The Mystery of the Metrics: Contractor Schedule Management

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- 2023 COST & SCHEDULE SYMPOSIUM
- MAY 2023

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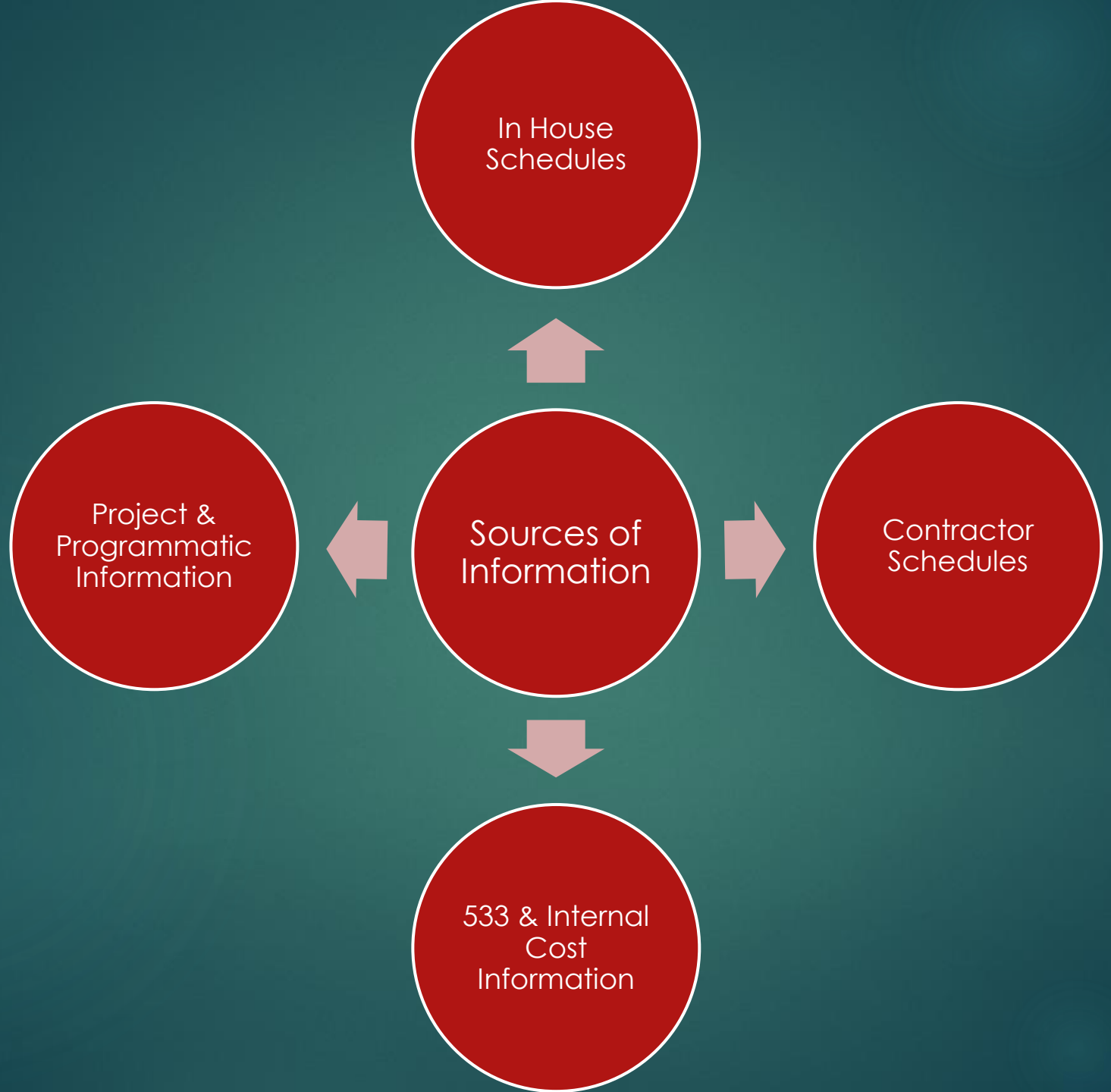
Introduction

Glenn Research Center Code MSI Code MSX


In House Schedules
Project & Programmatic Information
Sources of Information
Contractor Schedules
533 & Internal Cost Information

Murderers

Resources

Planning or Management Failure

Out of Scope

Overspending

Overschedule

Risk

9 Rooms of Metrics Management

- Cost Management
- Schedule Management
- Stakeholder Management
- Cost Variance
- Schedule Variance
- Procurement
- Risk Management
- Scope and Requirements Management
- Organizational communication and Human Behavior

6 Weapons

- Tools & Software that we use to solve problems
  - At a glance comparisons
  - Cost and schedule comparatives
  - Acumen Fuse Dashboard
  - Resource Usage Reports
  - Performance Reports
  - Risk and Performance Informed Predictive Modeling
- One-offs/Deep Dives
- Metrics & Definitions

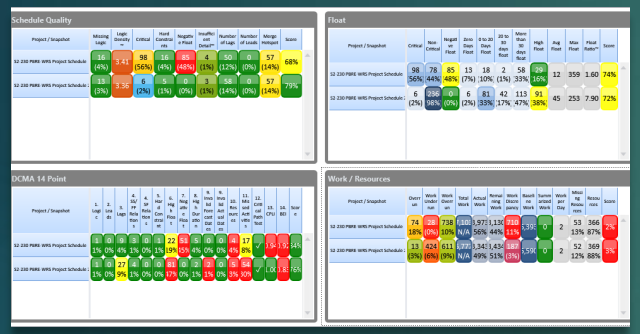
Breaking it down

- Take observations from hints to solidity
  - Use tools to filter and break down to detail
  - Provide detail with descriptive analysis and recommendations
  - Beware of a plot twist
  - Answer the questions for:
    - Project manager
    - Program Manager
    - Funding Office
    - Center Office
    - ~~Employer~~

Solving the Project Crime

- Scenario: Mr. Boddy, a SpaceFlight Project, is in the hospital on deaths door. Our program determining whether or not to continue to provide life support. Unless we can get to the root of the problem and provide workable solutions, Mr. Boddy is going to be unplugged. Can we prevent a project murder?

Gather and work through the clues



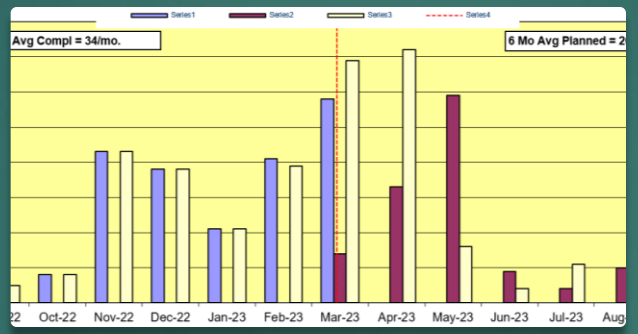
Clue:

Increased Negative Float

Increased Critical Path

Decreased High Float

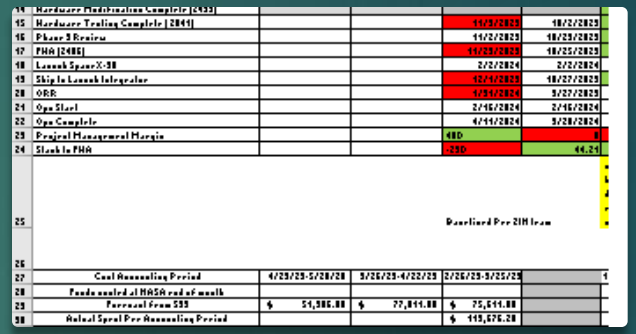
Actual Work Hours Increased



Clue:

April now a much lessor plan of activity

May greatly increased



Clue:

Schedule milestone dates slipped

Costs higher than planned

Schedule Quality

Project / Snapshot	Missing Logic	Logic Density™	Critical	Hard Constraints	Negative Float	Insufficient Detail™	Number of Lags	Number of Leads	Merge Hotspot	Score
S2 230 PBRE WRS Project Schedule	16 (4%)	3.41	98 (56%)	16 (4%)	85 (48%)	4 (1%)	50 (12%)	0 (0%)	57 (14%)	68%
S2 230 PBRE WRS Project Schedule 2	13 (3%)	3.36	6 (2%)	5 (1%)	0 (0%)	3 (1%)	58 (14%)	0 (0%)	57 (14%)	79%

Float

Project / Snapshot	Critical	Non-Critical	Negative Float	Zero Days Float	0 to 20 Days Float	20 to 30 days float	More than 30 days float	High Float	Avg Float	Max Float	Float Ratio™	Score
S2 230 PBRE WRS Project Schedule	98 (56%)	78 (44%)	85 (48%)	13 (7%)	18 (10%)	2 (1%)	58 (33%)	29 (16%)	12	359	1.60	74%
S2 230 PBRE WRS Project Schedule 2	6 (2%)	236 (98%)	0 (0%)	6 (2%)	81 (33%)	42 (17%)	113 (47%)	91 (38%)	45	253	7.90	72%

DCMA 14 Point

Project / Snapshot	1. Logic	2. Leads	3. Lags	4. SS/FF Relations	4. SF Relations	5. Hard Constraint	6. High Float	7. Negative Float	8. High Duration	9. Invalid Forecast Dates	9. Invalid Actual Dates	10. Resources	11. Missed Activities	12. Critical Path Test	13. CPLI	14. BEI	Score
S2 230 PBRE WRS Project Schedule	1 1%	0 0%	9 4%	3 1%	0 0%	1 1%	22 19%	51 45%	5 4%	0 0%	0 0%	4 4%	17 8%	✓	0.94	0.92	34%
S2 230 PBRE WRS Project Schedule 2	1 1%	0 0%	27 9%	4 1%	0 0%	0 0%	81 47%	0 0%	2 1%	2 1%	0 0%	5 3%	54 30%	✓	1.00	0.83	76%

Work / Resources

Project / Snapshot	Overrun	Work Underrun	Work Overrun	Total Work	Actual Work	Remaining Work	Work Discrepancy	Baseline Work	Summarized Work	Work per Day	Missing Resources	Resources	Score
S2 230 PBRE WRS Project Schedule	74 18%	28 (0%)	738 10%	7,103 N/A	3,973 56%	3,130 44%	710 11%	5,395	0	2	53 13%	366 87%	2%
S2 230 PBRE WRS Project Schedule 2	13 (3%)	424 (6%)	611 (9%)	5,777 N/A	3,343 49%	3,434 51%	187 (3%)	5,590	0	2	52 12%	369 88%	3%

G

Criteria:

Past 6 Mo vs Next 6 Mo

R is > 20%

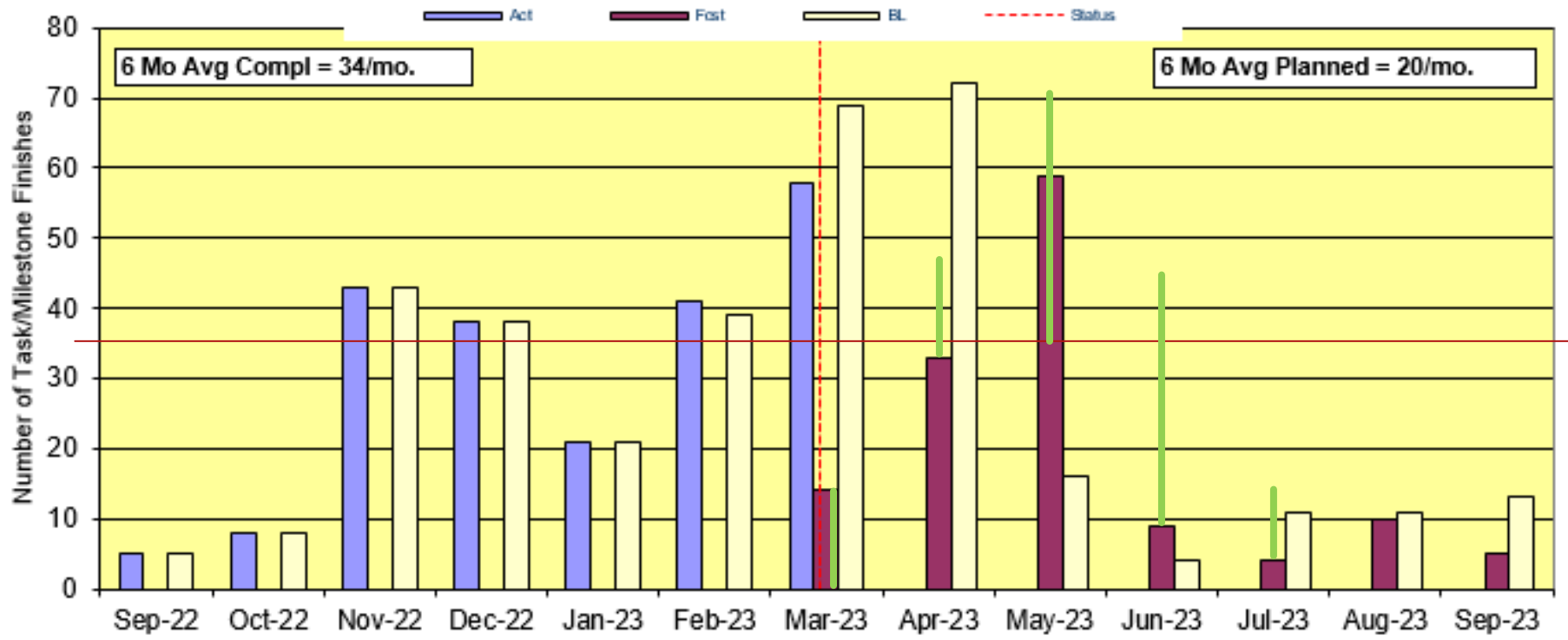
Y is 11% - 20%

G is <= 10%

Schedule Performance Trend

Schedule Performance & Work Off

Project Start Date: Oct-21

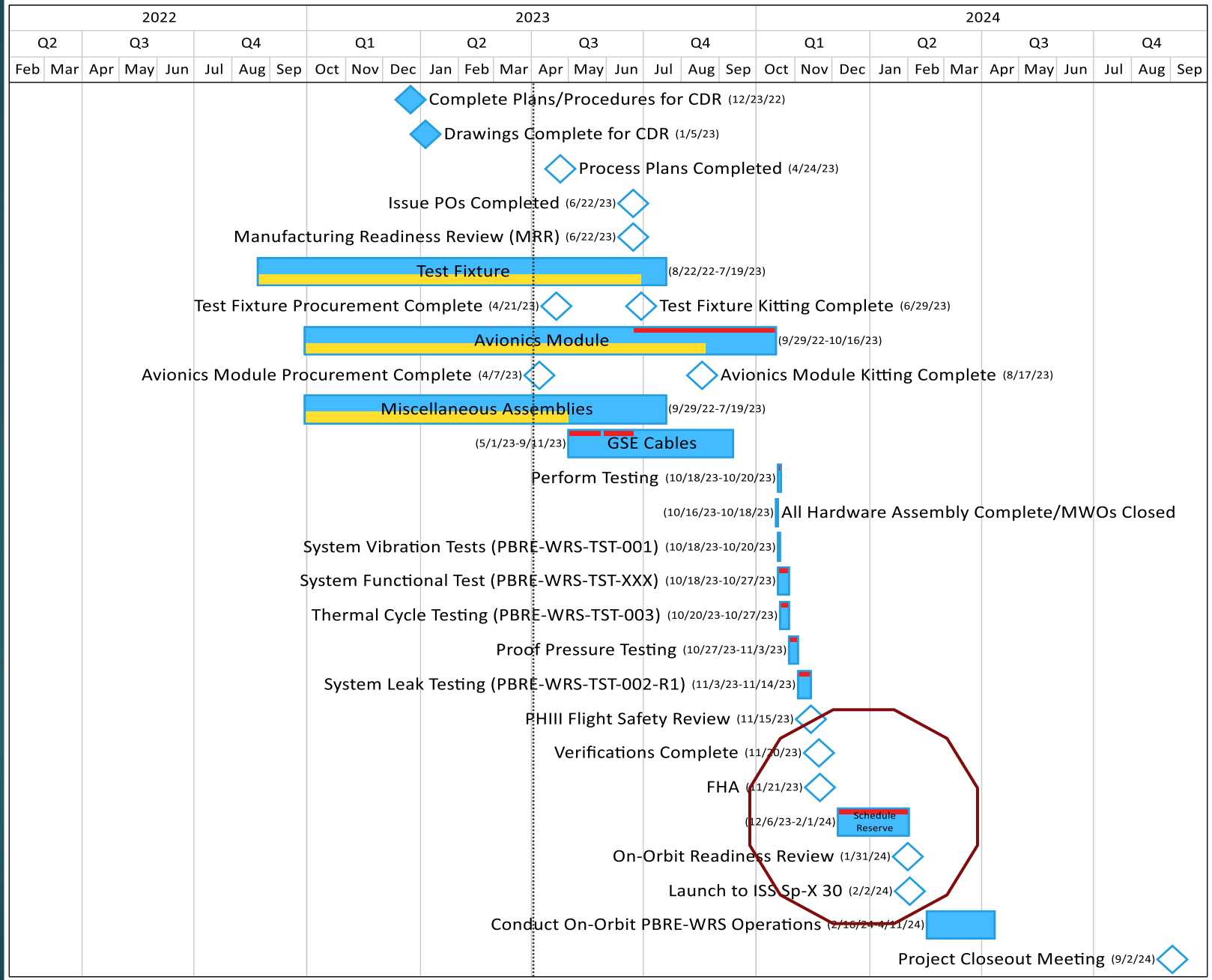


	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
Actual	5	8	43	38	21	41	58	0	0	0	0	0	0
Forecast	0	0	0	0	0	0	14	33	59	9	4	10	5
Baseline	5	8	43	38	21	39	69	72	16	4	11	11	13

	A	C	D	E	F
1	PBRE	6/1/2023	5/1/2023	4/1/2023	3/15/2023
2	Hardware Return Flight 2- SpaceX-24 (88)				
3	Hardware Delivered to GRC/ZIN (111)				
4	Hardware Refurbished (109)			6/29/2023	6/29/2023
5	**Milestones**				
6	Issue POs Completed			4/24/2023	4/3/2023
7	Process Plans Completed			3/31/2023	3/16/2023
8	Manufacturing Readiness Review (MRR)			4/24/2023	4/3/2023
9	Test Fixture Procurement Complete			4/21/2023	4/21/2023
10	Test Fixture Kitting Complete			5/1/2023	4/26/2023
11	Avionics Module Procurement Complete			3/31/2023	3/21/2023
12	Avionics Module Kitting Complete			6/16/2023	5/24/2023
13	Hardware Complete			8/23/2023	8/2/2023
14	Hardware Modification Complete (2433)				
15	Hardware Testing Complete (2041)			11/3/2023	10/2/2023
16	Phase 3 Review			11/2/2023	10/23/2023
17	FHA (2486)			11/29/2023	10/25/2023
18	Launch SpaceX-30			2/2/2024	2/2/2024
19	Ship to Launch Integrator			12/1/2023	10/27/2023
20	ORR			1/31/2024	9/27/2023
21	Ops Start			2/16/2024	2/16/2024
22	Ops Complete			4/11/2024	3/28/2024
23	Project Management Margin			40D	0
24	Slack to FHA			-29D	44.21

Cost Accounting Period	4/23/23-5/20/20	3/26/23-4/22/23	2/26/23-3/25/23	1/29/23-2/25/23
Funds costed at NASA end of month				$ 102,023.08
Forecast from 533	$ 51,306.00	$ 77,811.00	$ 75,611.00	$ 78,809.00
Actual Spent Per Accounting Period			$ 113,676.28	$ 73,878.44
Labor Cost Per Accounting Period	24586	$ 38,826.00	$ 44,902.00	$ 33,198.00
Forecast Variance			150%	94%
Estimate at Completion			$ 2,411,373.00	$ 1,895,993.00
Actual Cost			$ 2,030,517.41	$ 1,916,841.13
% of total costs spent			84%	101%
proportion of total cost spent this accounting period			5.6%	3.9%
% of total FY budget spent			~~72%~~	58%
Cumulative FY Costs			~~$ 579,453.46~~	$ 465,777.18
533 Planned Hours	575	904	752	802
533 Actual Hours			1038	765
Schedule Planned Hours	538.14	416.16	627	510
Schedule Actual Hours			574	812
variance of schedule plan vs actual hours			92%	159%
Variance of 533 Actual to Schedule Actual Hours			55%	106%
Cost Per Hour (labor only)			$ 78.22	$ 40.89
Forecast of Labor Cost at Average Rate Per Hour* Planned Hours	$ 42,091.67	$ 32,550.76	$ 49,042.02	$ 30,699.16
Forecasted Direct Costs Per 533	$ 17,816.00	$ 45,591.00	$ 50,182.00	$ 29,713.00
Sum of schedule forecast *last month hour + Forecast Direct Cost	59,907.67	$ 78,141.76	$ 99,224.02	$ 60,412.16
Expected Schedule Complete			75%	74%
Actual Schedule Complete			72%	67%
% of Total Schedule Earned			5%	-2%
Variance of Expected Schedule Earned			-3%	7%

PBRE-WRS



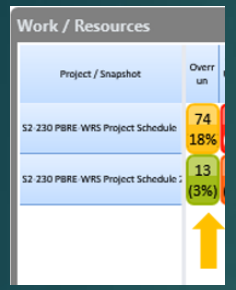
2023 April S2-230 PBRE-WRS Project Schedule.mpp

Snapshot Date: 4/3/2023

Created in OnePager® Pro

Murderers

Resources



Planning or Management Failure

Out of Scope or Requirements

Overspending - Not isolated

Overschedule - Not isolated

Risk

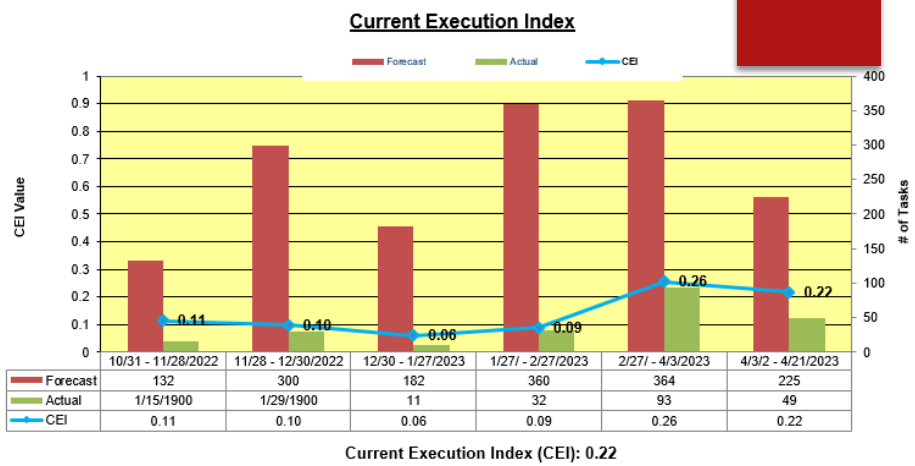
Solve the Crime to prevent the project death

- Schedule and costs are slipping, and the plan is varying off baseline substantially. Work plan demonstrates increasing amount of planned work.

R

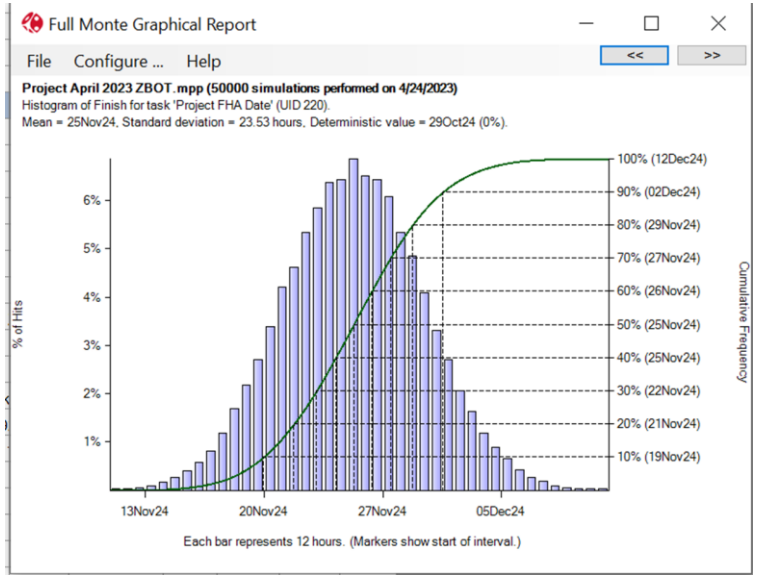
Criteria:

R is <= .80
Y is .81 - .90
G is > .90



	10/31 - 11/28/2022	11/28 - 12/30/2022	12/30 - 1/27/2023	1/27/ - 2/27/2023	2/27/ - 4/3/2023	4/3/2 - 4/21/2023
Forecast	132	300	182	360	364	225
Actual	1/15/1900	1/29/1900	11	32	93	49
CEI	0.11	0.10	0.06	0.09	0.26	0.22

Current Execution Index (CEI): 0.22



Rationale:

Planning or Management Failure

Room- Stakeholder Management

Weapons: Acumen Fuse, Performance Reports, Resource Usage analysis

Out of Scope or Requirements Definition

Room: Scope or Requirements Management

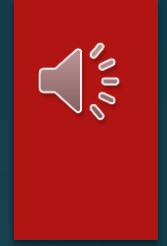
Weapons: 533, Master Tracker, Acumen Fuse, Comparison Reports- forensic analysis

Risk Management

Room: Risk Management

Weapons: Risk Register, Performance Reports, Predictive Modeling

Metric Combination Examples						
Metric		Metric		Who Done It	Confirm what room & Detail	With What Weapon
Historical Schedule Performance vs. planned schedule performance	+	Increasing work overrun	=	resource availability concerns	Options: Carefully review historical vs. planned performance by resource. Consider periods of over vs under utilization. Consider leveling options, resequencing, and changing durations or relationships. Calculate cost of forseen slip in both cost and schedule with what if and impact analysis. Model known risk in predictive modeling tool (Monte Carlo)	Compares schedule performance output with work/resource analysis. Tools: Acumen Fuse, two MPP files. Association: Cost of slip, cost of mitigation, impact of mitigation on other resources.
Increased Negative Float and/or lengthening critical path and Decreased High Float	+	Increased Actual Work	=	New work was identified	Options: Identify root cause. Consider change in scope, consider recent contractual changes (DO Mod), Consider recent technology or procurement challenges	Compare two MPP files in Fuse Forensics to isolate new work and changes to relationships to an appropriate detail. Quantify impact to cost and schedule. Look for optomization opportunities to mitigate.
Decreased Labor Cost per Hour	+	Improved Current Execution Index	=	Existing resources are getting more done	Options: Evaluate if schedule impact by evaluating milestone slip chart, identify root cause to seek opportunities, adjust future schedule and predictive modeling if conditions expected to continue, adjust independent forecast	Compare two MPP files, schedule performance tool, 533 data and independent calculations.
% of costs spent	>	% of schedule complete	=	overspending	Consider procurement phase, total % of procurement budget spent, cost and schedule trends over time. Model as required	Compare ratio of estimate at completion and total costs spent to date as a %, to % of actual schedule complete. Should fsee similar trendline



Questions & Answers