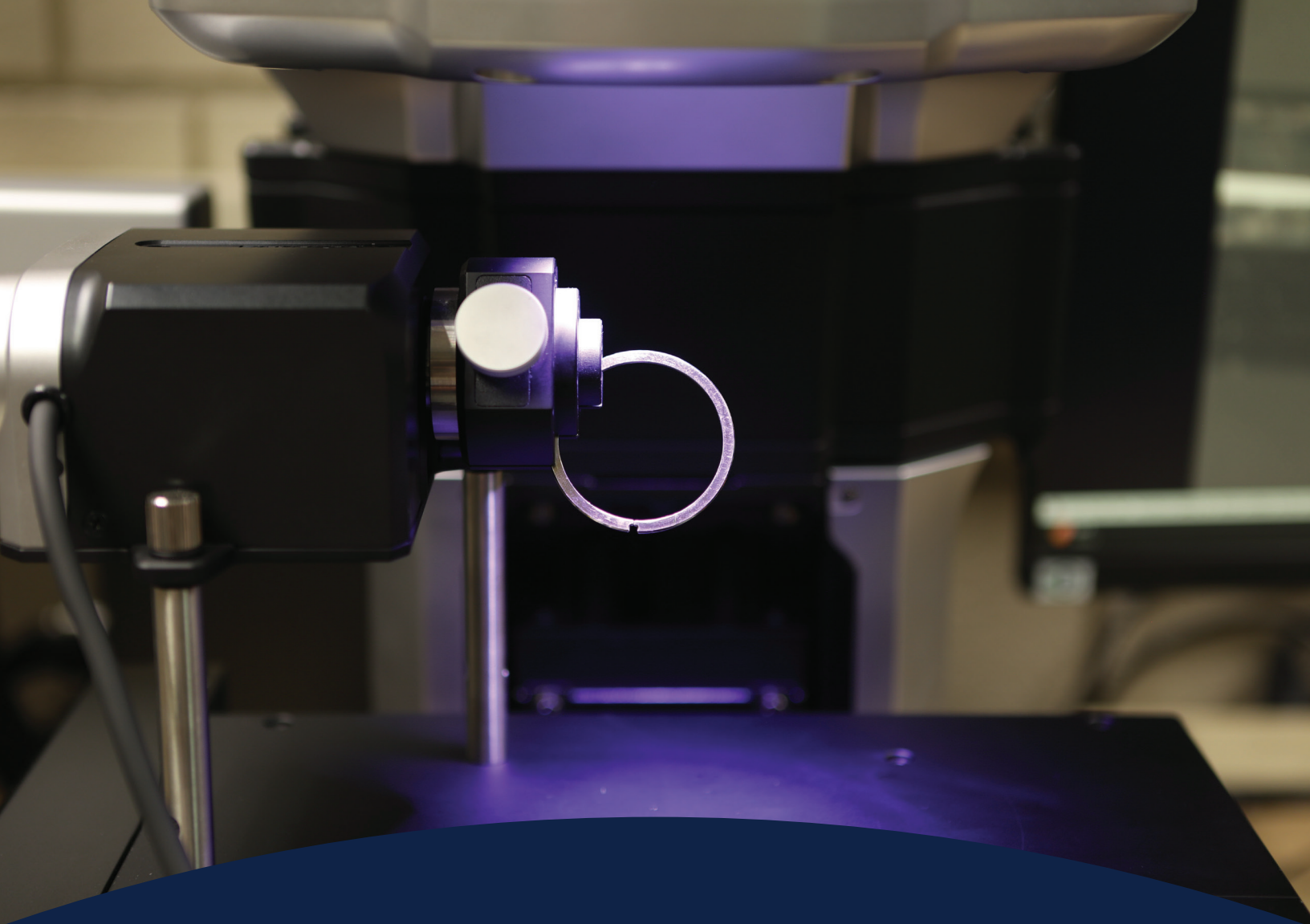




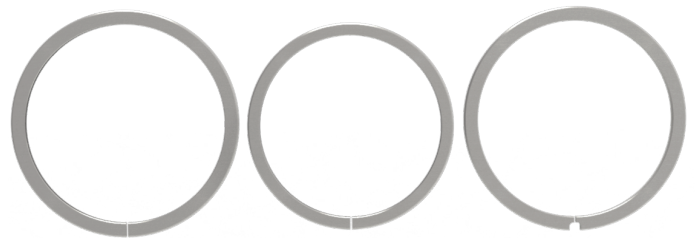
Application-Driven Customer Success Story

Delivering Under Pressure: Solving a Critical Aerospace Supply Challenge



Solving a Critical Aerospace Supply Challenge

In early 2025, a leading aerospace manufacturer approached Rotor Clip with an urgent requirement for high-performance piston and sealing rings used in aircraft pneumatic systems and bleed valves. These critical components operate in exacting environments where failure is not an option.



Despite extensive sourcing efforts, the manufacturer had difficulty finding a supplier that could consistently meet the program's production volumes, performance requirements, and delivery timelines. The challenge was not simply producing the part geometry, but achieving consistent sealing performance and tight dimensional control at production scale. Rotor Clip's capabilities helped address these requirements, strengthening supply continuity for both the manufacturer and its downstream customers.

Although Rotor Clip had not previously manufactured this product family, our nearly 70 years of expertise in precision ring production, coiling, heat treatment, inspection, and high-volume precision stamping, positioned us to take

on the challenge. Following an initial technical evaluation, we identified a viable path forward and committed the necessary resources to development. Backed by full top management support, we saw these requirements not as limitations, but as an opportunity to apply our core capabilities, systems, and standards in a new way.

Working in direct collaboration with the customer, Rotor Clip developed a manufacturing solution from the ground up. Together, we aligned on design specifications, validation protocols, and production processes to establish a qualified manufacturing process. The result was a reliable, high-quality production source, ensuring continuity for an active aerospace program in a fraction of the typical development timeframe.

Defining the Requirements: Performance, Precision, and Production at Scale

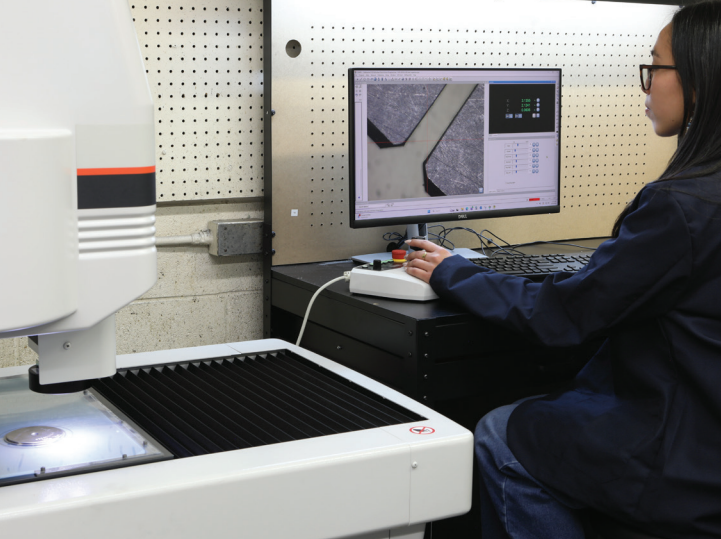


The customer engaged Rotor Clip after viewing a capabilities video and submitting an inquiry through our website. Our engineering team responded immediately, initiating direct engineer-to-engineer communication and moving quickly into technical review and feasibility assessment. From the outset, the project was highly collaborative, supported by regular technical discussions and onsite working sessions.

To move forward, the customer required a manufacturing partner capable of meeting a highly specific combination of engineering, quality, and production requirements that existing suppliers had been unable to meet. The solution needed to provide high-performance piston and sealing rings for critical aerospace systems with:



- ✓ AS9100-compliant quality documentation and full traceability.
- ✓ Exact conformance to engineering prints, including tight dimensional tolerances and sealing validation requirements.
- ✓ Material specifications matched to the operating environment.
- ✓ Consistent production to support active aerospace programs.
- ✓ Reliable delivery to support ongoing production schedules.



Accelerating Aerospace Qualification Through Rapid Development

Aerospace qualification programs of this nature typically exceed 18 months. Through a parallel development approach and close collaboration with the customer, Rotor Clip completed process development, validation, and production readiness in a fraction of the typical timeframe. This reduced qualification risk and provided a reliable production source much sooner than expected.

January 2025	Initial customer engagement, technical review, and first onsite engineering meeting. Weekly engineer-to-engineer collaboration established and maintained throughout the program.
February to May 2025	Manufacturability assessment, feasibility validation, tooling and process development underway.
June 2025	First Article Inspection (FAI) parts delivered, validating initial manufacturing capability.
July 2025	First production parts shipped, marking the transition from development to production readiness.
Within 12 Months	Six configurations approved, validated, and in production, with additional configurations already progressing through development using the established manufacturing processes, tooling, and validation methods.

Turning a Complex Requirement into a Manufacturable Part

Engineering Assessment and Process Development

Rotor Clip engineers worked directly from customer-supplied engineering prints to define manufacturing requirements and establish viable production methods for each ring configuration. This required adapting our expertise in ring forming, coiling, heat treatment, and inspection to meet new performance criteria, including sealing functionality and material behavior under operating conditions.



Unlike traditional retaining rings that retain components within an assembly, these components were required to maintain sealing performance under pressure while meeting tight dimensional tolerances.

Rather than approaching the challenge as a conventional sealing application, Rotor Clip applied its precision ring manufacturing expertise to develop a scalable manufacturing solution capable of supporting production volume requirements.

Drawing on nearly 70 years of precision ring

manufacturing experience, Rotor Clip developed repeatable production methods by controlling material behavior, forming parameters, heat treatment, and inspection throughout the manufacturing process. Quality verification was integrated at every stage to ensure consistent performance across all configurations. Executing the program also required close collaboration beyond the production floor, with continuous alignment on engineering requirements, qualification activities, and customer-specific documentation to achieve fully qualified parts.





Raw Material Readiness

For aerospace qualification programs operating on tight development schedules, raw material availability can become a critical constraint. While other suppliers experienced extended lead times for specialty materials, Rotor Clip already maintained the required material within our existing inventory and supplier network.

Combined with rapid internal coordination across engineering, production, and purchasing, this allowed process development and validation to begin immediately rather than waiting for raw material procurement. In an aerospace qualification program operating under strict timelines, that responsiveness proved critical, enabling the customer to maintain momentum without waiting for extended raw material lead times.

Strategic Investment in Manufacturing Capability

To support the program's technical and production requirements, Rotor Clip made targeted investments in equipment, tooling, inspection systems, personnel, and internal resources, establishing dedicated manufacturing capabilities to support both this project and future aerospace programs:

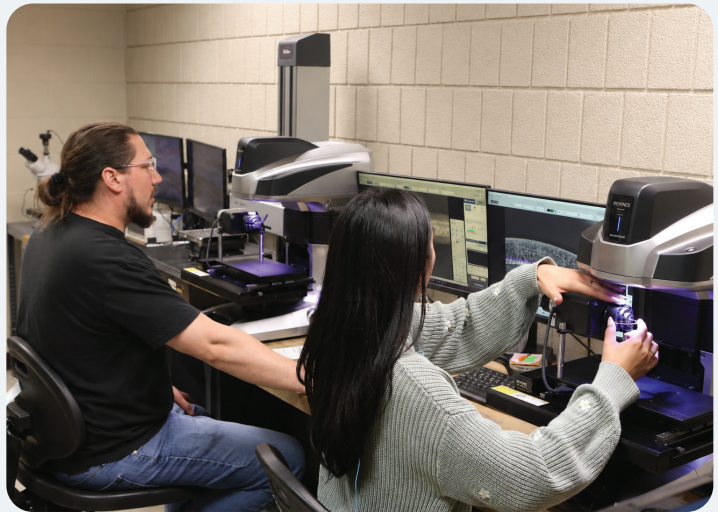
- ✓ CNC lathe and additional machining equipment
- ✓ Custom tooling, fixturing, and gauging
- ✓ Advanced vision inspection systems
- ✓ In-house leak testing equipment
- ✓ Specialized inspection processes
- ✓ A dedicated cross-functional team of 20-25 personnel

These investments enabled Rotor Clip to transition efficiently from development into production, establishing long-term manufacturing capacity for future aerospace applications. The program remained a priority across all levels of the organization, from top management to engineering and production, enabling rapid decision-making throughout qualification and production ramp-up.



Engineering Collaboration

We operated as an integrated engineering team alongside the customer from development through production. Direct engineer-to-engineer communication enabled rapid decision-making, eliminating delays typically associated with multi-layer review processes.



Frequent onsite engagement from customer engineering teams further strengthened this approach, with extended working sessions focused on tooling, process development, and validation. This level of integration was critical in maintaining momentum and achieving this compressed timeline.

Validated Production Outcome

Within the program timeframe, six aerospace part configurations were developed, validated, and transitioned into production, creating a qualified manufacturing process where none previously existed.

Each configuration met strict aerospace requirements for dimensional control, material performance, and sealing validation in helicopter and aircraft systems.

The program resulted in the customer securing a qualified manufacturing source for previously hard-to-source components, while Rotor Clip developed a new and lasting area of expertise in aerospace piston and sealing ring manufacturing.



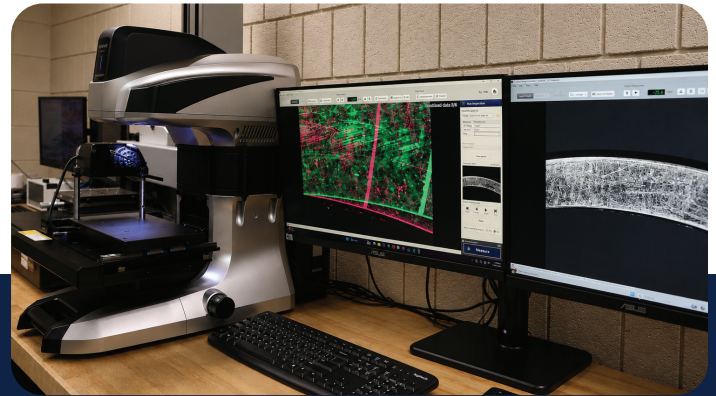
Program results included:

- ✓ Six part configurations qualified and in production with additional configurations in development.
- ✓ Validated manufacturing and inspection processes established for new aerospace rings.
- ✓ Stable supply chain established for a previously unavailable component category.
- ✓ Expanded manufacturing and internal capabilities to support future programs.



Application Driven Solution, Delivered

The successful qualification of this program resulted from more than manufacturing capability alone. By combining application-driven engineering, close customer collaboration, parallel development, and targeted investment in manufacturing resources, Rotor Clip established a qualified production process for a component previously unavailable at the required combination of performance, volume, and delivery. The program not only resolved an immediate supply challenge, but also established long-term manufacturing capability for future aerospace applications.



Program Highlights



Application-driven engineering enabled development of new manufacturing processes



Parallel engineering accelerated aerospace qualification



Direct engineer-to-engineer collaboration supported fast technical alignment and decision-making



Targeted investment and support from top management enabled optimization in equipment, personnel, processes, and inspection capabilities for long-term production readiness.



A non-traditional development approach allowed Rotor Clip to deliver a qualified solution where existing supply options could not meet requirements simultaneously



Need a part others can't manufacture?

When supply limitations, tight specifications, or compressed timelines prevent a standard qualification path, Rotor Clip works directly with your engineering team to develop a viable manufacturing solution.

We commit the necessary people, equipment, and process development to meet application requirements and move programs from initial concept through production. Where others are unable or unwilling to proceed, we build the capabilities to move forward.

Start the conversation with our engineers now at rotorclip.com

