

APPENDIX: STRUCTURAL ANALYSIS

In this appendix some of the structural results of the drone are shown.

Model description:

11365 Nodes

11334 elements (11329 QUAD4; 6 BAR2)

MPC at engines' locations

Wing profile modeled

Boundary conditions at center of symmetry

Forces:

Weight and engine force as punctual forces

Aerodynamic force as distributed pressure along the lower cover

Materials:

	E (GPa)	ν	P (T/m ³)	Location	
Steel	210	0.3	7.85	Center of symmetry to 400mm	0.65 mm thickness
CFRP (1 Ply)	65	0.05	1.56	400mm to Tip	Stacking 0/0/0/45

WING (Static Test)

Load Cases

1-Static - Max vertical thrust:

126 N applied to each tip engine

Max displacement: 165mm

Not critical stress

2-Static - Cruise flight:

8.18 N as tip engine weight

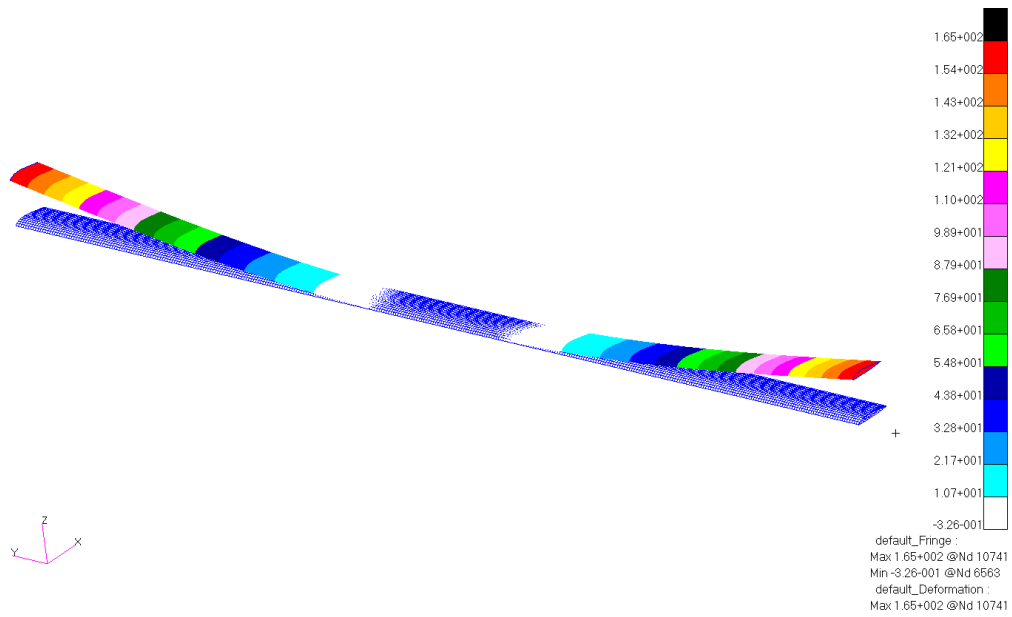
2.84 N as cruise engine weight

354 Pa as pressure

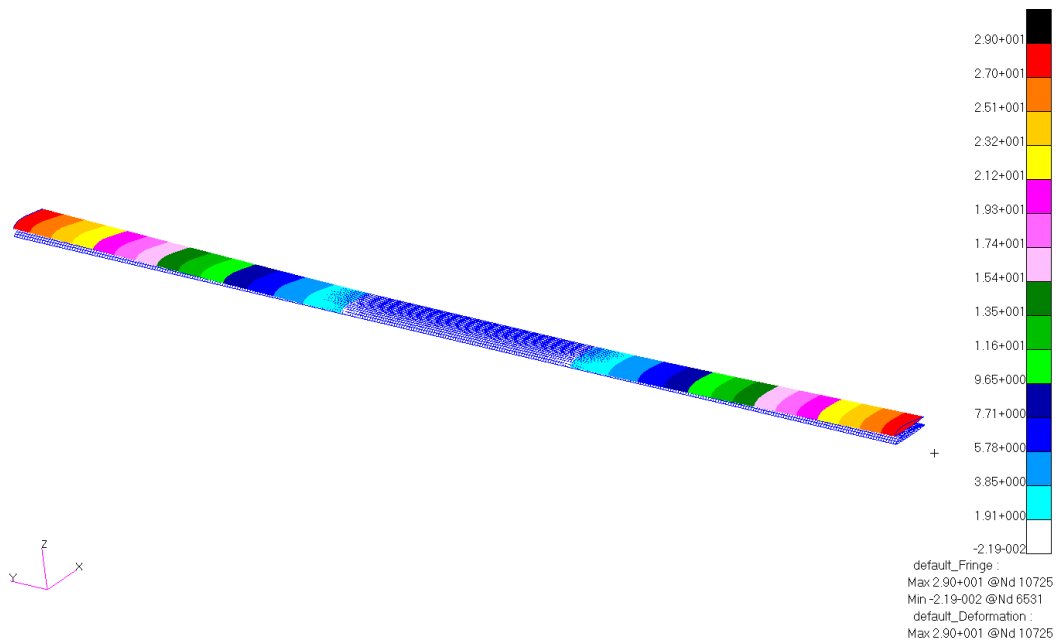
Max displacement: 29mm

Not critical stress

Max Vertical Displacement:



Cruise Displacement:



WING ROOT (Dynamic Test)

Load Cases

1-Dynamic-Harmonic response for the most unfavorable case: a vertical gust of 10 m/s flying at sea level at 194 Km/h.

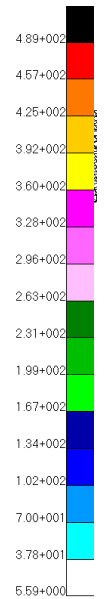
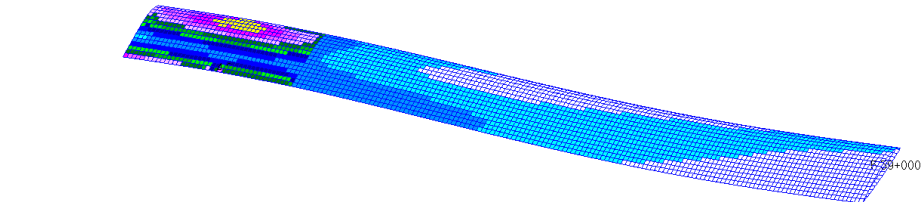
1461 N applied on tip

27Hz

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Fringe: Dinamico_Fase, Freq.=27.5, Stress Tensor, . von Mises, At Z1

Deform: Dinamico_Fase, Freq.=27.5, Displacements, Translational, . (NON-LAYERED)



default_Fringe :
Max: 4.89+002 @ Elm 6687.1
Min: 5.59+000 @ Elm 9929.1
default_Deformation :
Max: 5.63+001 @ Nd 10147

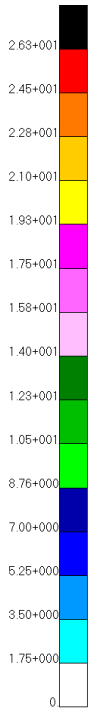
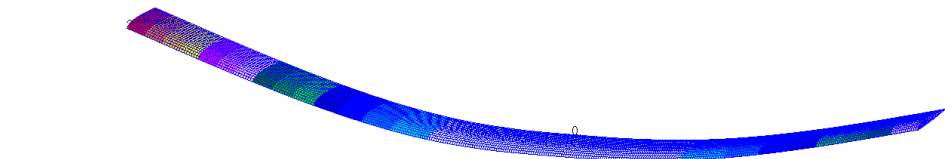
EIGENMODES

Mode 1:

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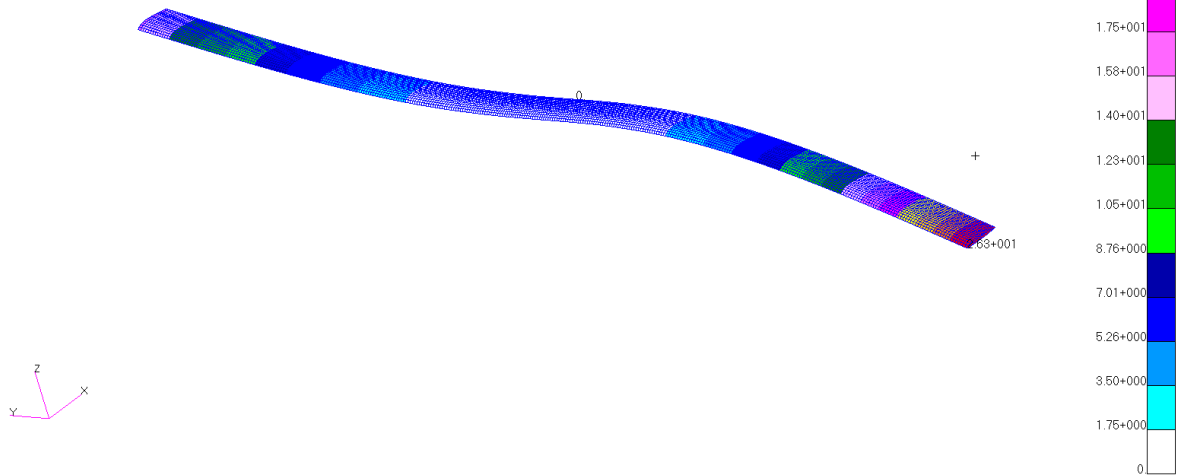
Fringe: DINAMICO_FASE, Mode 1.Freq.=4.2776, Eigenvectors, Translational, Magnitude, (NON-LAYERED)

Deform: DINAMICO_FASE, Mode 1.Freq.=4.2776, Eigenvectors, Translational,



Mode 2:

MSC.Patran 2005 r2 20-May-16 08:39:18
Fringe: DINAMICO_FASE, Mode 2:Freq.=4.2988, Eigenvectors, Translational, Magnitude, (NON-LAYERED)
Deform: DINAMICO_FASE, Mode 2:Freq.=4.2988, Eigenvectors, Translational.



Mode 3:

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Fringe: DINAMICO_FASE, Mode 3:Freq.=27.028, Eigenvectors, Translational, Magnitude, (NON-LAYERED)
Deform: DINAMICO_FASE, Mode 3:Freq.=27.028, Eigenvectors, Translational.

