NeoCASS Tutorial

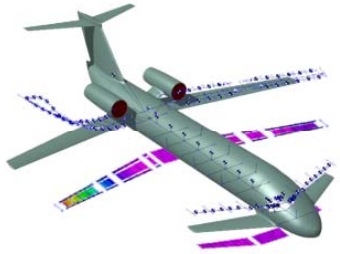
How to deal with mass configurations

"elastic aircraft option"

Version 2.2(.790)

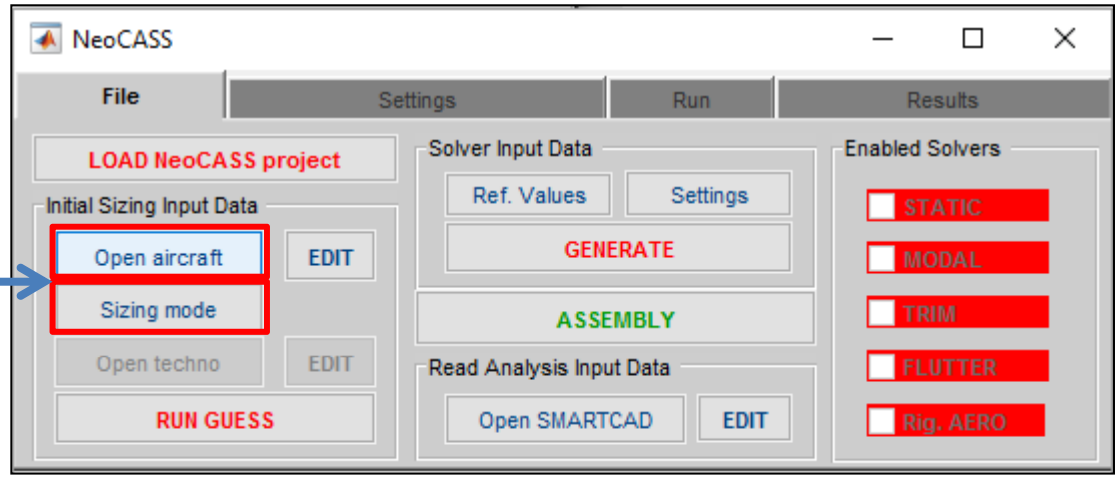
August 2017

Outline

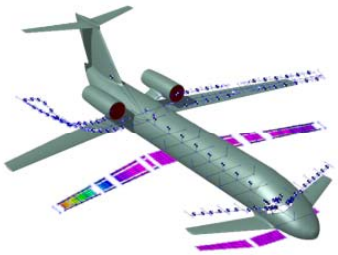


Maneuvers Set Definition

Do not forget to run the script *set_neocass_path* in the installation directory. That allows to include the NeoCASS routines into the current path. Then change directory that you will use for your analysis and start *NeoCASS*, typing it in the command window.

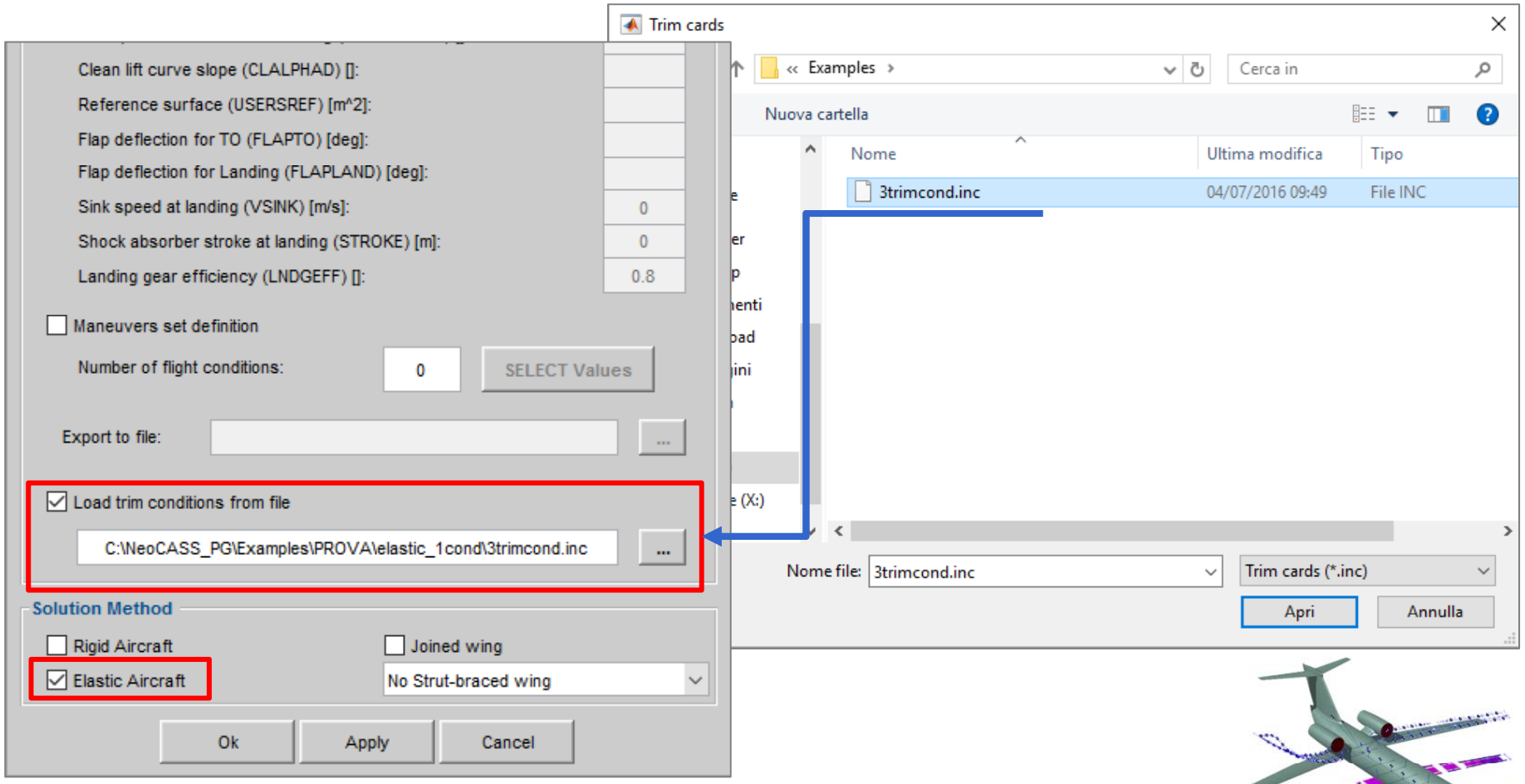


Open the aircraft model ('Open aircraft') and click on 'Sizing mode'. In this tutorial the *B747-400_reference.xml* is used.



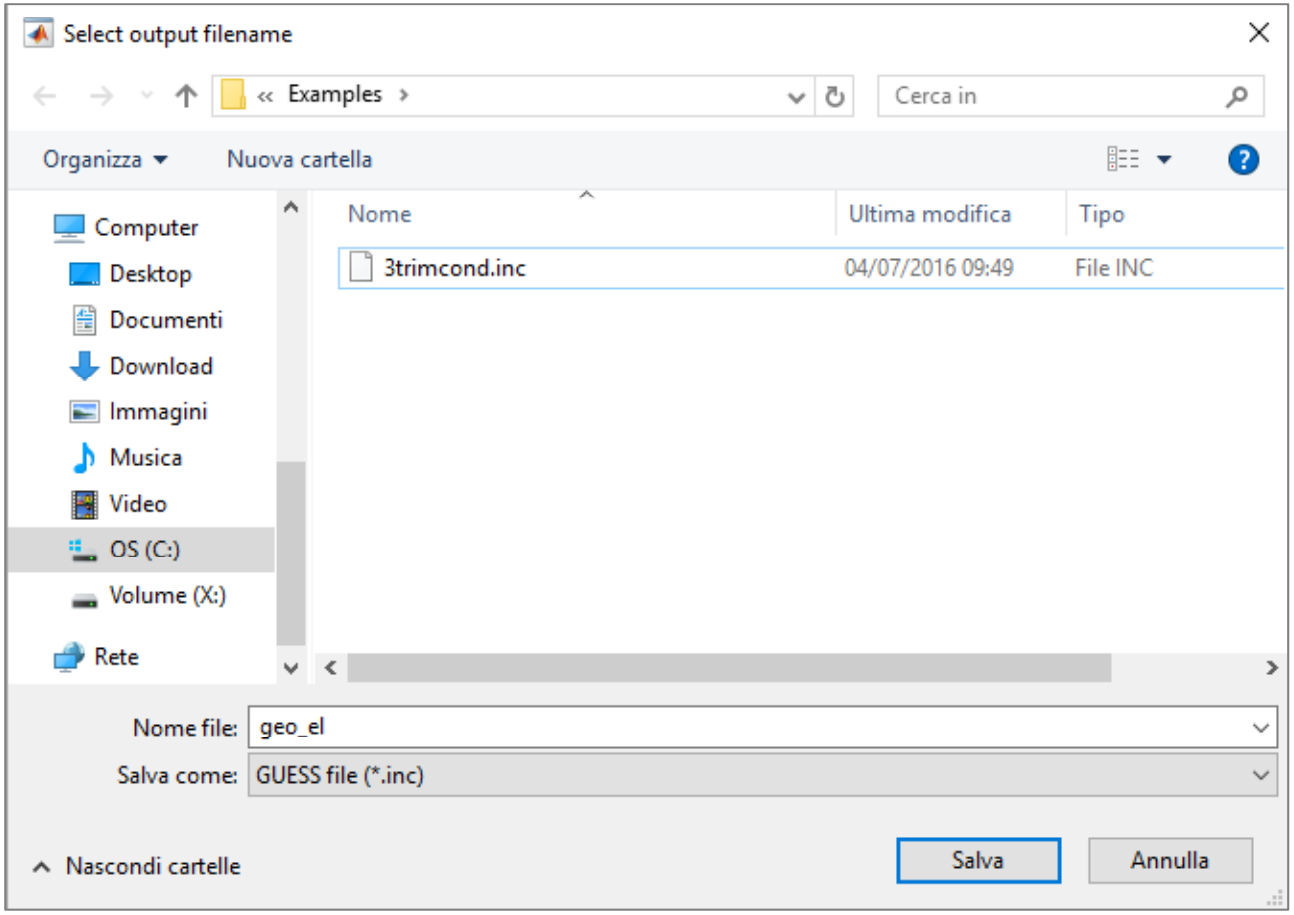
Maneuvers Set Definition

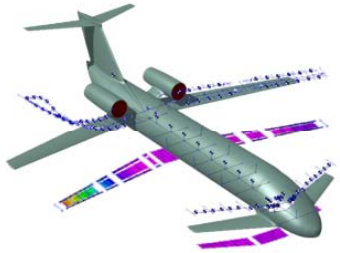
Load the three maneuvers .inc file of the previous tutorial on 'static analysis': *3trimcond.inc.* Select '*Elastic Aircraft*' in order to enable many mass configurations.



Maneuvers Set Definition

Run GUESS and specify where the results have to be saved

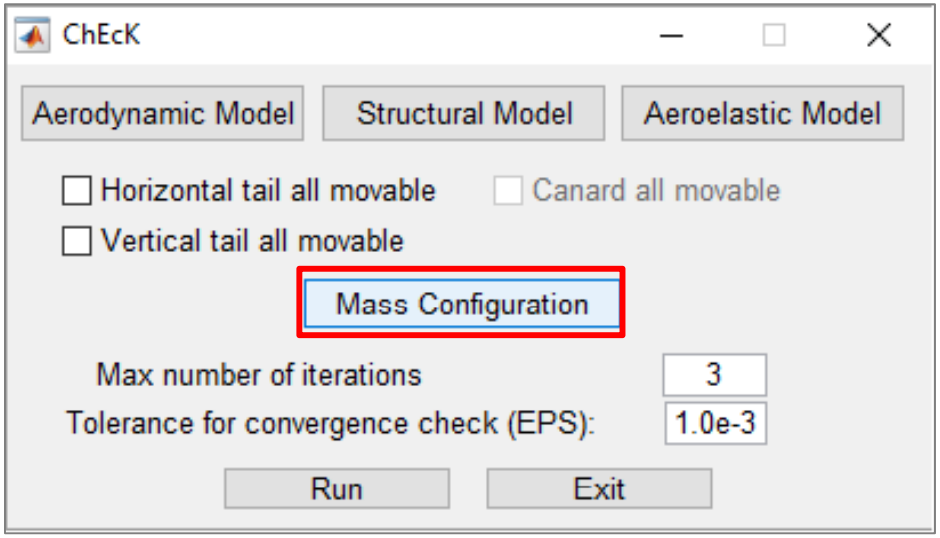


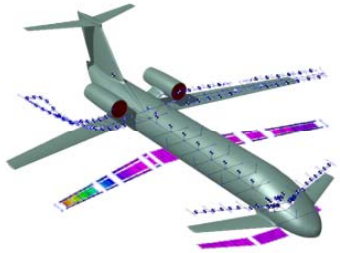


Mass configurations

The *ChEcK window* comes up in order to check the way your aircraft is modeled.

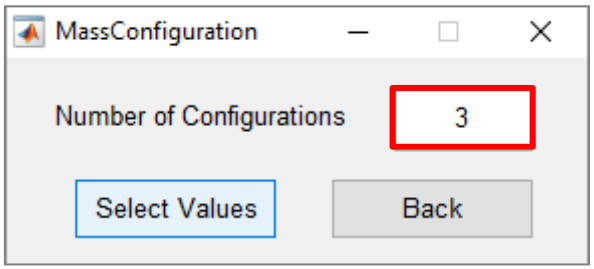
Now the '*Mass Configuration*' is enabled

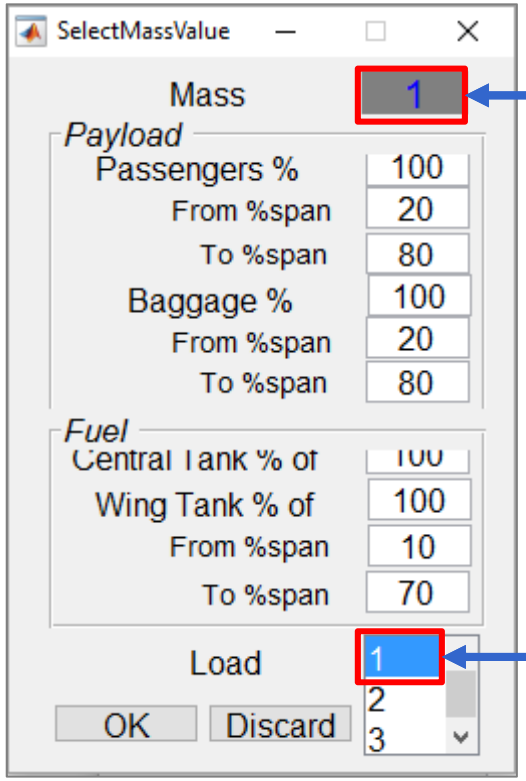




Mass configurations

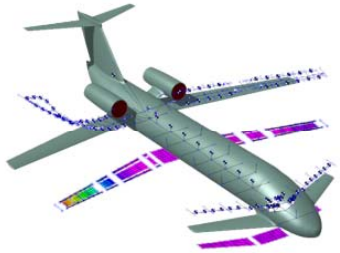
In these windows one can chose how many mass configurations should be considered (in this example 3) and associate separately each one to the previously defined maneuvers.





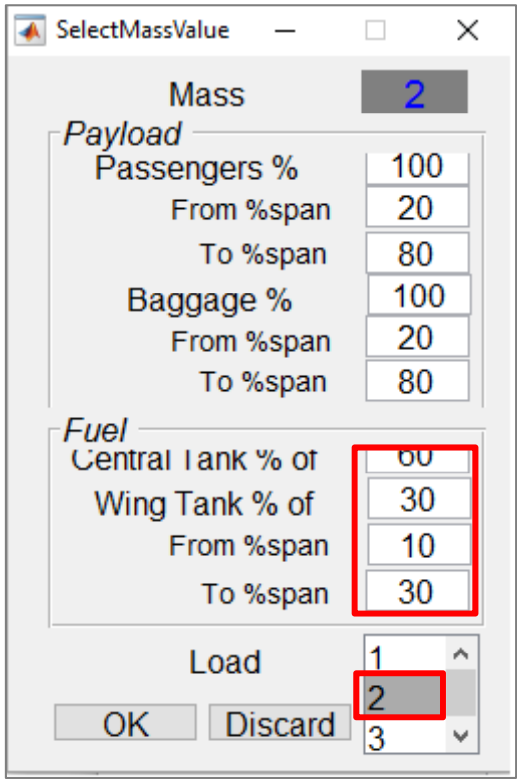
ID mass configuration

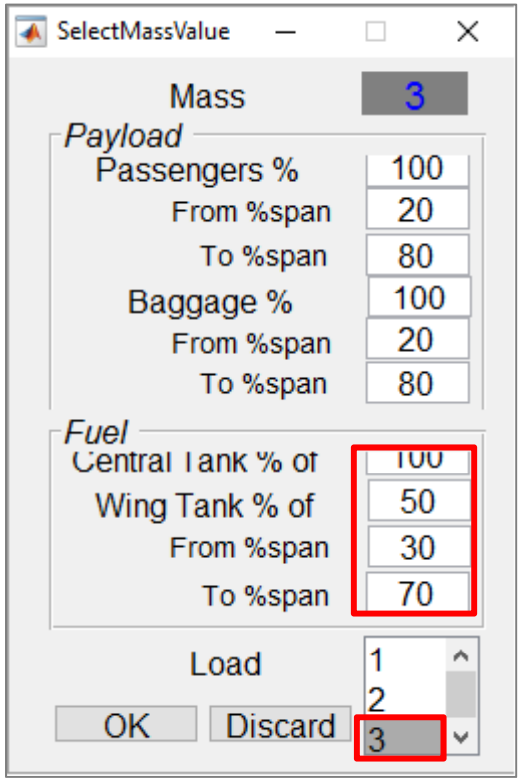
ID Load condition. *'pull-up'*

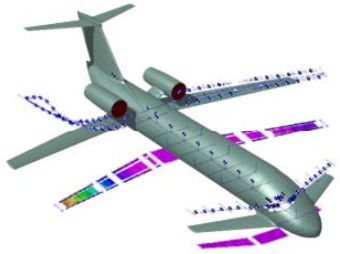


Mass configurations

Below one could see the other two mass configurations associated respectively to ‘negative_g’ and ‘side_slip’ trim conditions.







Critical Mass Configuration output

If everything goes well, the output will be similar to this one, where one could identify the three mass configuration .inc files:

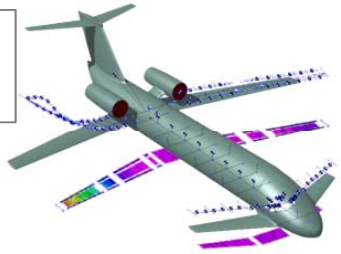
```
------------------------------------------ CONVERGENCE ------------------------------------------
- Refinement loop history:
    Iter    1: Total structural mass: 124319 Kg. Tolerance: 8.765e-02.
    Iter    2: Total structural mass: 125783 Kg. Tolerance: 1.280e-02.

- GUESS model saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_el_guess.mat file.
- GUESS summary saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_el_guess.txt file.
- SMARTCAD main file with OEW configuration saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_el.inc.
- SMARTCAD configuration file saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_elCONM_CONF1.inc file.
- SMARTCAD configuration file saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_elCONM_CONF2.inc file.
- SMARTCAD configuration file saved in C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\geo_elCONM_CONF3.inc file.
```

In order to view which mass configurations and maneuvers were the most accountable for each a/c part (in terms of bending, shear and torque), one have to load the guess result and process these data through the *'plot_sizing_man'* function.

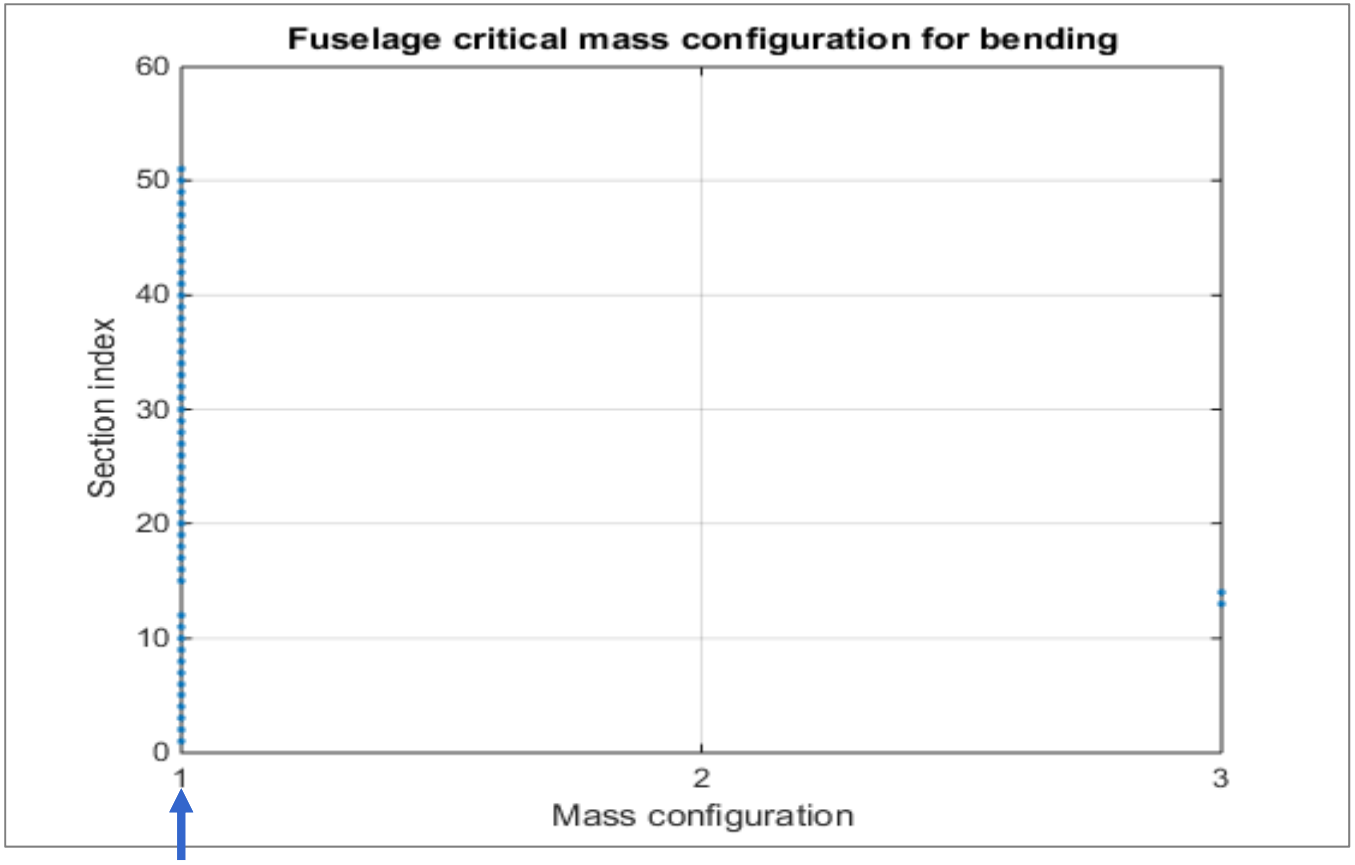
p

```
>> load('geo_el_guess.mat')
>> plot_sizing_man(guess_model.loads, guess_model, 1, [0.1:0.1:0.9], 1)
```

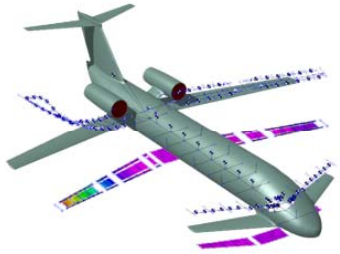


Critical Mass Configuration output

For instance, the most critical mass configuration for the fuselage in bending loading is predictably the MTOW (ID 1) that was associated to the 3,5g pull_up maneuver (ID 1).

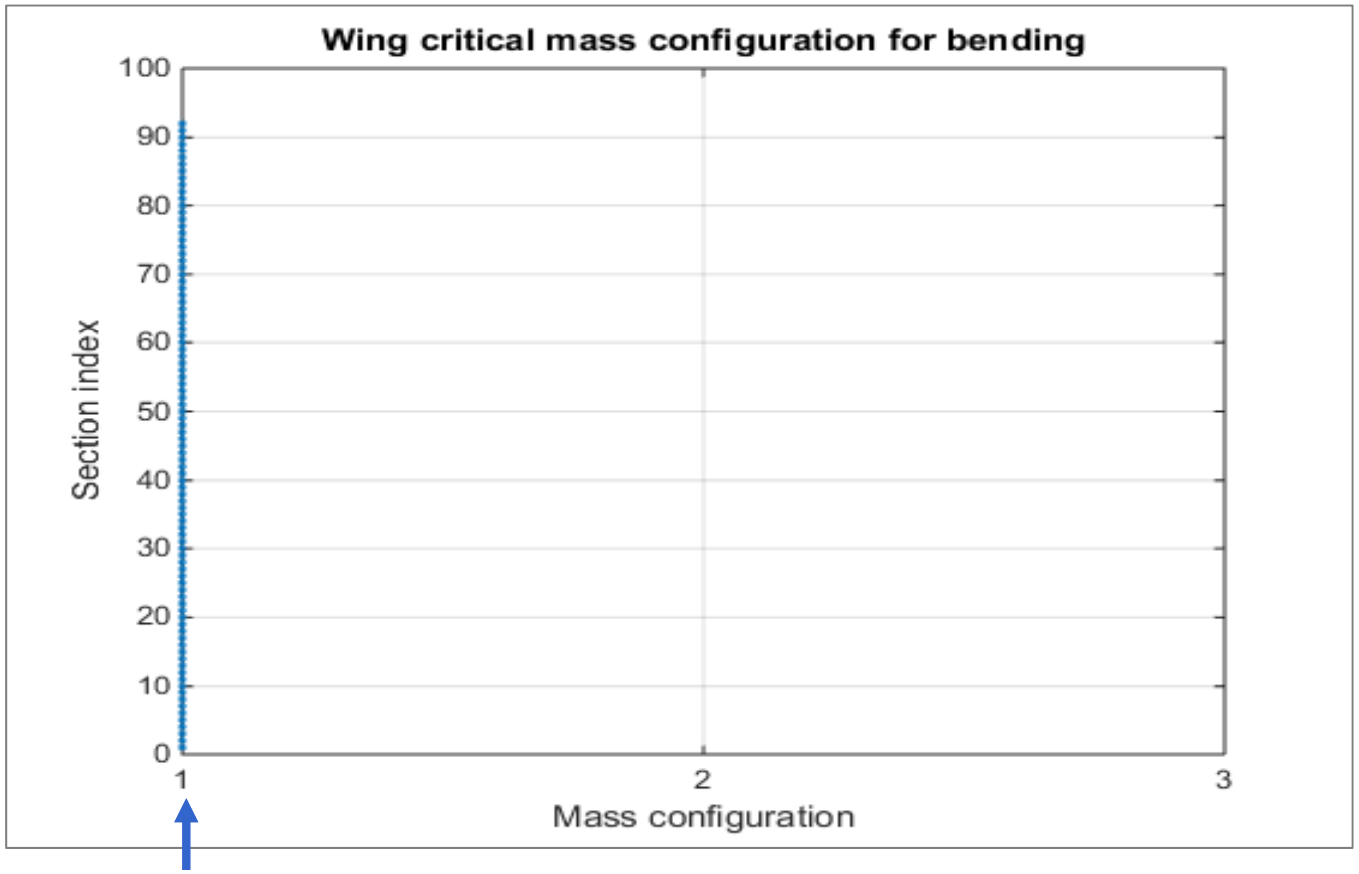


p = 1 : fuselage

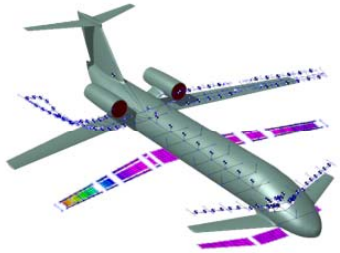


Critical Mass Configuration output

The same will be for bend, torque and shear of wings in mass configuration ID1.

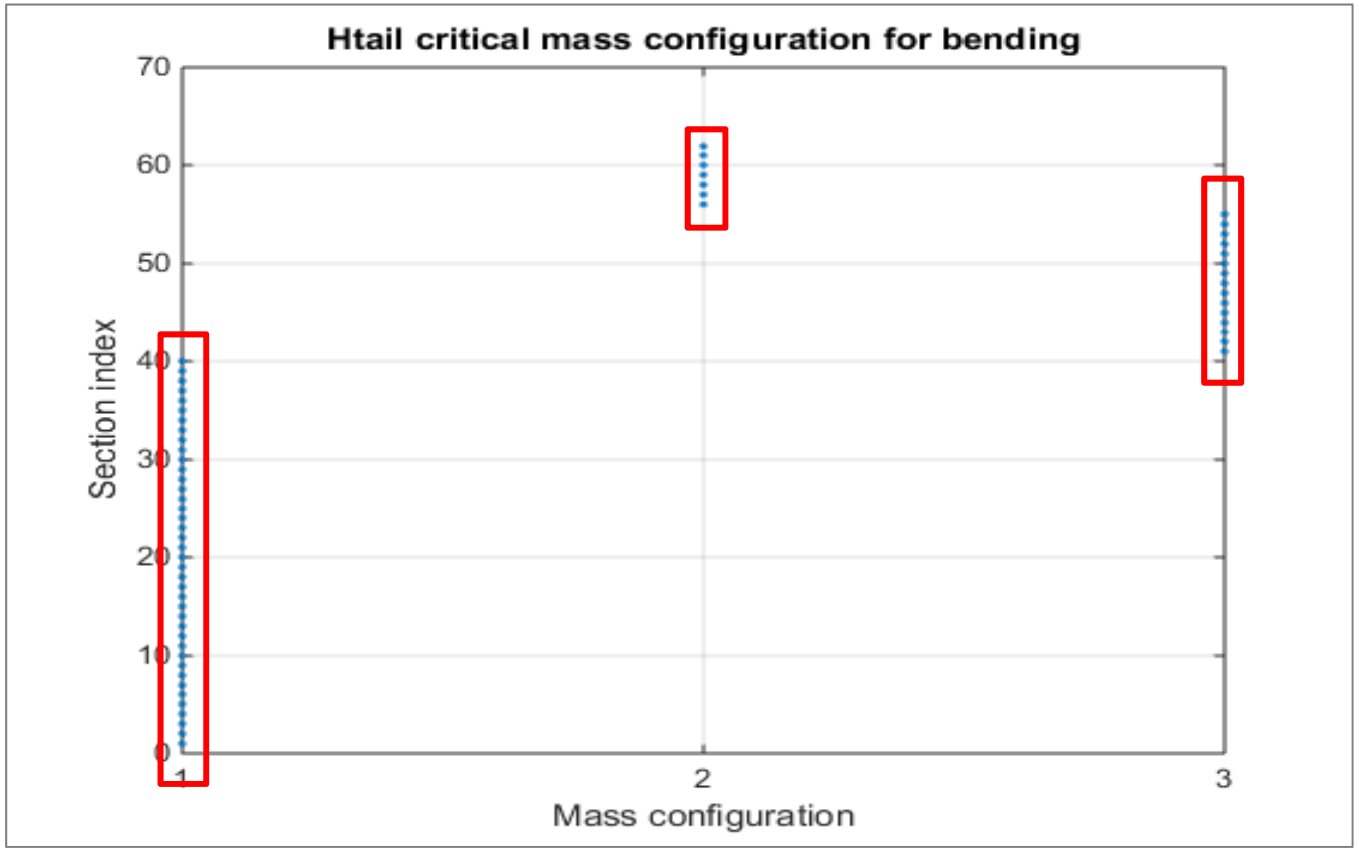


p = 2 : wings

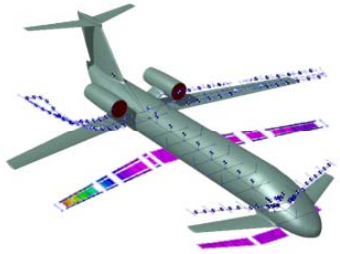


Critical Mass Configuration output

The three mass conditions have different influences on each horizontal tail sector.

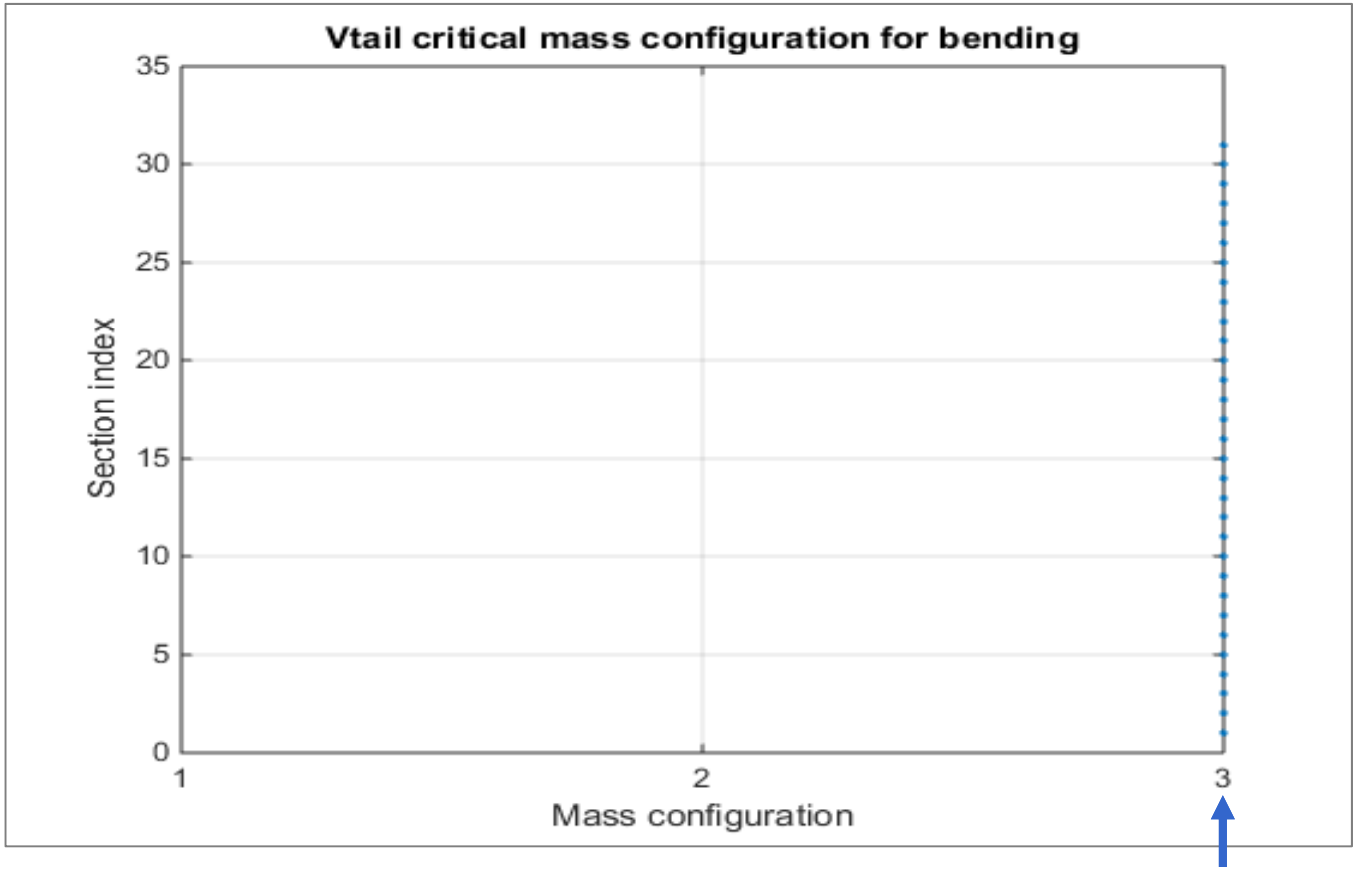


p = 3 : horizontal tail

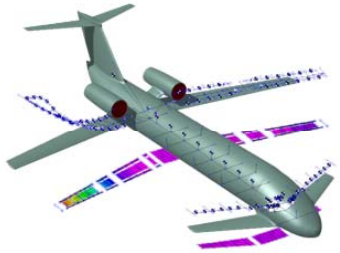


Critical Mass Configuration output

Finally, the fuel mass brought majorly near the wing tip (ID 3) associated to side_slip (ID3) is the most significant for the vertical tail sizing.



p = 4 :
vertical tail



Critical Mass Configuration output

In order to start further analysis, take a look to the other tutorials.

Note that for the actual version of NeoCASS, the SMARCAD module can process only one mass configuration and one maneuver each time.