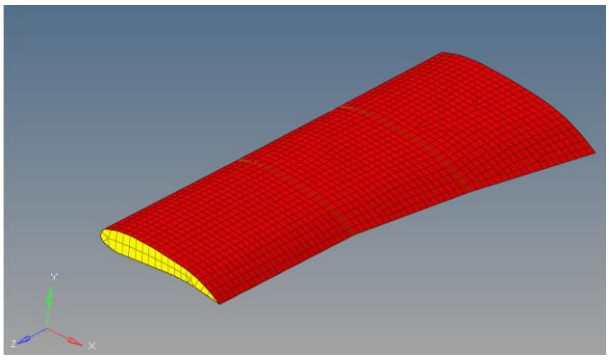
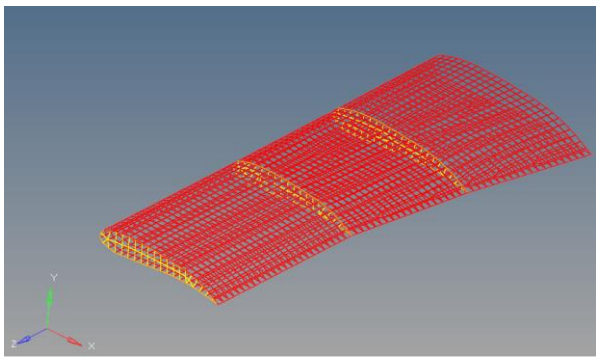
Example: Wing Linear Buckling Analysis

This exercise runs a linear buckling analysis on a simple aircraft wing. This is a typical problem for aerospace structures that need to be very light and consequently become slender. Because the structure has a high slenderness ratio, the buckling failure verification becomes necessary. The objective of this project is to verify if the 3 static load cases applied to the wing will not make it fail.

In this exercise, you will learn how to verify a wing baseline design for buckling criteria.



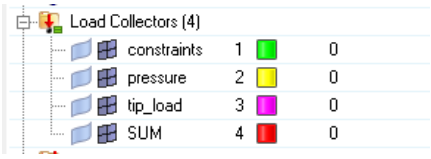


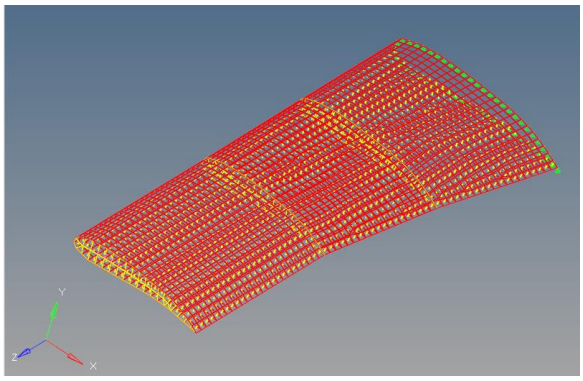
Design criteria:
Buckling: first mode > (1.5 x).
(Static: U < 20 mm and Von Mises < 70 MPa)

Material Aluminum:
ρ = 2.1e-9 T/mm^3 [RHO] Density
E = 70,000 MPa [E] Young's Modulus
ν = 0.33 [nu] Poisson's ratio

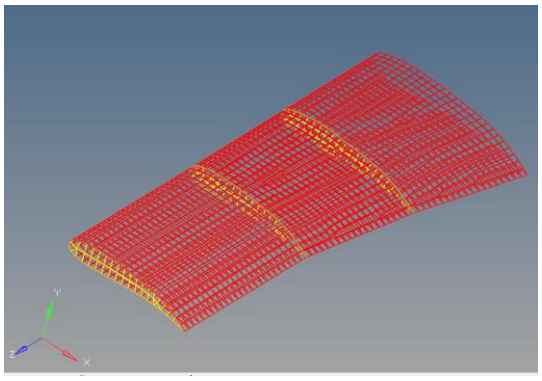
In the given model (Wing.hm), the load, the constraints and loadcases have already been created. Please review the property, material and load collectors before starting the baseline analysis.

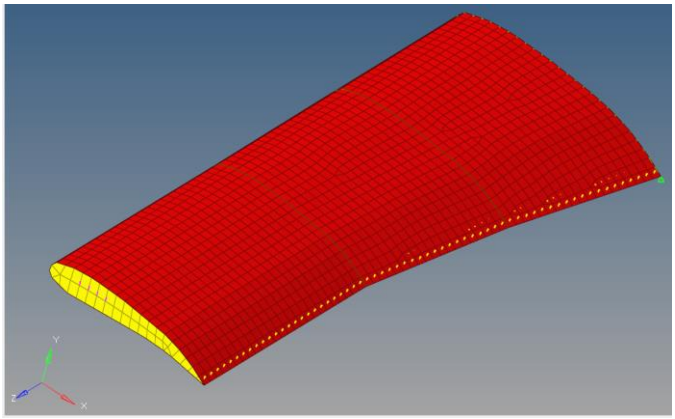
Here, we focus on the load collectors:



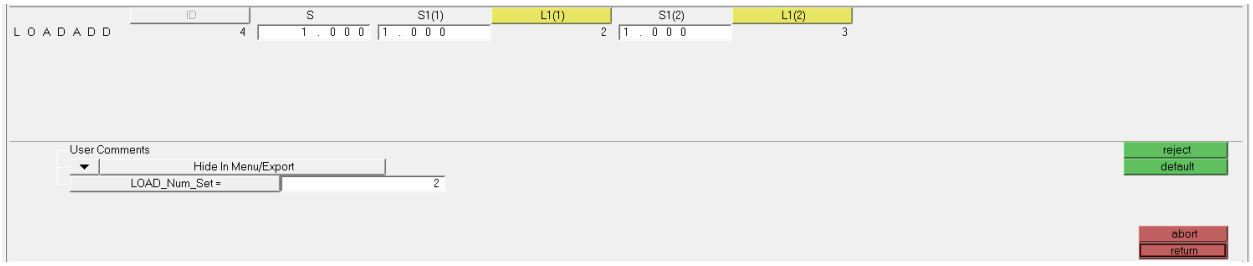


c

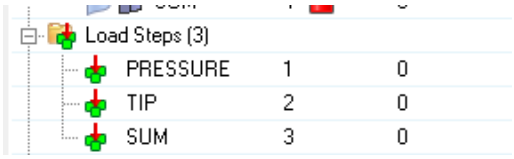


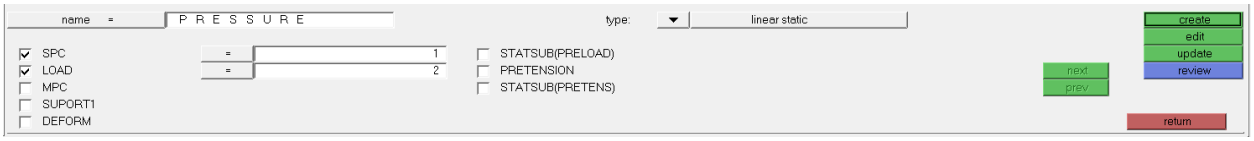


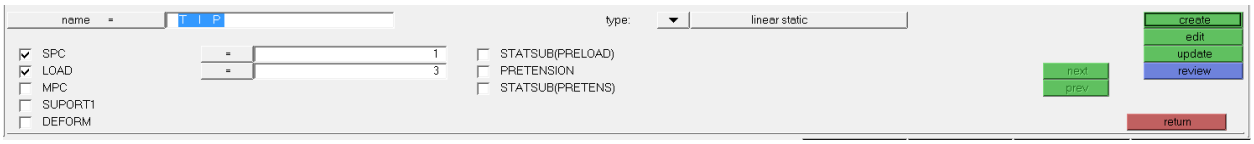
In the load collector named **SUM** (with card image **LOAD**), the loads from the load collectors **Pressure** (ID=2) and **tip_load** (ID=3) are combined. S, S1(1) and S1(2) are weighting factors, respectively.

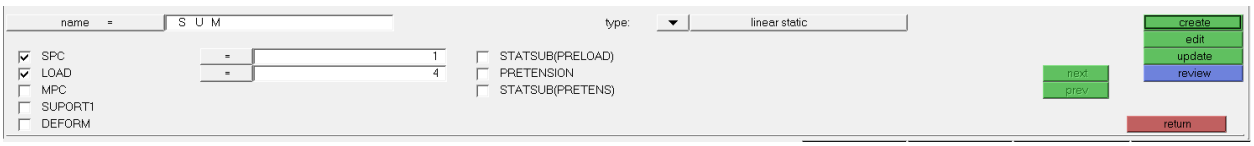


The three static load steps are:







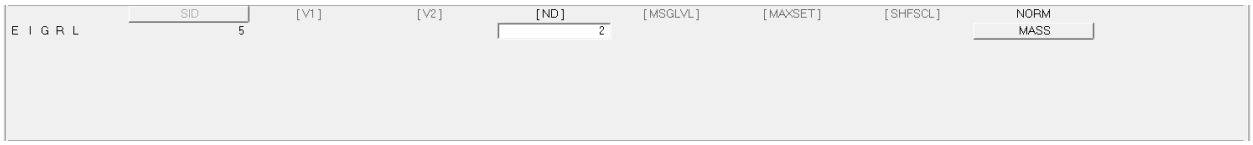


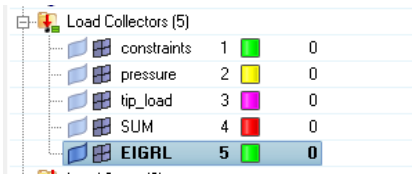
Note, the analysis **type** is set to **linear static,** respectively

In order to define the buckling load step, another load collector is needed. Do you recall what the missing load collector is about?

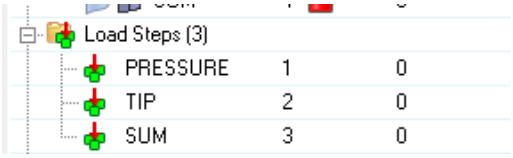
We need to create a load collector with Card Image **EIGRL** (to define the number of buckling modes we are interested in)

Its Card Image is:



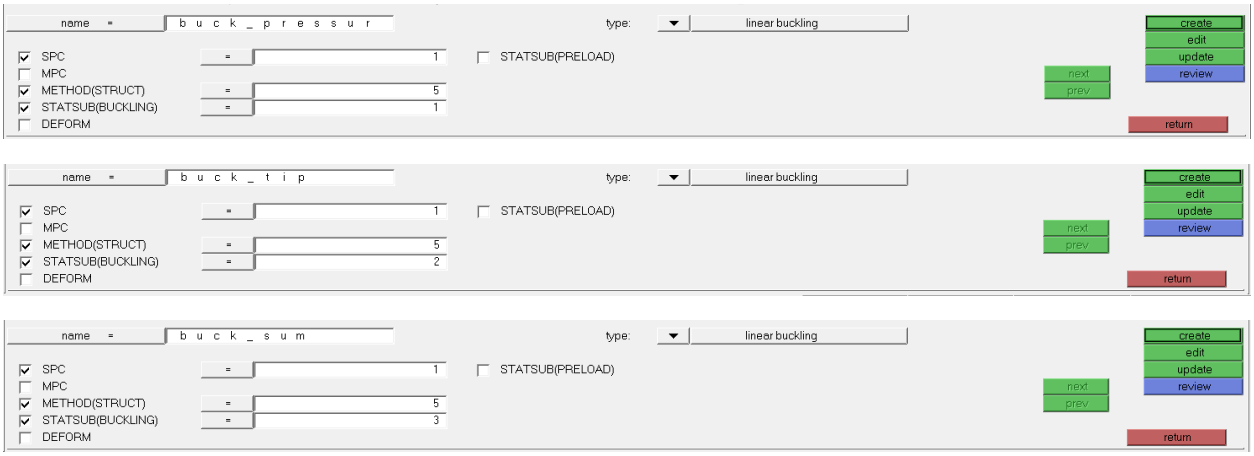


With respect to loadsteps of interest



We define the buckling loadstep next

Please compare the ID's of the referenced load collector (**SPC=** and **METHOD=**) and loadstep (**STATUSB=**)



Finally run the analysis and view the buckling modes.