Scientists from the S. P. Korolev Samara University have developed a new technology to enhance fastening elements used in aviation and astronautics. These components have become twice as strong while simultaneously reducing the weight of the structure.

The development is particularly relevant given the active use of composite materials in aircraft and rocket construction. Today, up to 50% of modern aircraft structures consist of lightweight yet durable composites. However, in areas where such materials are fastened, special reinforcing elements—previously manufactured using traditional methods—are required.

The scientists proposed using 3D printing and topology optimization algorithms to create such components. This approach automated the design process, reduced weight, and increased strength in areas of maximum load. Experiments confirmed that the new method more than doubles the load-bearing capacity.

Additionally, the development takes into account the interaction between plastic and metal, making the model more precise and applicable in production.