

Modal Analysis of a Composite Monocoque - Verification & Validation

Author: Jingsi Wu, Cornell University

[Problem Specification](#)

[1. Pre-Analysis & Start-Up](#)

[2. Geometry](#)

[3. Mesh](#)

[4. Physics Setup](#)

[5. Numerical Solution](#)

[6. Numerical Results](#)

[7. Verification & Validation](#)

[Exercises](#)

[Comments](#)

Verification & Validation

The following tables compares the results from analytical calculations with ANSYS simulation.

Value	Units	Variable
10.1	in	OR
9.265	in	IR
60	in	L
14.5	in	La
21	in	Lb
24.5	in	Lc
100	lbf	F
30	in	Larm
3000	in-lbf	T
190844.52	psi	Ga
198360.26	psi	Gb
2284717.88	psi	Gc
19.365	in	b
62798209	in-lb/deg	Ka
40154	in-lb/deg	Kb
444940633	in-lb/deg	Kc
40125	in-lbf/deg	K
3344	ft-lbf/deg	K

Elements	Force	Arm		Torque		Tangential		degree		Kt	
2854	100	lbf	30 in	3000	in-lbf	0.0236	in	0.0451	deg	5541.198	ft-lbf/deg
6389	100	lbf	30 in	3000	in-lbf	0.0220	in	0.0420	deg	5954.588	ft-lbf/deg
11356	100	lbf	30 in	3000	in-lbf	0.0226	in	0.0431	deg	5797.410	ft-lbf/deg

The solutions are reasonable because there are several factors ignored in the analytical equations. For example, there is a closed end on the actual cylinder which was not taken into consideration when deriving the analytical equations, the moment arm is not applied to the tangential axis of the cylinder, and finally the stiffness of the suspension arms were never incorporated. Therefore, the ANSYS did give a reasonable result and can be confidently used to simulate torsional properties of composite geometries.

[Go to Exercises](#)

[Go to all ANSYS Learning Modules](#)