CEVM

Center for
Earned Value Management

To make Naval Acquisition
the Standard of Excellence in Government

Analysis Toolkit

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Appendices

1. Introduction

The purpose of this Toolkit is to provide a Navy-wide standard application of Earned Value Analysis ensuring all analyst/Program Offices have the information required to approach EVM from the same platform.

Earned value management provides detailed insight into project performance at all levels of the Work Breakdown Structure. Proper management use depends on effective and tailored analysis that is responsive to management/SYSCOM needs. It is emphasized that a thorough, objective analysis is a team effort, fully integrated into the overall project management process via team meetings, technical reviews, etc. Effective analysis is forward thinking, considers all impacts (cost/schedule/technical/risks), courses of action, alternative solutions and generates informed decisions.

1.1 Teaming

In order to provide a fully-integrated value-added analysis, it is recommended that the analyst become part of the program team to gain an understanding of the programmatic and technical performance objectives. For purposes of this Toolkit, an analyst is defined as the person assessing EVM performance. Valuable information and insight are gained interfacing with the technical, business, cost estimating, contracts, Defense Contract Management Agency and contractor personnel. The level of involvement required will depend on the makeup of the specific program.

1.2 Preparing for Analysis & Getting Familiar with EVM Data

This section provides a list of specific reports and techniques the analyst becomes familiar with when beginning EVM analysis preparation. Specifically, the analyst should begin to seek out the following information;

- The supplier's operating characteristics, System description, accounting cycle, fee structure and cost and schedule performance on past contracts
- The type of contract or agreement, scope, contract Work Breakdown Structure or IPT structure, major subcontractors and their system description, type of subcontractor cost and schedule reporting
- The earned value techniques used to report progress and implications of each type of technique (e.g., percent complete, equivalent unit, level of effort, etc.)
- Required reports – Contract Performance Report (CPR) Formats, Integrated Master Schedule (IMS), CPR format relationships, and the terms used in reporting (direct cost, indirect cost, estimated costs, Budgeted Cost for Work Scheduled (BCWS), Budgeted Cost for Work Performed (BCWP), Actual Cost of Work Performed (ACWP), etc.) and their relationships
- Contract/agreement information (CPR, Integrated Master Schedule (IMS), Contract Data Requirements List (CDRL), Statement of Work (SOW), Schedule, Clauses)

The importance of reviewing and using the CPR and IMS submitted by the contractor/government activity as well as other support-type meetings/briefing information cannot be overemphasized. This data review, in conjunction with the use of analytical tools (wInsight,

performance charts) and information learned at program meetings/briefings all provide insight into root causes and assist in recommending future actions.

1.3 Estimates At Completion (EAC)

The EAC is one of the primary outputs of the EVM process. The analyst must work with other members of the IPT (technical, management and cost counterparts) to generate an independent assessment of all costs and schedule impact likely to be incurred to complete the effort *that is on contract*. In developing the EAC the intent is to try to quantify risk for the Command, and to evaluate potential impacts if the current path is not changed. By getting the risk assessment to a decision maker early it may provide them the information they need to change the current course of action. More about when to engage in an EAC will be discussed in Section **2.2.8** of this Toolkit.

1.4 Schedule Risk Assessment (SRA)

A schedule risk assessment (SRA) is a process which uses statistical techniques to identify technical, programmatic and schedule risk in a program and quantifies the impact of those risks on the program's schedule.

Program schedules typically only shows what will happen in the program if everything goes according to plan. All programs contain some risk and uncertainty. The Schedule Risk Assessment provides a means to quantify the risk in a program and determine the effect of things not going according to plan.

In most cases and especially on new contracts, the IMS CDRL mandates that the contractor will periodically perform an SRA. This is an excellent tool to help program management understand schedule risk and provides key inputs to the development of an EAC.

Refer to **Appendix D** of this Toolkit (used with the permission of NAVAIR) for more information on the SRA process/instruction and section 2.3.5 of this document for information on how to incorporate SRA results in analysis.

1.5 Information Used

When performing the analysis, ensure that the most current information is used in the brief. There is a delay between the time that the accounting period ends and the SYSCOM analysis is completed, therefore, additional information from team meetings or reviews should be included in the report.

1.6 Reporting EVM Values "at Cost" versus "at Price"

The standard for reporting EVM data is to report values "at cost" meaning data is reported without the cost of contractor fees/awards. When values include the cost of contractor fees/awards, the values are referred to as "at price".

1.7 Duration in Days

The standard monthly schedule analysis is presented in work days (Monday-Friday).

1.8 Consistency of Units/Formats

In the analysis, maintain a consistent use of units and formats (in line with the units/format of the Contract Performance Summary, CPS). If you begin your analysis in terms of thousands of dollars, ensure that you maintain consistency throughout. Unfavorable variances should be included in parenthesis: ($135K) NOT: -$135K.

1.9 Decimal Places

Consistent use of decimal places should also be used. Cost Performance Indices (CPIs) and Schedule Performance Indices (SPIs) should be rounded to two decimal places. Variance at Completion Percentages (VAC %) should be rounded to the nearest whole percentage point. By rounding to these percentages, the numbers will track to the early warning system indicators that will be discussed later.

1.10 Acronyms

All acronyms should be spelled out the first time that they are used. It may be beneficial to spell them out the first time they are used in each section of the analysis so that the sections may be used independently of each other. If only used once, spell out and don't provide the acronym.

1.11 Standard Analysis Check

At a minimum, before an analysis is completed, the following list of auditing functions are performed:

- Track consistency between the CPR & IMS
- Ensure all numbers track within the report
- Run a spell check
- Ensure all performance trend arrows are pointing in the right direction
- Verify that formulas are operating correctly in any spreadsheets.
- Verify accuracy of the distribution list
- Spell out all acronyms that are used
- Be able to speak to the main issues that are provided in the analysis (the analyst should have a general understanding of the major technical and programmatic issues)

See Appendix C of this Toolkit for a comprehensive list of audit checks.

2. Detailed Analysis

The following will guide the analyst through the steps of creating a detailed analysis. These steps are designed in a logical sequence in order for the analyst to be most efficient. The analyst should keep in mind that although these steps can be tailored, skipping steps could result in the inability to complete future steps. Depending on the type of reporting received from the contractor/government activity and the team structure, certain portions of this section may not apply.

We are providing value added analysis and forward looking assessments resulting in the return on investment to management. **It is not acceptable to merely reiterate the information provided in the contractor/government CPR and IMS**. In performing analysis, the analyst needs to make an assessment on the current and cumulative performance of critical and non-critical effort and include where she or he concludes the effort is going. When analyzing variances look at both favorable and unfavorable variances. If there are major favorable variances that may not stay that way it could change the outlook of the entire effort. It is also vital to integrate other information derived from alternate sources (e.g., technical / IPT meetings and reports) to bear on the analysis. Should discrepancies be noted between alternate sources of information (e.g., IPT technical lead indicates everything is on track while EVM data shows a potential slip), it is important track down the source of the differences, identify the correct status and include that in the analysis.

Finally, in developing the analysis it is crucial to work closely with the cognizant Branch Head, Management Systems Analyst (if this position exists), and Subject Matter Experts. If there are questions on how this integration should work see your Branch Head.

2.1 Preliminary Assessment

The analyst ensures the data on the submitted CPR/IMS is clear, complete, consistent, and credible. Checking data accuracy, consistency, and validity as well as searching for evidence of proper or improper program management baseline maintenance cannot be overemphasized. The analyst also ensures they are receiving all requirements of the CDRLS (IMP, CPR formats, SRA, etc). **Only after the data has been validated can it be used with confidence for contract performance evaluation**. A complete checklist for reviewing CPR's can be found in **Appendix C** of this Toolkit. However, at a minimum, the following checks should be performed:

2.1.1 Contract Performance Report (CPR) Validation Checklist

All Formats:

- ❑ Review the header information for completeness (Contract type/number, report period, negotiated cost, etc.)
- ❑ Check the entries in the remainder of the form (horizontal/vertical mathematics) for accuracy
- ❑ Compare current report to the previously submitted report, checking "Cumulative to Date" data (look for retroactive or current period changes – e.g. negative BCWS)
- ❑ Reconcile totals on each format by ensuring performance on Format 1 = Format 2 TAB and reported Management Reserve (MR) & Undistributed Budget (UB) on Format 3 = MR/UB reported on Format 1 & Format 2.
- ❑ Ensure the CPR submission is in accordance with the DID/CDRL on contract

Format 1:

- ❑ Ensure the Budget at Completion (BAC) is greater than Cumulative BCWS and that it is equal to the negotiated cost plus the estimated cost of authorized unpriced work (plus Over Target Budget, if applicable)
- ❑ Ensure the Contract Budget Base (CBB) tracks to the Negotiated Contract Cost (NCC)
- ❑ Ensure that Actual Cost of Work Performed (ACWP) is not greater than Estimate at Completion (EAC) or BAC
- ❑ Review and validate any corrections to actuals or performance (shown as a negative ACWP or BCWP)
- ❑ Ensure actuals have been accounted for in planned performance (in other words, if there is ACWP, there should be a reported BCWP)
- ❑ Identify the variances exceeding the thresholds (these require analysis depending upon how the CDRL was written)
- ❑ Review and resolve issues arising from the wInsight validity report (if applicable, see Appendix F)
- ❑ Examine the baseline change records, if any, and any related documentation or other background material
- ❑ Compare current period BCWS on the Format 1 versus Format 3. Differences between these two values indicate current period changes and should be worked with your contractor and/or management systems analyst.

2.1.2 Contract Funds Status Report (CFSR) Reconciliation Checklist

The CFSR (received quarterly) is compared against the CPR verifying the reported values make sense. The following are standard checks ensuring the numbers reported in the CFSR flow to the CPR Format 3 (baseline);

- ❑ CFSR accrued expenditures (less fee) should be close to the ACWP
- ❑ LRE plus profit or fee should be close to the contract work authorized

However, the values reported on the CFSR will vary from the CPR for the following reasons;

- ❑ The CFSR is reported “at price”, with the contractor fees/awards while the CPR is reported “at cost” which does not include contractor fees/awards.
- ❑ The CFSR takes into account termination liability (need to expound on this term),
- ❑ Ensure that the IMS submission is in accordance with the DID/CDRL on contract

2.1.3 Integrated Master Schedule (IMS) Analysis

IMS analysis is the interpretation of available information in order to identify and interpret schedule performance impacts. The analyst targets the areas that are in most need of improvement by analyzing the gap between where tasks are and where they need to be to achieve desired outcomes. Comparing the plan to actual performance reveals areas where the baseline was unrealistic or the contractor/government activity can improve performance in the future.

The quantitative portion of analysis involves the assessment of work progress based on different measures calculated using different groupings of schedule performance data. These metrics of ‘well-being’ allow the analyst to assess the project’s schedule performance

relative to targets and past performance. Over time, this allows the analyst to produce a composite measure of the time-based health for various WBS elements, augmenting data on the project schedule with cost performance data from the CPR.

Specifically, the analyst should analyze every aspect of the project schedule, including:

- Baseline vs. current
- Change order impacts
- Delays
- Critical Path impacts
- Out of Sequence work and disruptions
- Acceleration
- Planned vs. actual resource usage (if available)

Integrated Master Schedule (IMS) Checklist

- ❑ Ensure the "time now date" (known as the status date or "as of date") tracks with the IMS submittal
- ❑ Validate that critical path calculations were performed prior to submission and perform a time analysis
- ❑ Perform a cursory examination of the network schedule. See Appendix E: Schedule Assessment for reference
- ❑ Compare tasks and baseline to the previous months submittal
- ❑ Ensure project start and completion dates are correct
- ❑ Ensure all tasks with actual start and finish dates are in the past
- ❑ Ensure all tasks without an actual start have an early start in the future
- ❑ Ensure all tasks without an actual finish have an early finish in the future

2.1.4 Surveillance

If there is an on-site government representative providing EVM surveillance information from Defense Contracts Management Agency (DCMA), SUPSHIP and/or Defense Contract Audit Agency (DCAA) their input should be considered. In addition, the analyst may also want to request feedback from the contractor's IPT meetings if a DCMA/SUPSHIP/DCAA representative has been in attendance in order to glean information regarding the health/quality of data of the contractor's EVMS.

2.1.5 System Issues

System issues occur when the contractor or government activity is not following their own internal management procedures or sound Earned Value practices. Examples include; failure to develop or maintain a genuinely integrated project schedule, failure to develop or maintain a time-phased Performance Measurement Baseline (PMB), failure to update Latest Revised Estimates, making inappropriate baseline changes and using improper Earned Value techniques, etc. All system-related concerns are coordinated with the Center (CEVM).

A standard system issue analysis will include the following; identification of systems issues, impacts on Earned Value metrics, and length of time the issue has been unresolved and recommended action plan for resolving. Consultation with a cognizant management systems analyst (if available in your organization) is crucial to ensure flow of information between concerned parties as well as obtaining expert advice in the systems area. Issues are

typically initially identified by the EV analyst through their monthly assessments or during assessment reviews (i.e. SRA, CIR, IBR, etc.). The management systems analyst helps to validate the issue identifying it as "systemic" and works with DCMA/SUPSHIPs/CEVM and the Contractor to correct the issue. Mitigation sometimes requires coordination with the program office or Contracts which again falls to the EV analyst.

2.1.6 Integrated Baseline Review (IBR) Results

All analysts should address the results of a recent IBR. If there are major action items resulting from the review, the status needs to be given, as well as how they are being addressed.

For IBR details, refer to the CEVM Integrated Baseline Review Toolkit located on the CEVM website.

2.2 EV Analysis

Now that the analyst knows that the majority of the data is valid and / or where the weaknesses in the data are, he/she can begin the process of analysis. The analyst is not limited to just these steps; however these steps represent the general flow of the analyst's responsibilities with specific instruction where appropriate.

2.2.1 STEP 1: Update Various Excel Reports/EV Charts

It is recommended that an excel report be prepared upon receipt of the first CPR and updated for each CPR received (until the last contractual CPR is received). A suggested excel format (shown at high-level) is below. The benefit of tracking the CPR information in excel is that the analyst has a side-by-side, by month, of all performance data allowing trends/variances to be readily apparent.

In accordance with OSD guidelines (refer to OSD AT&L memo dated 11 July 07, *Implementation of the Central Repository System*), all ACAT I programs are required to post CPRs on the OSD repository. Analysts should ensure they have access and verify the contractor is in compliance with the OSD monthly reporting requirements.

In addition, the analyst also creates / updates EV Charts using a wInsight database (if available) as long as the contractor submits data in a compatible format. Depending on the wInsight version, the data files should be sent in one of the following formats: .trn, .xml, or .wsa. Ideally, the contractor will submit a current month and cumulative file, however, refer to the reporting requirements dictated in the CDRL.

Example:

CONTRACT DATA	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07
TARGET COST	$18,980	$18,980	$18,980	$19,500	$19,500	$19,500
AUTHORIZED UNPRICED WORK (AUW)	$0	$0	$0	$0	$0	$0
CONTRACT BUDGET BASE (CBB)	$18,980	$18,980	$18,980	$19,500	$19,500	$19,500
OVER TARGET BASELINE (OTB)	$0	$0	$0	$0	$0	$0
TOTAL ALLOCATED BUDGET (TAB)	$18,980	$18,980	$18,980	$19,500	$19,500	$19,500
MANAGEMENT RESERVE (MR)	$1,628	$583	$584	$61	$58	$114
COST VARIANCE	($2,044)	($2,200)	($2,130)	($2,733)	($2,596)	($2,550)
SCHEDULE VARIANCE	($2,405)	($2,582)	($2,825)	($1,926)	($2,099)	($2,117)
BASELINE EXECUTION INDEX (BEI)	0.95	0.95	0.95	0.95	0.95	0.95
MISSED % CUMULATIVE	25%	25%	25%	25%	25%	25%
DELINQUENT TASKS CUMULATIVE	18	18	18	18	18	18
FLOAT % (LESS THAN 5 DAYS)	20%	20%	20%	20%	20%	20%
MOST LIKELY LRE	$27,405	$28,358	$32,079	$28,358	$28,358	$28,358
MOST LIKELY EAC	$27,405	$28,358	$32,079	$28,358	$28,358	$30,000

Note: See Step 8 below on EAC

2.2.2 STEP 2: Forward Looking Earned Value data Analysis

The earned value data should be assessed in the format being managed by the team (Format 1 or 2), including Integrated Product Team or Work Breakdown Structure reporting formats. Identify major cost and schedule drivers for the month as well as cumulative drivers. The more common causes for unfavorable variances are:

- Poor initial planning or estimating
- Technical problems
- Rate changes higher than forecast

In evaluating cost and schedule drivers the analyst should identify and address the reason(s) for the variances as well as the status of any new or on-going issues. It is important to be as forward-looking as possible. The analyst should try to answer the following questions:

- Has the variance improved/worsened during the current period?
- Are these variances recoverable or unrecoverable?
- How favorable or unfavorable could the variances become?
- What is the impact to the overall program?

It is important to not just take the data and variance explanations from the CPR at face value, but also to work with the contractor, DCMA, and other government team members.

Integration between evaluating cost and schedule drivers is important, because you may identify a schedule driver that may become one of your key cost drivers. Additionally, impacts of management process issues on cost drivers should also be evaluated.

Favorable variances must also be analyzed and may not be desirable. The analyst must critically examine the reasons for the under runs as well as overruns. Favorable variances can mask unfavorable performance for sub items and can generally be attributed to one or more of the following reasons:

- LOE tasks not ramped up as planned
- Less difficult tasks being completed early

- Efficiencies being realized
- Work is less complex
- Fewer revisions and rework
- Favorable market fluctuations in the cost of labor or materials
- Decreases to overhead rates
- Poor initial planning or estimating
- Technical breakthroughs
- Method of earning BCWP affected by report cutoff dates

Identify and address the technical reason(s) for the variances as well as the status of any new or on-going issues.

Assess the potential Variance at Completion (VAC) for the elements that should be made in conjunction with evaluating the contractor/government activities Latest Revised Estimate for the element and associated risks. This section, as well as the others that follow, should integrate the program information being captured from the contractor, government team meetings, design reviews, and the like.

The Integrated Master Schedule (IMS) must be considered before a true impact can be assessed. Refer to Section 2.3.

2.2.3 STEP 3: Baseline Analysis

For contracts requiring submission of a CPR Format 3 (baseline) the analyst will be able to provide additional insight into the time-phasing of the budget and potential changes made by the contractor/government activity.

The analyst reviews the report focusing on the following areas:

- Verify baseline changes are made in accordance with contractor/government activities procedures. The management procedures and system description should outline the procedures and rules for changing budgets.
- Evaluate the time-phasing of the effort by comparing the budget curve against the project schedule and other programs to see if there are potential issues such as ramping up too fast or lack of ramp down at the end of the contract.
- Compare current period BCWS on the Format 1 versus Format 3. Differences between these two values indicate current period changes and should be worked with your contractor and/or management systems analyst. A sample table that can be used to evaluate baseline planning/shifting as shown below.

				FY05										PMB AT
	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	COMPLETE
Jun-04	252,144	272,350	292,529	273,030	259,627	304,114	2,272,443							15,854,638
Jul-04	261,133	281,811	267,975	267,263	239,612	327,610	268,515	2,069,866						15,935,753
Aug-04		275,905	254,679	263,344	227,584	308,968	261,169	245,400	1,815,390					15,936,257
Sep-04			250,794	262,459	221,154	321,329	260,438	244,270	259,120	1,568,440				15,936,257
Oct-04				264,662	221,830	320,622	265,372	243,908	253,631	246,550	1,329,895			15,936,259
Nov-04					218,585	315,125	266,938	244,263	254,201	246,663	258,472	1,082,440		15,936,259
Dec-04						313,780	263,188	242,246	252,408	250,264	259,242	273,180	809,262	15,936,259
Monthly Data														
Delta	8,989	(5,906)	(3,885)	2,203	(3,245)	(1,345)								
	3%	-2%	-2%	1%	-1%	0%								

2.2.4 STEP 4: Undistributed Budget Analysis

When budget is added to an effort, it initially enters the Earned Value Management (EVM) reporting as Undistributed Budget (UB). Contractors & government activities have rules on the amount of time that funding (budget) can reside on the UB line. All budgets in UB should have scope tied to it. In the monthly analysis, UB should be identified and the scope for the UB should be provided. A rule of thumb for UB is that it should be distributed within 30-60 days; however, the contractor/government activity procedures will provide the specifics for their management system.

2.2.5 STEP 5: Management Reserve Analysis

Management Reserve (MR) is budget set aside for unknowns that will occur during the life of the effort. MR is part of the total scope of the contract, and is not a contingency fund the government program manager can eliminate or use for cost overruns. As a rule of thumb, MR levels are usually between 5%-10% of the total budget; however, this will vary based on the effort. The analyst assesses MR usage monthly and provides explanations in the analysis for MR differences. In addition, an assessment is also conducted to determine whether MR is being used appropriately and if the current MR balance is projected to be adequate for the remainder of the effort.

2.2.6 STEP 6: Subcontractor Analysis

If there are major subcontractors that are providing EVM reporting, it is recommended that the analyst include all subcontractor major drivers (cost/schedule/technical) as well as any other pertinent information impacting the overall program.

2.2.7 STEP 7: Contractor's Latest Revised Estimate (LRE)

In practice when referring to an LRE, the term is considered to be the Contractor's LRE and is also known as the Contractor's EAC, or "KTR EAC" as reported in DAES. To review the LRE, the analyst performs a series of cross checks to determine reasonableness. One method used to cross-check the LRE is to compare it to the figures derived from the formula driven EACs estimates. Refer to the Appendix on Standard EVM Formulas for EAC formulas. Another cross-check is to compare the To Complete Performance Index (TCPI) versus current cost performance (CPI). The TCPI is the cost performance required on the balance of the contract in order to meet the LRE. The TCPI is compared against the contract's CPI to determine if there is a major variance. Specifically, a significant difference between TCPI and CPI indicates that past performance will not be indicative of future performance. This is usually not the case. The reasons for this difference should be explained by the contractor then assessed for validity by the analyst. More details on the TCPI and CPI formulas are also found in the Appendix on Standard EVM Formulas.

In addition, the analyst should also report on the difference between the contractor and government estimates and determine the cause/s of disparity.

2.2.8 STEP 8: Estimate at Completion (EAC)

In practice when referring to an EAC, the term is generally considered to be the Government's EAC (unless otherwise specified) and is also known as the Program Manager's EAC, or "PM EAC" as reported in DAES. A project's EAC is not derived from a standard EV formula but rather, is an independent assessment of the total cost to complete an effort. As a standard practice, the independent EAC is compared to the EAC generated by the standard EAC EV formulas (EAC_{CPI}, $EAC_{CPI*SPI}$, etc.). Refer to Appendix A of this Toolkit for details on standard EV formulas.

Maintaining and up-to-date, valid EAC is both important and required.

There are many different reasons why an EAC should be updated, below provides a short list:

1. If the analyst becomes aware that the estimate is invalid, the analyst needs to work with the technical team to either update the estimate or develop an explanation for the difference.
2. A difference of greater than 10 points between the TCPI and CPI would indicate that the EAC/LRE needs to be re-evaluated.

Most contractors do at least a yearly bottoms-up estimate update, and it may be useful to perform an internal government EAC update at the same time. Pressure to change or understate the EAC should be communicated to the Program Manager.

2.3 Integrated Master Schedule (IMS) Analysis

The idea that, "what gets measured gets attention" accurately and succinctly describes the process used to status the project schedule. This is particularly true when values are tied to the measures. It highlights the need and opportunity to expose potential impacts. The availability and interpretation of information are central to this process. Here, the transformation of data into information and analysis is a value-added process. Equally important to creating information is the method for archiving and disseminating it. A major objective of any EVM Division should be to assure that users can obtain access to data and other types of technical analyses to provide the optimum capability for decision-making.

The added value comes from giving decision-makers the data they need when they need it. The analyst should continuously provide the project manager insight to the when and how much.

A key part of using schedule data is the issue of general conclusions, including the identification and interpretation of performance gaps. By analyzing the gap between where tasks are and where they need to be in order to achieve desired outcomes, the analyst can target those areas that are in most need of improvement. Comparing the plan to actual performance will reveal areas where the baseline was unrealistic or the contractor/government activity can improve performance in the future. The quantitative portion of analysis involves the assessment of work progress based on different measures

calculated using different groupings of schedule performance data. These metrics of 'well-being' allow the analyst to assess the project's schedule performance relative to targets and past performance. Over time, this allows the analyst to produce a composite measure of the time-based health for various WBS elements, augmenting data on the project schedule with cost performance data from the CPR. The analyst should analyze every aspect of the project schedule, including:

- Baseline vs. current schedules
- Change order impacts
- Delays
- Critical Path impacts
- Out of Sequence work and disruptions
- Acceleration; and
- Planned vs. actual resource usage

Prior to the commencement of the schedule analysis, the analyst should be acutely familiar with the EVM guidelines and the discipline they impose on industry in their conduct of managing projects. Additionally, the analyst should be current with the EVMS description and associated instructions. As a first good scheduling habit, the analyst should be familiar with standard scheduling terminology and learn to 'manage' the large volume of detailed data. The analyst should think about what he or she is supposed to be doing and why. Learn to distinguish between real information and noise. The analyst should think about the time it will take to prepare a technical analysis and allow leeway when time is limited.

Consistency in data accumulation and the approach to executing analysis are imposed by way of specific guidance, thereby increasing the level of standardization within the division as well as the effectiveness of the message to management.

2.3.1 The Critical Path

A project's critical path is defined as the longest path through a schedule network. It is the minimum number of days required to complete a project. The critical path may or may not correspond to the most technically critical portion of a project. If a task is technically challenging and has a high degree of uncertainty regarding its initial success, it could be on the highest risk path without being on the critical path. Any tasks falling behind schedule that are "on the critical path" will cause the entire project to be delayed. Likewise, tasks not on the critical path are more flexible as their schedule delays do not generally impact a project's completion date. The difference between the time allowable for a task and the time required for completion is referred to as "float".

To begin, the analyst isolates the tasks on the critical path from all others. To do this, the analyst identifies the longest, continuous sequence of tasks through the network between two scheduled dates with the least total float. To determine if the critical path makes sense, the analyst graphically charts the path from contract start (or the current status date) to contract completion including all critical project milestones like PDR, CDR, First Flight, etc.

Precedence defines task sequencing order and how tasks are related to one another in the plan. If one task must be completed before the next task can be started, the first task has

precedence over the second task. Though some tasks must precede others in the logical order of work, many tasks can be started in parallel with other tasks.

Finding the critical path:
Some things to consider:

- ❑ Filter out all completed and summary tasks
- ❑ Remove all hard constraints (start/finish not later than, must finish, targets)
- ❑ Remove expected finishes on tasks that have not started

There are many different methods that can be used to find the critical path. The best way to ensure the most appropriate method is used is to consult the schedule process owner. Below are some steps (known as the constraint method) that may be useful in deriving the critical path. In addition, a manual trace through the network is recommended to ensure that the right sequence of tasks is selected.

1. Constrain the target milestones (CDR, IOC, Etc) to finish no later than a few months (use six unless milestone is less than six months away) prior to the baseline date.
2. Sort on Float.
3. Code the tasks with the least amount of float (should be a high negative number) as "critical" with a user field.
4. Return the constraint on the milestone to the milestone's baseline date.
5. Filter for the aforementioned code.

NOTE: Contractors may use different calendars on different tasks which will cause float values to be inconsistent from task to task. If this is the case, the Constraint Method cannot be used. Consult with the CEVM Schedule Branch Head if this is the case.

Analyzing the Critical Path
The first step is to identify the non-critical activities becoming critical and critical activities becoming non-critical. This determination is made by comparing current period's schedule with the previous period's schedule relating tasks on and near the critical path with the status of these tasks as reported in the cost performance data. The second step is to compare the summary and/or detailed schedule performance indices and/or any significant schedule variances.

Note that in order for this type of analysis to be performed properly, the IMS and CPR reporting requirements must have the same "as of date" and the Cost and Scheduling systems must be 100% traceable.

Ensuring Proper Status of Tasks:
If a task is running late, the contractor is pushing out the end date of the task by changing the duration or by other statusing techniques (expected finish, remaining duration). For critical and near critical path tasks, first be sure that if a task is not progressed to time now (the status date) then the contractor either moved the end date or addressed why they will not be moving the end date of that task. Some contractors use duration based percent complete to status their tasks, and others use earned value percent complete. **Note: For the IMS to produce a reliable forecast, the schedule must be calculated based on the duration percent complete.**

Duration based Percent Complete

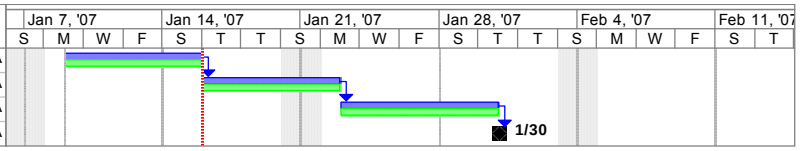
If the contractor is providing a schedule that only uses duration based percent complete, the analyst is limited on what they can derive from the schedule. It is extremely important to ensure that any progress lines end at the status date and the remaining duration is estimated based on the effort to go. If a task has a baseline start date prior to the status date, but has not started, the start of the task should be moved at least to the status date to project the impacts through the IMS.

The same methodology is applied to tasks with an early finish date in the past that do not have an actual finish. The analyst moves the early finish date to (at a minimum) the status date by increasing the duration.

The following charts are examples of what to look for when validating contractor schedules. In all three charts, the red lines indicates the status date, the blue bars are the early dates of the task and the green is the baseline plan.

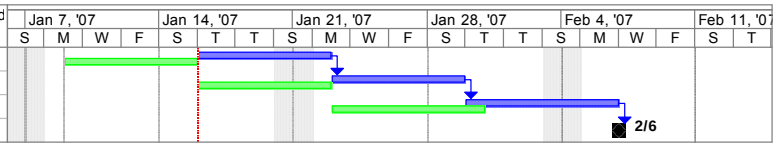
The first example shows a task without a start date, the task hasn't started and the contractor has not moved the start date to the status date as mentioned above.

ID	Task Name	Duration	Early Start	Early Finish	Actual Start	Actual Finish
1	A	5 d	1/9/07	1/15/07	NA	NA
2	B	5 d	1/16/07	1/22/07	NA	NA
3	C	6 d	1/23/07	1/30/07	NA	NA
4	End	0 d	1/30/07	1/30/07	NA	NA



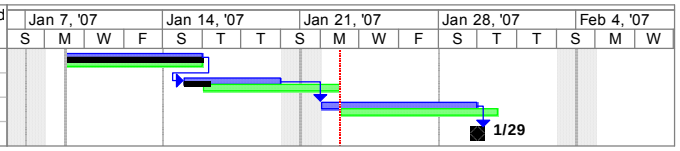
To correct this error, the contractor restates the start date as the status date since no other start date information is available.

ID	Task Name	Duration	Early Start	Early Finish	Actual Start	Actual Finish	Pred
1	A	5 d	1/16/07	1/22/07	NA	NA	
2	B	5 d	1/23/07	1/29/07	NA	NA	1
3	C	6 d	1/30/07	2/6/07	NA	NA	2
4	End	0 d	2/6/07	2/6/07	NA	NA	3



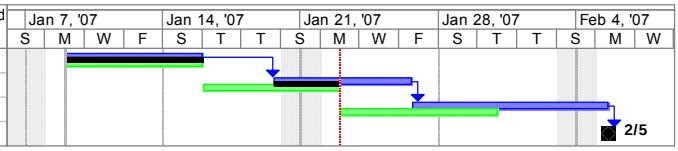
The second example shows tasking that has been incorrectly statused. The progress bar of task B should be lined up with the status date. This is because if only 25% of the task is done, the remainder of the work cannot be performed in the past. To correct this error, the analyst moves the progress bar to the status date to project impact through the schedule. The analyst also follows up with the contractor to determine when the task actually started.

ID	Task Name	Duration	Early Start	Early Finish	Actual Start	Actual Finish	% Complete	Pred
1	A	5 d	1/9/07	1/15/07	1/9/07	1/15/07	100%	
2	B	5 d	1/15/07	1/19/07	1/15/07	NA	25%	1
3	C	6 d	1/22/07	1/29/07	NA	NA	0%	2
4	End	0 d	1/29/07	1/29/07	NA	NA	0%	3



Below is an example of the schedule when it is correctly statused assuming the percent complete was correct and not the actual start date. Notice what happened to the end date of the schedule when it was correctly statused. These types of errors could have a significant impact on the end date of the schedule with critical and near critical path activities.

ID	Task Name	Duration	Early Start	Early Finish	Actual Start	Actual Finish	% Complete	Pred
1	A	5 d	1/9/07	1/15/07	1/9/07	1/15/07	100%	
2	B	5 d	1/19/07	1/26/07	1/19/07	NA	25%	1
3	C	6 d	1/26/07	2/5/07	NA	NA	0%	2
4	End	0 d	2/5/07	2/5/07	NA	NA	0%	3



Earned Value based Percent Complete

Everything written above also applies to schedules that show earned value percent complete, but the analyst can go a bit further in projecting impact. Many contractors use a method called` "EV to Time ratio" to examine the time dimension of work accomplishment. The primary use of an EV to Time ratio is to examine the time dimension of work accomplishment. For critical and near critical path tasks, the analyst should calculate the EV to Time ratio, comparing it overtime in search of insights into the time-based performance. The analyst should pay particular attention to the allocation of resources (or labor hours) when issuing general conclusions. A cumulative resource or cost curve shows usage for each time interval to the end of the project. Because resources (or labor hours) are often used unevenly over time, the analyst should examine, at a minimum, the resource (or labor hour) distribution of critical and near critical path tasks to identify non-linear profiles when comparing duration-related progress to the task's corresponding earned value calculation. It is important for the analyst to remember that a task's earned value assessment must be 'earned' based on the way the resources have been allocated.

EV to Time Ratio Formula:

= EV % Complete / % Complete (duration)

EXAMPLE:

EV % Complete = .50 (50 of 100 widgets completed)
% Duration Complete = .25 (25 of 100 days elapsed)
EV to Time Ratio = .50 / .25 = 2x

In this example, the task is being performed with twice the rate that duration is consumed. This may suggest that the activity can complete the remaining 50% of work (or remaining 50 widgets) in 25 days. In order to report such an assumption, the analyst must first determine if the pace of past performance will continue. To do this, examine how the hours or people are laid out against the remaining work time. Does the future work mirror that of the past? If not, one cannot make the assumption that past performance is a reliable indicator of the future.

Charting the Critical Path:
Charts are useful for envisioning the entire project through time. There are essentially two schedule charting formats the analyst should use (1) Gantt Diagram and/or (2) PERT Diagram. Schedules are most commonly expressed as a Gantt Diagram (as in the examples above), which graphically display all tasks as bars extending along the project's timeline. A PERT Diagram is typically used when assessing the construct and legitimacy of the relationship (or logic) selected to model a dependency between tasks. The analyst should choose the format that best suits the analysis

2.3.2 Status of the Critical Project Milestones

This section highlights and tracks time critical milestones and events that are part of the project schedule. It is recommended that the analyst include a table in the report providing the critical schedule milestones and events that reflect the contract's entire period of performance (award to finish).

To do this, the analyst enters the baseline for all milestones and events, actual and estimated finish dates (DD/MM/YY) and predecessor total float value. Next, the analyst identifies the predecessor task(s) with the lowest total float value for each critical project milestone or event. By identifying the total float of the task(s) immediately preceding a critical project milestone or event, the analyst is able to track the margin (in days) to meeting the baseline finish date. A trend indicator arrow (improving ↑ or worsening ↓) is added indicating a predecessor total float value change from the previous month.

Activity Desc.	Activity ID	Baseline Finish	Actual Finish	Early Finish	Total Float (w-days)	Previous Months TTL Float	Float Worsening ↓ or Improving ↑	AIR-4.2.3 Forecast	Comments
Contract Award	IMP.001	07/15/06	07/15/06	07/15/04	0	0			
PDR	IMP.020	08/22/07		08/18/07	6d	9d	↓	08/22/07	no slip anticipated
CDR	IMP.040	10/04/08		08/16/08	44d	38d	↑		
First Flight	IMP.060	04/07/05		04/07/05	0d	0d			
Developmental Test	IMP.080	11/04/05		11/04/05	44d	38d	↑		
Operational Test	IMP.100	01/26/07		02/06/07	44d	38d	↑		
DD250	IMP.120	11/26/08		02/24/09	0d	0d			
Contract End	IMP.130	01/28/09		03/24/09	0d	0d			

2.3.3 Schedule Status

The goal of this section is to identify the performance trends of key project schedule indicators (see Table below). Of particular interest are the performance trends of dates, durations, and tasks. The best way to know whether the project is on track is to compare reported progress to the baseline plan. The analyst should closely watch 'Task Status' indicators in determining the progress towards meeting deadlines for example. Numerical listings for 'Duration' are another key indicator in determining whether the contractor/government activity can complete all work within the contract's 'Period of Performance' without needing additional time.

For each project schedule indicator, the analyst should:

1. identify and interpret any changes from the previous month's numerical listing,
2. identify and interpret the current month's numerical listing,
3. issue general conclusions and,
4. address the major lines of reasoning that led to the conclusions.

The analyst should include a table in the analysis that provides information on the status of key project schedule indicators. The table should include the last three months and provide a comparison of the current month status to that of the previous month.

EXAMPLE:

IMS Date	DEC05	JAN06	FEB06	MAR06	APR06	MAY06	Delta
Period of Performance							
Program Baseline Finish	9/28/2012	9/28/2012	9/28/2012	9/28/2012	9/28/2012	9/28/2012	0
Program Projected Finish	9/28/2012	9/28/2012	9/28/2012	11/8/2012	9/28/2012	9/28/2012	0
Duration							
Baseline	2067	2067	2067	2067	2067	2067	-
Projected	2067	2067	2067	2096	2067	2067	0 wd
Completed Duration	383	401	421	446	466	486	20 wd
Remaining Duration	1684	1666	1646	1650	1601	1581	-20 wd
Percent Complete	18.5%	19.4%	20.4%	21.6%	22.5%	23.5%	1.0%
Task Status							
Tasks Not Started	1189	1075	1280	1371	1450	1545	95
Tasks In Progress	59	116	113	130	158	171	13
Tasks Completed	877	937	999	1070	1134	1196	62
Total Tasks	2126	2127	2393	2571	2742	2741	-1
Tasks To Be Completed	911	953	996	1089	1168	1234	66
Cum BEI	0.96	0.98	1.00	0.98	0.97	0.97	0

EXAMPLE ANALYSIS:

This month, the size of the schedule remained stable following three months of considerable increase due to rolling wave planning. The cumulative Baseline Execution Index (BEI) continues to fall slightly from its peak of 1.00 in February. This coincides with an increased number of tasks in progress. This is also the highest number of tasks in progress at one time and at the most technically challenging leading up to CDR. Despite these challenges, the program duration has stayed constant and the baseline finish date is projected to be met.

2.3.4 Analysis of the Baseline Execution (BEI)

The Baseline Execution Index (BEI) is a standard tripwire metric used by DCMA when reviewing contract performance data. The BEI is an index of the number of tasks that are completed over the number of tasks that should have been completed by the status date of the current schedule. In scheduling terms, it is the number of tasks with an actual finish date over the number of tasks with a baseline finish date less than or equal to the status date.

$$\textbf{BEI} = \frac{\#\text{ tasks with an actual finish} \leq \text{status date}}{\#\text{ tasks with a baseline finish date} \leq \text{status date}}$$

- A contractor can have a BEI greater than 1.0 if tasks are completed ahead of schedule.
- A BEI less than 1.0 means that they may be completing tasks ahead or behind schedule, but in total the contractor is completing less tasks than anticipated at this point in the program.
- BEI may be the best network-schedule-related metric to correlate with SPI because it considers both past performance and future effort when analyzed along with "Percentage of Delinquent Tasks" and "Future Tasks Completed" metrics (see below).

The following is a list of the key metrics used to analyze a projects BEI:

Percentage of Delinquent Tasks

- Delinquent tasks are very important to measure because of the impact they may have on the program. This can be measured monthly or cumulatively.
- The cumulative calculation is the number of tasks without an actual finish date and a baseline finish date in the past over the number of tasks with a baseline finish date in the past. The cumulative metric monthly is a good indicator of the bow wave effect. When the percentage of delinquent tasks continues to grow, it means that the contractor is falling further and further behind.
    - TIP: Add up the durations of all the tasks meeting these criteria. This is called Delinquent Days of Work. This will provide program managers a better indication of how much effort is required to catch up on the work that is behind. Remember, this does not account for number of hours or resources assigned

$$\textbf{\% of Delinquent Tasks} = \frac{\#\text{ tasks w/o Actual finish date and Baseline finish date} \leq \text{Status Date}}{\#\text{ tasks with a Baseline finish date} \leq \text{Status Date}}$$

Future Tasks Completed

- The number of tasks completed in the future is a complimentary metric to the BEI since the BEI includes tasks completed ahead of schedule. It will also help indicate how much future effort is represented in the SPI. This metric should be calculated each month and compared to identify trends in how many tasks are completed ahead of schedule. As long as the delinquent contractor tasks are not increasing each month, an increase to future tasks completed means that the contractor is working ahead of the plan.

- This metric is shown as a percentage of the completed tasks not base lined to complete until after the status date over the number of tasks that were base lined to complete on or before the status date.
    - TIP: Add up the duration of all the tasks meeting this criteria. This is called Future Days of Work Completed. This will offer a better understanding of how much work effort was completed early.

% Completed Tasks Future = $\frac{\text{\# of tasks actually finished but (Baseline finish > Status Date)}}{\text{\# of tasks with Baseline Finish} \leq \text{Status Date}}$

Critical Tasks Analysis -- Percentage of Tasks with Five* Days of 'Float' or Less

- Float is extremely helpful to look at because only the tasks that are incomplete have float values associated with them. Because this metric only includes incomplete tasks, it is considered the best overall forward-looking indication of schedule risk for the program manager.

* Note: NAVAIR currently sets 5 days as the default when calculating critical tasks. SYSCOMs may decide to use more or less days. This Toolkit will use 5 days in the below calculation for demonstration purposes.

    - TIP: Add up the duration of all the tasks that meet these criteria. This is called "Critical Days of Work". It will give a better understanding (not complete though) of how much effort is critical.

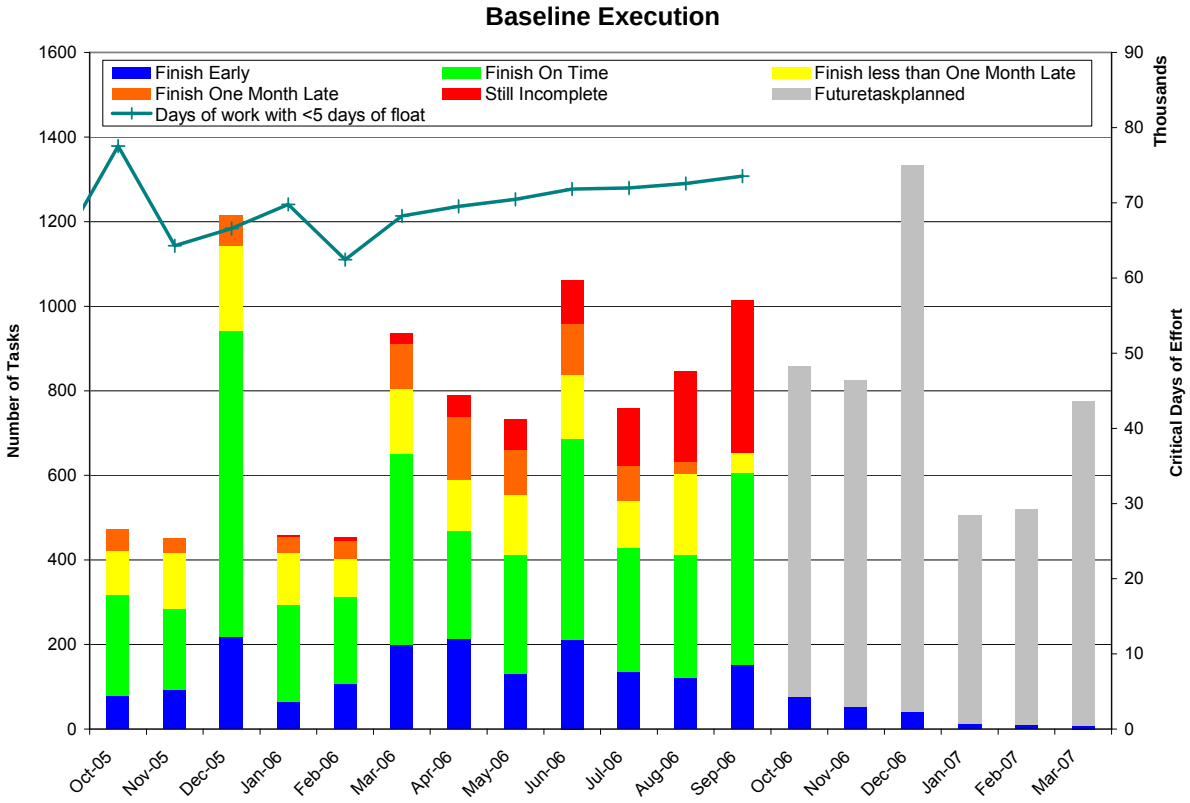
% Tasks Float $\leq$ 5 days = $\frac{\text{\# of tasks w/o actual finish and Total Float} \leq \text{5 work days)}}{\text{\# of tasks w/o Actual finish}}$

It is important to note that these metrics help tell a story when examined as a group, however, caution is recommended when analyzing each metric on a stand-alone basis.

Task Completion Tracking

As mentioned earlier in this section, there are many different ways to provide a baseline execution analysis to the program office. Ultimately, the goal is to clearly demonstrate *how poor,* or how well the contract is being executed. This will help the program manager make more informed decisions.

The below graph is a useful technique in demonstrating how poor or how well a contract is executing by displaying the contractors performance against baseline (i.e., shows current and future risk).



The bar portion of the chart contains all tasks planned to be completed (have a baseline finish) in that month. Each bar is broken up into five different categories: tasks finished early, tasks finished on time, late but by less than a month, late by more than a month and still incomplete. The time-scale of the chart is twelve months behind and six months ahead to give the program manager a historical trend and an idea of what kind of tasking/risk is forthcoming. Lastly, the risk in the schedule is plotted with a line on a secondary axis. This example represents the number of days of work that are associated with all tasks with float less than five days. The magnitude of this number should not be alarming; it is the trend of this line that is the storyteller. If the number of “critical days” increases significantly in a short period of time, it is an indicator of an increase in concurrency and less time available to accommodate slips in the schedule.

2.3.5 Perform a Schedule Risk Assessment (SRA)

Specific details on how to perform a Schedule Risk Assessment are located in Appendix D of this document in the Schedule Risk Assessment Instruction (used with permission of NAVAIR).

In summary, the following are the major components of a SRA.

A. Determining Risk Areas: What technical areas contain the most risk? This is determined by the Criticality Index. This index contains the tasks with a certain probability of becoming critical at some point in the future.

B. Performing a Sensitivity Analysis: What tasks are the most sensitive to the program completion date? In many tools, an output of a schedule risk assessment is a sensitivity analysis. It is also known as a "Tornado Chart" because of its funnel shaped appearance. The chart outlines the singular impact of each task on the end of the project thereby highlighting high-risk tasks/focus areas.

C. Quantifying Risk using Dates: Where will the milestones finish? A histogram is used showing the dates where key events or milestones will fall. Use these dates to help portray the distribution of risk to the program office. If previous schedule risk assessments have been run on the same milestone or key event, a trend diagram showing the results of each schedule risk assessment reflects whether mitigation efforts are achieving desired results, or more risk is being incurred.

2.3.6 Perform Time Impact Analysis

The purpose of this section is to bring together the analysis and commentary of previous sections and develop a forecast. The estimation of the work still to be done to complete a project or task as of the given deadline date must be produced to help project managers make more informed daily decisions.

To accomplish this, the analyst performs the following analysis techniques;

1) Spread resources in different ways
2) Changing a task's duration for the remainder of the plan
3) Reposition work to immediately see how each change affects the project's timeline

By simulating a range of input assumptions or what-if scenarios can uncover opportunities within the project not previously exploited. This exercise also enhances the analyst's accuracy of forecasting future deadlines. The more specific and accurate the assumption is, the better the results. The projection calculated under the Time Impact Analysis is a direct input into the integrated cost and schedule forecast. See Section 2.4.4 Integrated Forecasting.

2.4 Integrated Cost / Schedule Analysis

It is essential that the analyst ensures all cost and schedule information are integrated. Even one omission from either cost or schedule puts the entire project at risk.

2.4.1 Overview/General Discussion

Being able to foretell the project cost and schedule accurately and meaningfully is one of the most important and difficult tasks for an analyst. Cost performance data used in conjunction with Critical Path Method (CPM) or other logic driven schedule methods, provide an effective approach to predicting when work can be expected to occur.

In general, a comprehensive schedule;

1) Accurately and objectively describes the project's current schedule position, future risks and opportunities
2) Translate the contractor / government activities current status into a straightforward account of what happened, why, and who is responsible
3) Major schedule drivers are identified, quantified and provides reasons for the variance as well as the corrective action(s)
4) Identifies critical path impacts

2.4.2 Perform a Resource Analysis

Realistic schedule calculations must account for resource allocation and availability. Soon after contract award by way of the integrated baseline review (IBR) and then with each major modification to the contract, the analyst should begin the resource analysis by accessing the project's resource dictionary to confirm maximum and minimum resource limits, at a minimum, for critical and near critical path tasks. The analyst should then proceed with a determination of whether the available amount of a resource is sufficient to perform the assigned task. During schedule development, the assumption is that unlimited manpower, materials, and equipment are available. For example, does the schedule consider using two plumbers for ten days or ten plumbers for two days? Does the contractor have ten plumbers to use? The more common causes of schedule problems include not having enough resources and not having enough of the right resources.

As prescribed in ANSI-748-98A, the sum of all work package hours and planning package hours within a control account should equal the total hours assigned to the control account. Likewise, the sum of all control account hours should equal the total hours for the project. When determining whether resource estimates are reasonable, the analyst should pay particular attention to ensure that the resource hour allocation does not exceed the associated task's individual duration. Also, the analyst should investigate whether the allocation of resource skill sets does not exceed their availability and the rational distribution of resources from month to month. Pay particular attention to pronounced peaks and valleys in resource planning. Large jumps from one month to the next puts into question the realism of both the project schedule and Performance Measurement Baseline (PMB). Where possible, the analyst should seek out the most experienced team members who are responsible for the work to help determine the realism of resource estimates.

It is important that the analyst understand that the availability of resources has a direct bearing on the duration of each task and the project.

2.4.3 Network Schedule Relation To Earned Value

Networked schedules are an essential part of Earned Value Management and should not be considered something in addition to it. The establishment of a meaningful time-phased budget baseline or Budgeted Cost for Work Scheduled (BCWS) is fundamental to making an accurate assessment of schedule progress. BCWS is a schedule that reflects the contractor/government activities resource loaded, time phased plan for accomplishing the contractual scope of work. BCWS compliments, but does not replace formal task or event based schedules. The earned value dollarized schedule variance should be correlated to the schedule status via the master and subordinate schedules. By itself, the earned value dollarized schedule variance does not reveal critical path information and should be analyzed in conjunction with other schedule information.

It is important for the analyst to periodically perform two checks on the data;

Schedule Variance (SV): The analyst should utilize the IMS and its summary roll-up features to validate and confirm that;
1) The SV being reported is in fact being reported correctly
2) Identify if any tasks that are under-performing are either on or near the critical path
3) Determine if any schedule risks or opportunities are foreseeable in the near future.

Schedule Performance Index (SPI): The analyst compares the SPI reported on the CPR vs. the SPI reported on the IMS to;
1) Validate and confirm the reported indices are being reported correctly
2) Ensure no Level of Effort (LOE) activity is being included in SPI. SPI calculated from an IMS usually does not include LOE tasks, however, an SPI calculated from a CPR does include LOE tasks. To reconcile between the IMS and CPR, BCWS and BCWP are subtracted from the CPR data.
3) Determine if variances in SPI from IMS versus SPI on CPR is caused by material budgets not reflected in the IMS.

Schedule Variance vs. Float
Using the CPR, the analyst should identify the top negative schedule variances per reporting element. It is important to note how close the tasks with major schedule variances are to the critical path. The closer these tasks are to the critical path, the more risk they have in impacting the completion of the project

Some contractors provide the earned value in both hours and dollars. Dollars are always available from the CPR but hours correlate much better to a discrete task schedule. If the Prime contractor is 1000 hours behind in a certain control account, the analyst could filter directly to that control account and note the tasks contributing to the behind schedule status. When this analysis is performed month after month, it will identify significant recurring problem areas and will most likely identify tasks on the critical path.

The reason that dollars may not correlate directly to the schedule is that there may be considerable amounts of LOE work or subcontractor work included in the CPR that does not show up in the schedule. On most contracts, using the BCWS in hours is the best relation to the schedule since the IMS is usually planned in hours instead of dollars.

An example is provided below reflecting the SV or SPI vs. Float chart using ten control accounts with the most unfavorable indicators.

Top Control Accounts	SV	Network Schedule Status
4ZM1122AS02_CA-Sect 43	-10,920	Drawing Completion Pressure Box Inst-A is on the critical path to IOC. Majority of tasks within 1 to 9 days of impacting IOC
4ZM1110AS01_CA-Wing - N	-8,238	There is 8 days of float on two drawing packages that are slipping beyond the baseline. Other drawing packages have 4 to 9 days of float but no variances. **Last month there was only 1d of float for task #346A Multi-Fuel Drain Inst - Details. This month the float is 44d and the Predecessor relationship has changed from Finish to Start to Start-to-Start.**
4ZM1123AS01_CA-Sect 46	-6,604	There are 31 tasks are within 2 to 8 days of impacting build of T-1 (Wichita Assembly) and IOC. The majority of these tasks are drawing related.
4ZM1122AS04_CA-Sec.43_4	-5,115	CDR Prep and CDR Support are on the critical path. Another 6 tasks with 3 to 7 days of float but no variance.
4ZM1121AS03_CA-Sec 41	-2,259	There is 7 days of float on five drawing packages that are slipping beyond the baseline. Another 18 drawing tasks have 2 to 10 days of float but no variances.
4ZM1123AS02_CA-I&P Inte	-2,042	Several drawing tasks in progress are behind schedule however Boeing is showing no schedule slip.
4ZM1121AS02_CA-Sect 47_	-1,729	There are 34 tasks are within 3 to 10 days of impacting IOC. The majority of these tasks are drawing related.
4ZM1190AS02_CA-Wiring -	-1,589	There are 15 tasks with 3 days of float but no variance. Variances found in tasks with enough float to absorb slip at this time.
4ZM1300MS04_CA-OMI	-1,254	There are 27 tasks with 4 days of float but no variance. Variances found in tasks with enough float to absorb slip at this time.
4ZM1300MS09_CA-Applicat	-1,253	Variances found in tasks with enough float to absorb slip at this time.
4ZM1K80MS05_CA-MS I&T S	*-1,176*	***Last month two tasks were on the critical path and this month the same tasks have 247d float. It appears that the Predecessor relationship was changed from Finish-to-Start to Finish-to-Finish.***

2.4.4 Integrated Forecasting

Integrated forecasting is a methodology used by an analyst by developing a range of scenarios for schedule and cost including the critical path, This exercise can help to improve the projection of the project's timeline by simulating a range of input assumptions.

Output: Assumptions, Critical Paths, a dollar range, a schedule completion range in months.

1. EV Report Content

Recommended

- Earned Value Drivers
  - Cost
  - Schedule
- Critical Path Status
  - Near Milestone
  - End of Contract
- Milestone Status
- Schedule Graph
  - Baseline Execution

As Needed

- System Issues
- IMS Health Metrics
- IBR Results
- EAC Deltas
- MR/UB Deltas
- Surveillance
- Baseline Status (Format 3)
- Staffing – Resources
- Critical Path Status
- Risk Cube
- Funding Constraints
- Other PM Requested Slides
- EV Graphs (BCWP, BCWS, ACWP, EAC, TAB, SPI/CPI, Cost/Schedule Variances)
- Subcontract Performance

Appendix A - Standard EV Formulas and Assessing Results

Center for Earned Value Management (CEVM)

Earned Value Basics

Acronym	Description	Definition	Meaning
BCWS	**Budgeted Cost of Work Scheduled**	**Time phased value of planned work trough any given WBS level and time period.**	**Planning Baseline- PMB**
BCWP	**Budgeted Cost of Work Performed**	**Time phased value of completed work through any given WBS level and time period.**	**Value of the work accomplished, "Earned Value"**
ACWP	**Actual Cost of Work Performed**	**Time phased costs incurred for completed work through any given WBS level and time period**	**Actual cost of work accomplished**
BAC	**Budget at Completion**	**Total estimated value for all work planned through any given WBS level**	**Authorized Work**
EAC	**Estimate at Completion**	**Total expected cost once all work has been accomplished**	**Projected total cost of all work**

Earned Value Metrics - CPI, SPI, & TCPI

Acronym	Metric	Formula	Meaning
SPI	Schedule Performance Index	$SPI = \frac{BCWP}{BCWS}$	Schedule Efficiency Factor
CPI	Cost Performance Index	$CPI = \frac{BCWP}{ACWP}$	Cost Efficiency Factor
TCPI	To-Complete Performance Index	$TCPI = \frac{(BAC - BCWP_{CUM})}{(EAC - ACWP_{CUM})}$	Efficiency needed for remaining work to achieve a desired EAC

EV Standard Variance Formulas: Cost Variance (CV) & Schedule Variance (SV)

The Cost Variance is the difference between the earned value of work performed and the actual cost. Note: Cost Variances can be expressed in terms of man-hours or dollars.

CV= BCWP – ACWP

CV = Budgeted Cost for Work Performed – Actual Cost of Work Performed

The Schedule Variance is the difference between the earned value of work performed and the value of work scheduled.

SV = BCWP – BCWS

SV = Budgeted Cost of Work Performed – Budgeted Cost for Work Scheduled

The Cost Variance is also calculated as a percentage which is the percentage cost varies from the amount earned to date.

$$CV\ \% = \frac{CV}{BCWP}$$

$$\textbf{CV\%} = \frac{\textbf{Cost Variance}}{\textbf{Budgeted Cost of Work Performed}}$$

The Schedule Variance is also calculated as a percentage which is the percentage the schedule varies from what has been planned to date.

$$SV\% = \frac{SV}{BCWS}$$

$$\textbf{SV\%} = \frac{\textbf{Schedule Variance}}{\textbf{Budgeted Cost of Work Scheduled}}$$

EV Standard Performance Indexes: Cost Performance Index (CPI) & Schedule Performance Index (SPI)

The **Cost Performance Index (CPI)** is a measure of Cost Efficiency. It measures the value of work performed against the actual cost. A CPI of 0.90 indicates that .90 cents of work is accomplished for every dollar spent.

$$CPI = \frac{BCWP}{ACWP}$$

$$CPI = \frac{\text{Budget Cost of Work Completed}}{\text{Actual Cost of Work Completed}}$$

The **Schedule Performance Index (SPI)** is a measure of Schedule Efficiency. The SPI measures the value of work performed against the work scheduled. This is only an indicator of total work accomplished without regard to whether it was actually the work that was scheduled or whether the work is critical. An SPI of 1.10 indicates that $1.10 of work is completed for every dollar that was planned.

$$SPI = \frac{BCWP}{BCWS}$$

$$SPI = \frac{\text{Budget Cost of Work Completed}}{\text{Budgeted Cost of Work Performed}}$$

Assessing Cost Performance Variances

When assessing variances of cost performance, a favorable variance should not lead one to conclude the project is experiencing a cost "underrun" and likewise, a negative result does not definitively mean that the project is "overrunning". The below is provided to properly assess cost variances.

Potential Causes of Unfavorable Cost Performance

- Work more complex
- Design review comments extensive
- Rework
- Unclear requirements
- Unfavorable market fluctuations in the cost of labor or materials
- Increases to overhead rates
- Fluctuations to foreign exchange rates

Potential Causes of Favorable Cost Performance

- LOE tasks not ramped up as planned
- Efficiencies being realized
- Work less complex
- Fewer revisions and rework
- Favorable market fluctuations in the cost of labor or materials
- Decreases to overhead rates

Assessing Schedule Performance Variances

It is emphasized that a favorable result should not lead one to conclude the project is experiencing a cost "underrun" and likewise, a negative result does not definitively mean that the project is "overrunning". The below is provided to properly assess schedule variances.

Potential Causes of Unfavorable Schedule Performance

- Manpower shortage
- Revised education plan
- Supporting organizations behind schedule
- Late Vendor delivery
- Delayed customer feedback/direction
- Rework
- Work more complex than anticipated
- Design review comments extensive
- Unclear requirements
- Scope creep

Potential Causes of Favorable Schedule Performance

- Efficiencies being realized
- Work less complex than anticipated
- Fewer revisions and rework
- Favorable Market Fluctuations in the Cost of Labor or Material
- Subcontractor ahead of schedule

More on Schedule Variances

In order to determine if a favorable schedule variance by itself infers a favorable schedule performance, the Performance Measurement Baseline (PMB) must be validated and reflect consistency with the Integrated Master Schedule (IMS). If this information is not readily available, it is recommended that the analyst limit conclusions drawn in the prepared analysis.

Further, without validating the PMB/IMS, a schedule variance (favorable/unfavorable) will not be able to provide insight into the following:

- Impact of work sequence (was worked performed in correct sequence?)
- Importance of work accomplished vs. planned
- Reflect critical path assessment
- Give amount of time schedule could slip
- Identify source (labor/material) of difference
- Indicate the time ahead/behind schedule
- Indicate the cost needed to regain schedule

Schedule Variance status does:

- Indicate the dollar value difference between work accomplished to the value of work planned
- Reflect a given measurement method

EV Standard EAC Formulas

The objective when preparing an EAC is to provide an accurate projection of cost at the completion of the project. EAC is usually reported as a dollar value at a specified point in time and is composed of actual costs to date plus the estimated costs to complete the work. EAC is evaluated on a monthly basis and/or when a significant change occurs. The EAC should be based on historical performance, risks and opportunities. The following formulas can be used as cross-checks.

Estimate at Complete (EAC)
Generic Formula:

$$\mathbf{EAC} = \text{Actuals to date} + \frac{\text{(Remaining Work)}}{\text{(Efficiency Factor)}}$$

EAC_{CPIcum}

The EAC_{CPIcum} is derived from the above generic formula using the project's cumulative CPI as the Efficiency Factor

$$EAC_{CPICUM} = ACWP_{CUM} + \frac{(BAC - BCWP_{CUM})}{CPI_{CUM}}$$

Note: BAC does not include costs associated with Manangement Reserve (MR). In order to derive an EAC that is representative of the total cost of a contract, substitute Total Allocated Budget (TAB) in place of BAC.

$EAC_{Composite}$

The $EAC_{Composite}$ is derived from the above generic formula using the project's cumulative CPI multiplied by the project's cumulative SPI as the Efficiency Factor

$$EAC_{Composite} = ACWP_{CUM} + \frac{(BAC - BCWP_{CUM})}{(CPI_{CUM} * SPI_{CUM})}$$

Note: BAC does not include costs associated with Manangement Reserve (MR). In order to derive an EAC that is representative of the total cost of a contract, substitute Total Allocated Budget (TAB) in place of BAC.

More EAC Methods: Application of Rolling CPI's

Another variation of the generic EAC formula is to substitute the 3-month average CPI or 6-month average CPI as the Efficiency Factor. This type of rolling average helps to eliminate months at the beginning of the contract which may have significantly lowered the average monthly performance. This is because it may take time to fully staff (ramp up) a project.

$$CPI_3 = \frac{BCWP_{current\ month} - BCWP_{current\ month - 3}}{ACWP_{current\ month} - ACWP_{current\ month - 3}}$$

$$CPI_6 = \frac{BCWP_{current\ month} - BCWP_{current\ month - 6}}{ACWP_{current\ month} - ACWP_{current\ month - 6}}$$

$EAC_{CPI\ 3}$

The $EAC_{CPI\ 3}$ is derived using the project's cumulative CPI for the last 3 full months of data as calculated above.

$$EAC_{CPI\ 3} = ACWP_{CUM} + \frac{[(BAC - BCWP_{CUM})]}{CPI_3}$$

Note: BAC does not include costs associated with Manangement Reserve (MR). In order to derive an EAC that is representative of the total cost of a contract, substitute Total Allocated Budget (TAB) in place of BAC.

$EAC_{CPI\ 6}$

The $EAC_{CPI\ 6}$ is derived using the project's cumulative CPI for the last 6 full months of data as calculated above.

$$EAC_{CPI\ 6} = ACWP_{CUM} + \frac{[(BAC - BCWP_{CUM})]}{CPI_6}$$

Note: BAC does not include costs associated with Manangement Reserve (MR). In order to derive an EAC that is representative of the total cost of a contract, substitute Total Allocated Budget (TAB) in place of BAC.

More on EAC development

Evaluation/development of a project's EAC is time consuming when being performed as a "bottoms up" review, starting with the most detailed information on a project and progressively summarizing it to higher WBS levels. This type of comprehensive review is usually done on an annual basis. A monthly review of EAC is possible by focusing on major variances of control accounts determining if the cost/schedule variance trends indicate a future impact.

The following should be considered when developing an EAC or ETC (estimate to complete):

- Schedule completion
- Performance to-date (compared with the budget)
- Remaining work and its anticipated performance
- Rates (direct/indirect)
- Committed costs for material which have not yet been recorded as actual costs
- Scope changes which are approved but not yet incorporated in the baseline
- Pending scope changes or known change requests
- Funding constraints (for time-phased future costs)

Standard Formula and Assessment of TCPI

The TCPI represents projected performance in the Estimate to Complete (ETC). It compares the budget for remaining work with the estimate for remaining work, allowing a measure of what performance will be in the future to achieve the estimate at completion. The purpose of calculating a TCPI is to compare it with CPI since this comparison provides an immediate indication of whether or not the EAC is realistic. When comparing TCPI with CPI, the analyst should always ask if the results make sense. Determine how the work scheduled in the future (TCPI) varies from the work performed in the past (CPI). For example, on a development contract, the work completed to-date could have included the bulk of materials required and design/build of the prototype leaving the balance of work to include testing/evaluation. In this case, it might make sense that TCPI is higher than CPI. As a general rule-of-thumb, if the projected TCPI varies by more than .10 from CPI, the analyst will need to perform a more in-depth analysis to determine the validity of such a large variance.

$TCPI_{EAC}$

The $TCPI_{EAC}$ is the efficiency needed from "time now" to achieve a projected EAC. It is calculated by dividing the cost of work remaining by

$$TCPI_{EAC} = \frac{(BAC - BCWP_{CUM})}{(EAC - ACWP_{CUM})}$$

Note: In order to derive an EAC that is representative of the total cost of a contract, Total Allocated Budget (TAB) is used in place of BAC.

Appendix B: Program Schedule Assessment

INTRODUCTION

Scheduling standards are intended to inform industry of the meaning the navy attaches to various aspects of network scheduling. The criteria require a formal scheduling system be established and used consistently throughout the life of the contract. The contractor should demonstrate that the scheduling technique meets the minimum requirements of network scheduling (e.g., horizontal and vertical traceability) as defined in ANSI-748-98, and is consistent with the written system description and operating procedures.

The primary purpose of a program schedule assessment is to ensure that the right resources are available, scheduled, and applied at the appropriate time and in the proper amount. The initial assessment should be scheduled to begin as soon as the Performance Measurement Baseline (PMB) is implemented but no later than six months after contract award.

RELATED ANSI-748-98 GUIDELINES

#06 Task Sequence, Interdependencies
#07 Physical Products, Milestones
#23 Plan/Actual Schedule Performance

11 POINT ASSESSMENT

1. Does the schedule reflect the work to be done?
The program schedule should correlate to the contract WBS. The program schedule should also reflect all labor and material tasks to be performed. The inclusion of LOE tasks is optional if the resource feature of the scheduling tool is not being utilized. Where the entire effort is not subdivided into work packages, the contractor should identify the far term effort in larger planning packages. It is important that the contractor demonstrate that relevant subcontract work is integrated with the prime's work and is considered as part of the critical path calculation. Also, all government obligations (i.e., GFE, GFI) must be delineated. When determining whether the schedule reflects the work to be done, the analyst should crosscheck the program WBS Dictionary, RAM, and CPR to the SOW, ORD, and program schedule to ensure they match. Discrepancies should be documented and revisited for closure.

2. Are critical target dates identified; are they being used to plan the work?
Of prime importance is the identification of the schedule objectives of the contract, including the association of contract milestones with calendar dates for important contract development and production decisions. When determining whether critical target dates are identified and are being used to plan the work, the analyst should check to see if each task is traceable to an IMP event or program milestone. The analyst should also check to see if the program schedule has considered all IMP events and that there is at least one event or milestone per quarter for the length of the contract. The milestone should be logically tied

showing changes when associated tasks move to ensure vertical integration exists.

3. Is work sequenced logically?
Major tasks and sub-tasks in the program schedule should be presented in chronological order, or some other logical order that reflects the manner in which the overall job is to be performed. The schedule should define a sequence of operations (or tasks) that must be performed in the order specified. It is important to remember that the network diagram reveals the workflow, not just the work. The sequence is further defined by imposing precedence among the tasks. That is, for each task, there may be one or more tasks that must be performed before it. When determining whether work is sequenced logically, the analyst should begin by getting the opinion of experienced technical personnel. Once this has been accomplished, the analyst should compare the baseline duration and start/finish dates to the current estimated duration and start/finish dates for each task and milestone to ensure that the order of work (or sequence) has not been altered. While the contractor will at times re-sequence those tasks that have not started, it is important that those changes be documented, communicated, and revisited for realism purposes.

4. Are interdependencies planned in a logical manner?
Development of a networked schedule requires a thorough knowledge of all work tasks within the program and their associated interfaces and interrelationships. The network should be constructed at the control account work package tasks and planning package level within, and across, WBS elements. In order to achieve horizontal integration each discrete task should have at least one predecessor and one successor but no more than ten. Likewise, each program milestone and IMP event should have at least one predecessor and one successor to establish vertical integration but no more than ten. The intent is not to force the contractor to make arbitrary cutoff points simply to have a limited number of predecessors and successors, but to reduce the complexity of the network where possible. Often contractors will make improper successor selections in an attempt to maintain a precedence logic count that falls within the division’s stated goal.

When determining whether inter-dependencies are planned in a logical manner, the analyst should compare the number of isolated tasks to the total number of tasks in the schedule. Discrete tasks without predecessors or successors should not exceed 5 percent of the total program schedule. The analyst should also check to see that predecessors and successors are not assigned to summary tasks. For network calculation purposes it is preferable that the contractor assign early dates and late dates to each task.

5. Are constraints, leads, and lags justified?
The use of large lead times, negative lag times, and constraints such as must-start-on, must-finish-on, start-no-earlier-than, start-no-later-than, finish-no-earlier-

than, and finish-no-later-than should be minimal, approved by an appropriate authority, and reasons documented. The analyst should identify and assess the legitimacy of any delay between the start and finish of one task and the start and finish of another. Lag can be positive and negative. Negative lag is often used to 'overlap' related work efforts while positive lag is often used to reflect the consumption of non-resourced time. The analyst should pay particular attention to the contractor's use of constraints in the stated logic and recognize the 'overriding' affect they have on the calculation of early and late dates. For example, if a task cannot start until a specified date has been reached due to the availability of machinery or key resources the contractor may choose to add a soft constraint to the network. For network calculation purposes it is essential that the contractor limit and control the use of constraints. The total number of discrete tasks with either hard or soft constraints should not exceed 5% of the total number of discrete tasks for the program.

6. Are duration estimates meaningful?
Estimating the duration of tasks is one of the most important aspects of the program scheduling process. Where possible, the analyst should seek out the most experienced team members who are responsible for the work to help determine the realism of duration estimates. A key feature from the standpoint of evaluating the schedule is the desirability of having short-term discrete tasks to detail the lowest WBS levels. A discrete task is simply a lower level work assignment having a duration that is limited to a manageable, realistic span of time, preferably no more than 60 calendar days (or 2 months) in length. The intent is not to force contractors to make arbitrary cutoff points simply to have short-term tasks, but to plan according to the way the work will be done. For network calculation and monthly forecasting purposes it is important that the contractor have short-term discrete tasks.

When determining whether duration estimates are meaningful, the analyst should compare the number of discrete tasks that exceed 60 calendar days in length to the total number of discrete tasks in the schedule for a specified period of time, typically 6 months in length. Also, task durations should be measured in days using the normal workweek of Monday through Friday, unless the contractor specifies a different work calendar. Holidays should be identified and considered in the schedule calculation. Discrete tasks with durations greater than 60 calendar days should not exceed 5 percent of the total number of discrete tasks within a rolling wave (or 6 month) boundary.

7. Are resource estimates reasonable; are key resources available to support the plan?
The sum of all work package hours and planning package hours within a control account should equal the total hours assigned to the control account. Likewise, the sum of all control account hours should equal the total hours for the program. When determining whether resource estimates are reasonable, the analyst should pay particular attention to ensure that the resource hour allocation does

not exceed the associated task's individual duration. Also, the analyst should investigate whether the contractor's allocation of resource skill sets does not exceed their availability and the rational distribution of resources from month to month. Where possible, the analyst should seek out the most experienced team members who are responsible for the work to help determine the realism of resource estimates. Discrepancies should be documented and revisited for closure.

8. Does the critical path make sense; does the scheduling software calculate it?
The contractor should identify the longest, continuous sequence of tasks with the least amount of total float through the network between two scheduled dates. When determining whether the critical path makes sense, the analyst should calculate and graphically display the path from contract start (or the current status date) to contract completion. The analyst should also calculate and graphically display the path from 'time-now' to PDR, CDR, First Flight, or other major program milestone. The analyst should seek out the most experienced team members who are responsible for the work to help determine the reasonableness of the Critical Path(s).

9. Are float times reasonable?
The calculation of float is designed to provide a means for manipulating resources and durations to achieve targets. The use of total float is shared in common by the tasks in any particular path. If it is used in any one task, it is no longer available for any other task. For this reason, total float must be managed judiciously otherwise; many formerly non-critical items may rapidly become critical. When determining whether float times are reasonable for the type of work to be accomplished, the analyst should check to see that a positive total float value is calculated on all but the critical path. For example, if a task depends on an integration process with another system, the total float metric will indicate whether there is time enough to complete the integration within the time parameter of the program. The analyst should pay special attention to tasks with excessively large total float values. This may indicate that the contractor has not matured its network by neglecting to add a successor or soft constraint in any particular path. When determining whether total float values are reasonable, the analyst should compare the number of task with float values that exceed 60 calendar days to the total number of tasks in the schedule. Discrete tasks with a total float value of greater than 60 calendar days should not exceed 5 percent of the total program schedule.

10. Does the schedule provide logical status and forecasts of completion dates for all authorized work?
The contractor should identify, at least monthly, the significant differences between both planned and actual schedule performance. When determining whether the schedule adequately provides current status and forecasts of completion dates, the analyst should compare the program's schedule performance to the program milestone schedule (Tier I). The analyst should pay

particular attention to whether the contractor's scheduling system calculates a duration-related percent complete[1] separate from the earned value percentage.

The analyst should identify and record the contractor's current assessment of the date for completing all open and remaining work on the program. The schedule variance should indicate fluctuations in planning versus implementation of the plan and, should indicate the stability of the contractor's way-forward plan. Also, the analyst should crosscheck the contractor's current assessment to the Latest Revised Estimate (LRE) to ensure they match. For the estimated completion date, record the contractor's current assessment of the date that the contract or critical milestone actually will be completed. For contracts with a Cost Performance Report (CPR), this should be when the cumulative Budgeted Cost for Work Performed (BCWP) equals the Performance Measurement Baseline (PMB).

The analyst should perform a "Hit or Miss" ratio analysis. These numbers are derived from comparing the baseline or planned finish date for each task for the last three months through the current status date. The analyst should also perform a "Hit or Miss" ratio analysis to identify projected future misses beyond the current status date up to the next major program milestones. If a task finish date is realized when planned, it is considered a hit, if it misses by a day or more it is a miss. If it finishes early it's treated as a hit. Discrete tasks with actual finish date misses should not exceed 5% of the total number of discrete tasks for the last three months.

11. Can the current program schedule be accomplished at an acceptable risk level?
When determining whether the program schedule can be accomplished at an acceptable risk level, the analyst should identify risks associated with the timely completion of the program's overall schedule objectives. All tasks with zero total float are deemed critical and possess a degree of risk in that no delay is permissible in their execution. First, the analyst should identify the critical path and where there is zero or negative total float in the program schedule. Next, if time permits, the analyst should generate a probabilistic estimate showing the risk level for critical tasks and program milestones following the proper Schedule Risk Assessment (SRA) technique. The analyst should provide this probabilistic estimate in the integrated forecast of the analysis and be prepared to talk about the risks and contingencies associated with all remaining work.

SCHEDULE METRICS CHART
AIR-4.2.3 has established standard metrics and goals to measure proper scheduling techniques. Using these metrics to measure the condition of the contractor's scheduling approach will reveal whether the contractor's scheduling system and processes are inadequate and need immediate attention. First, the

[1] Duration related percent complete is a calculated field in the scheduling tool by dividing the actual duration of a task by its total duration.

purpose of measuring the precedence logic metric is to ensure that the government's network requirement is met. Fully networked logic refers to those tasks that need to be complete in relationship to the start or finish of other tasks. This requires each individual task to have a predecessor task and successor task identified. Second, a functioning networked schedule requires that the contractor limit the use of both hard and soft constraints to ensure that the network logic is not ignored. Third, the float metric is used to help identify whether there is any required down time or wait time between tasks, and if predecessors and successors have been

EXHIBIT A. SCHEDULE METRICS

AIR - 4.2.3 Standard Schedule Instruction Metric Goals		*Legend*					
		< 5%					
		5% to 20%					
		> 20%					
Program:		**Analysis Toolkit**					
Next Milestone:		Milestone					
Milestone Baseline Date:		xx/xx/xxxx					
Metrics For:		**Total Project**			**MAR06**		
IMS Date:		**JAN06**	**FEB06**	**MAR06**			
Schedule Status Date:		1/27/2006	2/24/2006	3/31/2006			
Statistics	Total Tasks	21276	23929	25598			
	% Complete	44%	42%	16%			
	% Incomplete	56%	58%	83%			
	Tasks Not Started	10749	12800	19742			
	Tasks in Progress	1159	1134	1581			
	% w/ SOW Reference	99%	99%	0%			
	Baseline Rate	9530	9958	6145			
Health	% Missing Logic	3%	4%	32%			
	% Constrained	10%	17%	19%			
	% High Float	68%	70%	48%			
	Average Float (Tasks > 44wd)	195	248	997			
	% High Duration (RW)	56%	53%	55%			
	Average Duration (RW)	100	94	148			
	% Tasks Missed (Cumulative)	31%	31%	51%			

Appendix C - Analysis Toolkit

Checklist for Review of the Contractor Performance Reports (CPRs)

Introduction

The CPR is prepared by the contractor and is used for analysis of cost and schedule status. This checklist is intended to aid in the review of contractors' CPR submissions.

The CPR consists of five formats:
Format 1 – Work Breakdown Structure (WBS)
Format 2 - Functional Categories
Format 3 – Baseline
Format 4 - Manpower loading
Format 5 - Problem Analysis

Formats 1 to 5 - Heading Information

- Is the contractor's name and location identified?
- Is the appropriate contract effort box checked?
- Is the contract identified correctly?
- Is the type of contract entered?
- Is the contract number entered?
- Is the number of the latest contract change or supplemental agreement entered?
- Are the program name and number identified?
- Are the reporting period beginning and ending dates entered?
- Is the report signed and dated?

Format 1 Heading Information

- Is the quantity of prime items to be procured entered?
- Is the negotiated dollar value (excluding fee or profit) entered?
- For cost-type contracts, has the estimated negotiated cost been entered?
- For fixed price incentive-type contracts, is the definitized contract target cost entered?
- Is this entry the estimated cost (excluding fee or profit) for work for which authorization has been given but for which contract prices have not been agreed to?
- Has the fee or percentage of profit been entered?
- Has the target price for definitized effort been entered?
- Is the total estimated cost at completion entered?
- Is the cost sharing ratio applicable to cost overruns and under-runs entered?
- Is the contract ceiling price for definitized effort entered?

- Is the estimated ceiling price for both definitized and undefinitized effort entered?

Format 1 - Performance Data

Note: If the G&A line is labeled "Non-Add", delete the references to "plus General and Administrative" or General and Administrative" in the appropriate paragraphs.

Column 1 WBS

- Are the WBS elements and levels reported the same as those specified in the contract?

Column 2 – current period – BCWS

- Is the sum of the BCWS for the individual WBS reporting elements, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?

Column 3 – current period – BCWP

- Is the sum of the BCWP for the individual WBS reporting elements, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?

Column 4 – current period – actual cost, work performed (ACWP)

- Is the sum of the ACWP for the individual WBS reporting elements, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?

Column 5 – current period – Schedule Variance (SV)

- Is the reported SV for the individual WBS reporting elements, cost of money, G&A, subtotal and total equal to the difference between column 8 (BCWP) and column 7 (BCWS)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are SVs that exceed the contractually established thresholds identified and fully explained in Format 5?

Column 6 – current period – Cost Variance (CV)

- Is the reported CV for the individual WBS reporting elements, cost of money, G&A, subtotal and total equal to the difference between column 3 (BCWP) and column 4 (ACWP)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are CVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 7 – cum-to-date – BCWS

- Is the sum of BCWS for the individual WBS reporting elements, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?
- Is the BCWS for the individual WBS reporting elements, cost of money and G&A greater for this reporting period than in the preceding reporting period?
- Is the BCWS less than or equal to the BAC column 14 for each WBS reporting element?

Column 8 – cum-to-date – BCWP

- Is the sum of BCWP for the individual WBS reporting elements, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?
- Is the BCWP for the individual WBS reporting elements, cost of money and G&A greater for this reporting period than in the preceding reporting period?
- Is the BCWP less than or equal to the BAC column 14 for each WBS reporting element?

Column 9 – cum-to-date – ACWP

- Is the sum of ACWP for the individual WBS reporting elements, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total?
- Is the ACWP for the individual WBS reporting elements, cost of money and G&A greater for this reporting period than in the preceding reporting period?

Column 10 – cum-to-date – Schedule Variance (SV)

- Is the reported SV for the individual WBS reporting elements, cost of money, G&A, subtotal, and total equal to the difference between column 8 (BCWP) and column 7 (BCWS)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are SVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 11 – cum-to-date – Cost Variance (CV)

- Is the reported CV for the individual WBS reporting elements, cost of money, G&A, subtotal, and total equal to the difference between column 8 (BCWP) and column 9 (ACWP)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are CVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 12 – reprogramming adjustments – CV

- If reprogramming has been approved and adjustments have been made to previously reported CVs, is the adjustment applicable to each WBS reporting element entered in column 12?
- Does the total line of column 12 equal the amount shown on the variance

adjustment line in column 11?

Column 13 – reprogramming adjustment – budget

- If reprogramming has been approved, are the total amounts added to the budget for each WBS reporting element entered in column 13? The amounts will consist of the sum of the budgets used to adjust CVs (column 12) plus the additional budget added to the QBS element for remaining work.
- Is the amount of budget added to cost of money, G&A, and MR entered on the appropriated line in column 13?
- Des the total line of column 13 equal the amount the contract has been budgeted in excess of the CBB?

Column 14 – at completion – budgeted -- NEGATIVE ENTRIES CANNOT BE MADE IN COLUMN 14.

- Is the sum of the BAC for the individual WBS reporting elements, cost of money, G&A, and UB equal to the reported subtotal?
- Is the sum of the subtotal and MR equal to the reported total BAC?
- Does the total BAC equal the CBB (the negotiated contract cost plus the estimated cost of authorized but unpriced work)? If the total BAC exceeds the CBB, government approval is required in advance and the portion of Format 1 under "Reconciliation to Contract Budget Base" must be filled out.

Column 15 – at completion – LRE

- Is the sum of the LRE for the individual WBS reporting elements, cost of money, G&A, and UB equal to the reported subtotal?
- If an entry other than zero is entered in column 15, is the rationale for this Figure explained in the narrative analysis on Format 5?
- Is the sum of the subtotal and MR equal to the reported total LRE?
- Are the LREs for the individual WBS reporting elements and total LRE consistent with customer estimates?
- Are the LREs for the individual WBS reporting elements and total LRE less than or equal to the ACWP column 9?

Column 16 – at completion – variance (VAC)

- Is the reported VAC for the individual WBS reporting elements, cost of money, G&A, subtotal, and total equal to the difference between column 14 (BAC) and column 15 (LRE)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are VACs which exceed the contractually established thresholds identified and fully explained in Format 5?
- G&A Has the G&A rate been applied correctly?

<u>Undistributed Budget (UB)</u>

- Are the UB entries in columns 14 and 15 the same?

- Is the UB fully explained in Format 5?
- MR Are all MR appications (differences between the last report's MR column 14 and the current report's MR column 14) explained in Format 5?
- Variance adjustments Doe the entries in columns 10 and 11 reflect the SV and CV adjustments which have been approved by the government?

Total contract variance

- Are the entries in columns 10 and 11 equal to the sum of the total and variance adjustment entries in columns 10 and 11?
- Is the entry in column 14 equal to the negotiated cost plus estimated cost of authorized unpriced work?
- Is the entry in column 16 equal to the difference between columns 14 and 15?

Format 2 – Functional Categories

If the G&A is labeled "non-add", delete the references to "and General and Administrative" in the appropriate paragraphs.

Column 1 – organizational or functional category

- Are the functional categories listed the same as those reflected in the contractor's internal management system and agreed to through negotiation?

Column 2 – current period – BCWS

- Is the sum of the BCWS for the individual functional categories, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with Format 1?

Column 3 – current period – BCWP

- Is the sum of the BCWP for the individual functional categories, cost of money and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with Format 1?

Column 4 – current period – ACWP

- Is the sum of the ACWP for the individual functional categories, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with Format 1?

Column 5 – current period – SV

- Is the reported SV for the individual WBS reporting elements, cost of money, G&A, subtotal, and total equal to the difference between column 3 (BCWP) and column 2 (BCWS)?
- Are negative (unfavorable) variances enclosed in parentheses?

- Are SVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 6 – current period – CV

- Is the reported CV for the individual WBS reporting elements, cost of money, G&A, subtotal, and total equal to the difference between column 3 (BCWP) and column 4 (ACWP)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are CVs which exceed the contractually established thresholds identified and fully explained in format 5?

Column 7 – cum-to-date - BCWS

- Is the sum of the BCWS for the individual functional categories, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with Format 1?
- Are the BCWS for the individual functional categories, cost of money, and G&A greater for this reporting period than in the preceding reporting period?
- Is the BCWS less than or equal to the BAC column 14 for each functional category?

Column 8 – cum-to-date BCWP

- Is the sum of the BCWP for the individual functional categories, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with format 1?
- Are the BCWP for the individual functional categories, cost of money, and G&A greater for this reporting period than in the preceding reporting period?

Column 9 – cum-to-date ACWP

- Is the sum of the ACWP for the individual functional categories, cost of money, and G&A equal to the reported subtotal?
- Does the subtotal equal the reported total? Is this number consistent with Format 1?
- Are the ACWPs for the individual functional categories, cost of money, and G&A greater for this reporting period than in the preceding reporting period?

Column 10 – cum-to-date SV

- Are the reported SVs for the individual functional categories, cost of money, G&A, subtotal, and total equal to the difference between column 8 (BCWP) and column 7 (BCWS)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are SVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 11 – cum-to-date – CV

- Are the reported CVs for the individual functional categories, cost of money, G&A, subtotal, and total equal to the difference between column 8 (BCWP) and column 9 (ACWP)?
- Are negative (unfavorable) variances enclosed in parentheses?
- Are CVs which exceed the contractually established thresholds identified and fully explained in Format 5?

Column 12 – reprogramming adjustment – CV

- If reprogramming has been approved and adjustments have been made to previously reported CVs, is the adjustment applicable to each WBS reporting element entered in column 12?
- Does the total line of column 12 equal the amount shown on the variance adjustment line in column 11?

Column 13 - reprogramming adjustment – budget

- If reprogramming has been approved, are the total amounts added to the budget for each functional category entered in column 13? The amounts will consist of the sum of the budgets used to adjust CVs (column 12) plus the additional budget added to the functional category for remaining work.
- Is the amount of budget added to cost of money, G&A, and MR entered on the appropriated line in column 13?
- Des the total line of column 13 equal the amount the contract has been budgeted in excess of the CBB?

Column 14 – at completion – budgeted (BAC)

- Is the sum of the BAC for the individual functional categories, cost of money, G&A, and UB equal to the reported subtotal BAC?
- Is the sum of the subtotal and MR equal to the reported total BAC? Is this number consistent with Format 1?
- Does the total BAC equal the CBB (the negotiated contract cost plus the estimated cost of authorized but unpriced work) when reprogramming has not occurred?

Column 15 – at completion – LRE

- Is the sum of the LRE for the individual functional categories, cost of money, G&A, and UB equal to the reported subtotal LRE?
- If an entry other than zero is entered in column 15, is the rationale for this Figure explained in the narrative analysis on Format 5?
- Is the sum of the subtotal and MR equal to the reported total LRE?
- Are the LREs for the individual functional categories and total LRE consistent with customer estimates?
- Are the LREs for the individual functional reporting categories and total LRE less than or equal to the ACWP column 9?

Column 16 – at completion – variance VAC

- Are the reported VACs for individual functional categories, cost of money, and G&A equal to the difference between column 14 (BAC) and column 15 (LRE)?
- Does the total line on format 2 agree with the total line on Format 1?

Format 3 – Baseline

Block 1 – original contract target cost

- Is the negotiated dollar value (excluding fee or profit) in the original contract entered?
- For cost-plus contract, has the negotiated estimated cost been entered?
- For a fixed price incentive contract, has the definitized contract target cost been entered?

Block 2 – negotiated contract changes

- Has the cumulative cost (excluding fee or profit) for definitized contract changes to date been entered?

Block 3 – current target cost

- Does the amount entered equal the sum of blocks 1 and 2?
- Is this amount equal to the current dollar value (excluding fee or profit) on which contractual agreement has been reached?
- Is this amount equal to the negotiated cost on Format 1?

Block 4 – estimated cost of authorized, unpriced work

- Is this entry the estimated cost (excluding fee or profit) for contract changes (with written authorization) but contract prices have not been negotiated?
- Is this amount the same as shown on Formats 1 and 2?

Block 5 – Contract Budget Base (CBB)

- Does the amount entered equal the sum of blocks 3 and 4?
- If reprogramming has not occurred, is this block the same as column 14, total line of Format 1?
- If reprogramming has occurred, is this block the same as column 14, total contract variance line of Format 1?

Block 6 – Total Allocated Budget (TAB)

- Is this amount equal to the total line in column 14 on Format 1?

Block 7 – difference

- Is the amount shown the difference between block 5 and block 6?
- Is the difference in value fully explained in Format 5?

Column 1 – item

- Has the time-phased Performance Measurement Baseline (PMB) which existed at the beginning of current reporting period been entered?
- Have the entries on this line been taken from previous report's PMB (end of period)? (NOTE: the column 2 entry will be the sum of the previous columns 2 and 3; column 3 will be th previous column 4, etc.).

Baseline changes

- Have all authorized baseline changes been listed?
- Are the changes adequately explained in Format 5?

General & Administrative (G&A)

- Are the appropriate G&A costs entered?

Undistributed Budget

- Is the total amount of UB as the end of the reporting period entered?
- Is this the same UB as shown on Formats 1 and 2?

PMB – baseline (end of period)

- Does this entry represent the effects of authorized changes and allocations of UB and Management Reserve (MR) upon PM Baseline (beginning of period for this reporting period)?

Management Reserve (MR)

- Verify this entry is the same amount of MR shown in column 12 of Format 1.

Format 3 – BCWS to date

- Do the entries in the bottom five lines of column 2 (G&A thru total) equal the corresponding entries in column 7 of Format 1?

- Total budget. Do the entries in the bottom five lines of column 14 (G&A through total) equal the corresponding entries in column 12 of Format 1?

Format 4 – Manpower Loading

- Is the reporting unit (equivalent man-months, man-hours, etc) indicated?

Column 1 – organization of functional category

- Are the functional categories shown the same as those in Format 2?
- Total direct. Is the amount entered equal to the sum of all the individual functional categories for each column?

Format 4 – Actual End of Current Period (cum)

- Does the entry in column 3 equal the column 3 entry from the previous report plus the column 2 entry from this report?

- At completion. For each category, do the entries in column 15 equal the sum of the entries in columns 3 through 14?

Format 5 – Problem Analysis Report

- Has a summary analysis of overall contract performance been provided?
- Have significant variances been explained?
- Are all UBs fully explained?
- Are all MR applications fully explained?
- Are all baseline changes identified and fully explained?

As a final check, an EAC should be developed within the program office. A current EAC should be maintained for comparison to the contractor's LRE. Differences between the government and contractor estimates should be examined thoroughly.

APPENDIX D: SCHEDULE RISK ASSESSMENT INSTRUCTION

DESCRIPTION

This instruction provides standard guidance for carrying out a schedule risk assessment. It follows a checklist method to help the government schedule analyst (referred to as analyst herein) obtain an understanding of standards that are relevant to scheduling and explains the reasons behind each check. The AIR-4.2.3 Subject Matter Expert (SME) has been delegated the responsibility to oversee and enforce the management systems review process in conformity with this instruction. It is the AIR-4.2.3 Branch Head that is responsible for the delegation of resources and to ensure that quality products are generated in a timely manner. This document is the governing document; the SRA toolkit contains more detailed instructions for conducting an SRA.

_____
David E. Burgess
Cost Department Head

_____
Ted E. Rogers
EVM Division Head

_____
Christopher D. Mushrush
EVM Deputy Division Head (SME)

_____
John Scaparro
Scheduling Process Owner

INTRODUCTION

Scheduling standards are intended to inform industry of the meaning NAVAIR attaches to various aspects of network scheduling. The criteria require a formal scheduling system be established and used consistently throughout the life of the contract. The contractor should demonstrate that the scheduling technique meets the minimum requirements of network scheduling as defined in ANSI-748-98, and is consistent with the written system description and operating procedures.

The primary purpose of a schedule risk assessment is to identify the high risk areas of the program, determine the likelihood of risk materializing, assess the impact of possible risk, and more importantly, have the information and opportunity to mitigate risk long before it impacts the program. The initial assessment should be scheduled to begin as soon as the Performance Measurement Baseline (PMB) is implemented but no later than six months after contract award. In accordance with specific contract requirements, it is preferable for the SRA to occur at least two weeks prior to the Integrated Baseline Review (IBR) and then quarterly thereafter.

NETWORK SCHEDULE BENEFITS

Network diagrams should be applied to all projects in all phases of development through production. The level of detail and specifics is much greater for development (EMD) contracts than for low rate (LRIP) and full rate (FRP) contracts. The primary purpose of a network diagram as opposed to a pictorial representation of a project schedule is to ensure that the right resources are available, scheduled, and applied at the appropriate time and in the proper amount. For complex, high dollar multi-year projects, network diagrams should not be an afterthought. By definition, budgeting means you are concentrating on making sure any type of scheduled work is something you can afford to do. Therefore, it is essential to have a calculated plan when making your evaluation. For project teams with discipline and common sense, network diagrams offer stability in a complex and unpredictable environment. When you establish strategies and targets for how your budget is to be spent, you spend it wisely. The more complex a project is, the greater the value the network diagram is in developing a schedule and a budget. Though there is a cost (in time and money) associated with implementing a network diagram, this cost is relatively low when compared to the potential benefits. The cost of network diagrams should be weighed against the broad costs of stakeholders' loss of confidence in performance data, which limits insight, weakens critical decision-making processes, and increases the chances of delays and cost overruns.

REPORT

As part of a schedule risk assessment, the analyst is required to use the following 7 steps as a checklist when determining the high risk areas of the program schedule. The analyst's assessment should be put in writing and delivered to the branch head for review no later than ten calendar days after completing the assessment. The branch head then has three workdays to review with comments and return to the analyst. The analyst is required to notify the branch head immediately if more time is needed and the branch head will notify the analyst if three workdays for review is not executable. Documentation can include screen shots, charts, decision tables, and

resource plans. The analyst's report should provide insight into the uncertainty associated with a high-risk task and make realistic statements with regard to the likelihood of a high risk task meeting its completion date. The final documented assessment should include the following parts:

- Cover Page
- Executive Summary
  - Conclusion
  - Recommendations
  - SRA trend chart
- SRA Assumptions
  - Objectives
  - Scope
  - Methodology
- Findings and Conclusions
- Recommendations
- Schedule Histograms (Appendix A)
- Contractor Data Sheets (Appendix B)
- Risk criticality (Appendix C)

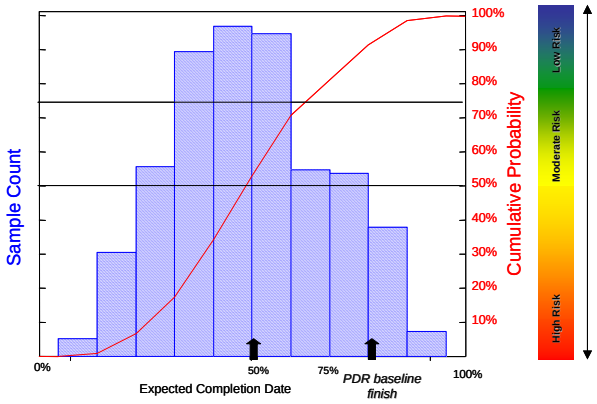
SCHEDULE RISK RATING

The analyst's written conclusion should rate the program schedule as one of the following:

High Risk. Probability of completing key program milestone(s) baseline finish date is less than or equal to 50%.

Moderate Risk. Probability of completing key program milestone(s) baseline finish date is greater than 50% but less than 75%.

Low Risk. Probability of completing key program milestone(s) baseline finish date is greater than or equal to 75%.



Where does the baseline date of the next milestone fall?

7 STEP PROCESS

Step 1. Develop a complete critical path network schedule using scheduling software. For the risk assessment to be successful, the network schedule must be developed and maintained appropriately. A schedule network represents the program strategy. Tasks are linked by relationships (e.g., finish-start, start-start, finish-finish) showing how the work is planned to be accomplished. Strings of linked predecessor and successor tasks constitute 'paths' through the network. The Critical Path Method (CPM) of scheduling is traditional and well accepted by industry for developing the logic of the schedule. More often than not, the contractor will modify the strategy several times until the network is sound and tasks flow correctly.

To be most effective, the contractor's network schedule must be approved or rejected within the beginning months of the program and then continuously revisited. Because a common baseline is vital to the determination of program delays, network approval must be a top priority. The assessment should be performed at the lowest level at which work will occur, usually the work package and planning level.

Step 2. Identify reporting tasks/milestones (also known as key events) and risk candidates. When building the risk assessment, the analyst should evaluate both critical and near-critical paths through the network schedule. It is best to show more paths rather than fewer, since the shorter poles might actually have more risk than the long poles identified by the network. This is best accomplished via Ground Rules and Assumptions meeting, to determine specific requirements. Refer to Contract CDRL for specific requirements.

Step 3. Enter risk parameters for each non-summary task. When preparing remaining duration estimates for each non-summary task listed on the network schedule, the analyst should interpret the future based on objective and rational judgment. The analyst should begin the process with a substantiation of the time incurred for the work accomplished to date. The analyst should then consider all known or expected impacts. This should be accomplished with the help of technical expertise from the government program office and the contractor. A 3-point remaining duration estimate should be prepared and classified into three categories: best case, worst case, and most likely, summarized below. Global edits, in addition to individual 3-point estimates, may bring added fidelity to the results. When identifying risk parameters, the analyst should assign a distribution curve. A triangular or beta distribution curve is recommended for near term, discrete, work packages. LOE and/or support tasks can be removed, de-linked, or otherwise discounted.

Assumptions for each scenario should be documented using the Contractor Data Sheet.

Best Case. A task's best case estimate is the one that results in the shortest duration. This estimate assumes that performance requirements can be met, and is based on the outcome of the most favorable set of circumstances. This estimate is also based on the outcome of the most favorable set of circumstances with a greater than 90% chance of occurrence[1].

Worst Case. The worst case estimate is the one that typically results in the longest duration to the task. This estimate assumes that performance requirements can be met, and is based on the outcome of the least favorable set of circumstances. This estimate is also based on the outcome of the least favorable set of circumstances a greater than 90% chance of occurrence.

Most Likely. The most likely estimate is the duration that you believe is the task's most likely outcome based on a knowledgeable estimate of all remaining work, known risks, known opportunities, and probable future conditions. Again, this estimate assumes that performance requirements can be met.

Step 4. Run the Monte Carlo Simulation. The analyst will need to determine the number of iterations to run the simulation, and select the options related to the collection of schedule data. The number of iterations will depend on the size of the network and relationship of the mean and standard deviation. The analyst will want to retain the results from each simulation for later analysis.

Step 5. Analyze Results. As part of the risk assessment, the analyst should analyze alternatives for assistance in decision making by identifying and quantifying all anticipated problems or achievements. The analyst should be sure to assess the risks (and opportunities) in each alternative course of action.

Step 6. Document process and results. Documentation includes all documentation necessary for providing a useful result to the Program office. This includes detailed notes during the SRA, augmenting documentation already provided on the Contractor Data Sheets, and any meeting summary documentation not already included in the details of the review.

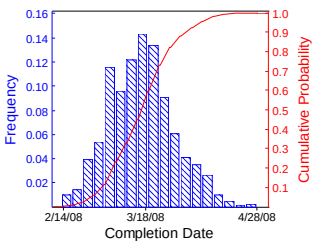
Subsequently, following the outline in this SSI as a guide, and the detailed instructions in the SRA toolkit, the analyst will bring all the information together in an SRA report. While the SRA report may be extremely detailed, the brief to the PMA may include just highlights and an executive overview. The analyst should be sure to point out risks (and opportunities) in each alternative course of action.

Step 7. Interpret and present results. After all documentation has concluded, the analyst will create a high level brief including SRA overview, conclusions, recommendations, pertinent histograms, and SRA trend chart. The EVMS analyst needs to schedule time to present the results to the PM, IPT leads, and other interested parties for reviewing interpretation of results, and potential program impacts. The analyst can then help the team identify what those risks mean to them, and which risks are most receptive to risk mitigation.

EXHIBIT A. SCHEDULE HISTOGRAM

Date: 12/19/2006 12:07:28 PM
Samples: 1000
Unique ID: 2805
Name: MS6 - START HCT

Completion Std Deviation: 8.95 d
95% Confidence Interval: 0.55 d
Each bar represents 3 d



Completion Probability Table

Prob	Date	Prob	Date
0.05	2/27/08	0.55	3/18/08
0.10	3/3/08	0.60	3/20/08
0.15	3/4/08	0.65	3/21/08
0.20	3/6/08	0.70	3/24/08
0.25	3/7/08	0.75	3/25/08
0.30	3/11/08	0.80	3/27/08
0.35	3/12/08	0.85	3/31/08
0.40	3/13/08	0.90	4/3/08
0.45	3/14/08	0.95	4/9/08
0.50	3/17/08	1.00	4/28/08

[1] A greater than 90% likelihood of occurrence is defined as the probability of an undesired event occurring that can cause some disruption of schedule, increase in labor hours, or degradation of performance, or a desired event that has the potential to save time, lower labor hours, or enhance performance.

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