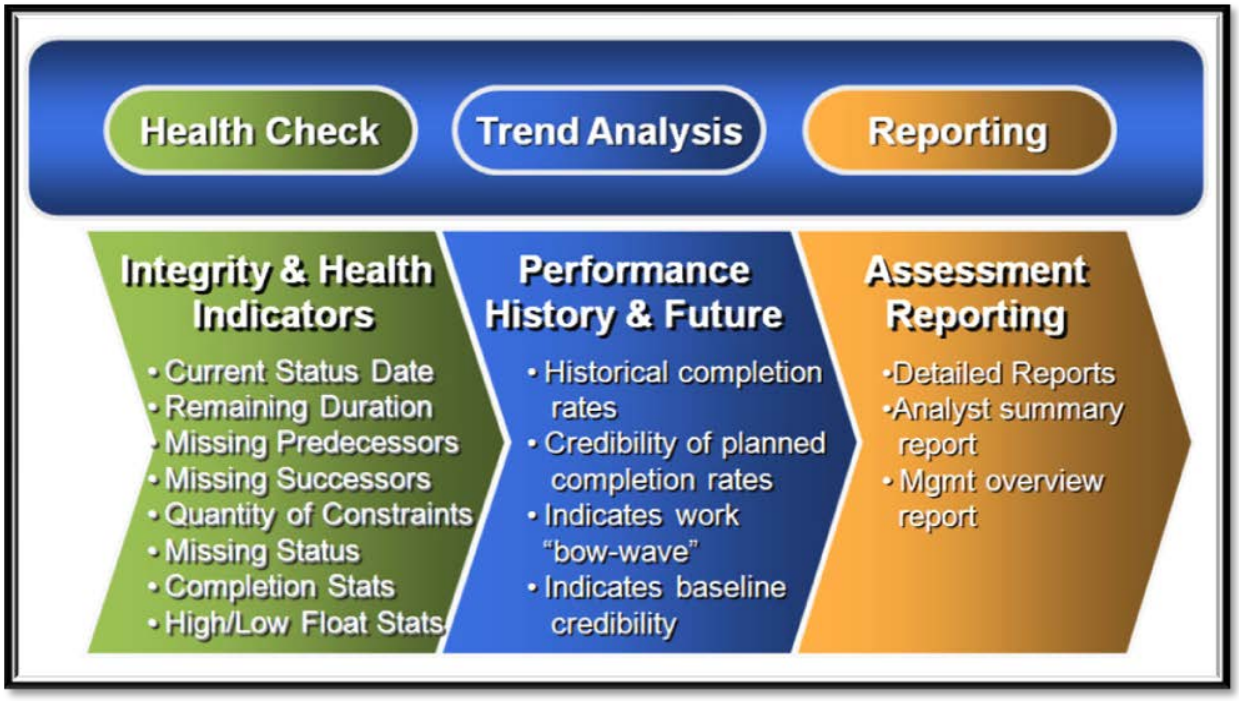
Schedule Test and Assessment Tool (STAT)

User's Guide



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Section 1: Overview and Purpose

Sound schedule management involves the establishment, utilization, and control of a baseline master schedule. Schedule management at the project level entails the creation of an Integrated Master Schedule (IMS) that contains a logic network made up of tasks and milestones, interdependency relationships, task durations, and valid date constraints. The IMS provides the framework for time phasing and coordinating all project efforts into a master plan to ensure that objectives are accomplished within project or program commitments. With the IMS playing such a critical role in achieving project success, it is crucial for project schedules to provide accurate and meaningful planning data for all levels of management oversight within both NASA and its contractor community. Regardless of the type project being implemented it is essential that the IMS contains credible schedule data that addresses the total scope of work at a level of detail to allow for discrete progress measurement, management visibility, and critical path identification and control. This approach provides management with greater schedule visibility and the capability to accurately plan necessary resources when needed to accomplish the work.

Schedule credibility can be determined by monitoring key indicators within an IMS that reflect both good and poor characteristics in the areas of schedule structure, maintenance, and performance. These indicators are based on both, the accepted rules of logic network development used in critical path method (CPM) scheduling techniques, and also the performance trending criteria established by the Office of Primary Responsibility for Project Planning and Control (PP&C) at MSFC.

The Schedule Test and Assessment Tool (STAT) was created to assist the scheduling community in the identification, measurement, and rating of key credibility indicators contained within a project IMS. By monitoring key indicators and incorporating necessary corrections, the STAT tool aids in the development of accurate project schedules, and also in their assessment of credibility within existing in-house and contractor schedules. This tool was also created to bring about greater efficiency in the development, assessment, and analysis of project schedules.

This schedule management tool was developed by NASA at the Marshall Space Flight Center (MSFC) in Huntsville, AL. Distribution of the STAT software is managed by the Performance and Capabilities Office (CS40) at MSFC. Contact information regarding the request or use of the STAT software is provided below.

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Section 2: Software Installation

Installation Instructions:

While the STAT tool is not a commercially developed application, it has been developed and packaged so that installation and operation processes are much the same as any commercial software product. Installing the STAT application can be accomplished by following the steps provided below.

Note: When installing the STAT software, Microsoft Project must be closed.

Step One:

Save the STAT zip file to a desired folder.

Step Two:

If an earlier version of the STAT application exists on your personal computer then removal of that version is required first. This can be accomplished by making the following selections:

Windows XP

- Select **Start**
- Select **Settings**
- Select **Control Panel**
- Select **Add/Or Remove Programs**
- Select **STAT Program**
- Select **Remove**

Windows 7

Select **Start icon** 
Select **Control Panel**
Select **Uninstall a Program**
Select **STAT Program**
Select **Uninstall**

Additionally, anyone who has previously installed the earlier "Schedule Health" macros, provided by the Marshall Space Flight Center (MSFC), must also remove that set of macros from the Microsoft Project application prior to installing STAT. This can be accomplished by making the following selections:

Microsoft Project 2007

- Select **Tools**
- Select **Macro**
- Select **Macros**
- Select **Macro for "old" Health Check**
- Select **Delete**

Microsoft Project 2010

Select **View**
Select **Macros**
Select **View Macros**
Select **Macro for "old" Health Check**
Select **Delete**

In some cases, earlier versions of the old Health Check macros may have also created specific filters that were needed to accomplish the Health Check process. These filters may prevent the STAT tool from functioning properly and should be removed. This can be accomplished by making the following selections:

Microsoft Project 2007	*Microsoft Project 2010*
➢ Select **Project**	Select **View**
➢ Select **Filter for:**	Select **Filter**
➢ Select **More Filters**	*(same remaining steps as MSProj 2007*
➢ Select **Organizer**	

- Select **Specific Filters in both 'Global.MPT' and Current Project listings** (select the filters created by the Health Check macro process – these filters will appear ambiguous and not follow typical naming conventions, for example: xxxx, yyyy, etc.)
- Select **Delete**

Step Three:

Using the WinZip utility, unzip the STAT file by selecting "Extract to here". See the following figure (Figure 2-1). Two files will be extracted to the folder (e.g.,"ProjToolsAddinSetup.msi" and "setup.exe")

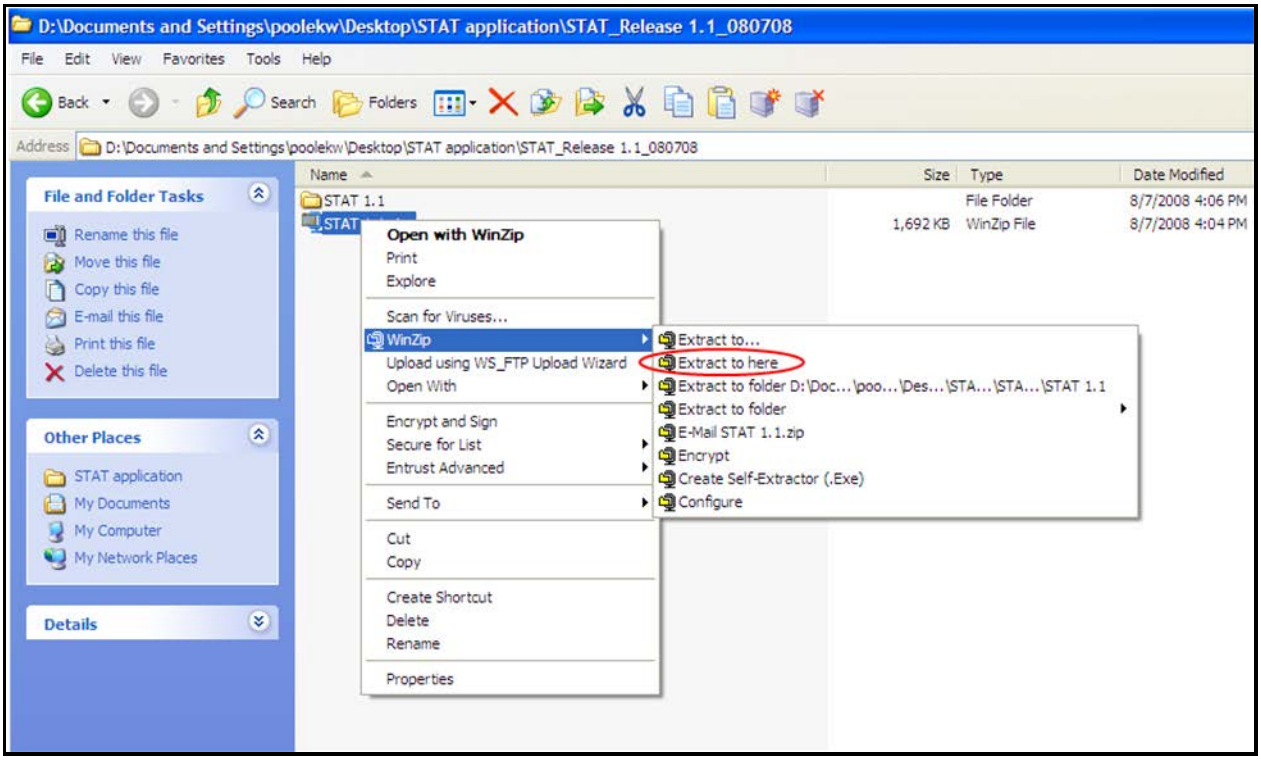


Figure 2-1: STAT Unzip and Installation Guidance

Step Four:

Select the setup.exe file that has been extracted.

Step Five:

Follow the on-screen instructions provided during the installation.

Step Six:

Verify that the STAT toolbar is visible by opening MS Project (versions 2003, 2007, or 2010) the STAT toolbar should have 4 selection buttons – Health Check, SASR, Trend Analysis and About). See the figures below (Figures 2-2, 3). The selection labeled "About" will indicate the version of STAT.

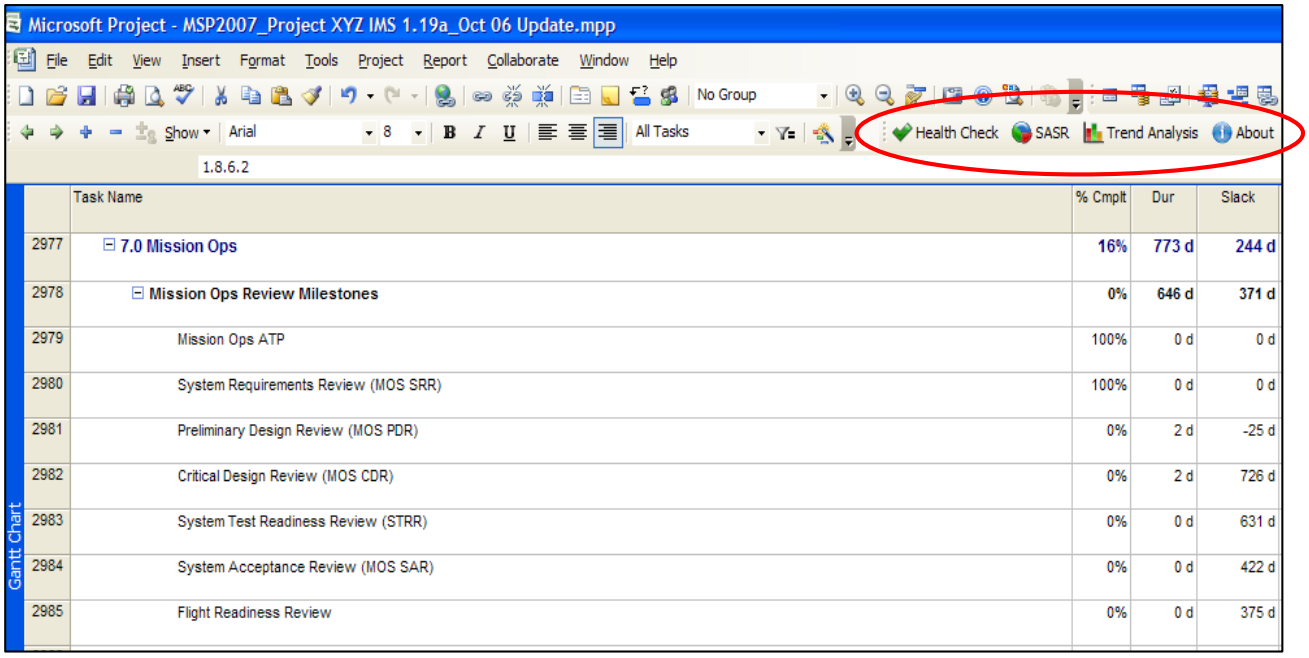


Figure 2-2: STAT Toolbar Icons after Installation (MS Project 2003 and 2007)

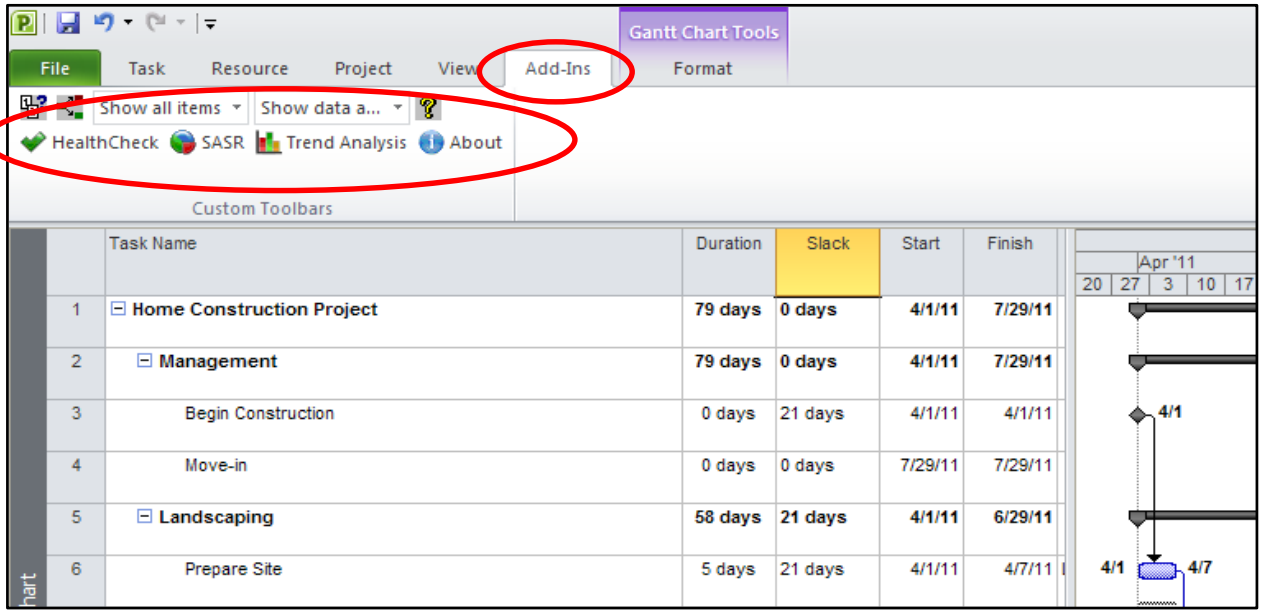


Figure 2-3: STAT Toolbar Icons after Installation (MS Project 2010)

Section 3: The Schedule Health Check

Initiating the Schedule Health Check:

The purpose of the Health Check is to provide the user a very quick assessment of schedule soundness and credibility. Schedule integrity is determined by monitoring key indicators within an Integrated Master Schedule (IMS) that reflect both good and poor characteristics of schedule structure and maintenance. Examples of key indicators within an IMS logic network that must be monitored include the following: number of missing predecessors and successors, invalid task constraints, omission of task status, improper status on future tasks, logic ties to/from summary tasks, inaccurate logic ties, and improperly reflecting tasks as milestones. These indicators are based on standard rules of logic network development utilized in critical path method (CPM) scheduling techniques. The automated Schedule Health Check assists in quickly monitoring and assessing these key indicators within a project schedule. To initiate this assessment function, select the Health Check icon from the MS Project toolbar. The icon initiates the Schedule Health Check Wizard. This wizard leads the user through five simple steps to produce a Schedule Health Check output report.

Step 1 produces a wizard dialogue box that allows the user to set the schedule "Status Date" on which the resulting Health Check data will be based. After selecting the desired status date click "Next" (see Figure 3-1). Note: The schedule should have a Status Date that represents the date the schedule was statused through. If the date is missing or obviously incorrect it should be added/changed.

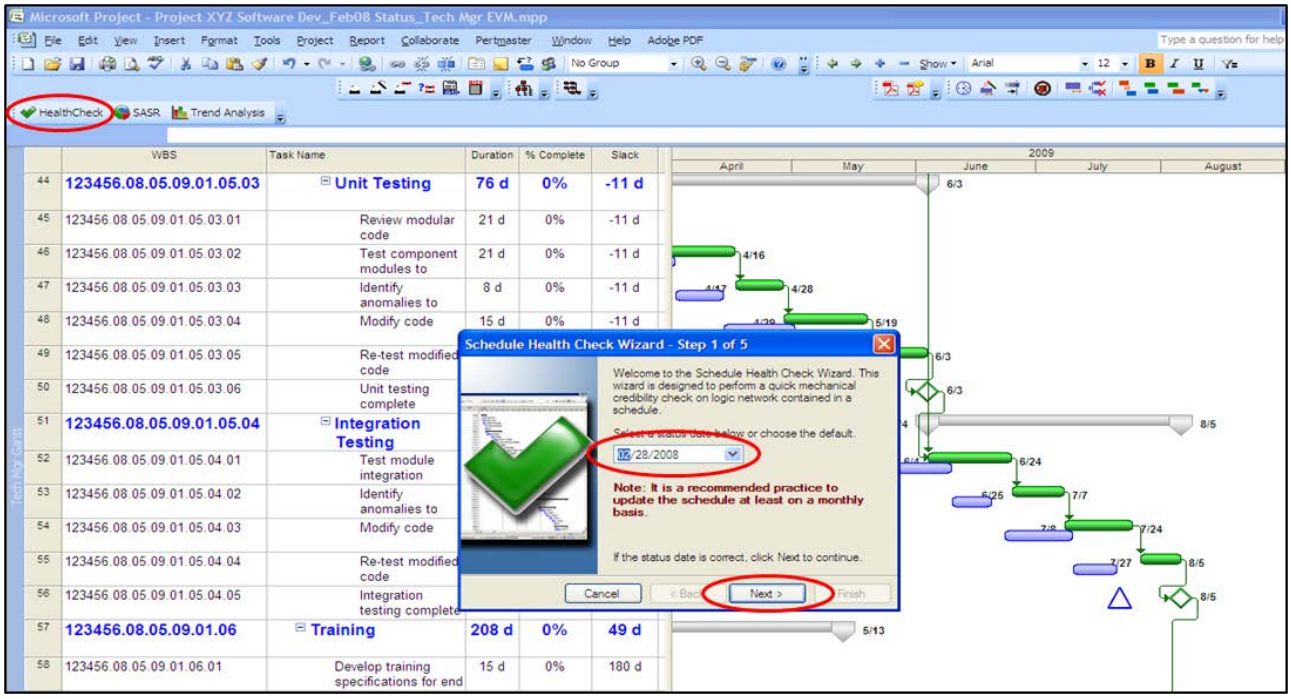


Figure 3-1: Health Check Wizard - Step 1

Step 2 of the Health Check Wizard produces a dialogue box that allows the user to set the percentage threshold for slack values that are considered too large. This is done by selecting a percentage value of the remaining project duration that is to be considered the threshold value for too much slack (see the figure below). The default percentage value is preset at 25% of the remaining project duration. STAT will calculate what this value equates to, in terms of project work days, and then tabulate for the user how many and what percentage of tasks/milestones have slack values that are greater than the set threshold percentage. This information provides the user an additional means to quickly discern whether too many schedule tasks are missing interdependencies, or possibly have incorrect interdependencies identified in the schedule. The results of this tabulation are found on line #42 in the Schedule Health Check report.

After selecting the desired percentage value, click next (see figure 3-2).

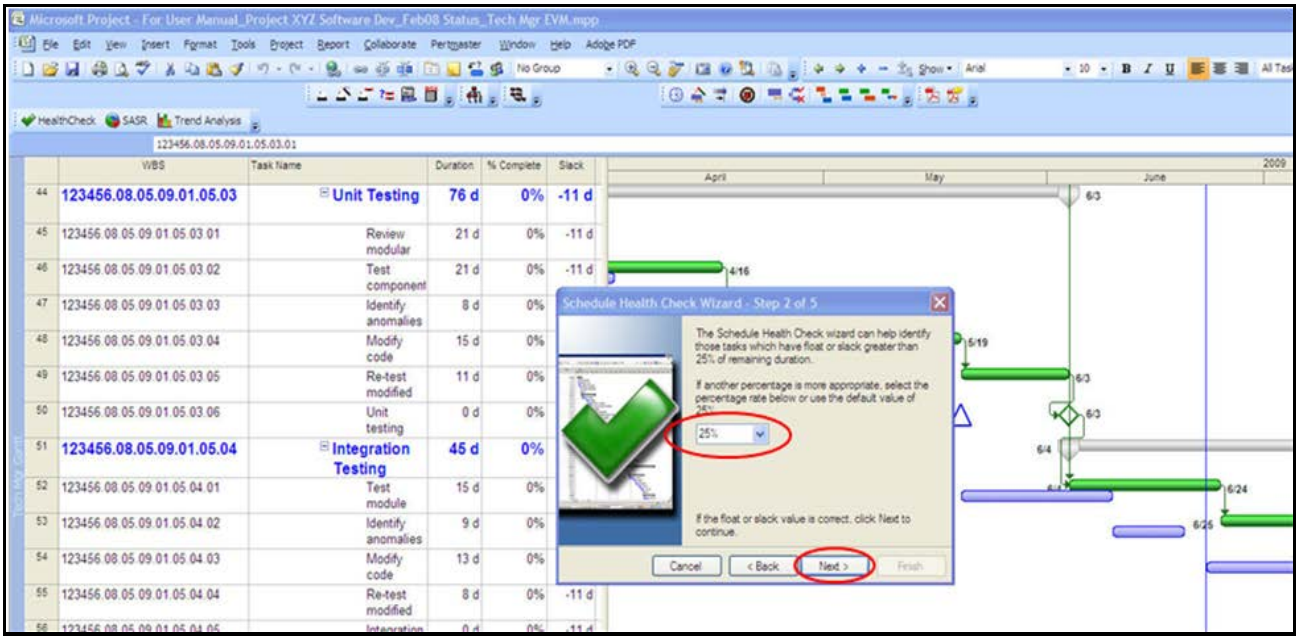


Figure 3-2: Health Check Wizard - Step 2

Step 3 of the Health Check Wizard produces a dialogue box that allows the user to select appropriate choices that apply to the schedule data being assessed. The choices to be made include the following: is the IMS traceable to the project Work Breakdown Structure (WBS), does the IMS identify a credible critical path, and is the IMS resource loaded. If the information is not yet known for any or all of these questions, the user can continue with the default selections in place and make the corrected choices at a later time.

After selecting the desired step 3 choices, click next (see figure 3-3).

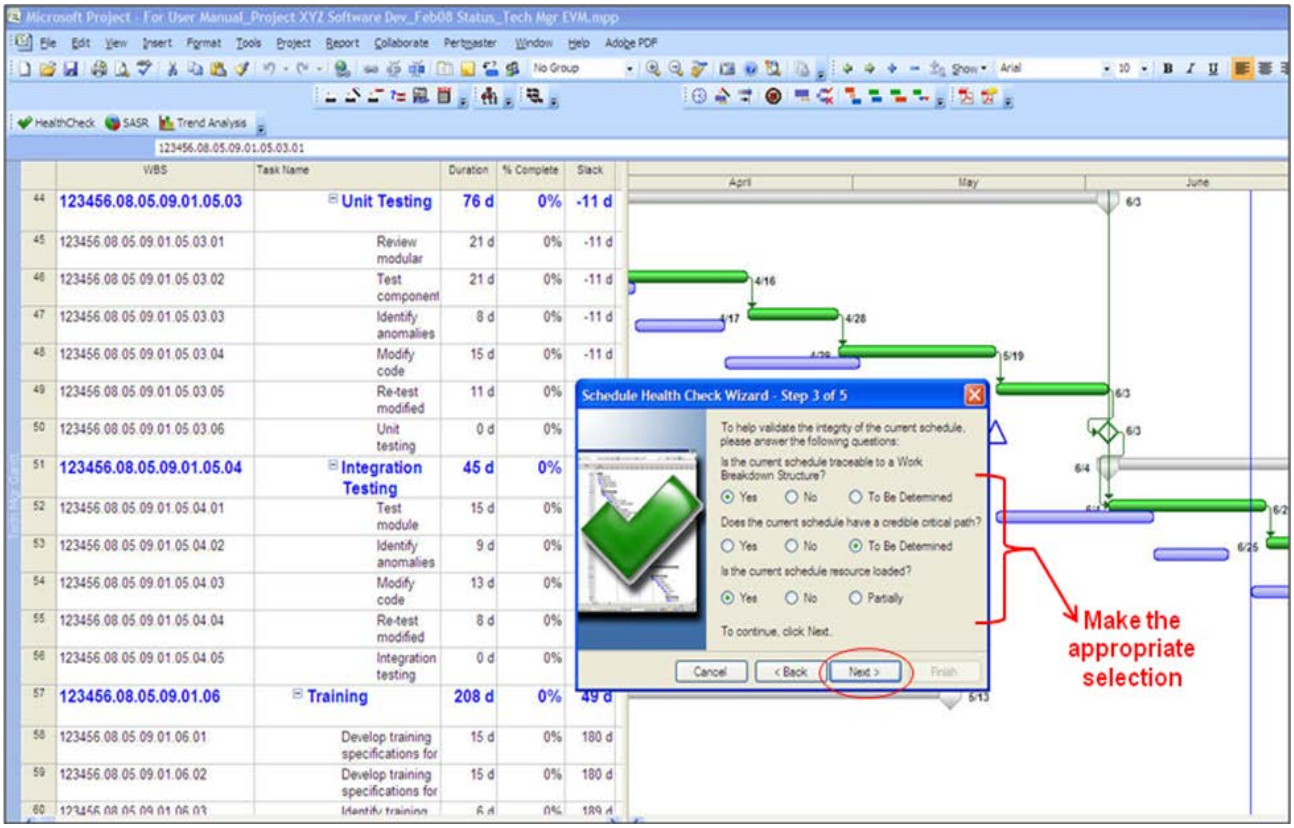


Figure 3-3: Health Check Wizard - Step 3

Step 4 of the Health Check Wizard produces a dialogue box that provides the user the option of receiving Health Check results reflecting only the most recent run or a comparison of results for both, the most recent run and a previous Health Check run. ***Note*** *– if the comparison option is selected, the user must ensure that the desired previous Health Check file, to be used in the comparison, is* ***not*** *open.*

The step 4 dialogue box also provides a browse function to allow the user to select the location where they wish the final output file to be stored.

After selecting the desired step 4 choices, click next (see figure 3-4).

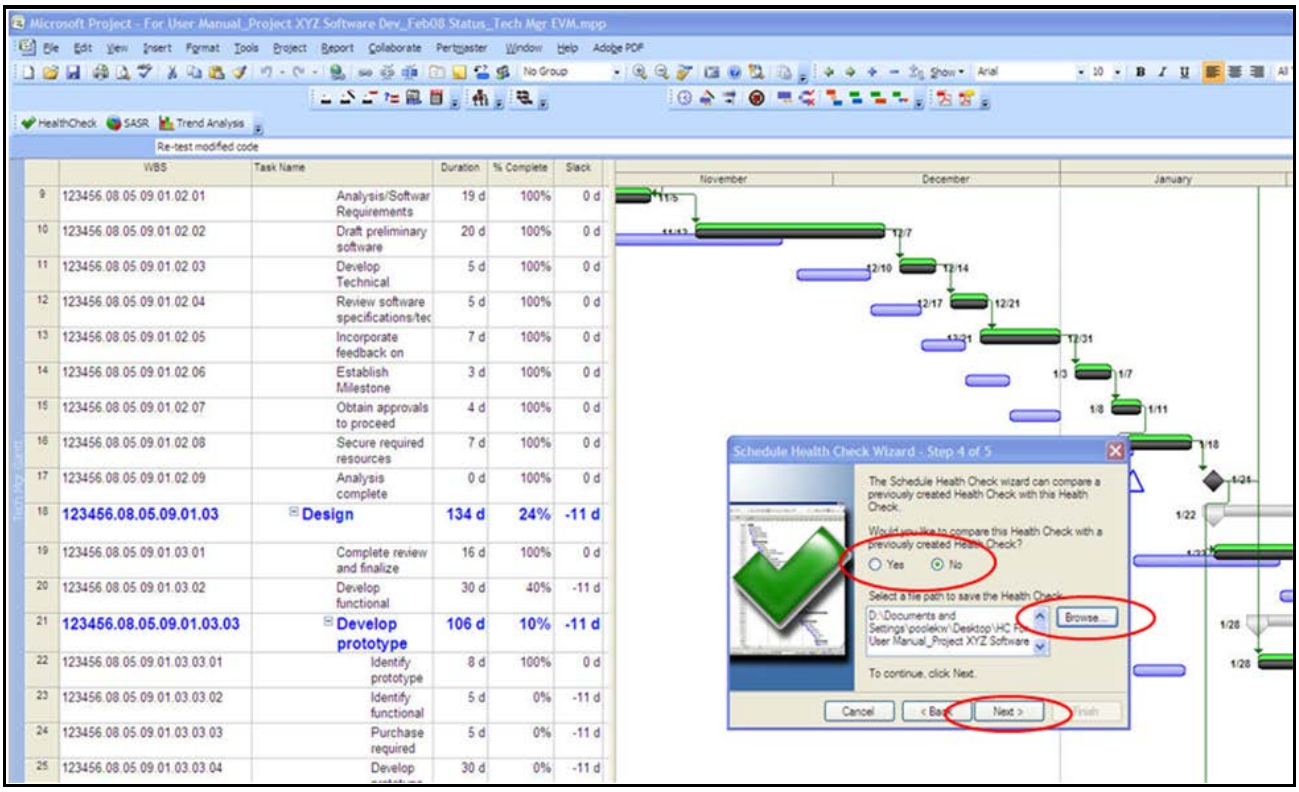


Figure 3-4: Health Check Wizard - Step 4

Step 5 of the Health Check Wizard produces a final dialogue box that allows the user to complete the final step in initiating the Schedule Health Check. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for transferring the Health Check data results into the Excel template may take several minutes if the schedule file size is very large.

Click finish (see figure 3-5) to complete the Schedule Health Check processing and compilation of assessment data.

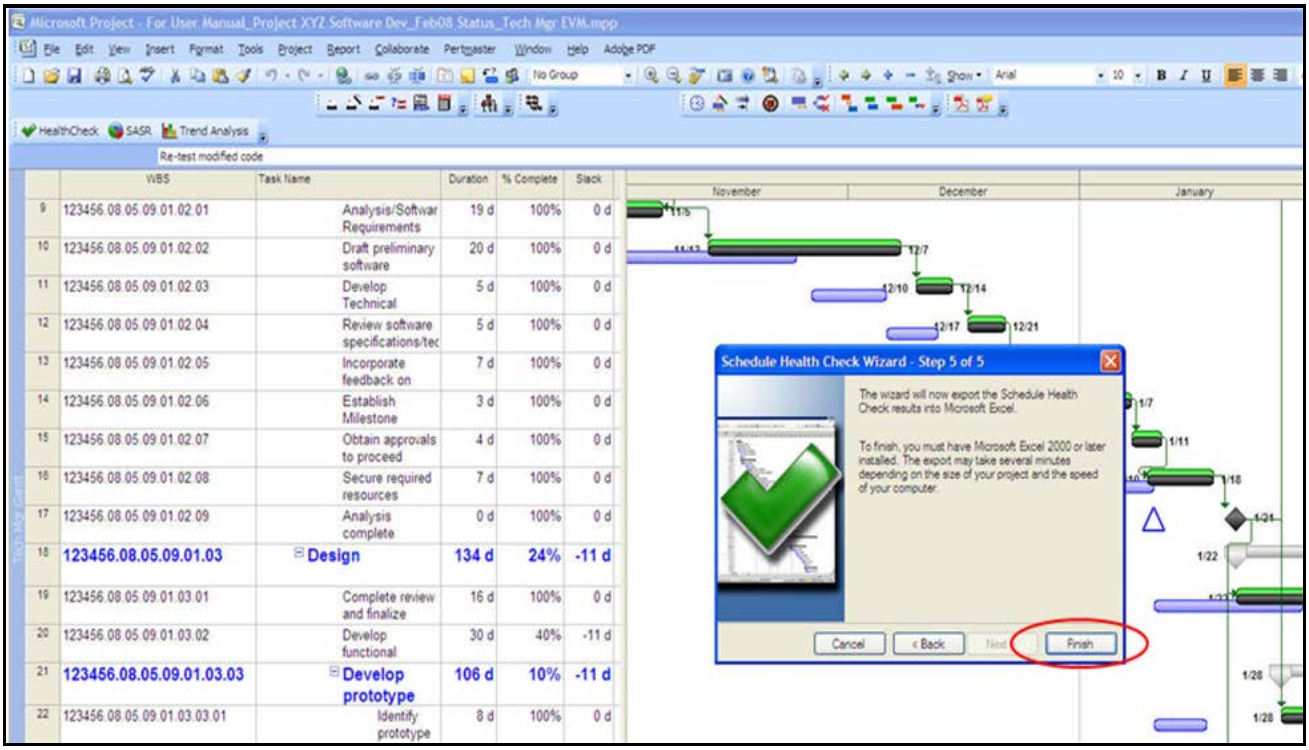


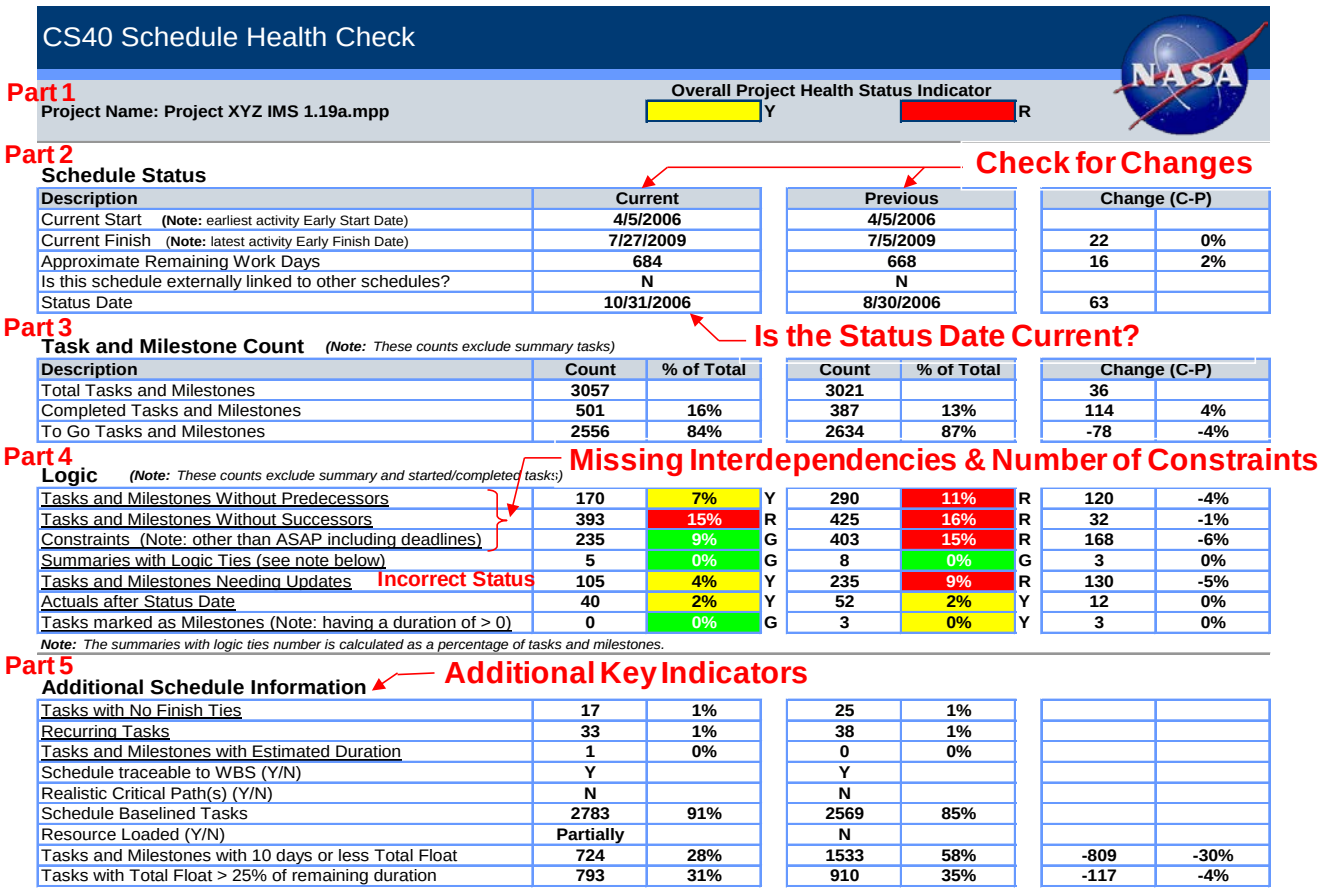
Figure 3-5: Health Check Wizard - Step 5

Understanding Schedule Health Check Results:

Credibility indicators, noted earlier in this section, should be identified and tabulated routinely using the Schedule Health Check on all detailed schedule tasks and milestones in the IMS that are not yet complete. Critical Path Method (CPM) scheduling guidelines call for logic networks to be structured so that all detailed tasks and milestones have accurate predecessor and successor relationships assigned. Additionally, it is crucial for only valid task date constraints to be used in a logic network, as well as an accurate reflection of current status (including new forecast dates for behind-schedule tasks) for all "to-go" tasks and milestones in the IMS. It is important that no task or milestone be left without progress prior to the current status date in the IMS. The higher the number of instances where these guidelines are not followed in the schedule logic, the more improbable it is to accurately identify the true critical path within a project schedule. It also

indicates that the overall schedule lacks credibility in the data output that it produces. The Health Check assessment process additionally provides the basic statistics of the IMS content such as current number of total tasks, number of completed tasks, number of remaining tasks, current completion date, status date, and the number of remaining work days in the schedule. This information should be compared after each update to aid in understanding what changes have occurred since the last IMS update.

The figure below (Figure 3-6) illustrates a schedule Health Check output which applies a stoplight rating feature based on the number of "good/poor" indicators found in a schedule's logic network dataset. Tabulation of these indicators is formatted in an Excel template that provides assessment results in a simple display that is easily understood by project schedulers. It is generally recommended that Health Check assessment results be presented and explained to the project manager and other appropriate team members. This will help the project management team to gain a clear understanding regarding the quality and credibility of their project IMS. The assessment results should also assist in getting schedule weaknesses corrected so that the IMS can serve as a credible management tool.



Description	Current			Previous			Change (C-P)	
Current Start (Note: earliest activity Early Start Date)	4/5/2006			4/5/2006				
Current Finish (Note: latest activity Early Finish Date)	7/27/2009			7/5/2009			22	0%
Approximate Remaining Work Days	684			668			16	2%
Is this schedule externally linked to other schedules?	N			N				
Status Date	10/31/2006			8/30/2006			63	
Task and Milestone Count (Note: These counts exclude summary tasks)								
Description	Count	% of Total		Count	% of Total		Change (C-P)	
Total Tasks and Milestones	3057			3021			36	
Completed Tasks and Milestones	501	16%		387	13%		114	4%
To Go Tasks and Milestones	2556	84%		2634	87%		-78	-4%
Logic (Note: These counts exclude summary and started/completed tasks)								
Tasks and Milestones Without Predecessors	170	7%	Y	290	11%	R	120	-4%
Tasks and Milestones Without Successors	393	15%	R	425	16%	R	32	-1%
Constraints (Note: other than ASAP including deadlines)	235	9%	G	403	15%	R	168	-6%
Summaries with Logic Ties (see note below)	5	0%	G	8	0%	G	3	0%
Tasks and Milestones Needing Updates	105	4%	Y	235	9%	R	130	-5%
Actuals after Status Date	40	2%	Y	52	2%	Y	12	0%
Tasks marked as Milestones (Note: having a duration of > 0)	0	0%	G	3	0%	Y	3	0%
Additional Schedule Information								
Tasks with No Finish Ties	17	1%		25	1%			
Recurring Tasks	33	1%		38	1%			
Tasks and Milestones with Estimated Duration	1	0%		0	0%			
Schedule traceable to WBS (Y/N)	Y			Y				
Realistic Critical Path(s) (Y/N)	N			N				
Schedule Baselined Tasks	2783	91%		2569	85%			
Resource Loaded (Y/N)	Partially			N				
Tasks and Milestones with 10 days or less Total Float	724	28%		1533	58%		-809	-30%
Tasks with Total Float > 25% of remaining duration	793	31%		910	35%		-117	-4%

Figure 3-6: Health Check Assessment Results Output

The stoplight rating criteria which is applied within the Health Check assessment function is shown below (Figure 3-7). This provides the user with an understanding of the criteria ranges that are associated with each stoplight rating. Item five in the figure below also provides the process by which an overall stoplight rating is applied to the total IMS being assessed. This "Overall Project Health Status Indicator" is contained in Part one of the Schedule Health Check output report, as shown in the previous figure.

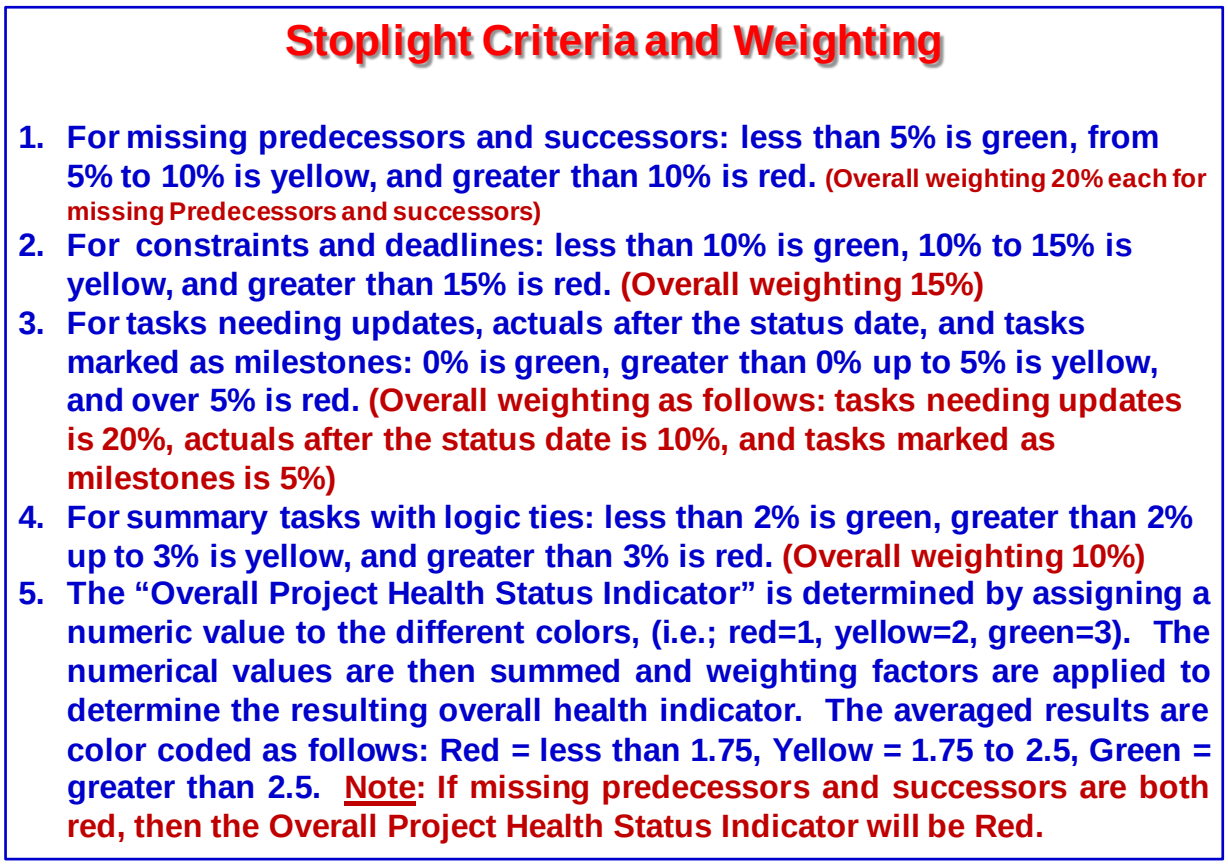


Figure 3-7: Schedule Health Check Stoplight Criteria and Weighting

The Health Check output provides the capability for viewing current assessment results only, or for comparing current results to those of any previous Health Check assessment. This will provide the user with the capability of tracking and presenting improvement details for schedule quality and credibility. The output format structures the data results into five parts. **Part one** provides an overall schedule health rating in red, yellow, and green stoplight fashion. This overall health rating is based on a weighted average of all health indicators contained in Part four. **Part two** provides general schedule status information relative to project start and forecast finish dates, how many work days are remaining in the project, whether there are external schedule interdependencies, and the project status date. It should be noted that, regardless if there are external interdependencies included in the schedule logic, the Health Check will still perform the assessment in the same manner as if there were only one project schedule file. Additionally, it is important for users to check the status date and ensure that the correct date is identified from which key portions of the

assessment will be based. Keep in mind that a project schedule that reflects and incorrect or old status date is considered suspect for any further schedule analysis.

Part Three provides information on the size of the project schedule relative to how many total tasks and milestones are included, how many are already completed, and how many tasks/milestones remain to be worked. Please remember that the numbers tabulated in this section only include detailed tasks and milestones. No summary tasks are counted in these totals because the details are of primary importance when assessing schedule status and credibility. Summary tasks are always driven and determined by the detailed tasks and milestones.

Part Four is the primary assessment portion of the Schedule Health Check. Crucial schedule logic credibility indicators are identified and tabulated for the user's assessment. Specific assessment criteria has been established and built into the STAT software for determining the stoplight ratings. Weighting factors have also been incorporated that apply to each indicator contained in Part Four and are also used in determining the overall schedule health rating as explained earlier in Part One. The following detailed explanations are provided for Part Four indicators:

- ***"Tasks and Milestones without Predecessors"*** – This indicator is very straight forward and provides a detailed count of all tasks/milestones that have no predecessor assignments in the IMS. Keep in mind that when a task or milestone does not have a predecessor assigned then, unless there is a valid constraint preventing its start, it should be scheduled to start immediately. If this is truly the case then this situation is fine, however, this is not typically the case. To accurately model a planned project implementation, the correct sequence must be identified for each task and milestone contained in the schedule. This will allow the automated scheduling tool to accurately calculate slack (float) for each task/milestone in the IMS which is required in order to correctly identify the project critical path. The Health Check correctly identifies all tasks/milestones that have no predecessor assignments so that they can be evaluated, and if necessary corrected.

- ***"Tasks and Milestones without Successors"*** – This explanation is nearly the same as the above indicator, except that when there is no successor assignment for a specific task or milestone, then that item may slip indefinitely with no impact to project completion. This situation also hinders correct slack calculation and critical path identification.

- ***"Constraints (Note: other than ASAP including deadlines)"*** – A constraint is a fixed date that has been assigned to a task or milestone in order to control when it starts or finishes. Caution should be exercised when using constraints because they are a significant factor in how slack (float) is calculated throughout the project schedule. All constraint types have some bearing on slack values, but certain types, such as: As Late As Possible, Finish No Later Than, Must Start On, Must Finish On, and Deadlines act as completion points in the IMS from which the slack values are calculated. While it is true that sometimes certain schedule situations arise that necessitate the valid use of a constraint, but many times constraints are over used and severely hinder the scheduler's ability to identify the project's critical path. Ideally, minimal use of constraints, other than "As Soon As Possible", is strongly encouraged. This Health Check indicator identifies and counts all constraints except for those with "As Soon As Possible", so that they can be evaluated for the extent of their impact to the project schedule.

- ***"Summaries with Logic Ties"*** – Summary tasks should never be assigned sequence interdependencies. When this occurs, the summary task sequence will override the sequence relationships that exist on the detailed tasks and milestones that exist under the summary task. Remember that detail task logic sequence should always drive the summary task dates and not the other way around. The impact is potentially incorrect schedule dates and incorrect slack calculation.

- ***"Tasks and Milestones Needing Updates"*** – This credibility indicator identifies and counts all tasks and milestones that are reflecting a behind schedule status of greater than seven days from the assigned status date. The purpose of this indicator is to locate tasks and milestones that need correct progress applied or new forecast start and/or finish dates. The impact of leaving tasks/milestones without correct progress is incorrect slack calculations and incorrect schedule dates.

- ***"Actuals after Status Date"*** – This indicator identifies all tasks and milestones that have been improperly progressed with a date that is later than the assigned project status date. The impact of this type of error is that schedule dates and calculated slack values associated with tasks/milestones in the downstream logic will also be incorrect.

- ***"Tasks marked as Milestones (Note: having a duration of >0)"*** – This indicator identifies all schedule tasks that have a duration assignment that is greater than zero, but also has been marked within Microsoft Project to be shown as a milestone. While this technique does not impact schedule slack calculations, it does prevent the schedule user from seeing the true task progress. The impact to the user is that a schedule task may be significantly behind schedule, but the user potentially won't be aware of the situation because it will be hidden and only reflected as a finish milestone.

The schedule Health Check provides a detailed listing of the findings for each of the above credibility indicators. At the bottom of the Health Check Excel output screen are worksheet tabs for each indicator (see Figure 2-8 below), that when selected provides the specific tasks and milestones needing attention by the schedule owner. Printouts can be run and distributed to those who are responsible for the needed corrections.

Part Five provides miscellaneous additional indicators that can assist the user in determining the integrity and credibility of the IMS. Some of these indicators are derived automatically as a function of the Health Check assessment and other indicators included as manual entries determined from observations and user judgment. The following detailed explanations are provided for Part Five indicators:

- ***"Tasks with No Finish Ties"*** – This indicator identifies all tasks in the IMS that, even though they have successors assigned, have no finish successors. The tasks identified have only successors that are either *start-to-start* or *start-to finish* type interdependencies. The impact of this type of interdependency is that the finish of the task involved may slip continuously with no resulting impact on the project completion. In other words, it has nearly the same impact as a task that has no successor assignments

- ***"Recurring Tasks"*** - .This indicator identifies tasks and milestones that are normally repetitious in nature, and that typically should not impact the project critical path. Examples of this type of task include: weekly meetings, routine report issuances, routine reviews, etc. While these tasks are necessary when resource loading is required, it can be a real concern if the IMS is predominantly made up with these kinds of tasks instead of the real project work scope.

- ***"Tasks and Milestones with Estimated Durations"*** – This indicator finds all tasks that have been added to the IMS without a specified duration assignment, or a duration assignment that is flagged as estimated and needs verifying. This type of occurrence is usually caused by the scheduler forgetting to add a duration value or not knowing what the correct duration assignment should be. Remember that incorrect task durations lead to incorrect schedule dates and also incorrect schedule slack calculations.

- ***"Schedule Traceable to WBS (Y/N)"*** – This Health Check indicator is a manual entry by the Health Check user. Prior to making this entry the user should take a quick look at the schedule to determine how much of the IMS has the WBS elements identified. Keep in mind that a project WBS serves as the approved framework for all technical, financial, and schedule planning. It is also a NASA requirement for the project WBS to be consistent with the integrated project baseline for all technical, budgetary, and schedule content. Having the WBS fully integrated into the IMS is a key approach to ensuring the required consistency exists.

- ***"Realistic Critical Path(s) (Y/N)"*** – This indicator is a manual entry by the Health Check user. It is strictly a subjective judgment call, but should be, in a large measure, based on the results indicated in the Part 4 stoplight assessment portion of the Health Check. If the stoplight indicators are predominantly red for IMS logic then it is reasonable to assume that any critical path identification or information would be very suspect at best, and typically not trustworthy for management decision making.

- ***"Schedule Baselined Tasks"*** – This indicator quantifies, for the Health Check user, how much of the IMS has been baselined. It should be understood that project management "best practices" dictate that at some point the total project schedule should be baselined in order to provide for meaningful performance measurement.

- ***"Resource Loaded (Y/N)"*** – This indicator is also a manual entry by the Health Check user. Prior to making this entry the user should take a quick look at the appropriate resource data fields within the schedule to determine if the total IMS has been adequately resource loaded. This indicator provides additional insight into schedule credibility.

- ***"Tasks and Milestones with 10 days or less Total Float"*** – This indicator provides the Health Check user with additional insight into the reasonableness and credibility of IMS data. There is no stoplight criteria applied to this metric. There are however, 50% and 5% recommended threshold percentages for analysis purposes. This means that if this indicator reflects a percentage of 50% or greater portion of the schedule has 10 days or less slack, then the IMS would generally be considered too optimistic. And conversely if a 5% or less percentage is reflected, then the IMS is mostly likely missing necessary interdependency

assignments. *Note: if a project is in its final five to six months of implementation then instead of using 10 days as the filtering criteria the user should use a value equal to 10% of the remaining duration* Keep in mind that there are always exceptions and that the percentage threshold for this indicator should be a user determined value based on the nature of the scope of work contained in the project.

- ***"Tasks with Total Float > 25% of remaining duration"*** – This final Health Check indicator also provides the user with additional insight into schedule credibility. The purpose of this indicator is to determine what percentage of the IMS has excessively large slack values. This is determined by identifying all detailed tasks/milestones whose total slack value is greater than 25% of the remaining project duration. Like the previous indicator, there is no stoplight criteria, or built-in threshold that is applied to this metric, but a 50% threshold is recommended for analysis purposes. This means that if this indicator reflects a percentage of 50% or greater portion of the schedule that has slack values that are greater than 25% of the remaining project duration then there are most likely many necessary interdependencies that are missing.

After running the STAT Health Check, the user can find the detailed listings of tasks and milestones that are identified and counted for each indicator metric. As shown in the figure below (Figure 3-8), the worksheet tabs located at the bottom of the Health Check screen can be selected to provide the specific indicator details for printing, reviewing, and as-needed corrections. ***Note*** **–** *the underlined indicator titles may also be selected to provide the detailed listing of tasks and milestones that make up that particular metric count.*

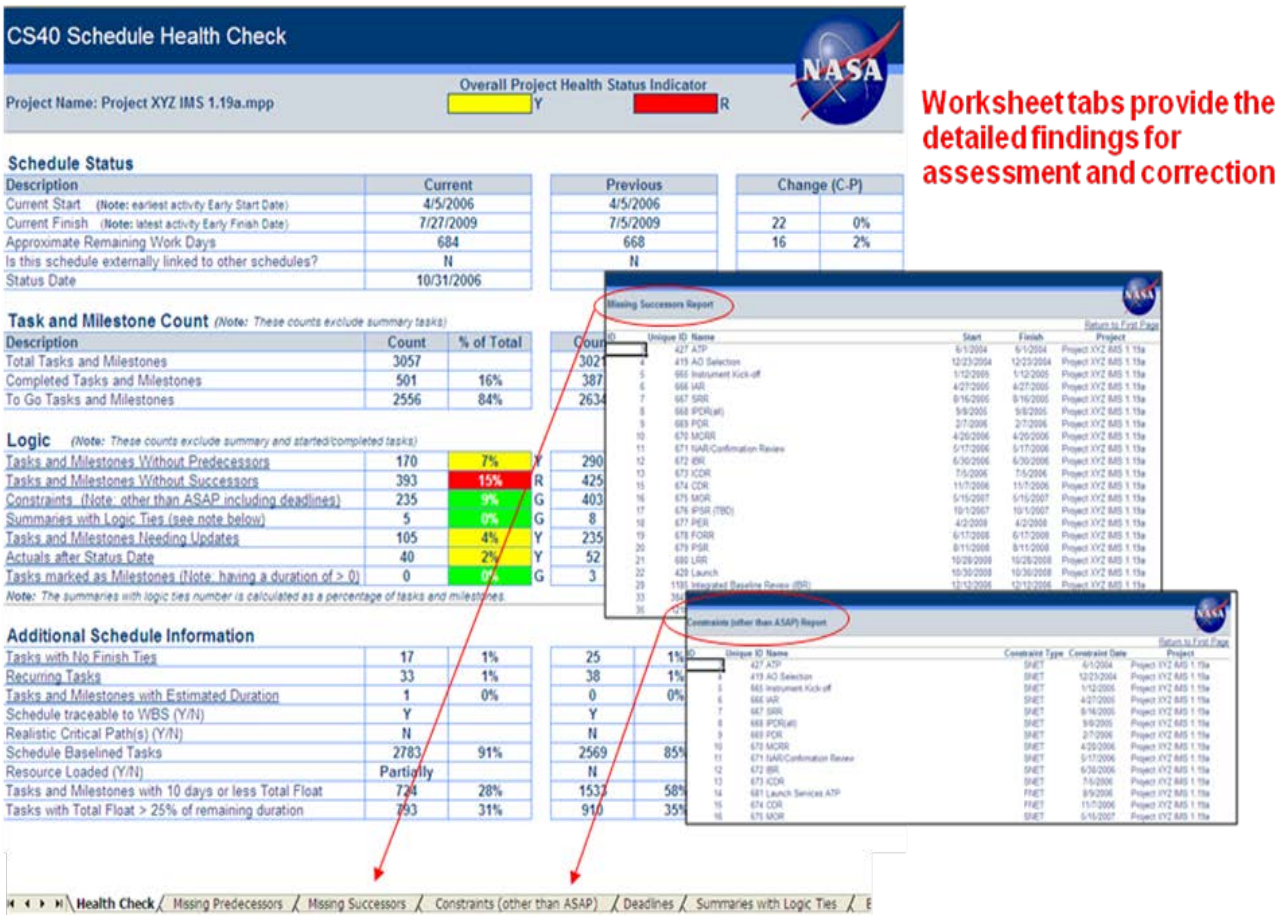


Figure 3-8: Health Check Detailed Indicator Listings

Section 4: The Schedule Assessment Summary Report (SASR)

Initiating the Schedule Assessment Summary Report (SASR)

The purpose of SASR is to provide the user with a tool for obtaining both quick assessment data reflecting schedule integrity and also schedule performance data indicating how well the schedule is being followed and met. This tool incorporates a combination of the primary credibility indicators from the Health Check along with other indicators of sound planning and performance achieved. The SASR output report provides multiple types of schedule integrity and performance data in graphical formats to assist the user in making correct assessment judgments and arriving at accurate performance analysis.

To initiate this analysis function, select the SASR icon from the MS Project toolbar. This icon initiates the automated SASR wizard to lead the user through five simple steps to produce a Schedule Assessment Summary output report.

Step 1 produces a wizard dialogue box that allows the user to set the schedule "Status Date" on which the resulting assessment and analyses data will be based. This dialogue box also allows the user to set the percentage threshold for slack values that are considered too large (same as for the Schedule Health Check). This is done by selecting a percentage value of the remaining project duration that is to be considered the threshold value for too much slack (see Figure 4-1). The default percentage value is preset at 25% of the remaining project duration. STAT will calculate what this value equates to, in terms of project work days, and then tabulate for the user how many and what percentage of tasks/milestones have slack values that are greater than the set threshold percentage. This information provides the user added insight to assist in discerning whether too many schedule tasks are missing interdependencies, or possibly have incorrect interdependencies identified in the schedule.

After selecting the desired Status Date and Total Slack percentage threshold then click "Next".

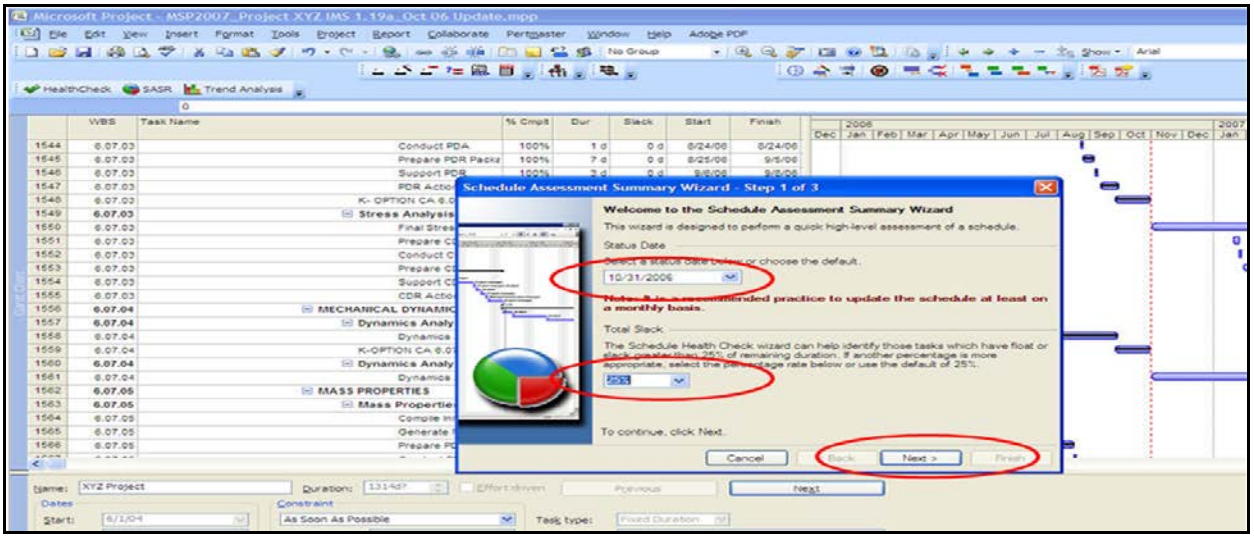


Figure 4-1: Schedule Assessment Summary Report Wizard – Step 1

Step 2 produces a wizard dialogue box that allows the user to select key milestones to monitor variances from the approved baseline dates. The SASR output report provides a comparison graphic that highlights the amount of variance from baseline dates for only those milestones that are selected in this dialogue box. Within this dialogue box a listing of all milestones (zero duration) contained in the project schedule are provided for user to select from. A **maximum of twenty milestones** may be selected for any single SASR run. To select multiple milestones from the list of milestones the user must hold down the control key as the desired milestones are selected.

The step 2 dialogue box also provides a browse function to allow the user to select the location where he wishes the final SASR output file to be stored.

After completing the desired step 2 choices, click next (see figure 4-2).

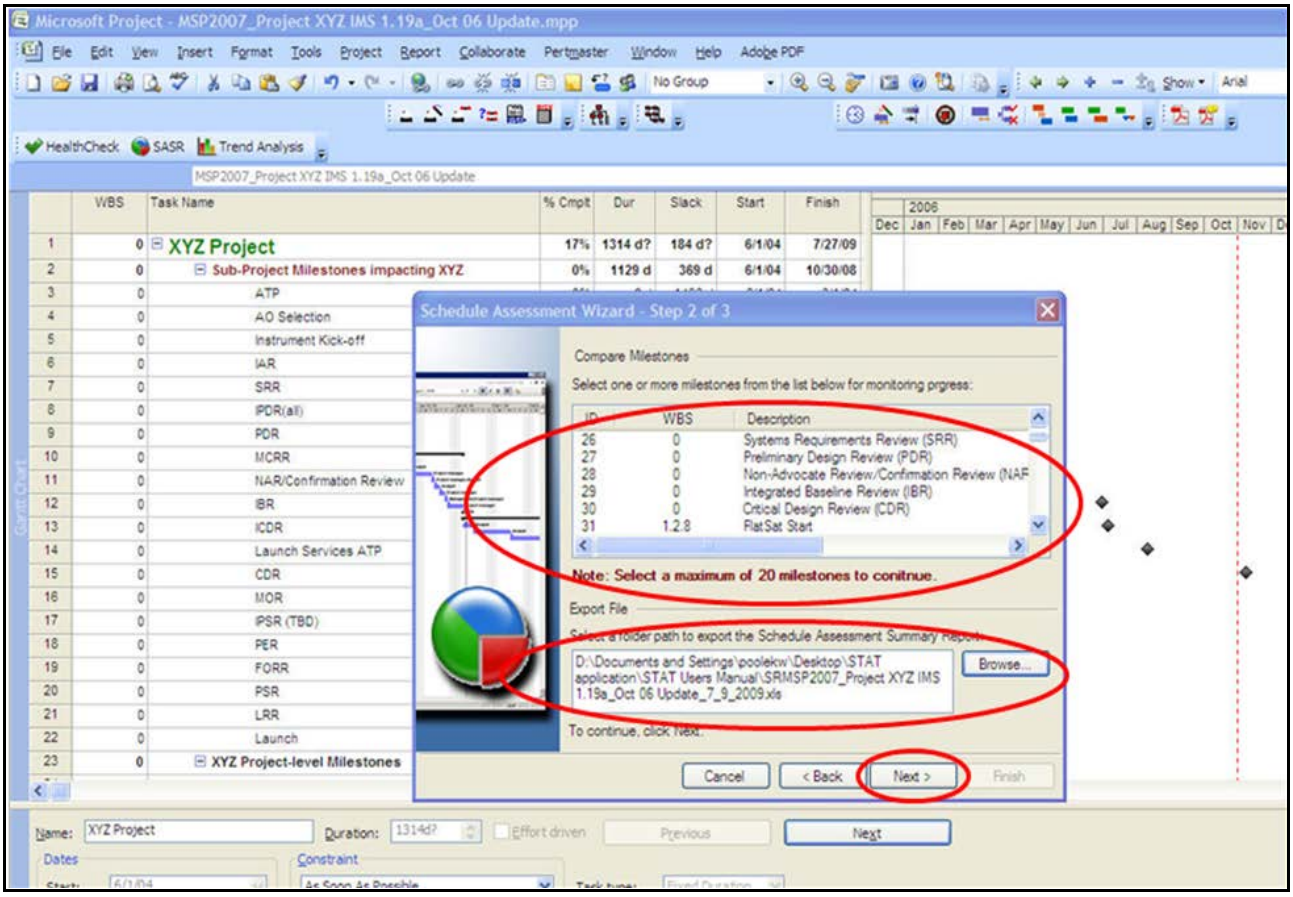


Figure 4-2: Schedule Assessment Summary Report Wizard – Step 2

Step 3 of the Wizard produces a final dialogue box that allows the user to complete the final step in initiating the SASR analysis report. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for creating and transferring the SASR data results into the Excel template may take several minutes if the schedule file size is very large.

Click finish to complete the Schedule Assessment Summary Report processing and compilation of assessment and performance data (see Figure 4-3).

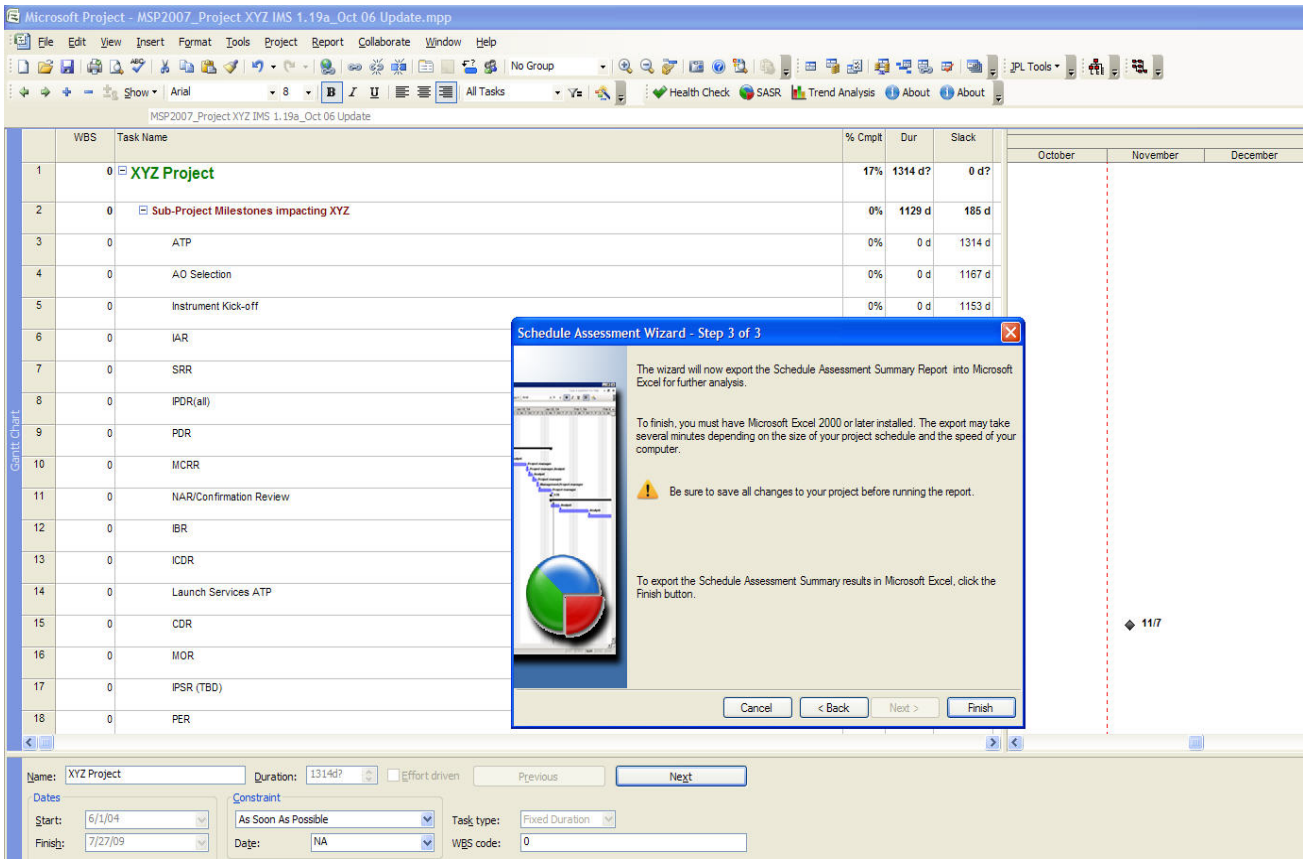


Figure 4-3: Schedule Assessment Summary Report Wizard – Step 3

Understanding Schedule Assessment Summary Report Results:

The SASR output is formatted as a three page report containing eight different analysis graphics along with an overall schedule health rating. As noted earlier, the SASR includes the primary credibility indicators from the Schedule Health Check along with various other integrity and performance data. Selected portions of the SASR analysis data are reflected in stoplight fashion. Stoplight portions contained in this report have also been formulated, through the use of assigned weighting factors and score card values, to provide an overall schedule credibility rating. The following paragraphs provide explanations of each graphic and analysis insight they provide to the user.

Overall Summary Rating: This stoplight rating provides a quick indicator for both the credibility of schedule structure and accuracy of data, and also the sufficiency of schedule accomplishment, as compiled from various trending data taken from the project IMS (see Figure 4-4). Through an established algorithm using fixed criteria factors and a weighting scorecard the automated overall schedule assessment stoplight metric is provided to assist the planner/scheduler in his assessment and analysis duties. In addition to the automated metric, there is also a manual indicator provided for user defined adjustments based upon associated knowledge and insight when warranted to reflect a more accurate assessment. Two user input locations are also provided for documenting analyst comments, rationale, or other important information related to the overall project schedule assessment.

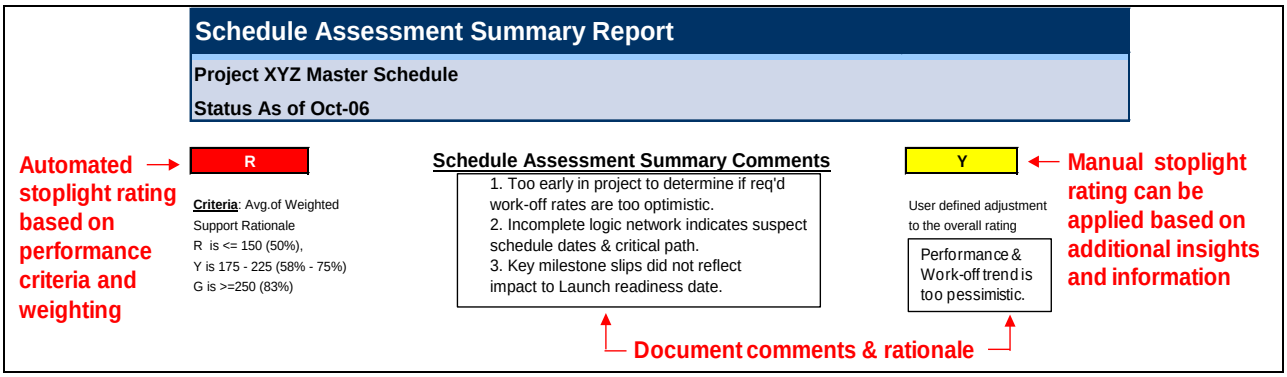


Figure 4-4: Schedule Assessment Summary Report (SASR) – Overall Rating

Schedule Formulation and Integrity: This graphic provides key selected Schedule Health Check credibility indicator results in a histogram format (see Figure 4-5). Primary credibility indicators include: how many tasks/milestones have no predecessors, how many tasks/milestones have no successors, how many tasks/milestones have fixed date constraints assigned, and how many tasks/ milestones need correct status (progress) updates. As indicated earlier in the Schedule Health Check section of this guide, Critical Path Method (CPM) scheduling guidelines call for logic networks to be structured so that all detailed tasks and milestones have accurate predecessor and successor relationships assigned *(note – this excludes minimal valid exceptions such as, Project Start, Project Complete, external project deliveries, etc.).* Additionally, it is crucial for only valid task date constraints *(ie; facility availability, component deliveries from external sources, etc.)* to be used in a logic network, as well as an accurate reflection of current status (including new forecast dates for behind-schedule tasks) for all "to-go" tasks and milestones in the IMS. It is important that no task or milestone be left without progress prior to the current status date in the IMS. The higher the number of instances where these guidelines are not followed within a project schedule, the more improbable it is for accurate task dates to be calculated and also for a clear identification of the true critical path for the project.

The Schedule Formulation and Integrity metric provides key criteria and high scorecard weighting factors within the established algorithm used for the overall IMS rating assessment addressed above.

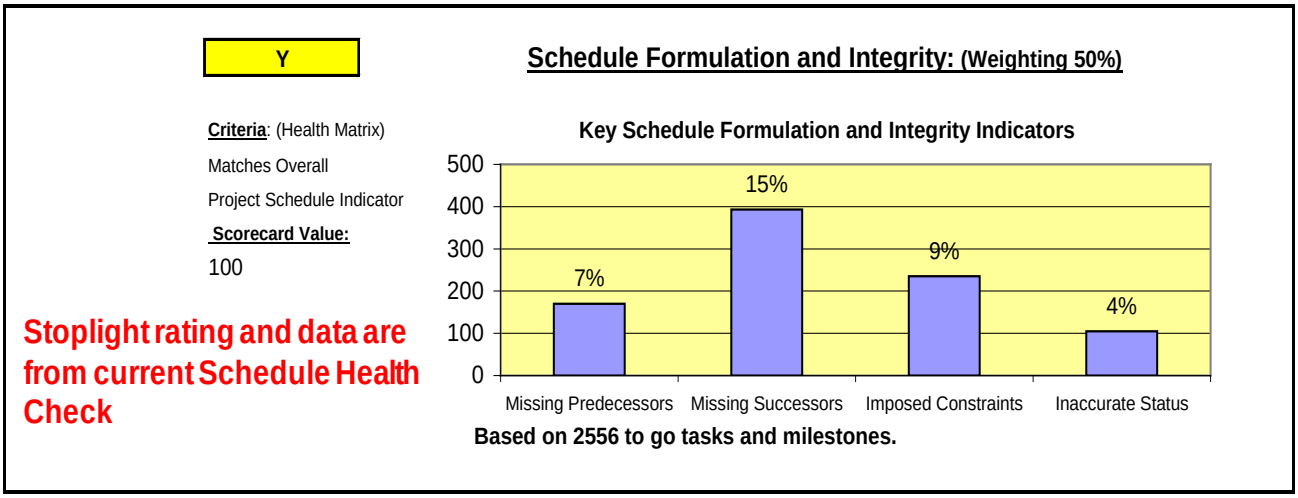


Figure 4-5: SASR -Schedule Formulation and Integrity

Schedule Performance Trend: This graphic provides analysis insight based on performance trends relating to actual and projected task and milestone completions. This metric focuses on the six month period prior to the current status date and also looks ahead to the six month period following the current status date. STAT sums the number of actual task/milestone completions per month for each of the previous six months and compares to the monthly baseline number of items that were supposed to be accomplished during the same period. A monthly average of actual completions for the six month period is also calculated. STAT then, in similar fashion, tallies the number of forecasted finishes for each of month included in the upcoming six month period and compares to the baseline number of expected finishes for each month during that same period. A monthly average of forecasted completions is also calculated to reflect what must occur to stay on schedule. The average performance of the past six months can then be compared to the average projected for the next six month period to see if the required monthly completion rate is optimistic, pessimistic, or reasonable.

Figure 4-6 below, provides an example of how the Schedule Performance Trend metric can be used for analysis and what other information can be gleaned and understood. The following illustration reflects a trend situation where the average monthly task completion rate during the past six months was 61 tasks/milestones. Based on this past performance trend, is it reasonable to expect the project to complete 176 tasks/milestones per month for the next six month period, as the figure indicates must be done to stay on schedule? The initial answer would typically be "*no*". However, at this point the planner/scheduler should look within the IMS to identify those specific tasks that are scheduled to complete during the next six months and determine if the type of work is such that tasks can be completed at a rate more than twice what has previously been done.

Other helpful information displayed on the Schedule Performance Trend are tasks and milestones that have been scheduled to worked, but are not progressed as time passes. The result of this practice is that incomplete schedule tasks are continuing to be reflected to the left of time-now, or in past history. It should be noted that this practice is not satisfactory for sound schedule management. In order to maintain schedule accuracy and critical path credibility, it is crucial that all tasks/milestones that were previously scheduled to have been started or completed prior to time-

now, be assigned with new forecast start/completion dates in the future if previous scheduled dates were not achieved. Tasks with inaccurate status, as described above, will hinder meaningful and effective schedule analysis.

The Schedule Performance Trend metric provides additional criteria and scorecard weighting factors within the established algorithm used for the overall IMS rating assessment addressed above.

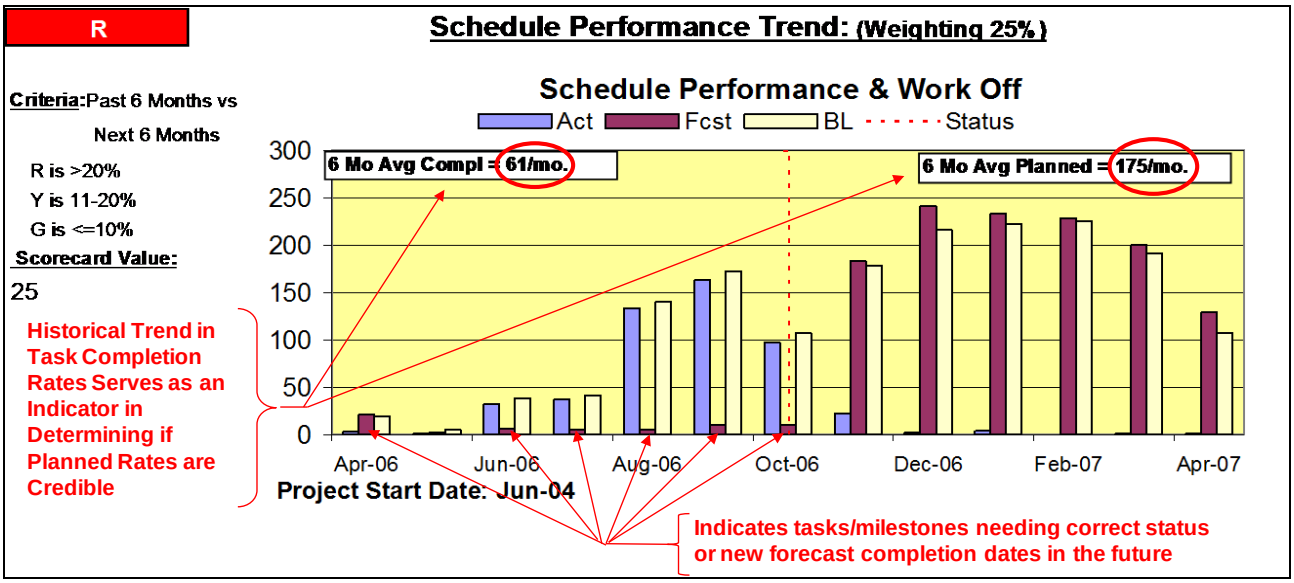


Figure 4-6: SASR – Schedule Performance and Work-Off Trend

Baseline vs. Actual Finishes Analysis: This analysis graphic portrays two related metrics that reflect actual schedule performance against the baseline plan. As shown below in Figure 4-7, the Baseline Execution Rate (BER) tracks a calculated monthly performance index that correlates to the scale on the right side of the graphic. This measurement is sometimes referred to as the "Hit or Miss" metric because it focuses solely on the specific tasks/milestones that are baselined to occur each month and reflects that they are either accomplished or not. The BER index is determined by tallying the total number of tasks/milestones that are actually completed during the correct month that they were baselined to occur in and dividing that number by the total number that were scheduled to occur per the baseline plan. They are either finished during the scheduled month or they are not. If all tasks/milestones are completed during the correct month they are scheduled to finish per the baseline plan then the BER will equal "1" on the right hand scale. On the other hand, if only six out of ten baseline schedule items are finished during the correct month, then the BER will equal "0.6".

The second metric within the Baseline vs. Actual graphic is a basic monthly cumulative total of tasks/milestones that have actually been completed to-date versus the cumulative total of schedule items that should be completed to-date per the baseline plan. This metric is not concerned about

whether tasks are completed during the correct baseline month or not, but rather a basic comparison of the total cum actuals to-date versus the total cum baseline plan to-date.

Analysis questions that can be easily answered by the data contained in this graphic include the following:

a) Is the baseline plan being worked?
b) Is the rate of baseline accomplishment sufficient to achieve project success?
c) Is there an excessive number of new schedule tasks being added to the IMS, but not being incorporated into the baseline plan?

To illustrate this analysis on the figure below, notice that the BER index has fluctuated quite drastically over the previous six months with very poor accomplishment in some months. This potentially indicates that the baseline plan is not being adequately accomplished at a sufficient rate to achieve "on-time" project completion. Next, notice that the "cum actual completions" graph is tracking nearly the same as the baseline plan. This indicates that there is a problem in that the wrong tasks are being worked, possibly tasks not yet scheduled to be worked. If this situation continues over a span of several reporting periods then it could be an indication that the baseline plan was not a viable plan to start with. Finally, notice that the current and baseline "cum" curves show a divergence indicating that numerous new tasks/milestones contained in the current IMS have not been incorporated into the baseline plan. This analysis information should be followed up on with the project team to determine resolve the issues identified.

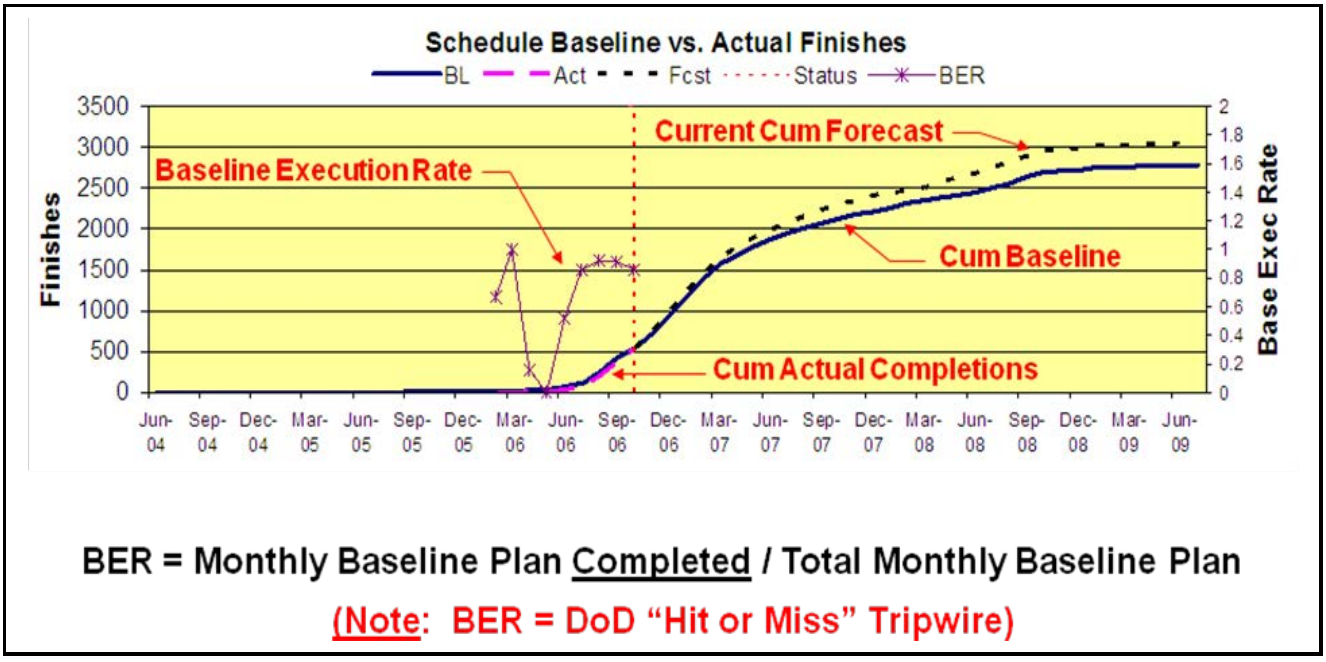
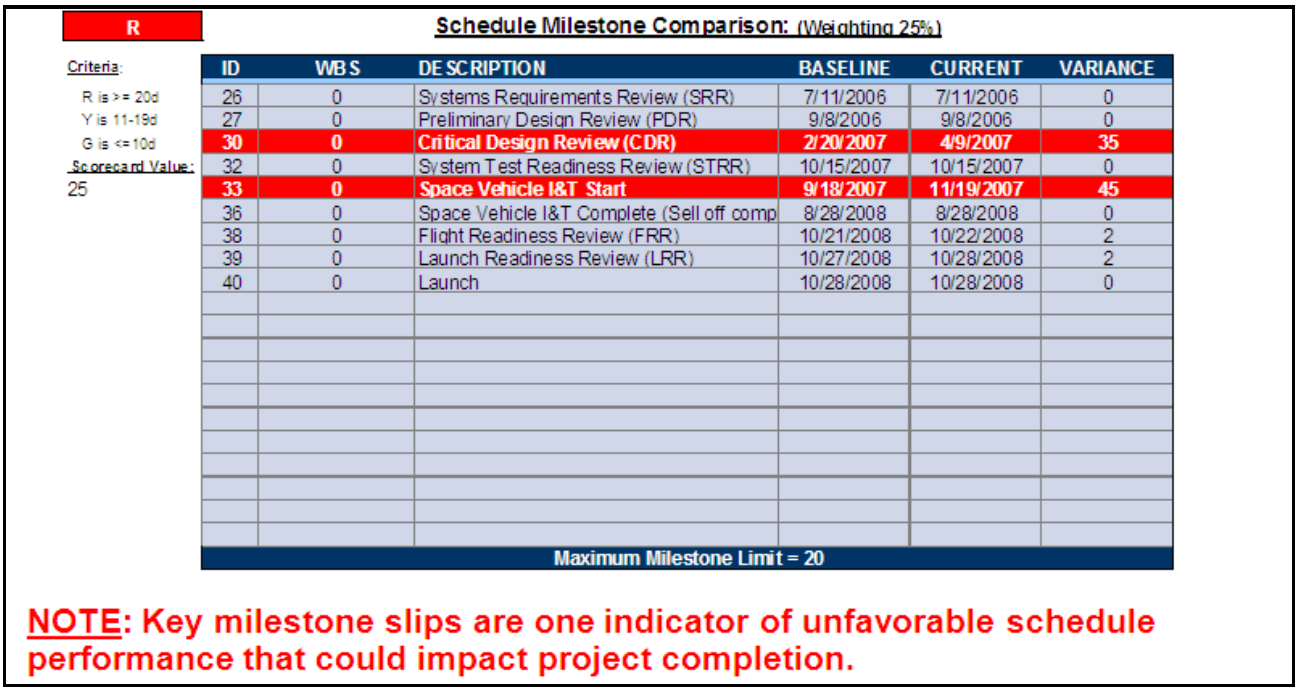


Figure 4-7: SASR – Baseline vs. Actual Finishes / Baseline Execution Rate

Schedule Milestone Comparison: This graphic provides a basic status comparison metric for up to twenty selected milestone dates from the project schedule. The comparison reflects the baseline dates versus the current dates for the selected project milestones. The amount of schedule variance

is also shown where the baseline and current schedules diverge. Red and yellow highlighting is added to flag those milestones where the schedule variance has significantly exceeded the established sufficiency criteria.

The Schedule Performance Trend metric provides additional criteria and scorecard weighting factors within the established algorithm used for the overall IMS rating assessment addressed above.



R

Schedule Milestone Comparison: (Weighting 25%)

Criteria:
R is >= 20d
Y is 11-19d
G is <=10d
Scorecard Value:
25

ID	WBS	DESCRIPTION	BASELINE	CURRENT	VARIANCE
26	0	Systems Requirements Review (SRR)	7/11/2006	7/11/2006	0
27	0	Preliminary Design Review (PDR)	9/8/2006	9/8/2006	0
30	0	Critical Design Review (CDR)	2/20/2007	4/9/2007	35
32	0	System Test Readiness Review (STRR)	10/15/2007	10/15/2007	0
33	0	Space Vehicle I&T Start	9/18/2007	11/19/2007	45
36	0	Space Vehicle I&T Complete (Sell off comp	8/28/2008	8/28/2008	0
38	0	Flight Readiness Review (FRR)	10/21/2008	10/22/2008	2
39	0	Launch Readiness Review (LRR)	10/27/2008	10/28/2008	2
40	0	Launch	10/28/2008	10/28/2008	0

Maximum Milestone Limit = 20

NOTE: Key milestone slips are one indicator of unfavorable schedule performance that could impact project completion.

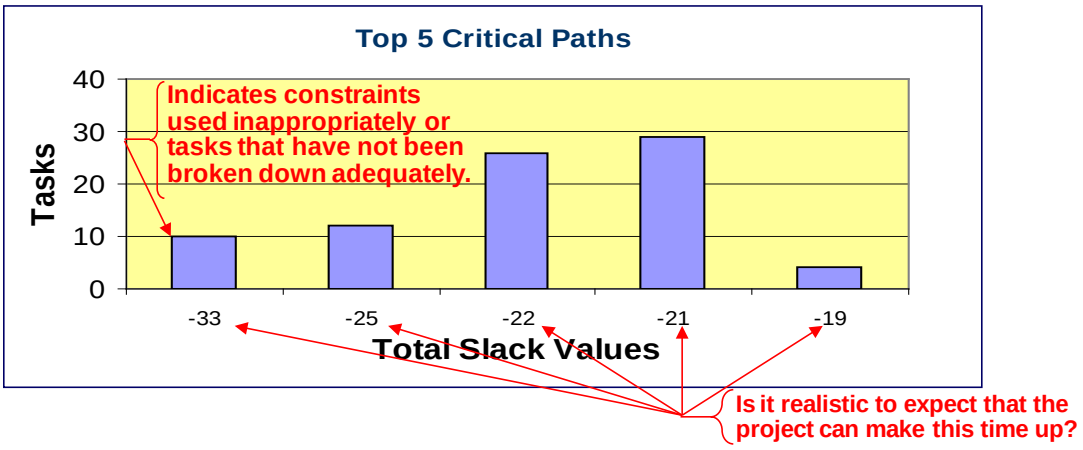
Figure 4-8: SASR - Schedule Milestone Comparison

Top Five Critical Paths: This graphic (see Figure 4-9) displays total slack (float) information for the five lowest slack paths contained in the project IMS. The lowest slack path is considered the primary critical path followed by the next four secondary paths. All five paths should be monitored closely on a continuing basis to ensure credibility. The management team should be aware of the specific tasks and milestones on each path and ensure that each assigned task duration and interdependency accurately reflects the planned implementation model. Caution should be used before making any analysis assumptions using the top five critical path data. It is very important to validate the credibility of each of the five paths contained in this metric. If the schedule Health Check indicates poor ratings for IMS formulation and integrity then this metric will be of lesser analysis value.

The analysis information gleaned from this graphic is typically found in the slack values of each path and also the number of tasks contained in each path. Below are examples of analytical data that can be gained from this graphic along with the potential analysis conclusions that can be reached.

1) If, after validating the credibility of the five lowest paths, the primary critical path, as well as any of the secondary lowest paths have significantly low total slack (float) values (a meaningful value determined by the team), then the project schedule is probably not reflecting a feasible or realistic plan for success.
2) Many times the number of tasks making up the critical path is a good indicator of credibility. Assuming that the level of task detail across all WBS elements contained in the IMS should be consistent, then it is generally expected that the primary critical path will contain more tasks than the secondary paths. This is expected because, by definition, the primary critical path represents the longest duration path from the current status date through the IMS network to project completion. If this is not the case, then it potentially indicates either inconsistency in task detail or an invalid use of fixed task constraints.

As noted below in the SASR report illustration, caution should be used when interpreting the data within this graphic because the credibility of slack calculations is totally dependent upon the formulation integrity and logical structure of the IMS. If the Schedule Health Check reflects a red stoplight rating then this metric will not provide much effective insight for management to use.



Caution: The above total Slack information is based solely on the project's IMS logic network (i.e.; predecessors, successors, constraints, etc.). Credibility of the data correlates directly to the quality reflected in the Schedule Health Check rating.

Figure 4-9: SASR – Top 5 Critical Paths

Total Slack Categories: This graphic displays an overall snapshot of how the project IMS can be broken down into three categories of total slack (float) values for analysis and general information purposes (see Figure 4-10). The categories of slack are described below:

1) The first category indicates the total percentage of detailed schedule tasks contained in the IMS that have ten days or less of total slack. A general rule of thumb pertaining to this category indicates that no more than 50% of the schedule should fall into this category. If greater than 50% of the scheduled tasks within any IMS have ten days or less of slack then it is highly probable that the project schedule is too optimistic and most likely unachievable. Schedule review and re-planning by the project team is recommended.

2) A second category indicates the total percentage of detailed schedule tasks contained in the IMS that have total slack values that are greater than 25% of the remaining project duration. In other words, this is a measure of how much of the project schedule has excessively high slack values. The analysis message that comes from this category for situations where the total percentage of schedule tasks exceeding the 25% of the remaining duration is that the schedule has not been sequenced correctly. Interdependency relationships between tasks either have not been assigned at all or they have been assigned incorrectly. Having this situation should also result in the project IMS being reviewed and/or re-planned by the project team.
3) The third category in this metric indicates what the total percentage is that makes up the balance of IMS tasks that are not falling into either of the above categories. The analysis that can be established from this category is that the total percentage of scheduled tasks should generally always be higher than either of the previous categories described. Any time this category is lower than either of the first two categories it becomes another indicator of poor or missing interdependency relationships between tasks, or an overly optimistic schedule.

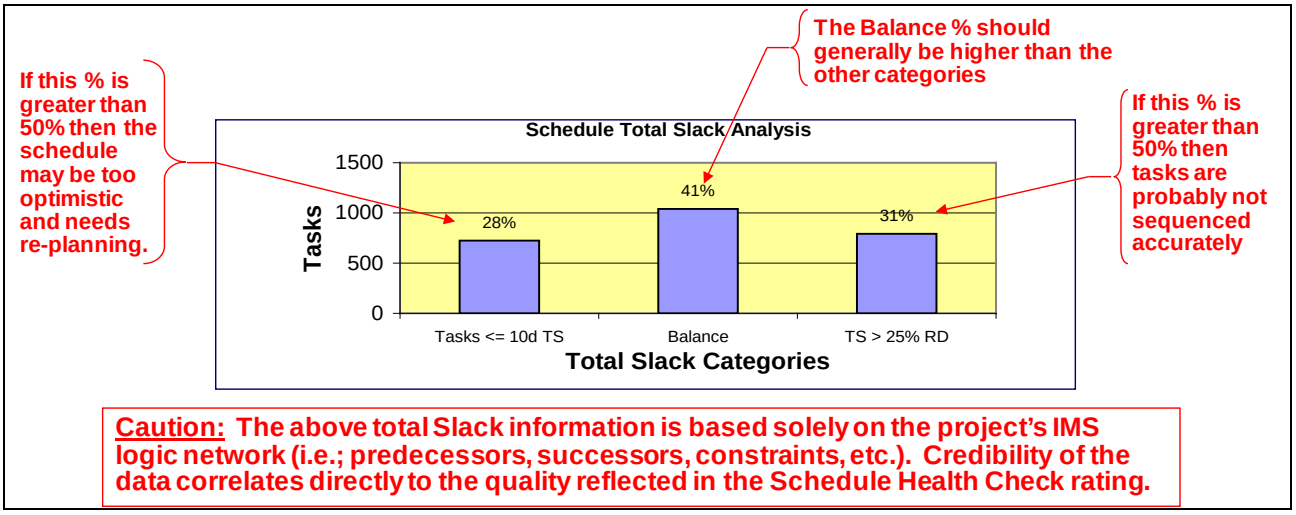


Figure 4-10: SASR – Schedule Total Slack Analysis

Logic Relationship Types: This graphic provides a breakdown of the types of task relationships and reflects the percentage of use within the IMS for each of the relationship type. As noted in the figure below (Figure 4-11), the percentages shown in this metric are based on the total number of detail task and milestone relationships contained in the IMS. CPM scheduling techniques utilize four different logic relationship types when establishing the sequence of tasks in the network. The four relationship types include: finish-to-start, start-to-start, finish-to-finish, and start-to-finish. It is important to note here, that it is an industry recognized goal to break down task detail to a level where finish-to-start relationships are used at least 90% of the time. It is also a NASA recommended goal that start-to-start and finish-to-finish relationships not be used any more than 5% of the time. True start-to-finish relationships between tasks are rare occurrences in sequencing work tasks, therefore it is not recommended that this relationship type be used in more than 1% of the assigned task dependencies within an IMS.

Each type of task relationship serves a specific purpose in reflecting how the project work will be sequenced. Using appropriate relationship types allows the planner/scheduler to create an accurate model of how the work is expected to be accomplished. This model can then be used for effective management of work and resources. The model can also be used for determining the project critical path (longest contiguous path to completion), along with identifying other secondary schedule drivers. If this schedule model lacks credibility then most data will be suspect and ineffective for management use.

As the scheduler assesses the IMS for credibility, the percentage criteria noted above enables the scheduler to make a determination as to the validity with which the schedule logic has been constructed. If the relationship percentages indicate that the logic network is not appropriately constructed using recommended relationship types, then schedule credibility will be lacking and data will potentially be inaccurate for management use

This graphic also provides a metric for the number of task relationships that include negative lag values (lead values). Task/milestone relationships containing negative lag values means that a successor task can actually occur prior to the predecessor task. In reality, this type of work sequence happens very rarely in a project and usually will only apply to a very specific or special situation. Therefore, the number of relationships that include negative lags should be very small (the goal is no negative lags). If the SASR assessment reveals that isn't the case, then this could potentially be another indicator of a project schedule that lacks credibility and any data should be used with caution.

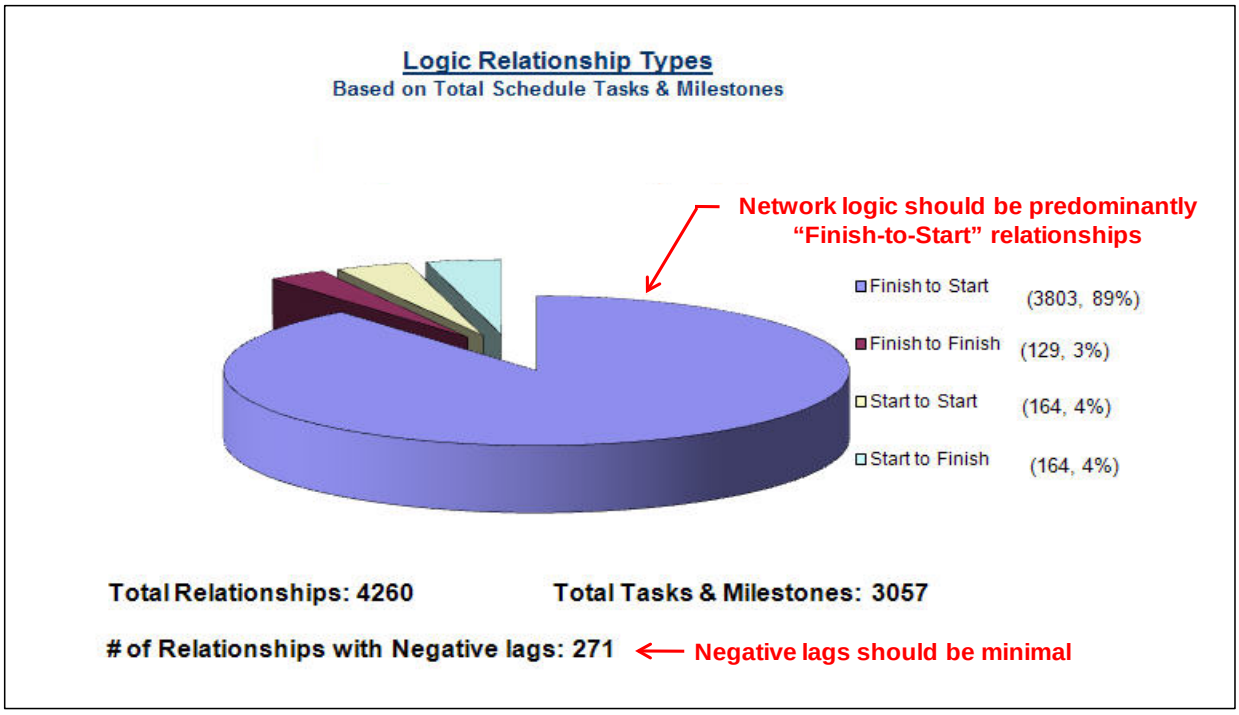


Figure 4-11: SASR – Logic Relationship Types

Remaining Duration Profile: The assessment graphic below (Figure 4-12) provides a histogram which displays a profile of all remaining task/milestone durations. The importance of this information is to gain an understanding of the level of task detail contained in the IMS and make an

assessment as to whether it is adequate or not. Generally, when task durations are long it is much more difficult to identify the specific interface points needed to allow for meaningful finish-to-start task relationships. The level of task detail within the IMS typically correlates to the development phase that the project is currently in. NASA projects in pre-phase A and also during portions of phase A generally reflect less detail in task definition resulting in much longer durations. As a project proceeds on into phase B and later phases the project definition becomes much clearer and task durations should become shorter and more discrete allowing effective task interdependencies and meaningful progress/performance measurement. Within phase B it is preferred that task durations for work during the upcoming 9-12 month period be kept at a level not exceeding 1-3 months. During phase C it is preferred that the majority of task durations for the upcoming 9-12 months should not exceed one month in duration. It is understood that keeping with these goals is not always possible and that tasks should not be arbitrarily split when there are not logical and meaningful break points. It is important to understand that the more meaningful and discrete the level of task detail is, the more effective and accurate the IMS will be for determining critical schedule drivers, measuring project progress/performance, allocating resources, and forecasting future accomplishment. In simple terms it is recommended that the predominant number of tasks within an IMS should not exceed three months in duration preferably less than two months.

Another industry best practice for the IMS is that it be structured in a task-oriented format. Milestones should be used for significant and meaningful project events. Using a task format enables the project team and their customers to have better insight into progress leading to task completions. If milestones are predominantly used in developing the IMS then accurate progress insight is many times more difficult to show. Some organizations across industry have a goal of keeping the number of milestones within the IMS to less than 20% of the total number of detail items in the schedule.

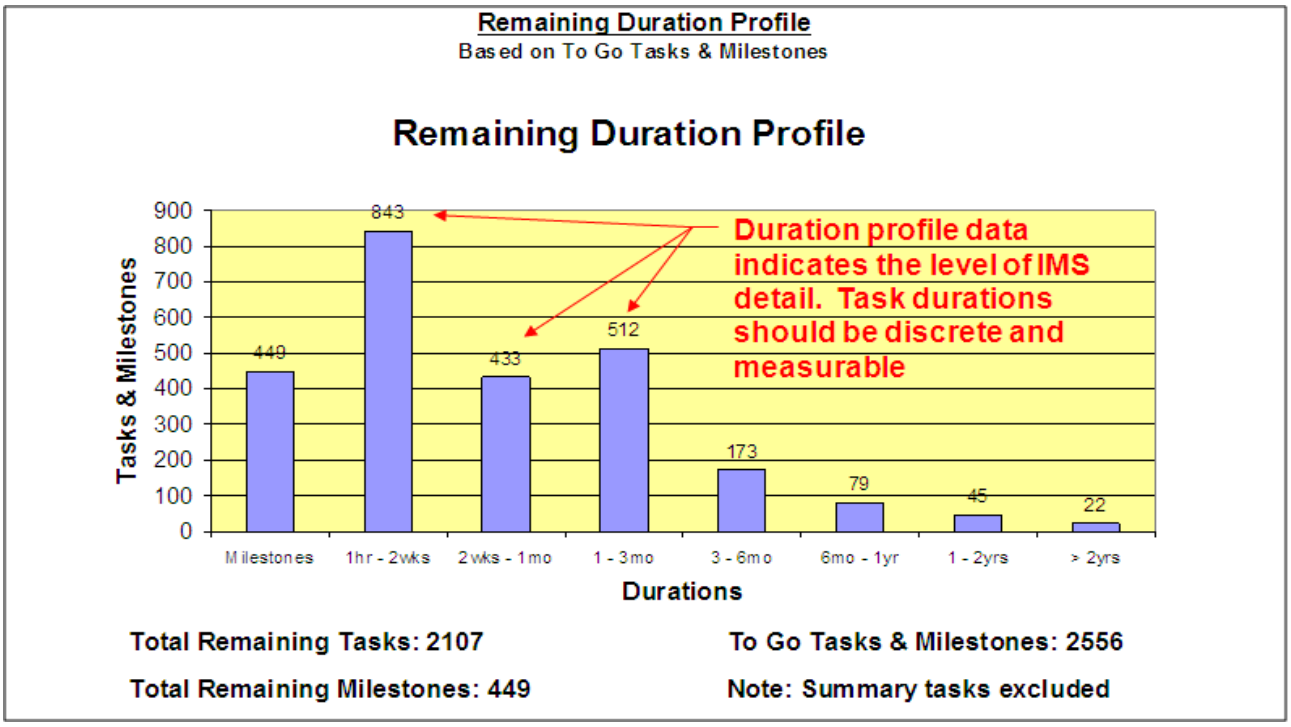


Figure 4-12: SASR – Remaining Duration Profile

SASR Management Overview Report (2 pages): This two-page management report (see Figures 4-13, 14) provides both thumbnail graphics of the above metrics along with narrative assessment explanations provided by the schedule analyst. This report allows the scheduler to explain in understandable terms the meaning of each metric along with the appropriate analysis conclusions as they relate to the project.

Management Overview Report (page 1)

Provides a format for brief analysis explanation for management reporting

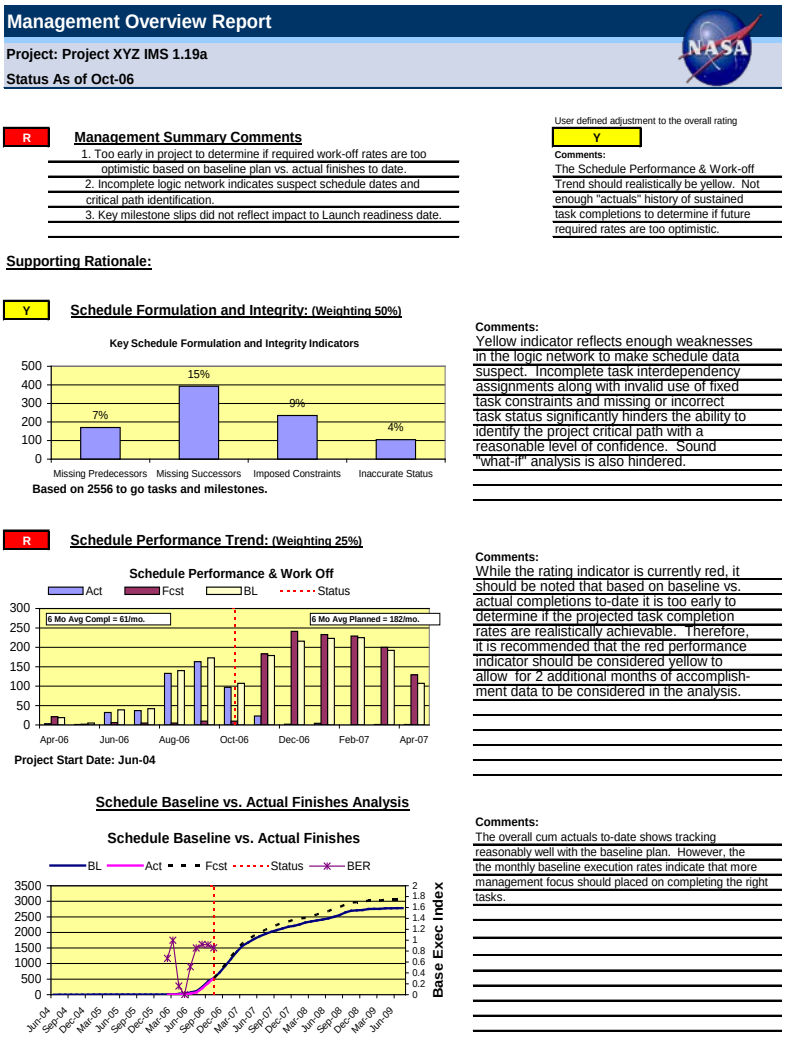


Figure 4-13: SASR – Management Overview Report (Page One)

Management Overview Report (page 2)

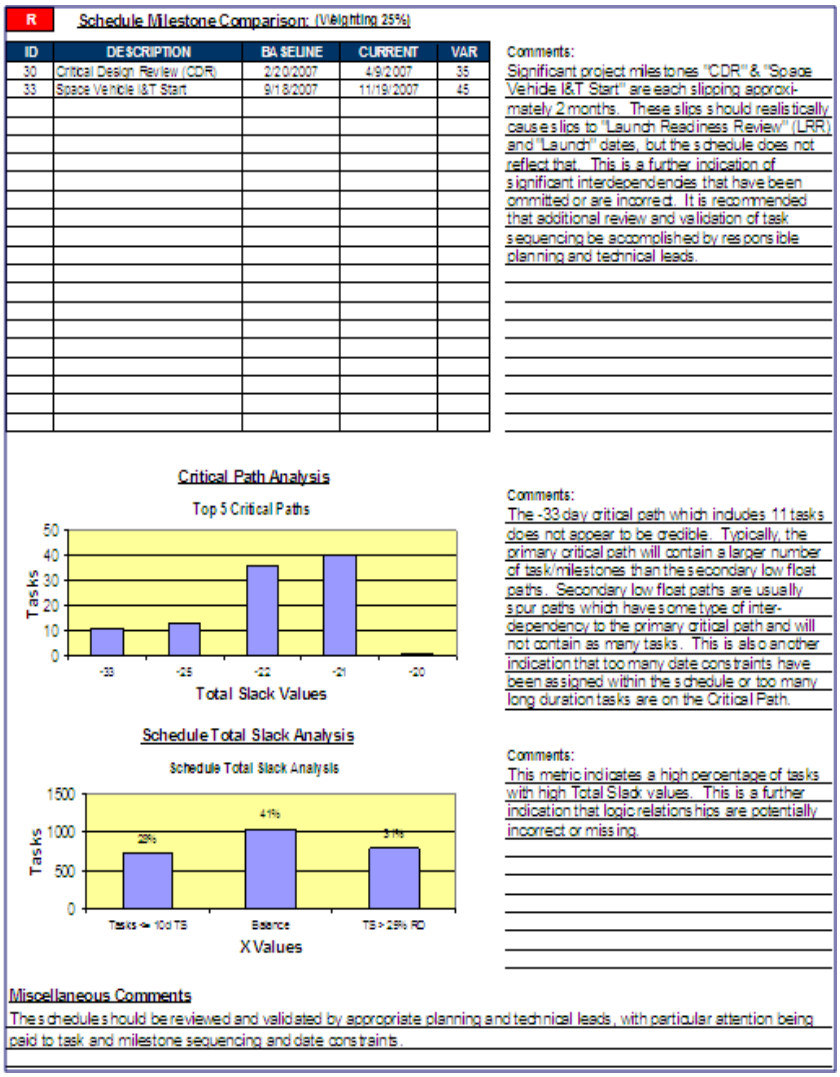


Figure 4-14: SASR – Management Overview Report (Page Two)

Section 5: The Schedule Performance and Work-Off Trend

Initiating the Schedule Performance and Work-Off Trend

The purpose of the Schedule Performance and Work-Off Trend is to provide the user with very quick visibility into how tasks and milestones stack up on a monthly basis within the project IMS. It reflects not only the baseline plan, but also actual accomplishment too date, and the schedule profile of how all remaining project tasks are scheduled to be worked in the future. This trend analysis report provides objective schedule data to assist in the assessment of IMS credibility.

To initiate this assessment function, select the Trend Analysis icon from the MS Project toolbar (see Figure 5-1). The icon initiates the Trend Analysis Wizard.

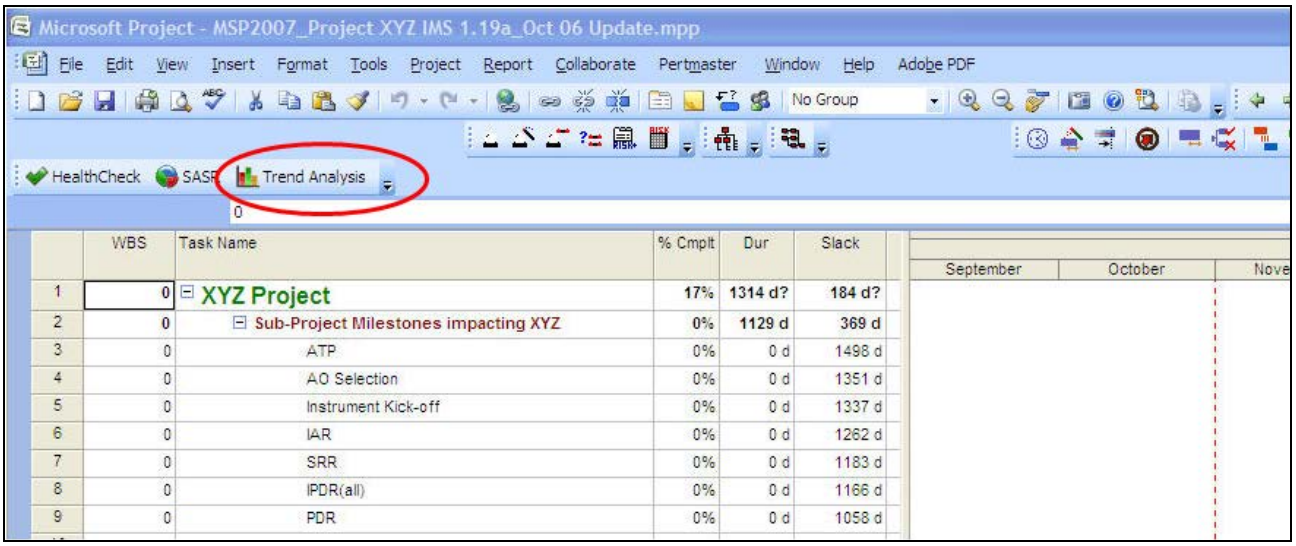


Figure 5-1: Performance and Work-Off Trend Tool Bar Selection

The Trend Analysis wizard dialogue box (Figure 5-2) allows the user to set the schedule "Status Date" on which the resulting performance and work-off trend data will be based. Note: The schedule should reflect a Status Date that represents the most current date for which the schedule has been progressed through. If the date is missing or obviously incorrect it should be added or changed.

The wizard dialogue box also provides a browse function to allow the user to select the location where they wish the performance and work-off output file to be stored.

After selecting a location for storing the Schedule Performance and Work-off Trend data file, then select finish. The STAT tool will then process the schedule data to produce a histogram profile within excel that shows how the scheduled tasks and milestones stack up by month for the duration of the project.

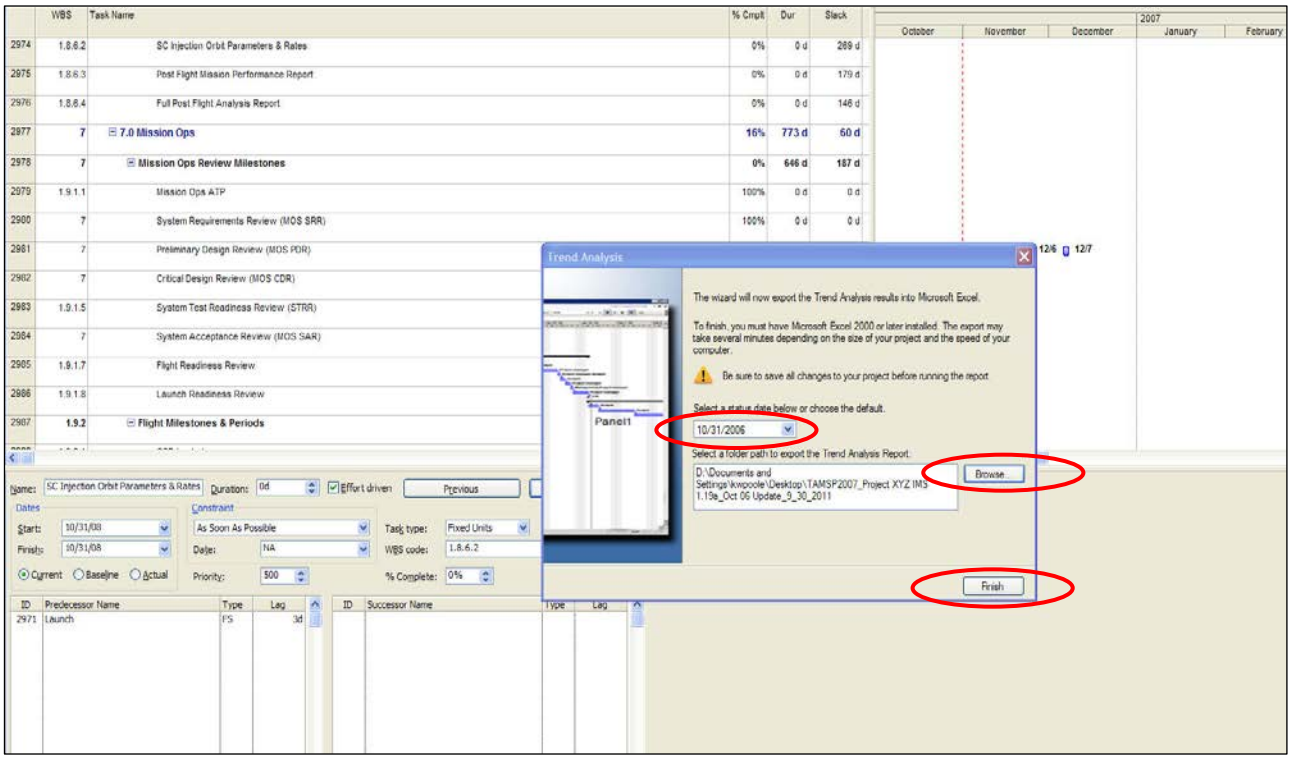


Figure 5-2: Performance and Work-Off Trend Wizard

Understanding Schedule Performance and Work-Off Trend Results

The performance and work-off trend data provides the user with objective information relative to past schedule achievements and to-go schedule forecasts while at the same time comparing to the IMS baseline plan. The illustration below (Figure 5-3) provides visibility for the overall duration of the project to assist the scheduler and project team in determining if the planned schedule execution profile looks reasonable and achievable. Assessing the peaks and valleys of the profile can sometimes be helpful when comparing to a project's labor profile to determine if there is a correlation or consistency in time phasing that exists between the number of tasks scheduled to complete each month and the amount of labor required to complete those tasks. This metric can identify and highlight where unrealistic bow-waves of scheduled work exists. Where bow-waves do exist, it is recommended that appropriate project team members review and revise the schedule as-needed to ensure data credibility for management decision making. Actual completion performance is also visible in this graphic to help in establishing performance trends that assist in evaluating chances for future schedule success.

Other helpful information displayed on the performance and work-off trend are tasks and milestones that have been scheduled to be worked, but are not progressed as time passes. The result of this practice is that incomplete schedule tasks are continued to be reflected to the left of time-now, or in past history. It should be noted that this practice is not satisfactory for sound schedule management.

In order to maintain schedule accuracy and critical path credibility, it is crucial that all tasks/milestones that were previously scheduled to have been started or completed prior to time-now, be assigned with new forecast start/completion dates in the future if previous scheduled dates were not achieved. Tasks with inaccurate status, as described above, will hinder meaningful and effective schedule analysis.

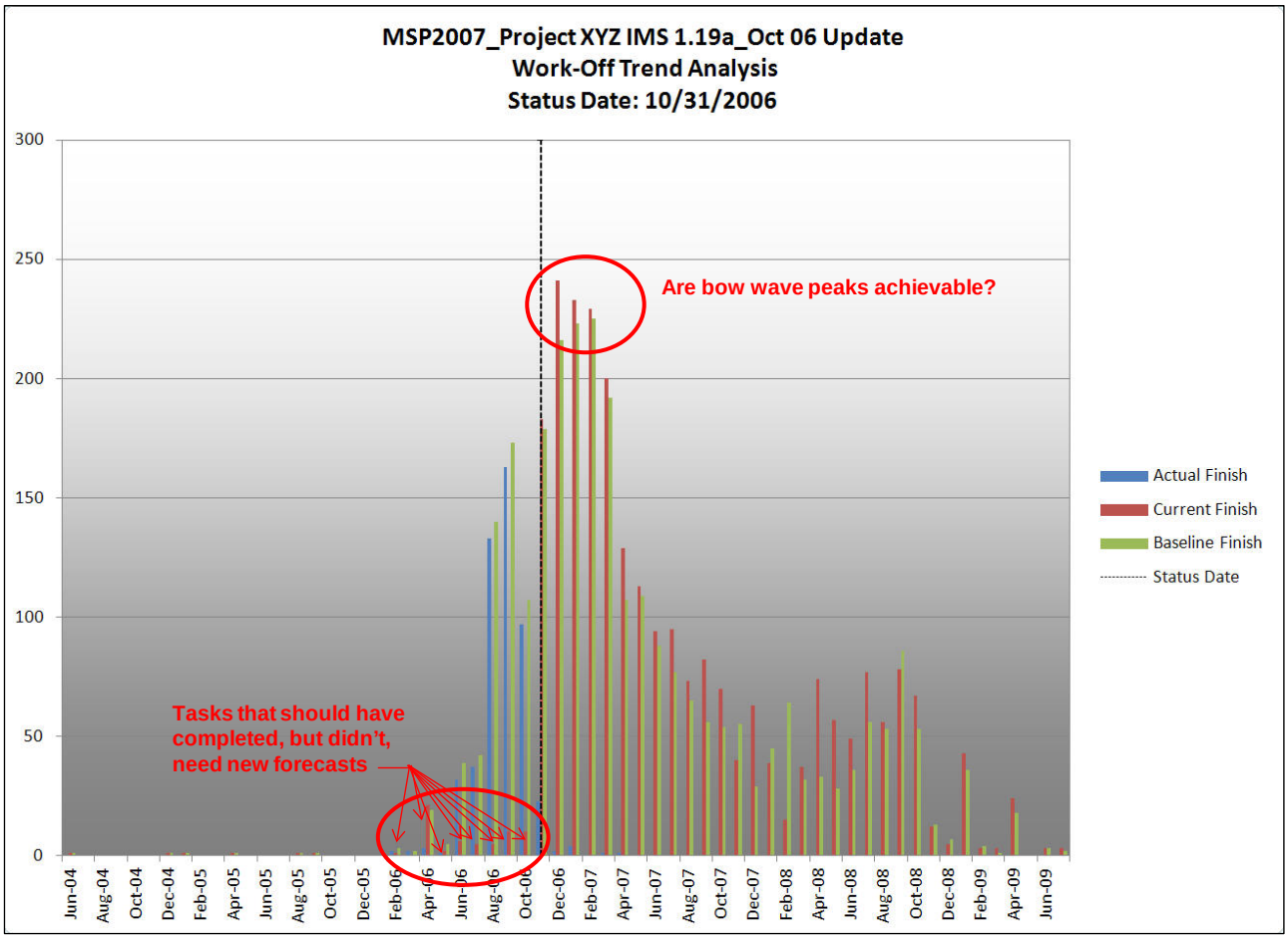


Figure 5-3: Schedule Performance & Work-Off Trend Illustration

National Aeronautics and Space Administration

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