

# **AEROSPACE & DEFENSE**<sup>TM</sup>

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inside this  
special issue?**

# Affordable Mass: Embracing a New Strategy for Advancing Defense Capabilities

**A**ffordable mass refers to the ability to rapidly produce large quantities of effective, cost-efficient munitions and systems. It's not about cutting corners but about optimizing every facet of the production process, from design to deployment. The challenge goes beyond strategic methods of design and manufacturing — and must feature industrywide acceptance of affordability as a means of adding capacity, survivability, and efficacy to a new generation of munitions.

The Department of Defense (DoD) is faced with preparing for potential confrontations with peer or near-peer adversaries. Unlike conflicts of the past, where U.S. forces may have faced

regional militias with limited air defense capabilities, today's enemy is armed with integrated air defense systems (IADS) capable of countering non-stealth aircraft and outdated weapons. While advanced 5th generation F-35 fighters and B-21 stealth bombers can penetrate these modern air defenses, the Air Force must also develop an inventory of mid-range, stand-in precision-guided munitions (PGMs) designed for contested environments. This fully capitalizes on stealth capabilities and delivers critical battlefield effects on which commanders rely. The ideal inventory of PGMs must offer the capacity, survivability, and effectiveness necessary to ensure that even the most advanced aircraft does not fall short in future conflicts.



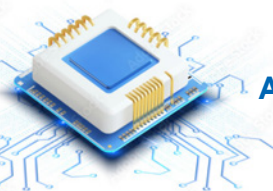
Affordable mass can make a difference. It focuses on developing low-cost weapon technologies to counter high-volume adversary capabilities and complements military programs responsible for more sophisticated weapons. It's a new approach that emphasizes the need to create solutions that are cost-effective, rapidly adaptable to various environments, and capable of being produced in large quantities.

The aerospace industry has long been associated with high costs, often due to the pursuit of "exquisite" weapons. Highly advanced and precise munitions are expensive—and they have their place. However, maintaining precision strike advantage requires a munitions balance of range, size, speed, survivability, and capacity. Adding a focus on affordability reflects a need to create a force mix that considers cost effectiveness, munitions inventory, and reliability and performance.

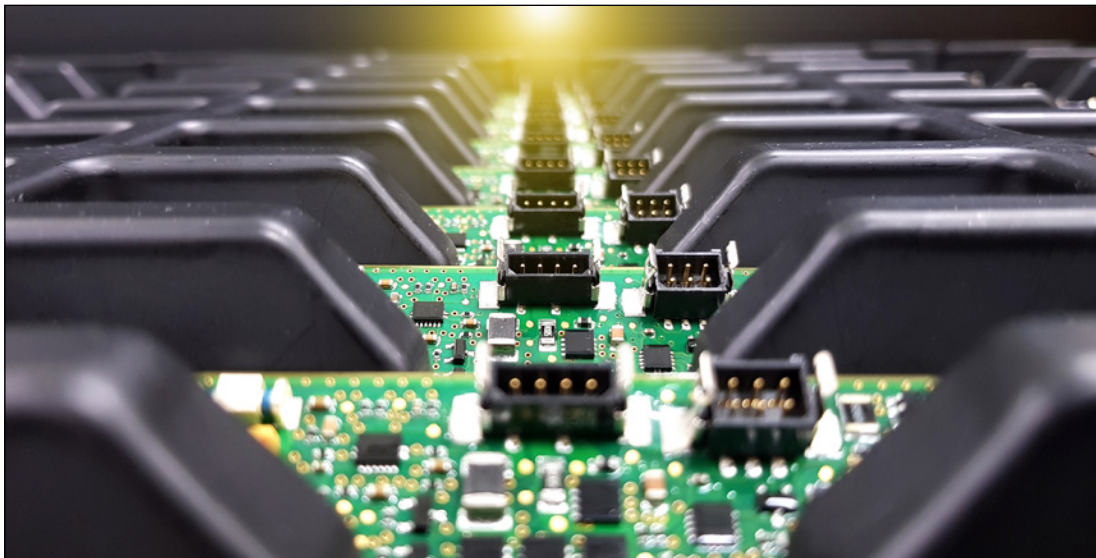
Affordability and sophisticated weapons are two concepts at odds — which is precisely the point. Relying solely on advanced, expensive weapons may be unsustainable in prolonged conflicts. The ideal is to balance the arsenal with low-cost PGMs that can be produced in large quantities to meet urgent military needs without depleting resources quickly. For the military, it's a shift in mindset as much as manufacturing processes, design strategies, and industry collaborations.

Affordable mass maintains high-quality outputs while significantly reducing costs — advocating that warfighters are better equipped with flexibility and without exhausting their arsenal's resources. One practical implementation of this concept relies on modifying existing, less sophisticated weapons, like Hydra rockets, with affordable guidance kits. Their accuracy is enhanced, extending their utility without the high costs associated with developing new, advanced munitions

Many defense analysts emphasize the importance of the Air Force deploying new stealth aircraft to stay competitive with China and Russia. However, they often overlook another key advantage of the service's 5th generation F-35 fighters and its B-2 and B-21 stealth bombers — their capacity to conduct "stand-in" strikes. These strikes allow aircraft to penetrate contested zones and engage multiple targets in a single mission. By operating closer to the target, stealth aircraft can carry larger payloads of smaller PGMs, which don't require additional components like powerplants or complex navigation systems for long-range missions. Furthermore, smaller, mid-range PGMs designed for survivability in high-threat environments will enhance both the lethality and cost-effectiveness of the Air Force's precision strike capabilities.



## Affordable Mass



Using standardized parts and components across different projects or models illustrates how these conflicting demands can be balanced for cost-effectiveness. Marotta Controls provides an example, achieving modularity in its control actuation systems (CAS) by standardizing on key system components that can be leveraged across programs. By using a circuit card assembly that has been proven successful in one of its high-volume CAS programs and incorporating it (with minor adjustments to the firmware) into another production, the company has decreased design time and created an economy of scale in purchasing circuit card assemblies. (Image: iStock)

For affordable mass to become a greater reality, the industry must move away from the pursuit of perfection at any cost. Instead, industry leaders should focus on creating “good enough” solutions that meet mission requirements without excessive costs. Such a shift requires a cultural change within many organizations, with designers, engineers, and executives learning to value cost-effective solutions as highly as cutting-edge technologies.

With this shift in mindset, real-world actions can more effectively follow. It’s a critical step in aerospace companies becoming more willing to adopt flexible design practices and brace for rapid adaptation to new requirements and environments.

For example, flexible design is essential to achieving affordable mass. As aerospace systems become more easily adaptable to different requirements and environments, changes in operational directives won’t necessarily drive completely new designs. Overall mass and cost can also be reduced with the development and use of advanced materials such as composites, alloys, and lightweight metals that offer superior strength-to-weight ratios and durability.

Manufacturing processes must also be more accommodating, featuring the ability to quickly switch between different production lines or products. This agility is crucial for responding to changing demands in a timely manner and should be a defining characteristic of aerospace manufacturing partnerships.

Supply chain operations must mirror the same kind of collaboration. By working closely with suppliers, manufacturers can ensure that materials and components are available when needed and that production processes are as effective as possible. By sharing information and aligning goals within each level of the supply chain, companies can further reduce lead times and improve overall efficiency.

Enhancing the supply chain reduces lead times, improves supplier relationships, and ensures the delivery of materials and components. Achieving affordable mass requires working closely with all levels of the supply chain to production processes that are aligned and optimized for cost efficiency. Collaborative efforts can lead to innovations that reduce costs while maintaining quality and performance. For example, engaging with suppliers early in the design process can confirm that materials and components are readily available and cost-effective. Partnering with other companies, research institutions, and government agencies allows the sharing of costs, expertise, and resources.

These same cooperative values can also support aerospace manufacturers in balancing standardization with customization. While customization is often required to meet specific mission requirements, introducing standardization wherever possible can reduce costs and streamline production. Reducing the need for custom parts, simplifying inventory management, and enabling bulk purchasing are all tenets of affordable mass and contribute to cost savings.

In a practical example, affordable mass can be advanced by identifying existing systems in production where specific components for other systems can be leveraged for advantages in both cost and performance. The shifting aerospace culture must recognize the need to achieve minimum viability for our products, including only the features essential to their design and purpose. Yes, we do have the exquisite products — but we must understand when those are and are not needed and be able to pivot to lower-cost system solutions appropriate for the mission.

Adapting strategies and resources to drive affordable mass systems today is an important step for the future. Clearly, all the factors needed to achieve affordable mass point to the need for a new level of innovation. Aerospace firms should antici-



pate the need for continuous investment in research and development to further drive innovation and advance new technologies that can reduce costs and improve performance. This includes workforce investments as well, such as providing employee training and development opportunities to build the skills that better support affordable mass ideals and strategies across the aerospace enterprise.

As global conflicts and geopolitical tensions steadily rise, the demand for rapid deployment and sustained military capacity increases in step. Smart choices are vital and must be grounded in an urgent rethinking of traditional aerospace manufacturing and supply chain management approaches. Maximizing combat power relies on a cost-effective mix of capabilities such as PGMs that leverage advanced 5th generation fighters and stealth bombers as key advantages.

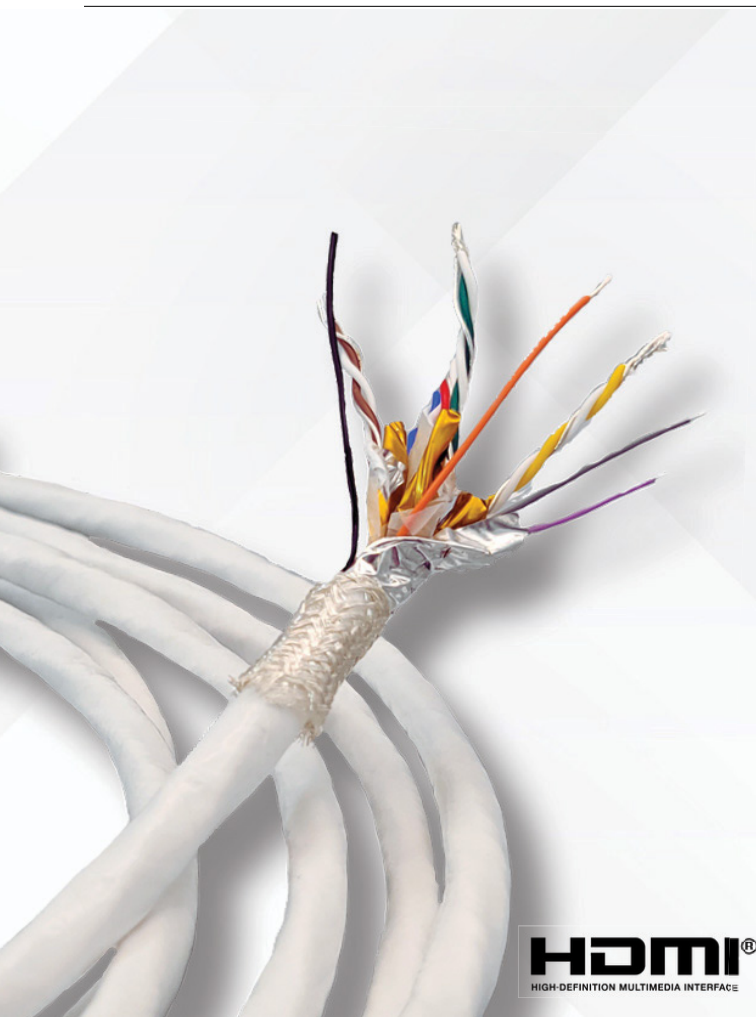
The demands of the modern battlefield require aerospace leaders to broadly embrace the concept of affordable mass. This cultural shift means adopting a mindset focused on cost efficiency, flexibility, and new technologies and partnerships. This is not optional — the Air Force's cutting-edge aircraft can only be as effective as the PGM inventory supporting them, which must have the capacity, durability, and impact necessary to secure victory in future conflicts. To best support the



Power supplies are shown here in volume production, a primary characteristic of affordable mass goals which focus on the ability to rapidly produce large quantities of effective, cost-efficient munitions and systems. Marotta discusses its affordable mass capabilities in this video. (Image: iStock)

warfighter and enable a force fit for the future, the industry can and must deliver the capabilities needed to ensure military readiness and resiliency for any challenge.

This article was written by Adit Girdhari, Vice President of Business Development, Marotta Controls (Montville, NJ). For more information, visit [www.marotta.com](http://www.marotta.com).



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