

Accreditation Authorities, Who they are, where to find them, and what do they do?

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ABSTRACT: *The Accreditation Authority is critical to the Verification, Validation and Accreditation process – yet arranging their participation is problematic. This paper discussed their qualifications, duties, and the selection process. It also provides real-world examples taken from representative classes of models and simulations.*

WHAT IS ACCREDITATION? -- NASA’s Modeling and Simulation (M&S) Verification, Validation and Accreditation (VV&A) Recommended Practices Guide (RPG) defines accreditation as the official endorsement that a model or simulation or federation of models and simulations and its associated data is acceptable for use for a specific purpose. Accreditation is the formal approval for use for a specific purpose of an M&S, given that the M&S and its associated data have been objectively and quantitatively evaluated by a cognizant SME and evidence exists supporting the ability of the M&S to produce real-world-representative data within the operational ranges of, and within the accuracy required by, the specific purpose. In short accreditation is the end user’s determination that an M&S is acceptable for the intended use. To understand what this means and how to implement it, consider the simple relationship of provider and consumer of information. The provider is the simulation user or analyst who generates data. The consumer is the manager or decision maker who uses data to support decisions. Each has responsibilities in assuring good design decisions.

The provider should be responsible for certifying, assessing, verifying, validating, and/or quantifying the uncertainty of the data given. The decision maker should be responsible for approving or accrediting the simulation that is used. Figure 1 shows the relationship between providers of M&S capability and the decision makers using the information generated by the M&S.

Accreditation is:

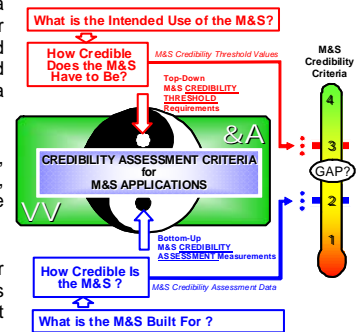
The official endorsement that a model or simulation or federation of models and simulations and its associated data is acceptable for use for a specific purpose.

The provider is:

Responsible for certifying, assessing, verifying, validating, and/or quantifying the uncertainty of the data given.

The decision maker is:

Responsible for approving or accrediting the simulation that is used. Or more simply put, just believing the data provided.



Accreditation Is The End User’s Determination An M&S Is Acceptable For Use

Figure 1: Provider and Decision Maker Relationships

CREDIBILITY ASSESSMENT VERSUS ACCREDITATION

– The recently approved NASA Standard for Models and Simulations, NASA STD 7009, has as its purpose to “ensure that the credibility of the results from models and simulations (M&S) is properly conveyed to those making critical decisions.” The requirements and recommendations of 7009 are intended to assure that

- a. Decision makers can assess the credibility of results from M&S used in decision-making.
- b. Responsible Parties are assigned to all M&S employed for key decision-making.
- c. Credibility of the M&S results can be traceable to the program or project requirements.

Accordingly 7009 contains a methodology to assess the credibility of simulation results. The authors have dealt with this topic in a number of papers^{[1][2][3][4]}; Figure 2 summarizes this relationship.

This figure introduces the “credibility chain-of-custody” diagram, which is a workflow diagram of the key M&S development and use activities. The workflow progresses left to right, from initial requirements development, through production of an M&S Results Report, with assessed credibility, ready for use by analysts to conduct their analysis studies for the specified problem the for which the M&S was developed or chosen. The diagram is divided into three major partitions, 1) activities before M&S use, 2) activities of M&S use, and 3) activities after M&S use. These activities are all color-coded consistently throughout this presentation material, according to the color-code legend shown at the bottom.

The key features of this workflow are explained in following slides, but here we simply want to emphasize the roles and context for “Traditional VV&A” compared to the new “M&S Results Credibility Assessment” activity. A primary distinction between these two is that VV&A should be conducted before M&S use, and credibility assessment can only be conducted after M&S use.

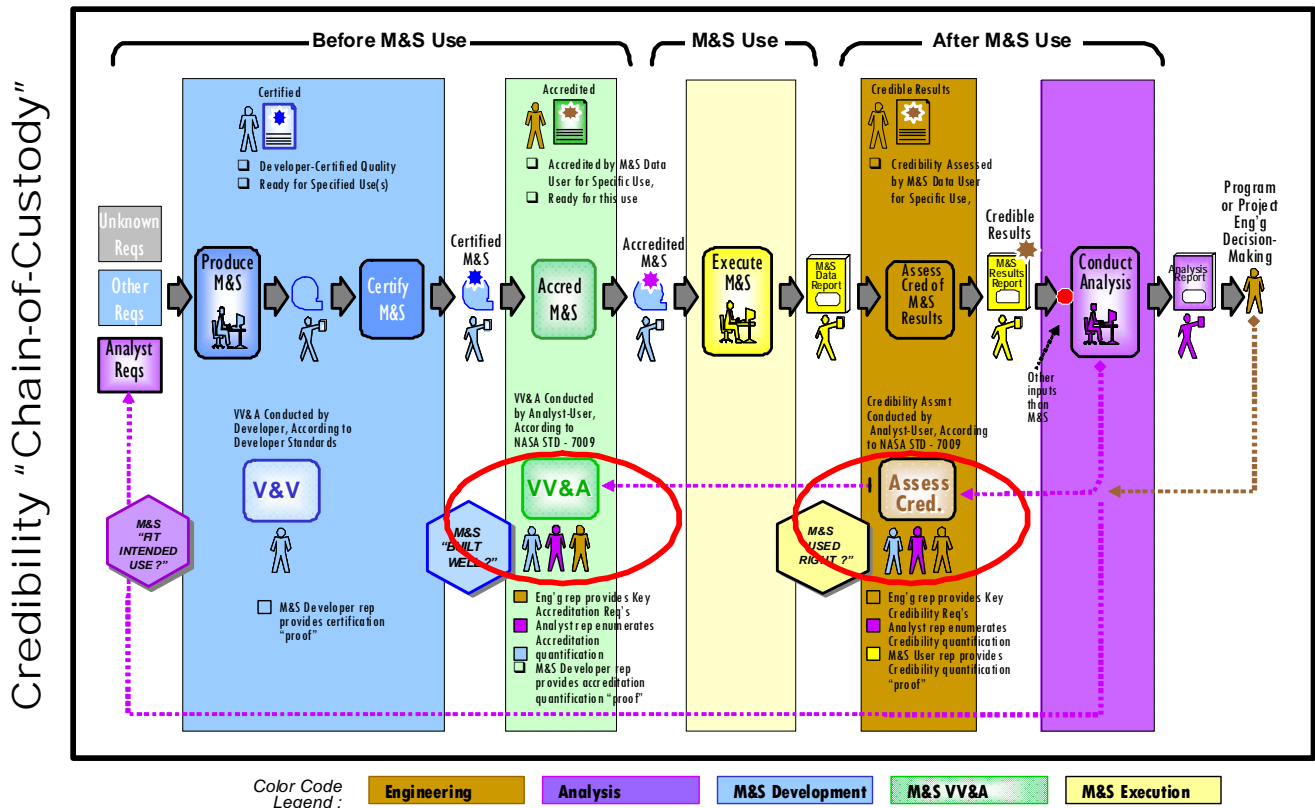


Figure 2: Context of M&S VV&A and Credibility in Chain-of-Custody for M&S Results Credibility

ACCREDITATION AUTHORITY QUALIFICATIONS – The Accreditation Authority should be the person responsible for the use of the results from the simulation. Ideally that person should control the resources necessary to correct any deficiencies noted during the verification and validation process. Figure 3 shows some of the other qualifications for an ideal Accreditation Authority.

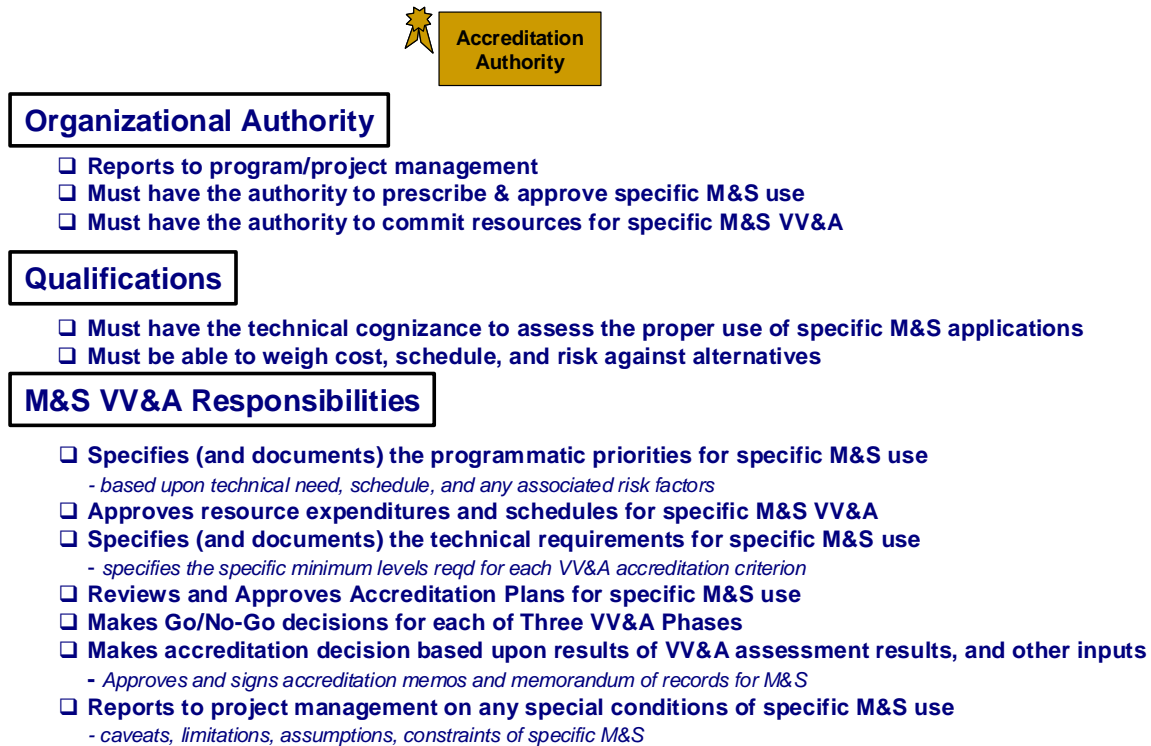


Figure 3: Authority, Qualifications and Responsibilities of Accreditation Authorities

EXAMPLES OF SUCCESSFUL ACCREDITATION AUTHORITIES – NASA has successfully employed several approaches to Accreditation Authority selection. This diversity of approach is consistent with the diversity inherent in NASA M&S applications. The following four examples illustrate the range of approaches.

Example (1) The Environments and Constraints SIG chairs, have accredited the Meteoroid Engineering Model (MEM) to characterize the meteoroid environment for the Constellation program. This model is described and referenced in the Natural Environments Definition for Design (NEDD) and the Design Specification for Natural Environments (DSNE) documents. MEM was developed by the Government and contractors in the Natural Environments Branch, EV44, at MSFC in cooperation with scientists from the University of Western Ontario. MEM applies to a wide variety of uses, but the users are not experts in meteorite flux prediction. NASA chose a recognized technical authority to accredit this M&S.

Example (2) SpaceNet is a logistics network analysis tool used to plan lunar and Martian missions. It was jointly developed by the Jet Propulsion Laboratory and the Massachusetts Institute of Technology, but used by the Constellation analysis group at the Johnson Space Center. The analysis group manager is the accreditation authority. He assembled a panel of Subject Matter Experts to review the verification and validation evidence presented by the developers. After careful review of the panel’s findings, the Analysis manager accredited SpaceNet.

Example (3) Campaign Manifest Analysis Tool (CMAT) was developed by NASA at the Langley research Center. This M&S is used by the developing organization to address high-level trades. The Accrediting Authority is the Headquarters sponsor for the tool.

Example (4) The Fully Unstructured Navier-Stokes 3-Dimensional code (FUN3D) is an example of common confusion in selecting accreditation authorities. FUN3D is a COTS computational fluid dynamics “code”. It has a somewhat open development community that employs rapid-development methods. It has a diverse user-industry community that overlaps the development community. When it was used by the NASA Ares Aero group as a predictor of aerodynamic loading of the Ares launch vehicle, some suggested the Ares Loads Panel, as users of the results, should accredit it. The Loads Panel maintained that the Aero Panel, as suppliers of the results, should accredit them. This push/pull accreditation conflict remains to be resolved. In this instance, a “workflow” diagram, showing the flow of information from development, through execution, through final data use, will be helpful. But the real issue to be resolved is one of “responsible party ownership”. This is a too common problem, and there is no single solution.

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AUTHOR BIOGRAPHIES

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