

# DEFENCE SIMULATION VERIFICATION, VALIDATION AND ACCREDITATION POLICY

## INTRODUCTION

1. The common purpose of simulations<sup>1</sup> is to gain knowledge or develop skills. Simulations must be relevant to the business processes that the knowledge and skills support. Confidence building approaches must therefore build the trust needed in the simulation to the extent that:
  - a. The role of the simulation meets the end-users' needs within their business process cycles (ie, that it is doing the right things); and
  - b. The fitness of the simulation to deliver outputs that all end-users and stakeholders have sufficient confidence in (ie, that it is doing those things right).
2. Generally, confidence building approaches focus on process and independent evaluation of results. Informal approaches might be adequate for less complex or less expensive simulations. The management of expectations is a key component of informal approaches to confidence building and the target outcome is of trust in the simulation by users and their stakeholders. In many cases, formal approaches will also be required. Formal approaches include standards that provide a regulatory and guidance framework and verification, validation and accreditation. These offer structured processes to identify potential problems before they arise. In all cases, it is only necessary to demonstrate the desired fitness for purpose in/of the simulation.<sup>2</sup>
3. This instruction will focus on simulation verification, validation and accreditation. For introductory purposes, formal definitions of these terms are encapsulated as follows:
  - a. **Verification** is the process of determining that a simulation implementation accurately represents the developer's conceptual description and specifications. In layman's terms, verification answers the question: "Are we developing the simulation 'right' to our specifications?"
  - b. **Validation** is the process of determining the degree to which the relevant aspects of a simulation effectively represent the real world from the perspective of the intended uses of the simulation. In layman's terms, validation answers the question: "Are we developing the 'right' simulation for the purposes we have determined?"
  - c. **Accreditation** is an official determination that the simulation is acceptable for its intended purpose. It is based on experience and expert judgement and the level of accreditation is dependent on the purpose of the simulation. In layman's terms, accreditation answers the question: "Should we use the simulation for the intended purpose?"

Further VV&A related definitions are provided at Annex A.

## AIM

4. The aim of this instruction is to promulgate the policy that will guide the process for verification, validation and accreditation (VV&A) of simulations in the Defence Organisation.

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<sup>1</sup> As defined in DI(G) OPS 42-1, a **model** is a physical, mathematical or otherwise logical representation of a system, entity, phenomenon or process. A **simulation** is the implementation or exercise of a model over time.

<sup>2</sup> For general guidance on confidence building approaches for simulation, refer to the Defence Simulation Proposal Guide.

## SCOPE

5. This instruction addresses computer-based simulation VV&A process, roles, activities and guidance.

## STRATEGIC ISSUES FOR THE VV&A OF SIMULATION

6. The Defence Simulation Policy DI(G) OPS 42-1 highlights strategic issues relevant to simulation in Defence. Specific strategic issues for implementing a Defence wide simulation VV&A process are:
  - a. increased confidence in simulation use;
  - b. reduced risk of incorrect simulation use;
  - c. increased simulation usability for future applications;
  - d. resource containment;
  - e. potential for better analysis;
  - f. satisfaction of policy requirements; and
  - g. interoperability.
7. These strategic issues have guided the development of Defence's approach to the VV&A of simulation, as described in this policy. The elements of this approach are:
  - a. a Defence VV&A process for simulation,
  - b. the establishment of formal Defence roles for VV&A of simulation, and
  - c. a set of defined activities for VV&A of simulation.

## DEFENCE SIMULATION VV&A PROCESS

8. All simulations in current use within Defence should undergo sufficient verification and validation to obtain defined levels of capability and credibility for all intended uses. The typical simulation VV&A process is shown in Annex B.
9. Verification and Validation (V&V) shall be:
  - a. commensurate with the relative criticality of the decisions or capability effects that result from the application of the simulation.
  - b. the responsibility of the simulation acquirer or manager.
  - c. implemented in accordance with a risk management framework to ensure the desired level of end-user confidence is achieved. It is expected that V&V activities will address high-risk areas as a minimum<sup>3</sup> with the remaining residual risk documented.<sup>4</sup>
  - d. required:
    - (1) for all significant simulation developments.<sup>5</sup>

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<sup>3</sup> The application sponsor should approve the risk areas to undergo V&V.

<sup>4</sup> The cost of this activity will be borne by the simulation acquirer in the Acquisition phase and the simulation manager when in the In Service phase. All simulation proposals should identify necessary resources to meet the application sponsors desired level of V&V activity.

<sup>5</sup> This includes, but is not limited to, a simulation whose intended application will require accreditation; that will be an element of a federation; that is intended for reuse; whose application involves safety of

- (2) when existing simulations undergo major upgrade or modification.

Note: Regulatory requirements may be imposed by the Australian Defence Force (ADF) Technical Regulatory Framework to ensure that ADF simulation material is fit for service, and poses no hazard to personnel, public safety, or the environment. Existing VV&A and T&E documentation may aid in addressing these additional requirements.

- e. incorporated into the development life-cycle management processes of all simulations.
- f. encouraged for all simulations in current use in the Defence Organisation.

10. The V&V of:

- a. individual simulations used in a federation shall remain the responsibility of the Defence Group managing that federation element.
- b. own forces and capabilities in joint, general and common-use simulation applications shall be formally coordinated with the respective ADF Service. The appropriate ADF Service shall be responsive to the Defence Groups requesting support to ensure that ADF capabilities are appropriately represented.
- c. opposing forces and capabilities in joint, general and common-use simulation applications shall be formally coordinated with the Australian Defence Force Warfare Centre (ADFWC) (representing Commander Joint Operations. The ADFWC shall be responsive to the Defence Groups requesting support to ensure that the opposing forces are appropriately represented in the simulation.
- d. foreign forces in simulation shall be formally coordinated with the appropriate authorities through the Defence Intelligence Organisation (DIO) to ensure conformance with established intelligence positions and assessments.
- e. fictitious forces shall be as agreed with the application sponsor.

11. Accreditation of a simulation:

- a. is the responsibility of the application sponsor. The application sponsor may designate an accreditation agent to conduct an accreditation assessment.
- b. federation is the responsibility of the Defence Group sponsoring the federation. The application sponsor may designate other Defence Groups to act as accreditation agents for elements of the federation, with the concurrence of the designated Defence Group.

12. The accreditation of a federation of simulations shall include a determination as follows:

- a. Federation elements (federates) can appropriately exchange data.
- b. Data items being exchanged are accurate and comparable across the federation to the extent required.
- c. Response times are commensurate across all system elements.
- d. The degree to which the federation is complete and meets real world behaviour, appearance, performance, fidelity, and interoperability expectations are acceptable for the intended purpose.

13. Simulations in support of Defence Organisation activities that are developed or used by non-Defence government organisations, contractors (including government funded research and development centres), academic institutions, and any other non-Defence organisations shall

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life or equipment; and whose development will involve the commitment of significant Defence resources.

comply with the intent, issues and outline processes of Defence VV&A policies and procedures. The Defence Group sponsoring the non-Defence simulation application is responsible for ensuring compliance with established VV&A policies and procedures.

## **DEFENCE SIMULATION VV&A ROLES**

14. Formal definitions of the simulation VV&A roles are encapsulated in Annex B. These roles should be identified for all simulation VV&A activities.

## **DEFENCE SIMULATION VV&A ACTIVITIES**

15. VV&A plans should be developed concurrently upon initiation of the development of a simulation or major upgrade of an existing simulation to include programming of V&V resources. VV&A plans shall be documented consistent with the following minimum information:

a. For accreditation:

- (1) Information on the intended use of the simulation.
- (2) Identification of the accreditation sponsor and accreditation agent (if different from the accreditation sponsor). It should also identify the validation and verification agents.
- (3) The information needed to assess the fitness of the simulation for the intended application. Accreditation criteria are usually developed to aid this activity.
- (4) The priorities based on associated risk.
- (5) The approach to be used for collecting or generating the information.
- (6) The approach for conducting the accreditation assessment.
- (7) Resources required and schedule for the VV&A process.

b. For verification and validation:

- (1) Identification of the validation agent and the verification agent. It should also identify the simulation developer.
- (2) Information on the intended use and background of the simulation.
- (3) Identification of the V&V tasks to be performed to address the accreditation information needs and priorities.
- (4) Identification of the resources required to perform each task and the associated task schedules.

16. VV&A reports shall be documented consistent with the following minimum information:

a. For verification and validation:

- (1) Identification of validation agent, verification agent and simulation developer.
- (2) A description of the simulation and its intended purpose.
- (3) Results of the verification and validation effort, including any identified simulation limitations and residual risk.
- (4) Any deviations from the V&V plan.

- b. For accreditation:
- (1) Identification of the accreditation agent if different from the application sponsor.
  - (2) A description of the simulation and its intended purpose.
  - (3) The accreditation agent's evaluation to include capabilities and limitations as they affect the appropriateness of the simulation, or federation of simulations for the intended purpose.
  - (4) The application sponsor's decision on whether or not to accredit the simulation, or federation of simulations for the intended purpose.

## **POLICY IMPLEMENTATION**

### **Defence Simulation Verification, Validation & Accreditation Guide**

17. The Australian Defence Simulation Office (ADSO), in consultation with the Defence Simulation Forum (DSF), shall develop and implement Defence Simulation VV&A guidance. The guidance shall describe the:
- a. process for the VV&A of Defence simulation,
  - b. roles required for the VV&A of Defence simulation interdependencies and interrelationships between those activities,
  - c. VV&A documentation to support this process,
  - d. relationship of VV&A to the ADF Technical Regulatory Framework and Test and Evaluation program,
  - e. methods for estimating the level of VV&A to be undertaken and associated costs, and
  - f. implementation of current VV&A standards.

### **Supporting policies and plans**

18. Where it is appropriate Defence Groups shall develop and implement subordinate simulation VV&A policies to meet individual Group requirements. These documents shall detail how the requirements of this policy, along with simulation requirements specific to that Group, shall be implemented. The content, format and structure of these documents are to be consistent with the degree of simulation undertaken within the respective Group.

## **SPONSORSHIP AND REVIEW**

19. ADSO is the sponsor of this instruction. ADSO is to review the instruction on an annual basis and implement any necessary amendments. Amendments are to be agreed in consultation with the DSF.

### **Related Policy**

DI(G) OPS 42-1 Defence Simulation Policy

DI(G) OPS 43-1 Defence Test and Evaluation Policy

DI(G) LOG 8-15 Regulation of Technical Integrity of ADF Material

### **Annexes:**

- A. [Definitions](#)
- B. [Supporting Information](#)

Sponsor: Australian Defence Simulation Office

## DEFINITIONS

1. **Accreditation (Simulation).** The official certification that a simulation, or federation of simulations is acceptable for use for a specific purpose.
2. **Accreditation Agent (Simulation).** The organisation designated by the application sponsor to conduct an accreditation assessment of a simulation application, or federation of simulation.
3. **Accreditation Criteria.** A set of standards that a particular simulation, or federation of simulations must meet to be accredited for a specific purpose.
4. **Application.** The executing software on a host computer that models all or part of the representation of one or more simulation entities. The simulation application represents or "simulates" real-world phenomena for the purpose of training or decision making. Examples include manned vehicle (virtual) simulators, computer-generated forces (constructive), environment simulators, and computer interfaces between a distributed simulation network and real (live) equipment.
5. **Application Sponsor (Simulation).** The organisation that utilises the results or products from a specific application of a simulation, or federation of simulations.
6. **Common-Use Simulation.** Simulation applications, services, or materials provided by a Defence Group to two or more Defence Groups.
7. **Data Certification.** The determination that data have been verified and validated.
8. **Data Validation.** The documented assessment of data by subject area experts and its comparison to known values.
9. **Data Verification.** Data verification is the use of techniques and procedures to ensure that data meets constraints defined by data standards and business rules derived from process and data modelling.
10. **Federation Element (or federate).** Term applied to an individual simulation that is part of a federation. Federation elements may be distributed.
11. **Federation.** A system of interacting simulations, with supporting infrastructure, based on a common understanding of the objects portrayed in the system.
12. **Model.** A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.
13. **Simulation.** The implementation or exercise of a model over time.
14. **Simulation Acquirers.** Those who procure simulations, with a focus on major and minor projects, including requirements analysis. They also administer the development of simulations.
15. **Simulation Developers.** Those who develop simulations including design and programming. They not only build the initial base level capability, but all subsequent levels of capability as well.
16. **Simulation Managers.** Those who manage a simulation or organisations which use or rely on simulation.
17. **Simulator.** A device which employs simulation to replace a real world system or apparatus, eg for training purposes. A simulator generally has three elements - a modelled process which represents the real world system, a control system, and a man-machine interface.
18. **Validation (Simulation).** The process of determining the degree to which a simulation, or federation of simulations, is an accurate representation of the real world from the perspective of the intended uses of the simulation.

19. **Validation Agent.** The organisation designated by the simulation sponsor to perform validation of a simulation, or federation of simulations.
20. **Verification (Simulation).** The process of determining that a simulation, or federation of simulations, implementation accurately represents the developer's conceptual description and specifications.
21. **Verification Agent.** The organisation designated by the simulation sponsor to perform verification of a simulation, or federation of simulations.

## SUPPORTING INFORMATION

1. **VV&A Process.** The typical simulation VV&A process is shown in figure 1.

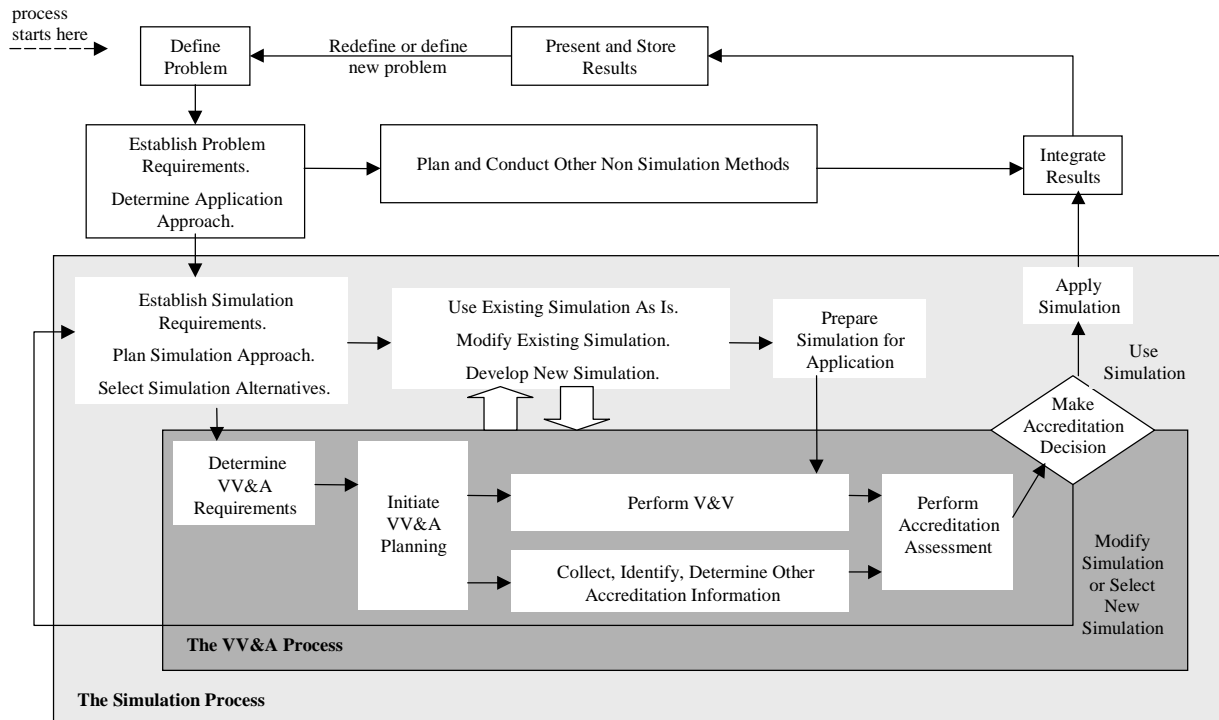


Figure 1: The VV&A Process<sup>6</sup>

2. **Defence Simulation VV&A roles.** Formal definitions of the simulation VV&A roles are encapsulated as follows:

- a. **Simulation Application Sponsor** - The organisation that utilises the results or products from a specific application of a simulation, or federation of simulations.
- b. **Simulation Accreditation Agent** - The organisation designated by the application sponsor to conduct an accreditation assessment of a simulation application, or federation of simulation.
- c. **Simulation Validation Agent** - The organisation designated by the simulation application sponsor to perform validation of a simulation, or federation of simulations.
- d. **Simulation Verification Agent** - The organisation designated by the simulation application sponsor to perform verification of a simulation, or federation of simulations.
- e. **Simulation Developers** - Those who develop simulations including design and programming. They not only build the initial base level capability, but all subsequent levels of capability as well.

<sup>6</sup> Adapted from US DOD VV&A Recommended Practices Guide.

3. Table 1 shows typical responsibilities for each VV&A role mapped to typical VV&A activities.

**Table 1: Typical responsibilities for the VV&A of simulation<sup>7</sup>**

Activity	VV&A Role			
	Application Sponsor	Accreditation Agent	V&V Agents	Simulation Developer
Define Simulation Requirements	Lead	Review	Review	Assist
	Approve			
Define Acceptability Criteria	Assist	Lead	Assist	Assist
	Approve			
Plan Simulation Development/Preparation	Lead			Assist
	Approve			
Develop Accreditation Plan	Review	Lead	Assist	
	Approve			
Develop V&V Plan	Review	Assist	Lead	Review
Conduct Verification			Lead	Assist
Conduct Validation			Lead	Assist
V&V Report	Review	Review	Lead	Assist
Develop Accreditation Report		Perform	Assist	
Perform Accreditation Assessment	Monitor	Perform	Assist	
Make Accreditation Decision	Perform	Assist	Assist	
Maintain Configuration Control	Lead			Assist

<b>Lead</b>	Leads the activity. Normally involves participation from others.
<b>Perform</b>	Actually does the activity. Normally involves participation from others.
<b>Assist</b>	Actively participates in activity.
<b>Review</b>	Participation normally limited to reviewing results of activity and providing recommendations.
<b>Monitor</b>	Oversee activity to ensure it is completed appropriately but does not normally participate.
<b>Approve</b>	Determines when an activity is satisfactorily completed and another can begin. Determines what activity should be pursued next. (eg. Whether to continue on to the next scheduled activity or to return to a previous activity).

<sup>7</sup> Adapted from US DOD VV&A Recommended Practices Guide.