Executive summary
This white paper discusses reducing aircraft operating costs and how documentation and diagnostics can improve a company’s bottom line. Airlines must focus on controlling costs in a highly regulated environment. Technical information plays a key part in reducing maintenance costs and increasing aircraft availability through maintenance efficiency.
Introduction

How can engineers make a difference in their operating bottom line? Providing comprehensive electrical information and prioritized diagnosis procedures reduces the ground time of aircraft, increasing the time it can be used to generate revenue. Modern software tools can help deliver these benefits to aircraft manufacturers and maintenance, repair and overhaul (MRO) operations.

Using customizable digital solutions makes sure MRO efficiency is possible and enables company-specific publication process definition and ecosystem integration. All integrations help minimize the impacts felt by the MRO on book time, tech training and service hardware.

MRO digital transformation delivers efficiency with a customizable solution. Having all the data is just what is needed; it’s important for digital solutions to be service hardware agnostic. What are the benefits of providing tailored, connected and focused content to consumers on service hardware platforms?

Technical information in the aerospace industry impacts maintenance efficiency and increases right first time repair processing. This white paper will demonstrate how to:

• Create logical, meaningful and linked data to provide information for a specific tail number. This removes the manual and mental task of searching for the correct applicable data in the heat of the moment

• Use a robust and repeatable methodology that enables re-use of engineering data to produce rich, cross-linked technical service content tailored to a specific brand/corporate identity

When engineers transform their service/maintenance output, they can minimize risk and take a step closer to maintenance efficiency.
Aerospace industry trends

The modern aerospace industry employs an increased use of electronics and electrical systems in modern platforms to provide greater performance and mission capabilities. This is influenced by the increase of more demanding missions and the push toward field-capable products. There has always been the need to shorten product development times to produce new capabilities and this trend has gained more emphasis over the years. At the same time, there have been several high-profile accidents caused by failures in electrical wiring and systems. These led to the development of regulations specific to the electrical wiring interconnect system (EWIS), which were published in the 2000s.

As aircraft have evolved, these regulations have been increasingly applied. Here are some significant electrical development trends throughout the years:

• The move to fly by wire and digital engine controls and cockpit digitalization became the norm in the 1980s

• Next, there was a push to improve safety with collision and terrain avoidance systems. The movement continued to bring electrical technology to the passengers while introducing digital cabin management systems and onboard wireless fidelity (WiFi)

• Today there’s an increased awareness of climate impact and sustainability, which is leading engineers toward developing electric propulsion

Since the 1980s, technical information has evolved from paper manuals, flat document forms delivered on compact discs (CDs) and digital video discs (DVDs), to websites. Today, the industry is slowly moving toward an MRO operating system (OS). For many years, paper manuals, CDs and DVDs were delivered at the point of product delivery. Whereas today, using the internet enhances the process, enabling authors to spend more time documenting and processing technical information and changes prior to delivery.

Figure 1. Timeline of aerospace industry trends.
Importance of providing technical information

The trends in the aerospace industry, have a direct impact on these six core areas of service information provision:

- Authoring time
- Engineering change
- Service documentation
- Technical training
- Book time
- Service hardware

To accommodate these impacts, it is critical to deliver on quality and efficiency. Further, by using the digital thread with a comprehensive electrical document and publication solution, engineers can make sure content is correct by construction. It eliminates manual human interference with the design data, which establishes quality, and it enables engineers to consume various other forms of data from specs, harnessed drawings, diagnostic data and more.

Additionally, using a modern technical publication tool enables engineers to enrich the end-user’s product interactions, giving them all the data needed to resolve the problems. By consuming content from engineering, manufacturing, suppliers and compliance departments, engineers can provide a rounded, complete set of data to support a product.

Absorbing the impacts on OEMs

Providing automated aids for the tech author to establish consistent, repeatable applications of tasks and their daily activities is another important factor. Rules-driven diagram generation can help original equipment manufacturers (OEMs) drastically save authoring time and release service documentation faster. For example, an engineering schematic can be transformed into a service variant diagram using this technology. The layout algorithm identifies the diagram objects and places them in a neat layout based on the predefined rules and various diagram generation parameters provided by the user; with minor cleanup, the diagram is ready for release.

Fetch related action

Fetch related action enables authors to complete varying diagrams efficiently while establishing quality. It automatically retrieves connected objects without the risk of any inadvertent changes to the connectivity itself if done manually.
Additionally, using fetch related action can enable users to add power connections from a source diagram to the target system diagram. Authors begin by creating a build list to define the scope for the action and set it as active. Then, they can select any object and invoke the action to pull in connectivity. This action can be executed multiple times to make sure all the necessary objects have been retrieved. After cleanup, the concrete diagram will be ready to publish.

**Lock print regions**
Lock print regions is a feature that increases the efficiency of authoring diagrams in publisher. Print regions help authors distribute content over pages and make them print ready. Print regions can get easily disturbed while embellishing diagrams, which can cause rework and inadvertent errors. Therefore, by locking print regions in their place, authors can embellish and move components without the fear of disturbing the print regions of a document.

**Maintenance repair operational efficiency**

These features help reduce the impacts felt by the OEM. They specifically target impacts on authoring time, engineering change and service documentation. Bringing together an efficient and customizable approach with the view that MROs have on the data is key to addressing those impacts. It’s critical to deliver the right information in one easy-to-use package. Guided diagnostics play a major role in rectifying issues reported on products. With modern software tool, engineers can bring a richer data flow of data to a technician.

**Smart clients**
Smart clients can drive efficiency in the troubleshooting process with the help of guiding diagnostics and 3D illustrations. Smart clients provide an integrated and interactive environment, which enables technicians to view guided diagnostic procedures, along with other resources like varying diagrams, 3D illustrations and more.
Any voltage measurements or connectivity checks on the connector can be easily carried out with help of face views containing pin and signal details. Once the fault is identified, a technician can take appropriate action and verify the functionality after the fix is implemented. Thus, working with guided diagnostics and 3D model integration enables technicians to complete jobs faster and increase efficiency.

Having all the data is critical, but it’s also important for technicians to make sure they are service hardware agnostic. The smart client can be used on a multitude of hardware, configurations from an iPad, laptop, or workstation. It is important to not be tied to a single platform. As products and systems change, there’s a huge amount of collateral in legacy systems to support older products. By using a low-code application software such as the Mendix™ low-code platform, engineers can pull data from older support packages and systems when required by the technician. This removes the burden of maintaining several portals technicians must have access to, to retrieve the information. Additionally, it removes the bigger burden of having to migrate the data from an old system to the new system flow.

All these integrations enable engineers to address the impacts felt by the MRO on book time, tech training and service hardware. Additionally, using a technical publication tool enables OEMs to efficiently produce high quality and an accurate output through delivery via the smart client. This enables a closed loop experience for the people on the ground in the field.

For the MRO, the smart client enables technicians to stay in the workshop instead of in the classroom, increasing technical uptime. This is possible by providing all the required information in front of the technician in a single portal on a single screen. This reduces training elements to explain how you get to data in different systems. Having all the data in the right place at the right time on a single screen enables engineers to get more jobs done with the same number of people at the MRO.

![Figure 3. Being efficient and customizable with the MRO's view and data usage is key.](image-url)
Conclusion

It is crucial for aerospace technicians to provide comprehensive electrical information and prioritized diagnosis procedures. The Capital™ software tool suite can help technicians reduce the ground time of aircraft and increase revenue. Capital is part of the Siemens Xcelerator portfolio, the comprehensive and integrated portfolio of software, hardware and services.

For example, a Siemens Digital Industries Software customer used Capital Publisher to directly generate documentation and reduce their overall authoring activities by 77 percent. For this customer, this has had a huge impact on downstream operations — it enabled them to reduce maintenance time, improve operational availability and accelerate outfitting by their completions team. They reduced preparation by 69 percent, reduced embellishment of the harness data by 73 percent and reduced documentation preparation by 83 percent. Overall, they reduced manual efforts by 90 percent.

The ability to deliver the right information in one easy-to-use package is critical. Capital Publisher enables authors to provide information for a specific tail number and re-use engineering data to produce rich, cross-linked technical service content tailored to a specific brand/corporate identity. This ultimately produces a richer data flow and brings technicians closer to maintenance efficiency.
About Siemens Digital Industries Software

Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, helps companies of all sizes create and leverage a comprehensive digital twin that provides organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit siemens.com/software or follow us on LinkedIn, Twitter, Facebook and Instagram. Siemens Digital Industries Software – Where today meets tomorrow.

About the author

Dave Reeves is the documentation and diagnostics senior product manager for the Integrated Electrical Systems (IES) segment of Siemens Digital Industries Software. Dave joined IES in June 2020, coming from the automotive industry. He has more than 30 years of experience in the engineering and after-sales environments within Rover, Land Rover and, for the last 14 years, at Bentley Motors.

Leading several departments over the years, Dave has delivered new technical publication authoring systems. He introduced a new way to deal with customer technical product complaints from the field – bringing clarity to customer focus and prioritizing a ‘customer promise’ philosophy – and managed the aftersales strategy for electrification/digital readiness for the new direction of the automotive industry.