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Standard

Flight Dynamics Model Exchange Standard

Approved American National Standard
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Flight Dynamics Model Exchange Standard

Sponsored by

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Abstract

This is a standard for the interchange of simulation modeling data between facilities. The initial objective is to allow easy, straightforward exchanges of simulation model information and data between facilities. The standard applies to virtually any vehicle model (ground, air, or space), but most directly applies to aircraft and missiles.

American National Standard

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Foreword

This standard was sponsored and developed by the AIAA Modeling and Simulation Committee on Standards. Mr. Bruce Jackson of NASA Langley conceived Dynamic Aerospace Vehicle Exchange Markup Language (DAVE-ML). DAVE-ML is the embodiment of the standard in XML. The DAVE-ML reference document, including examples of its use, and the document type definition for the XML implementation are included in this standard (Annex B).

This implementation was then tested by trial exchange of simulation models between NASA Langley Research Center (Mr. Bruce Jackson), NASA Ames Research Center (Mr. Thomas Alderete and Mr. Bill Cleveland), and the Naval Air Systems Command (Mr. William McNamara and Mr. Brent York). Numerous improvements to the standard resulted from this testing.

At the time of approval, the members of the AIAA Modeling and Simulation CoS were:

Bruce Hildreth, Chair	J. F. Taylor, Inc.
Bruce Jackson, DAVE-ML Chair	NASA Langley Research Center
Bimal Aponso	NASA Ames Research Center
Jon Berndt	Jacobs
William Bezdek	Boeing Phantom Works
Geoff Brian	Defence Science and Technology Organisation (DSTO)
Victoria Chung	NASA Langley Research Center
R. Thomas Galloway	University of Central Florida
Peter Grant	University of Toronto
Michael Madden	NASA Langley Research Center
Michael Silvestro	Charles Stark Draper Laboratory, Inc.
Jean Slane	Engineering Systems Inc.
Brent York	Indra Systems, Inc.

The above consensus body approved this document in December 2011.

The AIAA Standards Executive Council (VP-Standards Wilson Felder, Chairman) accepted the document for publication in February 2011.

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Introduction

The purpose of this standard is to clearly define the information and format required to exchange air vehicle simulation models between simulation facilities (see Figure 1). This standard simulation interchange format is implemented in XML and is described fully in Annex B of this document.

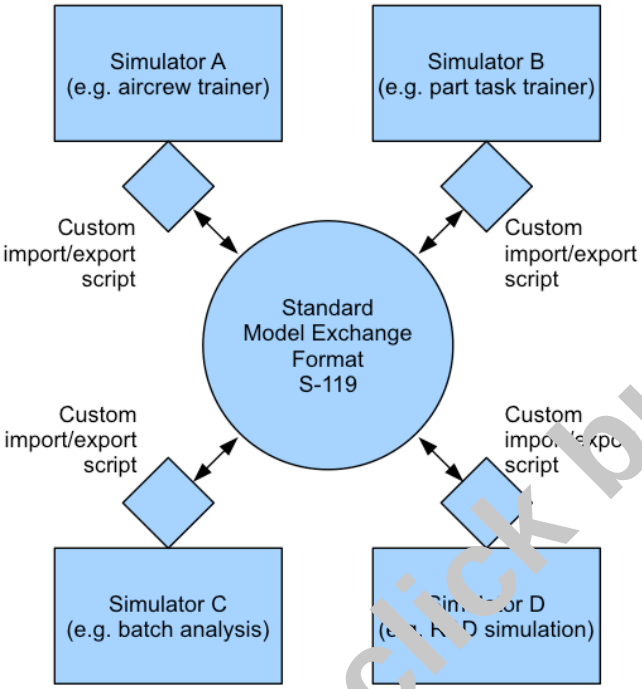

Figure 1 — Model exchange via a standardized format

The standard interchange format includes:

a) Standard variable name definitions — to facilitate the transfer of information by using these standard variables as a "common language". The interchange format can be used without using standard variable names. However, it will be more difficult because the exported model will have to include explicit definitions of all variables instead of just a subset unique to the particular model.

b) Standard function table definition — to allow easy transfer of nonlinear function tables of arbitrary dimension.

c) Standard coordinate system and reference frame definitions — used by the variable names and function tables to clearly define the information being exchanged.

d) Standard static math equation representation — for definition of static equations forming part of aerodynamic, propulsive, or other models.

A specialized grammar of XML provides a format for the exchange of this information, therefore each organization is required to design import/export tools that comply with the standard one time only.

Use of this standard will result in substantially reduced cost and time necessary to exchange aerospace simulations and model information. Test cases have indicated an order of magnitude reduction in an effort to exchange simple models when utilizing this standard. Even greater benefits could be attained for large or complicated models.

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1 Scope

This standard establishes definitions of the information and format used to exchange air vehicle simulations and validation data between disparate simulation facilities. This standard is not meant to require facilities to change their internal formats or standards. With the concept of an exchange standard, facilities are free to retain their well-known and trusted simulation hardware and software infrastructures. The model is exchanged through the standard, so each facility only needs to create import/export tools to the standard once. These tools can then be used to exchange models with any facility at minimal effort, rather than creating unique import/export tools for every exchange.

The standard includes a detailed convention for representing simulation variables. The purpose of this is to unambiguously describe all variables within the model when it is exchanged between two simulation customers or facilities. The variable representation includes explicit specification of all coordinate systems, units, and sign conventions used. XML is used as the mechanism to facilitate automation of the exchange of the information. Based on the definitions in the standard, a list of recommended but nonobligatory simulation variable names is included in Annex A. This list of standard variable names should further simplify the exchange of information, but is not required for use of the standard.

The standard includes capabilities for a model to be self-validating and self-documenting, with the provenance of a model's components included within the model and transferred with it. Statistical descriptions of the quality of a model may also be included.