



AEROSPACE INFORMATION REPORT

AIR7161™

Issued

2025-01

Guidance for Digital Thread Data Standards
Enablement, Monitoring, and Quantification with
the Digital Thread Framework and Digital Thread Index

RATIONALE

Organizations are struggling to implement industry specific Digital Thread data standards across various phases of the product lifecycle. These challenges include overlap of data standards and an increased requirement to monitor the level of data standards being implemented across various industries. The lack of Digital Thread data standards results in data interoperability challenges, cost overruns, increased overall flow time impacting product time-to-market, and the suboptimal utilization of organizational information resources.

The core objective of the proposed Digital Thread Framework and Index is to enable the Digital Thread standards monitoring and measurement for the effective implementation of Digital Thread data standards. The Digital Thread Framework essentially helps to define and understand Digital Thread objects, segments, and relationships by using visual “n” dimensional data objects to establish the organization and behavior of Digital Threads. Graph models can be used to notionally characterize the nature of Digital Thread objects and Digital Thread segments. Digital Thread objects are assessed based on qualitative attributes such as data standards, retention of data integrity, accuracy of the data, timeliness of data interface/interaction, and Digital Thread segment association.

Based on these attributes, the Digital Thread Index is defined as an aggregation of various factors such as standardization, efficiency, data quality, elasticity, and complexity of Digital Thread objects and its segments. Standardization factor represents percent (%) adherence of data standard for each object/segment, whereas efficiency factor determines the efficiency of data objects/segment transfer either from one lifecycle phase to another (or) object to object interaction. Elasticity factor signifies the architectural scalability of Digital Thread, whereas the complexity factor embodies the number of Digital Thread objects (objects and segments).

This proposed technical paper identifies and defines each of these factors and how an aggregate Digital Thread Index can be quantified using real-world examples. This methodology is intended to determine efficiencies as well as inefficiencies across various phases of a product lifecycle.

As this approach is continuously being evolved and matured, this presentation introduces and highlights the concept of Digital Mesh, which is an interwoven series of multiple Digital Threads.

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1. SCOPE

The scope of this document is to provide an overview and guidance to enable and monitor the use of Digital Thread data standards and the quantification of digital thread efficacy with the Digital Thread Qualitative Index. This document does not standardize the process. However, it does provide a methodology to determine efficiencies and inefficiencies of Digital Thread utilization across various phases of the product lifecycle.

1.1 Purpose

The purpose of this document is to provide an overview and implementation guidance to effectively implement Digital Thread data standards and measure the efficacy of Digital Thread standard utilization across the product lifecycle with the use of a Digital Thread Qualitative Index.

1.2 Approach

This document provides an overview of Digital Thread data standards that can be mapped to formulate Digital Threads. Digital Threads are composed of Digital Thread standard based defined data objects and Digital Thread segments. The aerospace industry can potentially leverage this methodology to effectively define and monitor the Digital Thread utilization across the entire product lifecycle. This document outlines Digital Thread Qualitative Index definition to quantify the efficacy of organization's Digital Thread implementation.

1.3 Intended Users

The intended users of this document are engineers, practitioners, academics, Original Equipment Manufacturers (OEMs), suppliers, operators, and Maintenance, Repair, and Overhaul (MRO) service providers who are various stakeholders in the aerospace and defense industry.

2. RELATED PUBLICATIONS

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR7367 Considerations for Requirements, Specifications, and Framework of a Digital Thread in Aircraft Data Life Cycle Management

3. INTRODUCTION

Digital Thread data standards help in achieving the goals of optimized use of organizational data resources, long-term data archiving, and retrieval of digital data, based on standardized approaches and solutions.

In addition, the data standards facilitate harmonization and minimized standardization efforts for organizations to enable data exchange and interoperability mechanisms between various data sources and platforms to ensure long-term use of digital data and technical information. The implementation and utilization of data standards helps an organization establish a semantic data definition for each stage of its product/service lifecycle. Figure 1 depicts high impact data standards landscape across a typical product lifecycle.