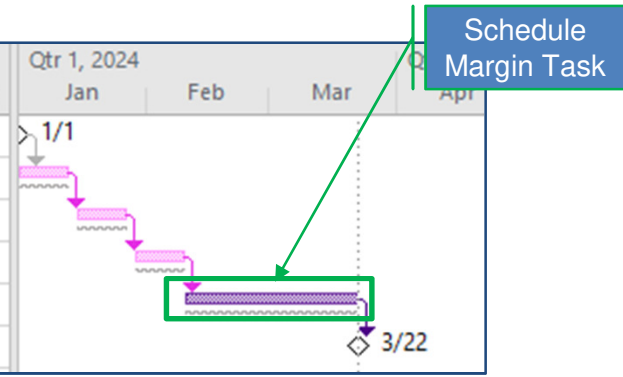# Schedule Margin Definition

- Schedule Margin is an optional management method for accommodating schedule contingencies that represent the difference between contractual milestone date(s) and the planned date(s) of accomplishment

- A schedule margin task holds as duration total slack to a key event so that any change in the schedule margin duration impacts the key event

> IPMDAR DID - <u>2.4.2.19 Schedule Margin</u>. If Schedule Margin is used, clearly and consistently identify all schedule margin tasks.
> - **2.4.2.19.1 Use schedule margin only as the last task before key contractual events, significant logical integration/test milestones, end item deliverables, or contract completion.**
> - 2.4.2.19.2 Explain changes to schedule margin tasks…

7d Task Calendar

Schedule Margin Task

	Task Name	DU	Total Slack	Start	Finish
	Start SubProject	0d	0d	1/1/24	1/1/24
	a	10d	0d	1/1/24	1/12/24
	b	10d	0d	1/15/24	1/26/24
	c	10d	0d	1/29/24	2/9/24
	SubProject Margin	42d	0d	2/10/24	3/22/24
	SubProject Complete	0d	0d	3/22/24	3/22/24

BPO/CAAG

Schedule Margin Verification

- In our simple example it seems obvious that the entire 42d schedule margin task is protecting the Complete key event

- To verify this we remove the schedule margin duration and the original forecast date of 3/22/24 pulls in to 2/9/24, a 42 calendar day change; that is, the available schedule margin

Schedule Margin - Calculation

- As in our example, to calculate how much schedule margin there is to a protected key event
  - record the key event's current forecast date
  - remove **all** schedule margin durations and constraint on key event
  - record the key event's revised forecast date
  - calculate the delta between the two dates
- We have developed a tool to automate the calculation

- Using the tool ensures a **consistent and repeatable** method to verify reported schedule margin values, quickly identifying any discrepancies in how much total slack exists to a protected milestone

Why Verify Schedule Margin?

- Increasingly we find schedule margin reporting to be inaccurate, typically overstating the amount available to a key event

- Primary issues:
  - Schedule margin is logically bypassed
  - Schedule margin tasks may or may not be additive

- Other contributing factors:
  - Date constraints on schedule margin tasks
  - Mixing calendar types on schedule margin tasks
  - Schedule margin isn't actively managed (i.e., not used to maintain key event's due date)
  - Lack of driving path analyses with schedule margin zeroed

When reported schedule margin does not protect the key event, further analysis is required

Bypassed Schedule Margin

- The below builds on the first sample file adding another path that is also required to reach the complete key event

- **Bypassed** schedule margin (protected key event has <u>more than schedule margin as a predecessor</u>)

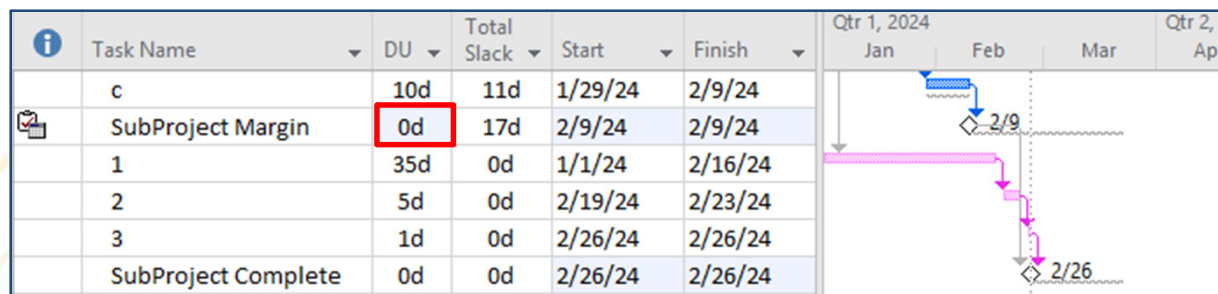|	Task Name	DU	Total Slack	Start	Finish	Gantt
	Start SubProject	0d	0d	1/1/24	1/1/24	1/1
	a	10d	0d	1/1/24	1/12/24	
	b	10d	0d	1/15/24	1/26/24	
	c	10d	0d	1/29/24	2/9/24	
	SubProject Margin	42d	0d	2/10/24	3/22/24	
	1	35d	19d	1/1/24	2/16/24	
	2	5d	19d	2/19/24	2/23/24	
	3	1d	19d	2/26/24	2/26/24	
	SubProject Complete	0d	0d	3/22/24	3/22/24	3/22
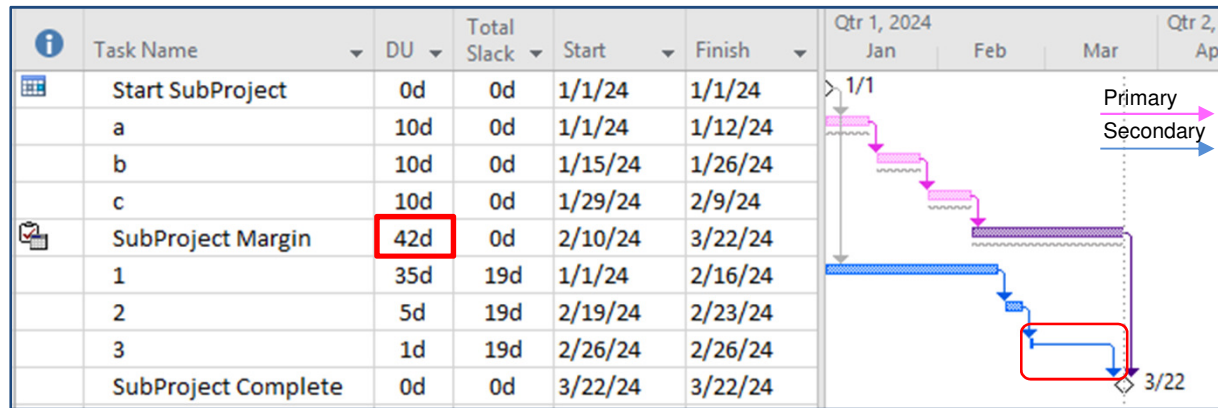
- Verification of schedule margin shows only **25** calendar days of effective schedule margin, not 42

	Task Name	DU	Total Slack	Start	Finish	Gantt
	c	10d	11d	1/29/24	2/9/24	
	SubProject Margin	0d	17d	2/9/24	2/9/24	2/9
	1	35d	0d	1/1/24	2/16/24	
	2	5d	0d	2/19/24	2/23/24	
	3	1d	0d	2/26/24	2/26/24	
	SubProject Complete	0d	0d	2/26/24	2/26/24	2/26

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Schedule Margin Parallel / Not Additive

- The below integrates the original file's delivery into a final key event

- **Parallel / Not Additive** schedule margin
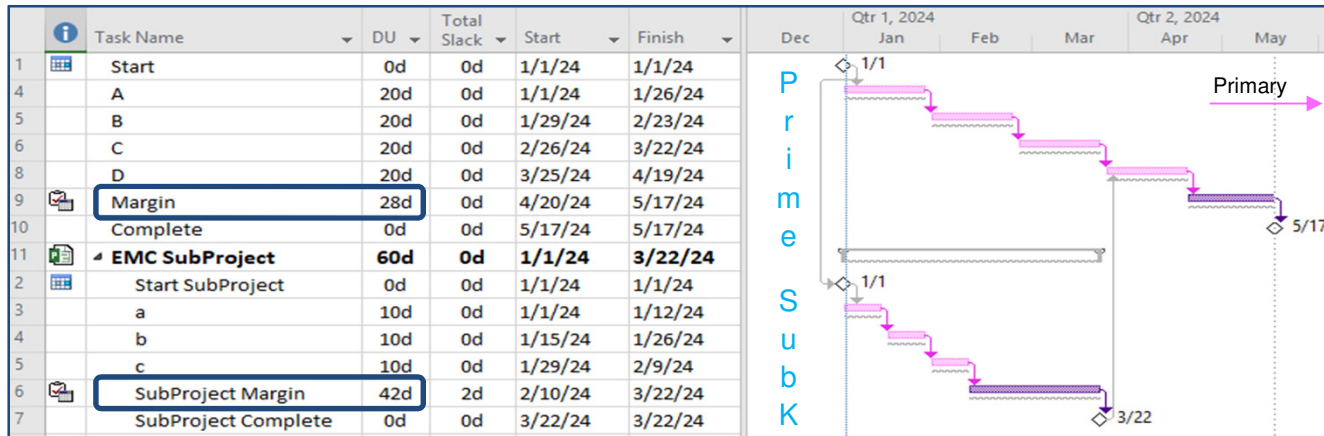
- Verification shows 28 of 70 calendar days effective schedule margin

- With schedule margin in, there are two driving paths to the key event

Case Study

Case Study –
How This Manifests in the Real World

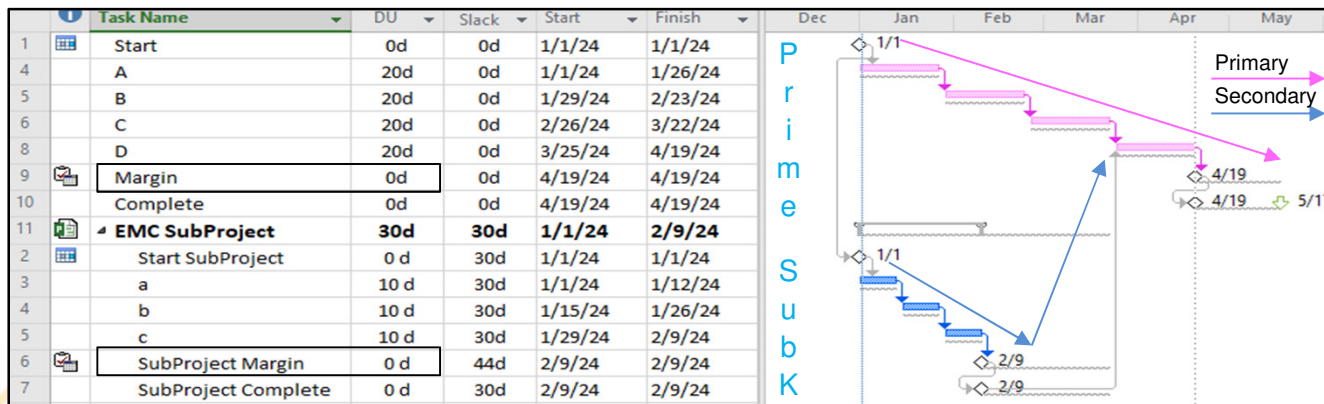- Developer IPMDAR reports 64d of launch schedule margin (doesn't identify if work or calendar days)

- We want to verify this value

- Contractor identifies schedule margin tasks as part of IPMDAR schema

- The Effective Margin Calculator (EMC) tool yields significantly different results from the IPMDAR write-up

- A manual check seems appropriate

Task Description	dur	Pr (1)	Δc (2)	TS	Start	Finish	PriFin (3)	Δf (4)
Payload Margin	74d	74d	0	10d	11/10/2023	3/1/2024	3/1/2024	0
Assembly and Test Margin	50d	50d	0	9d	12/15/2023	3/2/2024	3/2/2024	0
IPA Schedule Margin	25d	25d	0	0d	2/23/2024	3/28/2024	3/28/2024	0
FAT Margin	40d	40d	0	49d	5/22/2024	7/17/2024	7/17/2024	0
SAT Margin	0d	0d	0	49d	10/15/2024	10/15/2024	10/15/2024	0
PreShip Margin	25d	25d	0	0d	12/20/2024	2/1/2025	2/1/2025	0
Rehearsal Margin to Launch	21d	21d	0	11d	3/18/2025	4/15/2025	4/15/2025	0
Operations Schedule Margin	18ed	18ed	0	0ed	4/12/2025	4/30/2025	4/30/2025	0
Launch	0d	0d	0	0d	4/30/2025	4/30/2025	4/30/2025	0

Totals: 253 (Pr column), 128 (TS column)

- The MSP file above has custom fields added to show changes in values (Δ)*

- Totals for schedule margin & slack

- Total Slack (TS) shows not all slack to launch is captured, just three (red boxed) on launch's driving path at 0d total slack *(reported 64 work days)*

- Schedule margin is in parallel and two link directly into launch

- Review of Launch predecessors (not shown) confirms two schedule margin predecessors <u>and ~30 other tasks</u> bypassing the schedule margin tasks

- One schedule margin task uses elapsed days for duration

* Custom Fields: 1) Prior Duration, 2) DurΔ (change), 3) Prior Finish, and 4) FinΔ

BPO/CAAG   DurΔ = ([Duration]-[Prior Duration])/480 and FinΔ = projdatediff(Prior Finish,Finish)/480

Case Study – Schedule Margin Verification

Task Description	dur	Pr	Δc	TS	Start	Finish	PriFin	Δf	2024 S O N D J F M A M J J A	2025 S O N D J F M A M
Payload Margin	0d	74d	-74	114d	11/9/2023	11/9/2023	3/1/2024	-74		
Assembly and Test Margin	0d	50d	-50	89d	12/14/2023	12/14/2023	3/2/2024	-50		
IPA Schedule Margin	0d	25d	-25	55d	2/22/2024	2/22/2024	3/28/2024	-25		
FAT Margin	0d	40d	-40	94d	5/21/2024	5/21/2024	7/17/2024	-40		
SAT Margin	0d	0d	0	74d	9/14/2024	9/14/2024	10/15/2024	-20		
PreShip Margin	0d	25d	-25	38d	12/7/2024	12/7/2024	2/1/2025	-33		
Rehearsal Margin to Launch	0d	21d	-21	42d	3/3/2025	3/3/2025	4/15/2025	-31		
Operations Schedule Margin	0ed	18ed	-54	37.38ed	3/24/2025	3/24/2025	4/30/2025	112.1:		
Launch	0d	0d	0	19d	4/3/2025	4/3/2025	4/30/2025	-19		

- Schedule margin tasks durations reduced to zero
- The MS Project Δ fields calculate changes in duration & finish from prior values in work days
- Launch key event only moves earlier 19 work days (27 calendar days)
- Of the 253d schedule margin durations with 128d of total slack **only 19 work days are effective**

How does this compare to the Effective Margin Calculator?

BPO/CAAG

Case Study – Results Using EMC Tool

- Reported schedule margin is 64 days
- Launch is the selected key event
- All schedule margin tasks identified with Flag1
- Tool executes the schedule margin verification process
  - The key event forecast date without schedule margin tasks
  - Calculated schedule margin in both work days (to the MSP default task calendar) and calendar days
  - Ratio of effective schedule margin to duration from time now to key event completion

Effective Margin Calculator (EMC) Version 1.0

Run Page | Instructions | Notes

926 — Target Item ID — Lookup ID

Item Name

NASA-Scrub4EMC Launch

Schedule Margin Indicator

Margin Flag

⊙ Flag — Flag indicates margin tasks — Flag1

Or

Text Field

○ Text Field — Text iindicate margin tasks — Text11

Text String — MARGIN

Margin Effectiveness

04/03/2025	Zero Margin Finish Date
19 d	Effective Days (work days) (based on Project calendar)
27 d	Effective Days (calendar days)
3.5%	Margin Pecent (ratio from TimeNow to Event)

Restoring Original Durations . . .

100%
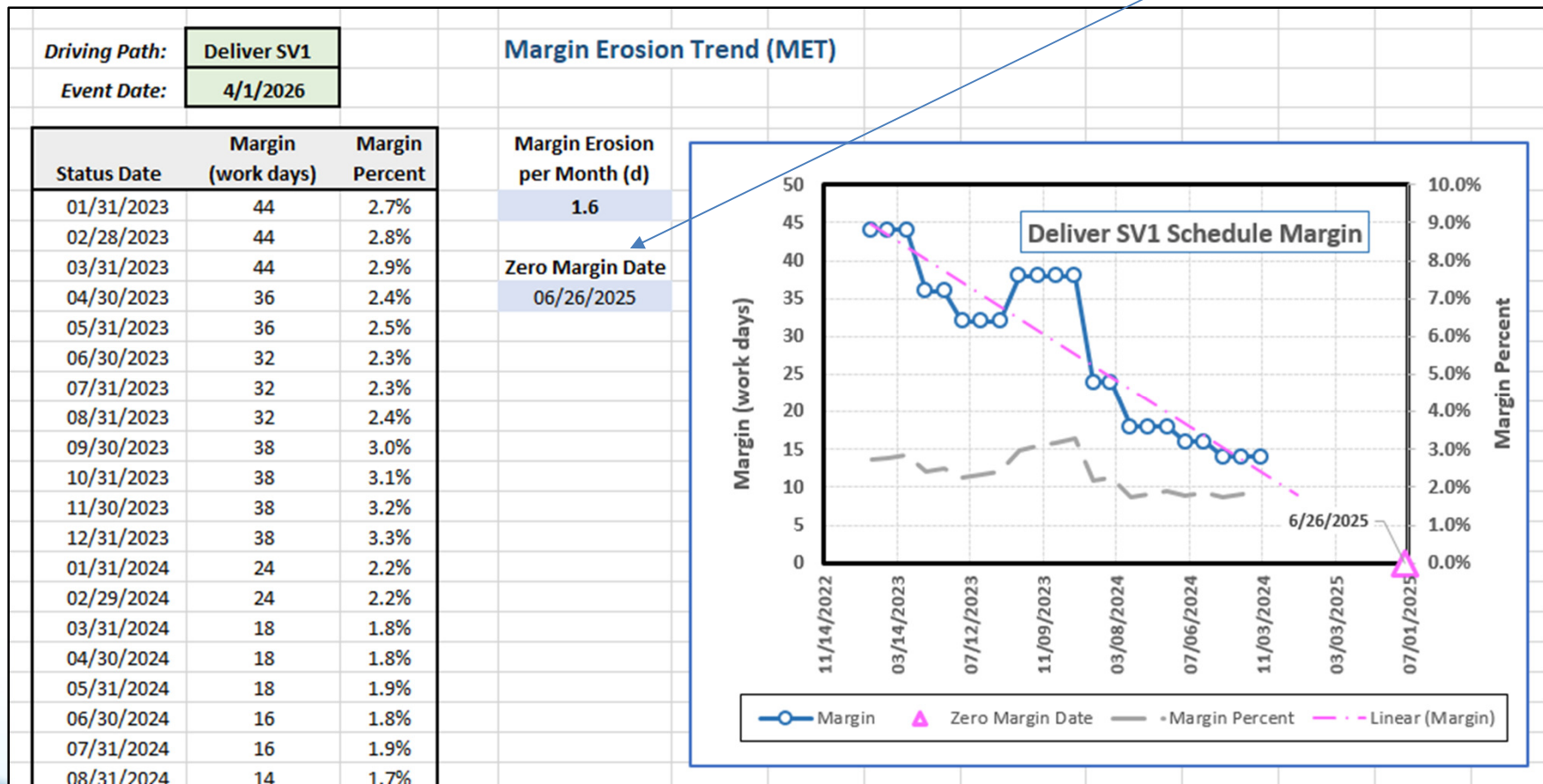
8 — Margin Tasks — Run — Close

Case Study – Close Out

- Conducted driving path analyses with schedule margin zeroed out revealed schedule issues

  – Discovered unnecessary SNETs preventing launch movement (removed for analysis)

  – The final driving path was an Agile software release unreported as a driving path to launch

- Contractor was provided this feedback

Schedule Margin Metric Trending

- Available with EMC tool, the Margin Erosion Trend (MET) is an Excel file that trends results over time via manual table entry
- Template projects the date when schedule margin goes to zero

Driving Path:	Deliver SV1
Event Date:	4/1/2026

Status Date	Margin (work days)	Margin Percent
01/31/2023	44	2.7%
02/28/2023	44	2.8%
03/31/2023	44	2.9%
04/30/2023	36	2.4%
05/31/2023	36	2.5%
06/30/2023	32	2.3%
07/31/2023	32	2.3%
08/31/2023	32	2.4%
09/30/2023	38	3.0%
10/31/2023	38	3.1%
11/30/2023	38	3.2%
12/31/2023	38	3.3%
01/31/2024	24	2.2%
02/29/2024	24	2.2%
03/31/2024	18	1.8%
04/30/2024	18	1.8%
05/31/2024	18	1.9%
06/30/2024	16	1.8%
07/31/2024	16	1.9%
08/31/2024	14	1.7%

Margin Erosion Trend (MET)

Margin Erosion per Month (d)
1.6

Zero Margin Date
06/26/2025

Final Thoughts

- EMC makes schedule margin verification consistent and repeatable

- Protected key event should only have a schedule margin predecessor

- The presence of multiple schedule margin tasks may complicate the understanding of effective schedule margin

- All schedule margin task durations should be set to zero prior to conducting driving path analyses

- Determine if schedule margin is in work or calendar days

Effective schedule margin verification with EMC is a powerful analysis method to determine schedule realism and achievability

Effective Margin Calculator Availability

- EMC is available for dissemination, please email us at BPO-CAAG-ECE@nro.mil

NATIONAL RECONNAISSANCE OFFICE

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