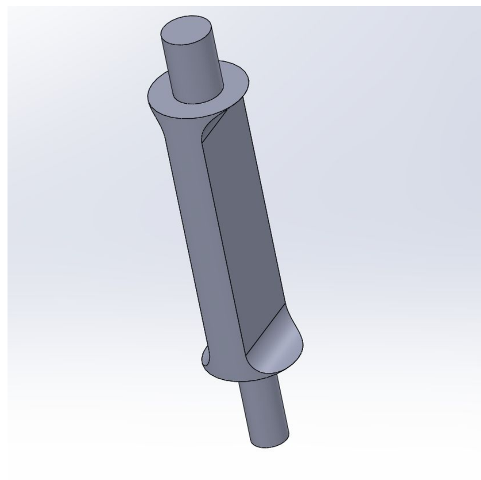
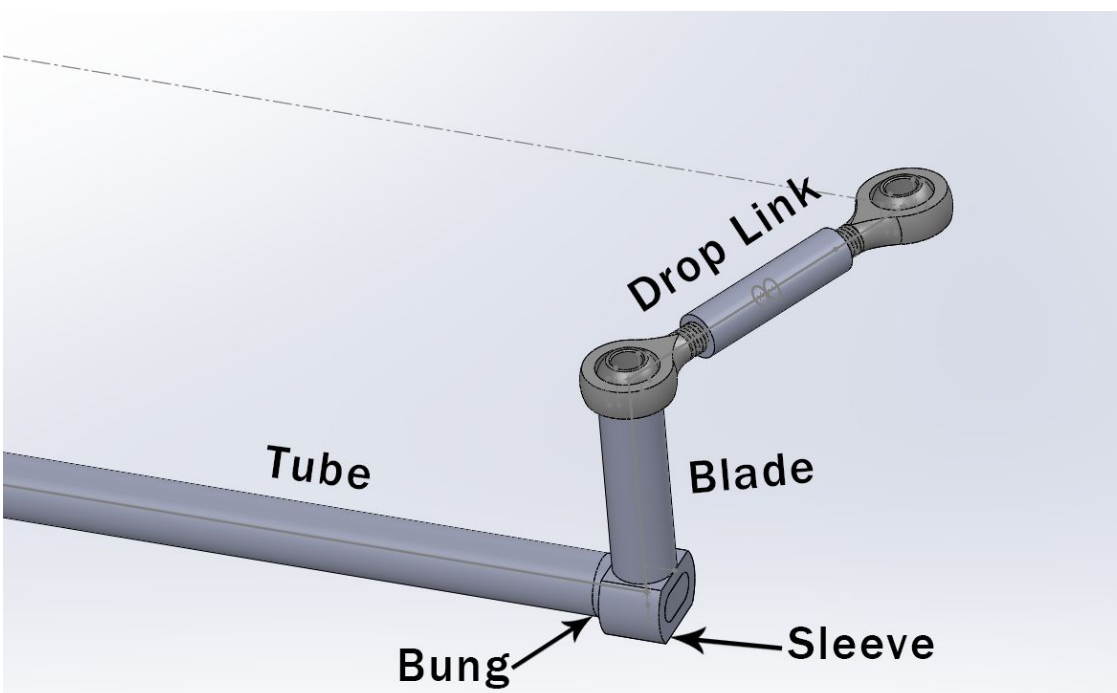
Conceptual Simulation and Setup:

The objective of this process is to design an adjustable blade to fit into the existing anti-roll system. The benefits of this are allowing for adjustment without swapping out parts (important during competition) and allowing for a much finer increment for adjustment. A rotatable blade was the path chosen to achieve this because it could be integrated into the curren roll bar design. This has the benefit of being able to swap this part out for the fixed solid rod blade. It was not possible to collect preliminary test data on this design, so although this decision does limit the options when designing the adjustable blades it decreases the risk of committing to a design that has not been validated.

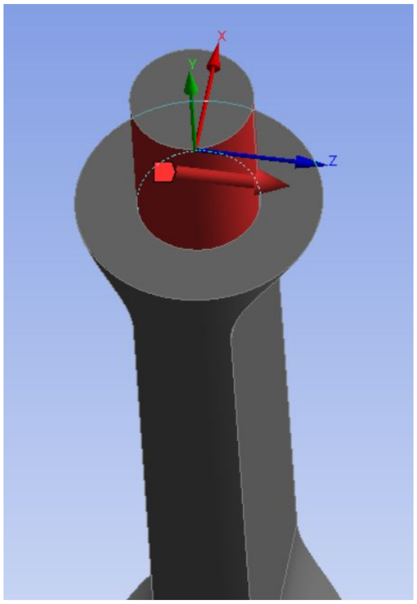
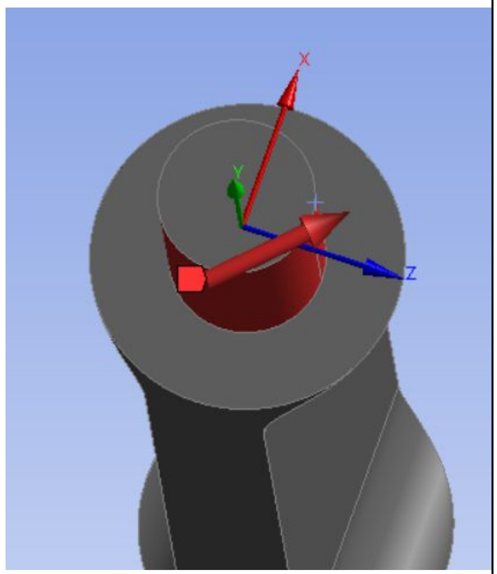
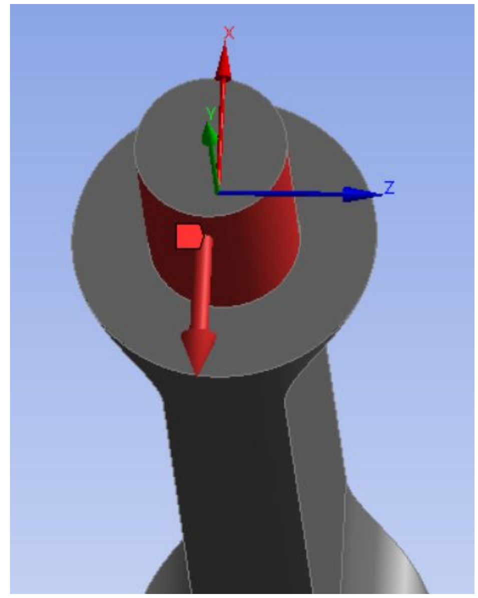
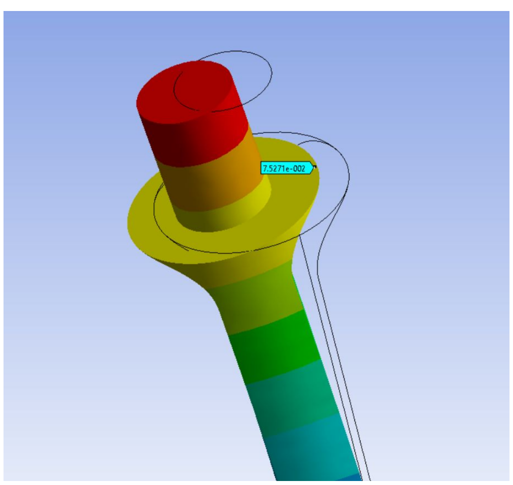
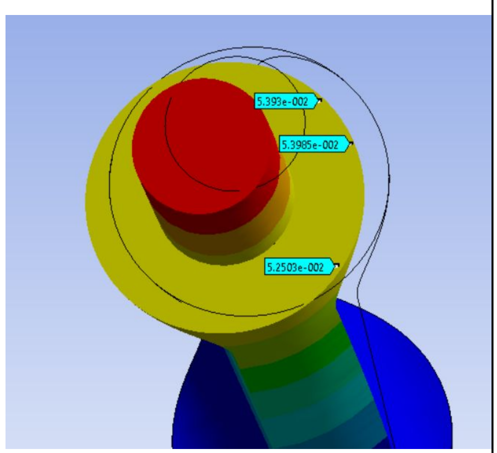
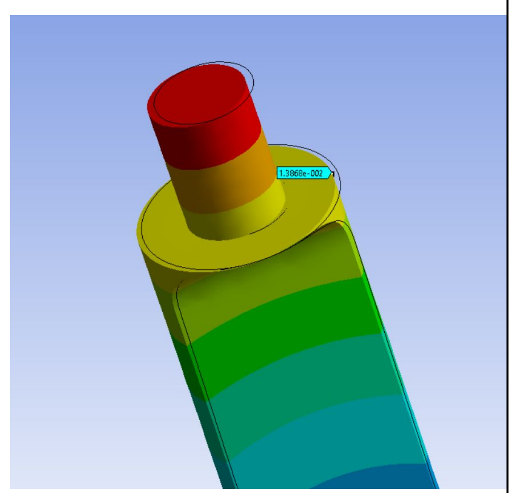
Off the shelf blade



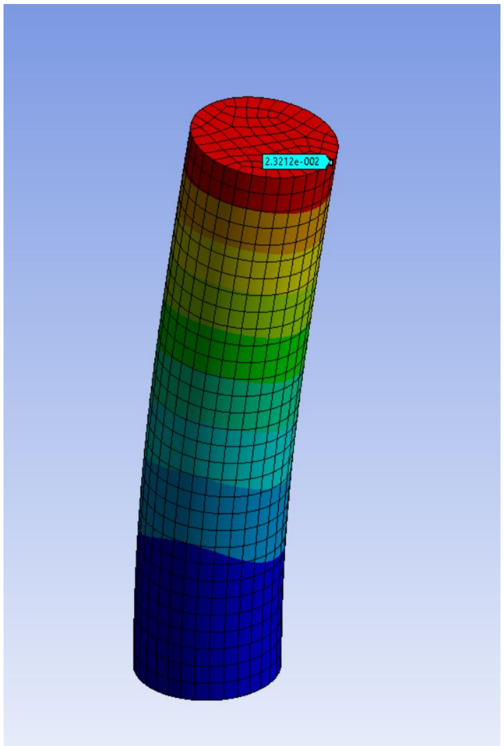
Blade fit into current ARB package



The design of this adjustable blade is based off of this style of off the shelf rotatable blade. They both work conceptually the same, when the force applied by the drop link is applied in line with the spine the blade will be stiffer than when it is turned ninety degrees so that the force is applied perpendicular to the blade.

<table>
<tr><td>Perpendicular, weakest spring rate</td><td>Middle, adjustable range</td><td>In line, strongest spring rae</td></tr>
<tr><td>
</td><td>
</td><td>
</td></tr>
<tr><td colspan="3">These images show true scale (1.0) deflection for a 500 lbf force applied respective orientation, this is meant as an initial proof that the design works conceptually</td></tr>
<tr><td>
</td><td>
</td><td>
</td></tr>
</table>

The above simulation was set up with simple fixed supports at the end of the blade that attach to the main ARB tube. This simplification is acceptable because of how stiff the ARB tubes are relative to the blades. A simple component force is then applied to the part of the blade that mounts to the drop link ball joint. This simulation, though simple, does prove how the orientation of such a blade relative to the force being applied results in varying displacement and therefore angular spring rate. This can be applied to the current anti-roll setup by comparing how an adjustable blade compares to a static rod blade.

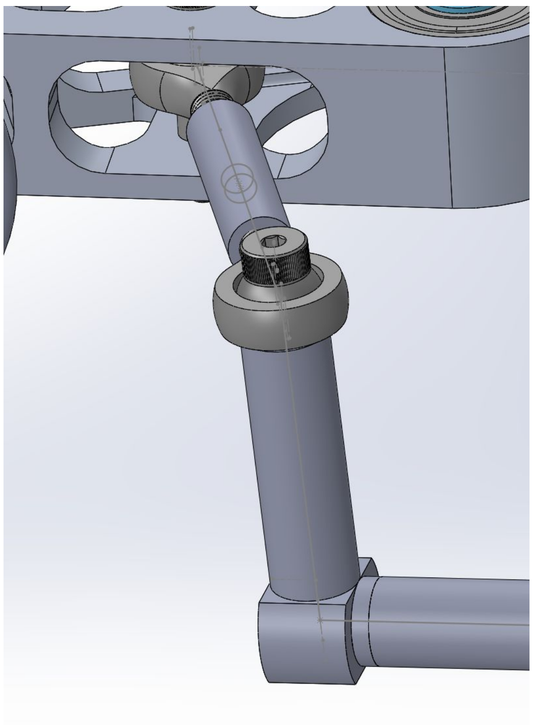
 Screenshot 7.2 deflection scale	This is the current 0.375” solid steel blade. It currently deflects slightly more than the stiffest setting of the adjustable blade above. This is good as it shows how the adjustable blade could be tuned to be both stiffer or lighter than the current static rod.

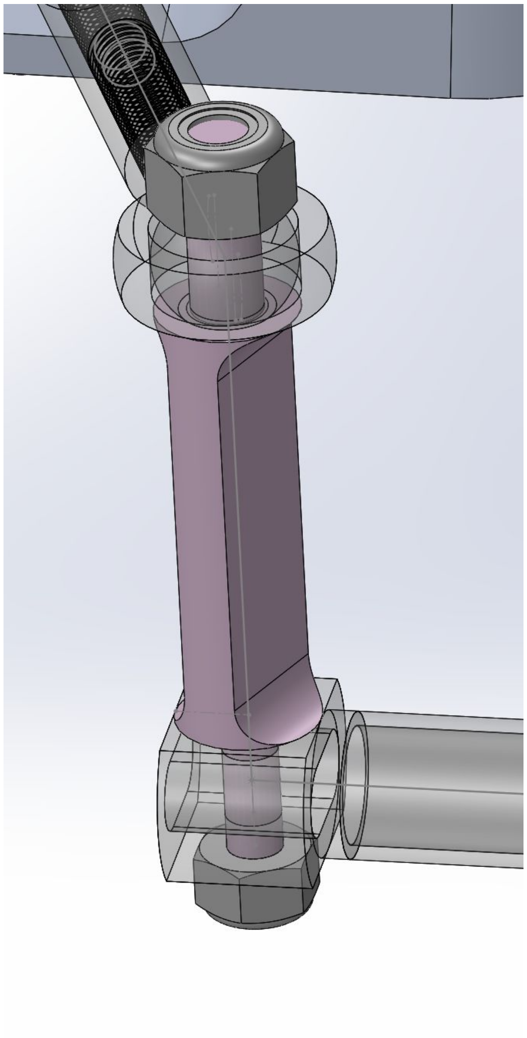
Interaction with ARB Calculator:

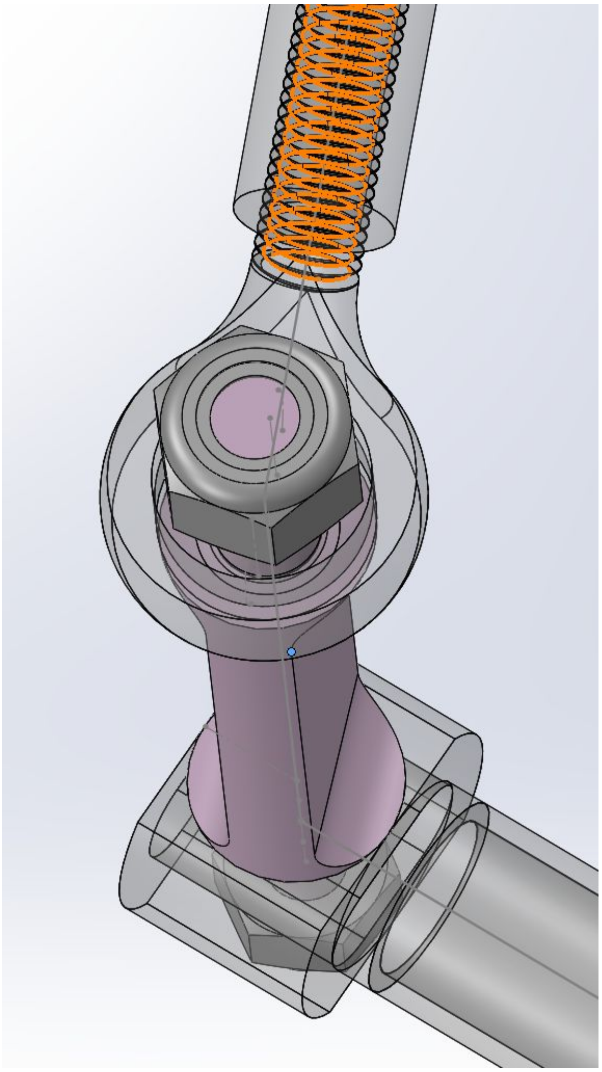
Now that the idea of this method of adjustment is proven to work it is important to understand how this would affect the overall characteristics of the anti-roll bar system. To do this a spring rate must be defined for the different orientations of the new blade. Then using these new spring rates they can be plugged into the ARB calculator in place of the static blade to see how the ARB angular rate is affected and thereby the handling of the car.

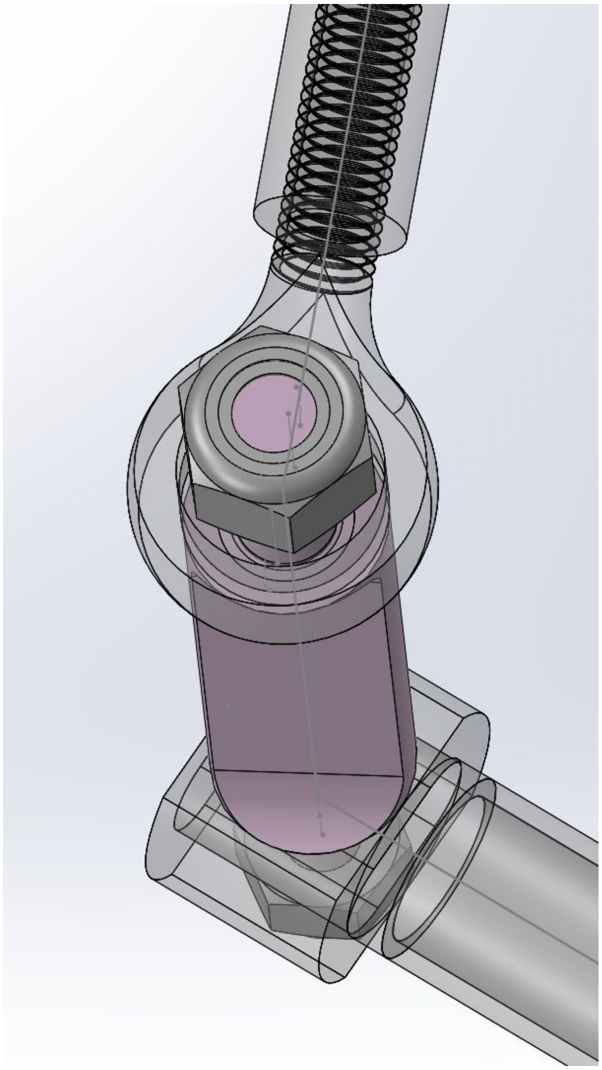
Interface with ARB System on Car:

Now the design of the adjustable blade must be configured so that it can be mounted in place of the static blade.Priority will be given for the moment to maintain compatibility with the static blade. Right now the only retention that keeps blade oriented is the clamping between the drop link and the sleeve, while this is not a very redundant method there are no forces that should disrupt its orientation anyways. So there are features on both sides of the blade with shoulders for the sleeve and ball joint to rest on, as well as thread for the nuts to thread onto. This does add a fair bit of complexity to the part as the additional features on both sides would need to have threads cut on a lathe (because of the shoulder for mounting in the ball joint and sleeve a dies would not be feasible here). Despite that because this part will be manufactured from round stock it would be easy to set this up before the other features are cut.

	Static blade mounted between drop link and sleeve.

	How the new adjustable blade would mount. Use the same size mounting holes on the ball joint and sleeve. Would need built in features to clamp on as there is no room in the trimmed down blade for bolts to mount it. The fact that it uses the same mounting hardware as the static blade means they would be completely interchangeable.

	Stiffest orientation where the spine of blade is in line with the drop link. This will result in the smallest deflection of the drop link

	Weakest orientation of the drop link where spine is perpendicular to the drop link. This is where the blade will fex the most.

Additional Notes:

- I did not include a taper as part of the blade feature as pictured on many of the off the shelf versions of this, best I could tell those simply made the part more compliant in all directions. The benefit of this is that you could save weight if you used a stiffer steel alloy and cut more of the material away for a blade with similar properties. This does add considerable complexity to the part and to the engineering process. I started to look into using spring or tool steels but we would have to outsource manufacture as we don't have the ability to properly heat treat these products after machining.