SIEMENS

VERIFICATION MANAGEMENT

5 ways digitalization streamlines the aircraft certification process

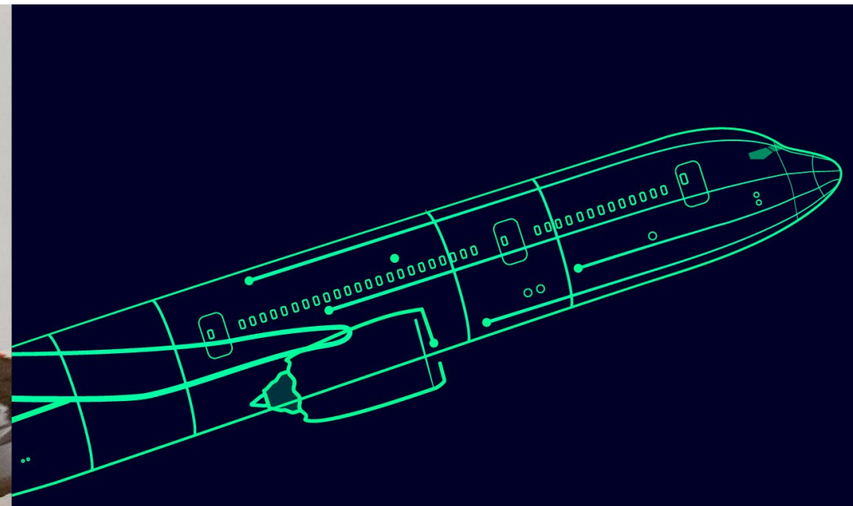
siemens.com/plm/vm

Gone are the days when verification activities could wait until the end of a program. Customers are demanding advancements including but not limited to aggressive sustainability targets and autonomous aircraft options – which require more integrated systems driven by software and electronics.

New technology like this is exponentially complex. It impacts all aspects of product development, including design, validation, and testing. Instead of a few components and hundreds of interfaces, there are now thousands of components with tens of thousands of interfaces. So, it's no surprise that today it costs more to certify an aircraft than it does to design it. Reconciling a single change is so tedious because the product data isn't traceable and it's not in context for certification. Then multiply one change across millions of parts and hundreds of suppliers! To meet certification faster, you need more efficient ways to track this level of product-, testing-, and design-change data. Plus, it's cost prohibitive to continue to solely rely on producing physical parts for testing.

Verification management is a new, more efficient product development approach that allows you to start connected and stay connected. With the ability to integrate simulation and virtual testing into your project plan, you can plan the certification testing and documentation in real time – at the same time you're designing parts and systems. This will allow you to create a link between the virtual and physical testing for proof of compliance – which reduces reliance on physical parts. And from requirements through service, you'll have a fully traceable and auditable chain of data.

With a virtual verification and validation process, you can more efficiently produce and more confidently show proof of compliance of your new advanced products and achieve certification faster. There are five ways digitalization processes such as this help streamline the aircraft certification process.



1 | Digitalization enables you to **integrate** certification into program execution

Historically, teams dedicated to certification wait until a program is winding down before their serious work begins. Some companies have attempted to have certification run concurrently with design. But, without the right ecosystem to foster the simultaneous execution of these two processes, any changes to product definition could create confusion and kinks in the chain of traceability, hindering verification and certification efforts.

To demonstrate compliance, meet traceability requirements, and minimize testing for today's complex products, you need to adopt a fully digital, closed-loop approach. By tying regulatory requirements to a digital model – starting at the earliest stage – you build verification and certification deliverables into daily design, analysis, and testing workflows.

Siemens' Verification Management digital thread integrates certification activities into the product development process by building traceability of regulatory requirements, means of compliance, test/analysis/simulation execution and results into the day-to-day tasks of development teams.

One standardized platform managing the configuration of analysis and test articles from requirements to verification reduces the need to import, export and recreate complex data. Instead, users can consume the data they need, where they need it and in the format of their choosing.

Step by step, digital certification management produces a comprehensive digital twin of the product throughout development. The most up-to-date requirements, designs and test articles are automatically linked across disciplines and locations within a single data management platform. This breakthrough capability eliminates the need to search for and compile technical documents at the end of the process. Certification should not be an afterthought during a program. Just as verifying quality throughout execution of the program plan leads to better products and faster time to market, building certification deliverables into the program execution helps put products in the air faster and at a lower cost.

> You need digital transformation to really help keep your costs under control, but also to ensure that the products are properly and completely verified and certified.

Dale Tutt – VP Industry Strategy, Siemens Digital Industries Software

2 | Digitalization helps you **stay up to date** with design changes no matter where or when they occur

No company would knowingly try to put an unsafe product in the air. But, despite the best intentions, things can still go wrong when manually trying to connect the widely dispersed dots needed to verify and certify products within a global supply chain. One design change halfway around the world could potentially have an unforeseen ripple effect on future certification efforts. It is no longer safe to manage change through spreadsheets, SharePoint, paper-based methods or other means not fully integrated with the processes used across the entire supply chain.

Adopting a digital approach for certification management moves the process from a document-centric approach to a data-centric one, allowing for granular changes to plans, test definitions, procedures and other documentation while supporting real-time reviews and configuration control.

The Verification Management digital thread provides the tools to manage verification and certification throughout the engineering review, test, check and equipment qualification phases while automatically documenting the proof that the correct, disciplined processes were used and there was accountability and traceability throughout the lifecycle. By streamlining all information within a single source of truth, the data needed for certification is always available and up to date with the latest changes.

Changes during a program are a common source of schedule and cost overruns. However, the digital thread fosters such a strong command over the dependent relationships between verification and certification elements that the impact of proposed changes can be identified and fully understood before being implemented. This drives down the time and costs associated with change.

3 | Digitalization helps you **stay in flight** over the lifespan

A freshly certified airplane delivered to a customer from the manufacturer has just begun its airworthiness journey. Airworthiness goes beyond delivery and continues through maintenance and repair. The plane must be consistently certified if it is to be kept in service. However, keeping a plane approved to fly becomes more challenging as the aircraft ages and parts become hard to find or obsolete.

Whether it is the manufacturer or owner-operator maintaining the aircraft, they must know how to sustain it for decades despite the supply chain changes likely to occur. Often, mechanics and engineers must use unproven alternatives or reverse-engineered parts. These options present their own certification challenges. The digital certification management system tracks modifications to the plane throughout its life while also keeping a record of suitable replacement parts, so there is minimal disruption when original parts are no longer available. The digital thread preserves the expertise to maintain an aircraft's airworthiness over its lifespan.

Historical data for maintenance planning is unreliable because the increasing use of electronics, software, and new materials change the timing and types of upkeep that must be performed. The digital thread integrates every aspect of aircraft design, manufacturing, maintenance and repair into a closed-loop process for failure reporting, analysis and corrective action system (FRACAS). This capability helps identify predicted failure points and provides feedback to evaluate safety and reliability constantly. With this process digital twin, owner-operators receive data from assets in the field to determine if certification goals are being met.

4 | Digitalization enables you to **trace data** from requirements through service

When it is time to obtain an airworthiness certificate, even the best-performing programs are not immune to missing target delivery dates and spending more money than was budgeted. Receiving certification requires demonstrating no broken links exist in the chain between the CAD model, simulation model and all relevant test data. But, working within a supply chain that stretches around the globe makes connecting the dots of data needed for regulatory approval an arduous and time-intensive task. Those difficulties are multiplied when using spreadsheets to track and trace diverse types of certification data maintained by various internal and external groups, often at several different physical locations.

The Verification Management digital thread keeps all elements for the proof of compliance in context of the digital twin, helping you avoid the time and costs needed to produce the engineering data for verification testing. A reliable digital certification management system has a record to demonstrate requirements have been met and can be used to trace back who made the part, if it was analyzed and who signed the approvals.

A vital function of the digital thread is Automated Test Correlation (ATC), which ensures changes to designs and requirements are automatically linked and correlated to the related test data. As with other verification and certification assets, the test data can easily be searched and presented for internal and external audits. The superior control ATC allows A&D companies to demonstrate what can be a fundamental component in building a digital certification program that customers and regulatory authorities trust.

5 | Digitalization helps you **improve collaboration**

Certification considerations apply to each person, process and piece of equipment associated with producing an aircraft. Digital certification management establishes a standardized system among development teams, manufacturers, OEMs, and the supply chain to deliver consistency within the data sets. With this system, A&D firms can create enforceable workflows based on responsibilities throughout the extended enterprise to make certification activities a shared responsibility. The common platform provides visibility into airworthiness status through real-time dashboard reporting and analytics to keep programs on schedule and budget. Through secure, cloud-based services, certification data can be created, modified, linked, and traced at any time, from anywhere.

The collaborative environment fostered by the digital thread extends further to include regulatory bodies. Siemens' Verification Management uniquely offers a bidirectional channel of communication directly with authorities. Because the documentation has been expertly managed throughout the product lifecycle, the thoroughness and quality of the data provided to regulators could lead to an expedited airworthiness certification process. Any tools that could speed up certification become more vital as complexity continues to grow from the increasing use of electronics, software and new materials.

> Increasing complexity, and the rise in cost that comes with it, highlights the need for seamless and automated aviation certification.
>
> *Dale Tutt – VP Industry Strategy, Siemens Digital Industries Software*

About Siemens Verification Management:

With Verification Management, you gain a digital, model-based, closed-loop approach. Customers can leverage the digital twin to reduce the cost and time it takes to build new, complex products. You can establish a common and comprehensive verification or certification management plan early, integrate it into the overall program plan, and incorporate it into daily tasks across all functional areas. Because everything and everyone is traceable, you can discover integration problems early and avoid unnecessary re-testing and reduce risks. This accelerates the certification process. You can reduce reliance on physical parts. You also gain a set of fully traceable data, create confidence that you can easily show compliance, and build trust with regulatory authorities.

Verification Management enables you to meet regulatory certification faster with confidence because you have accurate documentation, thorough end-to-end traceability, and a link between virtual and physical testing for proof of compliance.

With Xcelerator as a Service, you have the power of creating the world's most comprehensive digital twin – now in a more accessible, scalable and flexible form.

For more information on Siemens Verification Management, visit www.siemens.com/sm or follow us on LinkedIn and Twitter.

Siemens Verification Management,
Where today meets tomorrow.

Americas: +1 314 264 8499
EMEA: +44 (0) 1276 413200
Asia-Pacific: +852 2230 3333