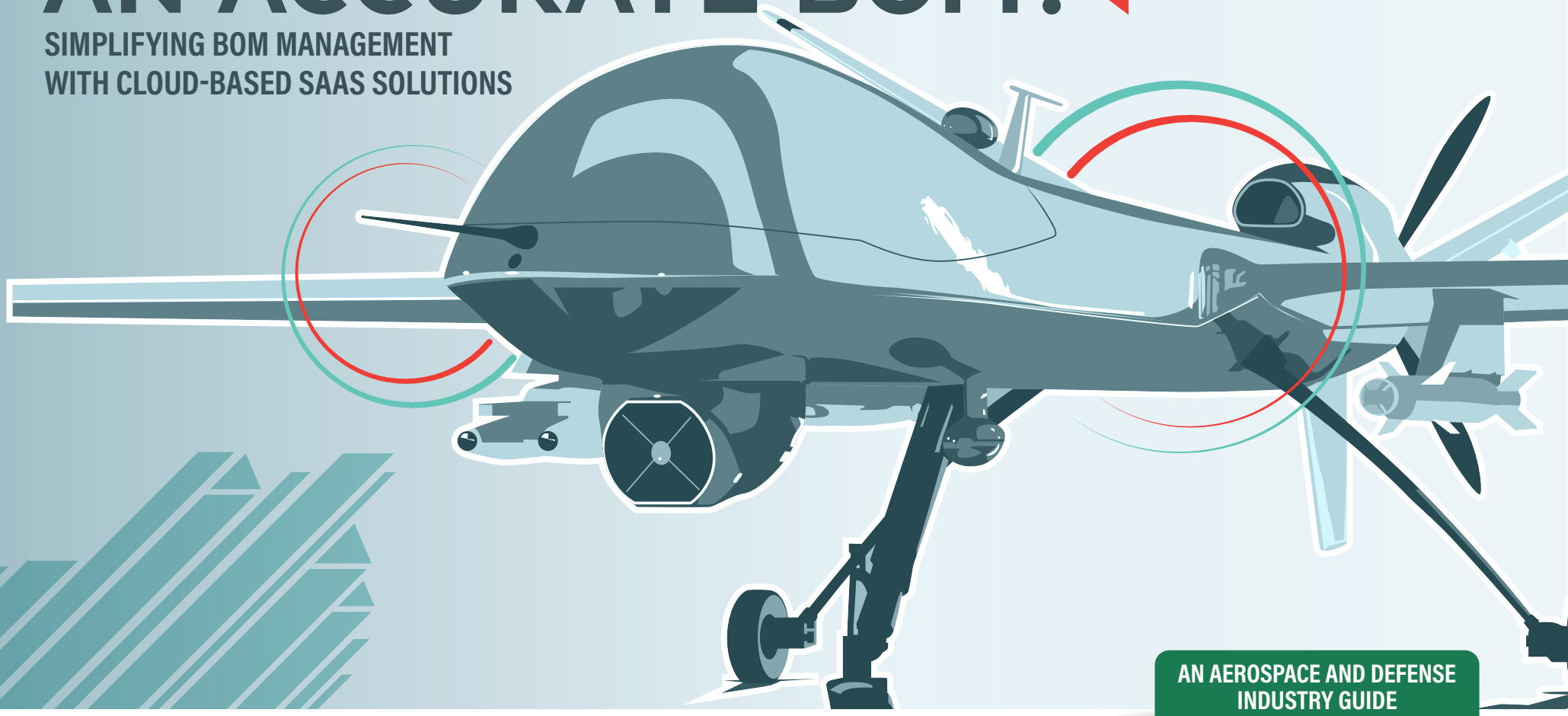
HOW DO I CREATE AND MANAGE AN ACCURATE BOM?

SIMPLIFYING BOM MANAGEMENT WITH CLOUD-BASED SAAS SOLUTIONS



AN AEROSPACE AND DEFENSE INDUSTRY GUIDE

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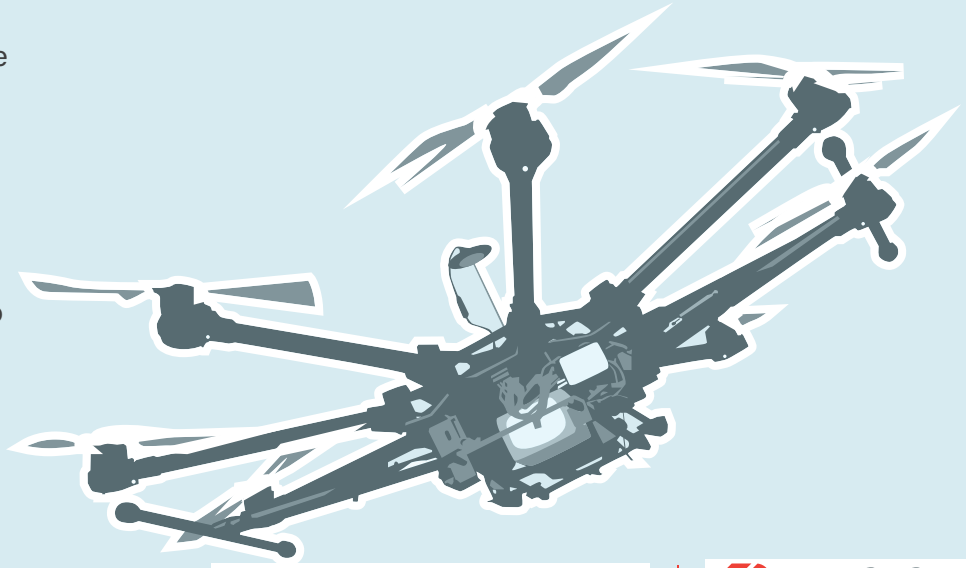
Introduction

The aerospace and defense sector is entering a period of significant change, driven by the need to create more sustainable aircraft and reduce the industry's environmental impact. At the same time, the certification process– and the safety it ensures– remains an essential concern for every aerospace and defense company. As these companies strive to improve sustainability and maximize safety, they must also contend with the increasing complexity of their systems and products. Companies must efficiently coordinate engineering work across multiple domains to address this challenge while meeting project deadlines and controlling costs. They must also work closely with other vital stakeholders in their procurement, manufacturing, and service departments and integrate the efforts of suppliers and original equipment manufacturers (OEMs).

Managing all of these efforts using traditional tools and existing development practices can lead to difficulties. Serious performance and safety issues can arise if even minor design changes made by one team are not propagated to other departments. Those issues may not be evident until prototyping and testing occur, at which point the engineers must complete arduous, expensive redesigns. Similarly, if other departments or external stakeholders act on outdated or inaccurate product data, it becomes harder for them to source parts and supplies in a timely, cost-effective manner.

Digital product lifecycle management (PLM) solutions give aerospace and defense companies the capability to deal with rising system complexity while pursuing safety and sustainability priorities. These solutions connect internal and external stakeholders, processes, and technologies through a common digital thread. Because this thread provides a single source of truth for team members throughout the organization, development decisions are always made based on up-to-the-minute product data. This improves the systems integration process and reduces the rounds of prototyping and testing required to achieve sustainable designs that meet the industry's rigorous certification standards. As a result, companies can control costs and keep projects on schedule.

This eBook is one of a series focusing on the challenges facing aerospace and defense companies, and how PLM solutions can address them.



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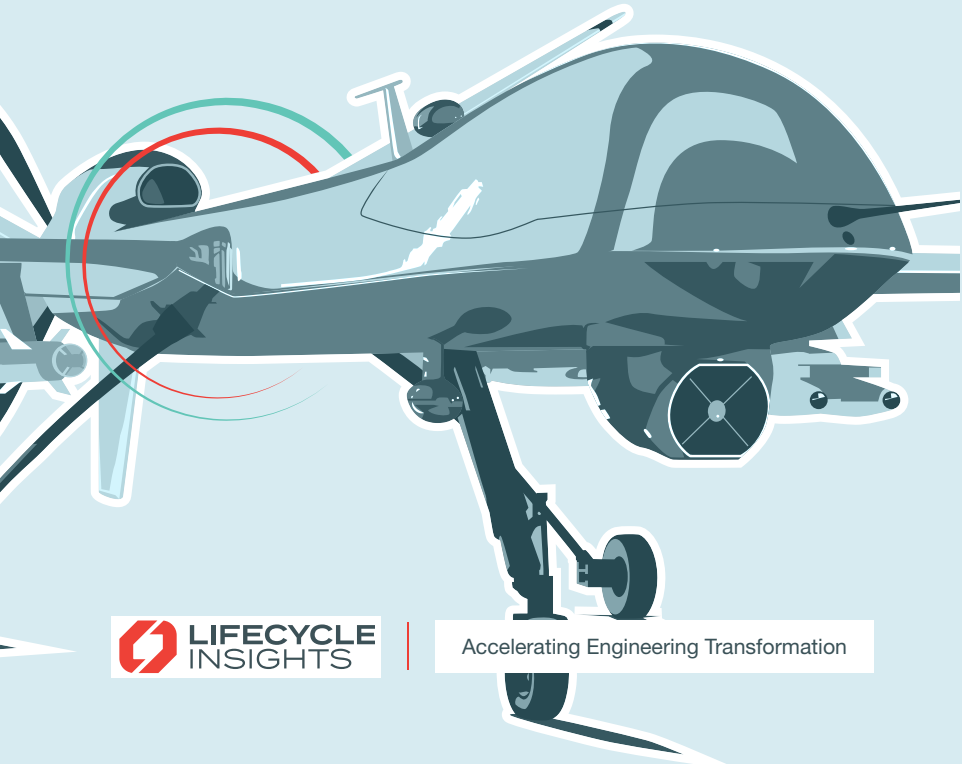

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The Role of the Bill of Materials in Development

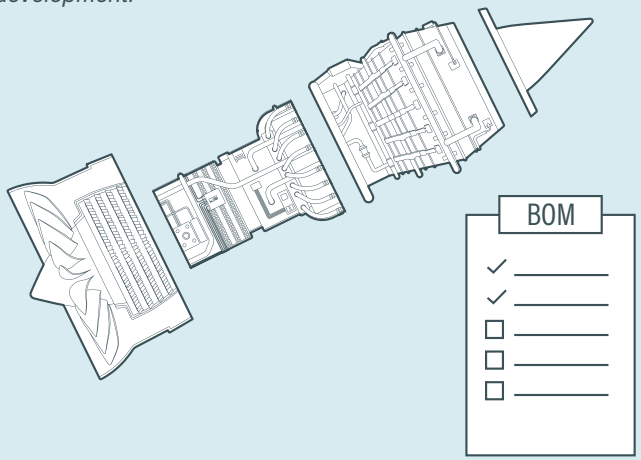
The bill of materials (BOM) is a critical piece of product development. Once engineering develops this deliverable, downstream departments use it to guide development, from design to manufacturing to regulatory approvals and certifications. Thus, the BOM is key to many stakeholders, both internal and external to the aerospace and defense company, including departments such as manufacturing, procurement, sales, finance, and servicing.

Each functional department tweaks and modifies the BOM for its own purpose. Engineering relies on it to track revisions and changes, meet cost targets and satisfy product requirements for performance, environmental compliance, serviceability, and safety. Manufacturing uses it to plan manufacturing processes and assembly operations.

Procurement harnesses it to source components. Service refers to it to plan service operations and spare parts provisioning. Management looks to the BOM to assess risk and formulate a risk management strategy.

This eBook will focus on the challenges of BOM management and how a cloud-based software-as-a-service (SaaS) approach can help aerospace and defense companies overcome those challenges.

Figure 1
The BOM is a critical deliverable in aerospace and defense product development.



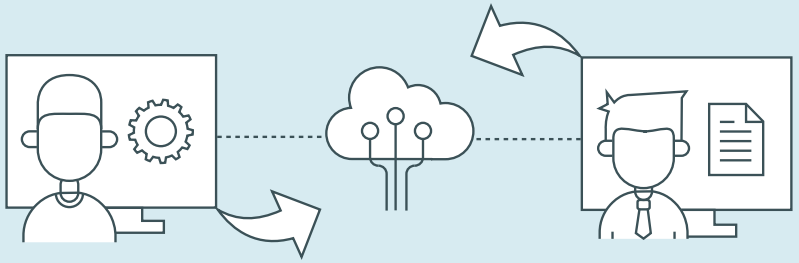


Figure 2
BOM creation and management is a collaborative process.

The Challenges In Developing the BOM

The BOM is an important deliverable in modern product development. Product development teams create, manage and finalize the BOM during the design cycle. But modern BOM development has several challenges that companies are looking to overcome.

To start, the increase of connected functionality and other advancements in aircraft technology means aerospace and defense companies are facing increasing product complexity, requirements, and variability. Continuous cost pressure also forces companies to standardize components and pursue economies of scale. This translates into a much more complex BOM—and more complicated BOM management. Companies in the aerospace and defense sector are looking for better ways of developing and managing the BOM.

The BOM is crucial to the entire product development process, so any shift in its creation or management must be at least as efficient and cost-effective as the traditional method. In addition, many are looking for ways to "disruption-proof" this deliverable so they are better prepared to meet challenges like the COVID-19 pandemic. Modern product lifecycle management (PLM) solutions take control of BOM management.

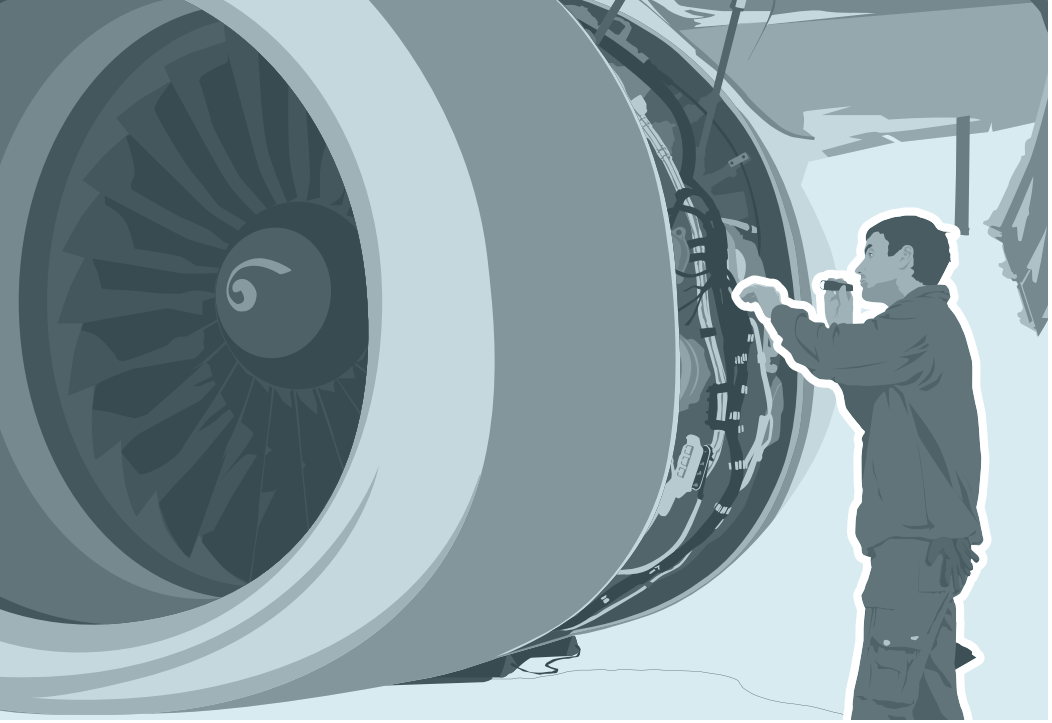


Figure 3
The BOM may contain data from mechanical CAD, electrical CAD, electronics EDA, and software and should update automatically when the data changes.

Synchronizing the BOM with Many Data Sources

Today's smart, connected aerospace and defense products include mechanical, electrical, electronics, and software components. Naturally, the BOM needs to reflect this and include data from various stakeholders and software programs. Different departments rely on the BOM to make decisions, so it must link to computer-aided design (CAD) data and supplier component databases to ensure the information is current and accurate.

Maintaining and updating all this data is challenging. People responsible for the BOM must ensure that the BOM updates as the CAD model changes. Traditionally, aerospace and defense companies have used emails or spreadsheets to keep up with this information.

However, manually updating those sources can be time-consuming and error-prone, resulting in stakeholders editing outdated versions. Luckily, modern PLM software tackles those issues. Such solutions can automatically generate the BOM based on existing templates whenever CAD models are checked in. Changes to the model update the BOM in an intelligent manner, keeping any exceptions defined by the engineer. These solutions provide an elegant, automated way to synchronize the many sources of internal and external data needed to complete the BOM.

Leveraging the BOM In Each Functional Department

Many functional departments use the BOM for further analysis to make critical decisions. Engineering uses the BOM to determine whether requirements for cost, regulations, and form, fit, and function (FFF) equivalents have been met. Manufacturing consumes the BOM to guide production. Procurement looks to the BOM to study supply-side risks and take appropriate mitigation measures. Finance relies on an accurate BOM to perform inventory cross-checks. Truly, the BOM is a central asset.

That is why it is vital for the BOM to be a single source of truth. The analysis data (cost analysis, risk analysis, etc.) created using the BOM is very valuable and must be linked back to the BOM to make it available to all stakeholders. The visualization of this data, its reliability, and its accessibility are crucial.

Traditional, document-based BOM management cannot ensure these fundamental requirements. A modern PLM solution, however, not only creates the BOM automatically, but manages and integrates all BOM-related analysis data. It enables the various departments to create strategies (costing, supply chain, manufacturing planning, risk mitigation) from the BOM. This data can be accessed across the organization, even by remote teams using a digital thread, to make sound business decisions.

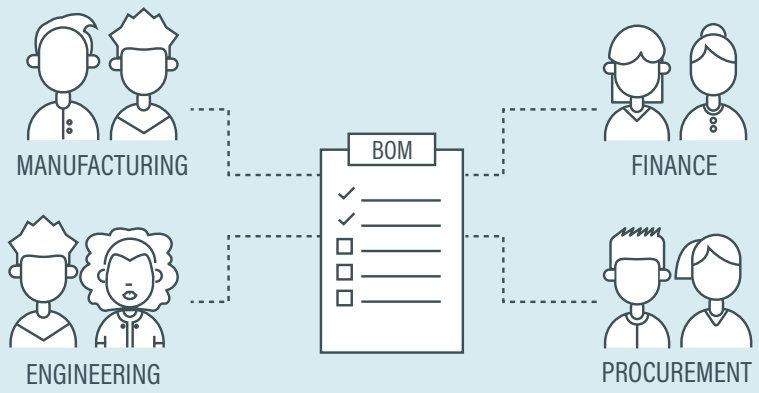


Figure 4
The BOM is used extensively by various functional departments such as manufacturing, finance, procurement etc.

Handling Variability with the BOM

Many products come with different variations. Take the airplane: There are civilian aircraft and those designed for military use, commercial aircraft, and transport planes. There are also many size, engine type, flight range, and control options available. Aerospace and defense organizations use marketing data to determine how many of each variation to manufacture. These decisions directly affect procurement, inventory management, and sales—all of which need accurate, up-to-date data to perform their functions efficiently. The BOM plays a critical role here.

But the traditional spreadsheet method of handling the BOM only exacerbates existing challenges when variability is involved. Variability means more complex spreadsheets, higher probability of mistakes, and increased likelihood of delays when stakeholders try to manually incorporate all changes into all the associated files. Inefficient and cumbersome BOM management is a recipe for disaster.

When an organization implements PLM-based BOM management, however, it can automate BOM generation to take care of variability. This can be done right from the requirements stage when engineers build the CAD model and first develop the BOM. Any later additions or deletions can be handled seamlessly, ensuring that all costing, manufacturing process planning, service engineering, inventory management, procurement, risk management, and certification-related tasks are informed by accurate, reliable data.

Figure 5
A progressive, PLM-based BOM management solution automatically handles variability.

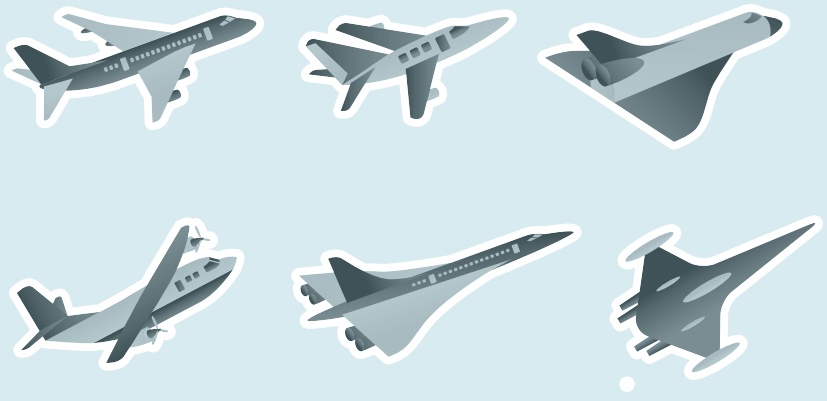
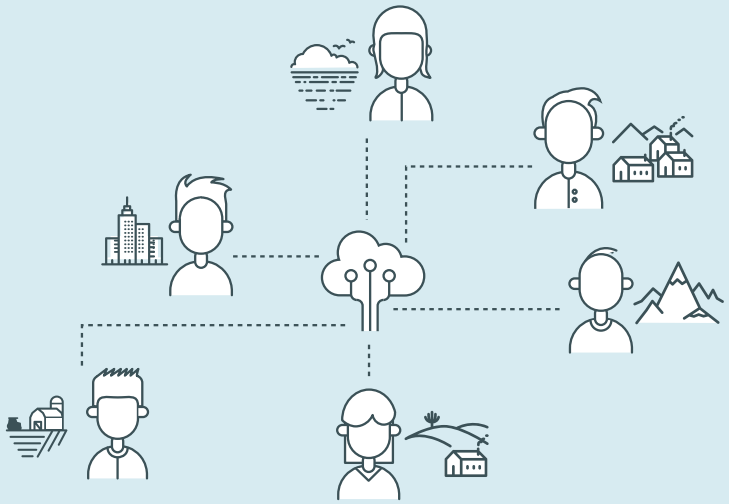


Figure 6
SaaS PLM provides quick access to critical capabilities like BOM management with little IT support.



The Advantage of SaaS Solutions

Cloud-based SaaS PLM solutions offer built-in, provider-curated best practices, either tailored to the aerospace and defense industry or configured by the customer to meet their exact needs. The result is quicker, more accurate BOM creation and management. These platforms offer the following advantages:

- *Efficiency.* Aerospace and defense companies can easily customize built-in, prescriptive best practices to meet their specific BOM-related needs.
- *Productivity.* Platforms include AI/ML (artificial intelligence/ machine learning) functionality to help identify issues within company workflows and reduce friction during collaboration.
- *Fast implementation.* Because these solutions are cloud-based, users can easily access them from any browser. Aerospace and defense companies can purchase a subscription and implement these solutions with less IT support.
- *Distributed total ownership.* SaaS PLM subscriptions don't require a large, up-front technology investment. Instead, they distribute the total costs over time.
- *Extended collaboration.* BOM creation requires input from both internal and external stakeholders. Cloud-based SaaS solutions permit easy viewing of engineering data without the need to install expensive software.
- *Security.* The internal IP is always protected, as companies can set their own standards and permissions for both viewing and editing.

Recap and Conclusions

Nearly all functional departments in any aerospace and defense company rely on the BOM to do their jobs. It is vital that these companies support a collaborative BOM creation process and provide sound management of changes to the deliverable over time. Spreadsheets, screenshots, and emails cannot provide stakeholders a single source of truth. But taking a more progressive approach and investing in PLM solutions can help ensure everyone in the company is working from the most accurate and up-to-date BOM.

- Modern PLM solutions can easily synchronize multiple sources of data to ensure the BOM includes information from all design domains.
- As the BOM is the basis for essential tasks across multiple downstream departments, it is important that stakeholders can easily access the most up-to-date version of the BOM.
- With the right technological foundation, the BOM can easily keep track of the variability of products, providing key data on different options that will need to be manufactured.
- PLM solutions, including cloud-based SaaS options, help progressive organizations overcome many BOM creation and management challenges.

The BOM Is The Basis for Essential Tasks Across Multiple Downstream Departments, it is Important that Stakeholders Can Easily Access The Most Up-To-Date Version of the BOM.

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