

Project Controls Expo – 13th Oct 2015 Emirates Stadium, London

The Challenges of Tracking Earned Value on The SV Scout Project





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Managing Consultant

- An Engineer, a Programme & Risk Management Consultant
- Background in Mechanical Engineering & MSc in Engineering Management
- 10 years of Programme Risk & Opportunity Management, 3 years of Safety Management and 2 years of Earned Value Management (EVM)

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BMT Hi-Q Sigma Core Capabilities

Portfolio Management Setting the direction and scope of a portfolio of projects to ensure outcomes are compatible with the overall business direction and objectives	Programme & Project Diagnostics Independent impartial advice providing assurance and confidence in the deliverability of programmes and projects	Enterprise Architecture Enabling organisations to understand, document, communicate and manage the components of their businesses to the optimum levels
Project Controls and EVM Support for development of Earned Value Management systems that enable profound understanding of current project performance	Investment Appraisal Cost management and strategic advice helping organisations use market forces to the best advantage	Risk and Opportunity Management Creating the environment, the processes and tools for risk management and opportunity exploitation
Requirements Definition Requirements are mapped to project outcomes providing full assurance that the expected benefits are quantifiable, measurable and achievable	Planning and Schedule Management Help in correlating and integrating schedules to enhance reliable decision- making and forecasting	Training and Mentoring A range of bespoke learning and development programmes from highly-skilled and experienced practitioners

Your EVM Experience

Which of these best describes your EV experience and skills:

A – (Advanced): I eat, sleep and breathe EVM and can't imagine my life without it.

B- (Practitioner): I have practiced EVM occasionally or a long time ago, am competent in its application but do not profess to be an expert!

C – (Basic): I am aware of what EVM is and why it might be used.

D – (None): I don't know what EVM means but I'd like to find out (or I have accidentally wandered into the wrong presentation and am now looking for the exit!).



Scout SV

- DE&S CAT A Project to deliver SV Scout + Variants
- Army's highest priority new equipment programme
- Biggest single order for fighting vehicles in 30 years
- 589 vehicles with expected IOC 2018

"The Scout SV project will deliver 'game changing reconnaissance' for the British Army, with a new fleet of armoured fighting vehicles including the Scout Reconnaissance variant. The vehicles have been designed with high levels of protection, mobility and crew comfort"



Scout SV will equip the army with:

- A family of rapidly-deployable medium weight Armoured Fighting Vehicles
- Effective across a spectrum of operations including
 - Rapid intervention
 - High intensity, Major Combat Operations
 - Enduring Peacekeeping and Peace Enforcement
- Equipped with the 40mm Cased Telescoped Cannon and Ammunition (CTCA) & world class mobility effective in all weathers & across a variety of terrain
- Game changing sensors, surveillance, protection & target acquisition systems







Scout SV Programme

- Demonstration Phase onto Manufacturing !
- The SV Programme consists of two blocks of capability including Training and Support elements:
- RB1: Four roles consisting of;
 - Scout (with 40mm Cannon)
 - Protected Mobility Recce Support (PMRS),
 - 2 Equipment Support (ES) variants for
 - Repair and Recovery
- Special To Role (STR) variants: Two roles consisting of;
 - Command & Control
 - Engineer Reconnaissance





Scout Variants

Single Base Platform Design

The Command and Control variant will process and manage information to provide commanders with information to make informed decisions on the battlefield.

The Engineering Reconnaissance variant will provide timely and accurate engineering information on the natural and man-made environment.

The Protected Mobility Reconnaissance Support (PMRS) variant will be used to deliver and support specialist troops across the battlefield.





Scout Variants

Single Base Platform Design

The Equipment Support Recovery variant is fitted with a recovery package that is optimised to provide the most effective means of recovering a casualty vehicle.

The Equipment Support Repair variant will be used to tow battlefield damaged vehicles and lift heavy subassemblies. The Scout Reconnaissance variant will be the mediumweight core of the British Army's deployable all-weather intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) capability.

EVM & Schedule Performance Support

The Requirement

- The MoD wants to know:
 - How is 'our' project progressing?
 - What has the contractor achieved with the money we have spent so far?
 - What is the true out-turn cost going to be?
 - Can I trust the data in the reports supplied by the contractor?
 - Do we have confidence in the contractor's delivery?
 - Associated to this:
 - What are their 'get-well' plans or recovery actions?





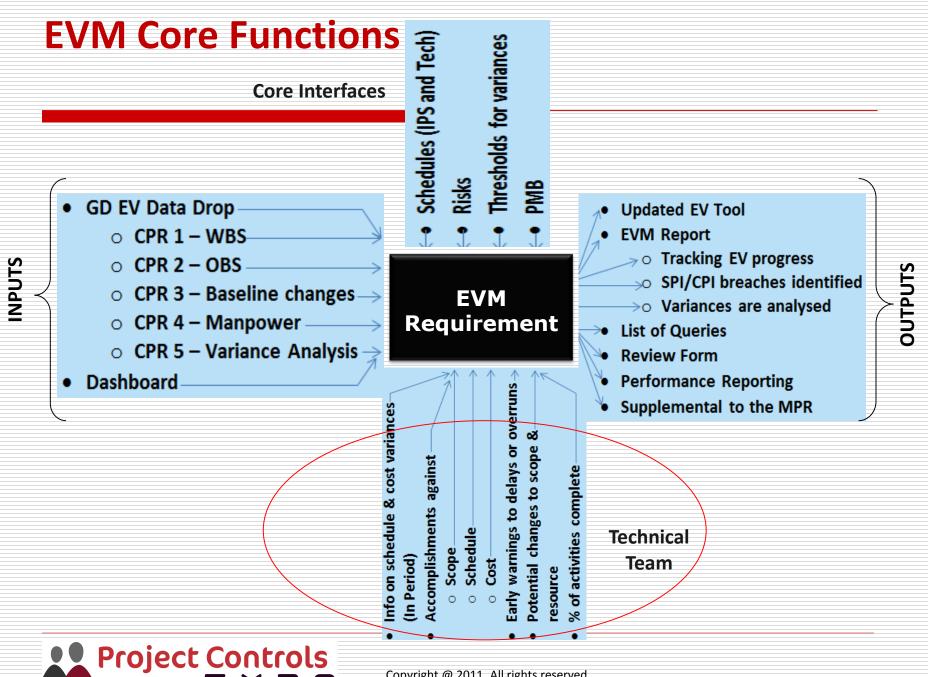
EVM & Schedule Performance Support

Meeting the Requirements

- Fully developed EVMS that is integrated with existing SV Risk and Schedule Processes
- EVMS that interfaces with industry programme management information
- Accurate collection of costs
- Generation of reliable SPI/CPI indices and Cost Schedule Variances
- Development of monthly EVM Reports
- Prediction of anticipated performance via
 - ETC, EAC and TCPI calculations
- Comparisons to SRA modelling using Forecast Schedule Estimates







EXPO

WBS, CAs and CAMs

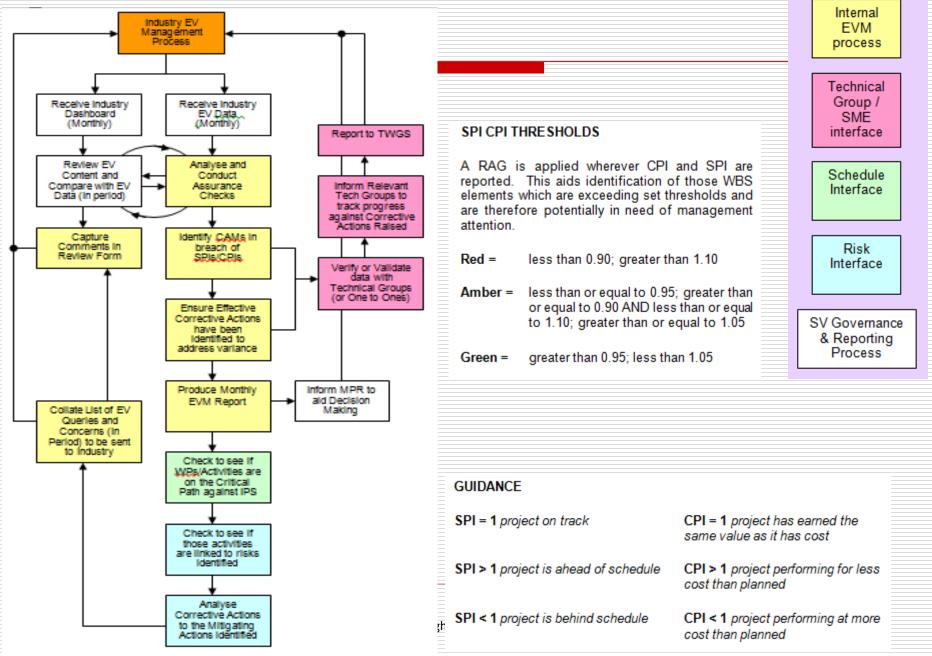
- A CA is allocated to one CAM
- All CAs are mapped to a CAM
- Allows for traceability ensuring
 - The £ amount in a CA plan should equal CA amount in the RAM
 - Sum of work scope should equal the PMB value



	P6 WBS	Name
_	8218	8218 Design Delivery
_	1.18.1	1.18.1 / DD Electrical and Electronic
_	1.18.2	1.18.2 / DD Mechanical Design
_	1.18.3	1.18.3 / DD Lethality
_	8220	8220 SI and Trials
_	1.20.1	1.20.1 / SI System Integration
_	1.20.2	1.20.2 / SI Trials
_	1.20.3	1.20.3 / SI Acceptance
-	1.20.4	1.20.4 / SI Trials Management
_	8219	8219 System Delivery
	1.19.1	1.19.1 / SD System Governance
	1.19.2	1.19.2 / SD System Delivery Team
_	1.19.3	1.19.3 / SD Platform Roles
_	1.19.4	1.19.4 / SD Requirements and Baseline Management
_	1.19.5	1.19.5 / SD Human Factors
_	1.19.6	1.19.6 / SD Weight
-	1.19.7	1.19.7 / SD Manufacturing
_		8216 EA Software Integration and Test
_	1.16.1	1.16.1 / EA PM Technical and Change Management
-	1.16.2	1.16.2 / EA EA SW Dev
_	1.16.3	1.16.3 / EA EA SI
-	1.16.4	1.16.4 / EA JSIB
_	1.16.5	1.16.5 / EA EA Materials
_	8222	8222 Programme Management
-	1.22.1	1.22.1 / PO Programme Management
_	1.22.2	1.22.2 / PO Commercial and Finance Management
_	1.22.3	1.22.3 / PO Config Data and Export Management
-	1.22.4	1.22.4 / PO Quality Management
_	8205	8205 Products EA and Survivability
	1.05.1	1.05.1 / PE Products EA
	1.05.2	1.05.2 / PE Products Survivability
	1.05.3	1.05.3 / PE Product Group Resource
=		8217 Safety
-	1.17.1	1.17.1 / SF Safety

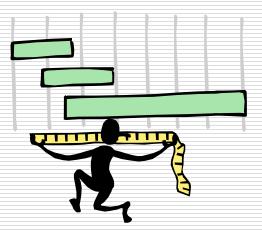


EVM Interface with Risk & Schedule



EAC/ETC Metrics

- Estimate At Completion (EACs)
 - How much will we have spent when we're actually done
- EACs calculated and analysed at any level of the WBS
- EAC = actual costs incurred + remaining work
- EAC = ACWP (cum) + ETC (Estimate To Complete)
 - Where ETC = (BAC-EV)/PI



(Performance Indicator - depending upon what variance (SPI/CPI) we want to factor in.

- We use this method because of past performance trends and the assumption that the current variances will continue to be present in the future.
- EAC = AC + (BAC EV) / CPI or EAC = AC + (BAC EV) / SPI



Forecast Schedule Completion Estimates

- Operating Milestone for System CDR 3rd Dec 2014 (Forecast Completion)
- Start of Contract date (Contract Effective Date)
 1st July 2010
- Forecasted Duration
- The SPI Cum
- Factoring SPI into duration

- approx 53 months
- 0.95
- 53 / 0.95 = 56 months

(which is a 3 month increase to the forecasted duration of 53 months)

Forecast Completion

Dec 2014 + 3 months = Mar 15



Milestone Chart Ouput

KEY OPERATIONAL MILESTONES		IPS			Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	
K-Milestones	Issue O 🔵	Issue P 🔵	Issue Q 🔘	Contract Dates 🔺														
K12 System CDR (AM2)	03-03-15	03-03-15	03-03-15	24-Mar-15														_
System CDR A	05-10-15	05-10-15	05-10-15	07-Aug-15		_			8		E	VF	ore	eca	st			_
System CDR B	31-07-15	31-07-15	31-07-15	30-Jul-15		Ž												
System CDR C	03-11-15	03-11-15	03-11-15	30-0ct-15						8								
System CDR D	31-03-16	31-03-16	31-03-16	31-Mar-16														
K11 Scout Chassis work Completed	14-05-15	14-05-15	14-05-15	15-May-15														
K12 Turret Delivery Complete	05-08-15	27-10-15	12-11-15	29-May-15			0		$\rightarrow 0$	≫								
K13 Turret to Chassis Integration Completed	26-10-15	02-12-15	14-12-15	26-0ct-15					2	\rightarrow)))							
K14 ES Repair TRR	10-12-15	20-01-16	20-01-16	20-Jan-16							0—	→ĭ						
K15 Scout TRR	01-12-15	10-02-16	21-01-16	31-Mar-16							0	 (
K16 ES Recovery TRR	12-02-16	03-03-16	03-03-16	08-Apr-16									0	8				
K17 Live Fire 1 and 2 Trials Completed	22-04-16	28-06-16	24-05-16	15-Aug-16													→	
K18 V&V Trials Completed	12-01-17	23-09-16	23-09-16	11-Aug-16														
K19 Design Configuration & Performance Review	26-10-16	17-01-17	14-11-16	15-Nov-16						SR	RA	Мо	de	llin	g			
K25 Performance Demonstrated	23-11-16	16-02-17	13-12-16	20-Jun-17														
K49 Logistics Readiness for IOC	22-12-17	11-12-17	11-12-17	06-Sep-18														_



Monthly EVM Report (front)

Scout SV – EV Summary Report

Prepared by:	Preet Bhuller	EV STATUS	SPI	CPI
Distribution:	Scout SV Management Team	Cum In-Period		1.00 0.56

SUMMARY

The schedule SPI maintains a downward trend at 0.95, due to WP delays in CDR Design, Design Support, LM (In-Period) and ongoing delays in EA Products and Support and Training. EAC ≈ BAC (approx) with cum SPI at amber. CDR Design shows a downward trend as the delayed Hazard Analyses Safety work packages has never really recovered even though progress was made on completing some of the back log. It remains to say that this 'progress' is highly speculative as there is no evidence of any safety outputs, a number of the safety deliverables have been rejected to date and the safety team are under resourced.

<u>Headlines</u>

- Lockheed Martin Continuous delays to the turret build with possible impact to the Trials schedule due to Turret availability. WP activities expected to be re-planned and re-forecast action to ascertain how delays are impacting the trials schedule of work.
- CDR Design Continued delays to Safety Documentation (huge overspend) and Crew station Assessment Rig Development activities. Impact to System CDR confirmed at event held in March 2015. Contractor has proposed a revised schedule of events/deliverables pending Authority Agreement.

Activities behind Schedule In Period:

- SW Software (In-Period SPI 0.85) has not recovered from being impacted by delays to previous software release. However contractor is committed to deliver SW LMUK by 23rd October 2015.
- o 1.16.68 Safety delays due to rejected safety cases
- o 1.57.56 Turret Build delays due to unscheduled design changes

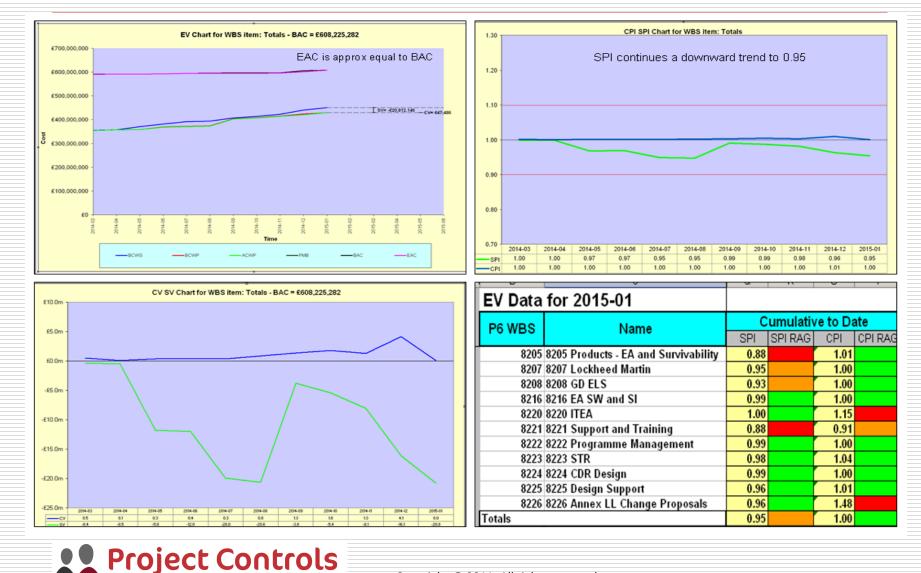
Activities ahead of Schedule In Period:

- o 1.16.02 / SW Software Requirements and Architecture
- o 1.16.08 / SW Software Release 4.2a
- o 1.16.15 / SW Software Test
- o 1.16.16 / EMC systems
- o 1.16.18 / Signature trials

To Watch (from in-month variances)

Products EA - Although products continue to be delivered in support of platform build, continuous delays in closing out of design compliance evidence in support of FCA/PCA and Final Support Deliverables is indicative of a cum SPI of 0.88. GD is currently working with supplier in closing out all technical compliance issues which led to the unsuccessful ASM Technical Readiness Review due to lack of evidence from supplier. One to monitor

Monthly EVM Report (back)



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EXPO



SV Scout EVM DAT Tool





Tony Purpuri

Managing Consultant

- A Chartered Engineer, Cost Estimator/Manager and Systems Engineer
- Background in Aeronautical Engineering
- 9 years of Cost Estimating, Systems engineering and Safety management

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SCOUT SV EV DAT

The Scout SV Requirement

- To store all Project's EV data
- To report EV data monthly in agreed formats
- To analyse EV data for integrity and check contractors calculations
- Receive full EV data input from Contractor in the form of excel data (CPRs 1-5)



SCOUT SV EV DAT

• The EV DAT Solution

- Excel based tool
- Monthly data stored in worksheet and metrics calculated
- Automatically formats contractors data
- Series of charts for data trends
- HTML outputs created using VBA
- Tool can handle changes to baseline and rebaselining



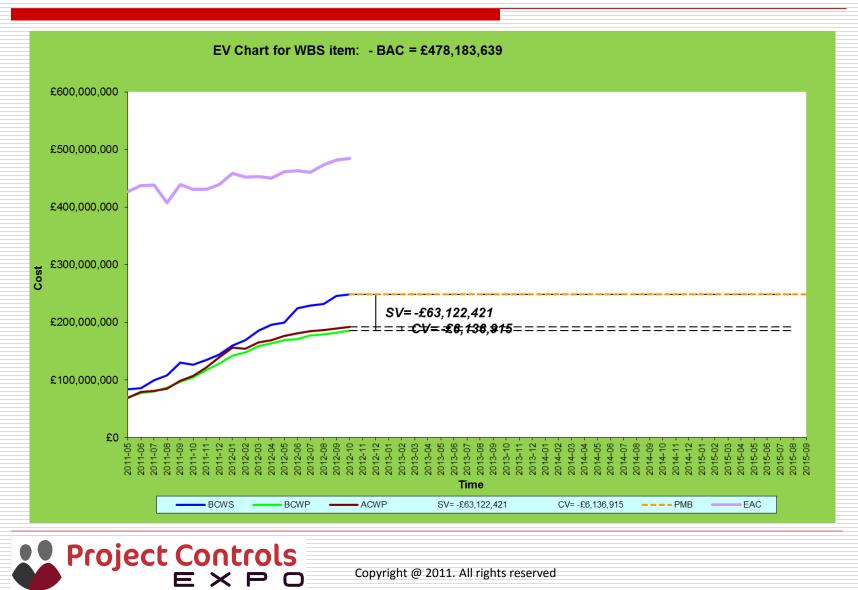


EV Data for 2012-01

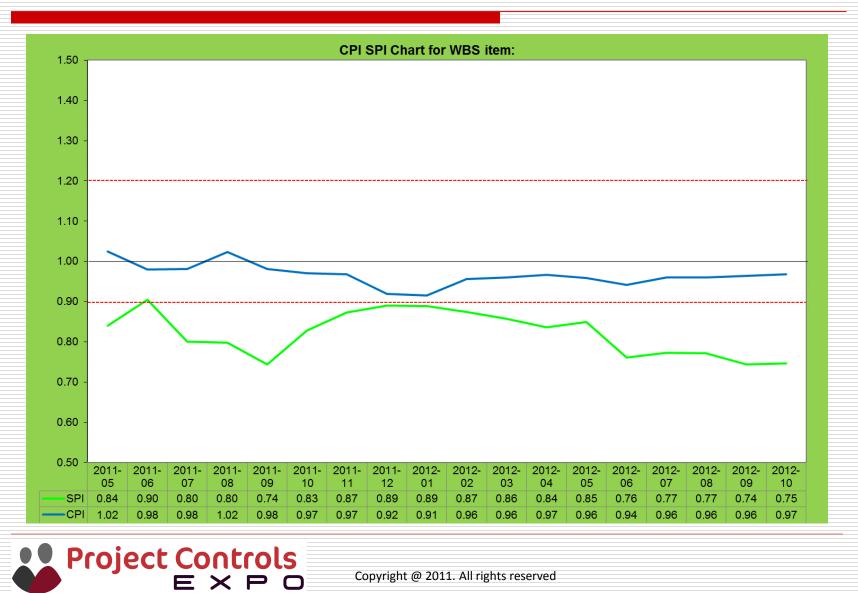
P6WBS	Name			Cu	milative to Da	ite				
PUVVD3	Nallie	BCWS	BCWP	ACWP	SV	CV	SPI	SPIRAG	CPI	CPI RAG
810	8101 Project Management	4,203,288	4,203,288	5,313,953	0	-1,110,665	1.00		0.79	
1.1.2	1.1.2 / PO Quality - Planning, Governance, Customer &	2,325,836	2,325,836	3,436,501	0	-1,110,665	1.00		0.68	
1.1.99	1.1.99 / PO Historic Actuals	1,877,452	1,877,452	1,877,452	0	0	1.00		1.00	
81	81 Systems Engineering	5,792,783	5,333,915	6,437,149	-458,868	-1,103,234	0.92		0.83	8
1.2.1	1.2.1 / SE SE020101W Project Management Dec-Mar	1,488,207	1,306,159	1,258,653	-182,049	47,506	0.88		1.04	
1.2.10	1.2.10 / SE SED21001W Operational Environment Work	1,034,687	931,134	1,187,925	-103,553	-256,790	0.90		0.78	
1.2.11	1.2.11 / SE SED21101W Architectural Analysis Ph	148,446	116,007	251,926	-32,439	-135,919	0.78		0.46	
1.2.13	1.2.13 / SE SVAD Section 1: Introduction	241,632	216,822	303,655	-24,809	-86,833	0.90		0.71	
1.2.3	1.2.3 / SE Travel and Living	59,542	59,542	84,651	0	-25,109	1.00		0.70	
1.2.4	1.2.4 / SE Meetings	37,627	37,627	27,650	0	9,976	1.00		1.36	
1.2.5	1.2.5 / SE Survive	95,749	85,289	133,164	-10,460	-47,875	0.89		0.64	
1.2.6	1.2.6 / SE Manoeuvre	186,869	146,321	525,085	-40,547	-378,764	0.78		0.28	
1.2.7	1.2.7 / SE SE020701W Lethal Architectural Analysis F	204,332	158,351	220,360	-45,981	-62,010	0.77		0.72	
1.2.8	1.2.8 / SE SE020801W Platform Physical Architecture D	183,037	178,595	232,021	-4,442	-53,426	0.98		0.77	
1.2.9	1.2.9 / SE SE020901 Architectural Analysis Phase	87,773	73,186	187,175	-14,587	-113,989	0.83		0.39	
1.2.99	1.2.99 / SE Historic Actuals	2,024,883	2,024,883	2,024,883	0	0	1.00		1.00	
31	810 L	53,890,645	53,890,645	55,024,384	0	-1,133,738	1.00		0.98	
1.4.1	1.4.1 / LM Project Management & Technical governance	1,766,727	1,766,727	1,467,358	0	299,368	1.00	. j	1.20	
1.4.4	1.4.4 / L Integration	0	0	2,107	0	-2,107	0.00		0.00	
1.4.5	1.4.5 / L Subcontract	35,192,000	35,192,000	36,623,000	0	-1,431,000	1.00		0.96	
1.4.99	1.4.99 /Historic Actuals	16,931,919	16,931,919	16,931,919	0	0	1.00		1.00	
3108	8108 ITEA	1,943,148	1,813,556	1,975,451	-129,592	-161,895	0.93		0.92	
1.8.2	1.8.2 / IT K4.	601,394	601,394	454,727	0	146,666	1.00		1.32	
1.8.3	1.8.3 / IT K6	770,004	647,976	1,060,974	-122,028	-412,998	0.84		0.61	
1.8.4	1.8.4 / IT K10_	227,569	220,005	115,568	-7,565	104,437	0.97		1.90	
1.8.5	1.8.5/ IT K1	0	0	0	0	0	0.00		0.00	
1.8.	1.8.99 / IT Historic Actuals	344,181	344,181	344,181	0	0	1.00		1.00	
31	811 Man	520,229	521,313	538,039	1,084	-16,726	1.00		0.97	
1.10.	1.10.1 / MF Man	427,363	428,447	445,173	1,084	-16,726	1.00		0.96	
1.10.99	1.10.99 / MF Historic Actuals	92,866	92,866	92,866	0	0	1.00		1.00	



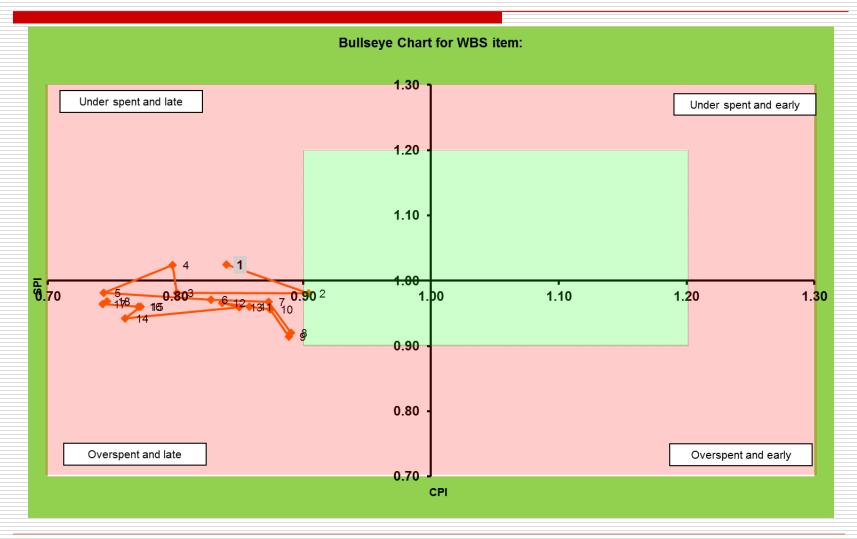




EV Reports



EV Reports





EV Data Analyses

- Needed to check the contractors AP figures
- Devised a series of data checks that independent assessed the integrity of the data
- The results of checks were fed back to contractor and PT to increase data fidelity.



EV Data Checks

Requirement Check	Number of WBS
RC01	91
RC02	37
RC03	10
RC04	27
RC05	18
RC06	
RC07	
RC08	3
RC09	
RC10	
RC11	4
RC12	5

RC01:	BCWP=0 ACWP>0 AP data
FN010603W	FN010603W Finance Management Management Apr - Jun
PM010303W	PM010303W Monthly management and reviews
PM010322W	PM010322W T&L Apr - Jun
SE020102W	SE020102W SE020102W Technical Management activities Dec-Mar
SE021011W	SE021011W SDR Safety Case Report (K5) Available
SE021028W	SE021028W Inspect and analyse Earthing and Bonding Design
SE021029W	SE021029W Transversals
SE021104W	SE021104W SDR Closeout
SE021304W	SE021304W SDR Closeout
SE020302W	SE020302W T&L SE020302W
SE020601W	SE020601W Driver and Nav Aids SSS Available (Initial Issue)
SE020604W	SE020604W SDR Closeout
SE020702W	SE020702W Self Defence Weapon SSS Available (Interim Issue)



Example EV Data Checks

RC01:

BCWP=0 ACWP>0 AP data RC01: The data for the current month (AP) reports that no value (BCWP) was earned but actual costs (ACWP) have been recorded. This indicates that work was done but the Earned Value Technique (EVT) criterion which would allow value to be earned was not achieved during the AP.



Example EV Data Checks

Cum BCWS = 0 AP'ly ACWP <> 0 RC03: The cumulative planned value (BCWS) to date is zero but the actual cost (AWCP) in AP is not zero. This indicates that ACWP has been attributed to a WP which is not planned to have started.



EV DAT Benefits

- Reporting interface
- Exactly compatible with the Contractor's Data Set
- Verification and validation tool when analysing industry's data
- EV assurance checks
- Flexible format that allows for rebaseline without loss of data





The Challenges



The Scout fleet will replace Scimitars, which have been in service in combat zones, such as Afghanistan, since the 1970s



Your EVM Challenges





Description

- Activities that are deemed complete but not fit for purpose.
- E.g. contractual documentation that is completed on time/budget but NOT deemed fit by the Mod

Solution

- take advantage of the rebase line exercise to ensure activities are described more intelligently
- (e.g.100% complete progress includes room for re-work and amendments post authority review)
- Ensure sensible use of EVM Techniques!



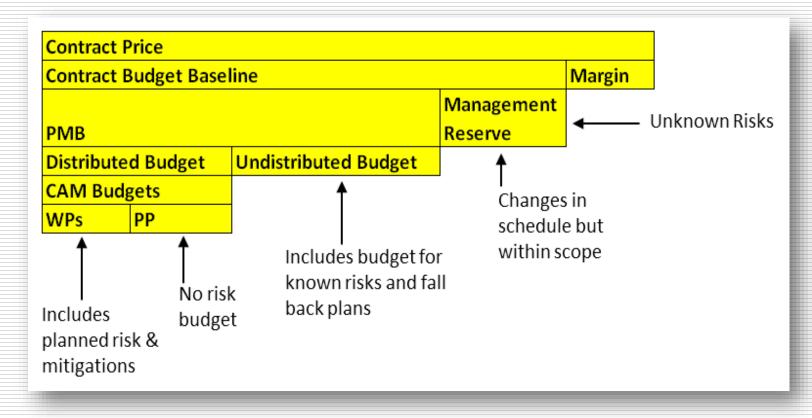


Description

- The challenge of incorporating re-work within an existing PMB! (Linked to challenge 2).
- How should re-work be incorporated?
 - What does best practice suggest? (APM manual)
 - Can it be promulgated on SV Scout?



Budget Elements

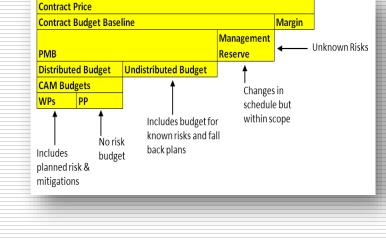




Types of Baseline Changes

- Baseline Maintenance via Rolling Wave (RW)
 - No impact to PMB
 - RW allows converting PPs to WPs
- Re-Planning
 - Within budget and schedule of CBB
 - Drawdown from MR
- Re-Baselining
 - Contract Change!
 - Impacts margin





Contractor EVM Plan stipulates

- Expected Work
 - An understanding of the effort is known
 - Work is planned into existing WPs during the next RW planning

Baseline Maintenance

Re-Planning

- Unexpected Work
 - If work is unexpected but part of the existing scope then
 - Rework is simply carried out within the WP (using existing float) impacting CPI and SPI
 - If work is unexpected and NOT part of the scope (change in scope!)
 - Requires new WPs to be created

Project Controls

Solution

- Using Re-Planning to justify the re-work
 - Ensuring that the new WPs are raised via an existing BCR process
 - Requiring a draw down from Management Reserve
- KEY!
- Ensuring that the new activities raised via the BCR are "intelligently" linked to existing milestones within the PMB





Description

 The schedules received is often out of 'kilter' with the corresponding EV data – making realistic comparisons a challenge

Solution

- In addition to analysing the schedule pitched at its existing level we also analysed schedules at a more detailed technical level (NB: non mandated/contractual requirement)
- This often requires visits to contractors site since the technical schedules were not contractual deliverables
- Helped by developing good and open relationships with the contractor





Description

- The ever present risk of Re-baselining for the wrong reasons is a challenge to manage and often, political and out of our hands
- The project has been re-baselined for the 3rd time!
- Solution ? (Opportunity rather...)
- Ensuring that previous EV data (CPRs) and trends is saved including any associated review notes and corrective actions
- Using LFE to ensure at baseline reset, previous scheduling/planning mistakes are not repeated. E.g. EVTs and activities in the schedule are defined intelligently to ensure EV tracking is robust



Your EVM Challenges









