

# T&E / V&V Integration Checklist

## RPG Reference Document

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## Ten-Step Process for Coordinating T&E and V&V Efforts

Please refer to the reference document "[T&E and V&V Integration](#)" for information on the theory and background underlying the following methodology.

### 1. Determine the integration case that best describes the situation

The diagram below illustrates how modeling and simulation (M&S) is being used to support system development in each case.

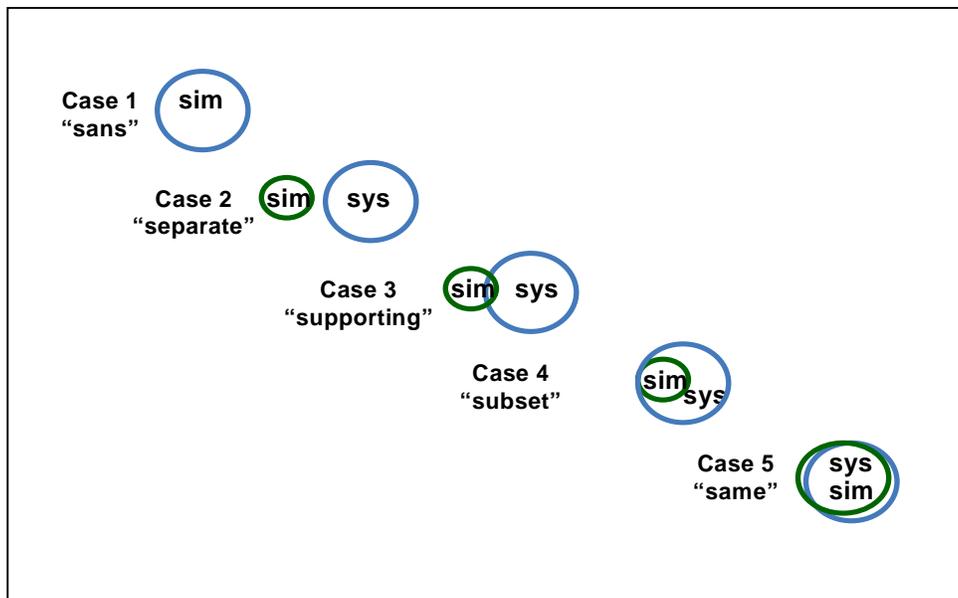
**Case 1: Sans.** M&S is used, but does not support development of a system.

**Case 2: Separate.** M&S use precedes system development; the simulation is separate from the system.

**Case 3: Supporting.** The simulation is partially embedded in the system.

**Case 4: Subset.** The simulation is wholly embedded in the system.

**Case 5: Same.** The simulation and the system are one and the same thing.



### 2. Determine simulation/system requirements

**Case 1:** Follow RPG guidelines for VV&A for M&S

**Case 2:** Follow RPG guidelines for VV&A for M&S

**Case 3:** Identify which simulation requirements coincide with system requirements

**Case 4:** Identify which simulation requirements coincide with system requirements

**Case 5:** Identify which simulation requirements coincide with system requirements

Cases 1 and 2 do not require integration of T&E and V&V. Continue to Step 3 only if the situation is a Case 3, 4, or 5.

### ***3. Separate the set of requirements common to both the simulation and the system (identified in step 2) into three bins***

- critical requirements
- important requirements
- less important requirements

If a very large set is involved, additional bins may be used. Each requirement should be in only one bin.

### ***4. Beginning with the most “critical” bin, distribute the subset of requirements into one of the following partitions***

- If the requirement assesses the simulation’s basic functionality, design, formats, or simple user interfaces, put it in the **Verification Partition**.
- If the requirement requires comparison of the simulation’s accuracy to the real world, put it in the **Validation Partition**.
- If the requirement addresses the system’s capacity, performance, or system interfaces, put it in the **DT&E (Developmental Test and Evaluation) Partition**.
- If the requirement examines the system’s capabilities to do its job or assesses the usability of its user interfaces, put it in the **OT&E (Operational Test and Evaluation) Partition**.
- If it is difficult to decide between two partitions, the requirement should be put in the higher-ranking partition.
- If still in doubt, put it in the **Verification Partition**.

### ***5. Set aside the Critical Requirements Bin created in step 3 and repeat the process with each of the remaining bins***

Partition the requirements in the next most “important” bin to create an Important Requirements Bin and the requirements in the “less important” bin to create the Less Important Requirements Bin.

The result, in this example, is three bins representing the critical, important, and less important requirements, each of which is further subdivided to show the requirements to

be assessed during verification, validation, during DT&E, and during OT&E. The general format for the Critical Requirements Bin is shown in the table below:

Critical Requirements Bin Assessment Table				
Requirement	Ver	Val	DT	OT
Requirement a	X			
Requirement b	X			
Requirement c		X		
Requirement d		X		
Requirement e			X	
Requirement f				X
Requirement g				X
* Verification ** Validation				

**6. Starting with the Critical Requirements Bin, determine what is needed to assess these requirements**

For each requirement in the bin, specify what technique(s) will be used to assess the requirement, when the assessment will occur, and what resources will be needed. (See the reference document on [V&V Techniques](#) for examples. T&E techniques generally involve test events that are defined by the test director.) The scheduling column should reflect the time it will take to perform the technique given that the resources needed are available. Clear, firm estimates are important to the success of the integrated V&V and T&E effort and can reduce the risk associated with these processes. The scheduling described in the matrix should also be consistent with test plans developed in support of the T&E effort and with the V&V plan. Finally, the matrix should reflect a balance of resources required to conduct these activities.

For example, additional resources may be available to reduce the amount of time needed to perform a given technique. Alternatively, where resources are limited, additional time may be afforded to the performance of a technique to distribute the resource requirement over a longer period of time. It is important to balance the costs associated with time and other resources against the additional credibility that can be determined with each additional investment. Although this is a difficult and somewhat tedious step, it is essential to save time and effort later. Once this step has been completed for the Critical Requirements Bin, define the same information for the requirements in the remaining bins, resulting with a matrix like the one shown below:

Critical Requirements Bin: Basic Assessment Matrix							
Rqmt	Ver	Val	DT	OT	Techniques	Scheduling	Resources
a	X				code analysis	start + 3 months	code analysis software
b	X				audit	start + 4 months	trained personnel
c		X			doctrine review	start + 3 months	doctrine, reviewer
d		X			audit	start + 5 months	trained personnel
e			X		system integration	start + 6 months	computer engineers
f				X	fleet test	start + 24 months	ship, personnel, software
g				X	live fire test	start + 24 months	missile, homing algorithm
* Verification ** Validation							

This example is only partially constructed to provide a general sense of the format. Many requirements may be assessed using more than one technique. Additionally, the list of required resources needs to be very explicit to ensure that it can address the needs of the assessment.

### ***7. Identify where assessments (verification, validation, DT&E, OT&E) can be combined or coordinated***

Combining multiple requirements into one assessment can save time, money, and effort. This should be done whenever possible, **as long as the assessment is not shortchanged for any of the requirements**. For example, “trained personnel” is not really detailed enough to describe the people needed for the given assessment. Specifics about the training needed should be given such as the subject matter in which the training is needed, whether the training has been obtained through formal education or on-the-job experience, the level of mastery needed, etc. Care should be taken when combining requirement assessments; combinations should be based on similar techniques, matching schedules, common resources, etc.

The f example in step 8 illustrates how the personnel resources listed in the previous paragraph can be further defined to meet the specific skill sets required for the technique. Again, this example is simplified to provide the general sense of what the matrix should contain.

**8. Number each requirement or combination of requirements (identified in step 7) to result in the following matrix**

Critical Requirements Bin: Example Assessment Matrix							
Rqmt	Ver*	Val**	DT	OT	Techniques	Scheduling	Resources
<b>Assess 1</b>	X						
a					code analysis	start + 3 months	code analysis software
<b>Assess 2</b>	X	X					
b					audit	start + 4 months	software engineers
d					audit	start + 5 months	software engineers
<b>Assess 3</b>		X	X				
c					doctrine review	start + 3 months	doctrine, military reviewer
d					audit	start + 5 months	software engineers
e					system integration	start + 6 months	computer engineers
<b>Assess 4</b>		X		X			
c					doctrine review	start + 3 months	doctrine, military reviewer
f					fleet test	start + 24 months	ship, trained crew, software
<b>Assess 5</b>				X			
f					fleet test	start + 24 months	ship, trained crew, software
g					live fire test	start + 24 months	missile, homing algorithm
* Verification ** Validation							

Again, for illustration purposes, the example is only partially constructed. The assessment of individual requirements can be combined where they require similar techniques, matching schedules, or common resources. Additionally, techniques and schedules can be combined across bins where less critical requirements can be assessed using the same resources and schedule as are used for more critical requirements. Make sure separate tables (matrices) are developed - one for each of bin (critical, important, less important). Where assessments of less critical requirements have been combined with more critical requirements, they should be listed in the table for the more critical requirement.

**9. Develop a timeline for each bin to illustrate when each assessment will occur**

System development milestones may be included on these timelines to indicate how the assessments will track with the development process.

**10. Present the bin tables and timelines to the user to identify which requirements to assess and to determine what resources should be allocated for each assessment**

Everyone involved should understand which requirements will be assessed, during which assessment phase (verification, validation, DT&E, OT&E) they will be assessed, when in the overall schedule the assessments will be performed, and what resources are authorized.

## References

### ***RPG References in This Document***

select menu: *RPG Reference Documents*, select item: "T&E and V&V Integration"

select menu: *RPG Reference Documents*, select item: "V&V Techniques"

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