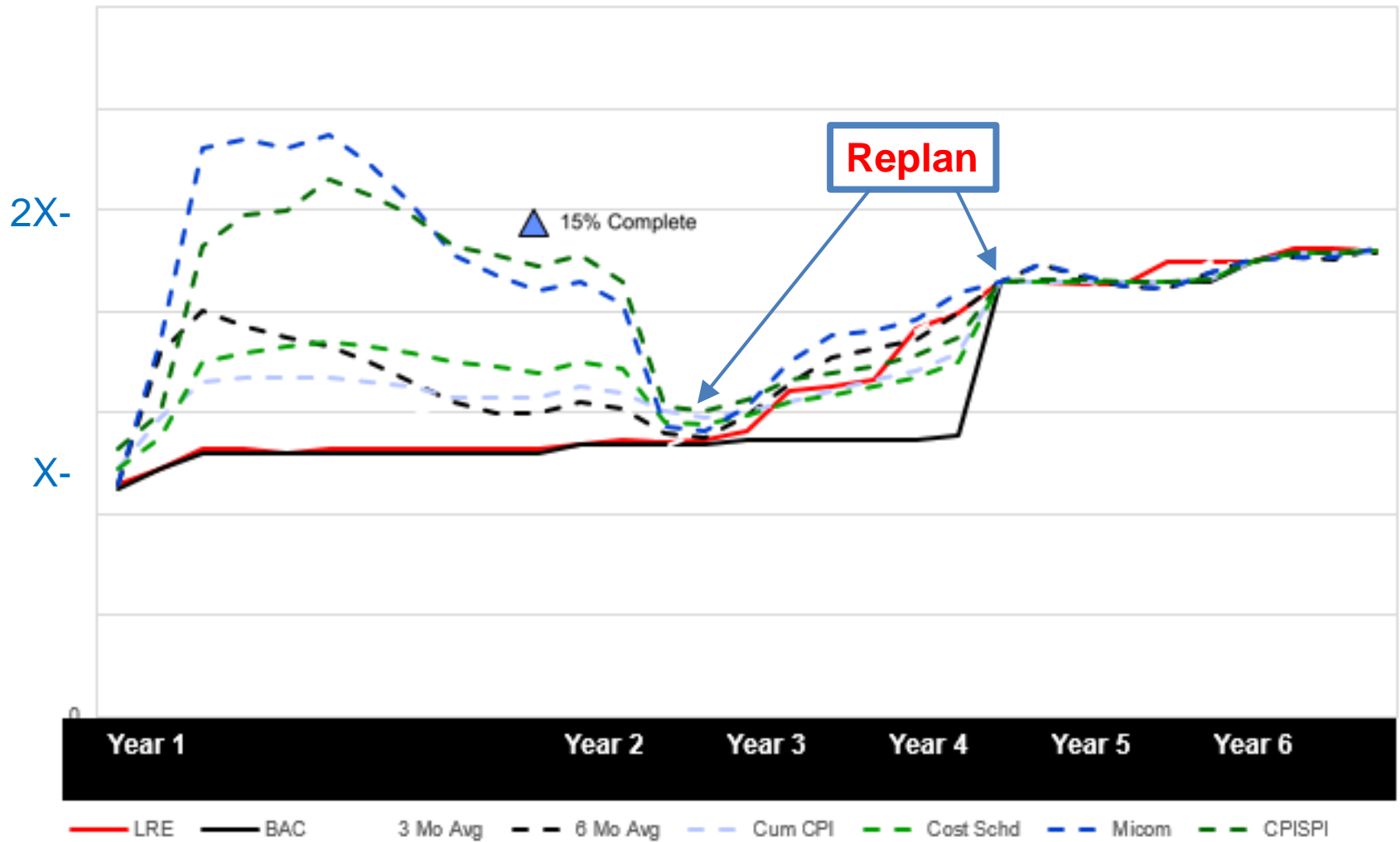


Date	Y1 M1	Y1 M2	Y1 M3	Y1 M4	Y1 M5	Y1 M6	Y1 M7	Y1 M8	Y1 M9	Y1 M10	Y1 M11	Y1 M12
CpiCur	0.92	0.68	0.62	0.72	0.75	0.79	0.94	0.89	0.94	0.89	0.85	0.79
SpiCur	0.92	1.16	0.31	0.50	0.63	0.45	0.61	0.74	0.80	0.76	0.82	0.78
CpiCum	0.92	0.84	0.79	0.78	0.78	0.78	0.80	0.81	0.82	0.83	0.83	0.83
SpiCum	0.92	0.97	0.70	0.66	0.66	0.62	0.62	0.63	0.65	0.66	0.67	0.68

Y1 M1 Y1 M2 Y1 M3 Y1 M4 Y1 M5 Y1 M6 Y1 M7 Y1 M8 Y1 M9 Y1 M10 Y1 M11 Y1 M12

— LRE — BAC - - - 3 Mo Avg - - - 6 Mo Avg - - - Cum CPI - - - Cost Schd - - - Microm - - - CPISPI

The Big Picture



The tools

NiteHawk 12/30/16 WBS Dollars [00000000 : NiteHawk]						
Six Period Summary						
ITEM	7/31/2016	8/31/2016	9/30/2016	10/31/2016	11/30/2016	12/30/2016
BCWS_c	863,492	750,068	729,503	689,653	433,457	1,272,862
BCWP_c	1,046,865	1,001,470	1,667,961	1,437,520	577,449	1,469,169
ACWP_c	1,329,316	2,459,044	1,249,967	1,237,910	1,298,686	1,849,684
SCH VAR_c	183,374	251,402	938,458	747,867	143,992	196,307
SCH VAR %_c	21.24	33.52	128.64	108.44	33.22	15.42
SPI_c	1.212	1.335	2.286	2.084	1.332	1.154
CEI	0.311					
COST VAR_c	-282,451					
COST VAR %_c	-26.98					
CPI_c	0.788					
BCWS	41,521,532					
BCWP	36,277,269					
ACWP	48,810,398					
SCH VAR	-5,244,263					
SCH VAR %	-12.63					
SPI	0.874					
BEI	0.929					
TOTAL FLOAT	0					
COST VAR	-12,533,129					
COST VAR %	-34.55					
CPI	0.743					
TCPI-BAC	3.151					
TCPI-EAC	0.631					
BAC	54,636,194					
EAC	77,925,298					
VAC	-23,289,104					
VAC %	-42.63					
% SCHED	76					
% COMP	66.4					
% SPENT	89.34					

NiteHawk 12/30/16 WBS Dollars [00000000 : NiteHawk]							
Six Period Summary							
ITEM	7/31/2016	8/31/2016	9/30/2016	10/31/2016	11/30/2016	12/30/2016	
CUR CPI Fcst	72,122,676	93,889,539	64,277,085	66,291,497	86,859,211	74,024,418	
3 PER AVG Fcst	73,855,105	82,017,141	73,790,265	71,289,505	69,594,918	74,023,442	
6 PER AVG Fcst	73,855,105	82,017,141	74,165,763	71,964,645	74,025,306	74,702,831	
CUM CPI Fcst	73,511,994	75,141,146	73,676,605	73,132,532	74,062,729	75,141,277	
CPI*SPI Fcst	77,082,871	78,338,359	75,879,096	74,718,915	75,530,189	76,416,083	
MICOM Fcst	77,475,582	86,135,278	76,419,176	73,455,405	75,489,876	75,946,987	
COST & SCH Fcst	71,518,827	72,844,894	71,568,359	71,131,038	71,967,780	73,089,853	
PERF FACTOR Fcst	67,169,323	68,626,897	68,208,903	68,312,600	69,197,008	70,502,770	
User Entered EAC	0	0	0	0	0	0	0
Entered EAC	NaN	NaN	NaN	NaN	NaN	NaN	NaN
Weighted VAR: Cost = 50.0%, Schedule = 50.0, Performance Factor = 1.00							
Forecasts are generated independently for each level.							

EAC ANALYSIS STUDY

What we did..

- Selecting data
 - Development work needed to be completed
 - Seven NASA projects selected for this study
- Reviewed relevant literature and previous studies
- Results are presented in percentages not \$

Findings

- **DoD Finding: Once a contract is more than 15-20% complete, the final overrun will be worse than the present overrun¹**
- **One of the seven projects did not have EVM data at the 20% completion point**
- **In all cases the overrun only worsened**

Project Cost Overrun at 20% and 100% Completion Points

Project	Percent Complete	
	20%	100%
A	0.3%	-6.6%
B	0.4%	-6.4%
C	-2.4%	-22.1%
D	-1.9%	-2.3%
E	0.7%	-17.0%
F	1.2%	-1.8%
Avg of \$ values	-1.0%	-10.6%

¹Christensen Wilson 1992

Findings

- **DoD Finding: Once a contract is over 20% complete, the cumulative Cost Performance Index (CPI) does not change by more than 10 percent, and in most cases it only worsens²**

- **One project (E) the CPI grew by more than 10%**
- **One project (D) the CPI improved**
- **NASA data generally supports DoD finding**

Project	Percent Complete					% Change (20 to 100)
	20%	25%	50%	75%	100%	
A	1.01	1.00	0.99	0.96	0.94	-7.6%
B	1.02	1.00	0.99	0.96	0.94	-7.8%
C	0.90	0.89	0.86	0.83	0.82	-8.8%
D	0.91	0.90	1.00	1.00	0.97	6.6%
E	1.04	1.00	0.92	0.86	0.85	-18.1%
F	1.08	1.07	1.03	1.00	0.98	-8.7%

²Christensen Wilson 1992

Findings

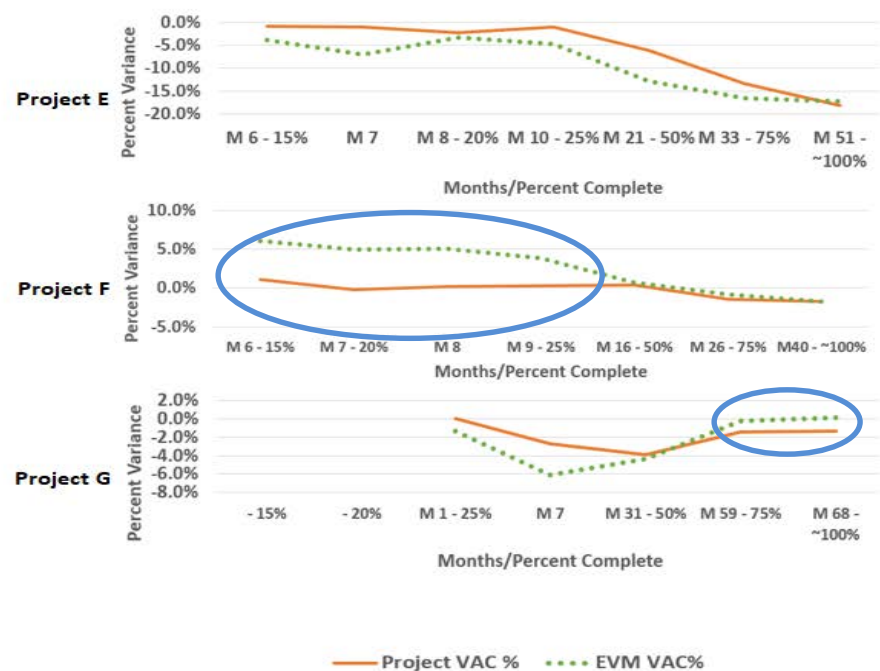
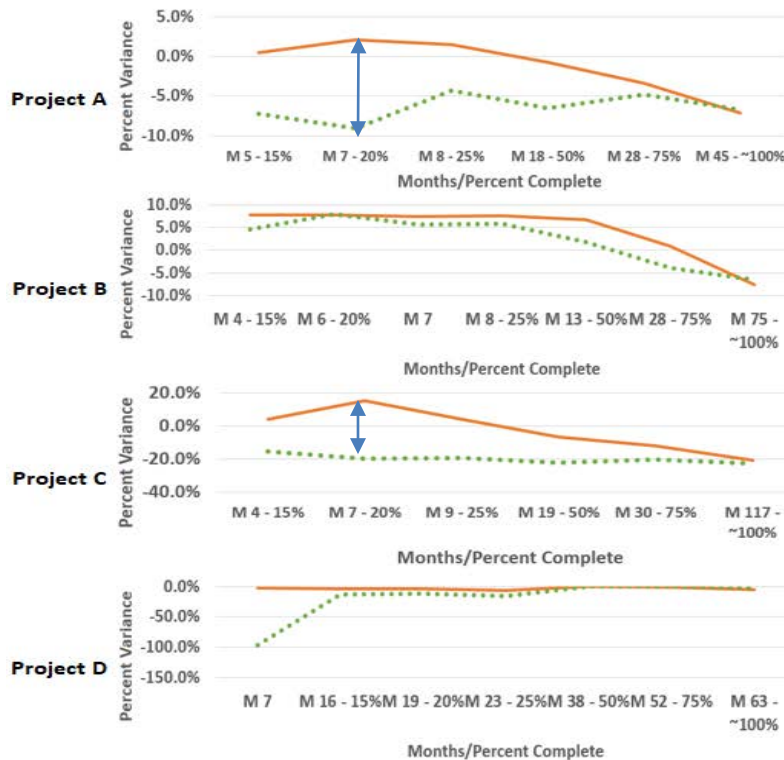
- At the 50% completion point for each of the NASA projects the EVM EAC was within 13% or less of the final cost to complete the project
- Prior to 50% completion, NASA projects have significant budget volatility (some projects were replanned)
- At 50% completion point the baselines stabilized and produced accurate EACs for each project

EVM Predictability of Final Cost at 50% and 75% Completion Points

Projects	EVM EAC	
	50%	75%
A	8%	4%
B	13%	7%
C	1%	1%
D	12%	7%
E	9%	2%
F	11%	5%
G	8%	1%

Findings

- DoD Finding: “overruns at completion predicted by the contractor and by the government program office were unrealistically optimistic



- NASA data generally supports the DoD study conclusion

Results

- Once a contract is more than 15-20% complete, the final overrun will be worse than the present overrun
- Once a contract is over 20% complete, the cumulative Cost Performance Index (CPI) does not change by more than 10 percent, and in most cases it only worsens
- Contractor/Projects EACs are usually more optimistic than EVM EACs

Summary

- EVM can provide early warning signs of potential cost and schedule problems
- This study validated that one of the benefits of implementing an EVM process is the ability to forecast how much a project will cost

EVM is effective in forecasting cost growth and predicting a realistic EAC

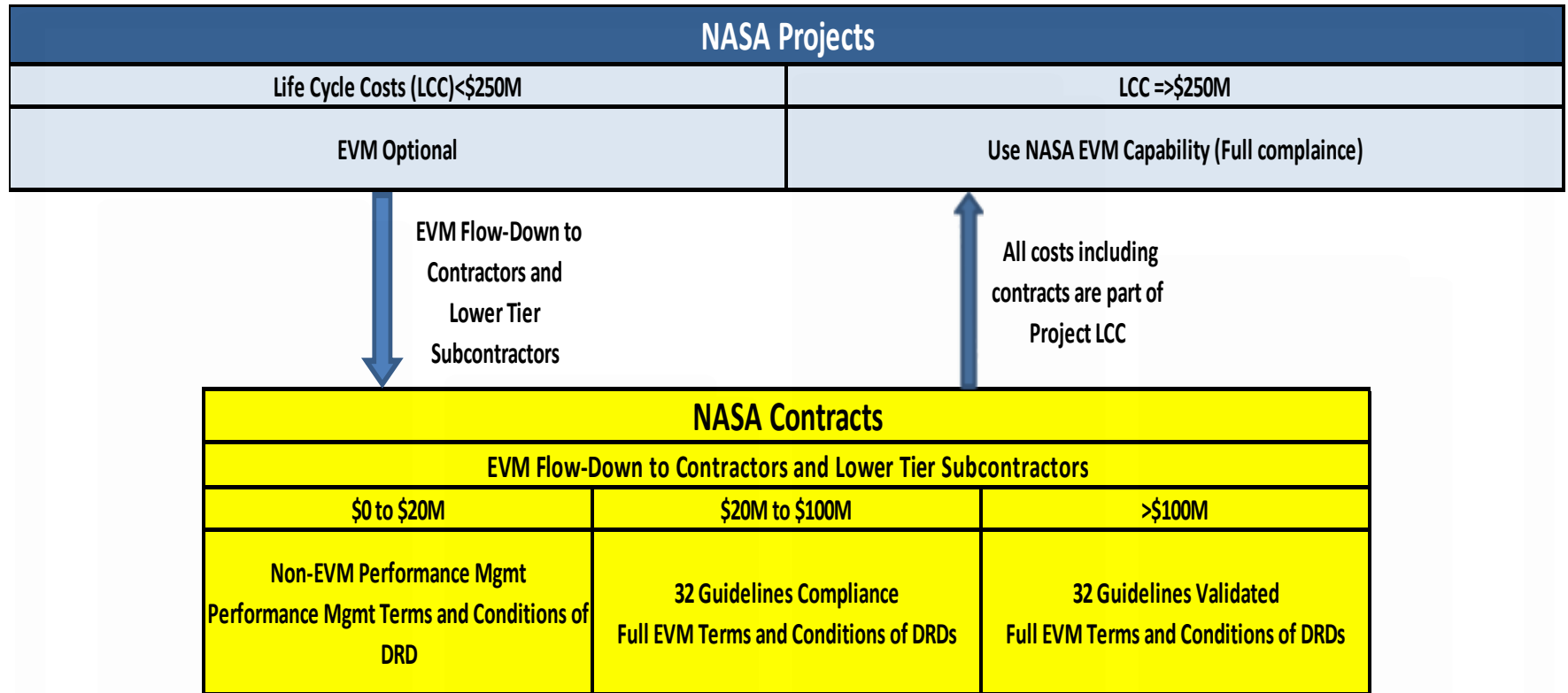


QUESTIONS?



BACK-UP

When is EVM required?



Projects that are valued to have a LCC => \$250M anytime prior to KDP-C require EVM.
Contract thresholds are governed by the NASA FAR Supplement 1852 and 1834

* SMD EVM Guidance for Cat 3, Class D less than requires the Seven Principles of EVM instead of the 32 guidelines for projects and contracts

EAC Formulas

