Supporting the changing needs of missile engineering

Whether launched from land, sea, or air, today's missile systems are expected to be faster, more accurate, and more reliable than ever before. At the same time, however, manufacturers are being asked to deliver these systems at a greater scale and with shorter lead times, often while integrating next-generation technologies. From hypersonics to enhanced seeker capability, modern missile design is evolving rapidly, and it's placing new demands on every part of the supply chain.

These are challenges that call not just for better products, but for more collaborative engineering, greater manufacturing flexibility, and a long-term view of program support. Regal Rexnord Aerospace Solutions is exploring these themes by drawing on experience from across its Kollmorgen™, Portescap™, Nook™, Rexnord Aerospace, Formsprag, Thomson, and Delavan™ brands.

Rising expectations

Missile systems face some of the most demanding requirements in the defense sector. They are expected to function flawlessly after years - sometimes decades - of storage. In flight, they must withstand high G-forces, rapid acceleration, and sudden environmental change. They are also expected to offer greater precision, faster response, and more flexible control than their predecessors.

"Modern missile platforms push the limits of precision and reliability," explains Jeff Coffed, Aerospace and Defense Industry Manager at Regal Rexnord. "They have to survive long stretches of time in dormant storage and then activate and perform flawlessly in an instant. That makes for a tough engineering brief."

To meet these demands, defense OEMs are pushing for smarter actuation, more integrated electronics, and motion systems that can support tighter control in smaller, lighter packages. The result is that suppliers are being asked not just to deliver to spec, but to actively shape those specifications through deeper engineering engagement.

At Regal Rexnord, for example, their teams work closely with customers during the early stages of development to help define key motion parameters, evaluate trade-offs between size, power, and control responsiveness, and propose system-level architectures that account for long-term manufacturability and compliance. This not only ensures they deliver on the OEM's goals, but relieve the burden on their internal teams.

Prototyping, scaling, and sustaining

For missile manufacturers, speed and scale are becoming just as important as technical performance. In recent years, the demand for proven missile systems has grown significantly, driven both by global instability and the evolving role of long-range weapons in modern deterrence strategies.

Many of these systems are well-established, but must now be produced at higher volumes, while others are still in development, requiring quick-turn prototyping and iterative refinement.

This is putting a spotlight on the ability of suppliers to bridge the gap between design and production. Engineering collaboration is now an essential part of ensuring a reliable source of missile systems. Likewise, companies that can support both small-batch development and high-volume manufacture offer significant advantages to their customers.

Critically, many missile programs are expected to remain in service for decades. That makes supplier continuity a key consideration, as teams need access to original design expertise and replacement components long after the initial production run is complete.

"From our side, it's not just about building a great motor, electromechanical actuator, or other individual component," says Coffed. "It's about helping customers go from early prototypes to full-rate production - and still being there when they're fielding the next batch twenty years later. That kind of continuity and flexibility is rare, but it’s vital in this industry."

Motion challenges in missile systems

The demands placed on missile motion systems are both technical and environmental. Control actuation systems (CAS), seeker head drives, and wing deployment mechanisms must all operate within tight space constraints and extreme thermal, vibrational, and dynamic conditions. These subassemblies also need to be highly reliable, with minimal maintenance requirements, and offer fast, precise response at the point of launch.

While the exact specification varies widely between platforms, these systems often include custom motors, high-precision gearing, and robust sensor integration – all engineered to meet both the performance and lifetime requirements of modern missile architectures.

Importantly, most motion components in this space are not off-the-shelf. They require close coordination between engineering teams to align with the mechanical and control interfaces of the missile. This is where suppliers with a wealth of defense experience and strong technical resources continue to play a pivotal role.

"These systems operate in extreme conditions – high G-forces, vibration, thermal stress – and have no margin for error," Christopher Cooper, Product Management Senior Director, adds. "You can’t afford surprises at launch. That’s why so many of our solutions are custom-engineered to match the specific envelope and performance needs of each platform."

Looking ahead

With demand increasing and technologies evolving, the need for adaptable, high-performance motion systems in missile design is unlikely to fade. Future systems may operate at higher speeds or require tighter integration with advanced guidance and control systems. At the same time, the need to sustain legacy platforms will continue.

This dual pressure - innovation at the high end, and dependability at scale - is shaping the future of motion engineering for missiles. It’s a space that will demand long-term thinking, robust quality frameworks, and sustained collaboration across the industry.

"The technologies are changing but the fundamentals remain the same," says Christopher Cooper. "Precision, reliability, and scalability will continue to define success in missile motion systems. We’re building around those principles now, and into the future."

Image captions:

Image 1: Regal Rexnord: Supporting the evolving demands of missile engineering with reliable, high-performance motion control solutions.

Credit: iStock.com/ Andrey Atanov

About Regal Rexnord

Regal Rexnord's 30,000 associates around the world help create a better tomorrow by providing sustainable solutions that power, transmit and control motion. The Company's electric motors and air moving subsystems provide the power to create motion. A portfolio of highly engineered power transmission components and subsystems efficiently transmits motion to power industrial applications. The Company's automation offering, comprised of controllers, drives, precision motors, and actuators, controls motion in applications ranging from factory automation to precision tools used in surgical applications.

The Company's end markets benefit from meaningful secular demand tailwinds, and include discrete automation, food & beverage, aerospace, medical, data center, energy, residential and commercial buildings, general industrial, and metals and mining.

Regal Rexnord is comprised of three operating segments: Industrial Powertrain Solutions, Power Efficiency Solutions, and Automation & Motion Control. Regal Rexnord is headquartered in Milwaukee, Wisconsin and has manufacturing, sales and service facilities worldwide. For more information, including a copy of our Sustainability Report, visit RegalRexnord.com.

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