Study Report

Analyzed File	quadcopter_frame
Version	Autodesk Fusion (2603.0.86)
Creation Date	2025-07-18, 12:20:54
Author	Wilson Heath

Report Properties

Title	Studies
Author	wilso

Simulation Model 1

Static Stress Test - Polycarbonate

Study Properties

Study Type	Static Stress
Last Modification Date	2025-07-18, 11:26:19

Settings

General

Contact Tolerance	0.10 mm
Remove Rigid Body Modes	No

Mesh

Average Element Size (% of model size)	
Solids	10
Scale Mesh Size Per Part	No
Average Element Size (absolute value)	-
Element Order	Parabolic
Create Curved Mesh Elements	Yes
Max. Turn Angle on Curves (Deg.)	60
Max. Adjacent Mesh Size Ratio	1.5
Max. Aspect Ratio	10
Minimum Element Size (% of average size)	20

Adaptive Mesh Refinement

Number of Refinement Steps	0
Results Convergence Tolerance (%)	20
Portion of Elements to Refine (%)	10
Results for Baseline Accuracy	von Mises Stress

Materials

Component	Material	Safety Factor
Body1	Polycarbonate, Bronze	Yield Strength

Polycarbonate, Bronze

Density	1.200E-06 kg / mm^3
Young's Modulus	2275.00 MPa
Poisson's Ratio	0.38
Yield Strength	62.01 MPa
Ultimate Tensile Strength	68.90 MPa
Thermal Conductivity	1.370E-04 W / (mm C)
Thermal Expansion Coefficient	6.750E-05 / C
Specific Heat	1256.10 J / (kg C)

Contacts

Mesh

Type	Nodes	Elements
Solids	7087	3287

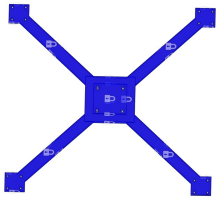
Load Case1

Constraints

Fixed1

Type	Fixed
Ux	Fixed
Uy	Fixed
Uz	Fixed

Selected Entities

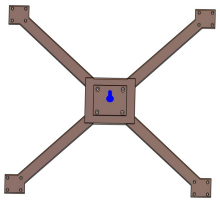


Loads

Gravity

Type	Gravity
Magnitude	9.807 m / s^2
X Value	0.00 m / s^2
Y Value	0.00 m / s^2
Z Value	-9.807 m / s^2

Selected Entities



Results

Result Summary

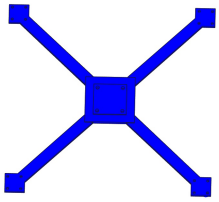
Name	Minimum	Maximum
Safety Factor		
Safety Factor (Per Body)	15.00	15.00
Stress		
von Mises	0.00 MPa	1.845E-05 MPa
1st Principal	-2.143E-05 MPa	3.634E-05 MPa
3rd Principal	-3.752E-05 MPa	1.975E-05 MPa
Normal XX	-2.236E-05 MPa	2.136E-05 MPa
Normal YY	-2.225E-05 MPa	2.117E-05 MPa
Normal ZZ	-3.644E-05 MPa	3.630E-05 MPa
Shear XY	-3.672E-06 MPa	3.430E-06 MPa
Shear YZ	-7.005E-06 MPa	5.329E-06 MPa
Shear ZX	-5.239E-06 MPa	6.527E-06 MPa
Displacement		
Total	0.00 mm	1.936E-08 mm
X	-3.832E-09 mm	4.187E-09 mm
Y	-3.689E-09 mm	4.308E-09 mm
Z	-1.936E-08 mm	0.00 mm
Reaction Force		
Total	0.00 N	4.285E-04 N
X	-3.417E-05 N	3.430E-05 N
Y	-3.522E-05 N	4.030E-05 N
Z	-3.371E-05 N	4.285E-04 N
Strain		
Equivalent	0.00	1.161E-08
1st Principal	0.00	1.308E-08
3rd Principal	-1.148E-08	0.00
Normal XX	-3.817E-09	4.183E-09
Normal YY	-4.456E-09	2.327E-09
Normal ZZ	-8.614E-09	9.285E-09
Shear XY	-4.455E-09	4.161E-09
Shear YZ	-8.499E-09	6.464E-09
Shear ZX	-6.356E-09	7.919E-09
Contact Force		

Total	0.00 N	0.00 N
X	0.00 N	0.00 N
Y	0.00 N	0.00 N
Z	0.00 N	0.00 N

Safety Factor

Safety Factor (Per Body)

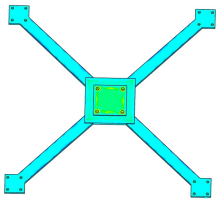
0.00 8.00



Stress

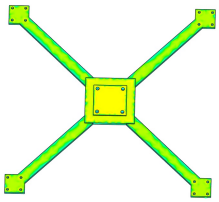
von Mises

[MPa] 0.00E-05 1.845E-05



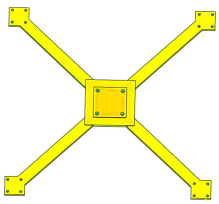
1st Principal

[MPa] -2.143E-05 3.634E-05



3rd Principal

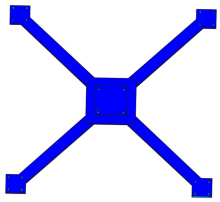
[MPa] -3.752E-05 1.975E-05



Displacement

Total

[mm] 0.00E-08 1.936E-08



Study 3 - Hover Load

Study Properties

Study Type	Static Stress
Last Modification Date	2025-07-18, 11:52:14

Settings

General

Contact Tolerance	0.10 mm
Remove Rigid Body Modes	No

Mesh

Average Element Size (% of model size)	
Solids	10
Scale Mesh Size Per Part	No
Average Element Size (absolute value)	-
Element Order	Parabolic
Create Curved Mesh Elements	Yes
Max. Turn Angle on Curves (Deg.)	60
Max. Adjacent Mesh Size Ratio	1.5
Max. Aspect Ratio	10
Minimum Element Size (% of average size)	20

Adaptive Mesh Refinement

Number of Refinement Steps	0
Results Convergence Tolerance (%)	20
Portion of Elements to Refine (%)	10
Results for Baseline Accuracy	von Mises Stress

Materials

Component	Material	Safety Factor
Body1	Polycarbonate, Bronze	Yield Strength

Polycarbonate, Bronze

Density	1.200E-06 kg / mm^3
Young's Modulus	2275.00 MPa
Poisson's Ratio	0.38
Yield Strength	62.01 MPa
Ultimate Tensile Strength	68.90 MPa
Thermal Conductivity	1.370E-04 W / (mm C)
Thermal Expansion Coefficient	6.750E-05 / C
Specific Heat	1256.10 J / (kg C)

Contacts

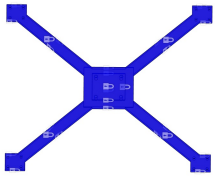
Load Case1

Constraints

Fixed1

Type	Fixed
Ux	Fixed
Uy	Fixed
Uz	Fixed

Selected Entities

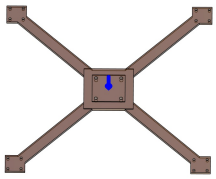


Loads

Gravity

Type	Gravity
Magnitude	9.807 m / s^2
X Value	0.00 m / s^2
Y Value	0.00 m / s^2
Z Value	-9.807 m / s^2

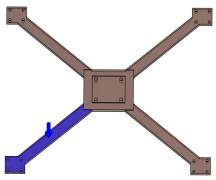
Selected Entities



Force1

Type	Force
Magnitude	0.309 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.309 N
Force Per Entity	No

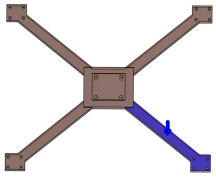
Selected Entities



Force2

Type	Force
Magnitude	0.309 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.309 N
Force Per Entity	No

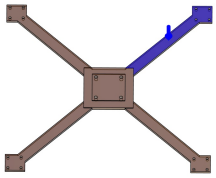
Selected Entities



Force3

Type	Force
Magnitude	0.309 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.309 N
Force Per Entity	No

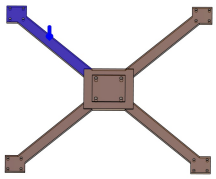
Selected Entities



Force4

Type	Force
Magnitude	0.309 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.309 N
Force Per Entity	No

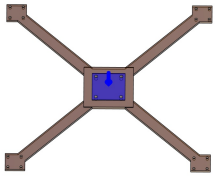
Selected Entities



Force5

Type	Force
Magnitude	2.18 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-2.18 N
Force Per Entity	No

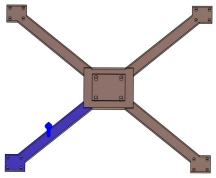
Selected Entities



Force6

Type	Force
Magnitude	0.931 N
X Value	0.00 N
Y Value	0.00 N
Z Value	0.931 N
Flip Direction	Yes
Force Per Entity	No

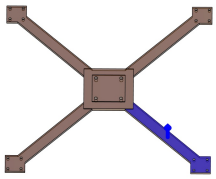
Selected Entities



Force7

Type	Force
Magnitude	0.931 N
X Value	0.00 N
Y Value	0.00 N
Z Value	0.931 N
Flip Direction	Yes
Force Per Entity	No

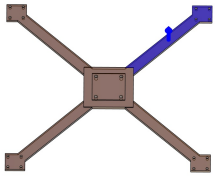
Selected Entities



Force8

Type	Force
Magnitude	0.931 N
X Value	0.00 N
Y Value	0.00 N
Z Value	0.931 N
Flip Direction	Yes
Force Per Entity	No

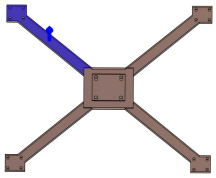
Selected Entities



Force9

Type	Force
Magnitude	0.931 N
X Value	0.00 N
Y Value	0.00 N
Z Value	0.931 N
Flip Direction	Yes
Force Per Entity	No

Selected Entities



Results

Result Summary

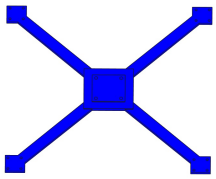
Name	Minimum	Maximum
Safety Factor		
Safety Factor (Per Body)	15.00	15.00
Stress		
von Mises	0.00 MPa	1.612E-05 MPa
1st Principal	-1.426E-05 MPa	2.843E-05 MPa
3rd Principal	-2.376E-05 MPa	1.690E-05 MPa
Normal XX	-1.433E-05 MPa	1.691E-05 MPa
Normal YY	-1.424E-05 MPa	1.722E-05 MPa
Normal ZZ	-2.375E-05 MPa	2.843E-05 MPa
Shear XY	-1.788E-06 MPa	2.118E-06 MPa
Shear YZ	-5.059E-06 MPa	4.540E-06 MPa
Shear ZX	-8.490E-06 MPa	7.401E-06 MPa
Displacement		
Total	0.00 mm	1.312E-08 mm
X	-1.466E-09 mm	1.450E-09 mm
Y	-1.420E-09 mm	1.330E-09 mm
Z	-1.310E-08 mm	0.00 mm
Reaction Force		
Total	0.00 N	0.016 N
X	-3.416E-05 N	3.429E-05 N
Y	-3.532E-05 N	4.030E-05 N
Z	-0.008 N	0.016 N
Strain		
Equivalent	0.00	1.283E-08
1st Principal	0.00	1.026E-08
3rd Principal	-1.188E-08	0.00
Normal XX	-2.224E-09	1.409E-09
Normal YY	-1.610E-09	1.303E-09
Normal ZZ	-5.676E-09	6.795E-09
Shear XY	-2.169E-09	2.569E-09
Shear YZ	-6.137E-09	5.507E-09
Shear ZX	-1.030E-08	8.979E-09
Contact Force		

Total	0.00 N	0.00 N
X	0.00 N	0.00 N
Y	0.00 N	0.00 N
Z	0.00 N	0.00 N

Safety Factor

Safety Factor (Per Body)

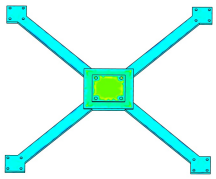
0.00 8.00



Stress

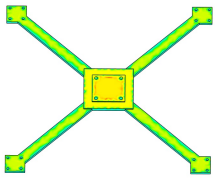
von Mises

[MPa] 0.00E-05 1.612E-05



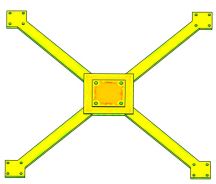
1st Principal

[MPa] -1.426E-05 2.843E-05



3rd Principal

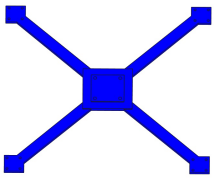
[MPa] -2.376E-05 1.69E-05



Displacement

Total

[mm] 0.00E-08 1.312E-08



Study 4 - Static Stress Hover (Modified Loads)

Study Properties

Study Type	Static Stress
Last Modification Date	2025-07-18, 12:16:35

Settings

General

Contact Tolerance	0.10 mm
Remove Rigid Body Modes	No

Mesh

Average Element Size (% of model size)	
Solids	10
Scale Mesh Size Per Part	No
Average Element Size (absolute value)	-
Element Order	Parabolic
Create Curved Mesh Elements	Yes
Max. Turn Angle on Curves (Deg.)	60
Max. Adjacent Mesh Size Ratio	1.5
Max. Aspect Ratio	10
Minimum Element Size (% of average size)	20

Adaptive Mesh Refinement

Number of Refinement Steps	0
Results Convergence Tolerance (%)	20
Portion of Elements to Refine (%)	10
Results for Baseline Accuracy	von Mises Stress

Materials

Component	Material	Safety Factor
Body1	Polycarbonate, Bronze	Yield Strength

Polycarbonate, Bronze

Density	1.200E-06 kg / mm^3
Young's Modulus	2275.00 MPa
Poisson's Ratio	0.38
Yield Strength	62.01 MPa
Ultimate Tensile Strength	68.90 MPa
Thermal Conductivity	1.370E-04 W / (mm C)
Thermal Expansion Coefficient	6.750E-05 / C
Specific Heat	1256.10 J / (kg C)

Contacts

Mesh

Type	Nodes	Elements
Solids	7087	3287

Load Case1

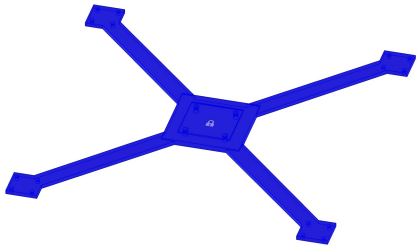
Constraints

Fixed1

Type	Fixed
Ux	Fixed
Uy	Fixed

Uz	Fixed

Selected Entities



Loads

Gravity

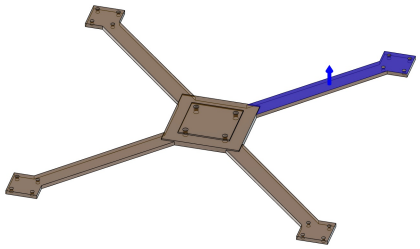
Type	Gravity
Magnitude	9.807 m / s^2
X Value	0.00 m / s^2
Y Value	0.00 m / s^2
Z Value	-9.807 m / s^2

Selected Entities

Force1

Type	Force
Magnitude	1.34 N
X Value	0.00 N
Y Value	0.00 N
Z Value	1.34 N
Flip Direction	Yes
Force Per Entity	No

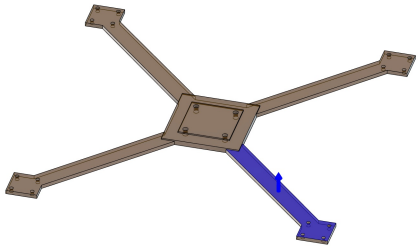
Selected Entities



Force2

Type	Force
Magnitude	1.34 N
X Value	0.00 N
Y Value	0.00 N
Z Value	1.34 N
Flip Direction	Yes
Force Per Entity	No

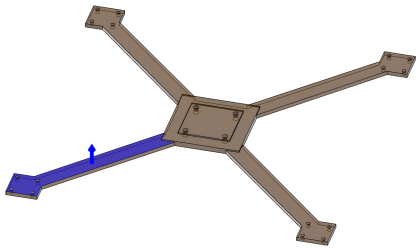
Selected Entities



Force3

Type	Force
Magnitude	1.34 N
X Value	0.00 N
Y Value	0.00 N
Z Value	1.34 N
Flip Direction	Yes
Force Per Entity	No

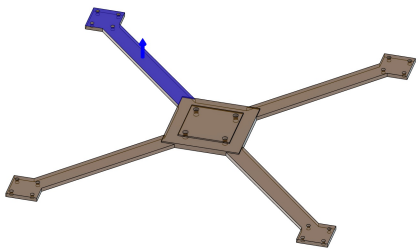
Selected Entities



Force4

Type	Force
Magnitude	1.34 N
X Value	0.00 N
Y Value	0.00 N
Z Value	1.34 N
Flip Direction	Yes
Force Per Entity	No

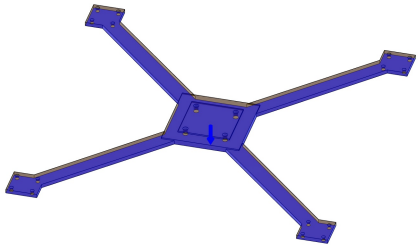
Selected Entities



Force5

Type	Force
Magnitude	1.64 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-1.64 N
Flip Direction	Yes
Force Per Entity	No

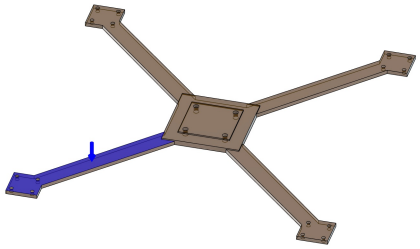
Selected Entities



Force6

Type	Force
Magnitude	0.255 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.255 N
Force Per Entity	No

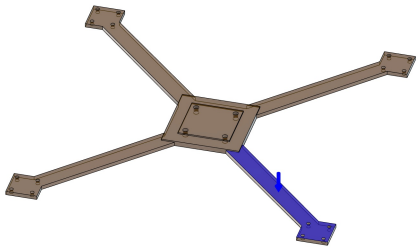
Selected Entities



Force7

Type	Force
Magnitude	0.255 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.255 N
Force Per Entity	No

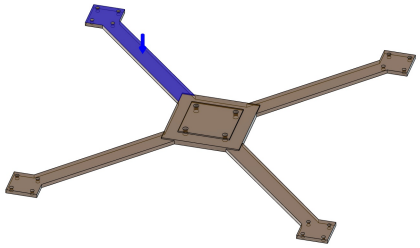
Selected Entities



Force8

Type	Force
Magnitude	0.255 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.255 N
Force Per Entity	No

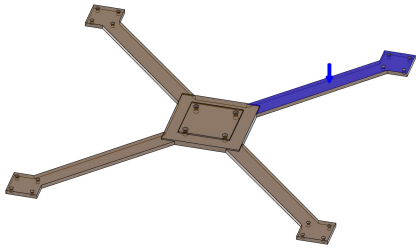
Selected Entities



Force9

Type	Force
Magnitude	0.255 N
X Value	0.00 N
Y Value	0.00 N
Z Value	-0.255 N
Force Per Entity	No

Selected Entities



Results

Result Summary

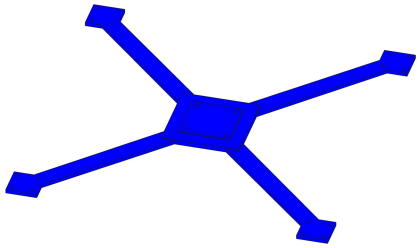
Name	Minimum	Maximum
Safety Factor		
Safety Factor (Per Body)	15.00	15.00
Stress		
von Mises	0.00 MPa	0.00 MPa
1st Principal	0.00 MPa	0.00 MPa
3rd Principal	0.00 MPa	0.00 MPa
Normal XX	0.00 MPa	0.00 MPa
Normal YY	0.00 MPa	0.00 MPa
Normal ZZ	0.00 MPa	0.00 MPa
Shear XY	0.00 MPa	0.00 MPa
Shear YZ	0.00 MPa	0.00 MPa
Shear ZX	0.00 MPa	0.00 MPa
Displacement		
Total	0.00 mm	0.00 mm
X	0.00 mm	0.00 mm
Y	0.00 mm	0.00 mm
Z	0.00 mm	0.00 mm
Reaction Force		
Total	3.856E-07 N	0.014 N
X	0.00 N	0.00 N
Y	0.00 N	0.00 N
Z	-0.014 N	0.004 N
Strain		
Equivalent	0.00	0.00
1st Principal	0.00	0.00
3rd Principal	0.00	0.00
Normal XX	0.00	0.00
Normal YY	0.00	0.00
Normal ZZ	0.00	0.00
Shear XY	0.00	0.00
Shear YZ	0.00	0.00
Shear ZX	0.00	0.00
Contact Force		
Total	0.00 N	0.00 N

X	0.00 N	0.00 N
Y	0.00 N	0.00 N
Z	0.00 N	0.00 N

Safety Factor

Safety Factor (Per Body)

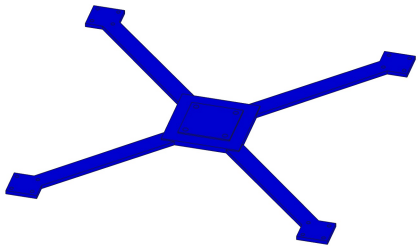
0.00 8.00



Stress

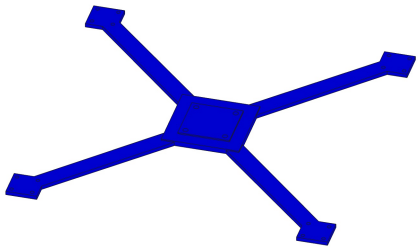
von Mises

[MPa] 0.00 0.00



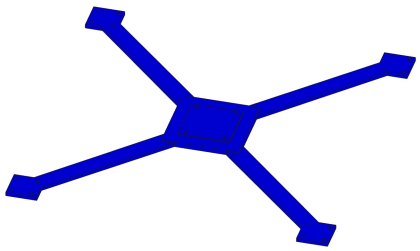
1st Principal

[MPa] 0.00 0.00



3rd Principal

[MPa] 0.00 0.00



Displacement

Total

[mm] 0.00 0.00