

## Power Form – Mandrel Seating Tool Design for Improved Repeatability / Non-Compliance Reduction

### Project Description

In the manufacturing lines at Pursuit, the metal Leading Edge Blades- designed to protect composite blades in aircraft turbine engines - that are produced go through a power-forming process. The current process of setting the part on to the mandrel is not standardized and not repeatable. The team's target is to make this process more repeatable and reliable.

### Existing Process

The current procedure that is done for setting the parts onto the mandrel that goes into the power-former is largely operator-based. The operator receives the part at room temperature, which is somewhat fixed onto the hot mandrel for pre-heating with loosely bolted fixtures on both ends. To seat the part into place, the operator strikes the blade onto the mandrel at different spots along its leading edge.

Leading Edge Blade on the Mandrel



Heated Power Form Press and Forming Process

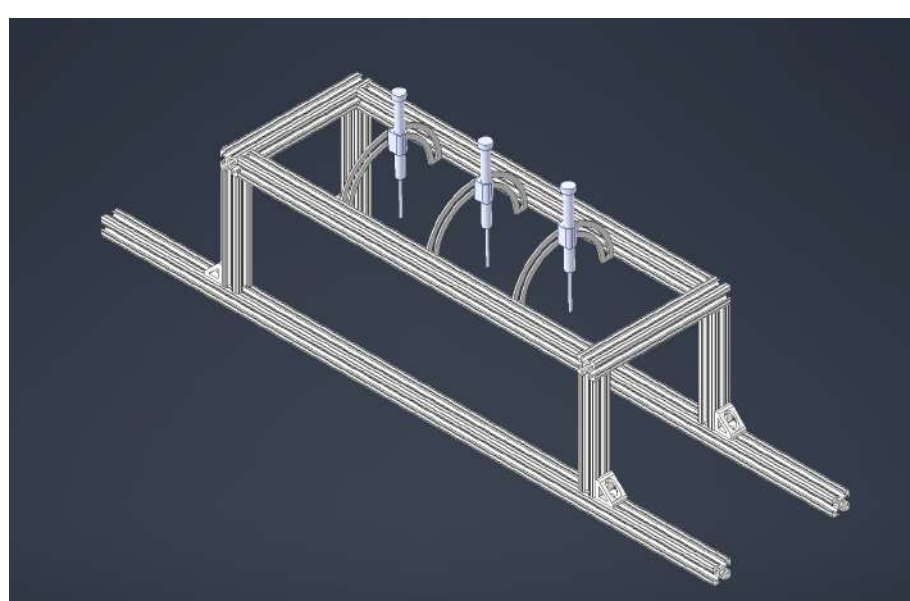


### Possible Problems and Solutions

The operator-based part setup causes considerable variation from part to part during the power-forming process. To prevent that, the team will design a solution that eliminates the human error arising from inconsistent positioning and applied forces on the blade.

#### Design for – Spring-Lock Punch Carrier

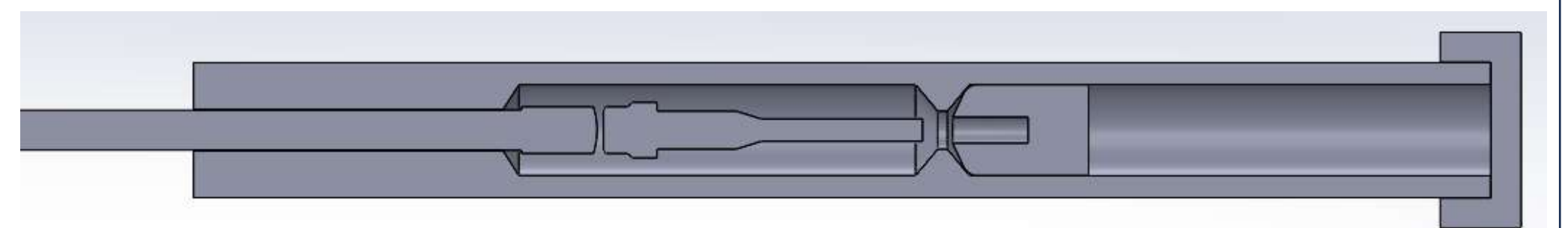
To allow the spring-lock punches to be properly located, there must be angle adjusters on the top of the frame.



The punches will be angled according to the helix geometry. This will allow the punches to be parallel to the leading-edge geometry at each specific position of the part.

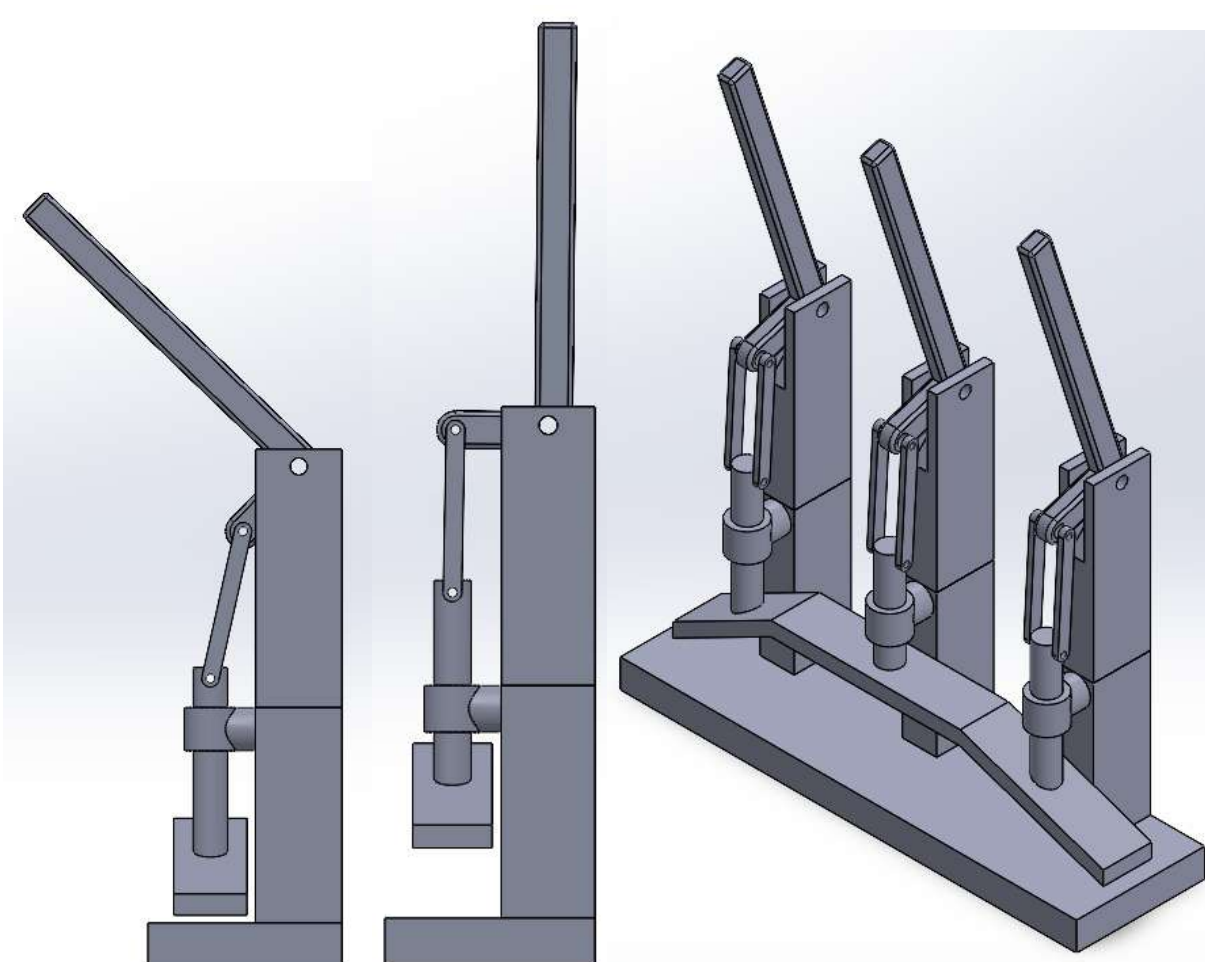
#### Designs for – Spring-Lock Punch Mechanism

The spring lock punch is an initial design. There is a middle pin that is intentionally misaligned in order to push the hammer up. The conical corridor in the middle of the tube aligns the middle pin to the hammer, allowing the hammer and the Punch end to strike down.



#### Designs for Mechanical Straight Clamp with Constant Displacement

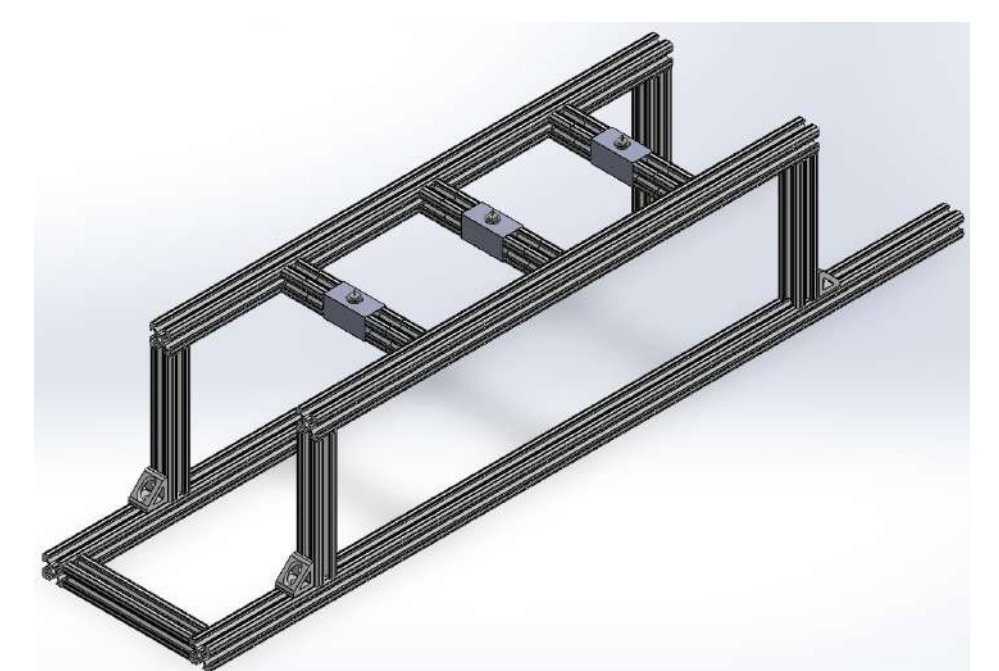
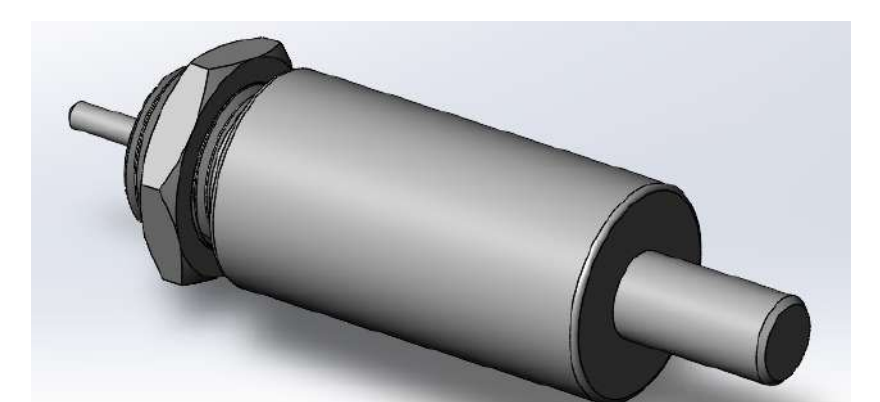
The purpose of this design is to be a fully mechanical and simple design. The full design is to be clamped to the mandrel by the operator. The clamps are then to be lowered until locked by the operator, ensuring an even and constant force distribution



#### Designs for Solenoid Punch

This solution uses linear “Push” solenoids controlled using pulse width modulation and a feedback control system to apply a constant force and distance to seat the blade.

The rack designed to hold the solenoids is projected to use 80 20 T-Slot framing with the system being controlled with sensors or a button depending on implementation limits.



### Semester Deliverables:

By the end of the semester, the team expects to have a fully designed, working solution virtually, ready to be prototyped and tested for the following semester.



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