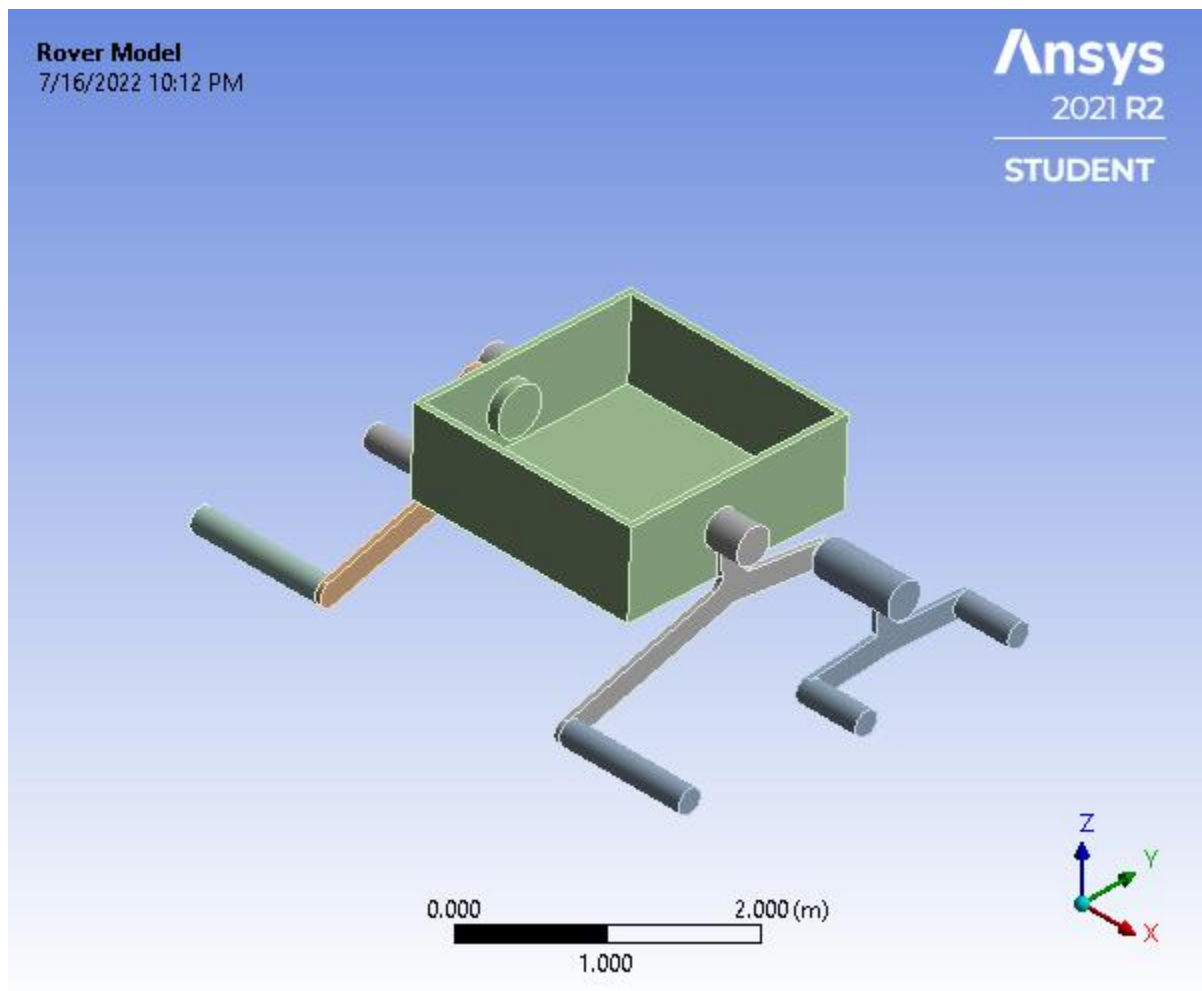




## MCA Rover Suspension Analysis

First Saved	Saturday, July 16, 2022
Last Saved	Saturday, July 16, 2022
Product Version	2021 R2
Save Project Before Solution	No
Save Project After Solution	No



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## Units

TABLE 1

Unit System	Metric (m, kg, N, s, V, A) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

## Rover Model (B4)

### Geometry

TABLE 2  
Rover Model (B4) > Geometry

Object Name	<i>Geometry</i>
State	Fully Defined
<b>Definition</b>	
Source	C:\Users\roger\Desktop\MCA Rover Suspension_files\dp0\Geom\DM\Geom.scdoc
Type	SpaceClaim
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color
<b>Bounding Box</b>	

Length X	4.5 m
Length Y	3.2749 m
Length Z	1.5955 m
<b>Properties</b>	
Volume	0.86786 m <sup>3</sup>
Mass	3114.1 kg
Scale Factor Value	1.
<b>Statistics</b>	
Bodies	9
Active Bodies	9
Nodes	62735
Elements	19939
Mesh Metric	None
<b>Update Options</b>	
Assign Default Material	No
<b>Basic Geometry Options</b>	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	Yes
Parameters	Independent
Parameter Key	
Attributes	Yes
Attribute Key	
Named Selections	Yes
Named Selection Key	
Material Properties	Yes
<b>Advanced Geometry Options</b>	
Use Associativity	Yes
Coordinate Systems	Yes
Coordinate System Key	
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

**TABLE 3**  
**Rover Model (B4) > Geometry > Parts**

Object Name	Back Link 1	Back Link 2	Body	Front Link Chassis 1	Front Link Leg 1	Front Link Connector 1	Front Link Chassis 2	Front Link Leg 2	Front Link Connector 2
State	Meshed								
Graphics Properties									
Visible	Yes								
Transparency	1								
Definition									
Suppressed	No								
Stiffness Behavior	Flexible								
Coordinate System	Default Coordinate System								
Reference Temperature	By Environment								
Treatment	None								
Material									
Assignment	Titanium Alloy		Aluminum Alloy	Titanium Alloy					
Nonlinear Effects	Yes								
Thermal Strain Effects	Yes								
Bounding Box									
Length X	1.05 m		2. m	0.4 m	1.15 m	0.7 m	0.4 m	1.1 m	0.65 m
Length Y	1.6466 m	1.6015 m	2.0314 m	2.5765 m	0.20824 m		2.5771 m	0.20836 m	
Length Z	0.8121 m	0.70205 m	0.8383 m	1.1293 m	0.20824 m		1.1309 m	0.20836 m	
Properties									
Volume	7.9347e-002 m³		0.484 m³	5.6035e-002 m³	3.6128e-002 m³	2.1991e-002 m³	5.6035e-002 m³	3.4558e-002 m³	2.042e-002 m³
Mass	366.58 kg		1340.7 kg	258.88 kg	166.91 kg	101.6 kg	258.88 kg	159.66 kg	94.342 kg
Centroid X	-2.5877 m	0.96844 m	-0.75961 m	-1.872 m	-2.4846 m	-2.2596 m	0.32796 m	0.89036 m	0.66537 m
Centroid Y	2.0054e-003 m	2.1073e-002 m	-0.67056 m	-0.96783 m	-2.3061 m	2.0726e-002 m	-0.96765 m	-2.3055 m	2.1091e-002 m
Centroid Z	0.70663 m	0.7065 m	1.4138 m	1.2649 m	0.71456 m	0.97426 m	1.2648 m	0.7136 m	0.97477 m
Moment of Inertia Ip1	94.596 kg·m²		742.4 kg·m²	93.268 kg·m²	0.82894 kg·m²	0.50581 kg·m²	93.268 kg·m²	0.79342 kg·m²	0.4699 kg·m²
Moment of Inertia Ip2	40.846 kg·m²		762.2 kg·m²	19.016 kg·m²	18.745 kg·m²	4.3922 kg·m²	19.016 kg·m²	16.443 kg·m²	3.5498 kg·m²
Moment of Inertia Ip3	120.38 kg·m²		1350.7 kg·m²	77.775 kg·m²	18.744 kg·m²	4.3922 kg·m²	77.775 kg·m²	16.443 kg·m²	3.5497 kg·m²
Statistics									
Nodes	6057		8123	1551	5836	12315	1551	7152	14093
Elements	3105		3926	682	1188	2666	682	1485	3100
Mesh Metric	None								
CAD Attributes									
PartTolerance:	0.00000001								

**TABLE 4**  
**Rover Model (B4) > Materials**

Object Name	<i>Materials</i>
State	Fully Defined
<b>Statistics</b>	
Materials	3
Material Assignments	0

## Coordinate Systems

**TABLE 5**  
**Rover Model (B4) > Coordinate Systems > Coordinate System**

Object Name	<i>Global Coordinate System</i>
State	Fully Defined
<b>Definition</b>	
Type	Cartesian
Coordinate System ID	0.
<b>Origin</b>	
Origin X	0. m
Origin Y	0. m
Origin Z	0. m
<b>Directional Vectors</b>	
X Axis Data	[ 1. 0. 0. ]
Y Axis Data	[ 0. 1. 0. ]
Z Axis Data	[ 0. 0. 1. ]

## Connections

**TABLE 6**  
**Rover Model (B4) > Connections**

Object Name	<i>Connections</i>
State	Fully Defined
<b>Auto Detection</b>	
Generate Automatic Connection On Refresh	Yes
<b>Transparency</b>	
Enabled	Yes

**TABLE 7**  
**Rover Model (B4) > Connections > Contacts**

Object Name	<i>Contacts</i>
State	Fully Defined
<b>Definition</b>	
Connection Type	Contact
<b>Scope</b>	
Scoping Method	Geometry Selection
Geometry	All Bodies

Auto Detection	
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	1.4474e-002 m
Use Range	No
Face/Face	Yes
Face-Face Angle Tolerance	75. °
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	8
Active Connections	8

**TABLE 8**  
**Rover Model (B4) > Connections > Contacts > Contact Regions**

Object Name	Contact Region	Contact Region 2	Contact Region 3	Contact Region 4	Contact Region 5	Contact Region 6	Contact Region 1789	Contact Region 1790
State	Fully Defined							
Scope								
Scoping Method	Geometry Selection							
Contact	2 Faces				1 Face			
Target	2 Faces				1 Face			
Contact Bodies	Back Link 1	Back Link 2	Body		Front Link Chassis 1		Front Link Chassis 2	
Target Bodies	Front Link Connector 1	Front Link Connector 2	Front Link Chassis 1	Front Link Chassis 2	Front Link Leg 1	Front Link Connector 1	Front Link Leg 2	Front Link Connector 2
Protected	No							
Definition								
Type	Bonded							
Scope Mode	Automatic							
Behavior	Program Controlled							
Trim Contact	Program Controlled							
Trim Tolerance	1.4474e-002 m							
Suppressed	No							
Advanced								
Formulation	Program Controlled							
Small Sliding	Program Controlled							
Detection Method	Program Controlled							

Penetration Tolerance	Program Controlled
Elastic Slip Tolerance	Program Controlled
Normal Stiffness	Program Controlled
Update Stiffness	Program Controlled
Pinball Region	Program Controlled
<b>Geometric Modification</b>	
Contact Geometry Correction	None
Target Geometry Correction	None

## ***Mesh Adaptive Relevance 4***

**TABLE 9**  
**Rover Model (B4) > Mesh**

Object Name	<i>Mesh Adaptive Relevance 4</i>
State	Solved
<b>Display</b>	
Display Style	Use Geometry Setting
<b>Defaults</b>	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	Default
<b>Sizing</b>	
Use Adaptive Sizing	Yes
Resolution	4
Mesh Defeaturing	Yes
Defeature Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Diagonal	5.7897 m
Average Surface Area	0.29906 m <sup>2</sup>
Minimum Edge Length	1.4118e-002 m
<b>Quality</b>	
Check Mesh Quality	Yes, Errors
Error Limits	Aggressive Mechanical
Target Quality	Default (0.050000)
Smoothing	Medium
Mesh Metric	None
<b>Inflation</b>	
Use Automatic Inflation	None

Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	5
Growth Rate	1.2
Inflation Algorithm	Pre
View Advanced Options	No
<b>Advanced</b>	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	No
Rigid Body Behavior	Dimensionally Reduced
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
<b>Statistics</b>	
Nodes	62735
Elements	19939

## Suspension Structural Analysis (B5)

**TABLE 10**  
**Rover Model (B4) > Analysis**

Object Name	<i>Suspension Structural Analysis (B5)</i>
State	Solved
<b>Definition</b>	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL
<b>Options</b>	
Environment Temperature	93. °C
Generate Input Only	No

**TABLE 11**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Analysis Settings**

Object Name	<i>Analysis Settings</i>
State	Fully Defined
<b>Restart Analysis</b>	
Restart Type	Program Controlled
Status	Done
<b>Step Controls</b>	
Number Of Steps	1.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	Program Controlled
<b>Solver Controls</b>	
Solver Type	Program Controlled
Weak Springs	Off
Solver Pivot Checking	Program Controlled



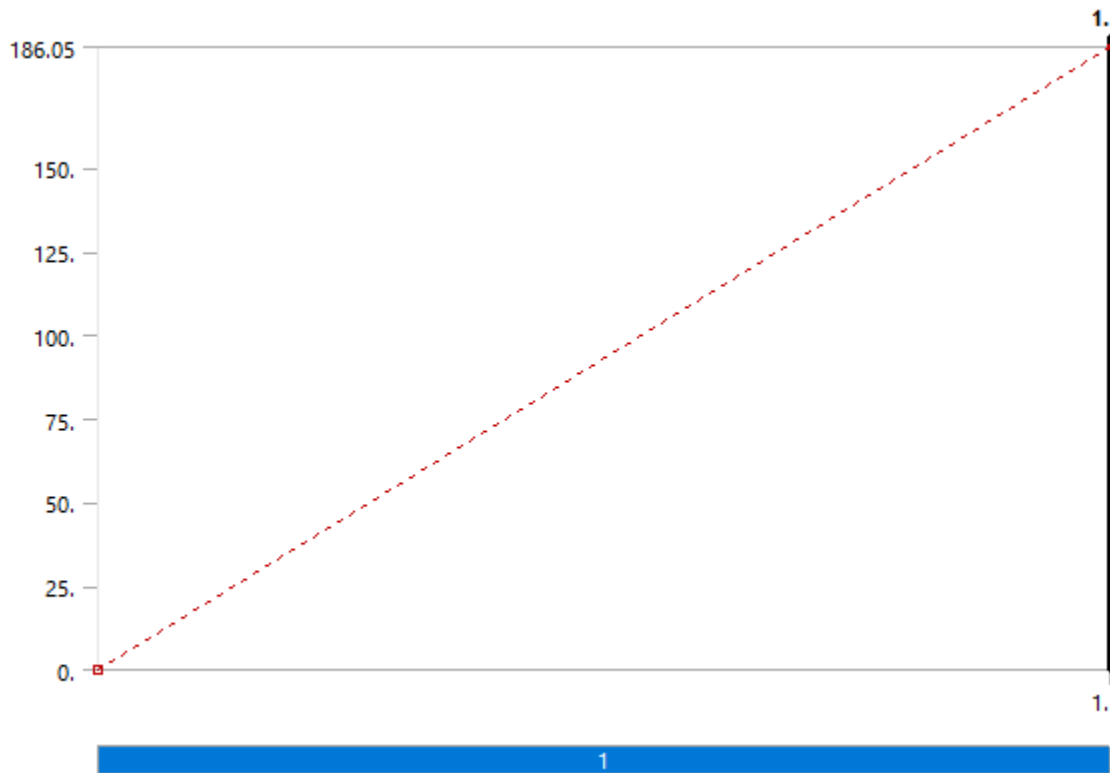
Large Deflection	Off
Inertia Relief	Off
Quasi-Static Solution	Off
<b>Rotordynamics Controls</b>	
Coriolis Effect	Off
<b>Restart Controls</b>	
Generate Restart Points	Program Controlled
Retain Files After Full Solve	Yes
Combine Restart Files	Program Controlled
<b>Nonlinear Controls</b>	
Newton-Raphson Option	Program Controlled
Force Convergence	Program Controlled
Moment Convergence	Program Controlled
Displacement Convergence	Program Controlled
Rotation Convergence	Program Controlled
Line Search	Program Controlled
Stabilization	Program Controlled
<b>Advanced</b>	
Inverse Option	No
Contact Split (DMP)	Off
<b>Output Controls</b>	
Stress	Yes
Surface Stress	No
Back Stress	No
Strain	Yes
Contact Data	Yes
Nonlinear Data	No
Nodal Forces	No
Volume and Energy	Yes
Euler Angles	Yes
General Miscellaneous	No
Contact Miscellaneous	No
Store Results At	All Time Points
Result File Compression	Program Controlled
<b>Analysis Data Management</b>	
Solver Files Directory	C:\Users\roger\Desktop\MCA Rover Suspension_files\dp0\SYS\MECH\
Future Analysis	Prestressed analysis
Scratch Solver Files Directory	
Save MAPDL db	No
Contact Summary	Program Controlled
Delete Unneeded Files	Yes
Nonlinear Solution	No
Solver Units	Active System
Solver Unit System	mks

**TABLE 12**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Loads**

Object Name	<i>Weight of Rover</i>	<i>Fixed Support at Wheel Axles (Braking)</i>
State	Fully Defined	

Scope		
Scoping Method	Geometry Selection	
Geometry	1 Face	6 Faces
Definition		
Type	Force	Fixed Support
Define By	Vector	
Applied By	Direct	
Magnitude	186.05 N (ramped)	
Direction	Defined	
Suppressed	No	

**FIGURE 1**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Weight of Rover**



**FIGURE 2**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Weight of Rover > Weight Model**

### B: Suspension Structural Analysis

Weight Model

Time: 1. s

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Weight of Rover: 186.05 N  
Components:  $-1.7758 \times 10^{-13}$ , -8.2832, -185.87 N

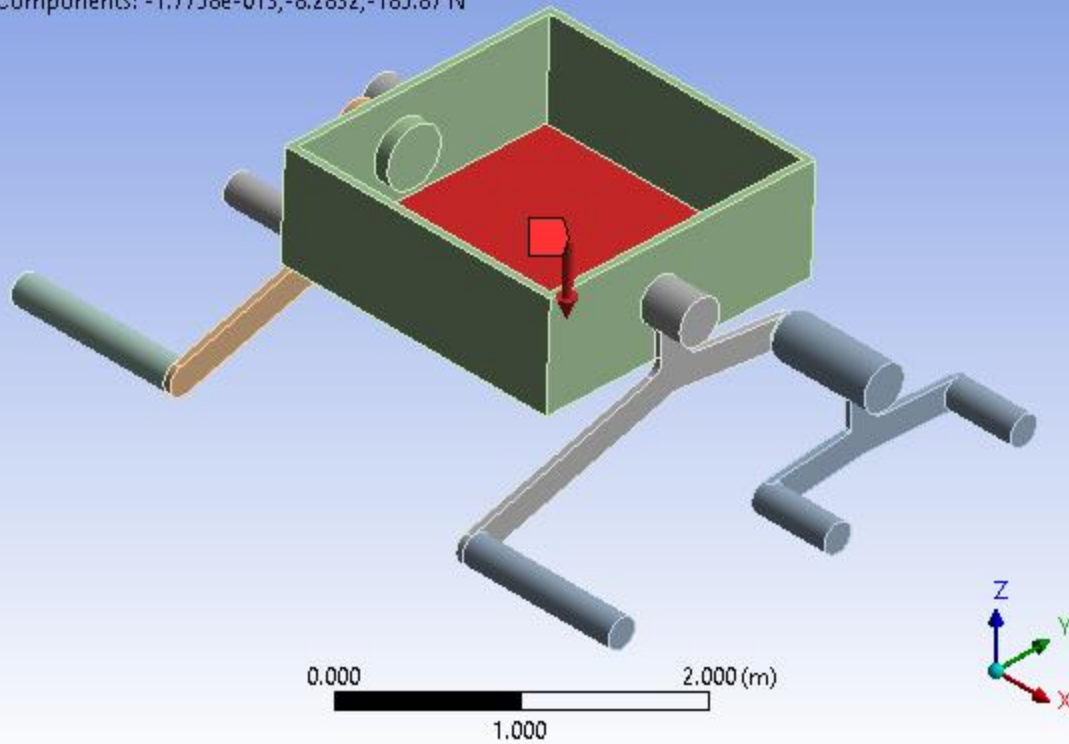
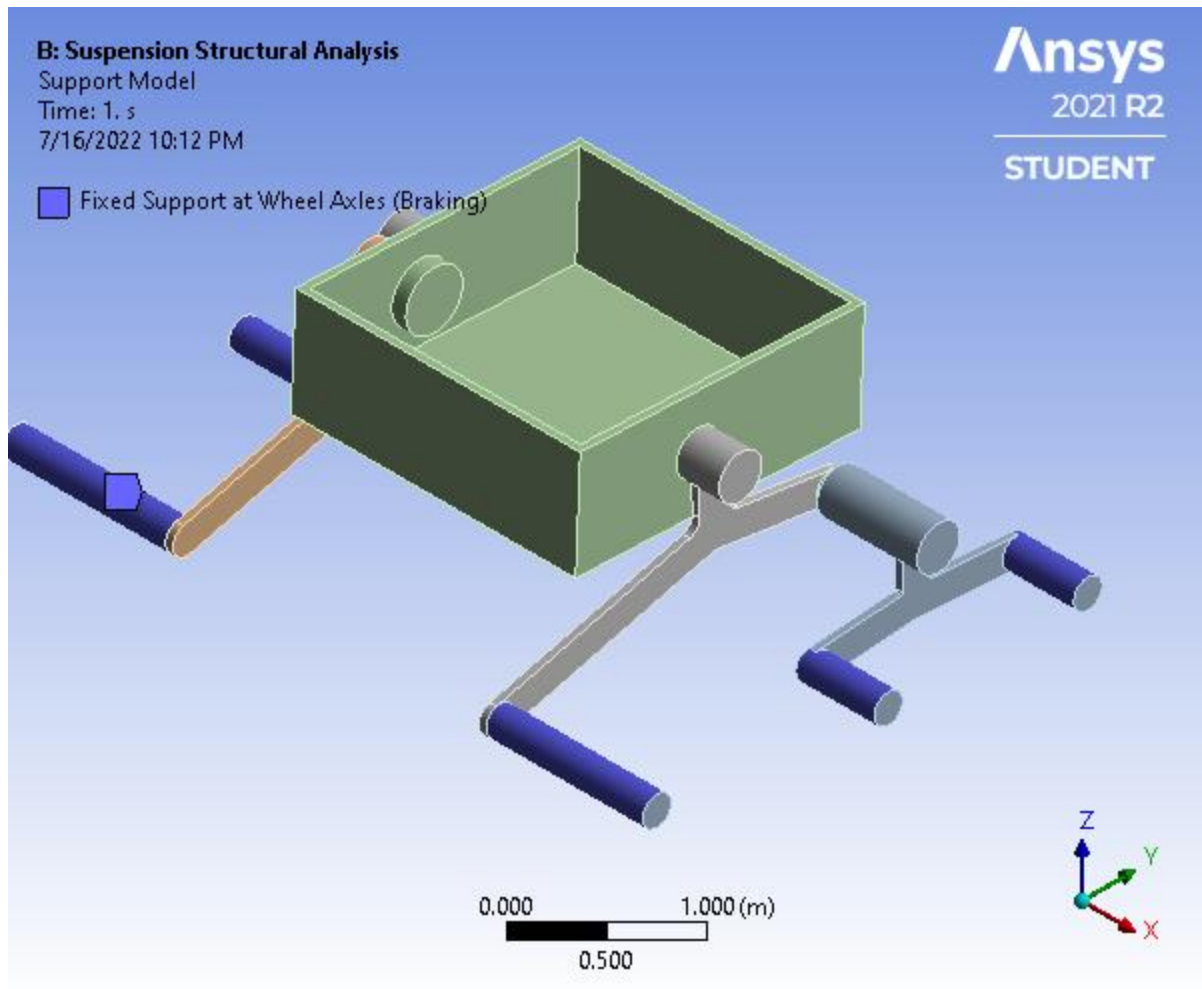


FIGURE 3

Rover Model (B4) > Suspension Structural Analysis (B5) > Fixed Support at Wheel Axles (Braking)  
> Support Model



## Solution (B6)

**TABLE 13**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution**

Object Name	<i>Solution (B6)</i>
State	Solved
<b>Adaptive Mesh Refinement</b>	
Max Refinement Loops	1.
Refinement Depth	2.
<b>Information</b>	
Status	Done
MAPDL Elapsed Time	34. s
MAPDL Memory Used	445. MB
MAPDL Result File Size	19.125 MB
<b>Post Processing</b>	
Beam Section Results	No
On Demand Stress/Strain	No

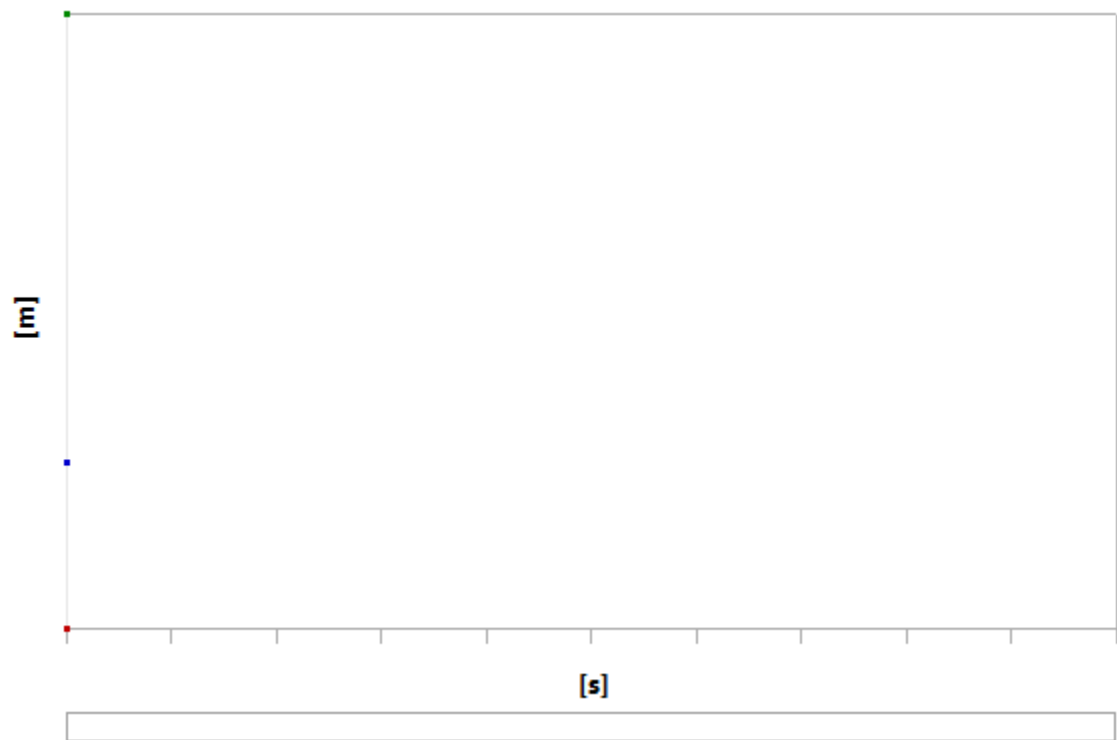
**TABLE 14**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Solution Information**

Object Name	<i>Solution Information</i>
State	Solved
<b>Solution Information</b>	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Identify Element Violations	0
Update Interval	2.5 s
Display Points	All
<b>FE Connection Visibility</b>	
Activate Visibility	Yes
Display	All FE Connectors
Draw Connections Attached To	All Nodes
Line Color	Connection Type
Visible on Results	No
Line Thickness	Single
Display Type	Lines

**TABLE 15**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Results**

Object Name	Total Deformation	Equivalent Stress
State	Solved	
Scope		
Scoping Method	Geometry Selection	
Geometry	All Bodies	
Definition		
Type	Total Deformation	Equivalent (von-Mises) Stress
By	Time	
Display Time	Last	
Calculate Time History	Yes	
Identifier		
Suppressed	No	
Results		
Minimum	0. m	1.6079e-005 Pa
Maximum	1.8507e-005 m	3.3274e+005 Pa
Average	5.0158e-006 m	8739.2 Pa
Minimum Occurs On	Back Link 1	Front Link Leg 2
Maximum Occurs On	Body	Back Link 2
Information		
Time	1. s	
Load Step	1	
Substep	1	
Iteration Number	1	
Integration Point Results		
Display Option		Averaged
Average Across Bodies		No

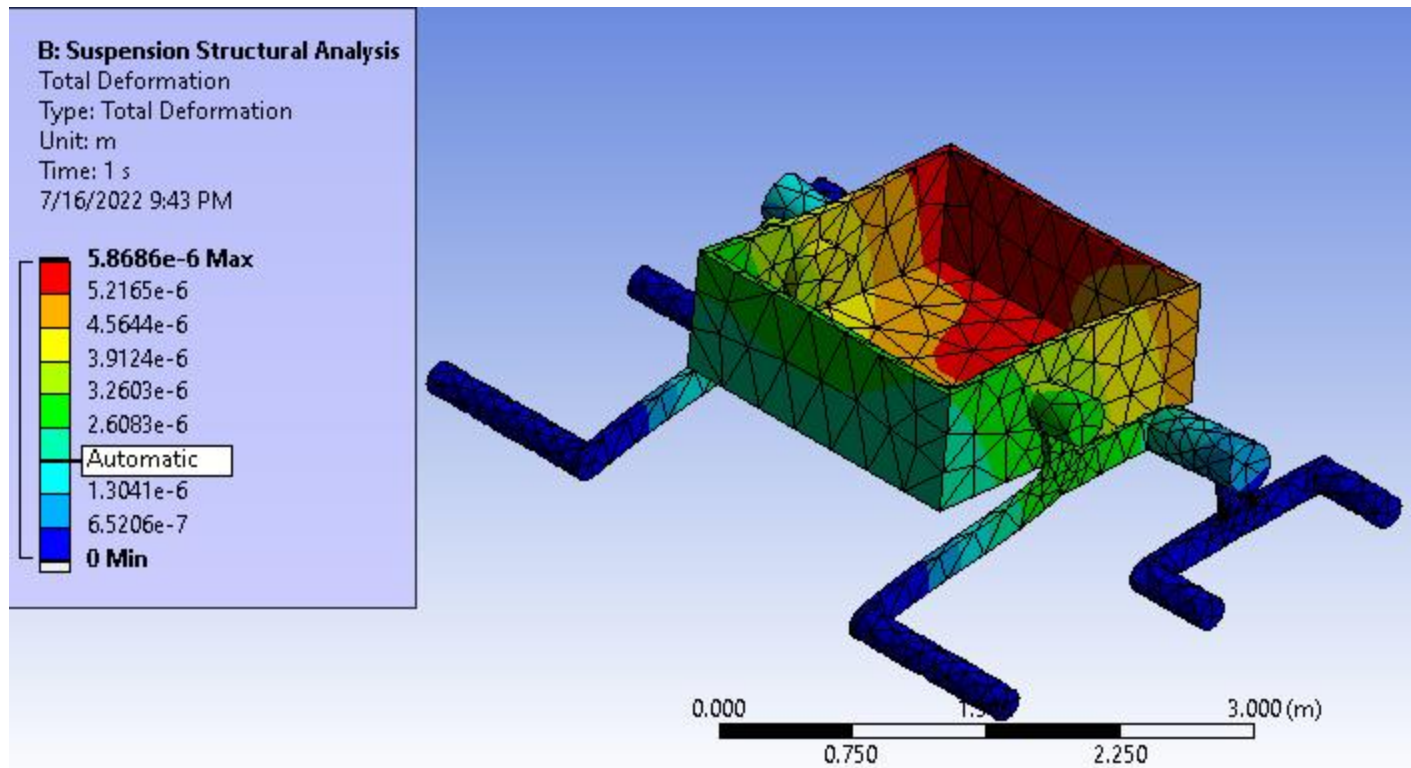
**FIGURE 4**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation**



**TABLE 16**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation**

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	1.8507e-005	5.0158e-006

**FIGURE 5**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation > Course Mesh**



**FIGURE 6**  
 Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation > Intermediate Mesh

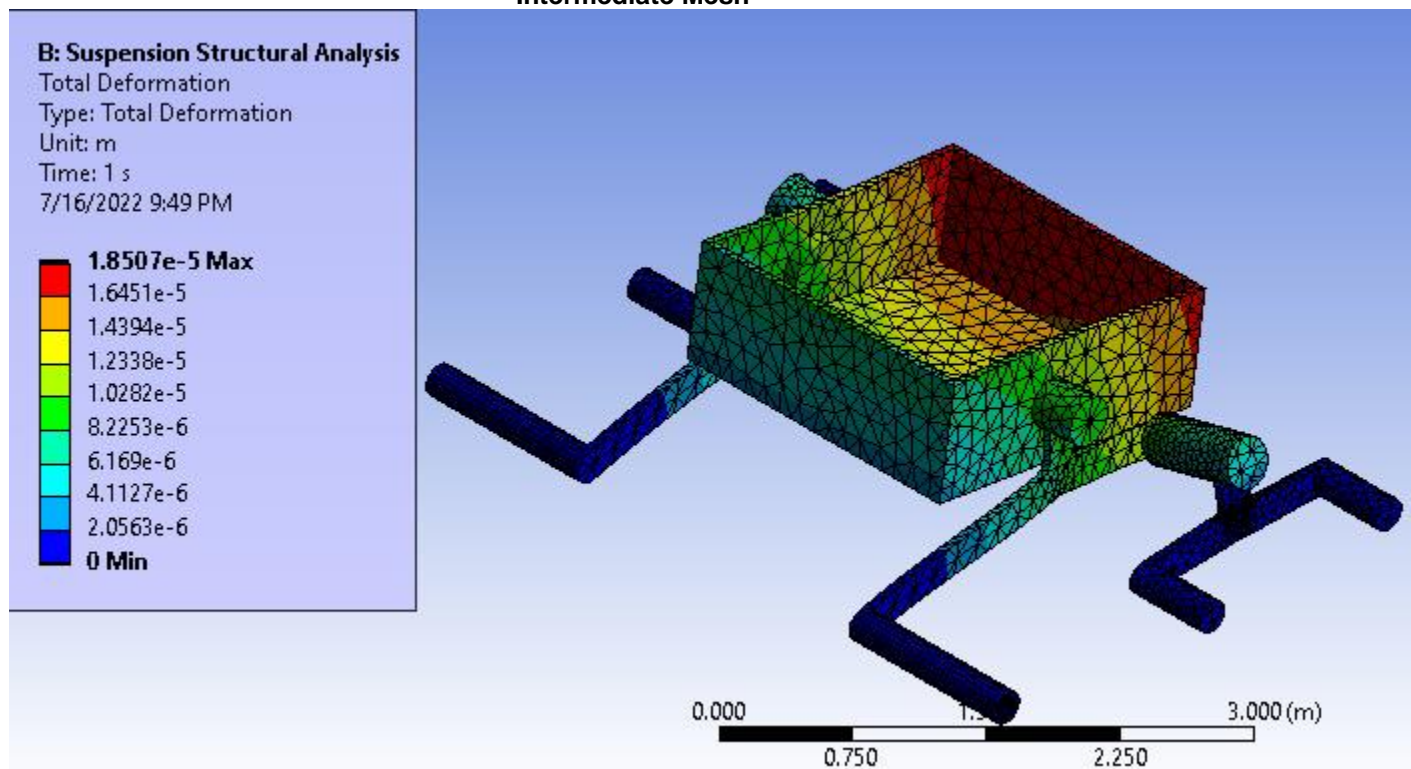


FIGURE 7  
Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation >  
Fine Mesh

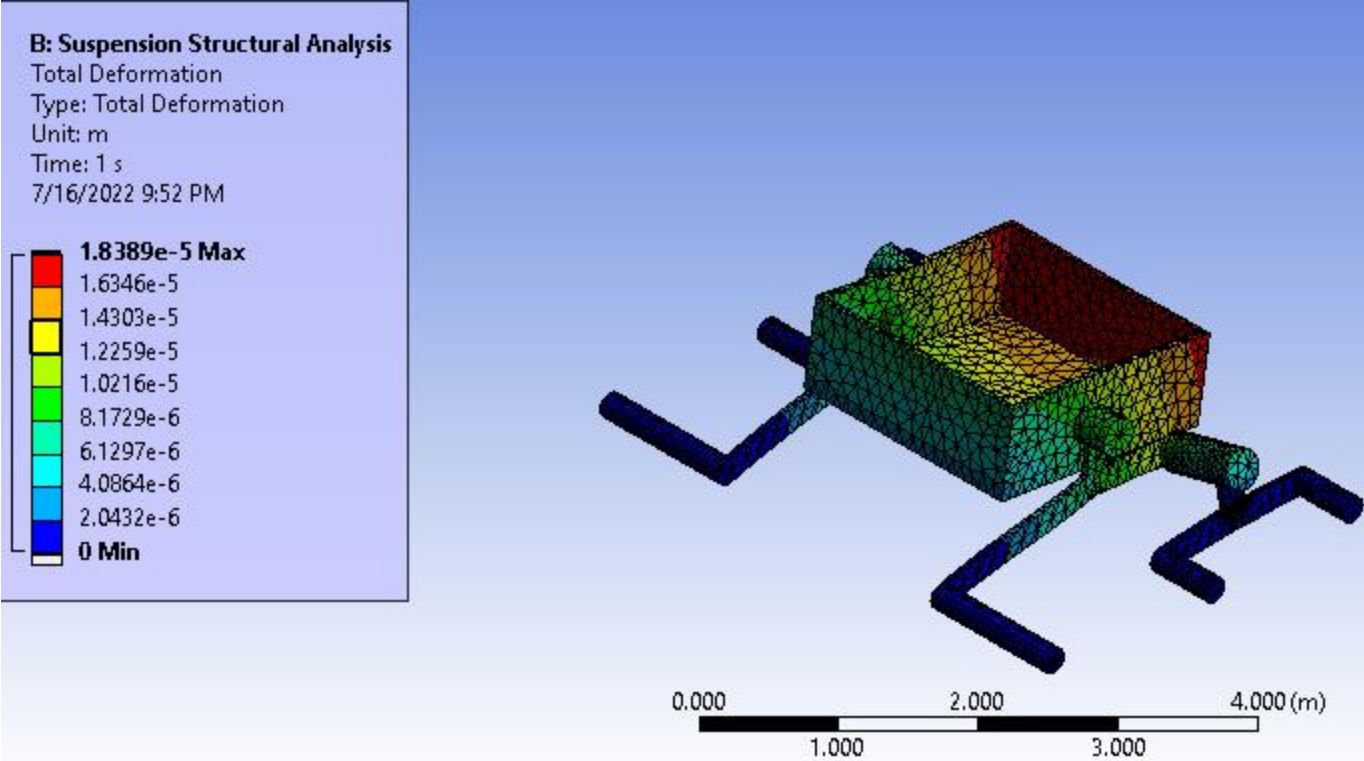


FIGURE 8  
Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation >  
Deformation Model Iso



### B: Suspension Structural Analysis

Deformation Model Iso

Type: Total Deformation

Unit: m

Time: 1 s

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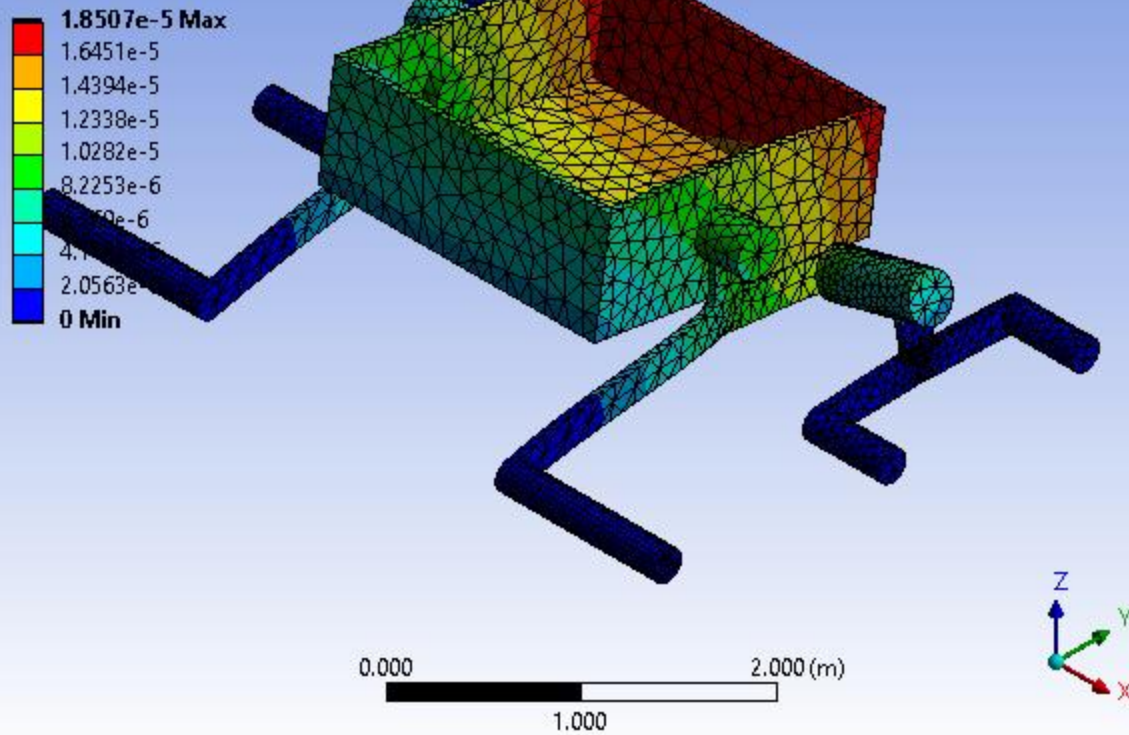
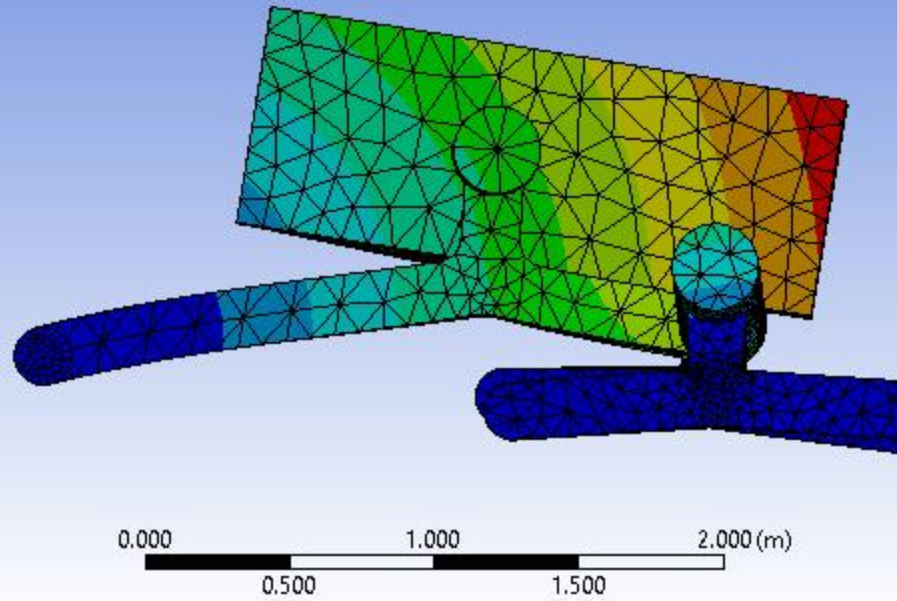
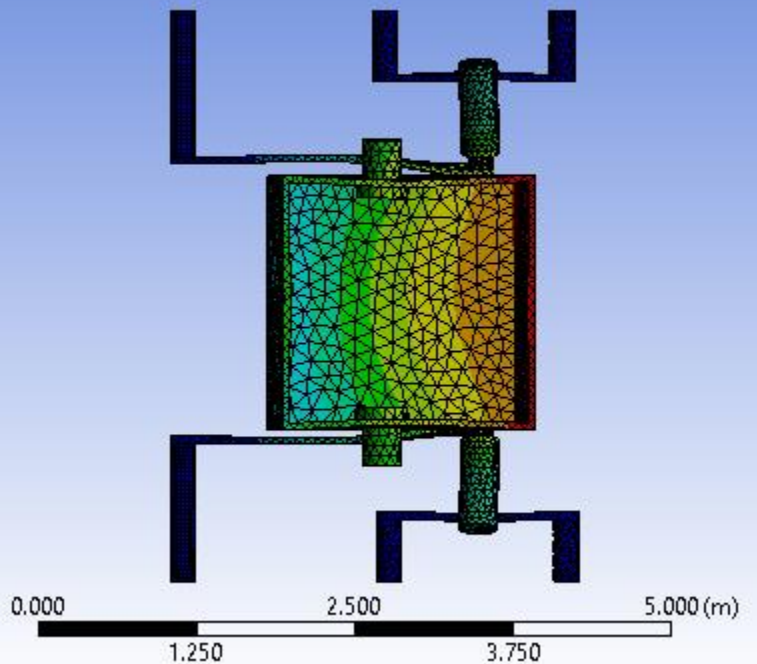
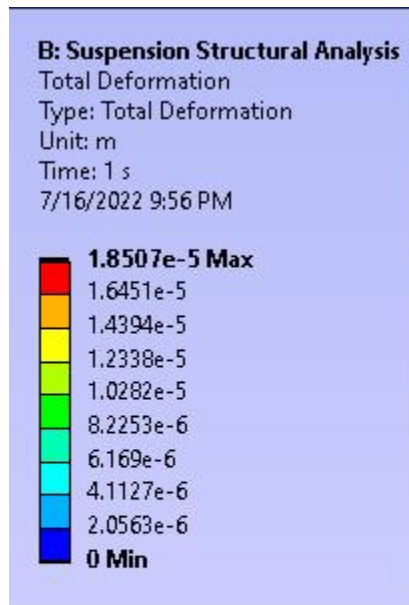


FIGURE 9

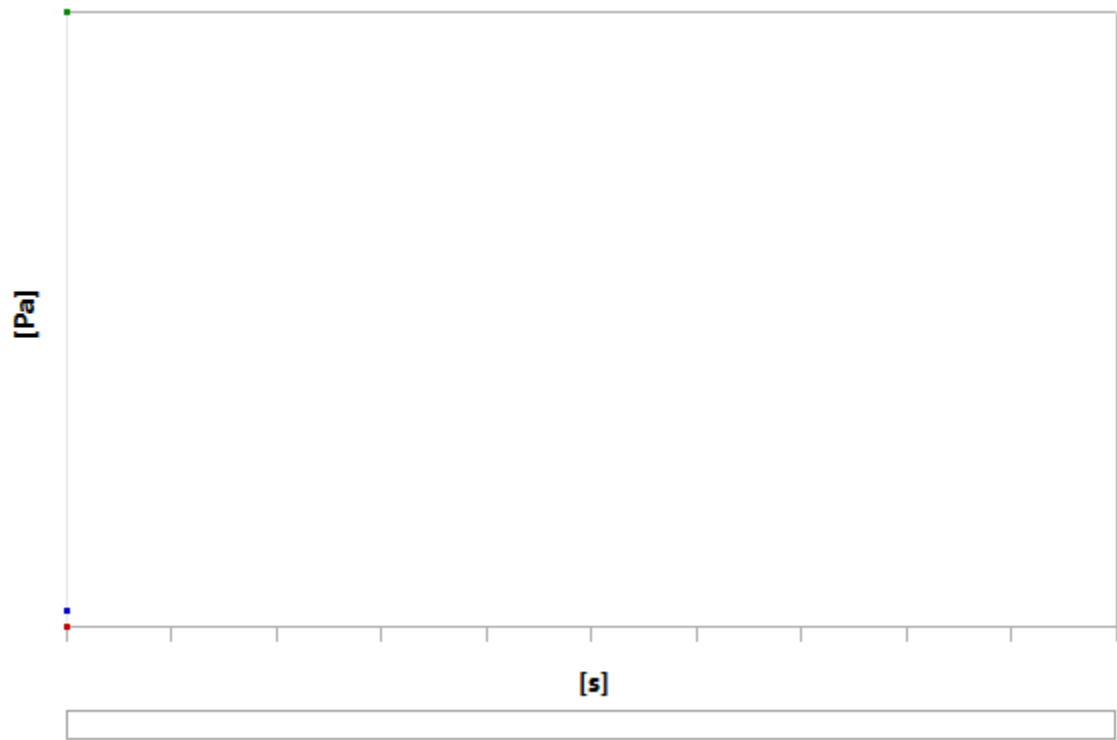
Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation > Deformation Model Side



**FIGURE 10**  
 Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Total Deformation > Deformation Model Top



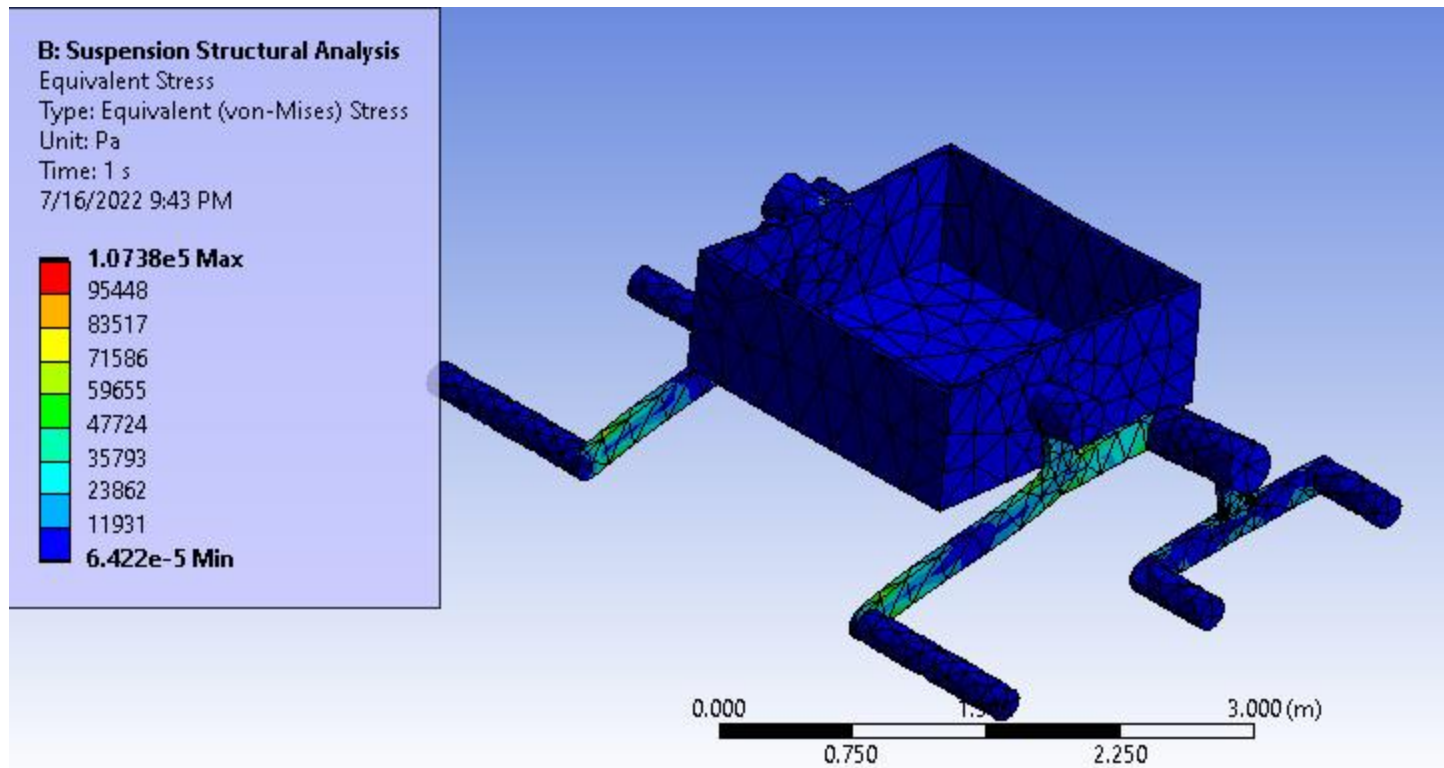
**FIGURE 11**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress**



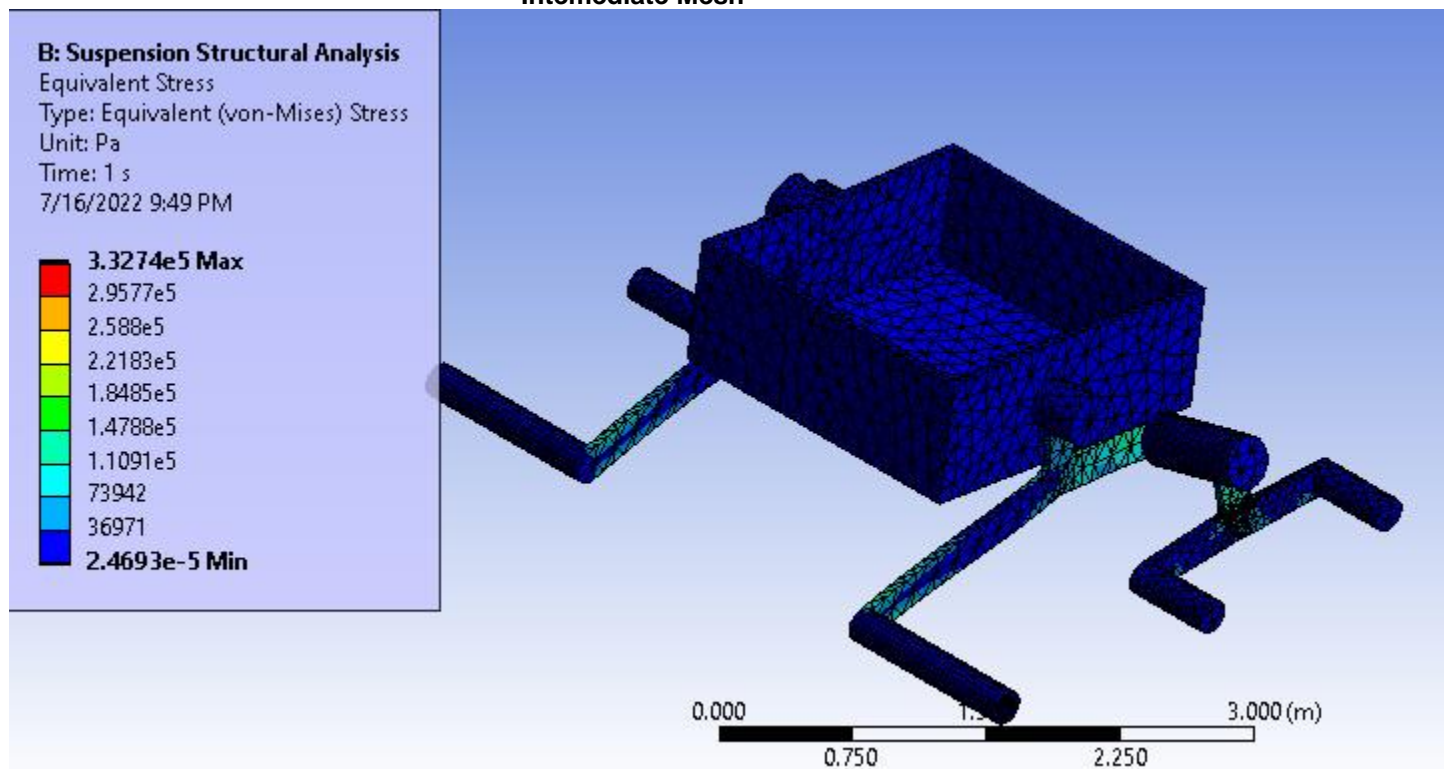
**TABLE 17**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress**

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	1.6079e-005	3.3274e+005	8739.2

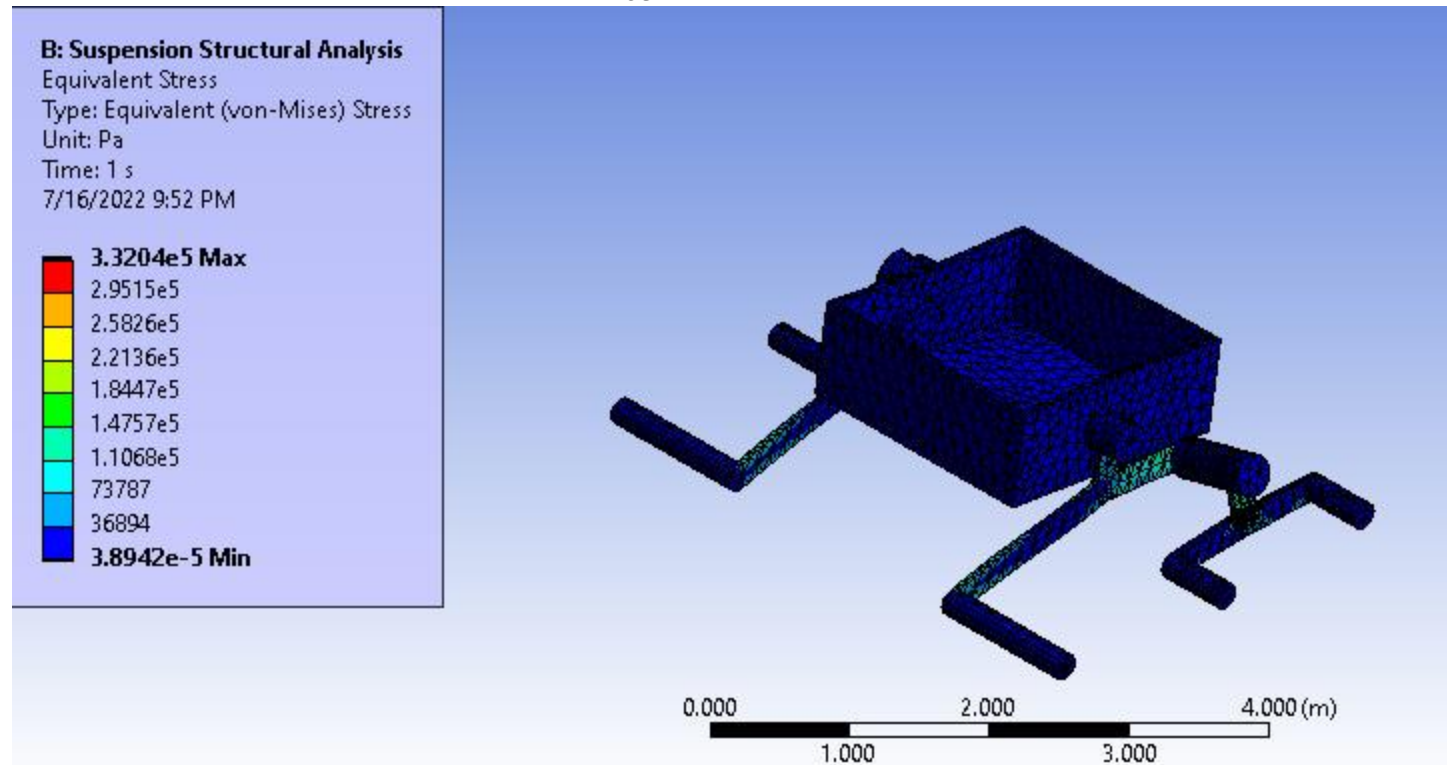
**FIGURE 12**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Course Mesh**



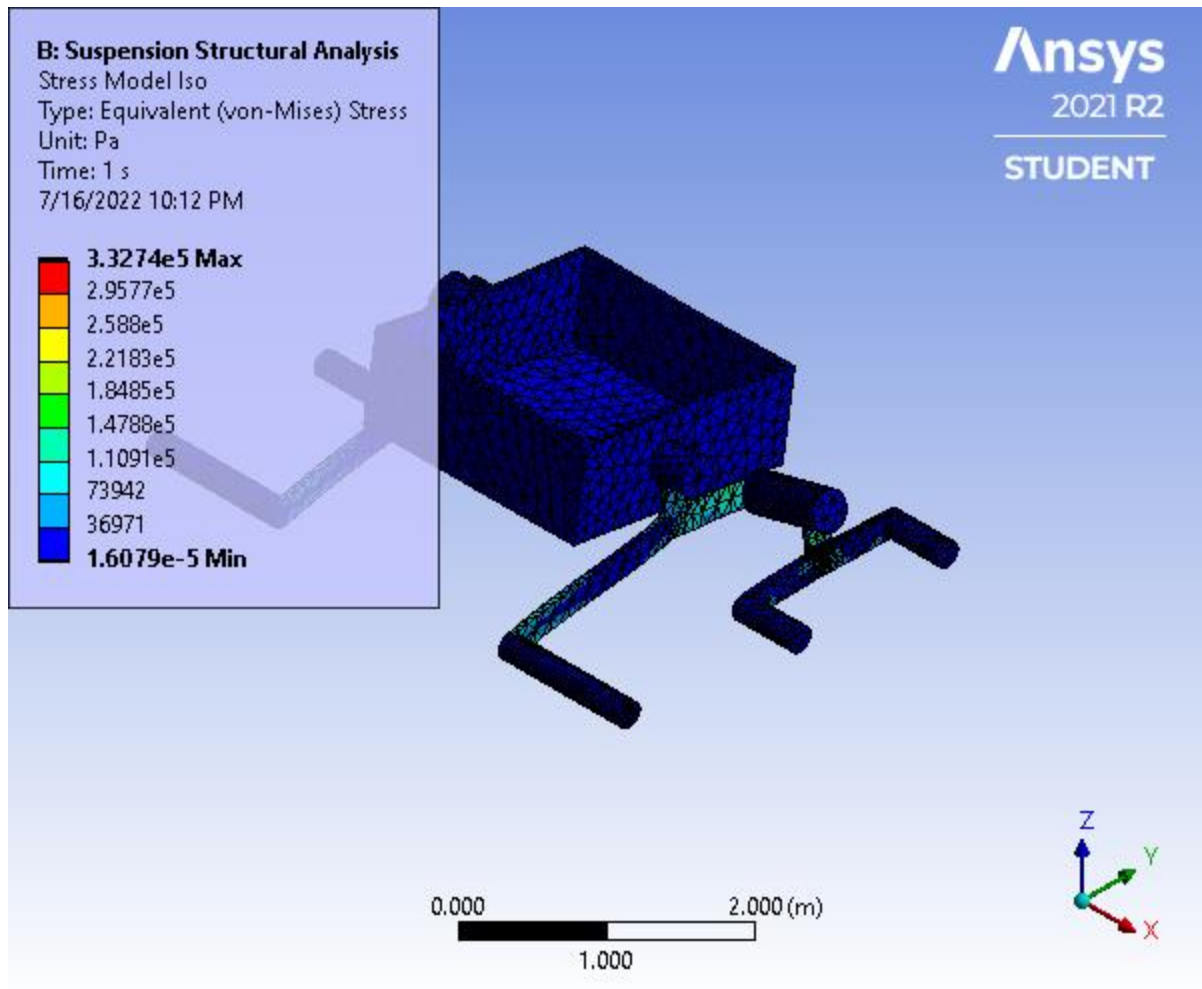
**FIGURE 13**  
 Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Intermediate Mesh



**FIGURE 14**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Fine Mesh**

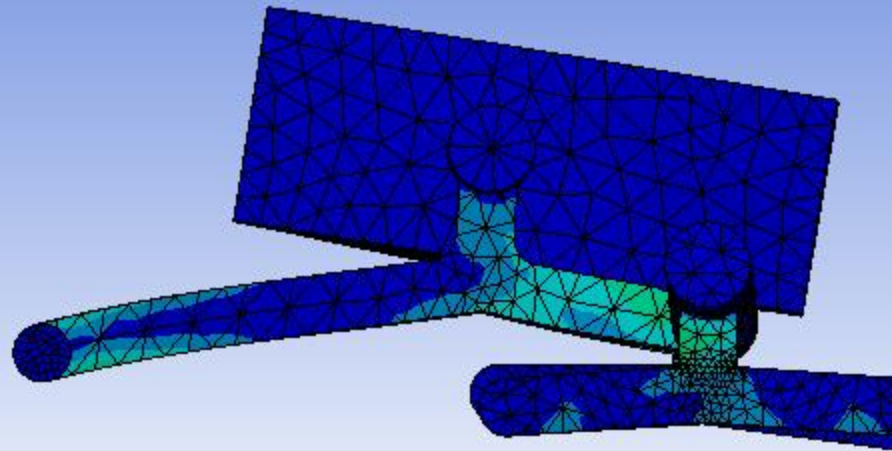
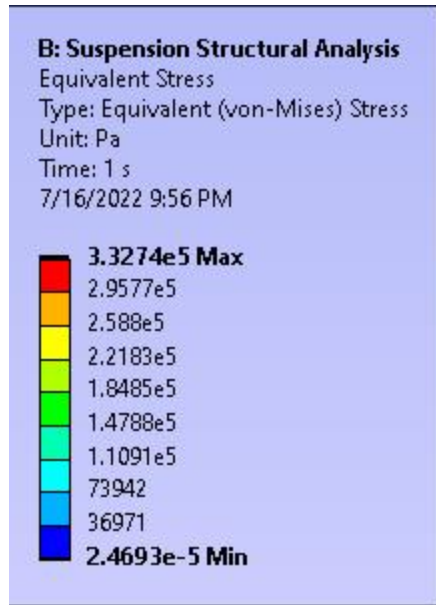


**FIGURE 15**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Stress Model Iso**



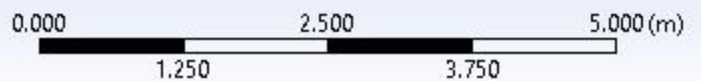
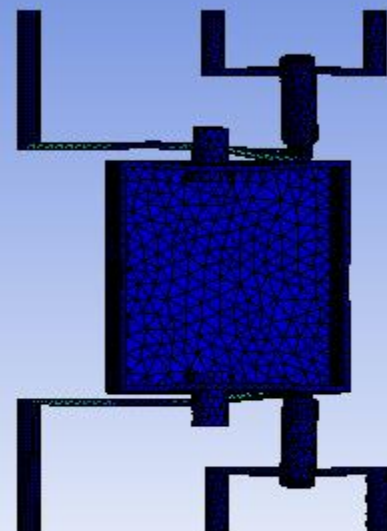
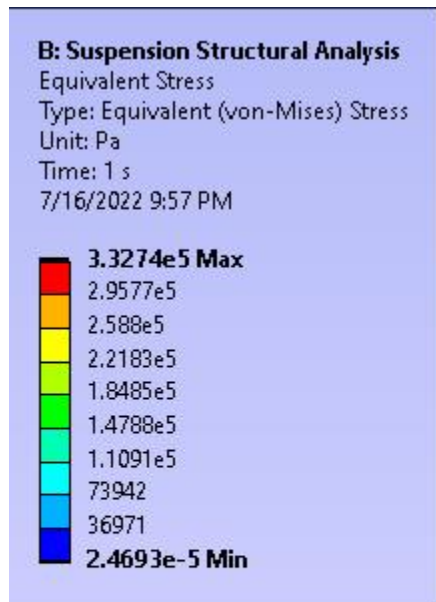
**FIGURE 16**  
Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Stress Model Side





**FIGURE 17**

**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Equivalent Stress > Stress Model Top**

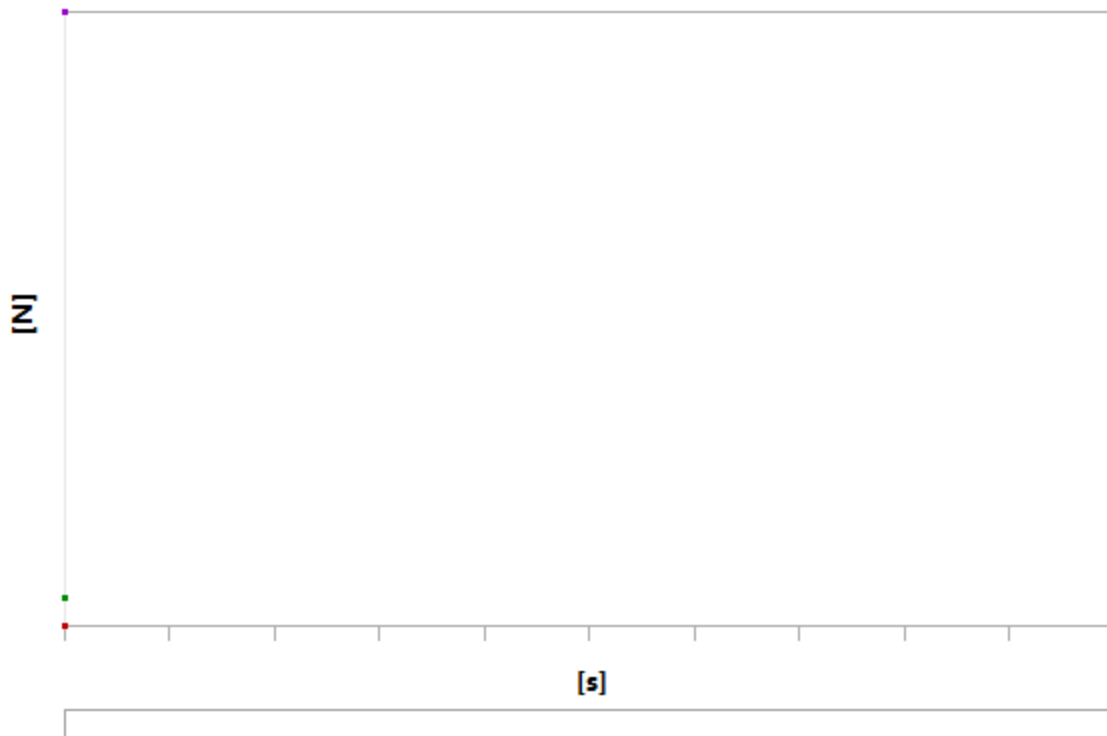


**TABLE 18**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Probes**

Object Name	<i>Force Reaction</i>
State	Solved
<b>Definition</b>	
Type	Force Reaction
Location Method	Boundary Condition
Boundary Condition	Fixed Support at Wheel Axles (Braking)
Orientation	Global Coordinate System
Suppressed	No
<b>Options</b>	
Result Selection	All
Display Time	End Time
<b>Results</b>	
X Axis	-1.9461e-004 N
Y Axis	8.2832 N
Z Axis	185.87 N
Total	186.05 N
<b>Maximum Value Over Time</b>	
X Axis	-1.9461e-004 N
Y Axis	8.2832 N
Z Axis	185.87 N
Total	186.05 N
<b>Minimum Value Over Time</b>	
X Axis	-1.9461e-004 N
Y Axis	8.2832 N
Z Axis	185.87 N
Total	186.05 N
<b>Information</b>	
Time	1. s
Load Step	1
Substep	1
Iteration Number	1

**FIGURE 18**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Force Reaction**

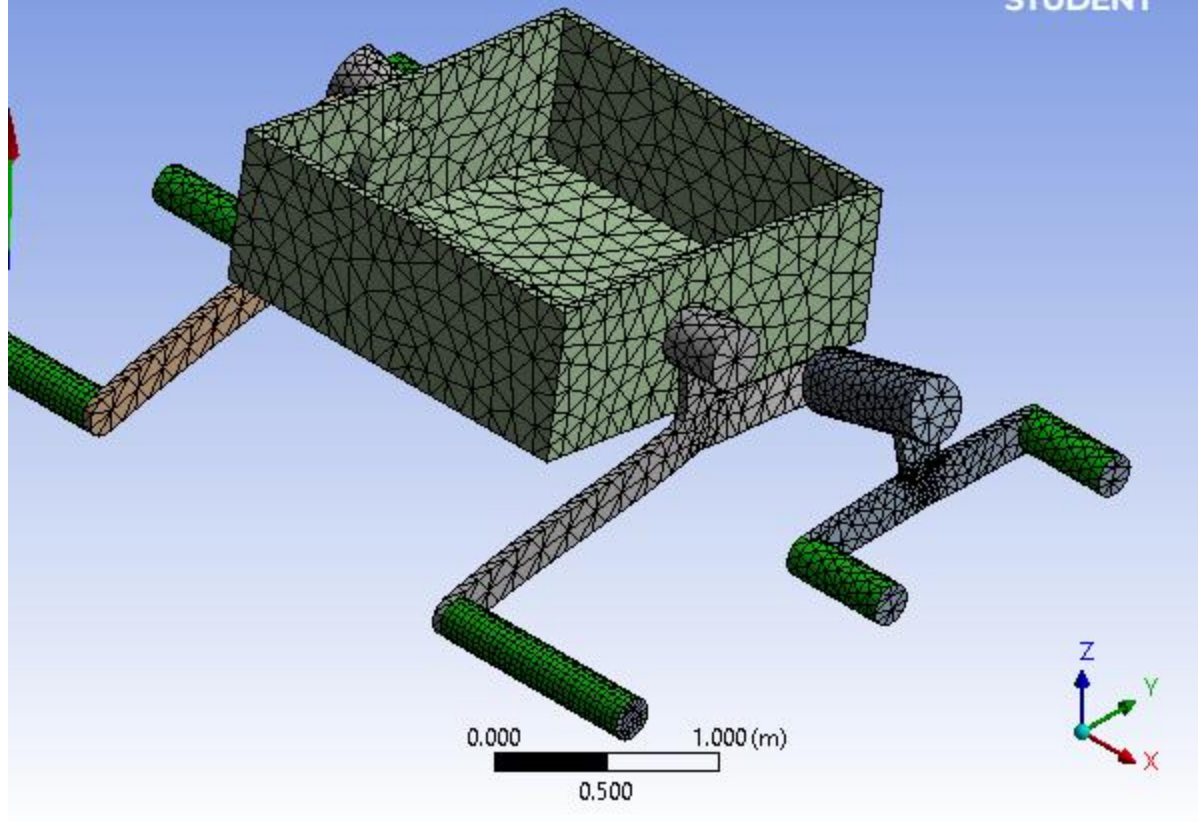




**TABLE 19**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Force Reaction**

Time [s]	Force Reaction (X) [N]	Force Reaction (Y) [N]	Force Reaction (Z) [N]	Force Reaction (Total) [N]
1.	-1.9461e-004	8.2832	185.87	186.05

**FIGURE 19**  
**Rover Model (B4) > Suspension Structural Analysis (B5) > Solution (B6) > Force Reaction >**  
**Reaction Model**  
**Total reactions forces are 186.05 N**



## Material Data

### *Titanium Alloy*

**TABLE 20**  
**Titanium Alloy > Constants**

Density	4620 kg m <sup>-3</sup>
Coefficient of Thermal Expansion	9.4e-006 C <sup>-1</sup>
Specific Heat	522 J kg <sup>-1</sup> C <sup>-1</sup>
Thermal Conductivity	21.9 W m <sup>-1</sup> C <sup>-1</sup>
Resistivity	1.7e-006 ohm m

**TABLE 21**  
**Titanium Alloy > Color**

Red	Green	Blue
88	72	117

**TABLE 22**  
**Titanium Alloy > Compressive Ultimate Strength**

Compressive Ultimate Strength Pa
0

**TABLE 23**  
**Titanium Alloy > Compressive Yield Strength**

Compressive Yield Strength Pa
9.3e+008

**TABLE 24**  
**Titanium Alloy > Tensile Yield Strength**

Tensile Yield Strength Pa
9.3e+008

**TABLE 25**  
**Titanium Alloy > Tensile Ultimate Strength**

Tensile Ultimate Strength Pa
1.07e+009

**TABLE 26**  
**Titanium Alloy > Isotropic Secant Coefficient of Thermal Expansion**

Zero-Thermal-Strain Reference Temperature C
22

**TABLE 27**  
**Titanium Alloy > Isotropic Elasticity**

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
9.6e+010	0.36	1.1429e+011	3.5294e+010	

**TABLE 28**  
**Titanium Alloy > Isotropic Relative Permeability**

Relative Permeability
1

## *Aluminum Alloy*

**TABLE 29**  
**Aluminum Alloy > Constants**

Density	2770 kg m <sup>-3</sup>
Coefficient of Thermal Expansion	2.3e-005 C <sup>-1</sup>
Specific Heat	875 J kg <sup>-1</sup> C <sup>-1</sup>

**TABLE 30**  
**Aluminum Alloy > Color**

Red	Green	Blue
138	104	46

**TABLE 31**  
**Aluminum Alloy > Compressive Ultimate Strength**

Compressive Ultimate Strength Pa
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0
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**TABLE 32**  
**Aluminum Alloy > Compressive Yield Strength**

Compressive Yield Strength Pa
2.8e+008

**TABLE 33**  
**Aluminum Alloy > Tensile Yield Strength**

Tensile Yield Strength Pa
2.8e+008

**TABLE 34**  
**Aluminum Alloy > Tensile Ultimate Strength**

Tensile Ultimate Strength Pa
3.1e+008

**TABLE 35**  
**Aluminum Alloy > Isotropic Secant Coefficient of Thermal Expansion**

Zero-Thermal-Strain Reference Temperature C
22

**TABLE 36**  
**Aluminum Alloy > Isotropic Thermal Conductivity**

Thermal Conductivity W m <sup>-1</sup> C <sup>-1</sup>	Temperature C
114	-100
144	0
165	100
175	200

**TABLE 37**  
**Aluminum Alloy > S-N Curve**

Alternating Stress Pa	Cycles	R-Ratio
2.758e+008	1700	-1
2.413e+008	5000	-1
2.068e+008	34000	-1
1.724e+008	1.4e+005	-1
1.379e+008	8.e+005	-1
1.172e+008	2.4e+006	-1
8.963e+007	5.5e+007	-1
8.274e+007	1.e+008	-1
1.706e+008	50000	-0.5
1.396e+008	3.5e+005	-0.5
1.086e+008	3.7e+006	-0.5
8.791e+007	1.4e+007	-0.5
7.757e+007	5.e+007	-0.5
7.239e+007	1.e+008	-0.5
1.448e+008	50000	0
1.207e+008	1.9e+005	0

1.034e+008	1.3e+006	0
9.308e+007	4.4e+006	0
8.618e+007	1.2e+007	0
7.239e+007	1.e+008	0
7.412e+007	3.e+005	0.5
7.067e+007	1.5e+006	0.5
6.636e+007	1.2e+007	0.5
6.205e+007	1.e+008	0.5

**TABLE 38**  
**Aluminum Alloy > Isotropic Resistivity**

Resistivity ohm m	Temperature C
2.43e-008	0
2.67e-008	20
3.63e-008	100

**TABLE 39**  
**Aluminum Alloy > Isotropic Elasticity**

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
7.1e+010	0.33	6.9608e+010	2.6692e+010	

**TABLE 40**  
**Aluminum Alloy > Isotropic Relative Permeability**

Relative Permeability
1