



**Particle Physics Division
Mechanical Department Engineering Note**

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Project: NOvA

Title: Stress and Deflection in FHEP Air Spring Mount

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Abstract Summary: The following engineering note shows the stress and deflection in the wheel support air spring mount as part of the FHEP block pivoter. The stress and deflection are a result of the pressure exerted by the air spring.

Applicable Codes:

An air spring mounted to a wheel support plate will create a pressure loading on the plate which will lead to stress and deformation in the plate. This engineering note determines the maximum stress and the deflection that will result from the air spring. The maximum pressure that will occur within the air spring is 100 psi. This pressure is exerted within a circle, centered on the plate, which has a diameter of 19". The plate was modeled using the I-DEAS modeling and Finite Element analysis software. A one-quarter section of the plate was modeled and constraints were added in order to simulate the symmetry of the plate. A pressure loading was placed on a quarter-circle section where the center of the plate would be. Several mesh sizes were applied to the plate until a trend developed in the resulting maximum stress and deflection.

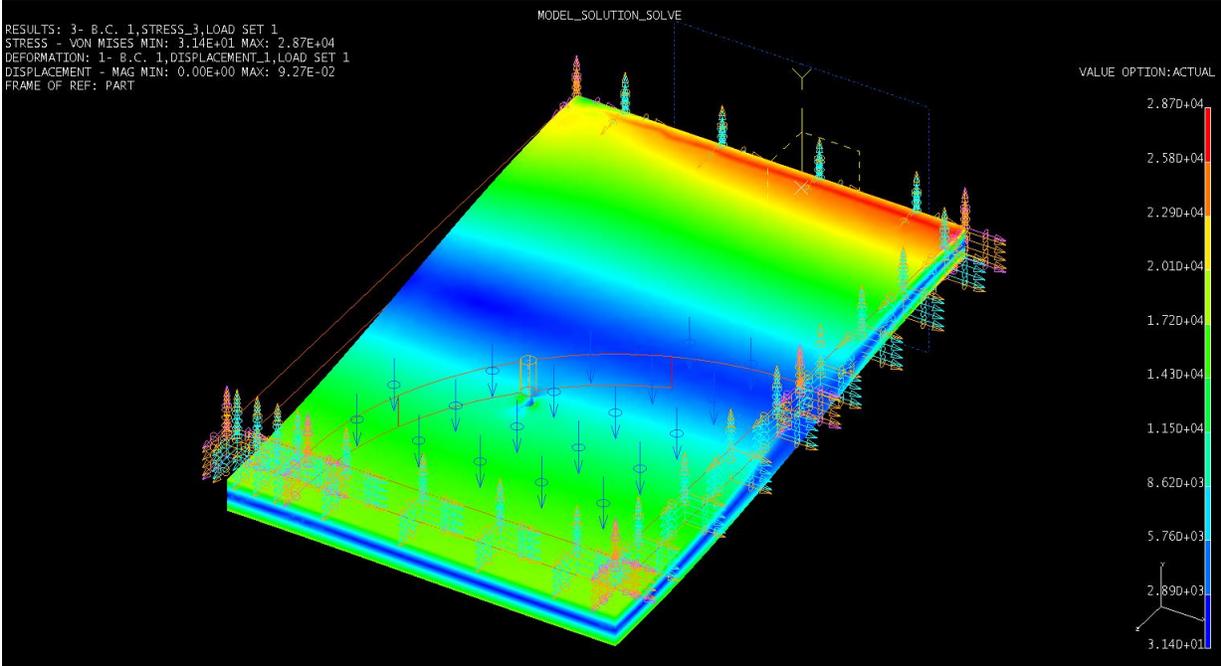


Figure 1: Mesh Size = 0.38, Maximum Stress = 28.7 ksi, Maximum Deflection = 0.093 in.

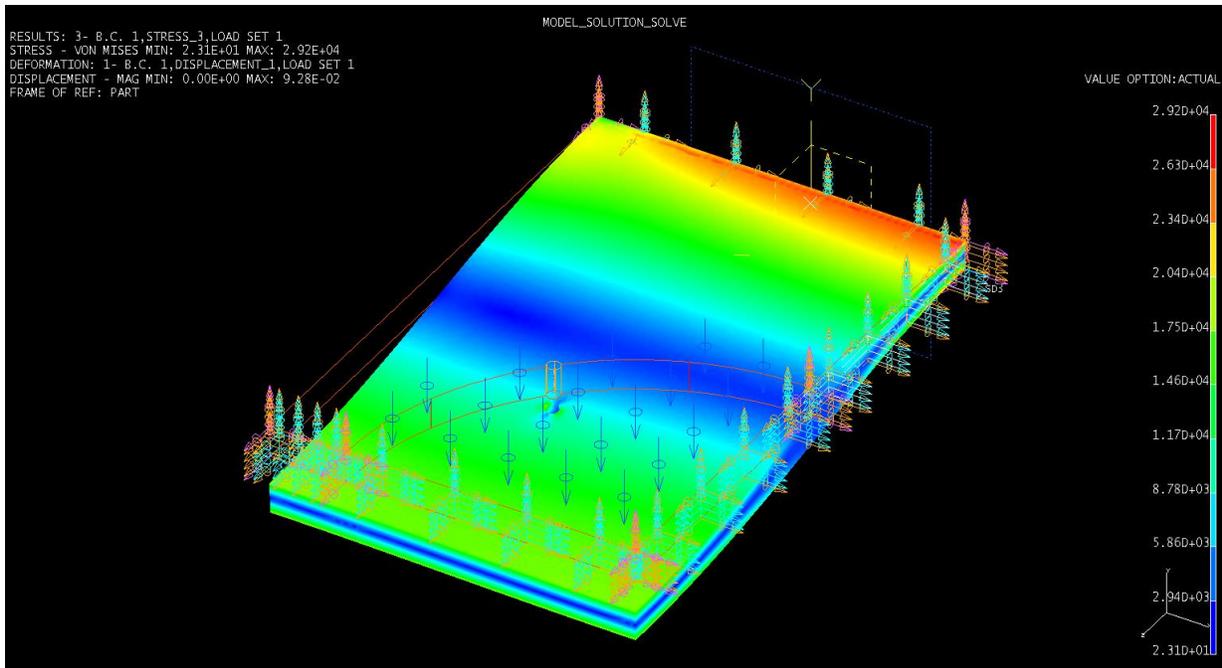


Figure 2: Mesh Size = 0.25, Maximum Stress = 29.2 ksi, Maximum Deflection = 0.093 in.

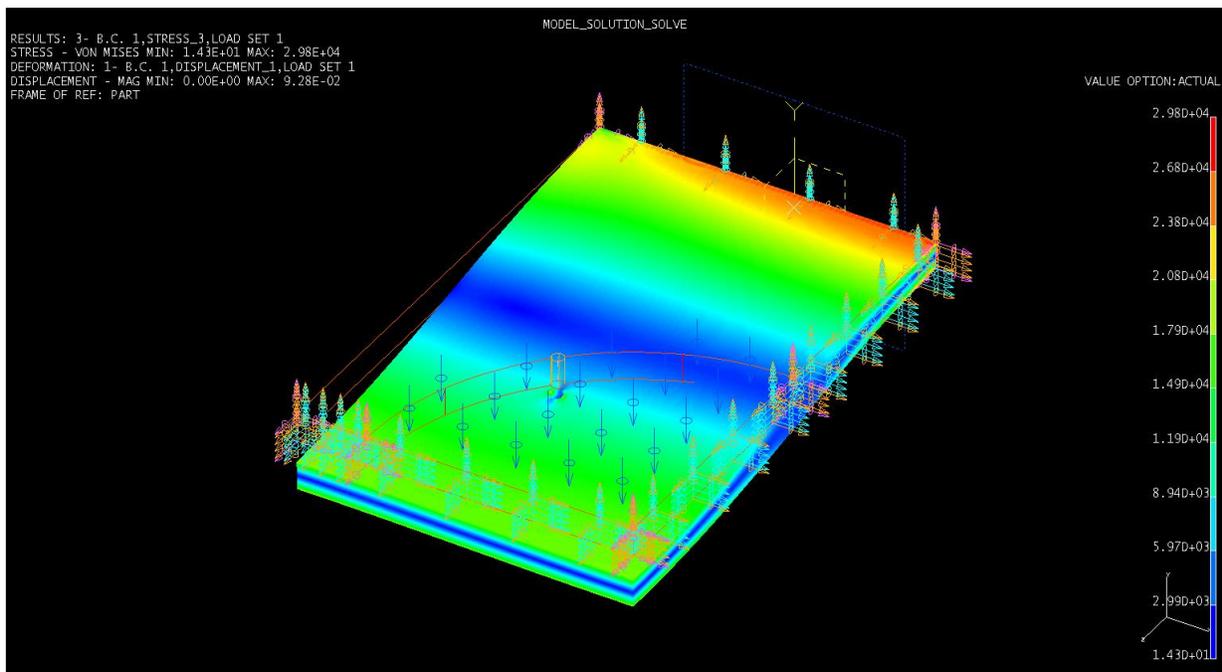


Figure 3: Mesh Size = 0.19, Maximum Stress = 29.7 ksi, Maximum Deflection = 0.093 in.

The stress in the plate is rather high, considering the yield strength of ASTM-A36 structural steel is 36 ksi (tension). After taking into account a factor of safety, the plate is well above allowable stress limits. In order to lower the stress in the plate, stiffeners were added to the plate at the ends in order to provide a greater amount of support.