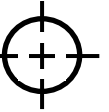
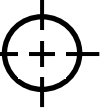
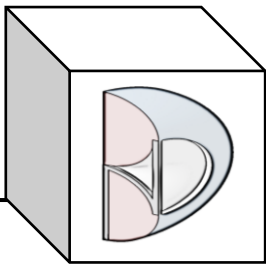


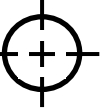
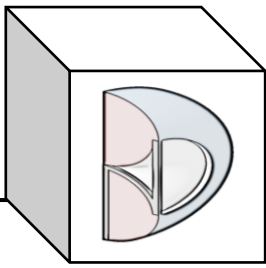
BND TechSource

A faded, technical-style illustration of a car's front suspension system, showing various components like the control arms, steering knuckle, and coil spring assembly.

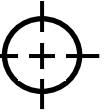
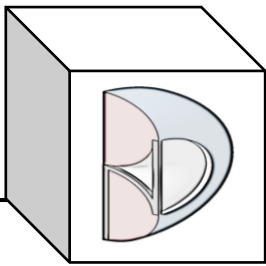
Front Suspension Simulation using CATIA DMU Kinematics



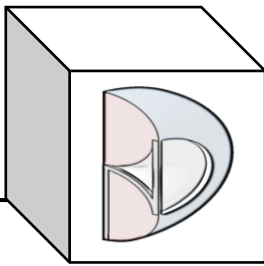
- The following licenses are required to create this DMU Kinematic simulation:
 - Digital Mockup Kinematics
 - Mechanical Part Design
 - Generative Shape Design
 - Assembly Design



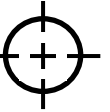
- To create this DMU Kinematic simulation, we must begin with several known parameters.
- Known:
 - All suspension “hard points”.
 - Pivot points and lines
 - Angles of axes and planes
 - Min/Max Command values
 - Shock down/up (-50mm, 48mm)
 - Steering left/right (-55mm, 55mm)



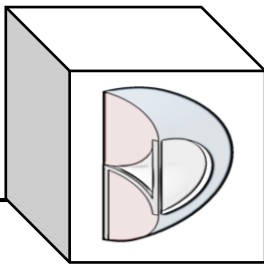
Vehicle Suspension Hardpoints												
Front Suspension												
Configuration:	GM C5 Corvette Independent Front Suspension											
Scrub (Pivot) Radius =				10.0 mm								
Steering (Kingpin) Inclination Angle (SAI) =				8.8 deg								
Caster Angle =		6.5 deg	+0.4 deg	+/- 0.5 deg								
Mechanical (or caster) trail =				35.5 mm								
Toe Angle =			+0.04 deg	+/- 0.10 deg								
Camber Angle =			-0.2 deg	+/- 0.5 deg								
Ball Joint Pivot Points relative to Suspension Analysis Axis												
Upper (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
Upper Ball Joint =			X	Y	Z	mm						
			-17.51	663.90	468.99							
Lower (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
Lower Ball Joint =			X	Y	Z	mm						
			16.11	709.94	171.58							
Lower only (MacPherson strut) = (x, y, z)				n/a								
Upper Strut Attachment/Pivot Point (MacPherson strut) = (x, y, z)				n/a								



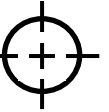
BND TechSource



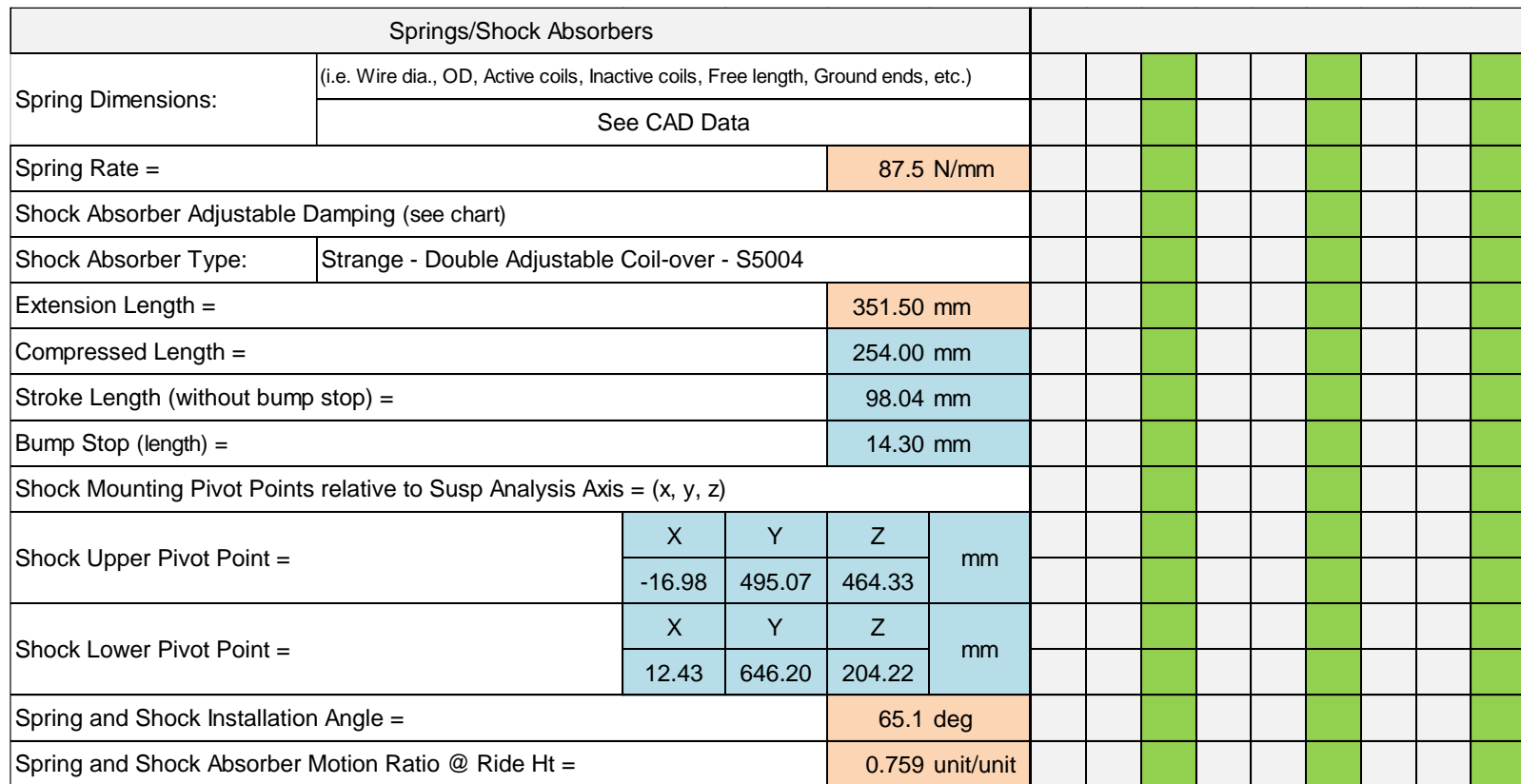
Control Arm Chassis Attachment Points relative to Suspension Analysis Axis												
Forward Upper (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
UCA Fwd Mnt =	X	Y	Z	mm								
	125.23	408.97	490.14									
Rearward Upper (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
UCA Rwd Mnt =	X	Y	Z	mm								
	-158.38	394.43	431.36									
Forward Lower (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
LCA Fwd Mnt =	X	Y	Z	mm								
	161.41	330.47	171.45									
Rearward Lower (Double wishbone, Multi-link, Trailing Arm, etc.) = (x, y, z)												
LCA Rwd Mnt =	X	Y	Z	mm								
	-223.59	330.47	171.79									
Fwd Lower only (MacPherson strut) = (x, y, z)			n/a									
Rwd Lower only (MacPherson strut) = (x, y, z)			n/a									

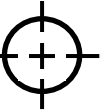


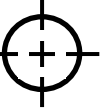
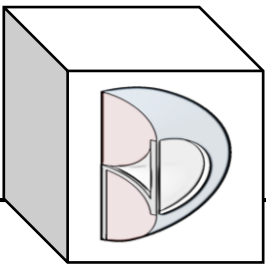
BND TechSource



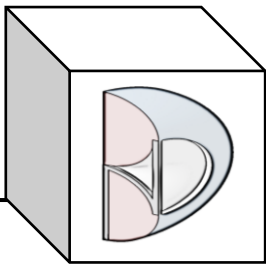
Knuckle/Brakes/Steering															
Hub Dimensions:	(i.e. hub dia/thickness, pilot dia, hub face to knuckle, stud size/circle dia, etc.)														
	See CAD Data														
Brake Rotor Dimensions:															
Rotor Thickness =				32.0 mm											
Rotor Diameter =				325.0 mm											
Inner Face of Hub to Inner Rotor Surface =				38.0 mm											
Inner Hub Diameter =				190.0 mm											
Outer Hub Diameter =				217.0 mm											
Center Hole Diameter =				70.0 mm											
Brake Caliper to Wheel (min clearance) =				6.5 mm											
Steering Rack Centerline relative to Susp Analysis Axis = (x, y, z)															
Steering Rack Centerline =	X	Y	Z	mm											
	124.11	n/a	273.78												
Tie Rod Pivot Point (inboard) relative to Susp Analysis Axis = (x, y, z)															
Tie Rod Pivot Pt (inboard) =	X	Y	Z	mm											
	124.11	370.00	273.78												
Tie Rod Pivot Point (outboard) relative to Susp Analysis Axis = (x, y, z)															
Tie Rod Pivot Pt (outboard) =	X	Y	Z	mm											
	120.10	724.65	284.52												



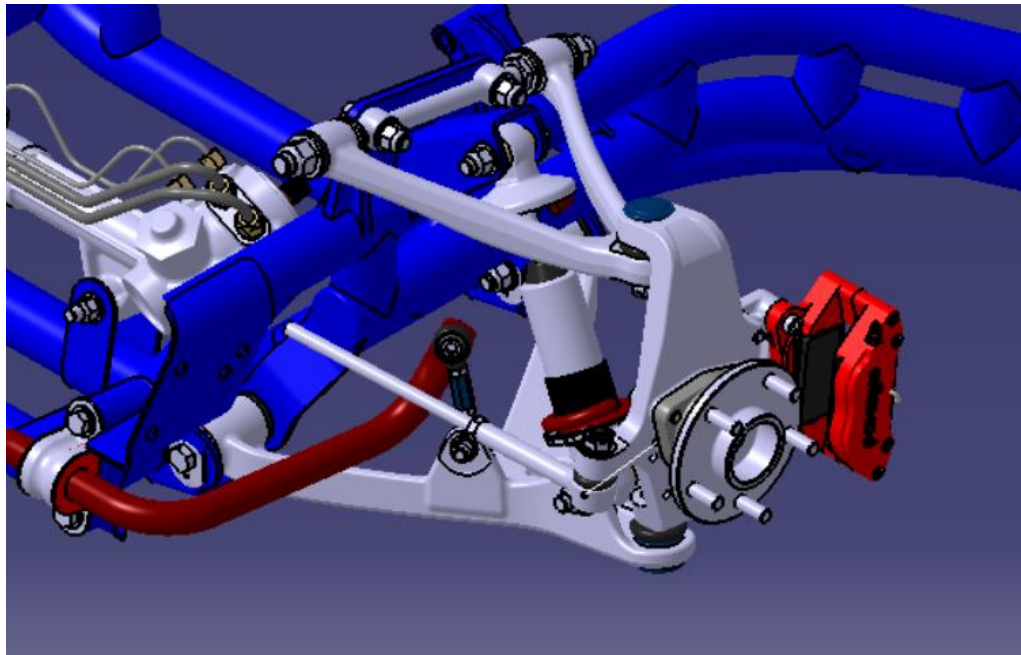
[illegible]

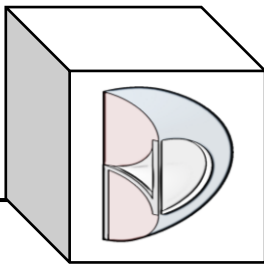


Step 1: Understand the suspension system

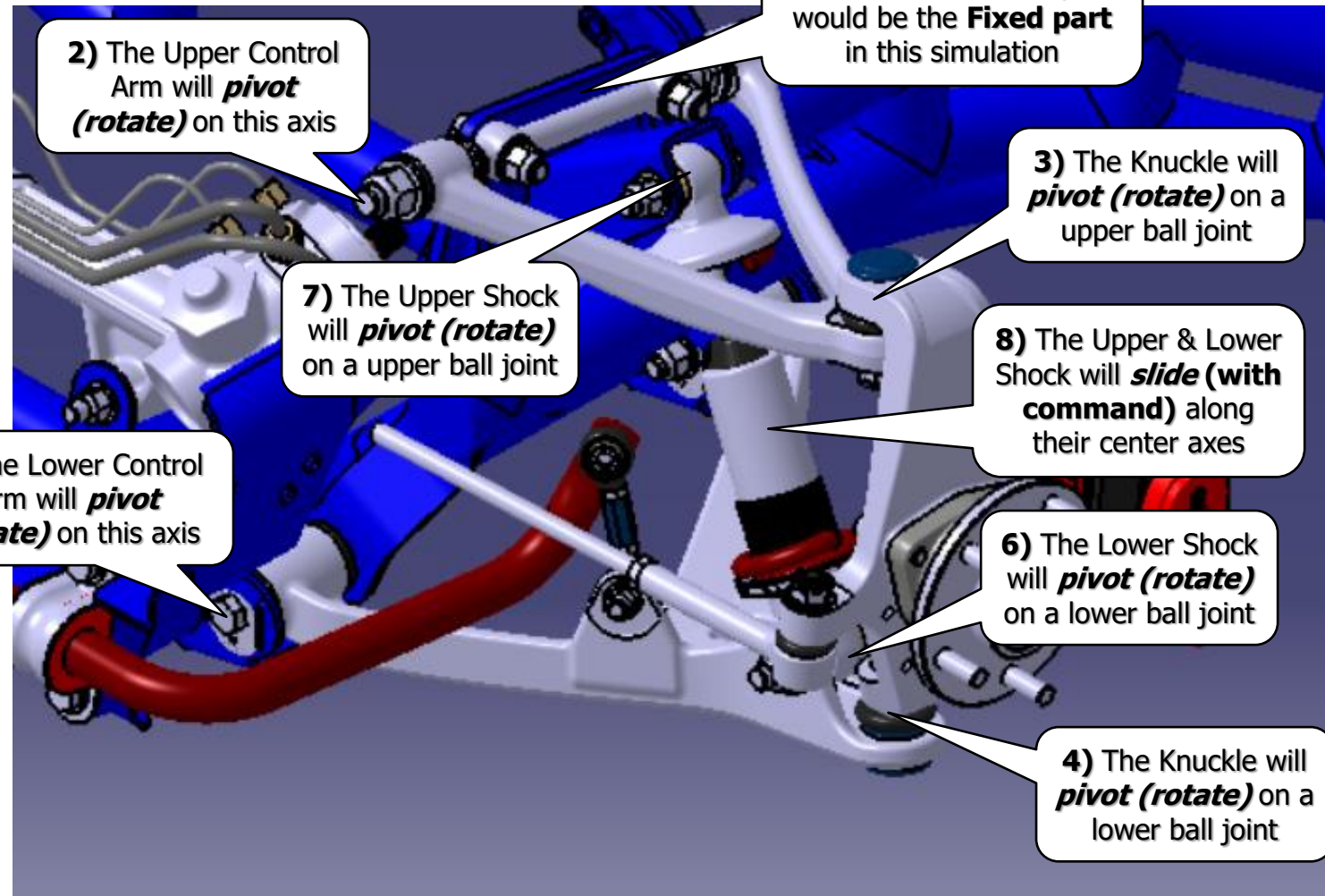
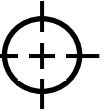


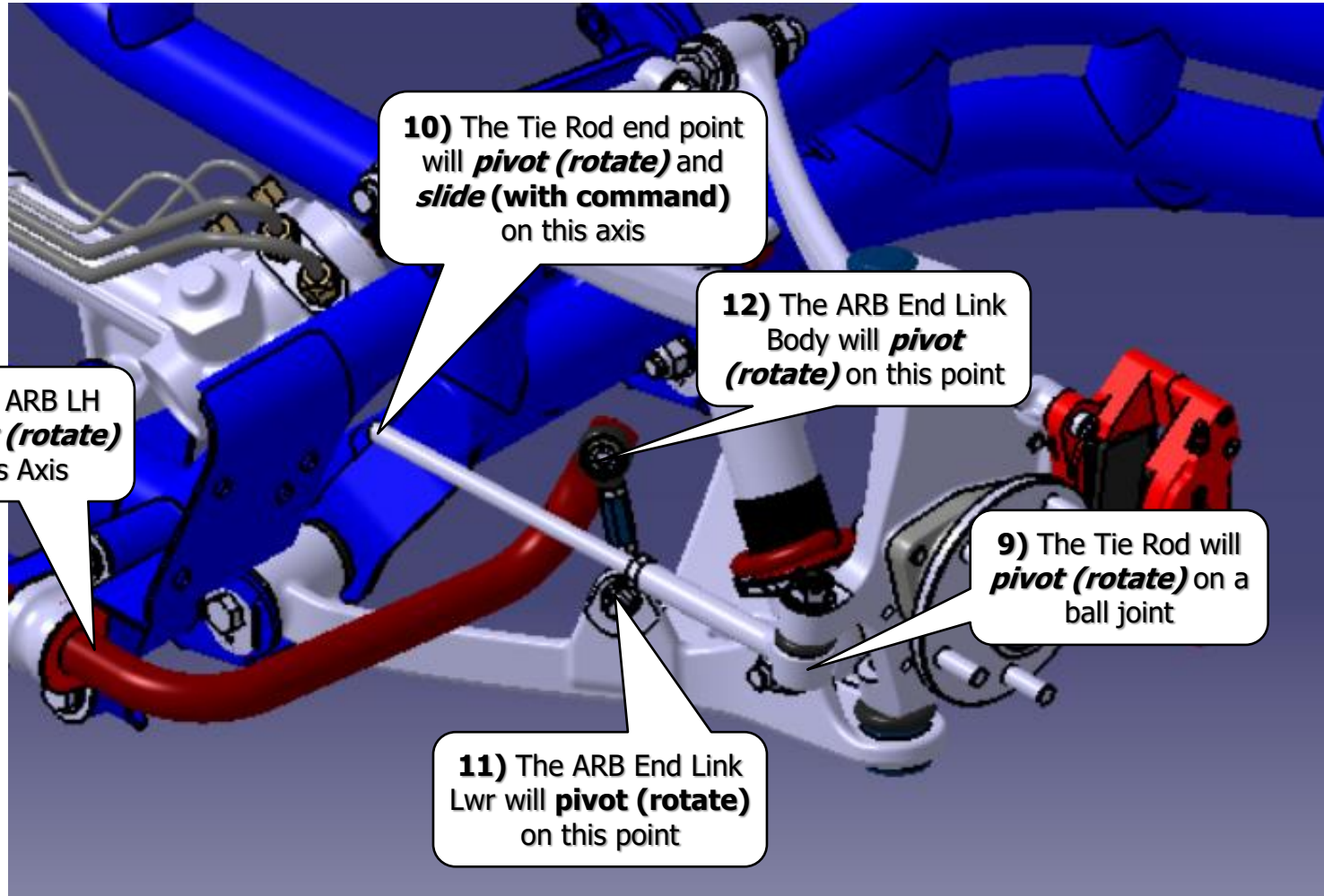
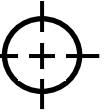
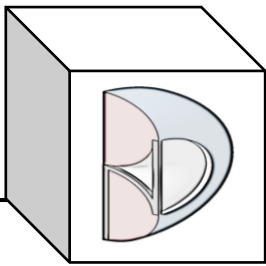
- Begin with the completed Front Suspension Assembly.
- This will help to understand all the pivot and links within the system.

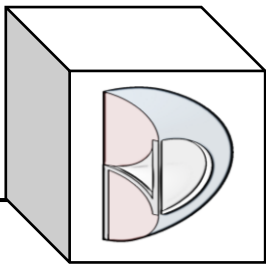




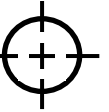
BND TechSource



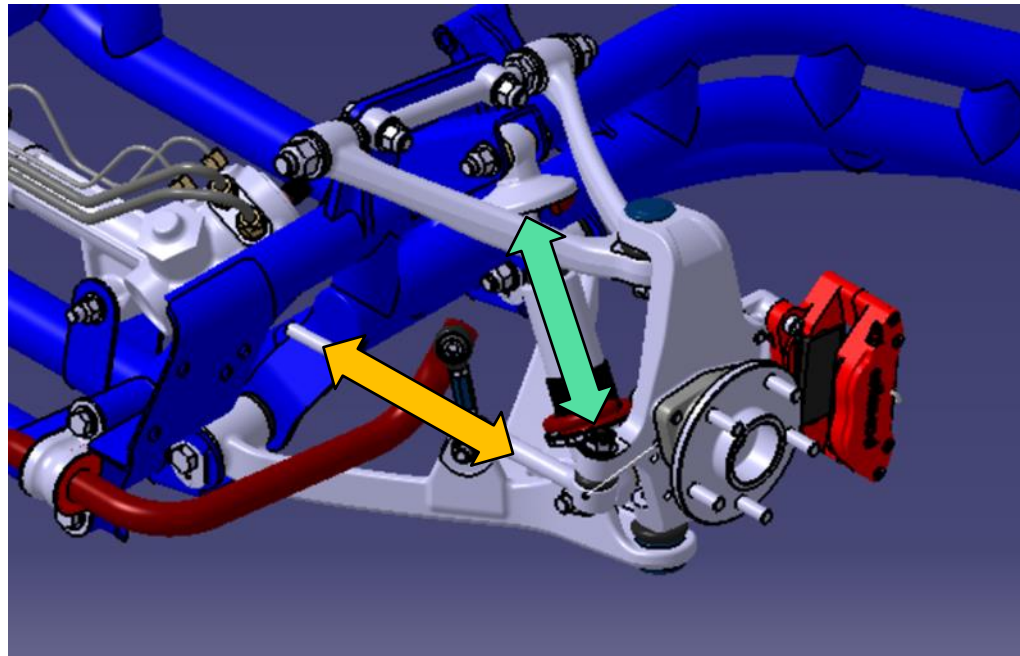


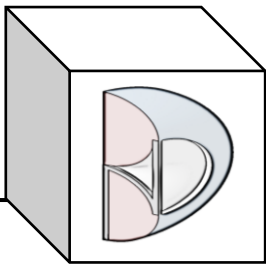


BND TechSource

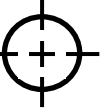


- Understand which joints need commands.
 - Min/Max Command values
 - Shock down/up (-50mm, 48mm)
 - Steering left/right (-55mm, 55mm)

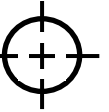




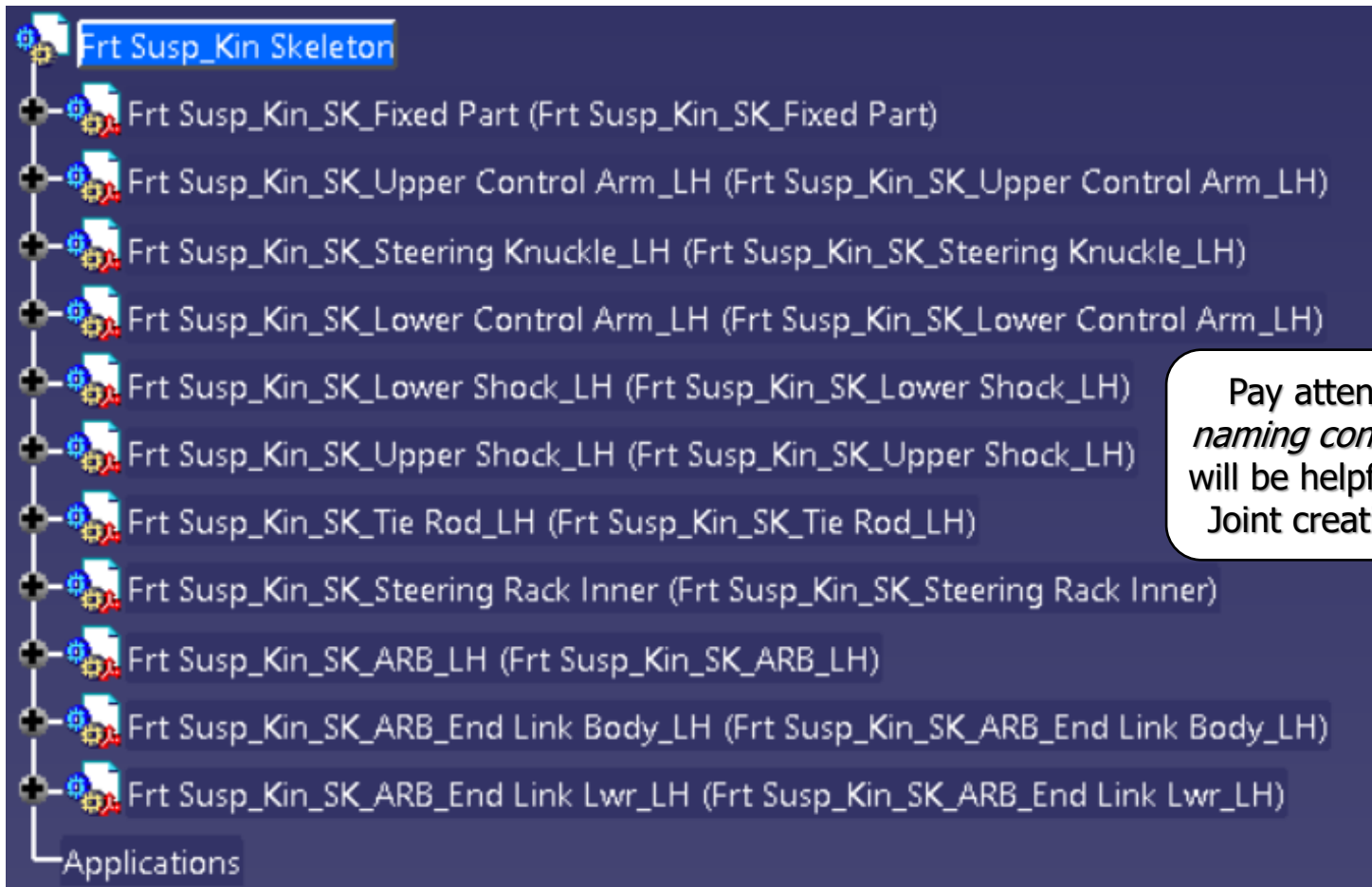
BND TechSource



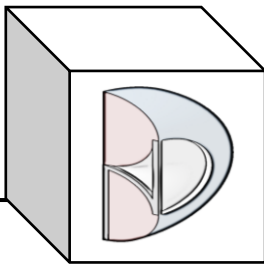
Step 2: Create a kinematic skeleton structure



- Create a skeleton product and all parts required for the kinematic simulation.



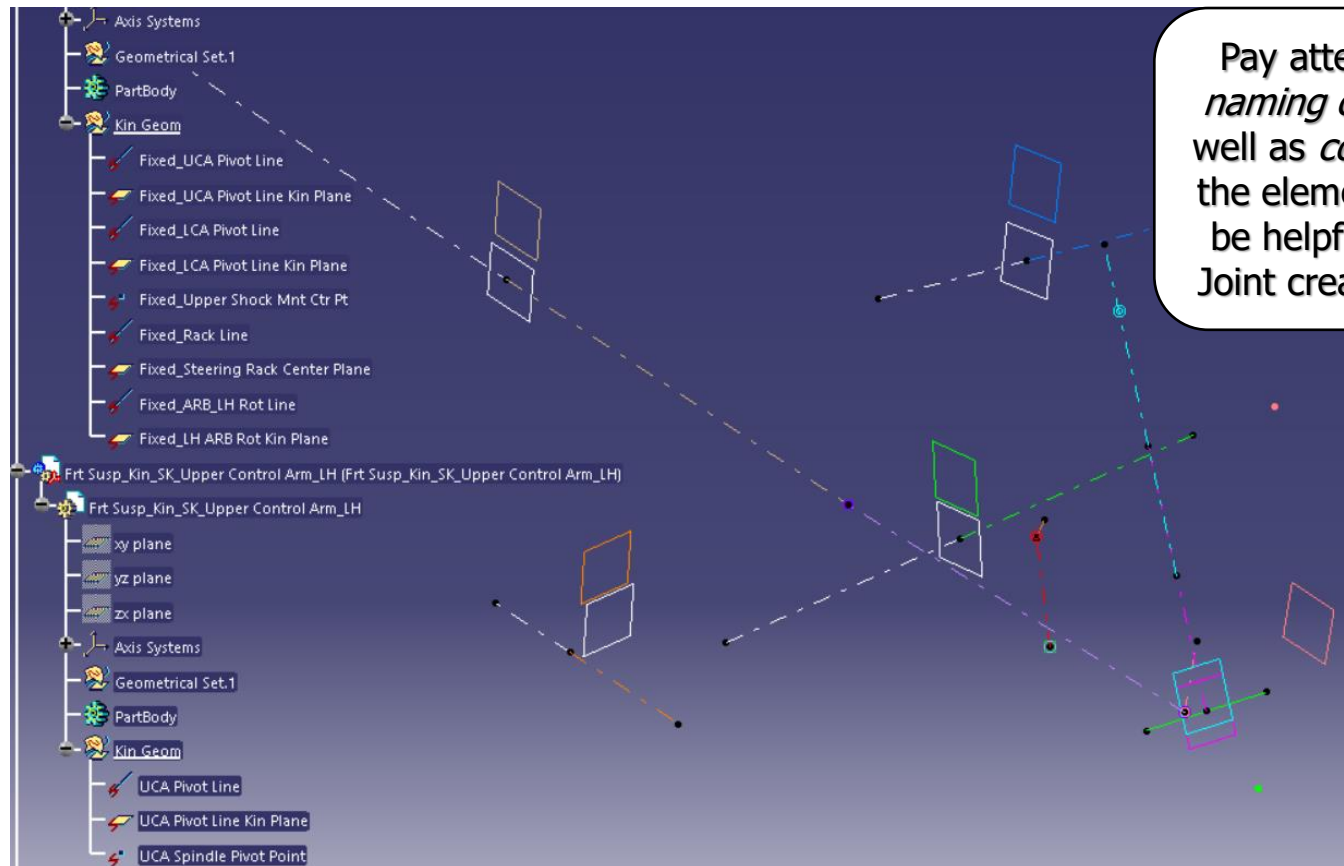
Pay attention to the *naming convention*, as it will be helpful during the Joint creation process.

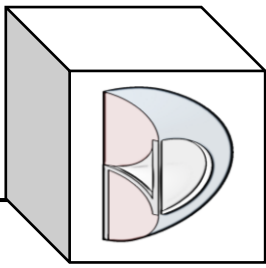


BND TechSource

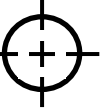


- Create all points, lines, & planes inside each part within the kinematic structure.

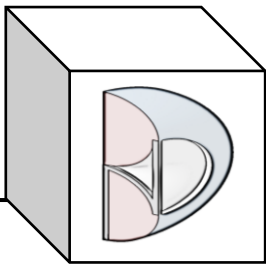




BND TechSource



Step 3: Create the kinematic Joints



- Create the Fixed Part and name the Mechanism.

5) Pick the Fixed Part

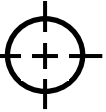
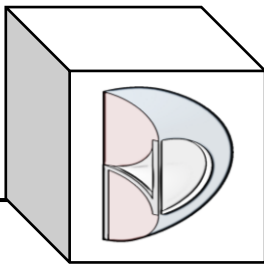
1) Pick the Fixed part icon

3) Give the New Mechanism a name

4) Pick OK

2) Pick New Mechanism

The screenshot shows the SolidWorks interface with a tree view on the left containing parts like 'Frt Susp_Kin Skeleton', 'Frt Susp_Kin_SK_Fixed Part', 'Frt Susp_Kin_SK_Upper Control Arm_LH', 'Frt Susp_Kin_SK_Steering Knuckle_LH', 'Frt Susp_Kin_SK_Lower Control Arm_LH', 'Frt Susp_Kin_SK_Lower Shock_LH', 'Frt Susp_Kin_SK_Upper Shock_LH', 'Frt Susp_Kin_SK_Tie Rod_LH', 'Frt Susp_Kin_SK_Steering Rack Inner', 'Frt Susp_Kin_SK_ARB_LH', and 'Frt Susp_Kin_SK_ARB_End Link Body_LH'. The 3D model in the center shows a suspension system. Two dialog boxes are open: 'Mechanism Creation' and 'New Fixed Part'. The 'Mechanism Creation' dialog has 'Mechanism name: Mechanism.Frt_Susp' and 'OK' and 'Cancel' buttons. The 'New Fixed Part' dialog has 'Mechanism:' and 'New Mechanism' and 'Cancel' buttons. A red circle highlights the 'Fixed Part' icon in the bottom right toolbar.



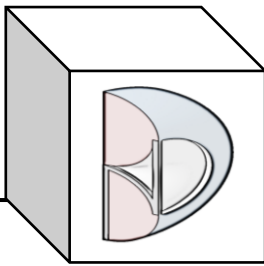
- Create a Revolute Joint between the Fixed part and the Upper Control Arm.

The screenshot shows the SolidWorks interface with the Revolute joint creation dialog box open. The dialog box has the following fields:

- Axis: Mechanism.Frt_Susp
- Plane: Revolute.1
- Current selection:
- Line 1: Frt Susp_Kin_SK_Fixed Part/Fixed_UCA Pivot Line
- Line 2: Frt Susp_Kin_SK_Upper Control Arm_LH/UCA Pivot Line
- Plane 1: Frt Susp_Kin_SK_Fixed Part/Fixed_UCA Pivot Line Kin Plane
- Plane 2: Frt Susp_Kin_SK_Upper Control Arm_LH/UCA Pivot Line Kin Plane
- Plane 3: -
- Plane 4: -
- OK button

Numbered callouts indicate the steps:

- 1) Pick the Revolute icon
- 2) Or Pick Line 1 from tree
- 3) Or Pick Line 2 from tree
- 4) Or Pick Plane 1 from tree
- 5) Or Pick Plane 2 from tree
- 6) Pick OK



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- Create a Spherical Joint between the Upper Control Arm and the Knuckle.

1) Pick the Spherical icon

2) Or Pick Point 1 from tree

2) Pick Point 1 geometry

3) Or Pick Point 2 from tree

3) Pick Point 2 geometry

4) Pick OK

Joint Creation: Spherical

Mechanism: Mechanism.Frt_Susp

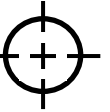
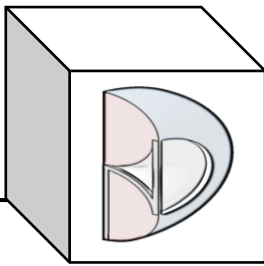
Joint name: Spherical.2

Current selection:

Point 1: Frt Susp_Kin_SK_Upper Control Arm_LH/UCA Spindle Pivot Point

Point 2: Frt Susp_Kin_SK_Steering Knuckle_LH/Knuckle_UCA Spindle Pivot Point

OK Cancel



- Create a Spherical Joint between the Knuckle and the Lower Control Arm.

1) Pick the Spherical icon

2) Or Pick Point 1 from tree

2) Pick Point 1 geometry

3) Or Pick Point 2 from tree

3) Pick Point 2 geometry

4) Pick OK

Joint Creation: Spherical

Mechanism: Mechanism.Frt_Susp

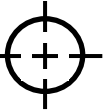
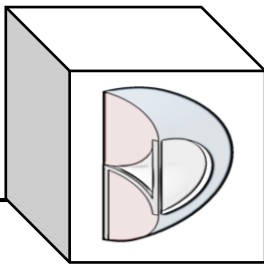
Joint name: Spherical.3

Current selection:

Point 1: Frt Susp_Kin_SK_Steering Knuckle_LH/Knuckle_LCA Spindle Pivot Point

Point 2: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA Spindle Pivot Point

OK Cancel



- Create a Revolute Joint between the Lower Control Arm and the Fixed part.

The screenshot shows the SolidWorks interface with a 3D model of a suspension system. The left-hand tree view contains the following items:

- Fixed_LCA Pivot Line
- Fixed_LCA Pivot Line Kin Plane
- Fixed_Upper Shock Mnt Ctr Pt
- Fixed_Rack Line
- Fixed_Steering Rack Center Plane
- Fixed_ARB_LH Rot Line
- Fixed_LH ARB Rot Kin Plane
- Frt Susp_Kin_SK_Upper Control Arm_LH (Frt Susp_Kin_SK_Upper Control)
- Frt Susp_Kin_SK_Steering Knuckle_LH (Frt Susp_Kin_SK_Steering Knuckle)
- Frt Susp_Kin_SK_Lower Control Arm_LH (Frt Susp_Kin_SK_Lower Control)
- Frt Susp_Kin_SK_Lower Control Arm_LH
- xy plane
- yz plane
- zx plane
- Axis Systems
- Absolute Axis System
- OriginX
- OriginY
- OriginZ
- Geometrical Set.1
- PartBody
- Kin Geom
- LCA_Lower Shock Mnt Ctr Pt
- LCA Spindle Pivot Point
- LCA Pivot Line
- LCA Pivot Line Kin Plane

The 3D view shows the lower control arm and the fixed part. The Revolute icon is circled in the top toolbar. The following steps are indicated by callouts:

- 1) Pick the Revolute icon
- 2) Pick Line 1 geometry
- 3) Pick Line 2 geometry
- 4) Pick Plane 1 geometry
- 5) Pick Plane 2 geometry
- 6) Pick OK

The Joint Creation: Revolute dialog box is open, showing the following settings:

- Mechanism: Mechanism.Frt_Susp
- Joint name: Revolute.4
- Line 1: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA Pivot Line
- Line 2: Frt Susp_Kin_SK_Fixed Part/Fixed_LCA Pivot Line
- Plane 1: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA Pivot Line Kin Plane
- Plane 2: Frt Susp_Kin_SK_Fixed Part/Fixed_LCA Pivot Line Kin Plane
- Plane 3: -
- Plane 4: -
- Angle driven: ☐
- OK button

2) Or Pick Line 1 from tree

4) Or Pick Plane 1 from tree

3) Or Pick Line 2 from tree

5) Or Pick Plane 2 from tree

1) Pick the Revolute icon

2) Pick Line 1 geometry

3) Pick Line 2 geometry

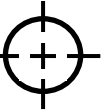
4) Pick Plane 1 geometry

5) Pick Plane 2 geometry

6) Pick OK



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- To avoid binding in the mechanism, we will create a Universal Joint between the LCA and the Shock Lower.

1) Pick the U-Joint icon

2) Or Pick Spin 1 from tree

2) Pick Spin 1 geometry

3) Pick Spin 2 geometry

3) Or Pick Spin 2 from tree

4) Pick OK

Joint Creation: U Joint

Mechanism: Mechanism.Frt_Susp

Joint name: U Joint.5

Current selection:

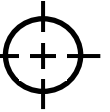
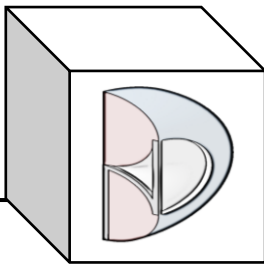
Spin 1: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA_Lower Shock Mnt CL Spin 2: Frt Susp_Kin_SK_Lower Shock LH/Lo Shock_CL

Cross-pin axis direction

☐ Normal to spin 1 ☒ Normal to spin 2

☐ Any:

OK Cancel



- Create a Spherical Joint between the Knuckle and the Lower Control Arm.

1) Pick the Spherical icon

2) Or Pick Point 1 from tree

2) Pick Point 1 geometry

3) Or Pick Point 2 from tree

3) Pick Point 2 geometry

4) Pick OK

Joint Creation: Spherical

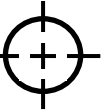
Mechanism: Mechanism.Frt_Susp

Joint name: Spherical.3

Current selection:

Point 1: Frt Susp_Kin_SK_Steering Knuckle_LH/Knuckle_LCA Spindle Pivot Point Point 2: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA Spindle Pivot Point

OK Cancel



- Create a Prismatic Joint between the Lower Shock CL and the Upper Shock CL and make it *Length driven*.

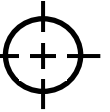
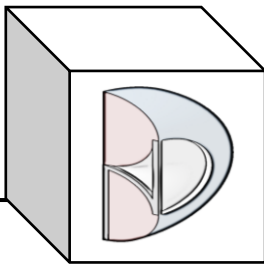
The screenshot shows the SolidWorks interface with a 3D model of a mechanical assembly. The Prismatic Joint tool is selected in the top toolbar. The following steps are indicated by numbered callouts:

- 1) Pick the Prismatic icon
- 2) Or Pick Line 1 from tree
- 3) Or Pick Line 2 from tree
- 4) Or Pick Plane 1 from tree
- 5) Or Pick Plane 2 from tree
- 6) Pick Length driven
- 7) Pick OK

The Prismatic Joint dialog box is open, showing the following selections:

- Mechanism: Mechanism.Frt_Susp
- Joint name: Prismatic.6
- Line 1: Frt Susp_Kin_SK_Lower Shock_LH/Lower Shock_CL
- Line 2: Frt Susp_Kin_SK_Upper Shock_LH/Upper Shock_CL
- Plane 1: Frt Susp_Kin_SK_Lower Shock_LH/Lower Shock_Plane thru Upr & Lwr Shock Mnts
- Plane 2: Frt Susp_Kin_SK_Upper Shock_LH/Upper Shock_Plane thru Upr & Lwr Shock Mnts
- ☒ Length driven

The OK button is highlighted.



- Create a Spherical Joint between the upper Shock mounting point and the Fixed part mounting point.

1) Pick the Spherical icon

2) Pick Point 1 geometry

3) Pick Point 2 geometry

3) Or Pick Point 2 from tree

2) Or Pick Point 1 from tree

4) Pick OK

Joint Creation: Spherical

Mechanism: Mechanism.Frt_Susp

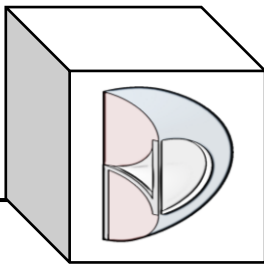
Joint name: Spherical.7

Current selection:

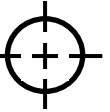
Point 1: Frt Susp_Kin_SK_Upper Shock_LH/Upper Shock_Mnt Ctr Pt

Point 2: Frt Susp_Kin_SK_Fixed Part/Fixed Upper Shock_Mnt Ctr Pt

OK Cancel



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- Use Analyze + Mechanism Analysis to understand there is still one degree of freedom open.

The one degree of freedom still open is due to the Knuckle not being controlled.

We will control the Knuckle to the Fixed part via the Tie Rod and Steering Rack.

Mechanism Analysis

General Properties

Mechanism name: Mechanism.Frt_Susp

Mechanism can be simulated: No

Number of joints: 7

Number of commands: 1

Degrees of freedom without command(s): 2

Degrees of freedom with command(s): 1

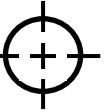
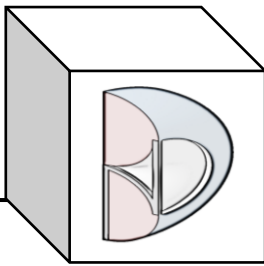
Fixed part: Frt Susp_Kin_SK_Fixed F

Joints visualisation: ☐ On ☒ Off

Joint	Command	Type	Part 1	Geometry 1	Part 2	Geometry 2	Part 3
Revolute.1		Revolute	Frt Susp_Kin_SK_Fixed Part	Fixed_UCA Pivot Line	Frt Susp_Kin_SK_Upper Control Arm_LH	UCA Pivot Line	
Spherical.2		Spherical	Frt Susp_Kin_SK_Upper Control Arm_LH	UCA Spindle Pivot Point	Frt Susp_Kin_SK_Steering Knuckle_LH	Knuckle_UCA Spindle Pivot Point	
Spherical.3		Spherical	Frt Susp_Kin_SK_Steering Knuckle_LH	Knuckle_LCA Spindle Pivot Point	Frt Susp_Kin_SK_Lower Control Arm_LH	LCA Spindle Pivot Point	
Revolute.4		Revolute	Frt Susp_Kin_SK_Lower Control Arm_LH	LCA Pivot Line	Frt Susp_Kin_SK_Fixed Part	Fixed_LCA Pivot Line	
U Joint.5		U Joint	Frt Susp_Kin_SK_Lower Control Arm_LH	LCA_Lower Shock Mnt CL	Frt Susp_Kin_SK_Lower Shock_LH	Lower Shock_CL	
Prismatic.6	Command.1	Prismatic	Frt Susp_Kin_SK_Lower Shock_LH	Lower Shock_CL	Frt Susp_Kin_SK_Upper Shock_LH	Upper Shock_CL	
Spherical.7		Spherical	Frt Susp_Kin_SK_Upper Shock_LH	Upper Shock_Mnt Ctr Pt	Frt Susp_Kin_SK_Fixed Part	Fixed_Upper Shock Mnt Ctr Pt	

Mechanism dressup information:

Part 1	Part 2	Part 3



- Create a Spherical Joint between the Knuckle spindle point and the Tie Rod spindle point.

1) Pick the Spherical icon

2) Or Pick Point 1 from tree

2) Pick Point 1 geometry

3) Or Pick Point 2 from tree

3) Pick Point 2 geometry

4) Pick OK

Feature Tree:

- Geometrical Set.1
 - PartBody
 - Kin Geom
 - Knuckle_Frt Caster Angle Plane (6.5)
 - Knuckle_UCA Spindle Pivot Point
 - Knuckle_LCA Spindle Pivot Point
 - Knuckle_Tie Rod End Pivot Pt
 - Knuckle_Tie Rod Spindle CL
 - Frt Susp_Kin_SK_Lower Control Arm_LH (Frt Susp_Kin_SK_Lower Control Arm_LH)
 - Frt Susp_Kin_SK_Lower Shock_LH (Frt Susp_Kin_SK_Lower Shock_LH)
 - Frt Susp_Kin_SK_Upper Shock_LH (Frt Susp_Kin_SK_Upper Shock_LH)
 - Frt Susp_Kin_SK_Tie Rod_LH (Frt Susp_Kin_SK_Tie Rod_LH)
 - Frt Susp_Kin_SK_Tie Rod_LH
 - xy plane
 - yz plane
 - zx plane
 - Axis Systems
 - Absolute Axis System

Joint Creation: Spherical

Mechanism: Mechanism.Frt_Susp

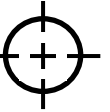
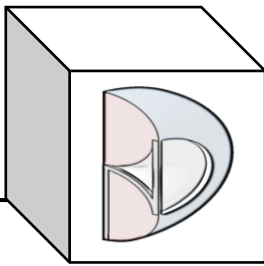
Joint name: Spherical.8

Current selection:

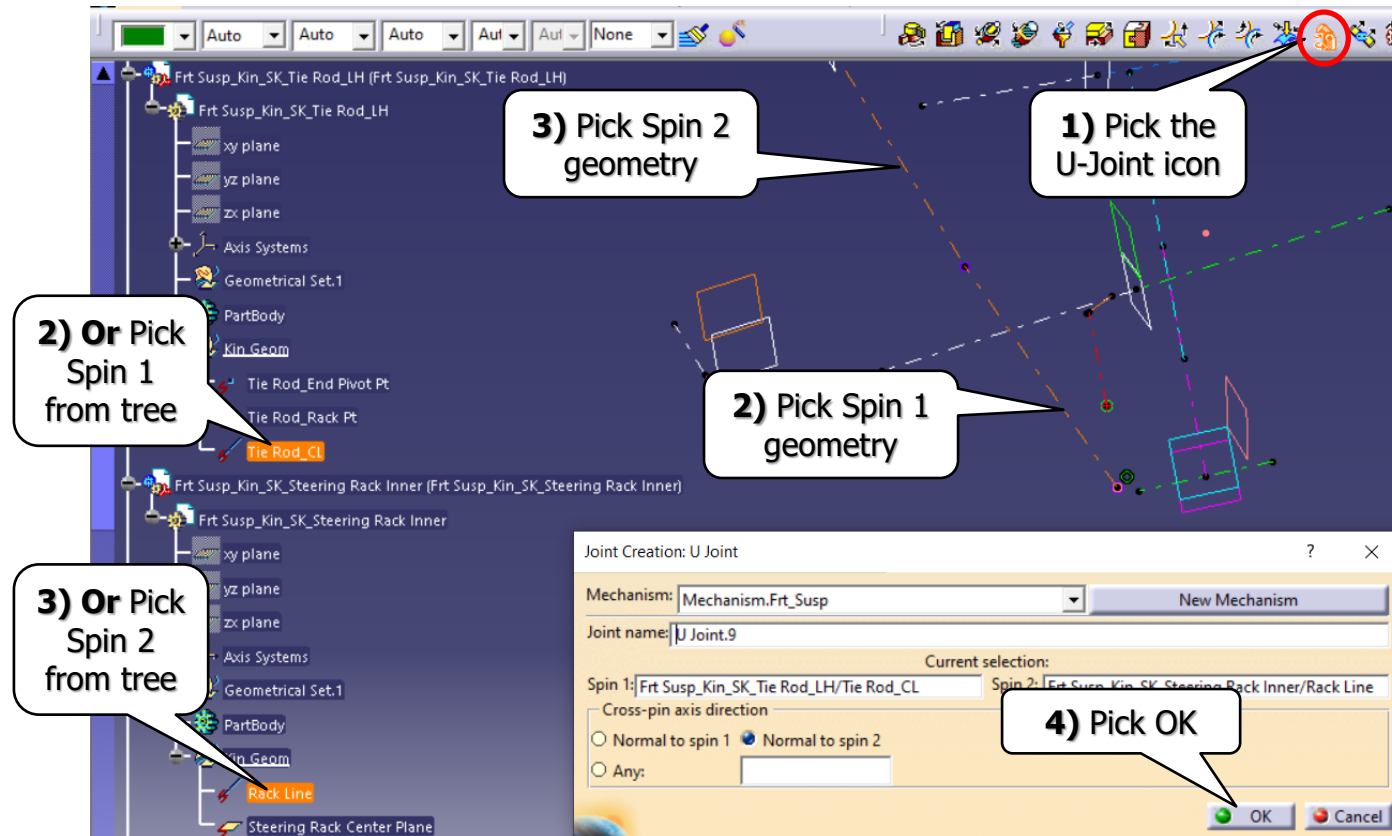
Point 1: Frt Susp_Kin_SK_Steering Knuckle_LH/Knuckle_Tie Rod End Pivot Pt

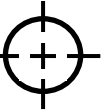
Point 2: Frt Susp_Kin_SK_Tie Rod_LH/Tie Rod End Pivot Pt

OK Cancel



- To avoid binding in the mechanism, we will create a Universal Joint between the Tie Rod and the Steering Rack Inner.





- Create a Prismatic Joint between the Steering Rack Line and the Fixed Rack Line and make it *Length driven*.

3) Or Pick Line 2 from tree

4) Pick Plane 1 geometry

1) Pick the Prismatic icon

2) Pick Line 1 geometry

5) Or Pick Plane 2 from tree

3) Pick Line 2 geometry

5) Pick Plane 2 geometry

Information

The mechanism can be simulated

OK

2) Or Pick Line 1 from tree

4) Or Pick Plane 1 from tree

Joint Creation: Prismatic

Mechanisms: Mechanism.Frt_Susp

Joint name: Prismatic.10

Current selection:

Line 1: Frt Susp_Kin_SK_Steering Rack Inner/Rack Line

Line 2: Frt Susp_Kin_SK_Fixed Part/Fixed_Rack Line

Plane 1: Frt Susp_Kin_SK_Steering Rack Inner/Steering Rack Center Plane

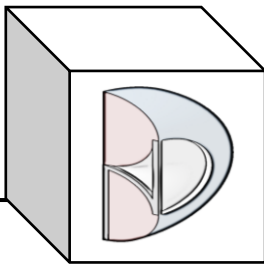
Plane 2: Frt Susp_Kin_SK_Fixed Part/Fixed_Steering Rack Center Plane

☒ Length driven

6) Pick Length driven

7) Pick OK

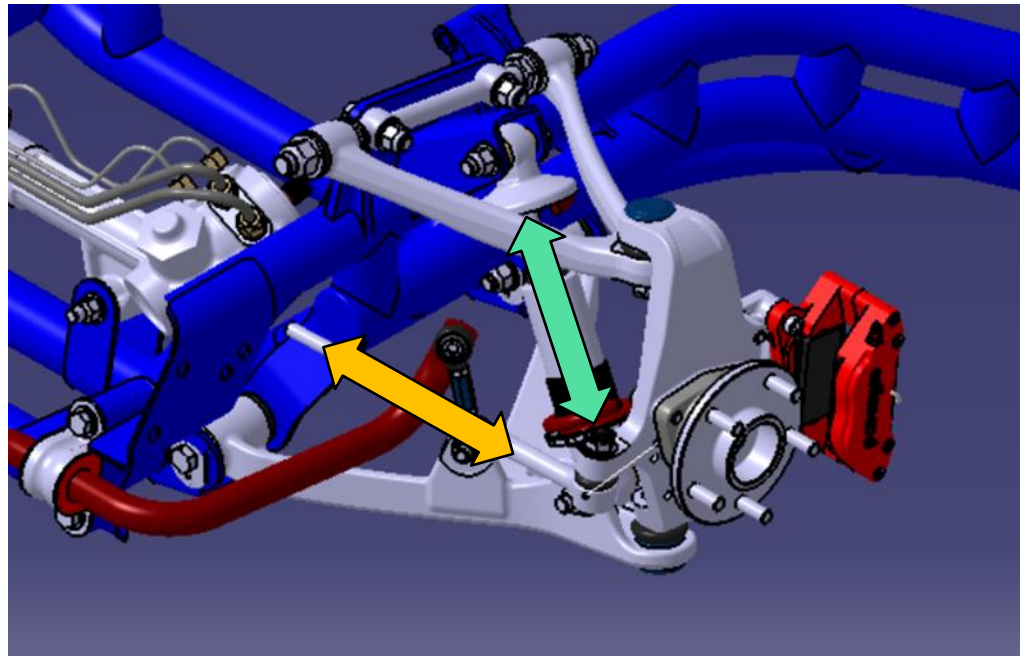
OK Cancel

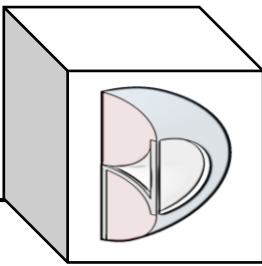


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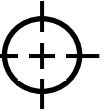


- Edit the Command values for the driven commands.
 - Min/Max Command values
 - Shock down/up (-50mm, 48mm)
 - Steering left/right (-55mm, 55mm)





BND TechSource



- Edit the Command values for the driven commands.

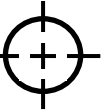
The screenshot displays the SolidWorks interface with a mechanism assembly. The left-hand tree view shows the hierarchy: Constraints, Applications, Mechanisms, Mechanism.Frt_Susp, DOF=0, Joints, and Commands. The 'Prismatic.6 (Frt Susp_Kin_SK_Lower Shock_LH, Frt Susp_Kin_SK_Upper Shock_LH)' joint is highlighted with a red box. A callout bubble points to it with the text: **1) Double-Pick the Prismatic Command for the Lower to Upper Shock**.

The 'Joint Edition: Prismatic.6 (Prismatic)' dialog box is open on the right. It shows the joint name 'Prismatic.6' and the joint type 'Prismatic'. The 'Length driven' checkbox is checked. The 'Limits' section shows 'Lower limit: -50mm' and 'Upper limit: 48mm'. A callout bubble points to the 'Upper limit' field with the text: **3) Edit the Upper Limit**. Another callout bubble points to the 'OK' button with the text: **4) Pick OK**.

A second callout bubble points to the 'Lower limit' field with the text: **2) Edit the Lower Limit**.



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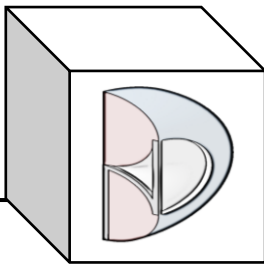


- Edit the Command values for the driven commands.

The screenshot displays the SolidWorks interface with a mechanism assembly. The left-hand tree view shows the hierarchy: Constraints, Applications, Mechanisms, and Joints. Under Joints, 'Prismatic.10 (Frt Susp_Kin_SK_Steering Rack Inner, Frt Susp_Kin_SK_Fixed Part)' is highlighted with a red box. A callout bubble points to this joint with the instruction: **1) Double-Pick the Prismatic Command for the Steering Rack to the Fixed Part.**

The 'Joint Limits' dialog box for 'Prismatic.10 (Prismatic)' is open. It shows 'Line 1' and 'Line 2' both set to 'Frt Susp_Kin_SK_Steering Rack Inner'. Under 'Joint Limits', the 'Lower limit' is set to '-55mm' and the 'Upper limit' is set to '55mm'. Callout bubbles point to these fields with instructions: **2) Edit the Lower Limit** and **3) Edit the Upper Limit**.

At the bottom of the dialog box, there are 'OK' and 'Cancel' buttons. A callout bubble points to the 'OK' button with the instruction: **4) Pick OK**.



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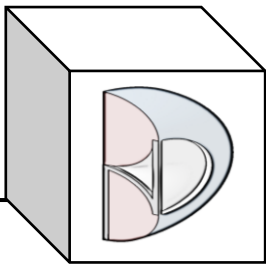
- If 48mm is not upwards and -50mm not downwards:

The screenshot shows the SolidWorks interface with a suspension mechanism assembly. The left-hand tree view displays the assembly structure, including Kinematic Geometry, Constraints, Applications, Mechanisms, and Joints. A red box highlights the 'Prismatic.6' joint in the Joints list. A callout bubble points to this joint with the text: **1) Double-Pick the Prismatic Command for the Lower to Upper Shock**. The 'Joint Edition: Prismatic.6 (Prismatic)' dialog box is open in the foreground. It shows the joint name as 'Prismatic.6' and the joint geometry defined by two lines and two planes. The 'Length driven' checkbox is checked. Under 'Joint Limits', the 'Lower limit' is set to '-50mm' and the 'Upper limit' is set to '48mm'. A callout bubble points to the 'OK' button with the text: **3) Pick OK**. Another callout bubble points to the 'Flip' arrow in the dialog box with the text: **2) Pick the Arrow to flip**.

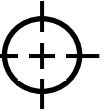
1) Double-Pick the Prismatic Command for the Lower to Upper Shock

2) Pick the Arrow to flip

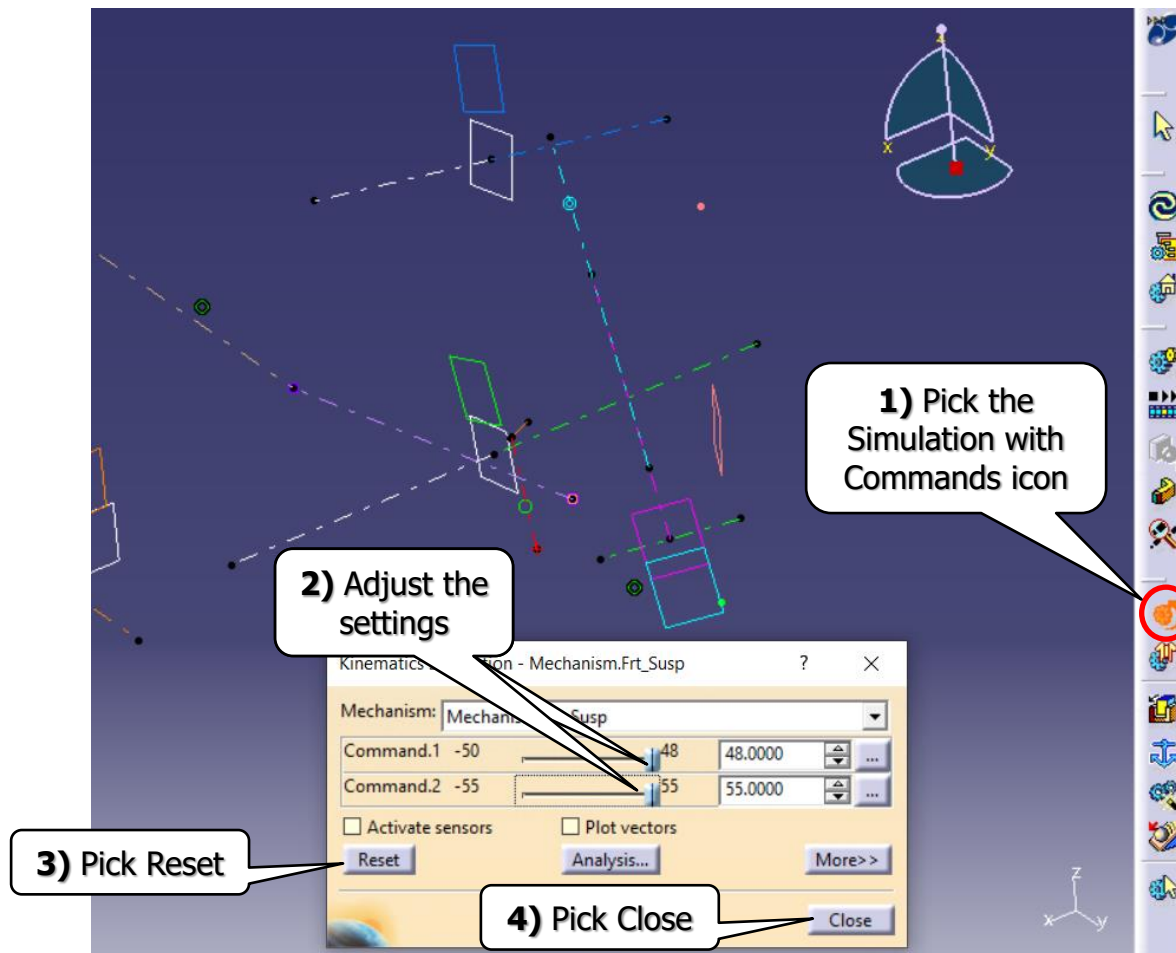
3) Pick OK

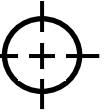
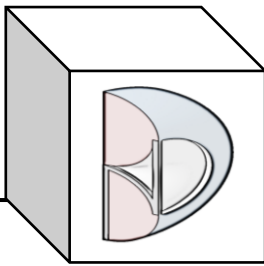


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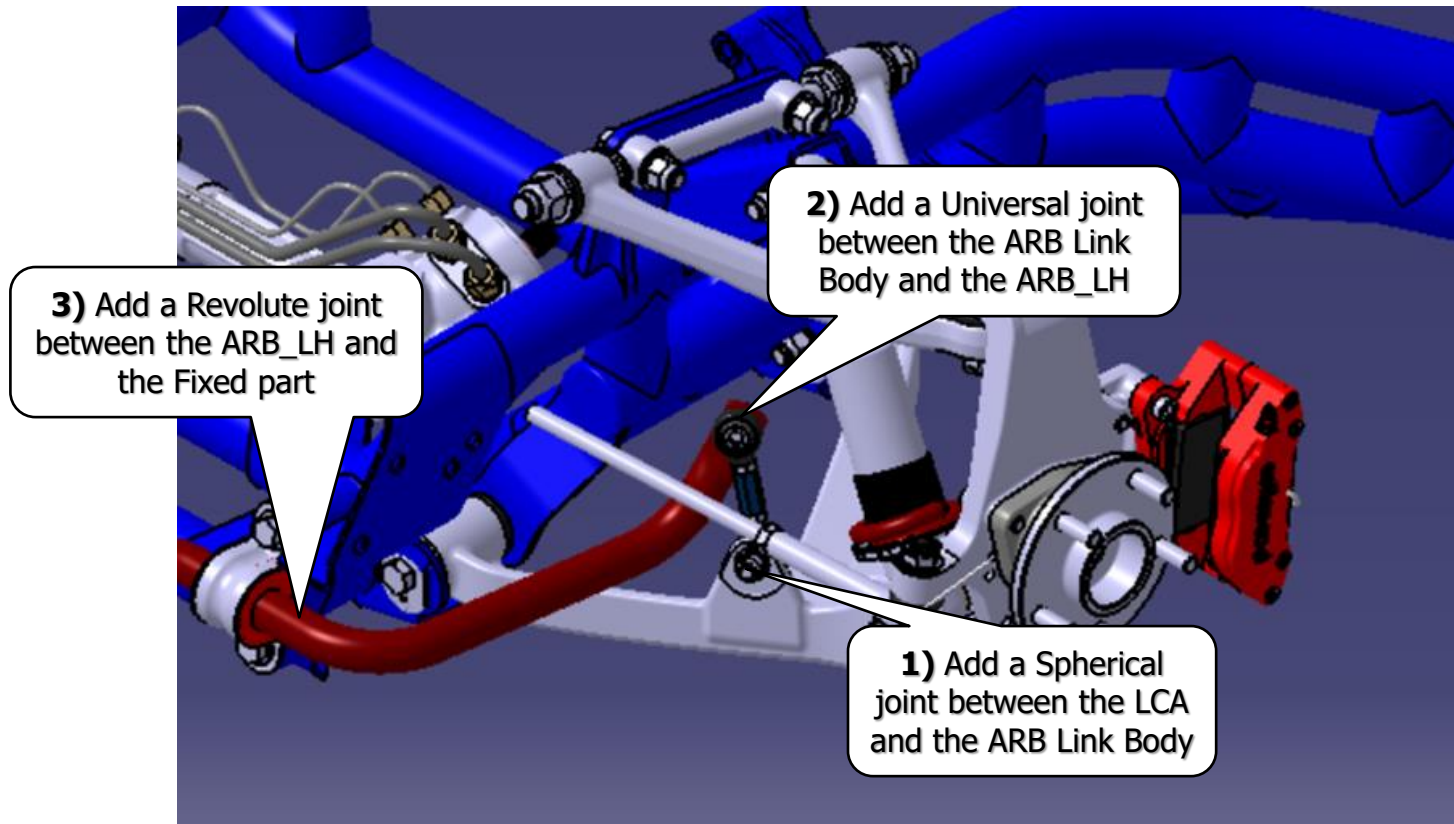


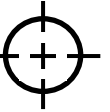
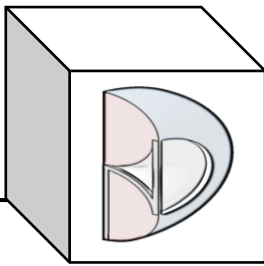
- Run Simulation with Commands.





- To finish the simulation, add the ARB into the mechanism.





- Create a Spherical Joint between the LCA ARB Link Body point and the ARB Link Body point.

1) Pick the Spherical icon

2) Or Pick Point 1 from tree

2) Pick Point 1 geometry

3) Or Pick Point 2 from tree

3) Pick Point 2 geometry

4) Pick OK

Joint Creation: Spherical

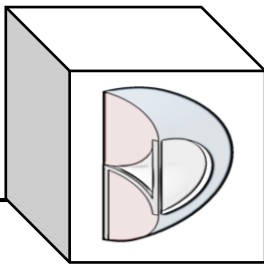
Mechanism: Mechanism.Frt_Susp

Joint name: Spherical.11

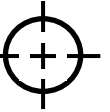
Current selection:

Point 1: Frt Susp_Kin_SK_Lower Control Arm_LH/LCA_ARB_Link_Body_Pivot_Pt Point 2: Frt Susp_Kin_SK_ARB_End Link Body_LH/ARB_End Link Body_Pivot_Pt

OK Cancel



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- To avoid binding in the mechanism, we will create a Universal Joint between the ARB LH Spin Axis 1 and the ARB Link Spin Axis 2.

1) Pick the U-Joint icon

2) Pick Spin 1 geometry

3) Pick Spin 2 geometry

2) Or Pick Spin 1 from tree

3) Or Pick Spin 2 from tree

4) Pick OK

Joint Creation: U Joint

Mechanism: Mechanism.Frt_Susp

Joint name: U Joint.12

Current selection:

Spin 1: Frt Susp_Kin_SK_ARB_LH/ARB_LH U-Joint Spin Axis 1

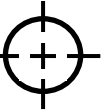
Spin 2: Frt Susp_Kin_SK_ARB_End Link Body_LH/ARB End Link Body_Spin Axis 2

Cross-pin axis direction

☐ Normal to spin 1 ☒ Normal to spin 2

☐ Any:

OK Cancel



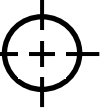
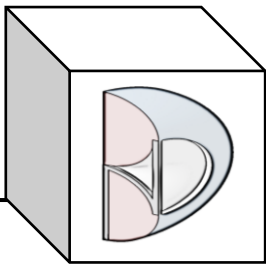
- Create a Revolute Joint between the ARB LH Rot line and the Fixed part Rot line.

The screenshot shows the SolidWorks interface with the following callouts and steps:

- 1) Pick the Revolute icon**: Points to the Revolute joint icon in the top toolbar.
- 2) Or Pick Line 1 from tree**: Points to the 'ARB_LH Rot Line' in the left-hand tree view.
- 3) Or Pick Line 2 from tree**: Points to the 'Fixed_ARB_LH Rot Line' in the left-hand tree view.
- 4) Or Pick Plane 1 from tree**: Points to the 'Fixed_LH ARB Rot Kin Plane' in the left-hand tree view.
- 5) Or Pick Plane 2 from tree**: Points to the 'Frt Susp_Kin_SK ARB LH/ARB_LH Rot Line' in the left-hand tree view.
- 6) Pick OK**: Points to the 'OK' button in the 'Joint Creation: Revolute' dialog box.

The 'Joint Creation: Revolute' dialog box shows the following settings:

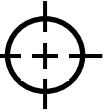
- Mechanism: Mechanism.Frt_Susp
- Joint name: Revolute.13
- Line 1: Frt Susp_Kin_SK ARB LH/ARB_LH Rot Line
- Line 2: Frt Susp_Kin_SK Fixed Part/Fixed_ARB_LH Rot Line
- Plane 1: Frt Susp_Kin_SK Fixed Part/Fixed_LH ARB Rot Kin Plane
- Plane 2: Frt Susp_Kin_SK ARB LH/ARB_LH Rot Kin Plane
- Plane 3: -
- Plane 4: -
- ☐ Angle driven
- ☒ Null Offset
- ☐ Centered
-



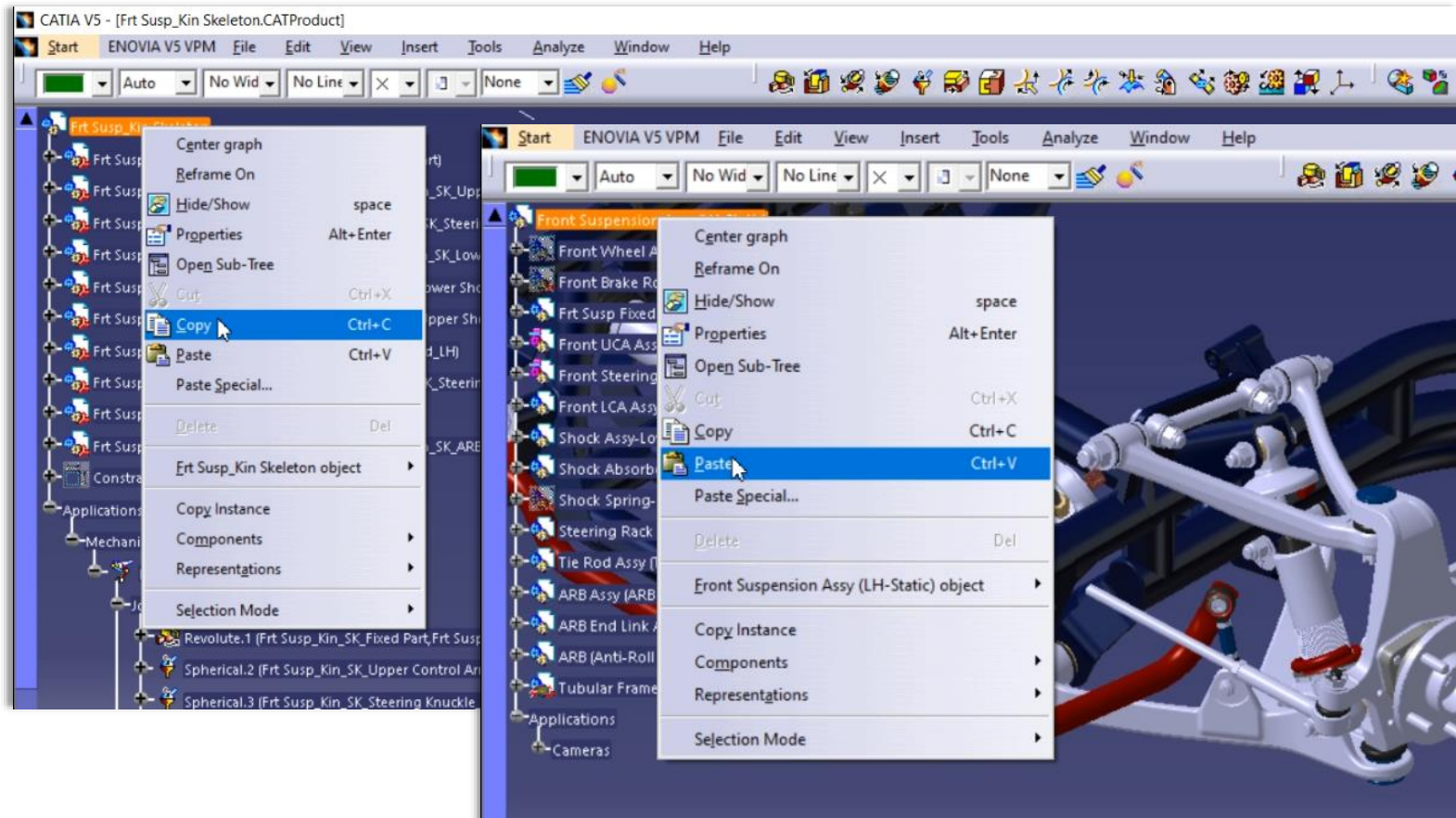
Step 4: Link the Kinematic Skeleton to the Main parts assembly via Mechanism Dressup

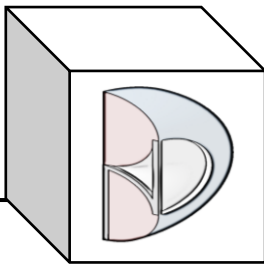


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- Copy the skeleton product and paste it into the suspension parts assembly.

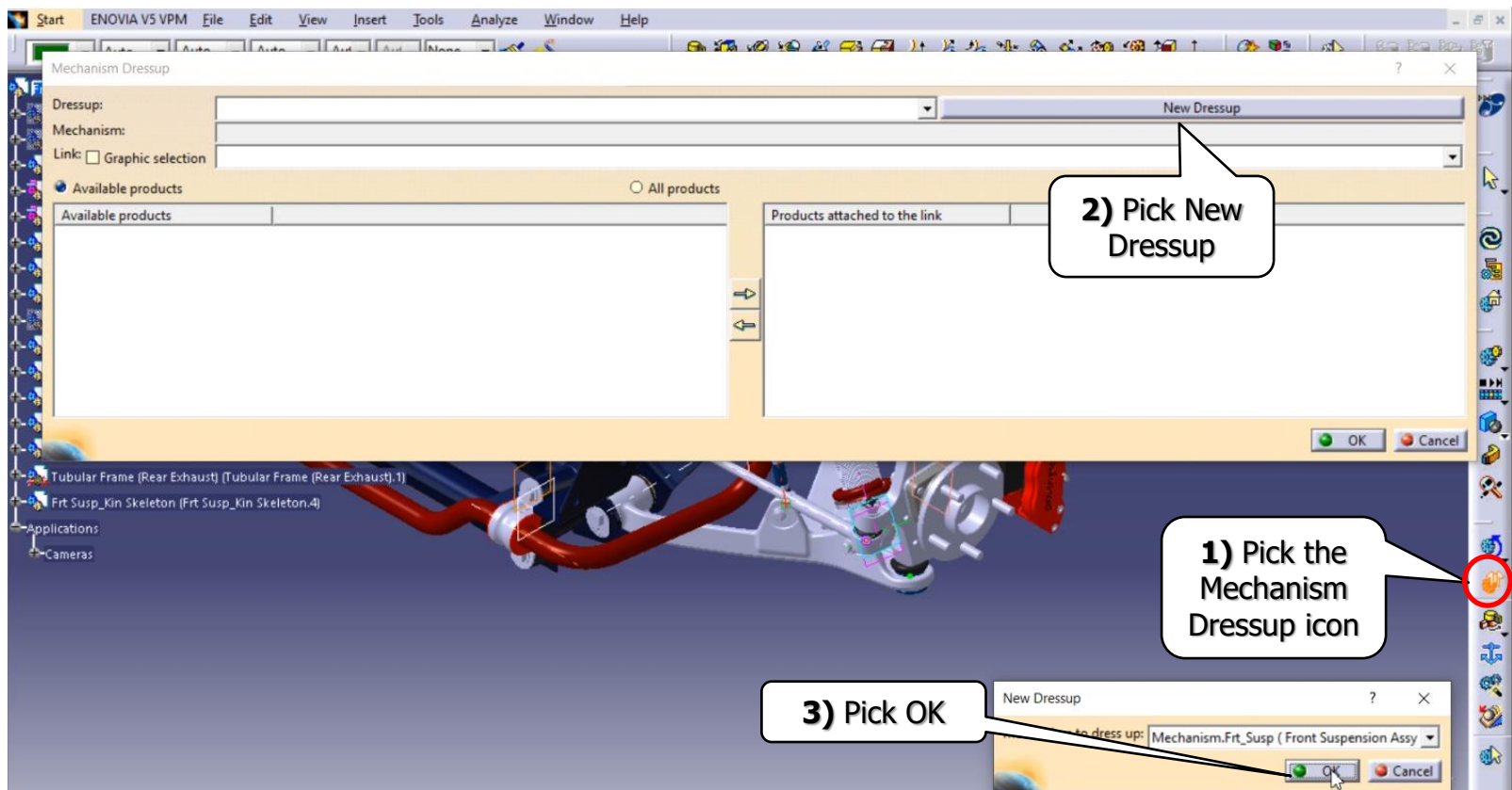


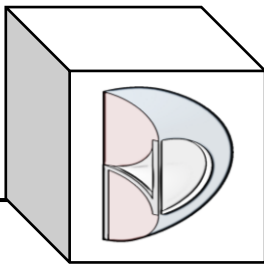


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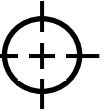


- Link the parts to the kinematic skeleton using Mechanism Dressup.

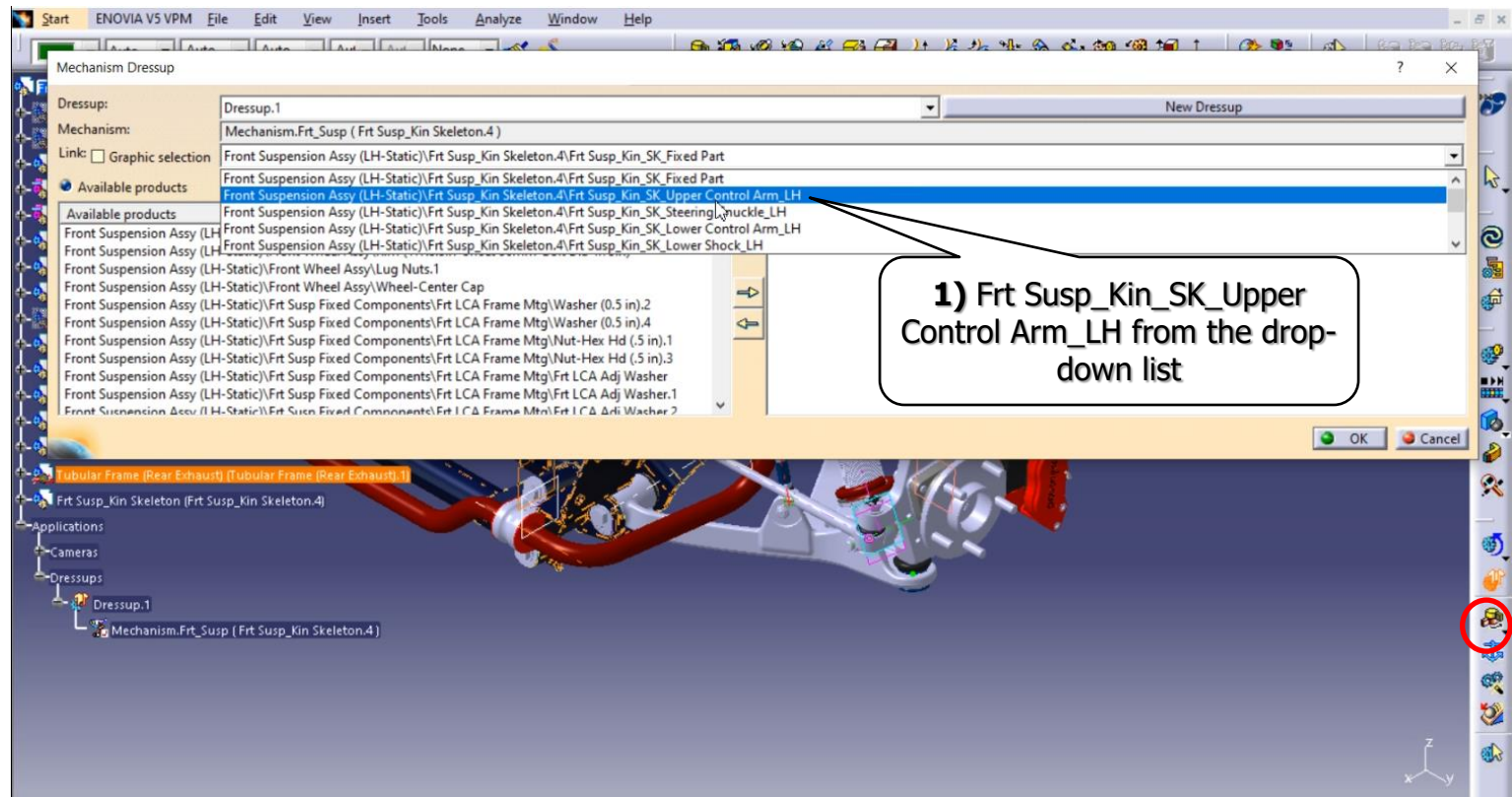


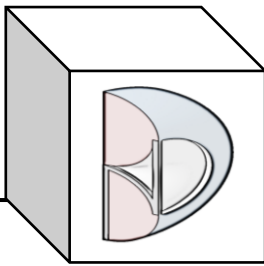


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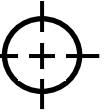


- Step A: Choose Frt Susp_Kin_SK_Upper Control Arm_LH from the drop-down list.

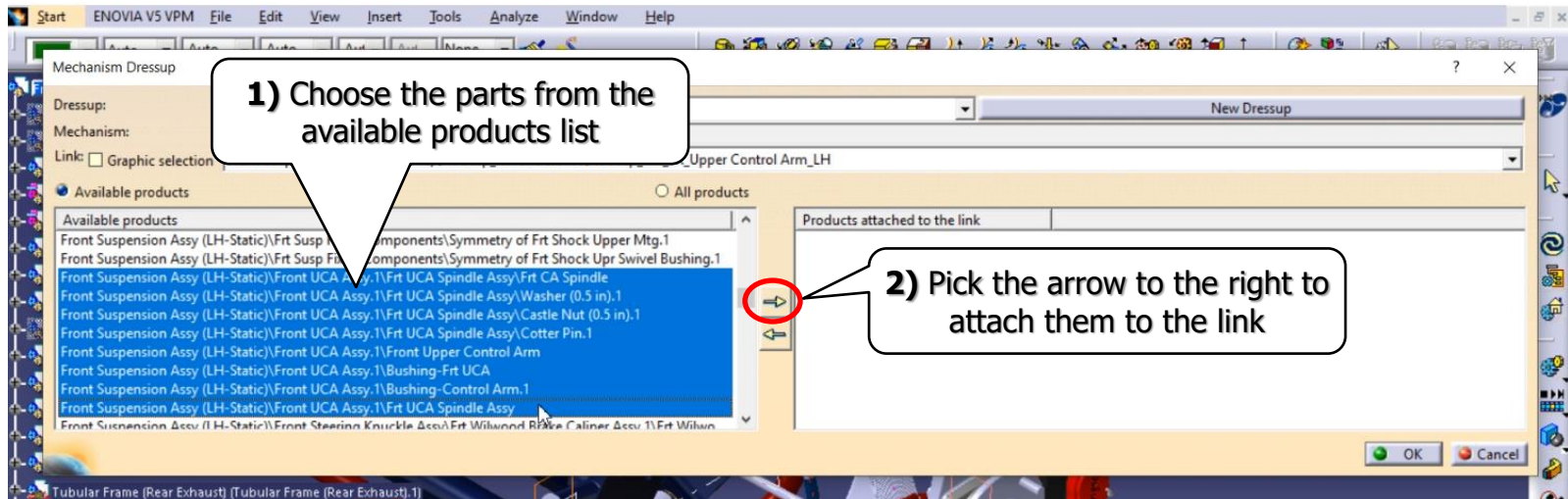




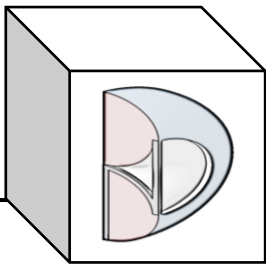
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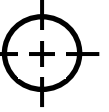
- Step B: Choose the parts from the available products list and pick the arrow to the right to attach them to the link.



- Repeat Steps A & B until all the links on the drop-down list have been attached to the available products.



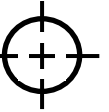
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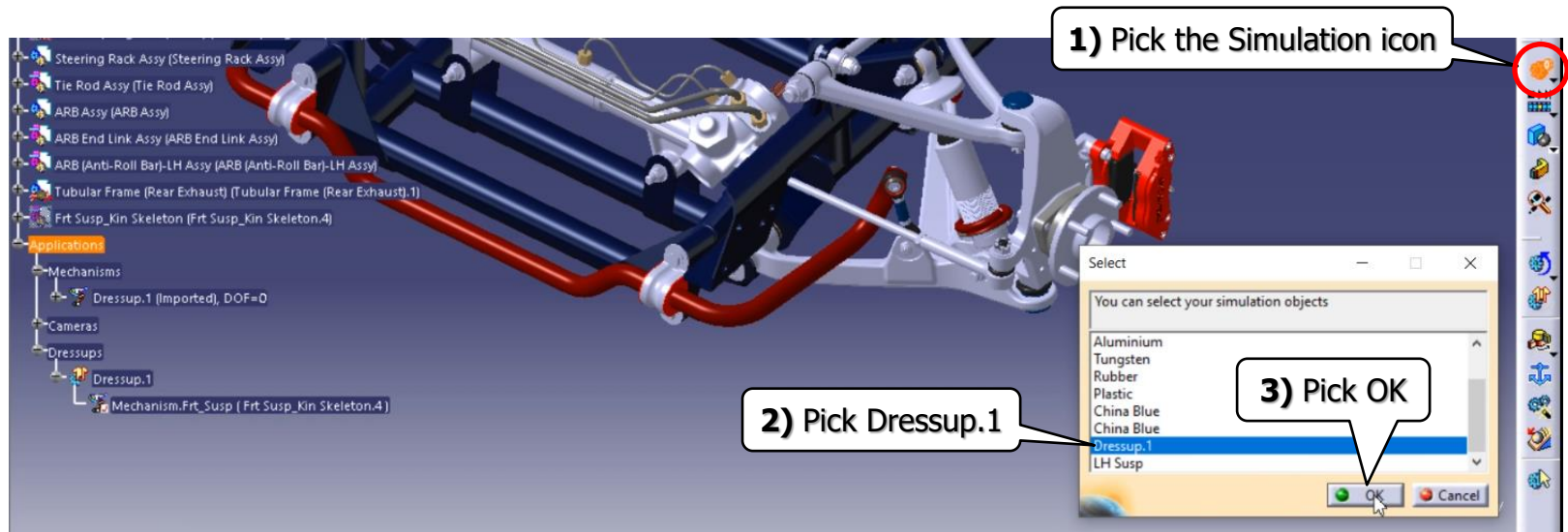
Step 5: Create and Save a Kinematic Simulation

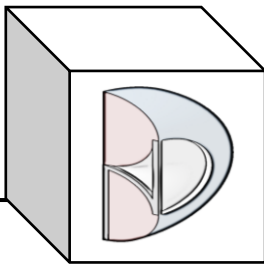


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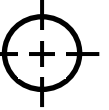


- At this point we can run a simulation and see that all parts are now moving according to the kinematic mechanism.

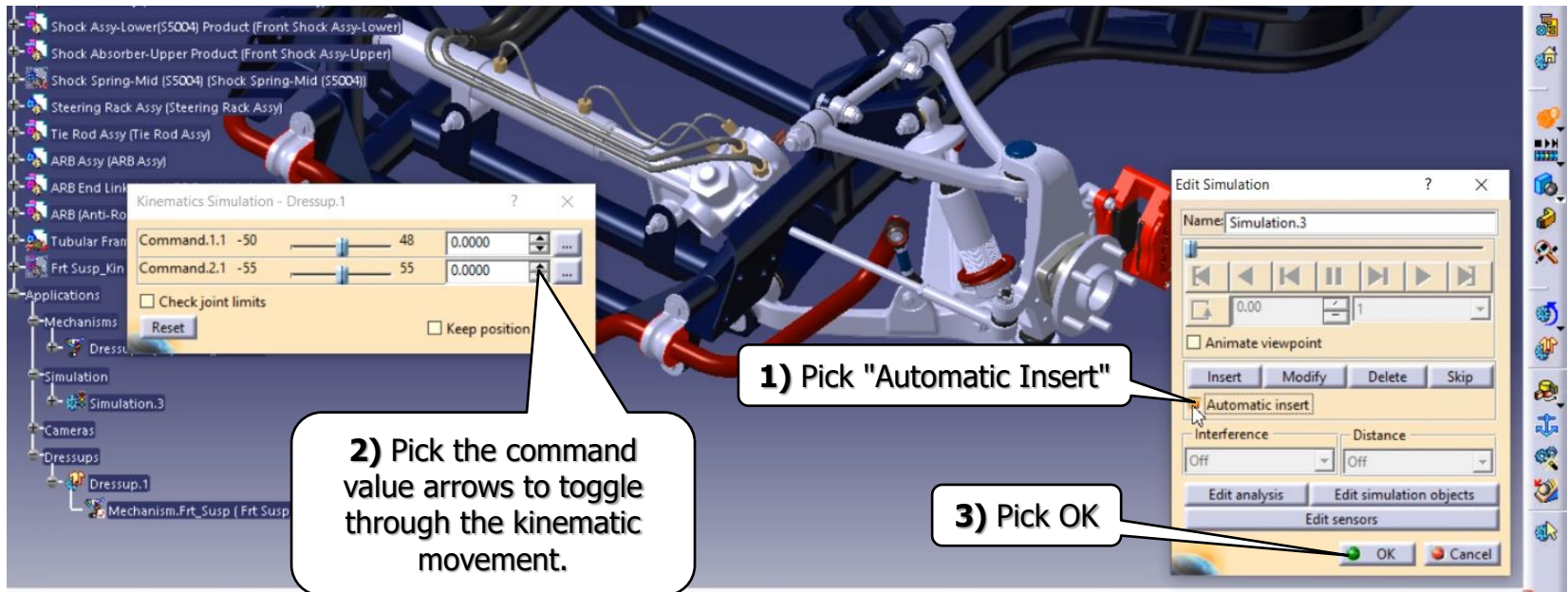


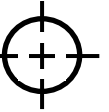


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- Create a simulation which can be stored and run automatically.



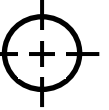
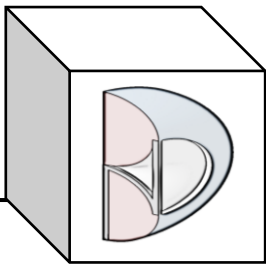


- Run the Simulation.

1) Double-click on the simulation stored in the tree

2) Pick on the play arrow to run the simulation automatically

3) Pick OK



- Conclusion:

This is an example of how to create a CATIA DMU Kinematic simulation for a front independent suspension.

We hope this will help those who need this type of simulation.

As always, we are open to any discussions this may bring.

Please ***subscribe*** to our YouTube channel!

