PROTOLABS
Manufacturing. Accelerated.

Tech Sheet

Generative Design with NASA

NASA embraces generative design to significantly accelerate their product development process. By adding design parameters to generative design software, NASA engineers can use artificial intelligence (AI) to drastically reduce development time for functional parts.

The generative design process is faster and ensures that the part meets requirements, including design for manufacturability. Today, NASA uses generative design for vital parts in many active missions as they employ a "build more, design less" philosophy.

	Design Time	Design Iterations
Human Engineers	2 days	4
Generative Design/AI	1 hour	31

Spotlight: PowerSource Global Summit

NASA engineers recently ran a generative design experiment at the PowerSource Global Summit in which they asked attendees to develop a list of environmental hazards for a hypothetical trip to the moon as part of the Artemis program.

Scenario
During the Artemis mission, astronauts will capture volatile compounds released after sunrise on the surface of the moon. During that time, the temperature increases dramatically from -315 F to -55 F (-193 C to -48 C). Conference attendees used generative design strategies to create an apparatus that would effectively hold the sample collection containers.

Key Design Parameters

Can carry 68 pounds of mass
Aluminum 6061 has an outstanding strength-to-weight ratio and corrosion resistance.

Stackable/Modular
Space travel is expensive, so size was reduced via stacking.

Can be placed on a sloped surface
Create feet for myriad ground conditions.

Quickly machinable
Breaks in the circular border allow for 2-axis CNC machining in just 19 hours.

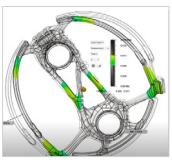
Part Delivered in 36 Hours

Monday
10:30–11:30 Generative design presentation/crowdsourcing of constraints
12:00–19:30 Generative design computations
21:20 CAD file uploaded to Protolabs digital thread
21:34 Block loaded into milling machine

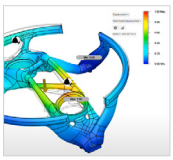
Tuesday
15:00 Part is complete after 19 hours of milling
16:00 Part leaves Protolabs facility in Brooklyn Park, Minn.

Wednesday
08:00 Part arrives in Orlando, Fla. before the doors open at the PowerSource Global Summit

No larger than a shoebox
X: 9.75 in. (247.64mm)
Y: 9.88 in. (250.98mm)
Z: 2.88 in. (73.17mm)



Design considers wide temperature range
Thermal stress analysis confirmed feet would bind when cooled.



Durable
Modal frequencies over 100 Hertz are necessary to survive launch conditions.