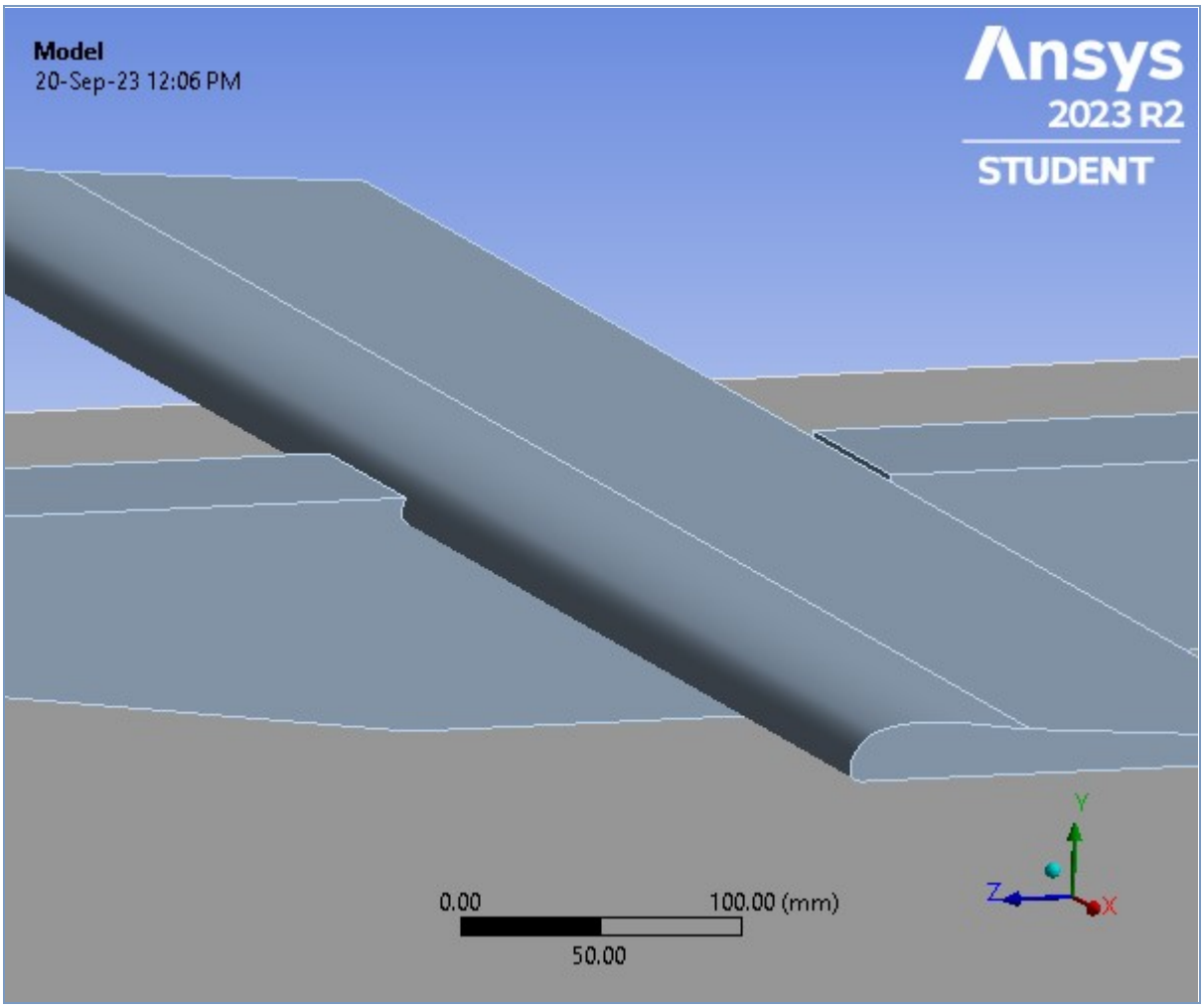
Project*

First Saved	Tuesday, September 19, 2023
Last Saved	Wednesday, September 20, 2023
Product Version	2023 R2
Save Project Before Solution	No
Save Project After Solution	No



Contents

Units

TABLE 1

Unit System	Metric (mm, kg, N, s, mV, mA) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

Model (A4)

TABLE 2
Model (A4) > Geometry Imports

Object Name	*Geometry Imports*
State	Solved

TABLE 3
Model (A4) > Geometry Imports > Geometry Import (A3)

Object Name	*Geometry Import (A3)*
State	Solved
Definition	
Source	E:\cte project\g3 with runway.IGS
Type	Iges
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No

Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
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	Program Tolerance
Stitch Tolerance	0.0000001
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

Geometry

TABLE 4
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	E:\cte project\g3 with runway.IGS
Type	Iges
Length Unit	Millimeters
Display Style	Body Color
Bounding Box	
Length X	1130.2 mm
Length Y	360. mm
Length Z	1090.7 mm
Properties	
Volume	1.2726e+008 mm³
Mass	308.19 kg
Scale Factor Value	1.
Statistics	
Bodies	2
Active Bodies	2
Nodes	4470
Elements	5670
Mesh Metric	None
Update Options	
Assign Default Material	No
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No

Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
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	Program Tolerance
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 5
Model (A4) > Geometry > Parts

Object Name	*g3 with runway-FreeParts*	*g3 with runway-FreeParts[2]*
State	Meshed	
Graphics Properties		
Visible	Yes	
Transparency	1	
Definition		
Suppressed	No	
Stiffness Behavior	Flexible	
Coordinate System	Default Coordinate System	
Reference Temperature	By Environment	
Reference Frame	Lagrangian	
Material		
Assignment	CONCRETE-L	Composite, Epoxy/glass fiber, woven prepreg, biax.
Bounding Box		
Length X	1130.2 mm	1000. mm
Length Y	100. mm	250. mm
Length Z	1090.7 mm	745. mm
Properties		
Volume	1.2327e+008 mm³	3.9878e+006 mm³
Mass	300.79 kg	7.4054 kg
Centroid X	35. mm	35.001 mm
Centroid Y	-98.485 mm	36.553 mm
Centroid Z	60.941 mm	21.906 mm
Moment of Inertia Ip1	3.007e+007 kg·mm²	1.9771e+005 kg·mm²
Moment of Inertia Ip2	6.1837e+007 kg·mm²	6.0608e+005 kg·mm²
Moment of Inertia Ip3	3.2269e+007 kg·mm²	4.1939e+005 kg·mm²
Statistics		
Nodes	3248	1222
Elements	2268	3402
Mesh Metric	None	

TABLE 6
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	5
Material Assignments	0

Coordinate Systems

TABLE 7
Model (A4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*
State	Fully Defined
Definition	
Type	Cartesian
Origin	
Origin X	0. mm
Origin Y	0. mm
Origin Z	0. mm
Directional Vectors	
X Axis Data	[1. 0. 0.]
Y Axis Data	[0. 1. 0.]
Z Axis Data	[0. 0. 1.]

Connections

TABLE 8
Model (A4) > Connections

Object Name	*Connections*
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes
Statistics	
Contacts	0
Active Contacts	0
Joints	0
Active Joints	0
Beams	0
Active Beams	0
Bearings	0
Active Bearings	0
Springs	0
Active Springs	0
Body Interactions	1
Active Body Interactions	1

TABLE 9
Model (A4) > Connections > Body Interactions

Object Name	*Body Interactions*
State	Fully Defined
Advanced	
Contact Detection	Trajectory
Formulation	Penalty
Sliding Contact	Discrete Surface
Body Self Contact	Program Controlled
Element Self Contact	Program Controlled
Tolerance	0.2

TABLE 10
Model (A4) > Connections > Body Interactions > Body Interaction

Object Name	*Body Interaction*

State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Frictionless
Suppressed	No

Mesh

TABLE 11
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Explicit
Element Order	Linear
Element Size	Default (40.285 mm)
Sizing	
Use Adaptive Sizing	No
Growth Rate	Default (1.5)
Max Size	Default (40.285 mm)
Mesh Defeaturing	Yes
Defeature Size	Default (4.0285 mm)
Capture Curvature	Yes
Curvature Min Size	Default (20.143 mm)
Curvature Normal Angle	Default (72.0°)
Capture Proximity	No
Bounding Box Diagonal	1611.4 mm
Average Surface Area	52020 mm²
Minimum Edge Length	0.29452 mm
Quality	
Check Mesh Quality	Yes, Errors and Warnings
Target Element Quality	Default (0.2)
Target Characteristic Length (LS-DYNA)	Default (4.0285 mm)
Target Aspect Ratio (Explicit)	Default (5.0)
Smoothing	High
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	1
Growth Rate	1.2
Inflation Algorithm	Pre
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	
Rigid Body Behavior	Full Mesh
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Default (18.128 mm)
Generate Pinch on Refresh	No

Statistics	
Nodes	4470
Elements	5670
Show Detailed Statistics	No

Explicit Dynamics (A5)

TABLE 12
Model (A4) > Analysis

Object Name	*Explicit Dynamics (A5)*
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Explicit Dynamics
Solver Target	AUTODYN
Options	
Environment Temperature	22. °C
Generate Input Only	No

TABLE 13
Model (A4) > Explicit Dynamics (A5) > Initial Conditions

Object Name	*Initial Conditions*
State	Fully Defined

TABLE 14
Model (A4) > Explicit Dynamics (A5) > Initial Conditions > Initial Condition

Object Name	*Pre-Stress (None)*
State	Fully Defined
Definition	
Pre-Stress Environment	None Available
Pressure Initialization	From Deformed State

TABLE 15
Model (A4) > Explicit Dynamics (A5) > Analysis Settings

Object Name	*Analysis Settings*
State	Fully Defined
Analysis Settings Preference	
Type	Program Controlled
Step Controls	
Number Of Steps	1
Current Step Number	1
Load Step Type	Explicit Time Integration
End Time	7.e-003
Resume From Cycle	0
Maximum Number of Cycles	1e+07
Maximum Energy Error	0.1
Reference Energy Cycle	0
Initial Time Step	Program Controlled
Minimum Time Step	Program Controlled
Maximum Time Step	Program Controlled
Time Step Safety Factor	0.9
Characteristic Dimension	Diagonals
Automatic Mass Scaling	No
Solver Controls	
Solve Units	mm, mg, ms
Beam Solution Type	Bending

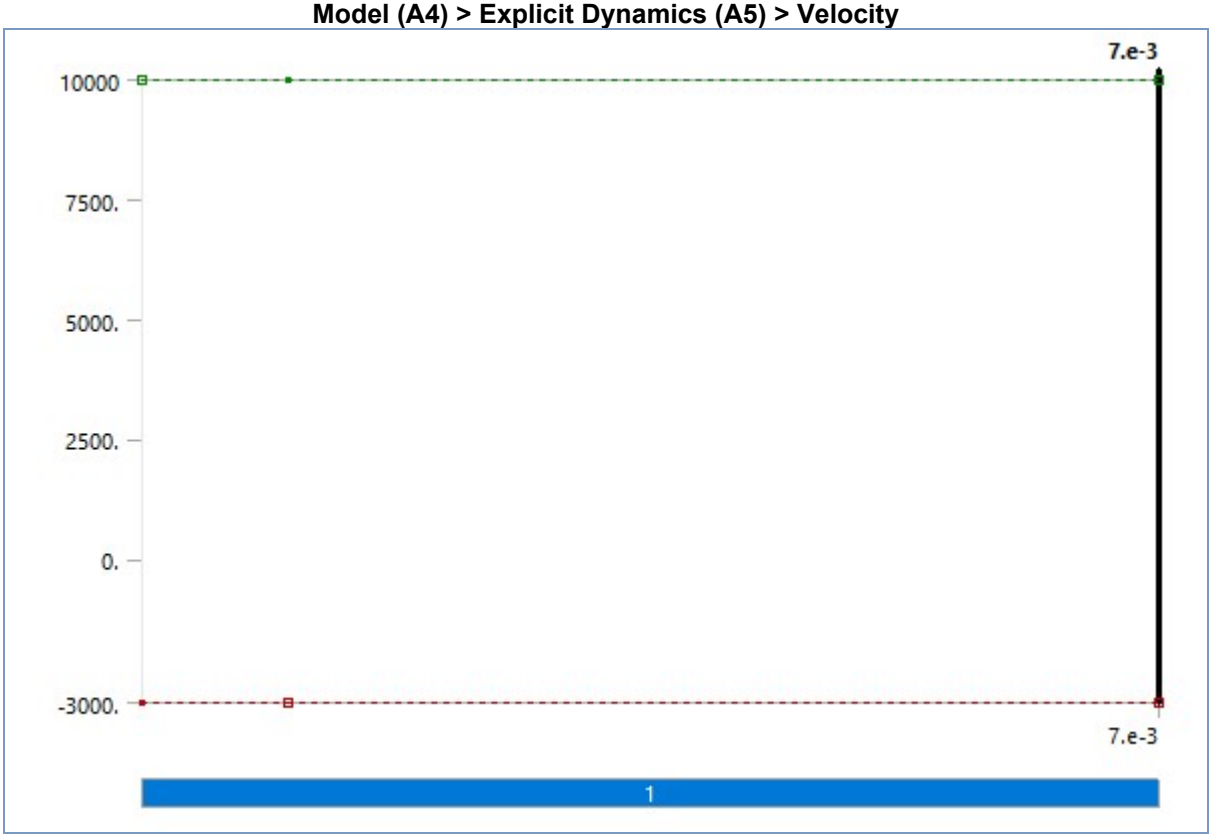
Beam Time Step Safety Factor	0.5
Hex Integration Type	Exact
Shell Sublayers	3
Shell Shear Correction Factor	0.8333
Shell BWC Warp Correction	Yes
Shell Thickness Update	Nodal
Tet Integration	Average Nodal Pressure
Shell Inertia Update	Recompute
Density Update	Program Controlled
Minimum Timestep for SPH	1.e-010 s
Minimum Density Factor for SPH	0.2
Maximum Density Factor for SPH	3.
Density Cutoff Option For SPH	Limit Density
Minimum Velocity	1.e-003 mm s^-1
Maximum Velocity	1.e+013 mm s^-1
Radius Cutoff	1.e-003
Minimum Strain Rate Cutoff	1.e-010
Detonation Point Burn Type	Program Controlled
Euler Domain Controls	
Domain Size Definition	Program Controlled
Display Euler Domain	Yes
Scope	All Bodies
X Scale factor	1.2
Y Scale factor	1.2
Z Scale factor	1.2
Domain Resolution Definition	Total Cells
Total Cells	2.5e+05
Lower X Face	Flow Out
Lower Y Face	Flow Out
Lower Z Face	Flow Out
Upper X Face	Flow Out
Upper Y Face	Flow Out
Upper Z Face	Flow Out
Euler Tracking	By Body
Damping Controls	
Linear Artificial Viscosity	0.2
Quadratic Artificial Viscosity	1.
Linear Viscosity in Expansion	No
Artificial Viscosity For Shells	Yes
Linear Artificial Viscosity for SPH	1.
Quadratic Artificial Viscosity for SPH	1.
Hourglass Damping	AUTODYN Standard
Viscous Coefficient	0.1
Static Damping	0.
Erosion Controls	
On Geometric Strain Limit	Yes
Geometric Strain Limit	1.5
On Material Failure	No
On Minimum Element Time Step	No
Retain Inertia of Eroded Material	Yes
Output Controls	
Step-aware Output Controls	No
Save Results on	Equally Spaced Points
Result Number Of Points	20
Save Restart Files on	Equally Spaced Points
Restart Number Of Points	5
Save Result Tracker Data on	

	Cycles
Tracker Cycles	1
Output Contact Forces	Off
Analysis Data Management	
Solver Files Directory	E:\cte project\g3 with stress strain_files\dp0\SYS\MECH\
Scratch Solver Files Directory	

TABLE 16
Model (A4) > Explicit Dynamics (A5) > Loads

Object Name	*Velocity*	*Fixed Support*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	4 Edges	6 Faces
Definition		
Type	Velocity	Fixed Support
Define By	Components	
Coordinate System	Global Coordinate System	
X Component	Free	
Y Component	-3000. mm/s (step applied)	
Z Component	10000 mm/s (step applied)	
Suppressed	No	

FIGURE 1
Model (A4) > Explicit Dynamics (A5) > Velocity



Solution (A6)

TABLE 17
Model (A4) > Explicit Dynamics (A5) > Solution

Object Name	*Solution (A6)*
State	Solved
Information	

Status	Done
Post Processing	
Beam Section Results	No

TABLE 18
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Solution Information

Object Name	*Solution Information*
State	Solved
Solution Information	
Solution Output	Solver Output
Update Interval	2.5 s
Display Points	All
Display Filter During Solve	Yes

TABLE 19
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Results

Object Name	*Total Deformation*	*Equivalent Elastic Strain*	*Equivalent Stress*
State	Solved		
Scope			
Scoping Method	Geometry Selection		
Geometry	All Bodies		
Definition			
Type	Total Deformation	Equivalent Elastic Strain	Equivalent (von-Mises) Stress
By	Time		
Display Time	6.6503e-003 s	Last	
Separate Data by Entity	No		
Calculate Time History	Yes		
Identifier			
Suppressed	No		
Results			
Minimum	0. mm	0. mm/mm	0. MPa
Maximum	83.328 mm	0.62136 mm/mm	14905 MPa
Average	19.089 mm	8.7768e-003 mm/mm	151.46 MPa
Minimum Occurs On	g3 with runway-FreeParts		
Maximum Occurs On	g3 with runway-FreeParts[2]		
Minimum Value Over Time			
Minimum	0. mm	0. mm/mm	0. MPa
Maximum	0. mm	0. mm/mm	0. MPa
Maximum Value Over Time			
Minimum	0. mm	0. mm/mm	0. MPa
Maximum	83.328 mm	0.62136 mm/mm	14905 MPa
Information			
Time	6.6503e-003 s	7.0003e-003 s	
Set	20	21	
Cycle Number	18818	19824	
Integration Point Results			
Display Option		Averaged	
Average Across Bodies		No	

FIGURE 2
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

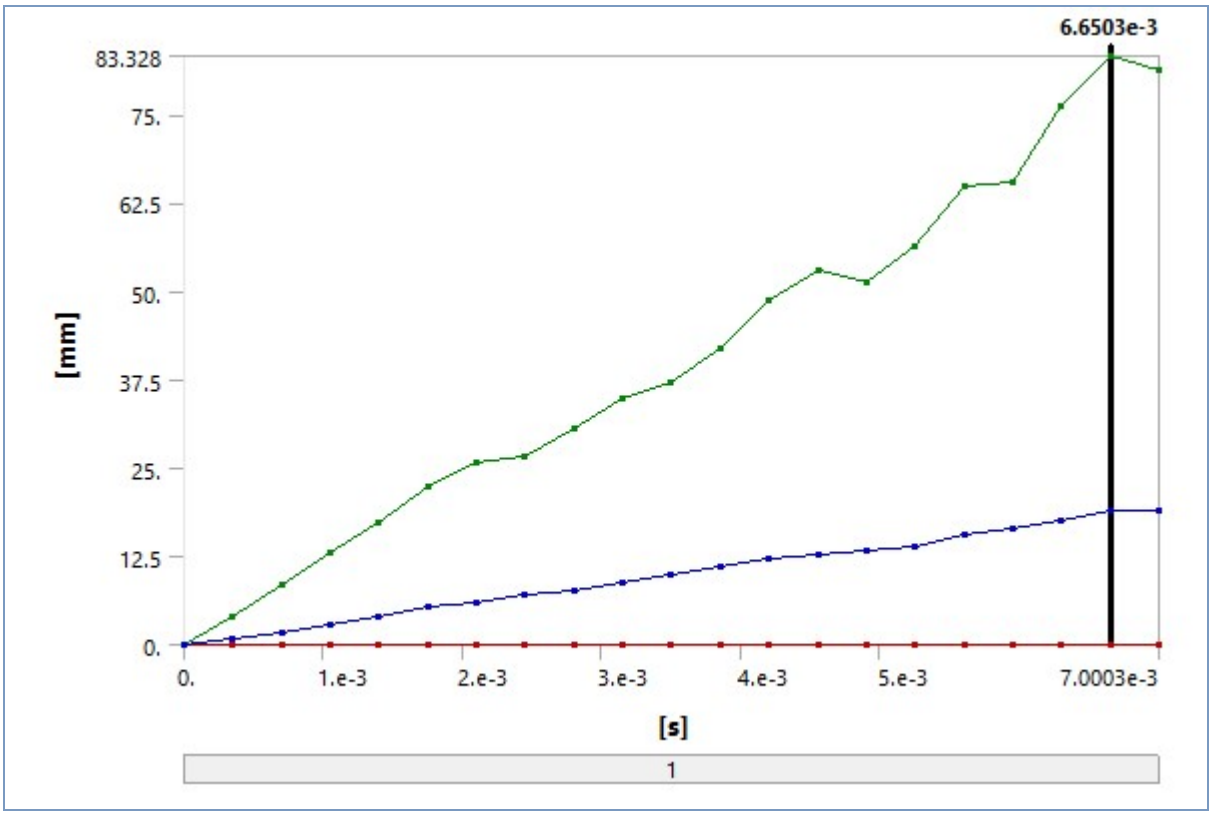


TABLE 20
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
1.1755e-038		0.	0.
3.5027e-004		4.0886	0.82923
7.0028e-004		8.4903	1.6959
1.0501e-003		12.999	2.9546
1.4002e-003		17.305	3.9452
1.7501e-003		22.494	5.4032
2.1003e-003		25.669	5.9944
2.4502e-003		26.762	7.0145
2.8001e-003		30.567	7.6231
3.1502e-003		34.919	8.7069
3.5001e-003	0.	37.028	9.7978
3.8502e-003		41.932	11.115
4.2002e-003		48.745	12.147
4.5502e-003		52.92	12.709
4.9002e-003		51.337	13.369
5.2503e-003		56.318	13.828
5.6001e-003		64.93	15.584
5.9502e-003		65.482	16.314
6.3003e-003		76.161	17.709
6.6503e-003		83.328	19.089
7.0003e-003		81.339	19.101

FIGURE 3
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Elastic Strain

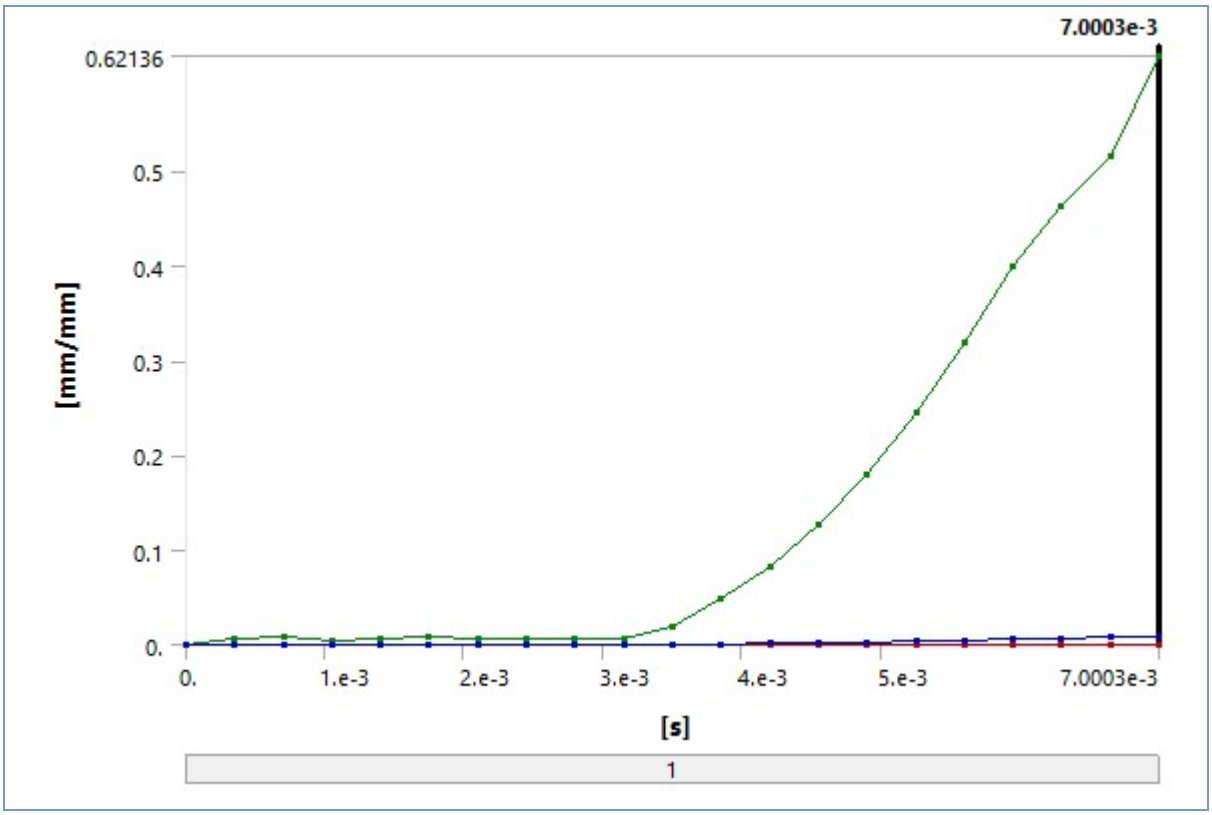


TABLE 21
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Elastic Strain

Time [s]	Minimum [mm/mm]	Maximum [mm/mm]	Average [mm/mm]
1.1755e-038	0.	0.	0.
3.5027e-004		5.4812e-003	3.783e-004
7.0028e-004		7.4606e-003	4.6197e-004
1.0501e-003		4.4084e-003	3.9473e-004
1.4002e-003		5.3424e-003	4.4235e-004
1.7501e-003		9.e-003	5.7103e-004
2.1003e-003		6.7089e-003	5.5969e-004
2.4502e-003		5.5605e-003	4.3693e-004
2.8001e-003		7.0041e-003	5.2856e-004
3.1502e-003		6.1372e-003	4.4541e-004
3.5001e-003		1.8047e-002	3.2794e-004
3.8502e-003		4.9596e-002	6.1226e-004
4.2002e-003		8.1551e-002	1.3764e-003
4.5502e-003		0.127	2.2655e-003
4.9002e-003		0.18052	3.0978e-003
5.2503e-003		0.24444	3.6346e-003
5.6001e-003		0.31855	4.8028e-003
5.9502e-003		0.39962	6.0229e-003
6.3003e-003		0.46358	6.8229e-003
6.6503e-003		0.51636	7.8362e-003
7.0003e-003		0.62136	8.7768e-003

FIGURE 4
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress

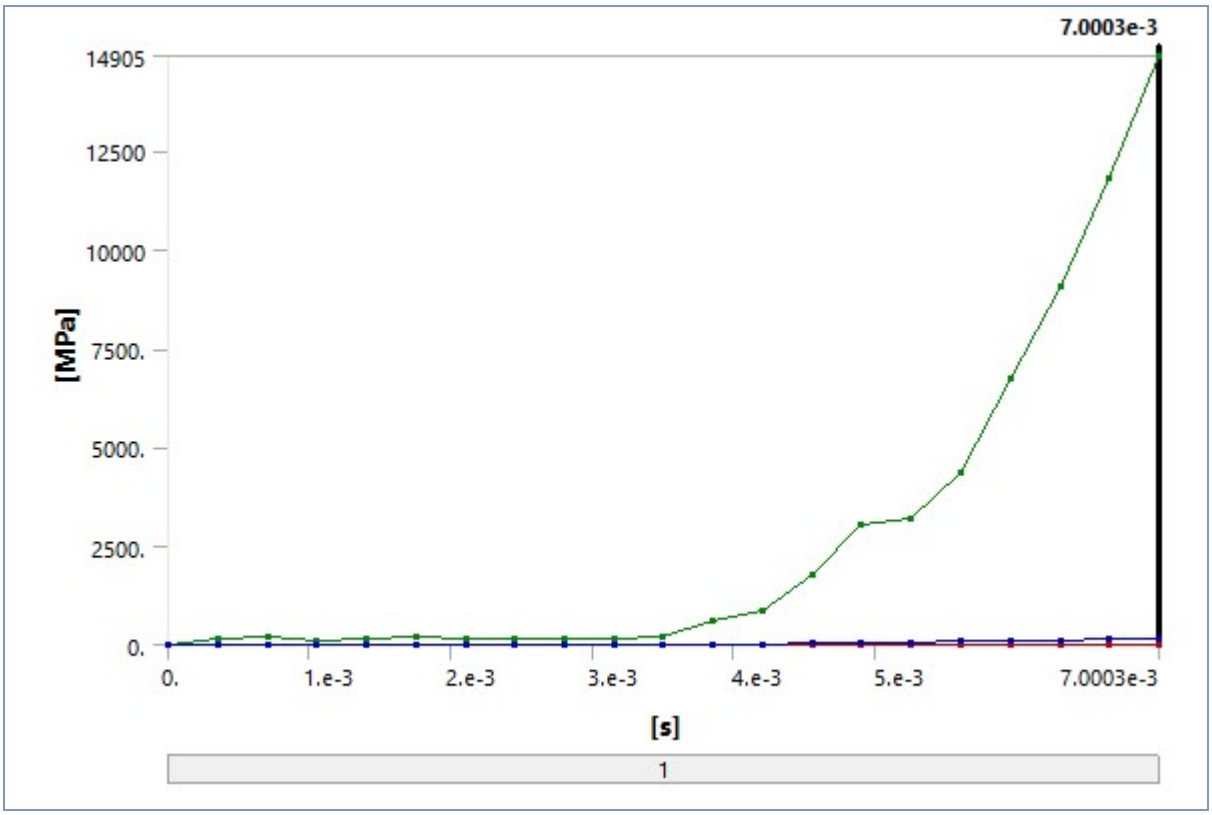


TABLE 22
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1.1755e-038	0.	0.	0.
3.5027e-004		139.38	7.8288
7.0028e-004		184.2	9.9745
1.0501e-003		111.54	8.5267
1.4002e-003		129.47	9.995
1.7501e-003		216.32	12.651
2.1003e-003		151.04	12.133
2.4502e-003		140.46	9.5138
2.8001e-003		160.43	10.933
3.1502e-003		151.68	9.296
3.5001e-003		196.42	5.5038
3.8502e-003		590.9	9.366
4.2002e-003		879.61	22.462
4.5502e-003		1773.8	38.416
4.9002e-003		3057.9	51.681
5.2503e-003		3179.	60.134
5.6001e-003		4364.1	77.497
5.9502e-003		6719.1	97.566
6.3003e-003		9089.3	110.52
6.6503e-003		11829	133.09
7.0003e-003		14905	151.46

Material Data

CONCRETE-L

TABLE 23
CONCRETE-L > Constants

Density	2.44e-006 kg mm^-3

TABLE 24
CONCRETE-L > Solid Density Linear

Solid Density kg mm^-3	
2.44e-006	
Pressure MPa	Density kg mm^-3
0	2.34e-006
25	2.35e-006
70	2.4e-006
130	2.46e-006
250	2.5e-006
Soundspeed mm s^-1	Density kg mm^-3
2.2e+006	2.34e-006
2.2e+006	2.44e-006

TABLE 25
CONCRETE-L > Drucker-Prager Strength Piecewise

Pressure P MPa	Yield Stress Y MPa
0	25
80	110
110	160
200	195

TABLE 26
CONCRETE-L > Shear Modulus

Shear Modulus MPa
7880

TABLE 27
CONCRETE-L > Tensile Pressure Failure

Maximum Tensile Pressure MPa
-2.5

TABLE 28
CONCRETE-L > Color

Red	Green	Blue
103	192	205

Composite, Epoxy/glass fiber, woven prepreg, biax.

TABLE 29
Composite, Epoxy/glass fiber, woven prepreg, biax. > Constants

Density	1.857e-006 kg mm^-3
Tensile Yield Strength	440.1 MPa
Tensile Ultimate Strength	440.1 MPa
Isotropic Secant Coefficient of Thermal Expansion	1.688e-005 C^-1
Isotropic Thermal Conductivity	5.523e-004 W mm^-1 C^-1
Specific Heat Constant Pressure	1.069e+006 mJ kg^-1 C^-1
Isotropic Resistivity	5.586e+016 ohm mm
Isotropic Electric Loss Tangent	3.266e-003
Isotropic Relative Permittivity	5.012

TABLE 30
Composite, Epoxy/glass fiber, woven prepreg, biax. > Appearance

Red	Green	Blue
153	51	51

Opacity
0.6
Metallic Finish
0

TABLE 31
Composite, Epoxy/glass fiber, woven prepreg, biax. > Isotropic Elasticity

Young's Modulus MPa	Poisson's Ratio	Bulk Modulus MPa	Shear Modulus MPa	Temperature C
26400	0.1543	12728	11436	23

TABLE 32
Composite, Epoxy/glass fiber, woven prepreg, biax. > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
23