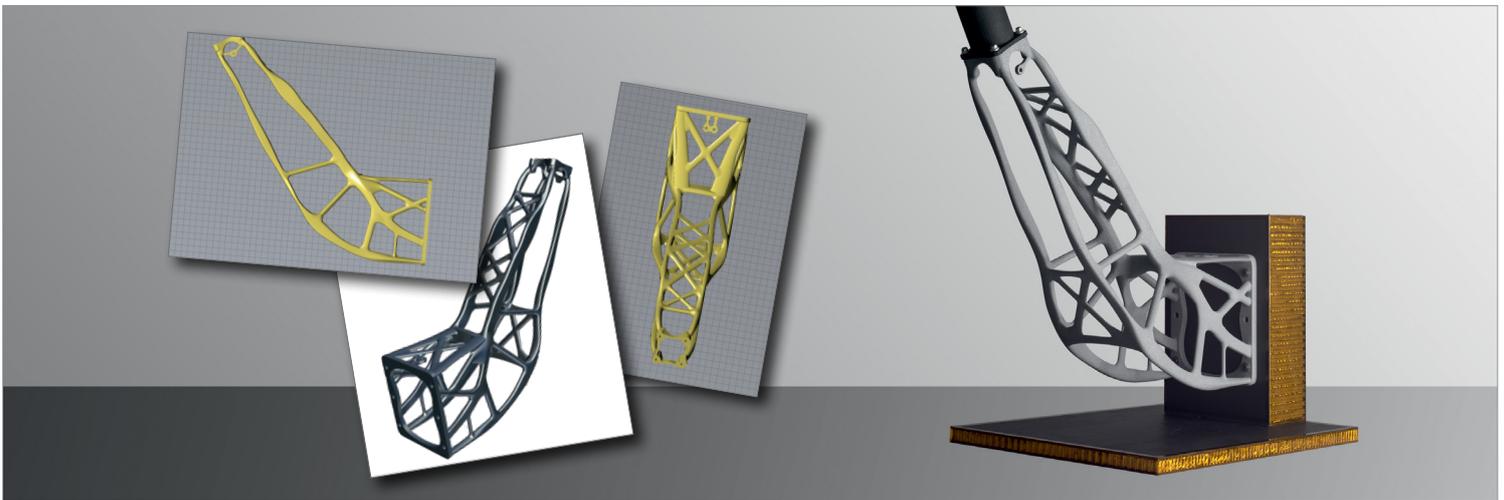


case study

RUAG Space

Topologically Optimized & 3D Printed Component on its Way to Space

Weight reduction is a decisive factor in the space industry, since the lighter a satellite is, the less it costs to send it into space. Since 2013, RUAG Space has been conducting intensive research and development work to investigate how to 'print' its components using an Additive Manufacturing (AM) process. The goal of the engineers was to take full advantage of the design freedom AM offers and to create an aluminum component that would be significantly stiffer while at the same time lighter than the original design. In addition, RUAG's engineers also wanted to cut down design and development time to get results and the final component faster.



solution

An antenna support arm was selected as a component that could be manufactured additively and had a high weight saving potential. RUAG selected Altair's product development division, Altair ProductDesign, to support the design for 3D printing process due to the company's expertise in developing and utilizing optimization techniques.

To perform the optimization studies, the combined team deployed Altair's structural solver, OptiStruct, part of the HyperWorks suite of simulation tools. The team identified a 'design space' within OptiStruct and applied the known load cases that the antenna would be subjected to during launch and use in space. Using this information, OptiStruct was able to suggest an ideal, material efficient design that RUAG and Altair could use as a basis for the final design. After the optimization and design stages of the project, the component was manufactured by RUAG's AM technology provider, EOS. Thanks to the accuracy of OptiStruct, coupled with the abilities of Altair ProductDesign to interpret the optimization results into a feasible part, the final component required very few adjustments to meet EOS' 3D printing requirements.

result

The symbiosis of optimization and Additive Manufacturing enables a new level of lightweight design since this manufacturing process is able to realize structurally efficient components which were not previously possible without a lot of time and effort using traditional production methods. The final design developed by RUAG in conjunction with Altair ProductDesign is much closer to the ideal design proposal coming from the optimization results. Stiffer and lighter components contribute enormously to cut down launching costs for space vehicles and satellites. The simulation driven design process of the antenna bracket led to reduced stress, increased stiffness and a weight reduction of 50% compared to the baseline design.