

# What is the best way to plant a seed?



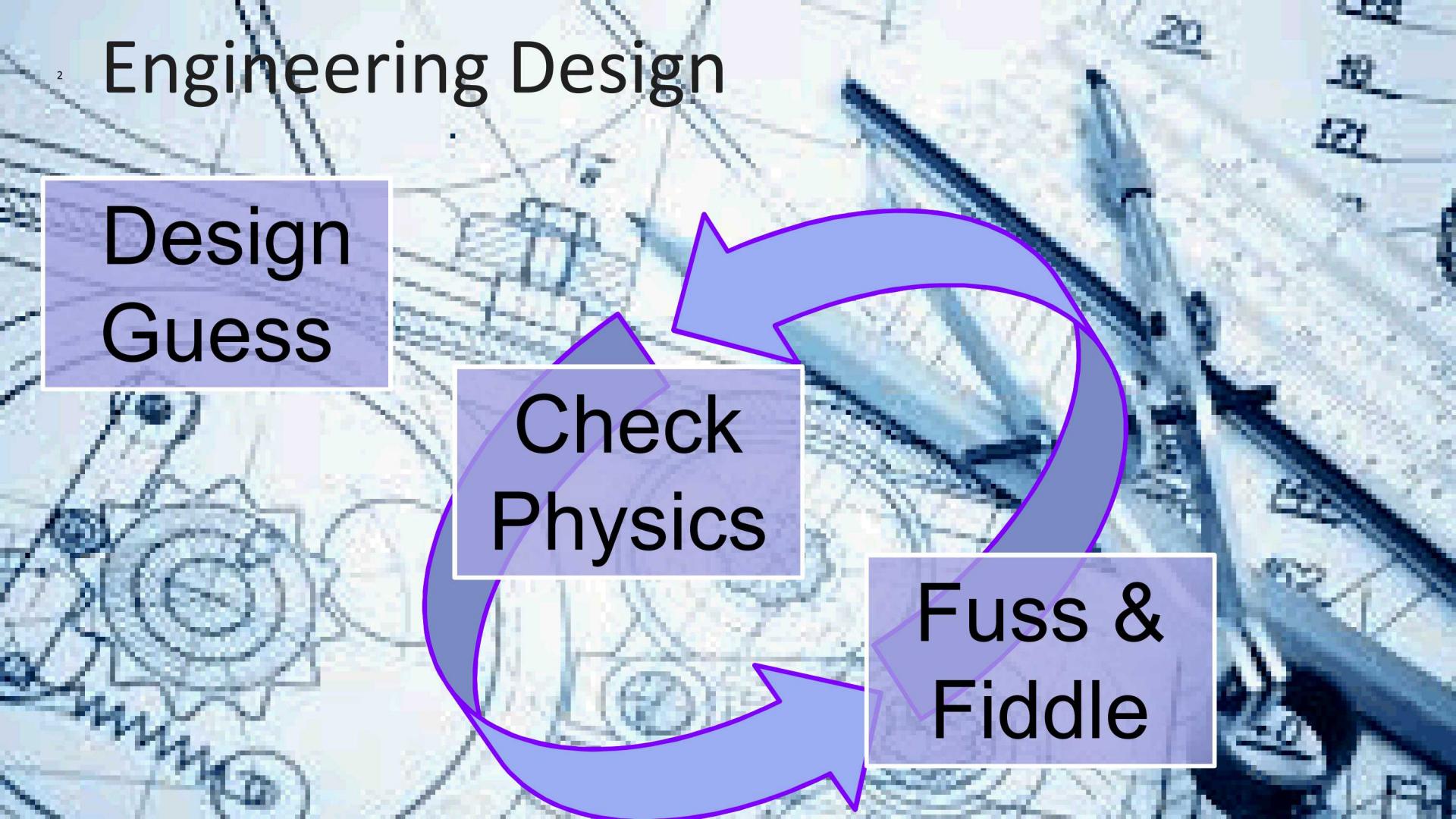
SAND2018-11877C

# Engineering Design

Design  
Guess

Check  
Physics

Fuss &  
Fiddle



# Generative Design

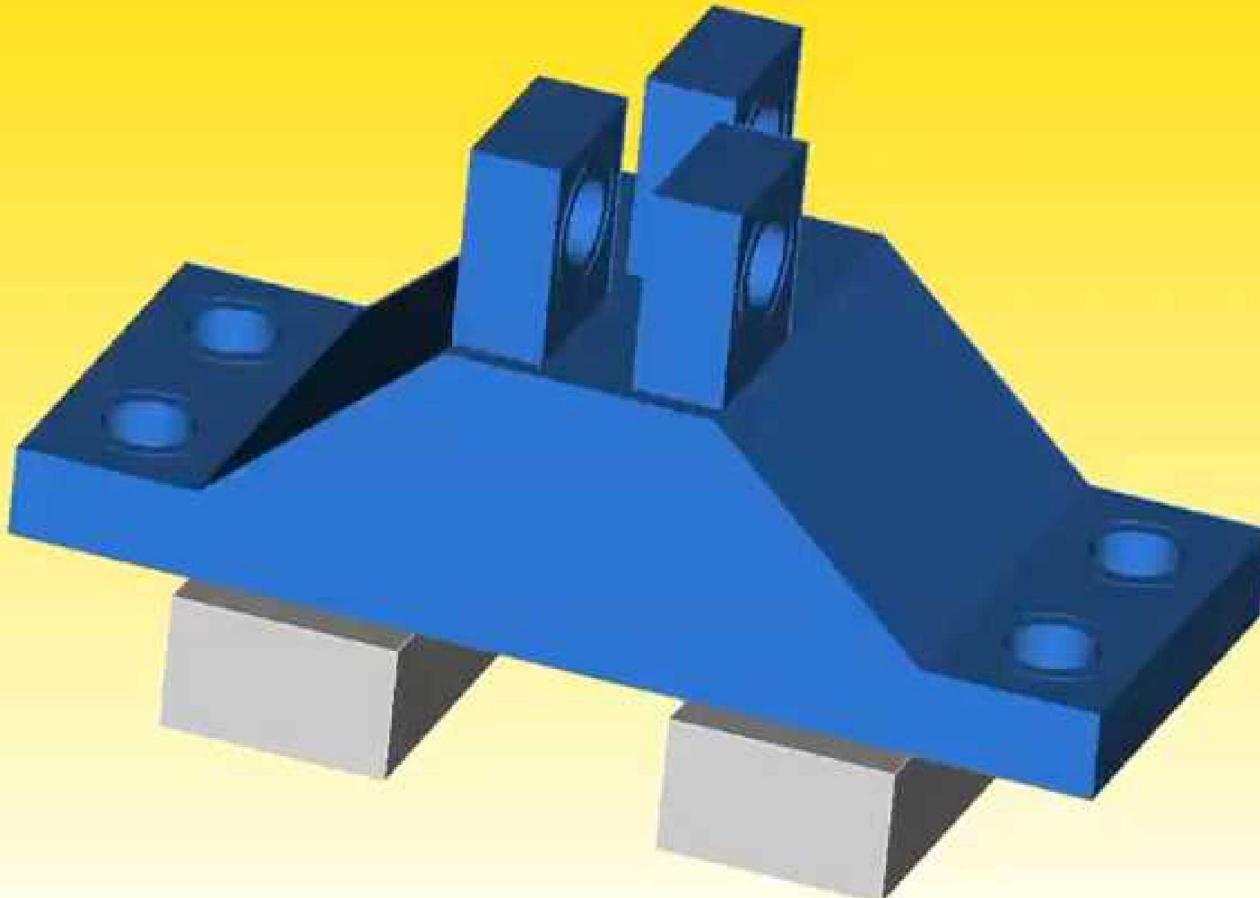
Physics'  
Design

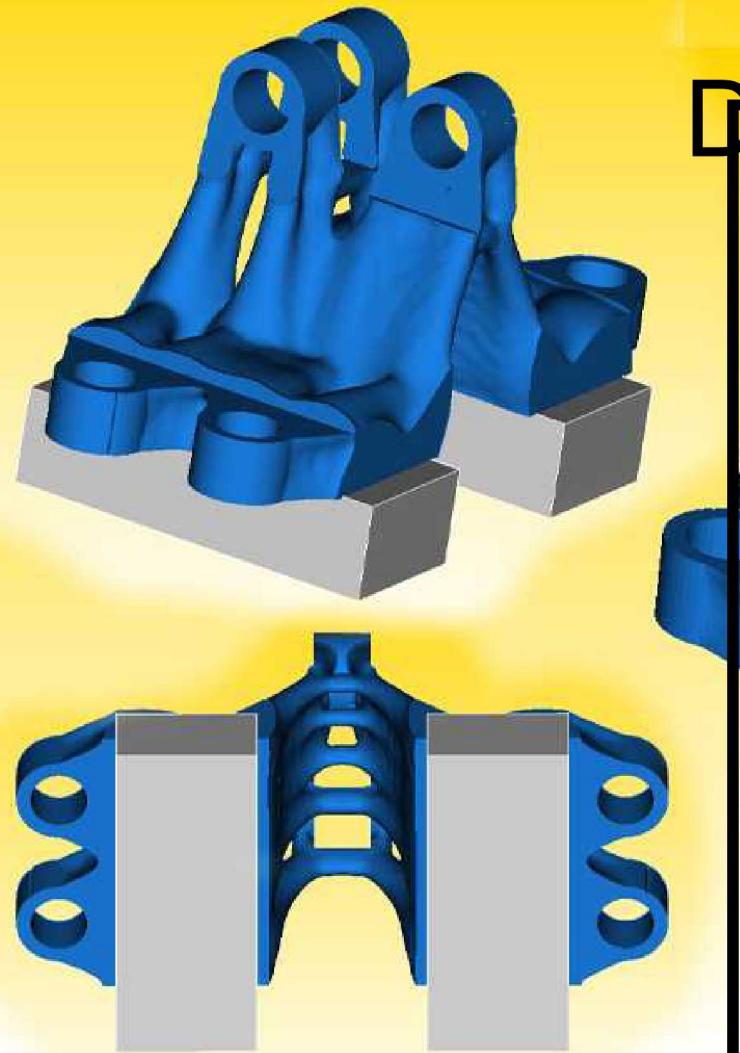
Check  
Physics

Fun &  
Flexible



# Here's How It Works



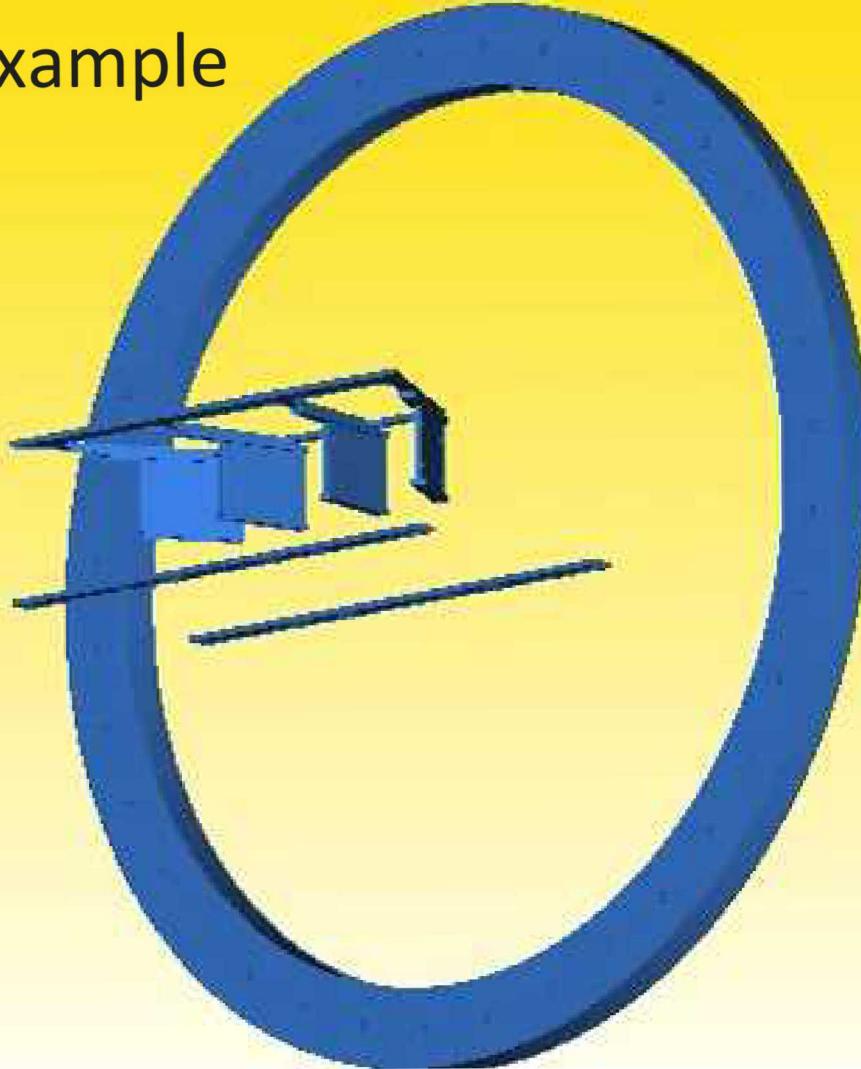


D

... a man need examine nothing but what  
is best and most excellent ...

A black and white photograph of a marble bust of the ancient Greek philosopher Plato. He is shown from the chest up, in profile facing left, with his head turned slightly towards the viewer. He has a thoughtful expression, with his right hand resting against his chin and his fingers partially hidden in his hair. The background is dark.

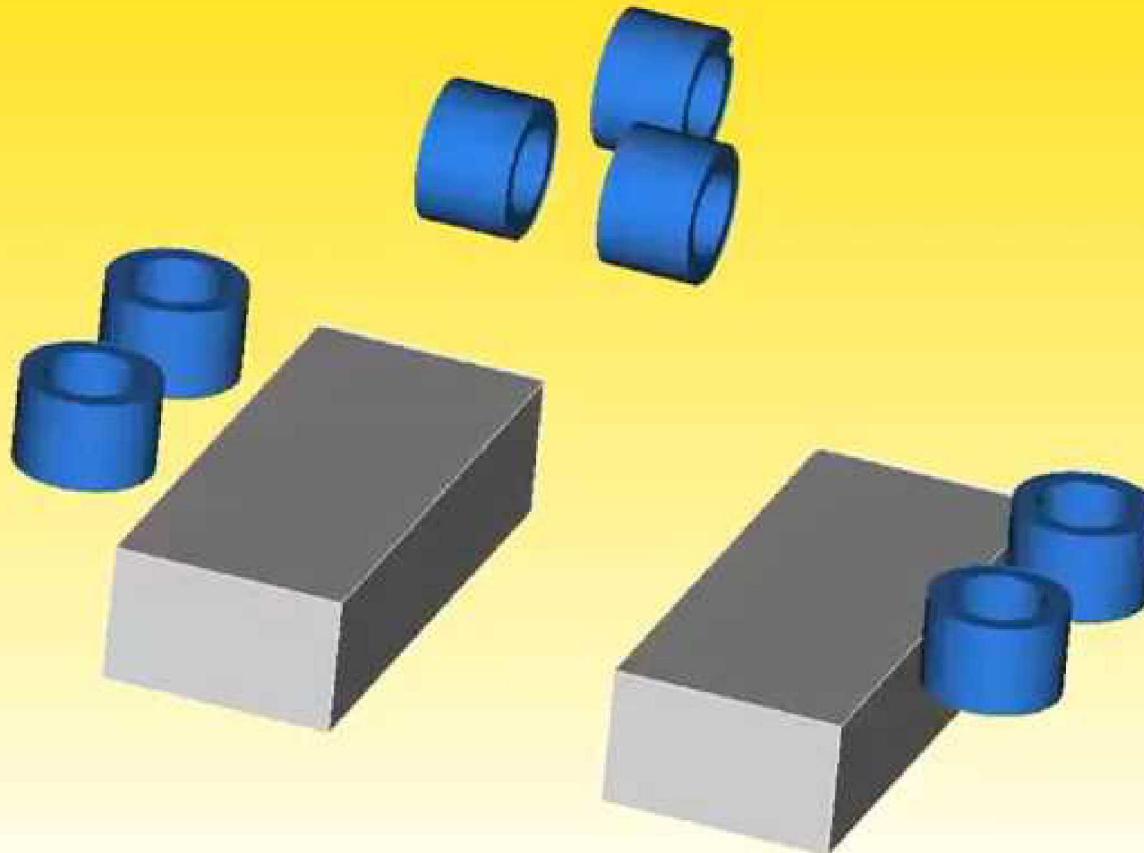
# Fixture Mount Example



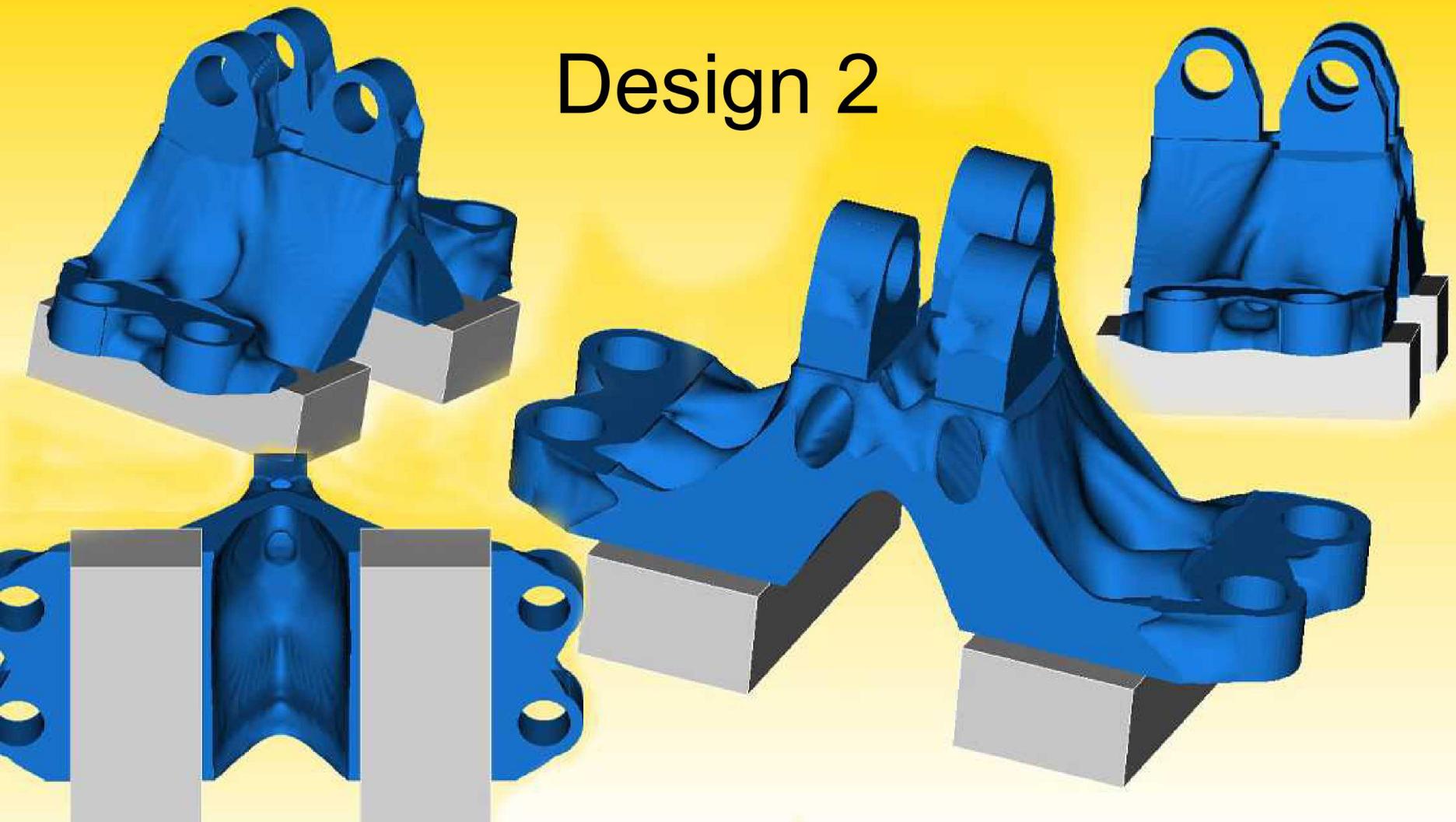
Conversion to CAD



# Dealing With Uncertainty

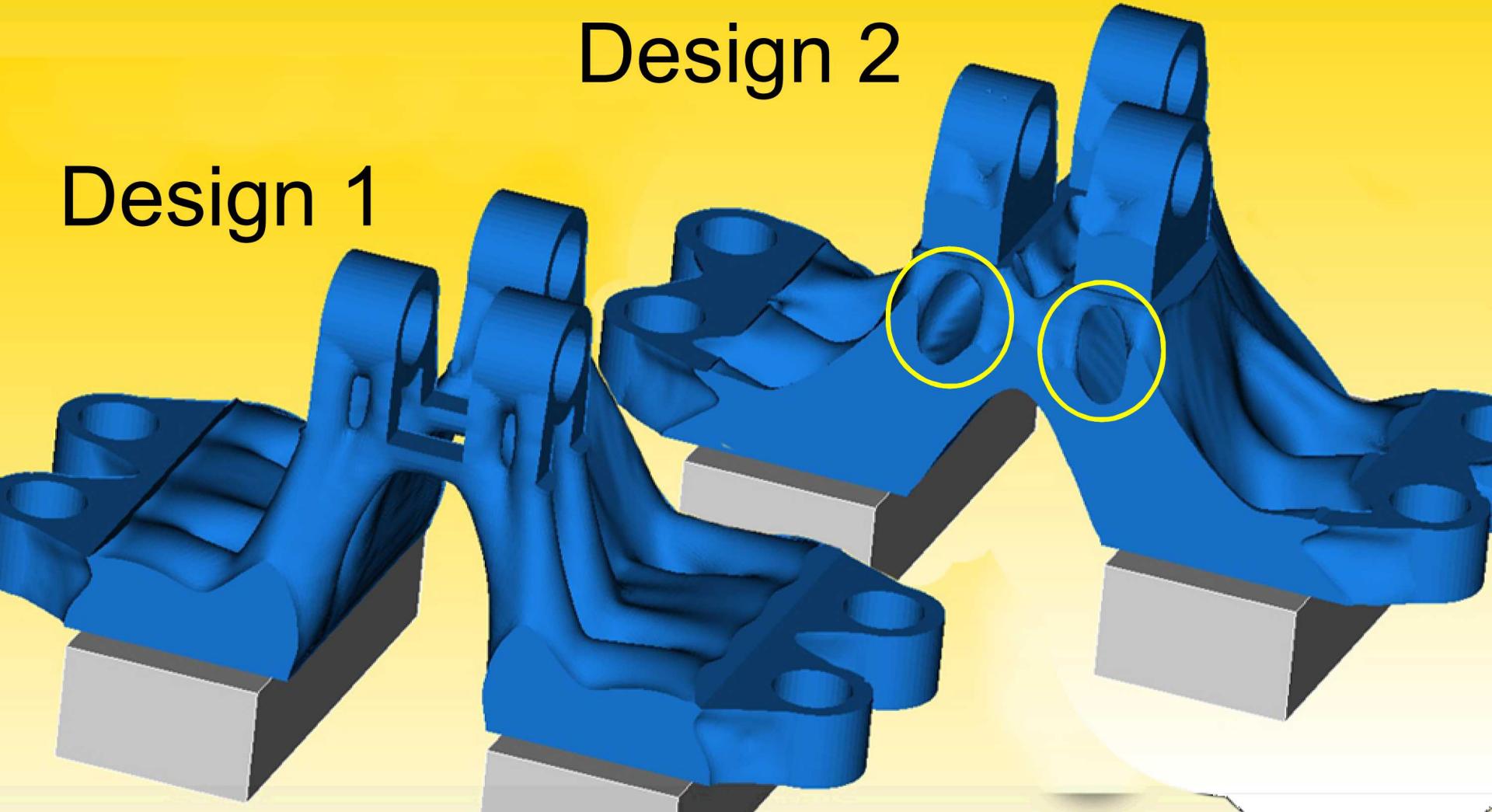


# Design 2



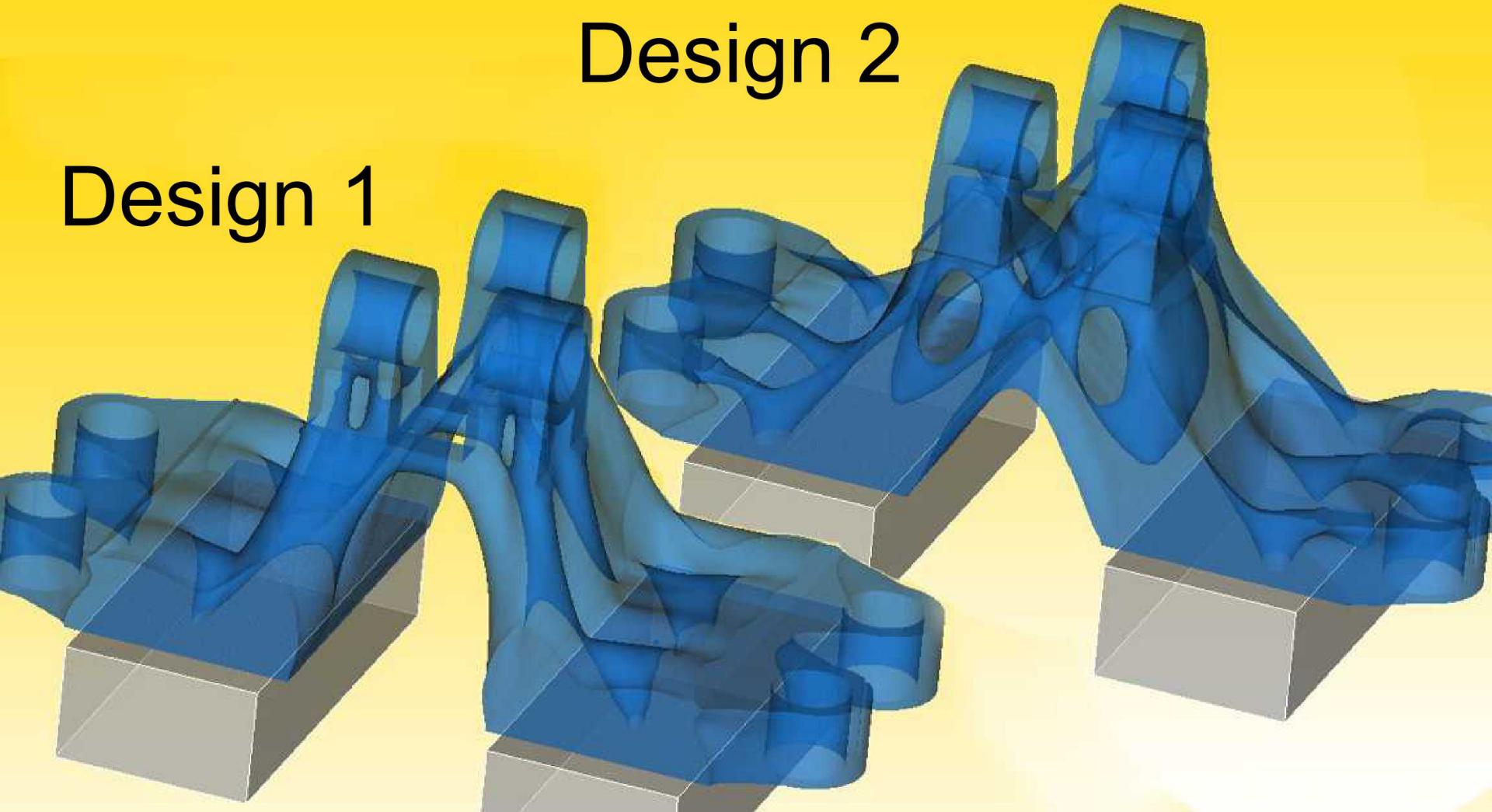
Design 2

Design 1



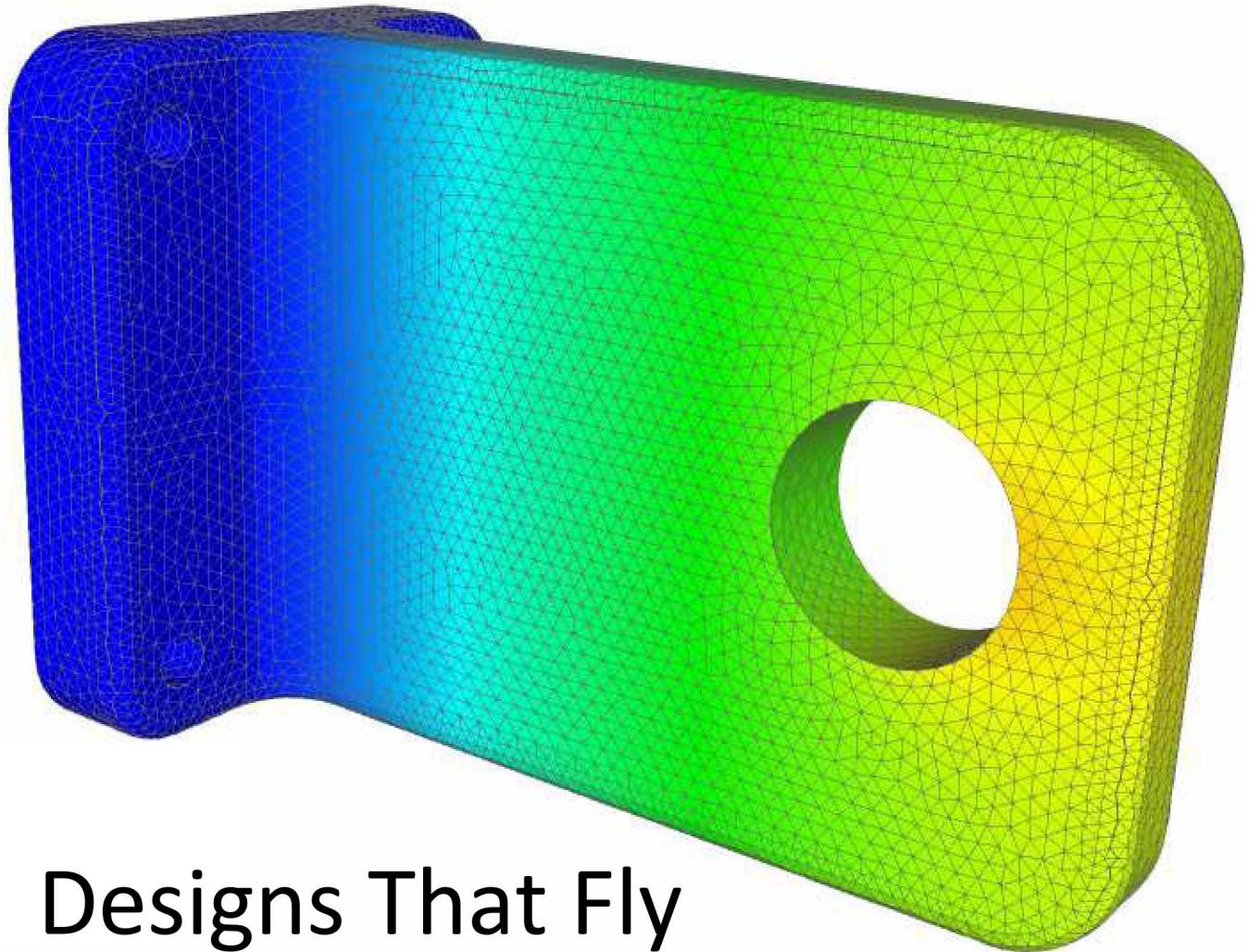
Design 2

Design 1



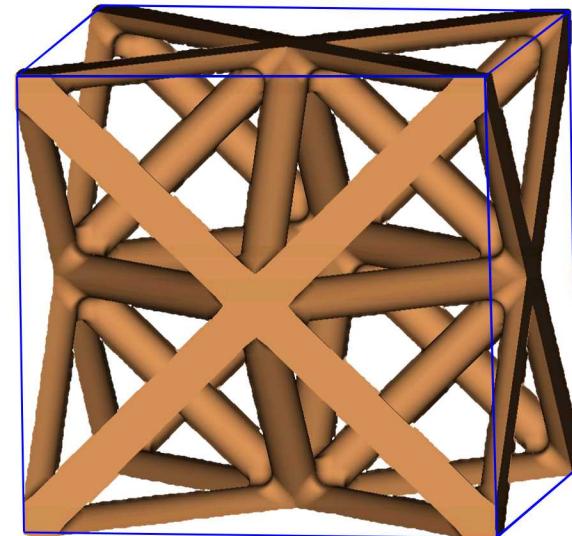
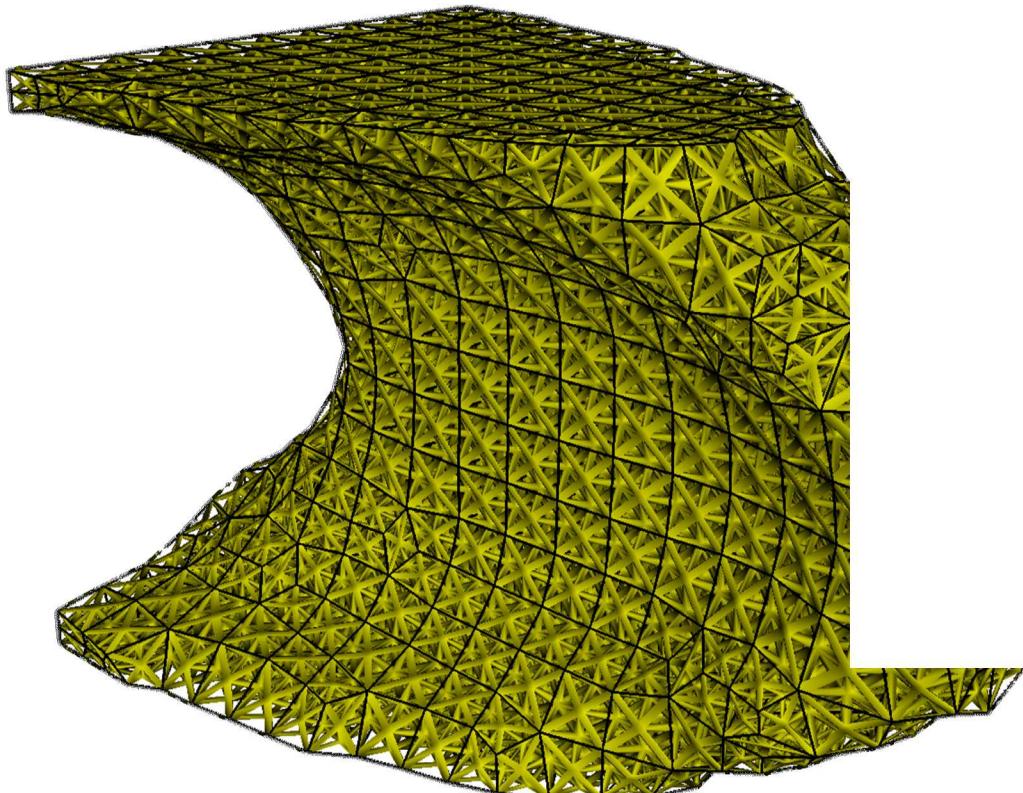




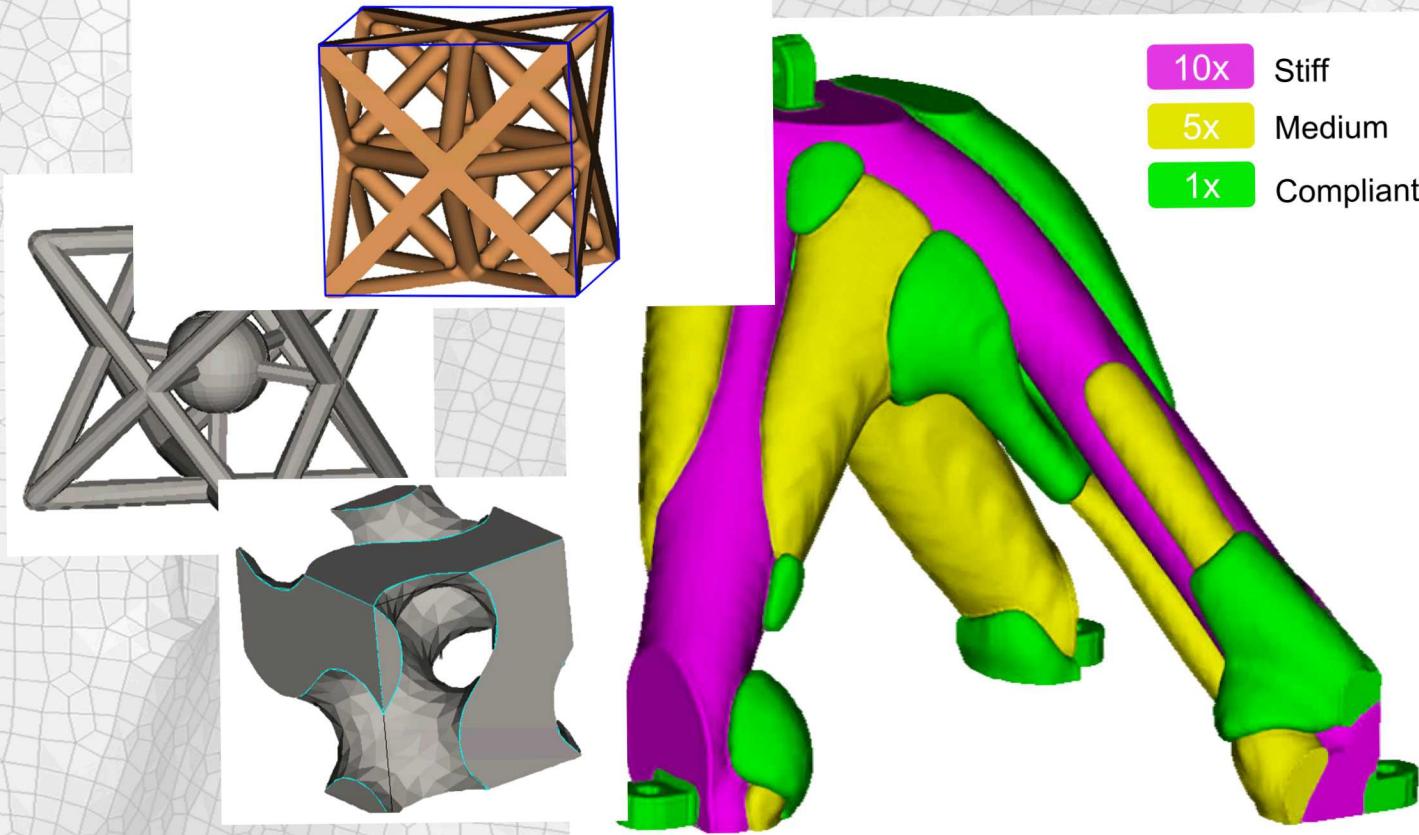


Designs That Fly

# Design at the Meso Scale

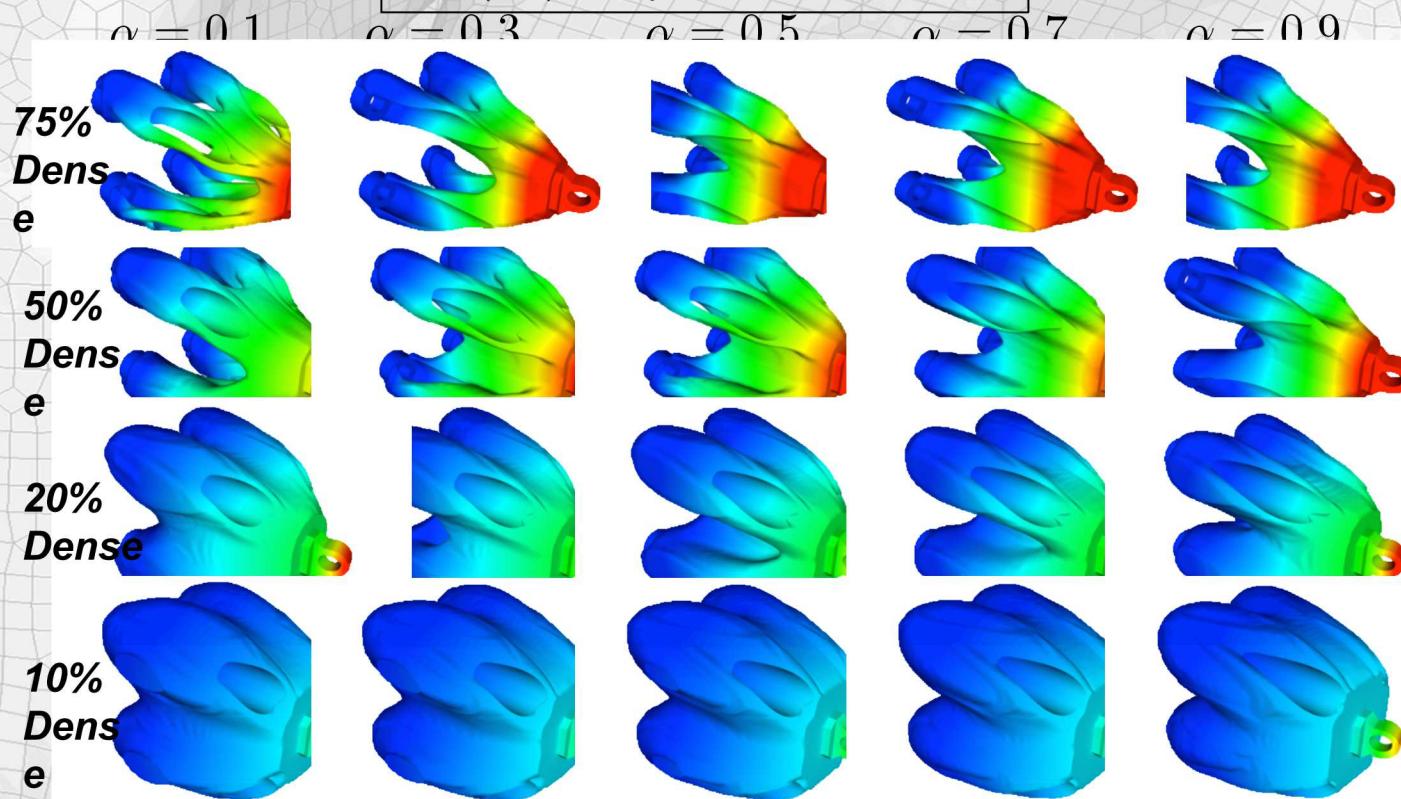


# Multiple (Meso) Materials



# Design Space Explosion

Min:  $(1-\alpha)^* \text{compliance} + \alpha^* \text{thermal}$



# Generative Design: A New Era



*Let the Physics Win!*