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|  | |  | | --- | | **Simulation of Final\_Prototype**  **Date: March 26, 2023 Designer: Solidworks**  **Study name: Static 3**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc130766836)  [Assumptions 2](#_Toc130766837)  [Model Information 3](#_Toc130766838)  [Study Properties 4](#_Toc130766839)  [Units 4](#_Toc130766840)  [Material Properties 5](#_Toc130766841)  [Loads and Fixtures 6](#_Toc130766842)  [Connector Definitions 6](#_Toc130766843)  [Interaction Information 7](#_Toc130766844)  [Mesh information 8](#_Toc130766845)  [Sensor Details 8](#_Toc130766846)  [Resultant Forces 9](#_Toc130766847)  [Beams 9](#_Toc130766848)  [Study Results 10](#_Toc130766849)  [Conclusion 13](#_Toc130766850) | |
| Description No Data |

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| Assumptions  |  |  | | --- | --- | | Original Model | Model Analyzed | |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** Final\_Prototype**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Mirror3** | **Solid Body** | ****Mass:0.0586688 kg****  ****Volume:1.35868e-05 m^3****  ****Density:4,318.06 kg/m^3****  ****Weight:0.574955 N**** | ****D:\uOttawa\2nd term\Engineering Design\3D\_Model\Final\_Prototype.SLDPRT****  **Mar 26 00:29:34 2023** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Static 3 | | Analysis type | Static | | Mesh type | Solid Mesh | | Thermal Effect: | On | | Thermal option | Include temperature loads | | Zero strain temperature | 298 Kelvin | | Include fluid pressure effects from SOLIDWORKS Flow Simulation | Off | | Solver type | Automatic | | Inplane Effect: | Off | | Soft Spring: | Off | | Inertial Relief: | Off | | Incompatible bonding options | Automatic | | Large displacement | On | | Compute free body forces | On | | Friction | Off | | Use Adaptive Method: | Off | | Result folder | SOLIDWORKS document (D:\uOttawa\2nd term\Engineering Design\3D\_Model) | |

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| Units  |  |  | | --- | --- | | Unit system: | SI (MKS) | | Length/Displacement | mm | | Temperature | Kelvin | | Angular velocity | Rad/sec | | Pressure/Stress | N/m^2 | |

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| Material Properties  |  |  |  | | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | |  | |  |  | | --- | --- | | ****Name:**** | **Ti-6Al-4V(3DP)** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **7.3e+08 N/m^2** | | ****Tensile strength:**** | **8.45e+08 N/m^2** | | ****Elastic modulus:**** | **1.048e+11 N/m^2** | | ****Poisson's ratio:**** | **0.31** | | ****Mass density:**** | **4,318.06 kg/m^3** | | ****Thermal expansion coefficient:**** | **9e-06 /Kelvin** | | **SolidBody 3(Mirror3)(Final\_Prototype)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(N)** | **1,500** | **0.000518799** | **-0.00524521** | **1,500** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Apply normal force** | | Value: | **1,500 N** | | | **Force-3** |  | |  |  | | --- | --- | | Entities: | **8 face(s)** | | Type: | **Apply normal force** | | Value: | **400 N** | | |

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| Connector Definitions No Data |

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| Interaction Information  | Interaction | Interaction Image | Interaction Properties | | --- | --- | --- | | Local Interaction-1 |  | |  |  | | --- | --- | | Type: | **Contact interaction pair** | | Entities: | **4 face(s)** | | Advanced: | **Surface to surface** | | | ****Contact/Friction force****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Contact Force(N)** | **-2.8935E-18** | **4.4582E-16** | **2.9365E-14** | **2.9369E-14** | | | | |

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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Blended curvature-based mesh | | Jacobian points for High quality mesh | 16 Points | | Maximum element size | 4.77425 mm | | Minimum element size | 0.765367 mm | | Mesh Quality | High |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 19854 | | Total Elements | 10976 | | Maximum Aspect Ratio | 693.94 | | % of elements with Aspect Ratio < 3 | 91.8 | | Percentage of elements with Aspect Ratio > 10 | 0.547 | | Percentage of distorted elements | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:09 | | Computer name: | ANUJ | |

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| Sensor Details No Data |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 1,500 | 0.000518799 | -0.00524521 | 1,500 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 0 | 0 | 0 | 0 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |

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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 1.234e+06N/m^2  Node: 12069 | 1.588e+09N/m^2  Node: 11395 | | **Final\_Prototype-Static 3-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00mm  Node: 206 | 9.371e-01mm  Node: 107 | | **Final\_Prototype-Static 3-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 1.022e-05  Element: 5753 | 1.134e-02  Element: 2907 | | **Final\_Prototype-Static 3-Strain-Strain1** | | | |  | Name | Type | | --- | --- | | Displacement1{1} | Deformed shape | | **Final\_Prototype-Static 3-Displacement-Displacement1{1}** | | |

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| Conclusion |