



BND TechSource



Front Suspension Baseline Optimization of Bump/Roll Steer

The logo for BND TechSource features a vertical black line on the left side. To the left of this line are three overlapping squares: a blue one at the top, a red one in the middle, and a yellow one at the bottom. To the right of the vertical line, the text "BND TechSource" is written in a bold, blue, sans-serif font.

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- The Steering Knuckle in an SLA (Short/Long Arm) Independent Front Suspension has three pivot point attachments. These are at the Upper Control Arm, the Lower Control Arm, and the Tie Rod end.
- Bump/Roll Steer (change in toe) occurs due to the Tie Rod pivot at the Knuckle swinging through a different arc than the Control Arms.
- The baseline for this arc can be optimized using CATIA DMU Kinematics.

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- Certain parameters were set in this particular design.
 - Track: Front/Rear = 1490/1510mm
 - Wheelbase = 2489.2mm
 - Tire Size:
 - Front = P245/45ZR-17
(Static Rolling Radius = 302mm)
 - Rear = P275/40ZR-18
(Static Rolling Radius = 314mm)
 - Wheel Size:
 - Front = 17 x 8.5 in, Offset = 56mm
 - Rear = 18 x 9.5 in, Offset = 63mm

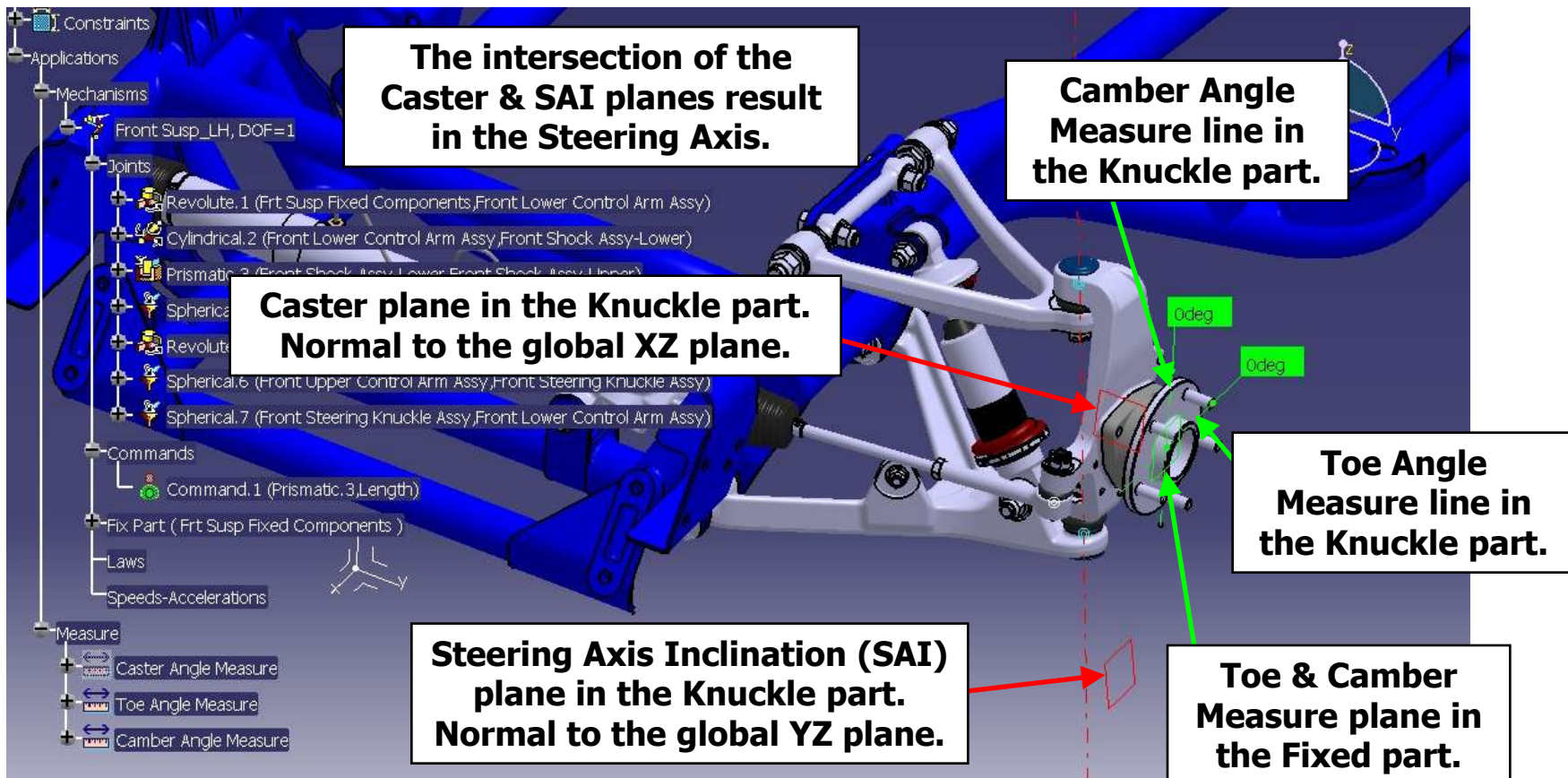
The logo features a vertical black line on the left, with a blue square above a red square, and a yellow square below the red one. The text "BND TechSource" is in a bold, blue, sans-serif font with a slight shadow effect.

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- Parameters (cont'd).
 - Scrub Radius = +10mm
 - Steering Axis Inclination = 8.8°
 - Caster Angle = 6.5°
 - SLA Ratio = 1.43:1
 - Brake Rotor Offset (Hub face to Rear Rotor face) = 38mm
 - Ackermann Steering = 82.5%
 - Shock Extension/Compression = 48.7/36.1mm
- All of these parameters affect the three pivot points on the Steering Knuckle.

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- In design position, the Toe and Camber Angles measure zero degrees.



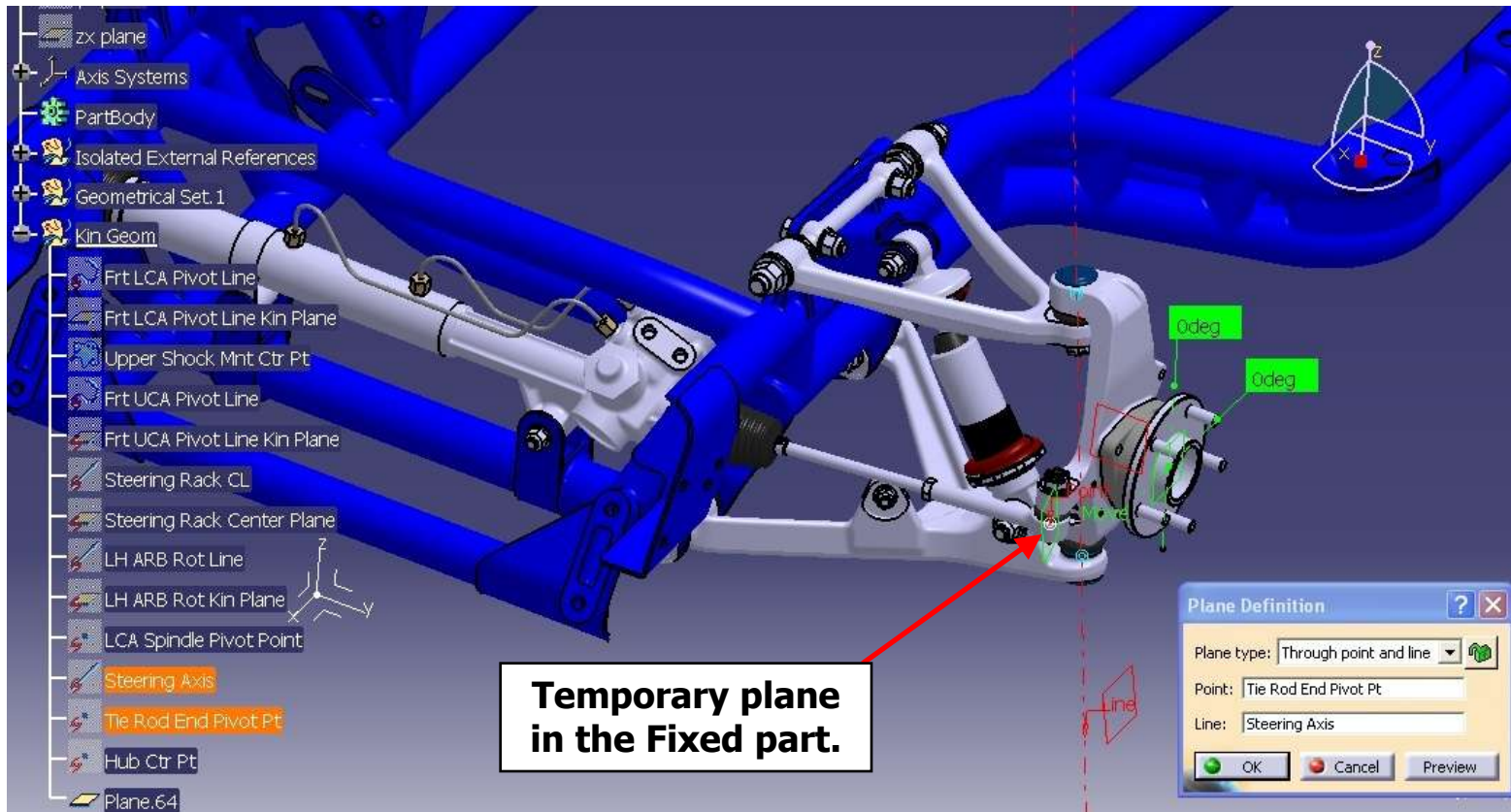
The logo features a vertical black line intersecting a horizontal black line. To the left of the intersection, there are three overlapping squares: a blue one at the top, a red one in the middle, and a yellow one at the bottom. The text "BND TechSource" is positioned to the right of the vertical line, with "BND" in a smaller font size than "TechSource".

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- To optimize the Toe Angle delta as the suspension moves through jounce and rebound, the Tie Rod pivot arc must first be determined.
- The method shown in this example is an expedient way to get the optimized plane to swing the Tie Rod pivot arc.

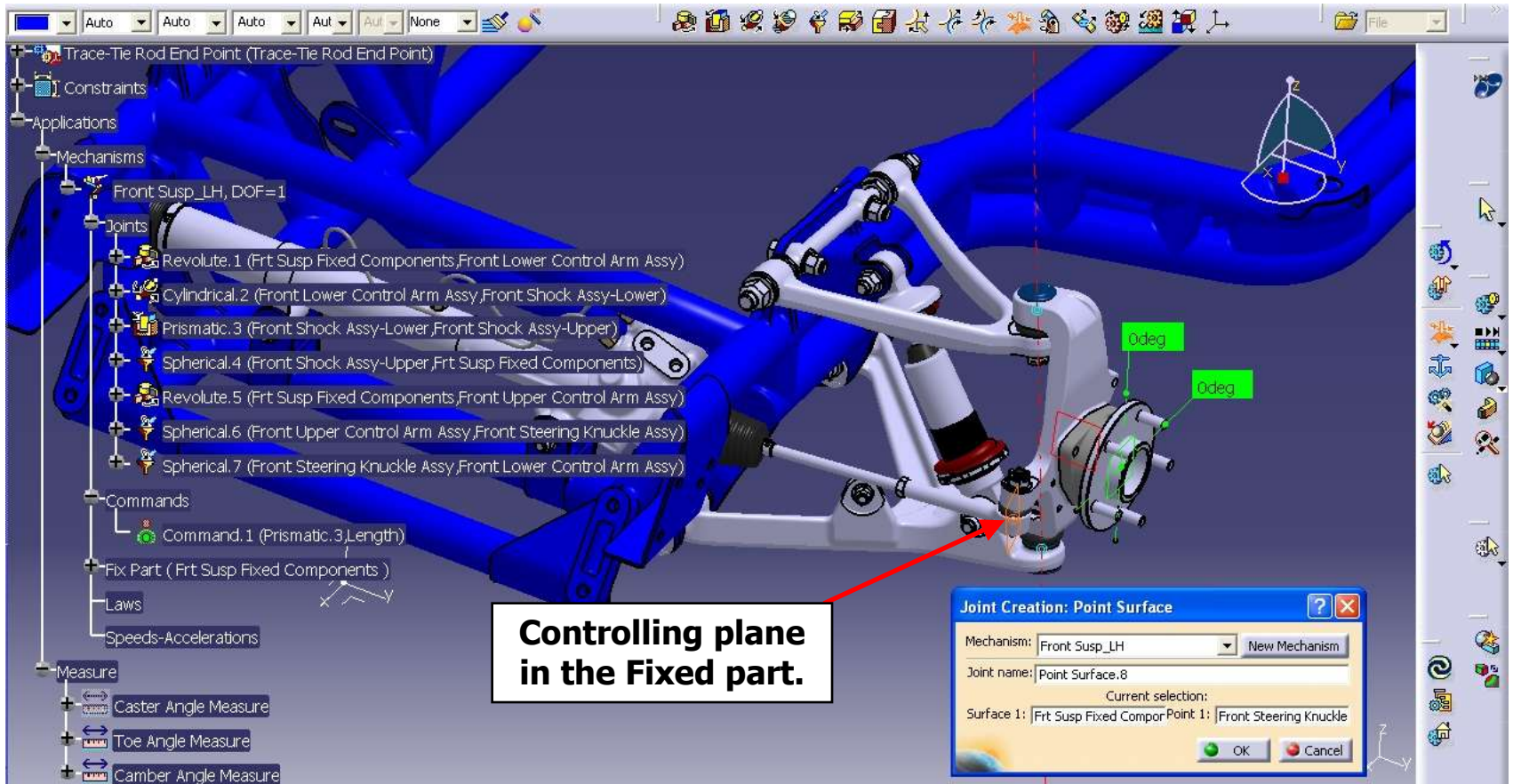
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- Step 1: In the Fixed Part, create a temporary plane through the Steering Axis and the Tie Rod pivot point.



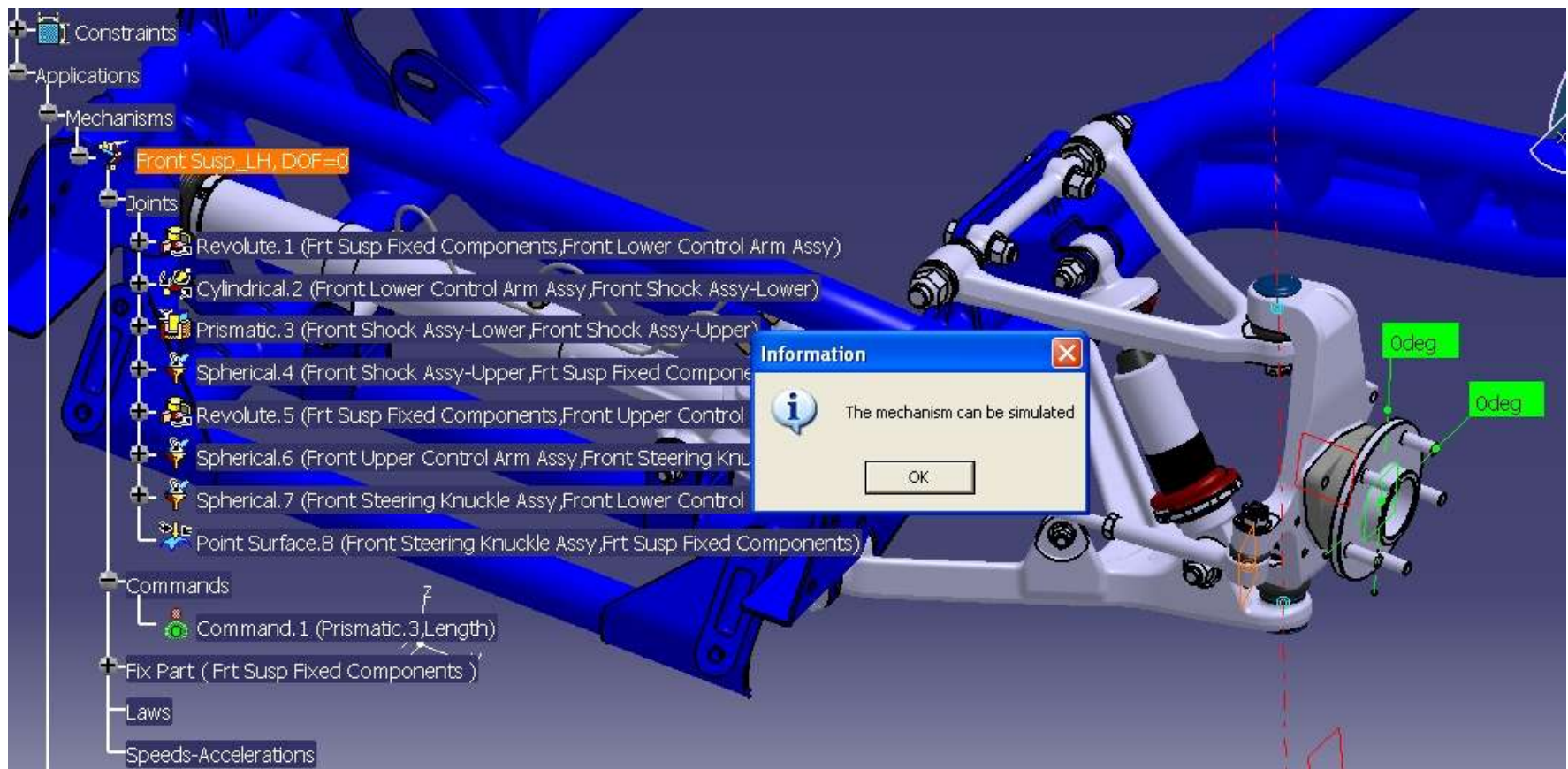
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- Step 2: Use the temporary plane as the controlling surface in a Point-Surface joint to complete the suspension Kinematic.



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- Step 2: The completed Kinematic.



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- Step 3: Run the Kinematic to full jounce position.

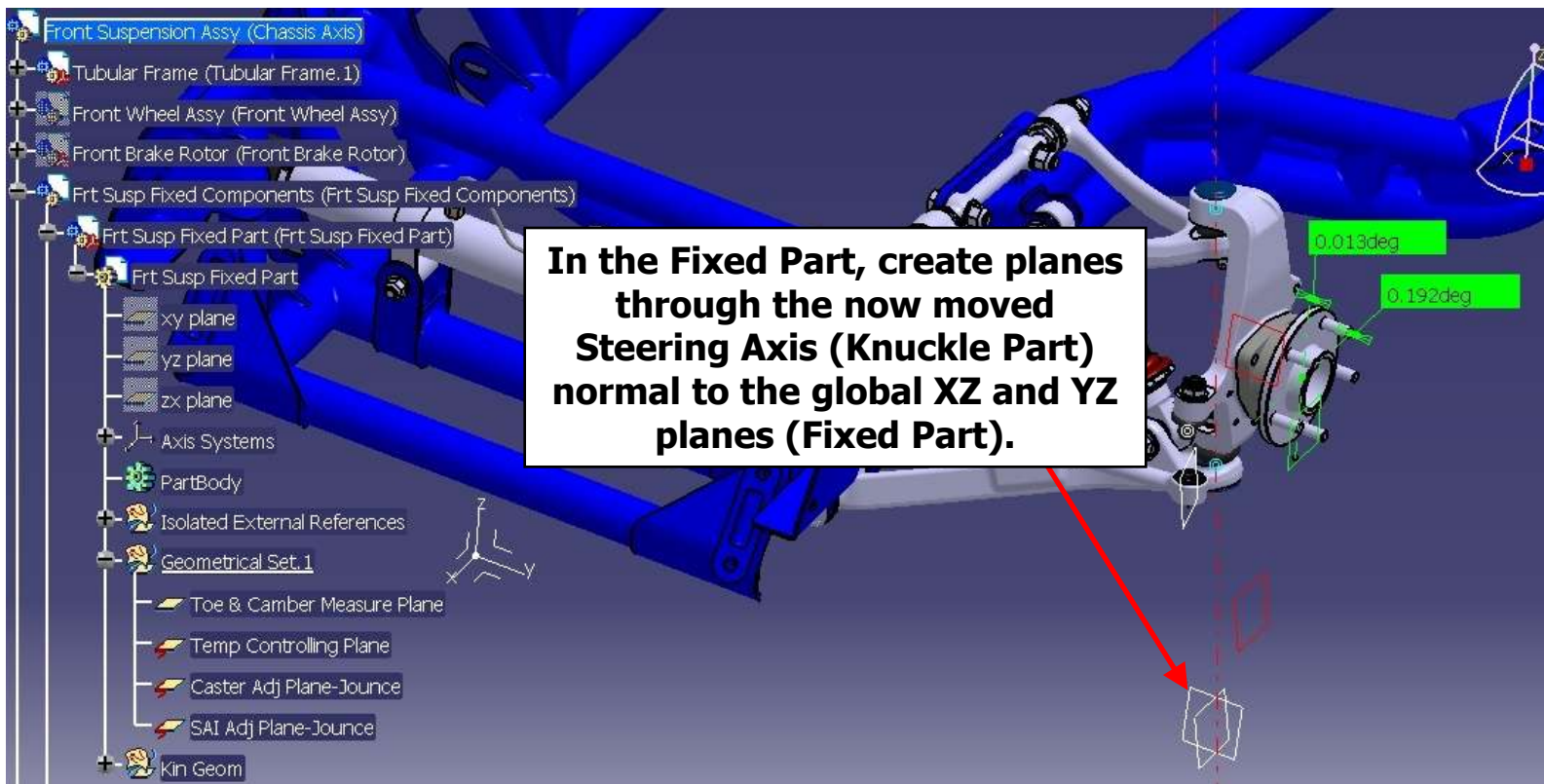
To view the values, the measures must first be chosen in the Selection tab.

Sensor	Value	Unit
Front Suspension Assy (Chassis Axis)\Toe Angle Measure\A...	0.192023	Degree
Front Suspension Assy (Chassis Axis)\Camber Angle Measur...	0.0131141	Degree

Pick Activate Sensors.

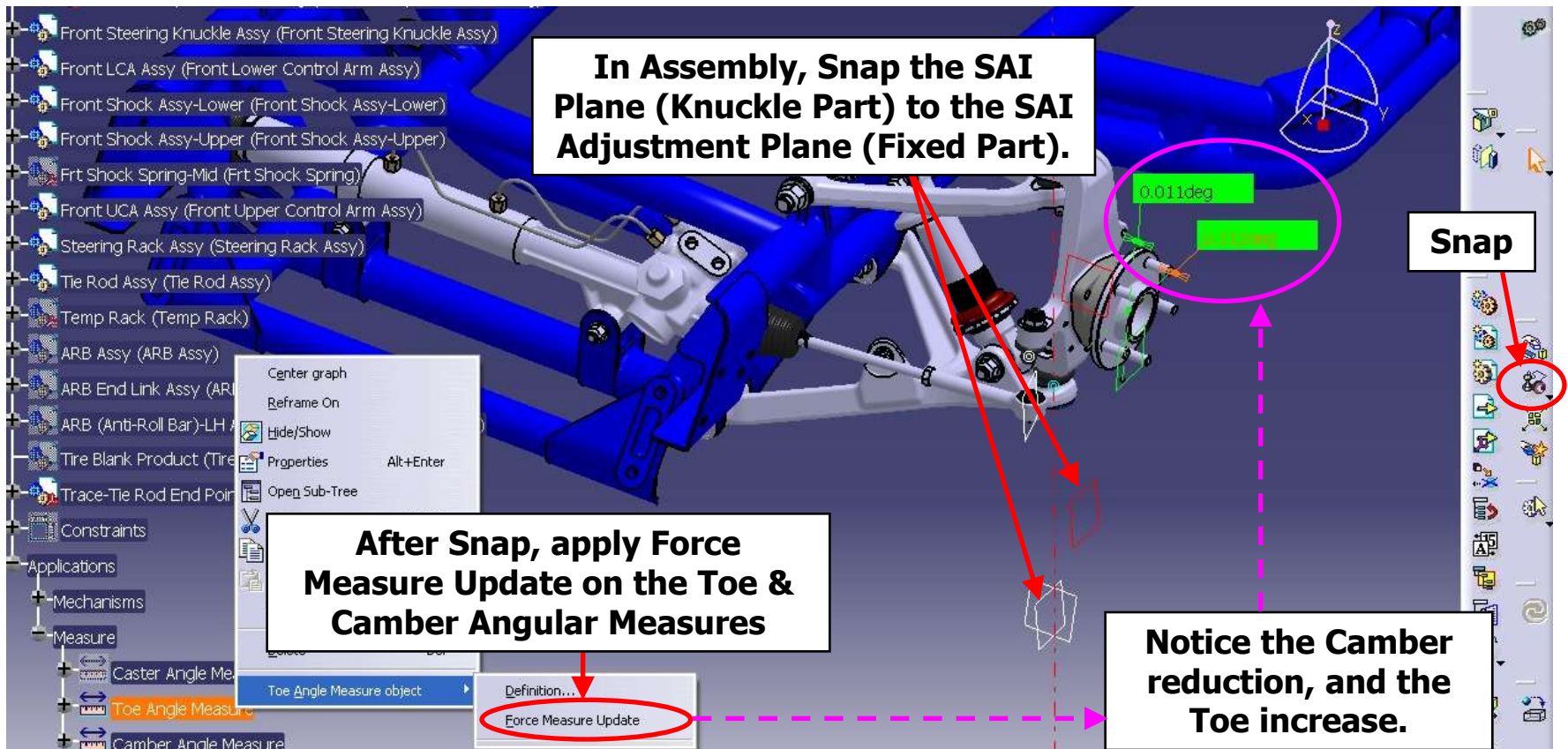
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- Step 4a: Adjust the Knuckle to Optimized position.



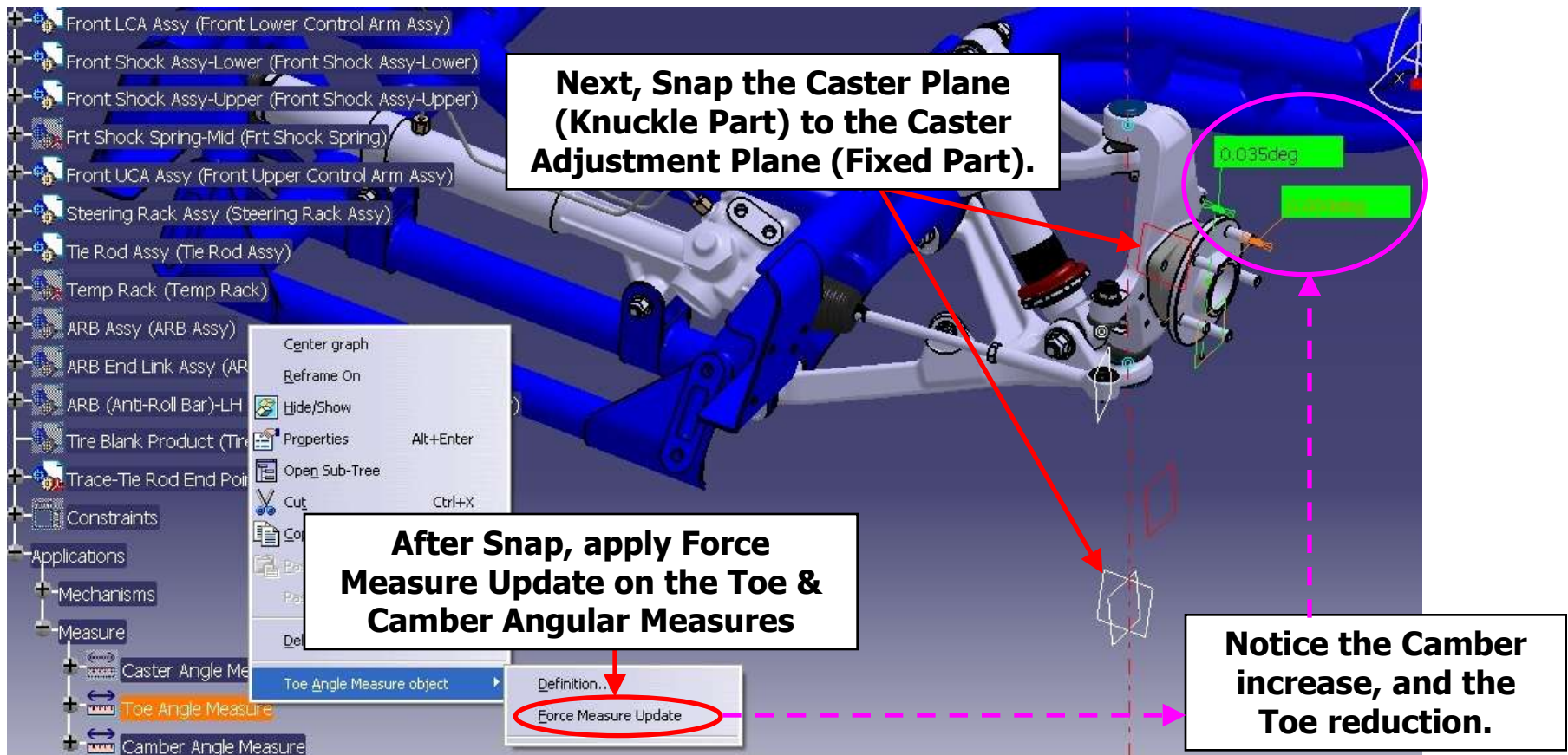
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- Step 4b: Adjust the Camber to Optimized position using Snap.



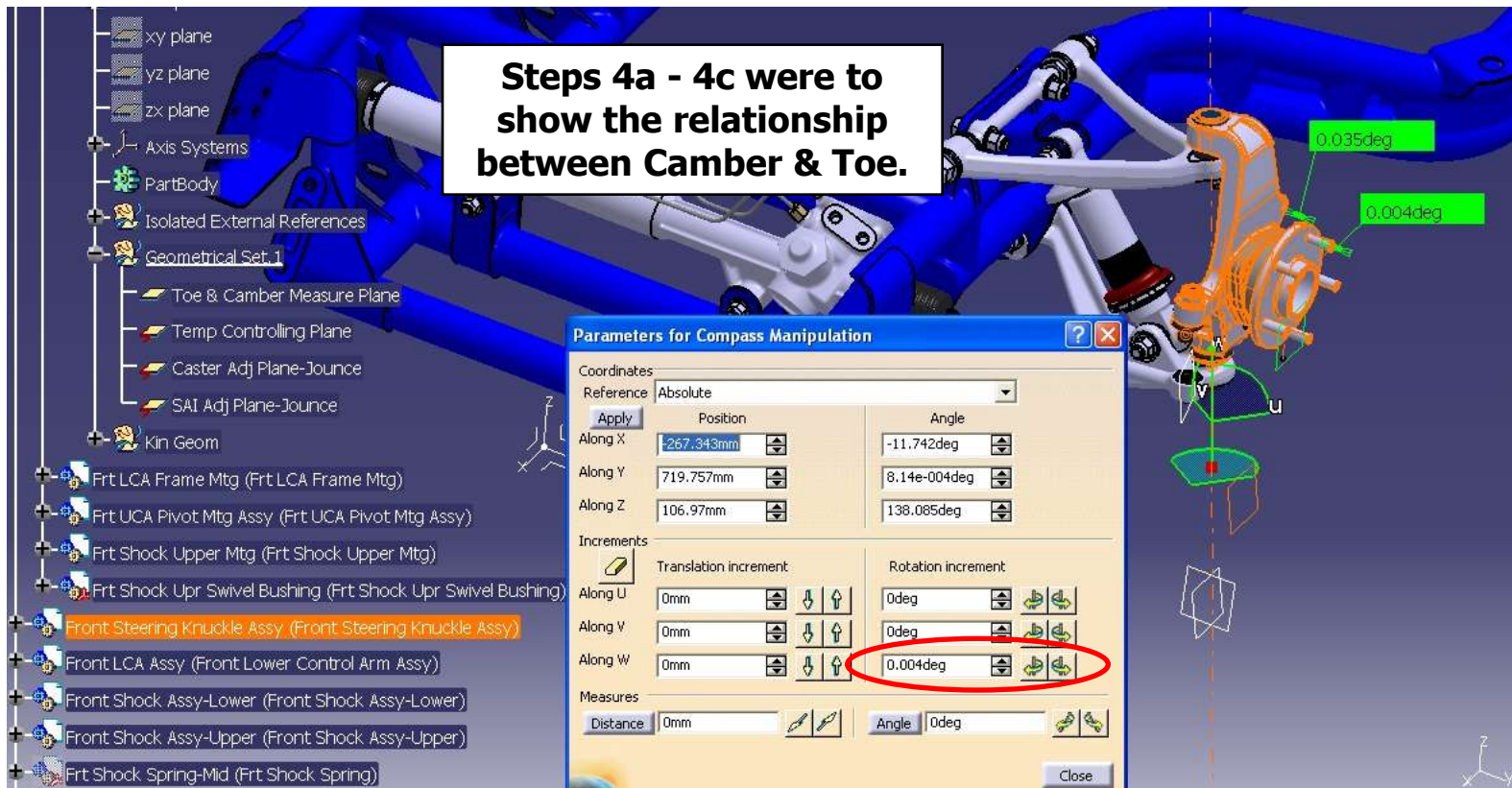
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- Step 4c: Adjust the Toe to Optimized position using Snap.



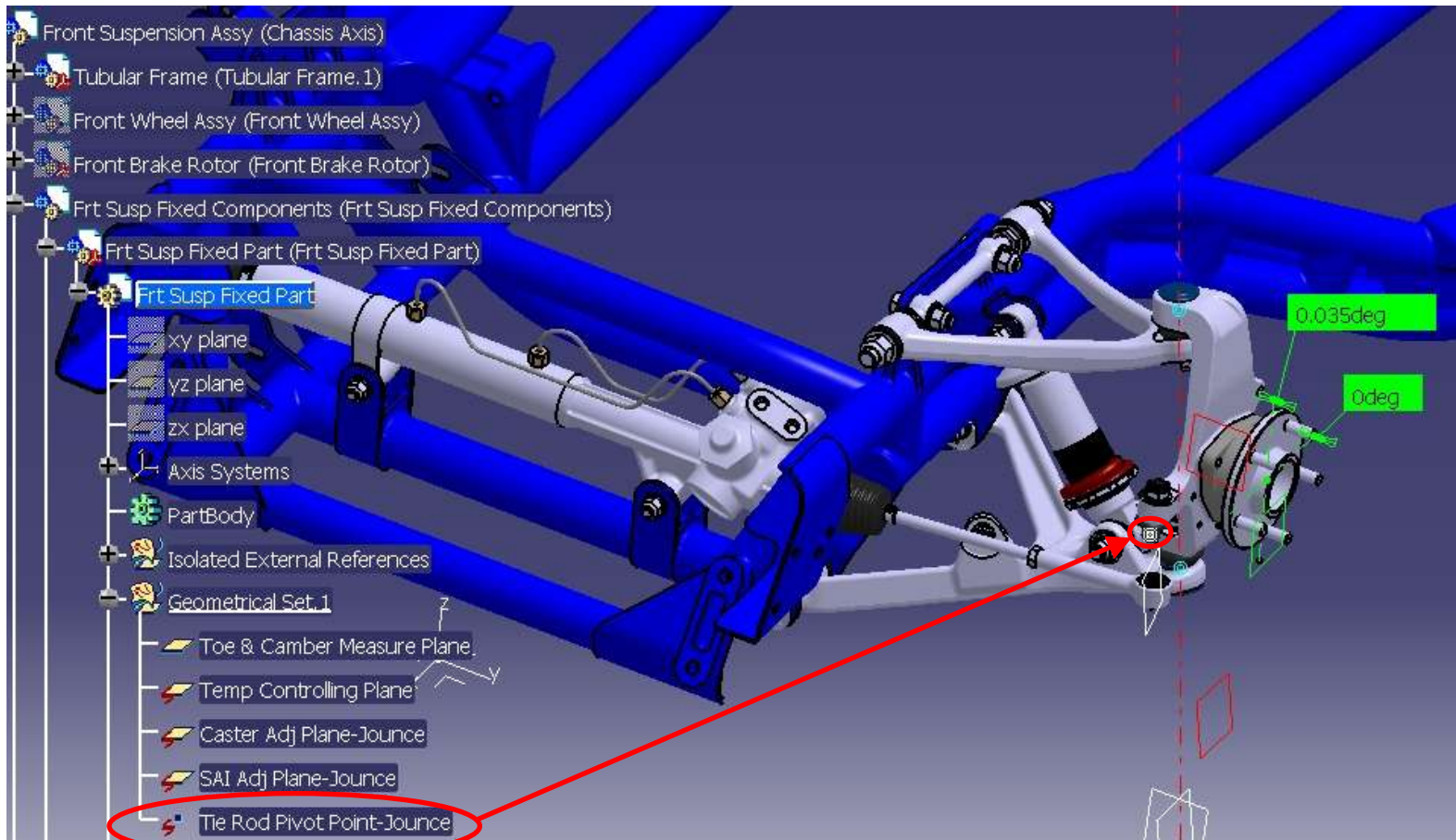
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- Step 4d: Adjust the Toe to Optimized position using Compass on the Steering Axis. This method could be used in lieu of steps 4a – 4c.



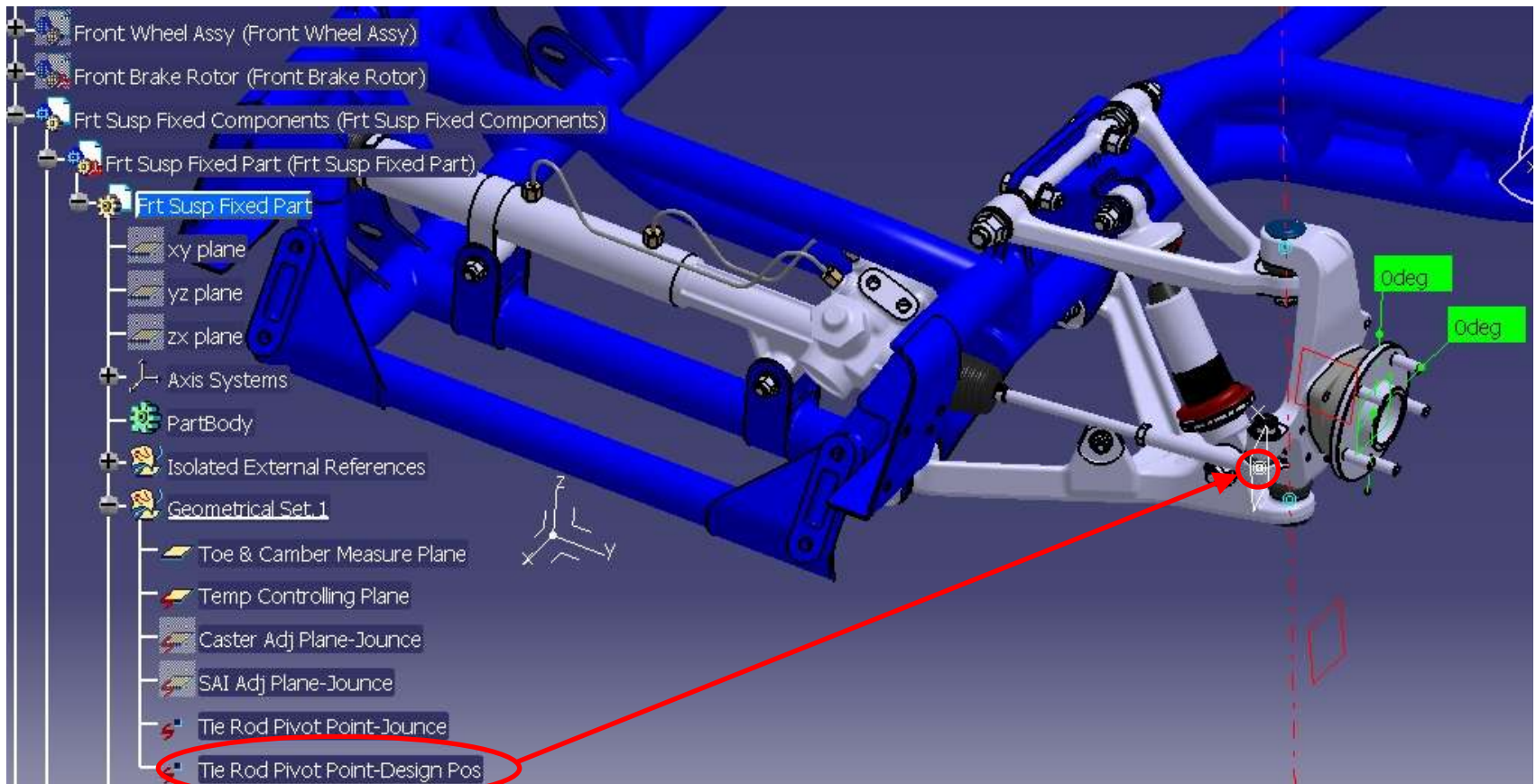
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- Step 4e: In the Fixed Part, create a point at the now moved Tie Rod pivot.



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- Step 5: Return the Kinematic to design position. In the Fixed Part, create a point at the now moved Tie Rod pivot.



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- Step 6: Run the Kinematic to full rebound position.

To view the values, the measures must first be chosen in the Selection tab.

Sensor	Value	Unit
Front Suspension Assy (Chassis Axis)\Toe Angle Measure(A...	4.15265	Degree
Front Suspension Assy (Chassis Axis)\Camber Angle Measur...	0.237913	Degree

Pick Activate Sensors.

Kinematics Simulation - Front Susp_LH

Mechanism: Front Susp_LH

Command.1: -36.1 | 48.7 | -36.1000

Activate sensors Plot vectors

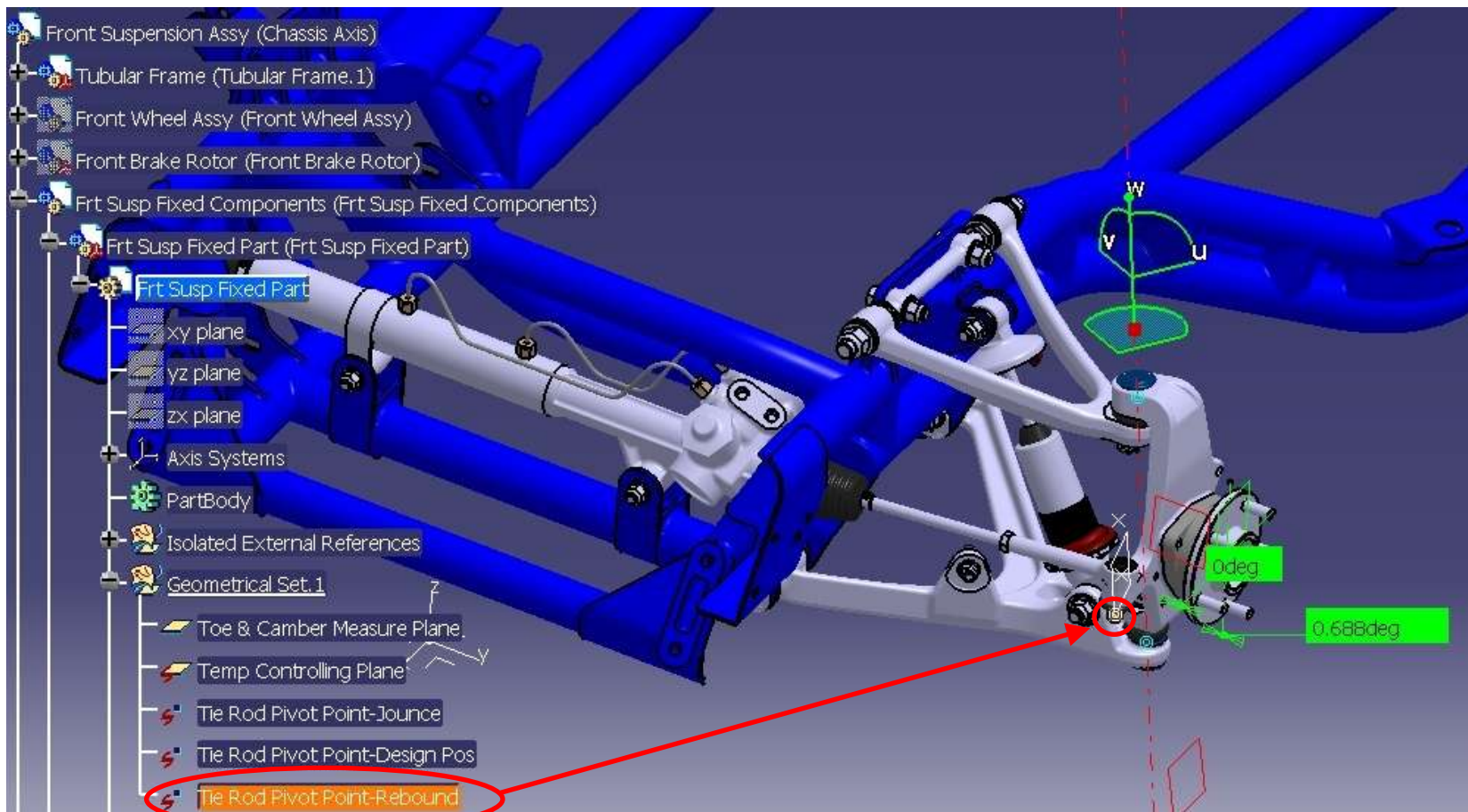
Reset Analysis... <<Less

Simulation: Immediate On request

Number of steps: 40

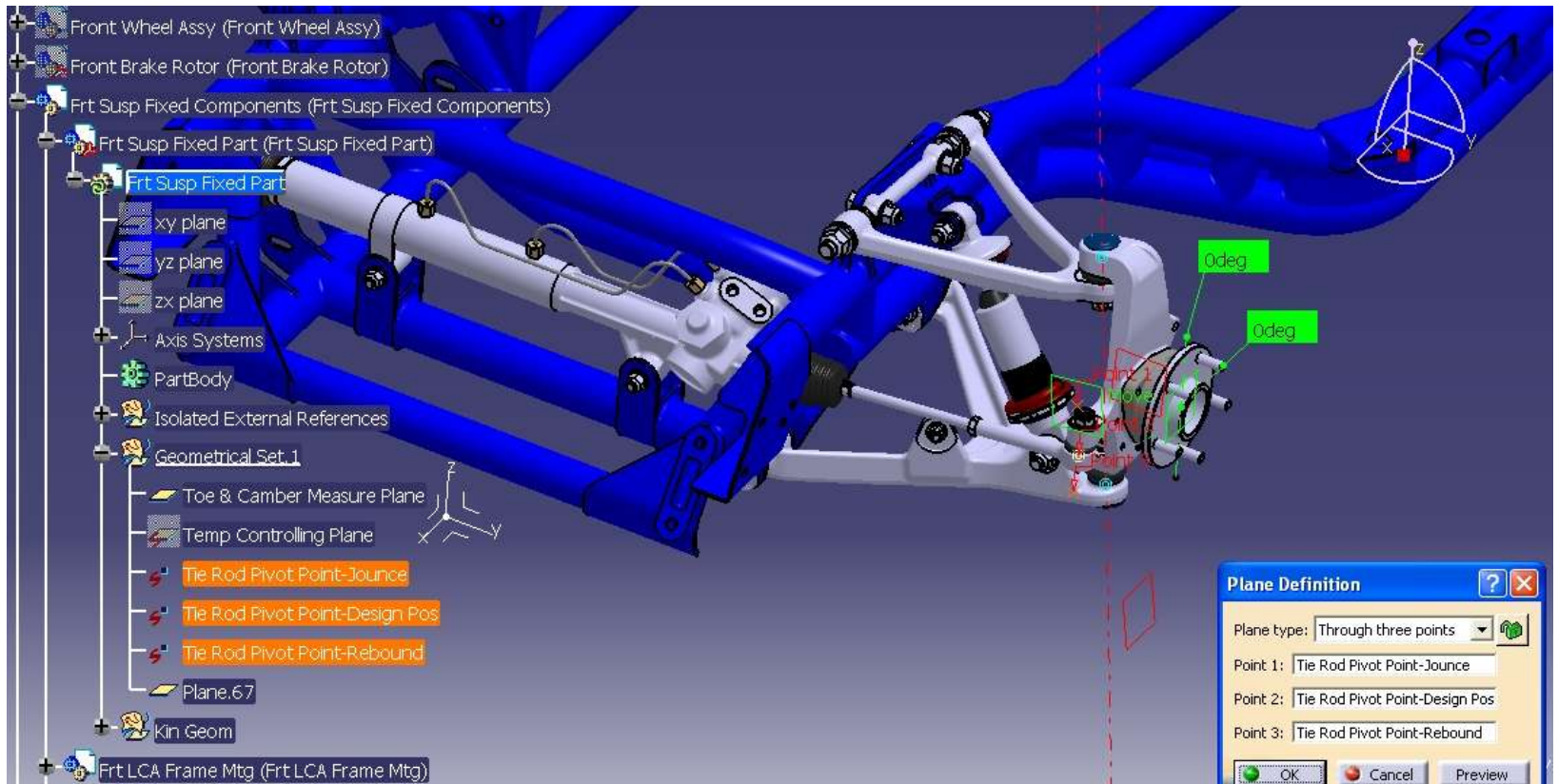
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- Step 7: Repeat Steps 4d & 4e in rebound position.



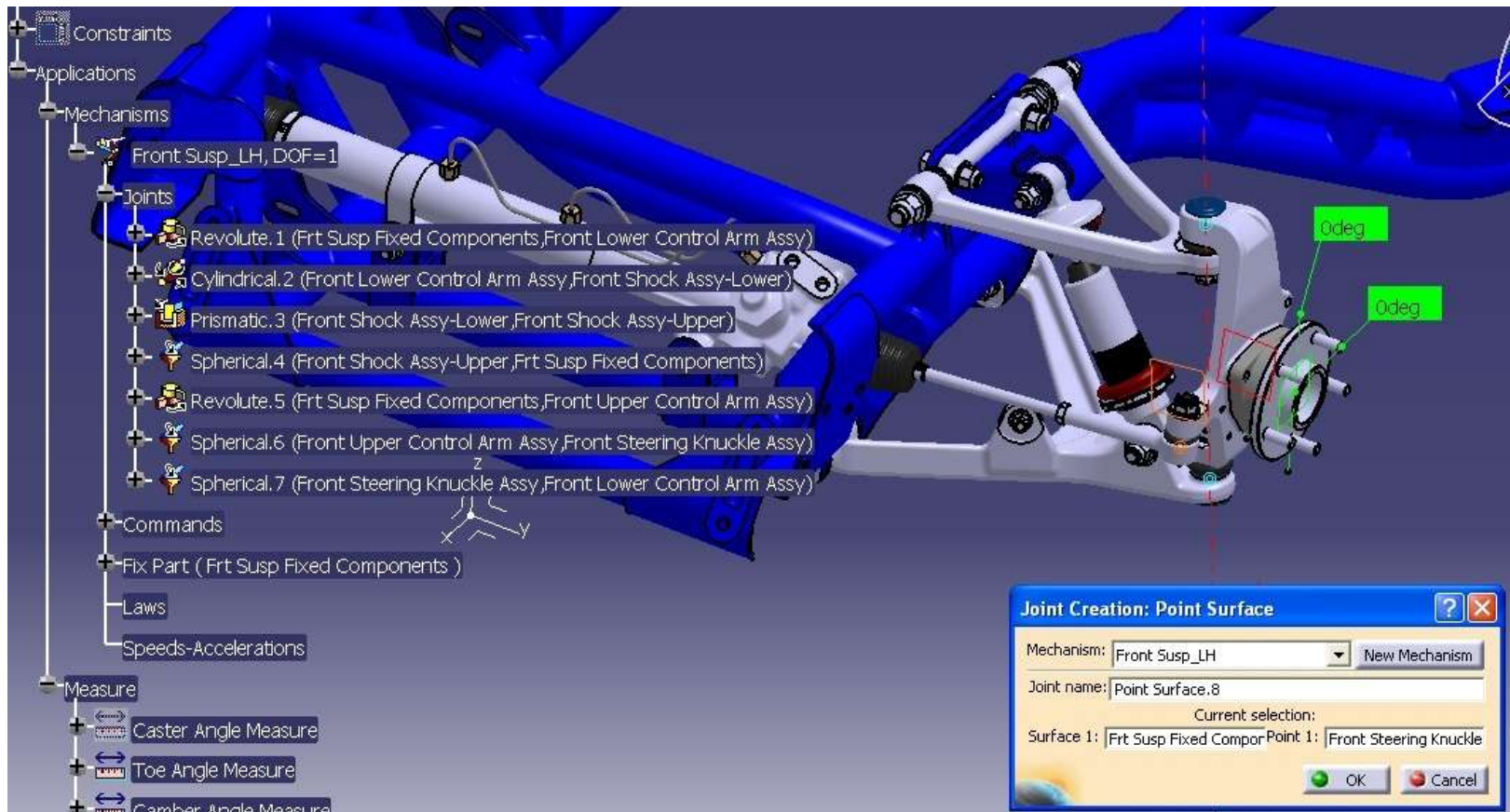
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- Step 8: Return the Kinematic to design position. In the Fixed Part, create a plane through the three Tie Rod Pivot points.



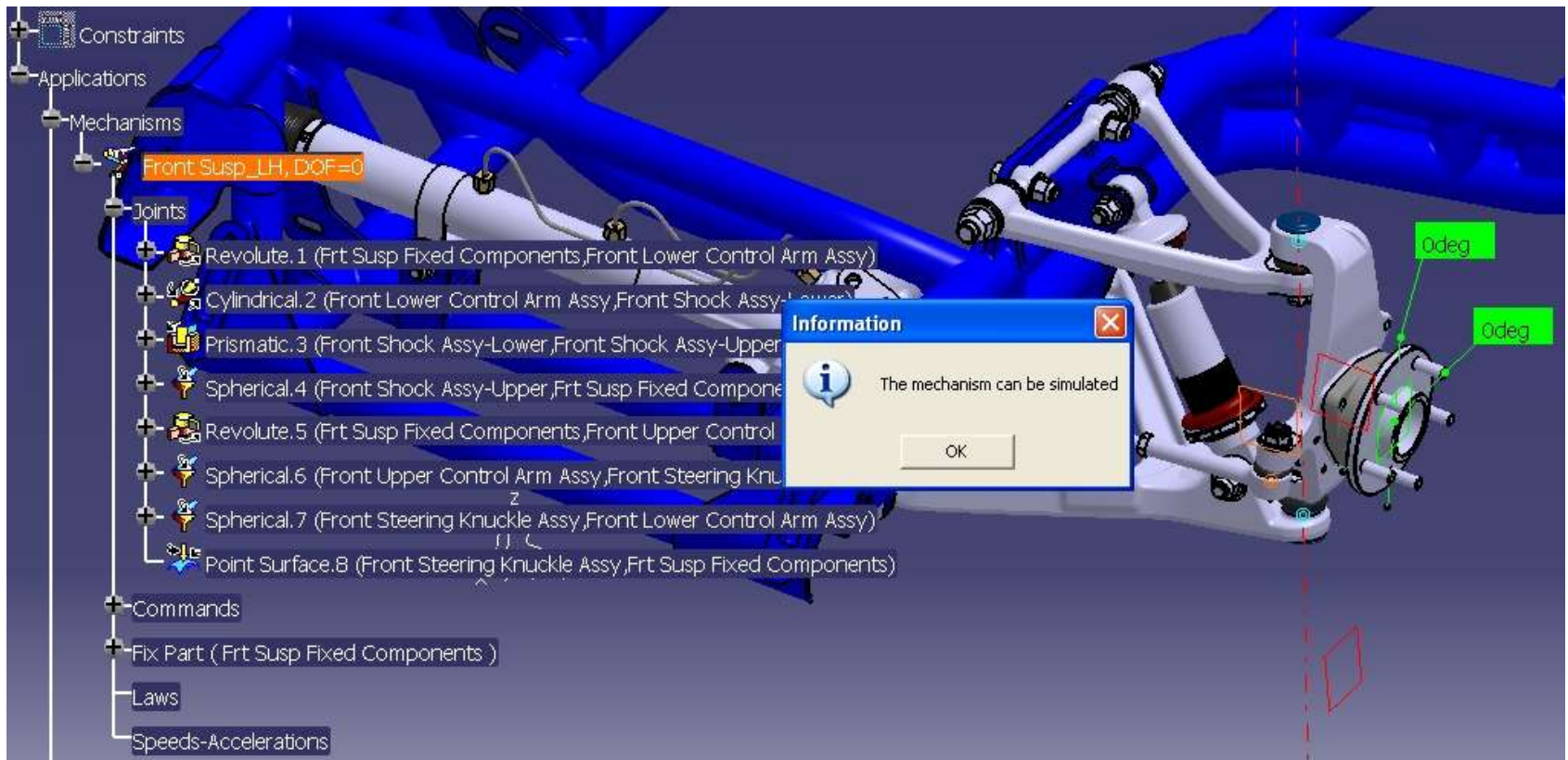
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- Step 9: Replace the Temporary Controlling Plane in the Kinematic with the Optimized Controlling plane.



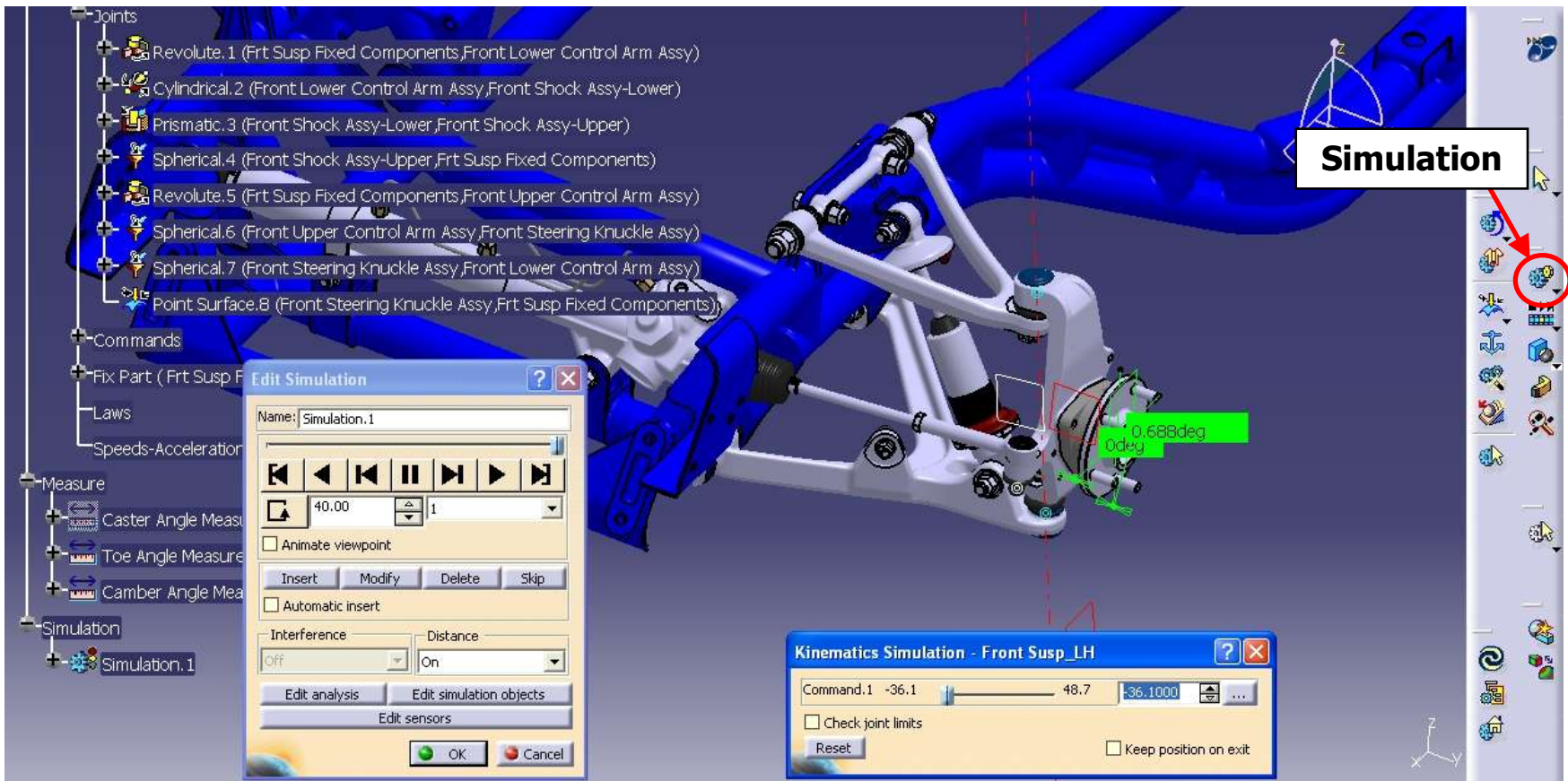
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- Step 9: The completed Kinematic.



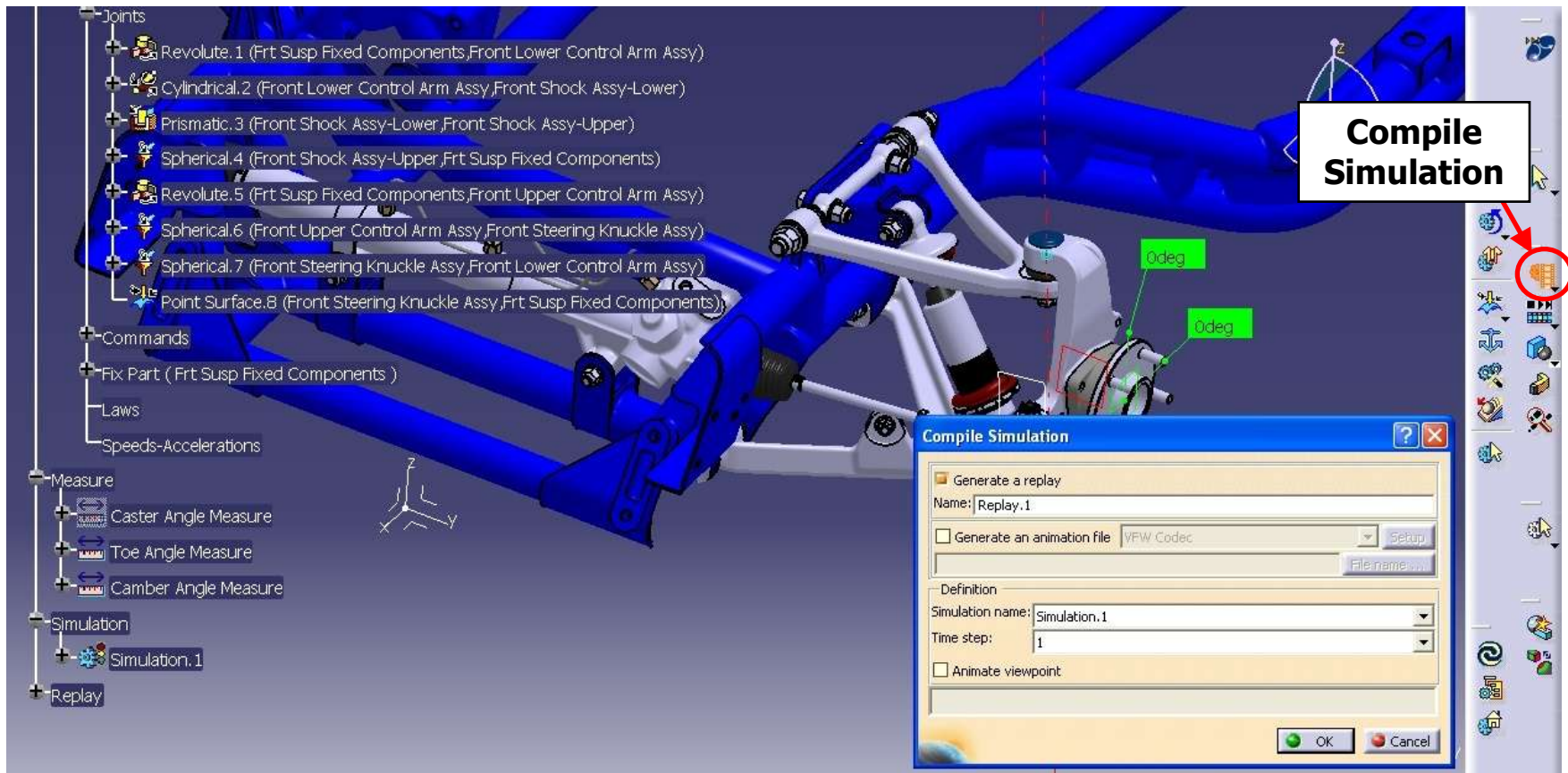
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- Step 10a: Create a Kinematic Simulation (for the Trace).



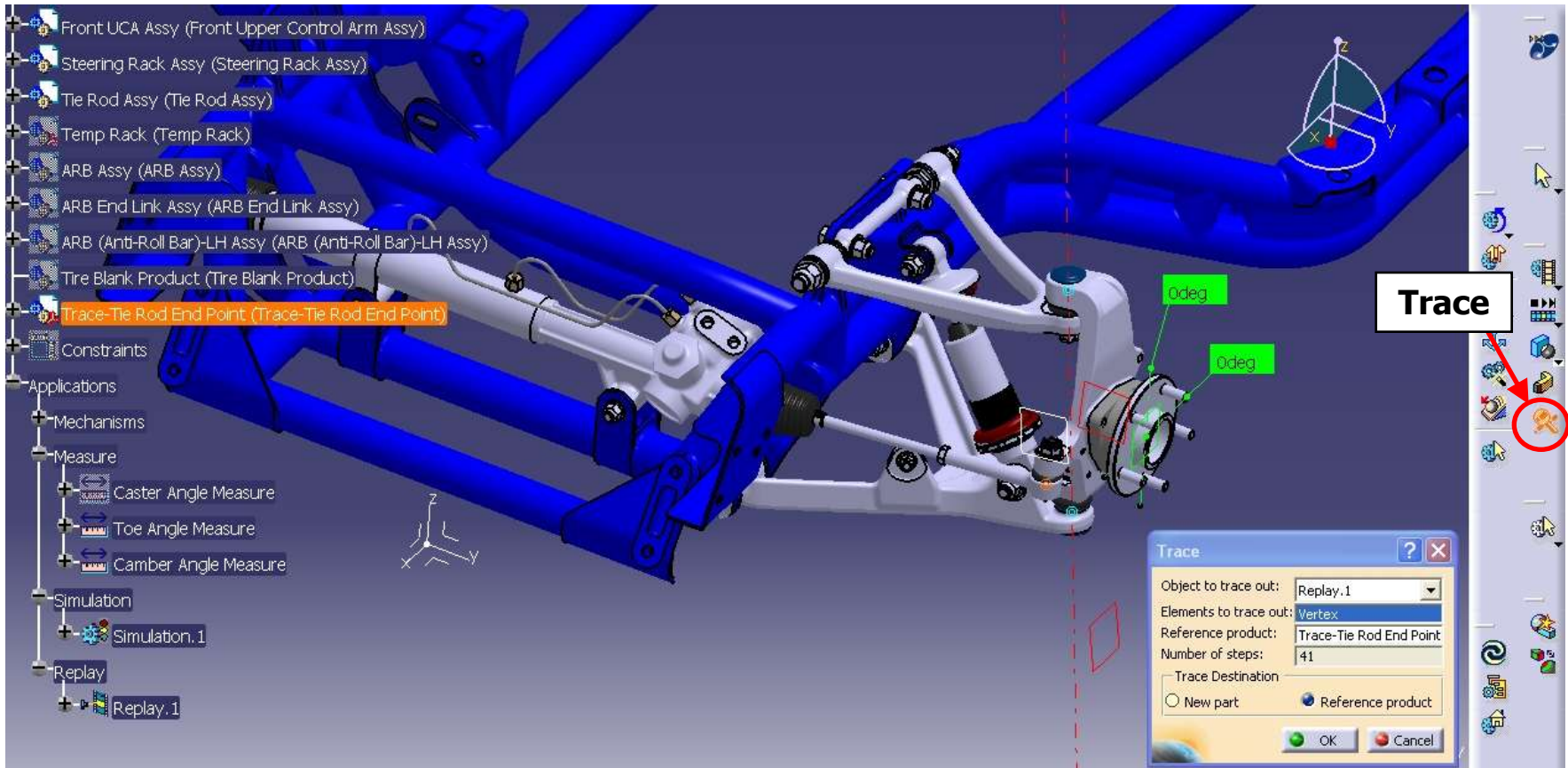
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- Step 10b: Compile the Kinematic Simulation (for the Trace).



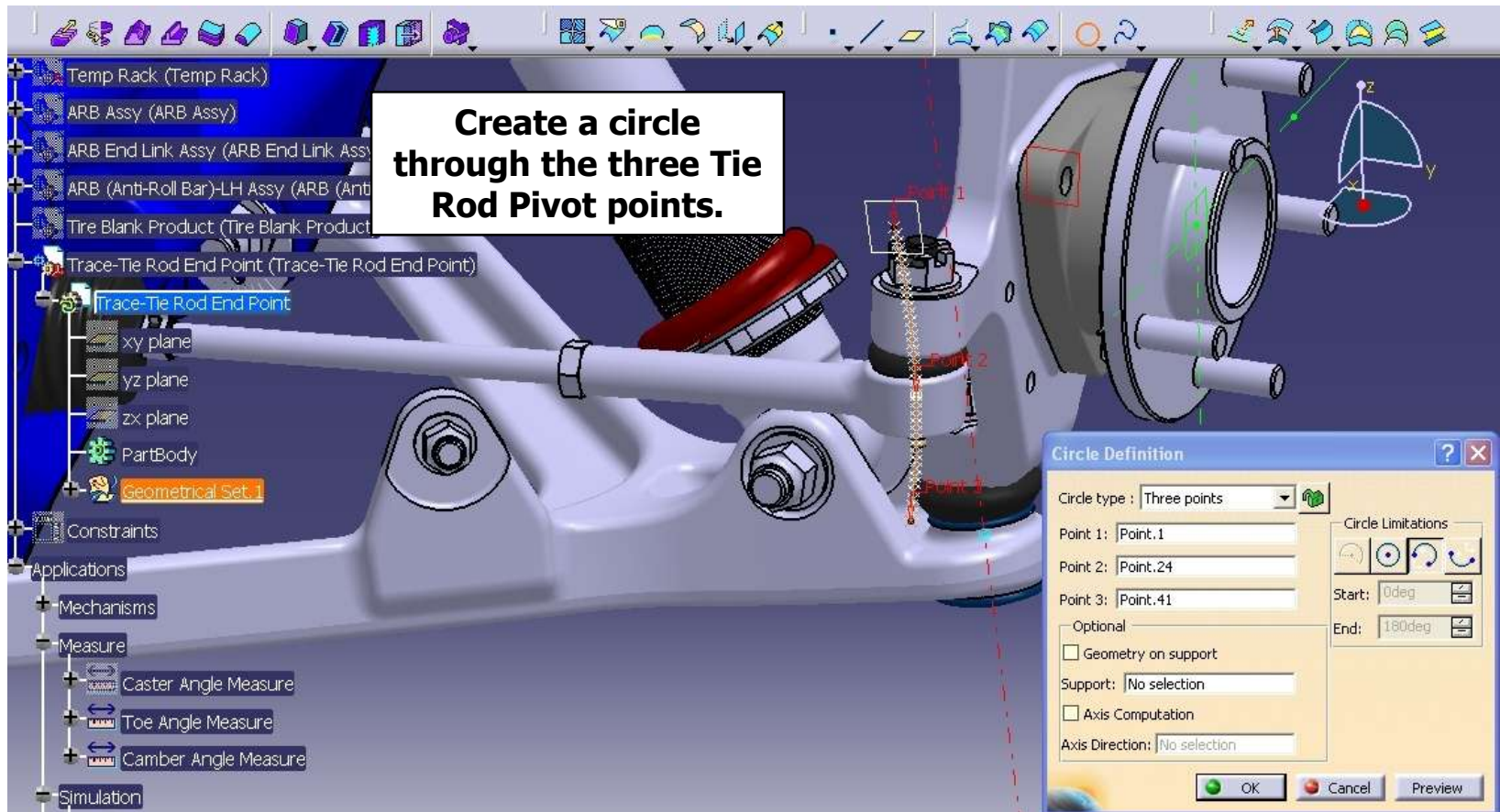
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- Step 10c: Create a Kinematic Trace of the Optimized Arc for the Tie Rod Pivot Points.



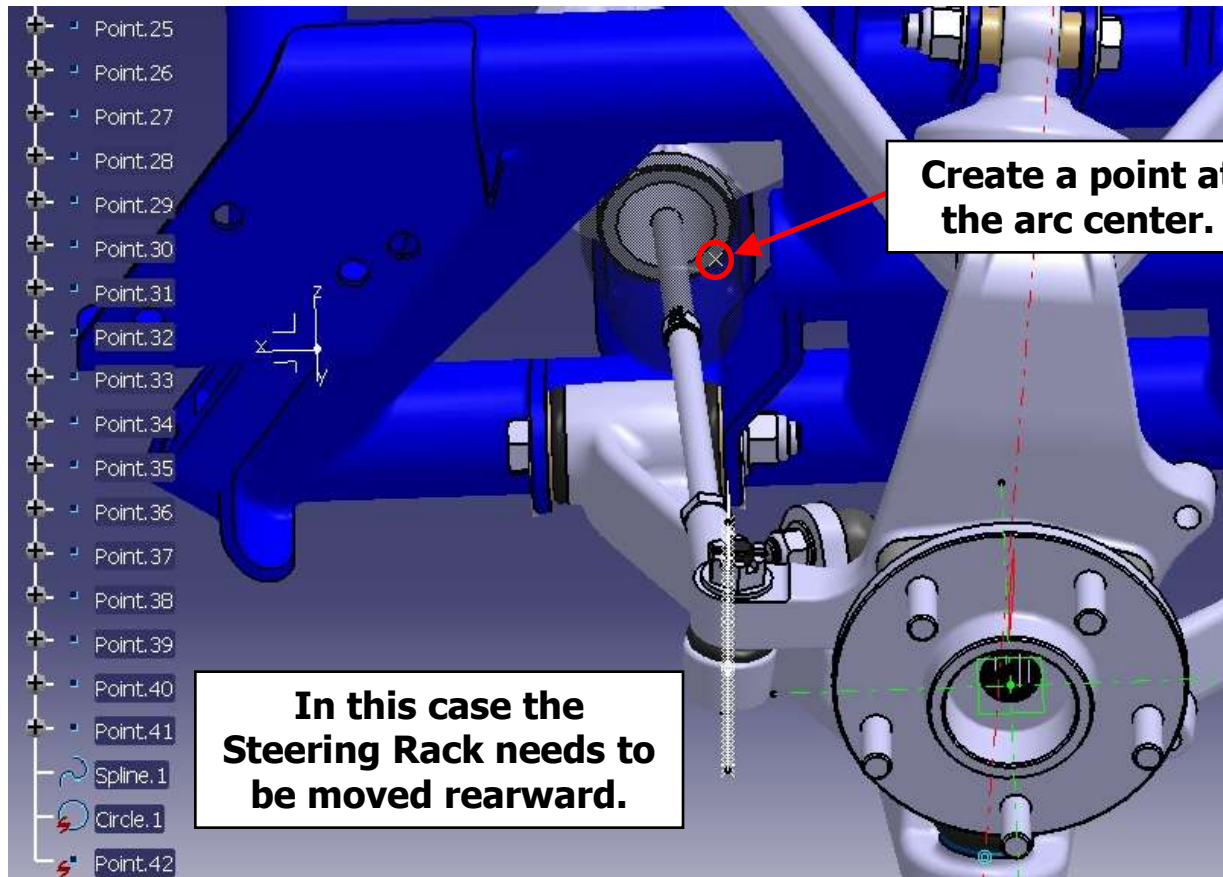
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- Step 11a: Use the Kinematic Trace of the Optimized Arc to determine the optimized Steering Rack attachment point.



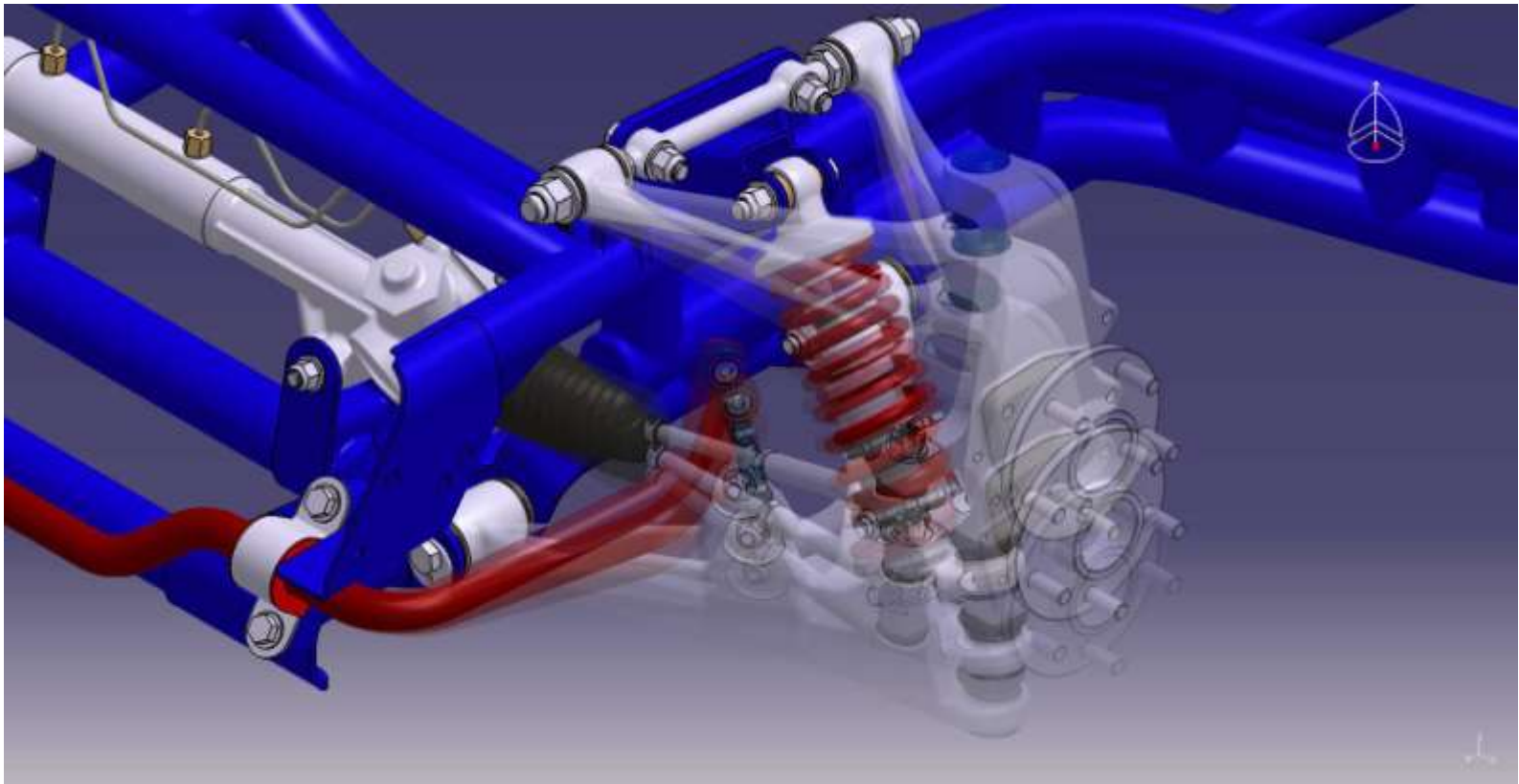
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- Step 11b: Use the Optimized Arc to determine the optimized Steering Rack attachment point.



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- Step 12: Reposition the Steering Rack to the Optimized Arc Center Point and complete the Kinematic with the proper Tie Rod joints in place of the Point-Surface joint.



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- Step 12: Run the Kinematic with Sensors Activated and Output the data into an Excel Spreadsheet.

