

NeoCASS Tutorial

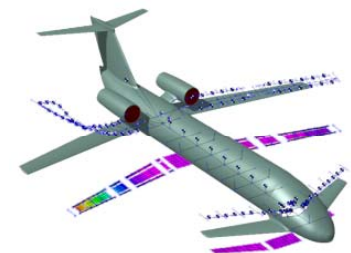
How to deal with mass configurations
“elastic aircraft option”

Version 2.2(.790)

August 2017

Outline

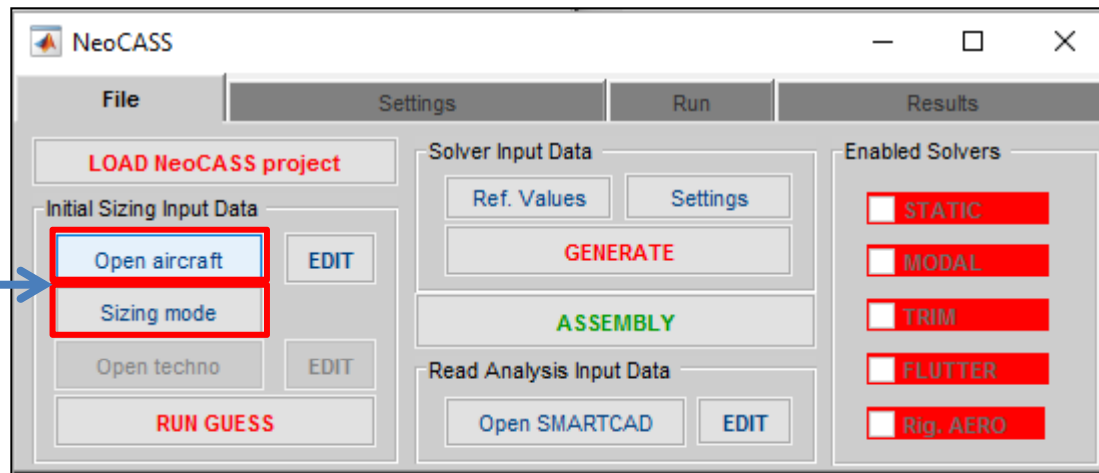
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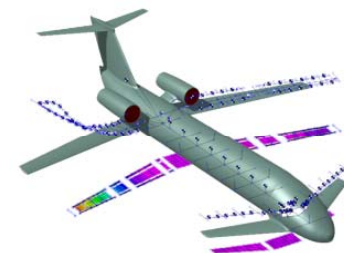
Maneuvers Set Definition



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.

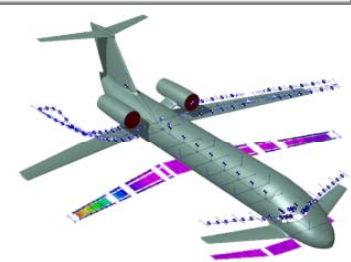


Maneuvers Set Definition



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.

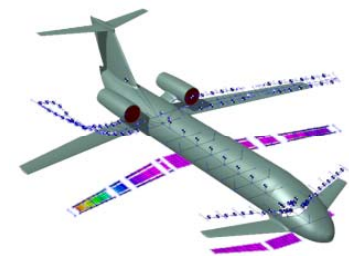
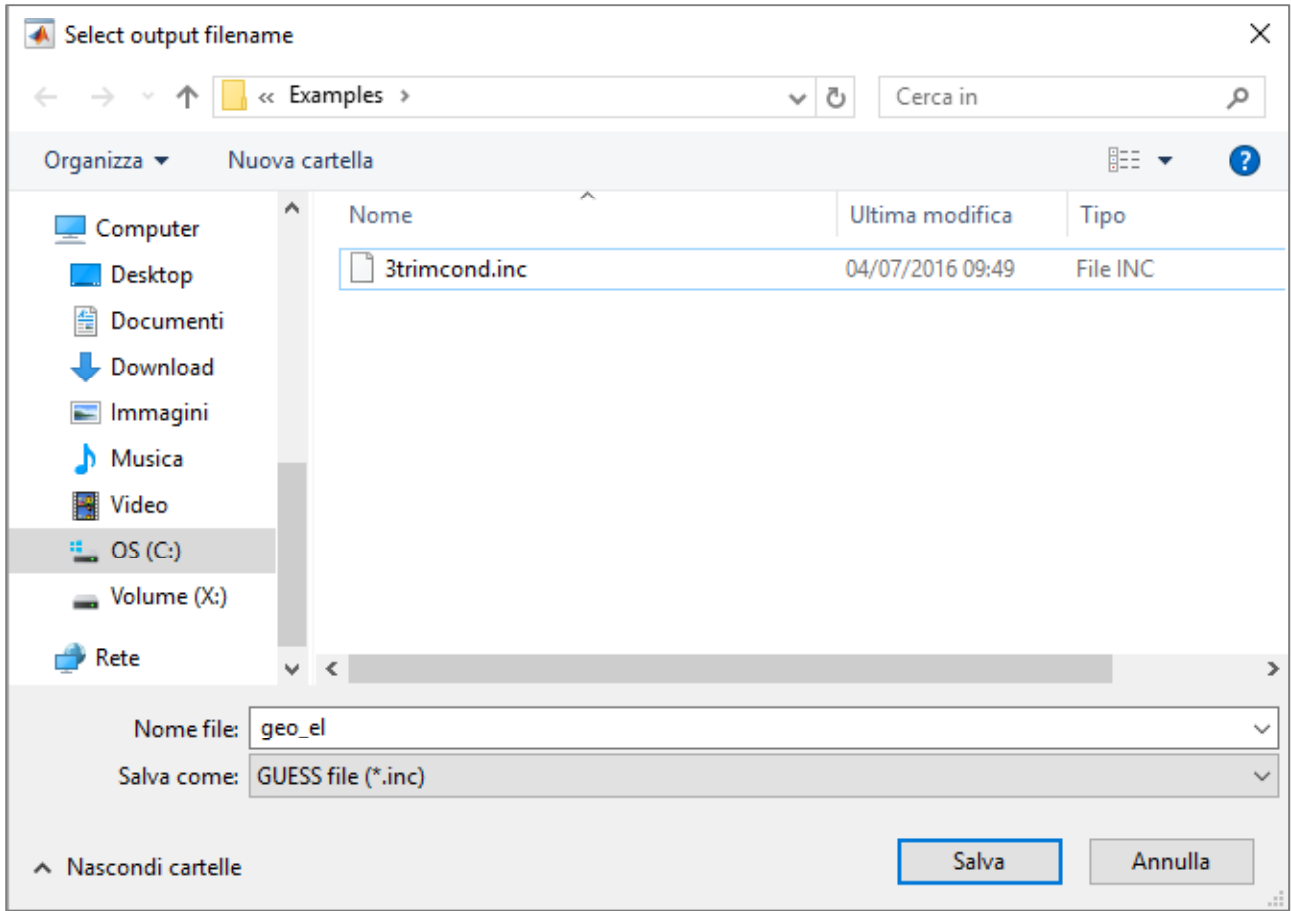
The image shows a software interface with two overlapping windows. The background window is titled "Trim cards" and contains several input fields and checkboxes. The "Load trim conditions from file" checkbox is checked and highlighted with a red box. Below it, the file path "C:\NeoCASS_PG\Examples\PROVA\elastic_1cond\3trimcond.inc" is entered. The "Solution Method" section has "Elastic Aircraft" checked and highlighted with a red box. The foreground window is a file explorer showing a folder named "Examples" with a file named "3trimcond.inc" selected. A blue arrow points from the selected file in the explorer to the file path field in the dialog box.



Maneuvers Set Definition



Run GUESS and specify where the results have to be saved

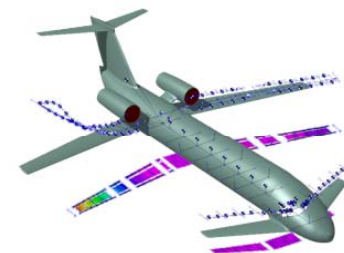
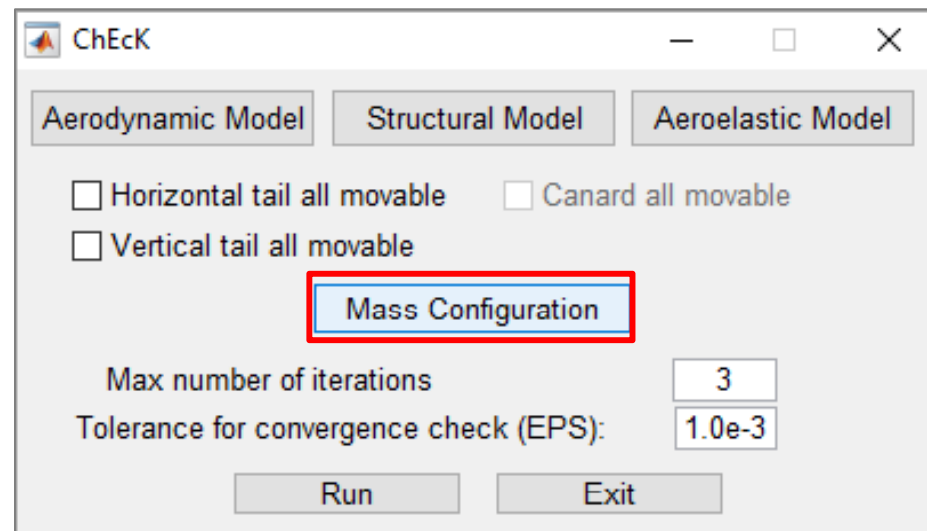


Mass configurations



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

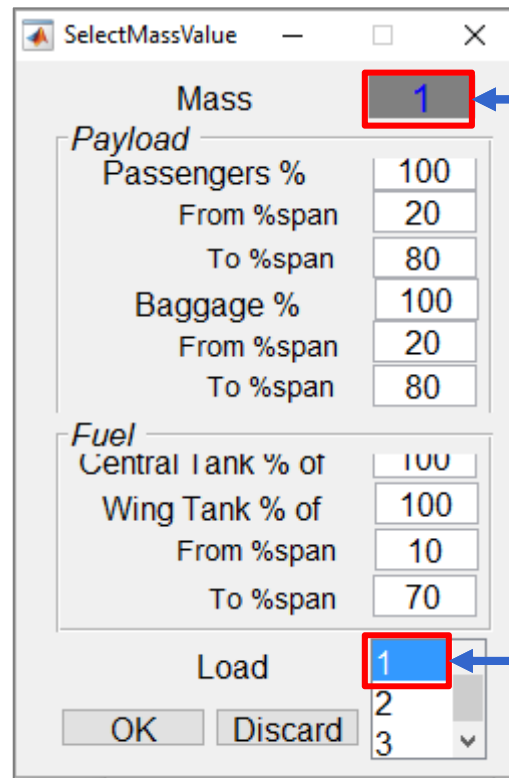
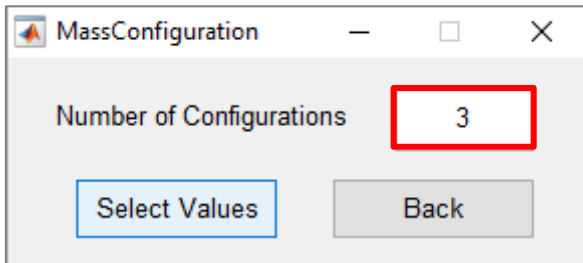
Now the *'Mass Configuration'* is enabled



Mass configurations

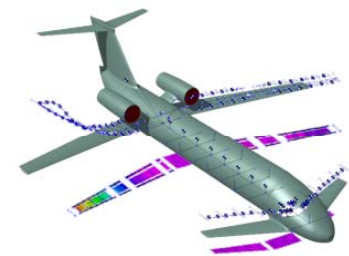


In these windows one can chose how many mass configurations should be considered (in this example 3) and associate separately each one to the previously defined maneuvers.



ID mass configuration

ID Load condition. 'pull-up'



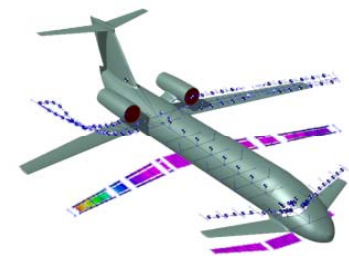
Mass configurations



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

SelectMassValue	
Mass	2
<i>Payload</i>	
Passengers %	100
From %span	20
To %span	80
Baggage %	100
From %span	20
To %span	80
<i>Fuel</i>	
Central Tank % of	60
Wing Tank % of	30
From %span	10
To %span	30
Load	1
	2
	3
OK	Discard

SelectMassValue	
Mass	3
<i>Payload</i>	
Passengers %	100
From %span	20
To %span	80
Baggage %	100
From %span	20
To %span	80
<i>Fuel</i>	
Central Tank % of	100
Wing Tank % of	50
From %span	30
To %span	70
Load	1
	2
	3
OK	Discard



Critical Mass Configuration output

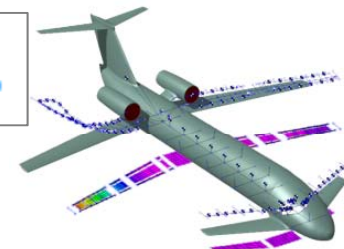


If everything goes well, the output will be similar to this one, where one could identify the three mass configuration .inc files:

```
----- 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.

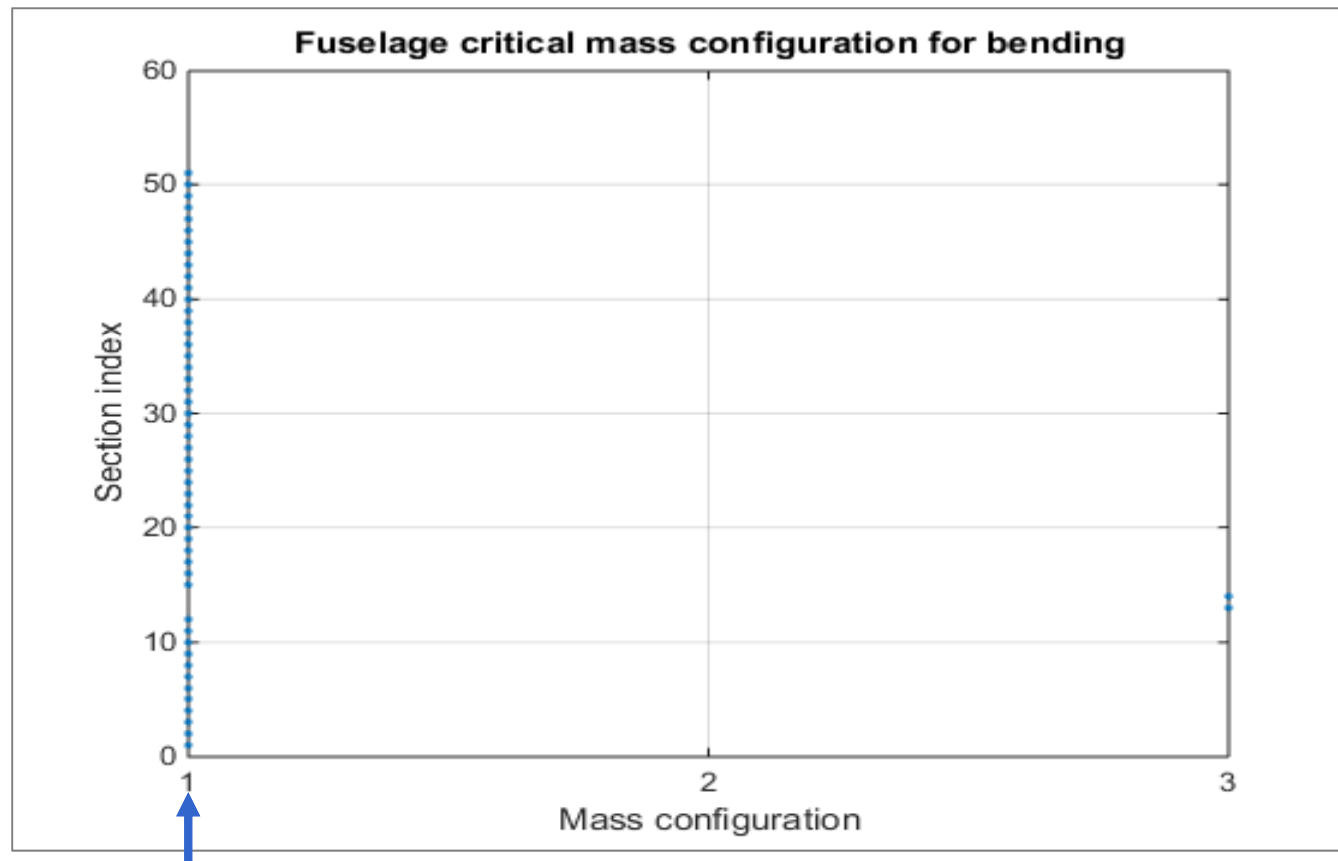
```
>> load('geo_el_guess.mat')  
>> plot_sizing_man(guess_model.loads, guess_model, p1, [0.1:0.1:0.9], 1)
```



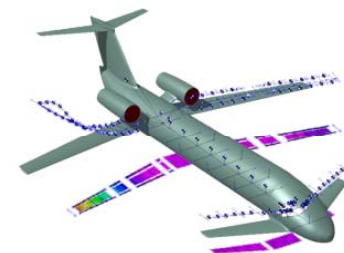
Critical Mass Configuration output



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).



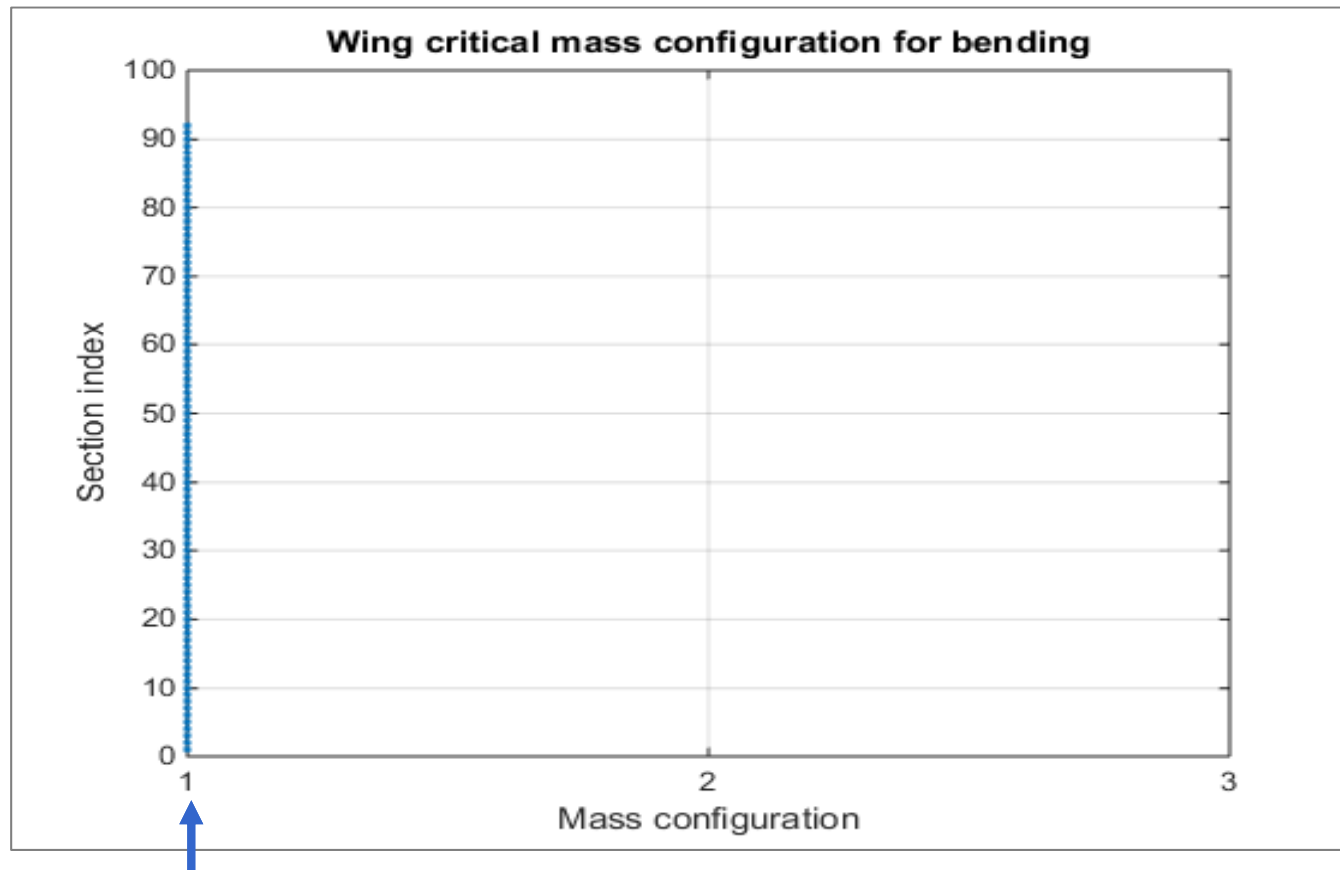
*p = 1 :
fuselage*



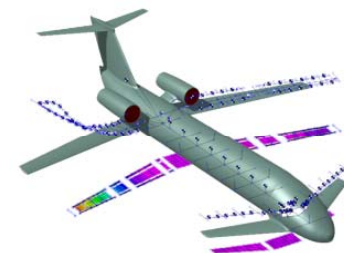
Critical Mass Configuration output



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



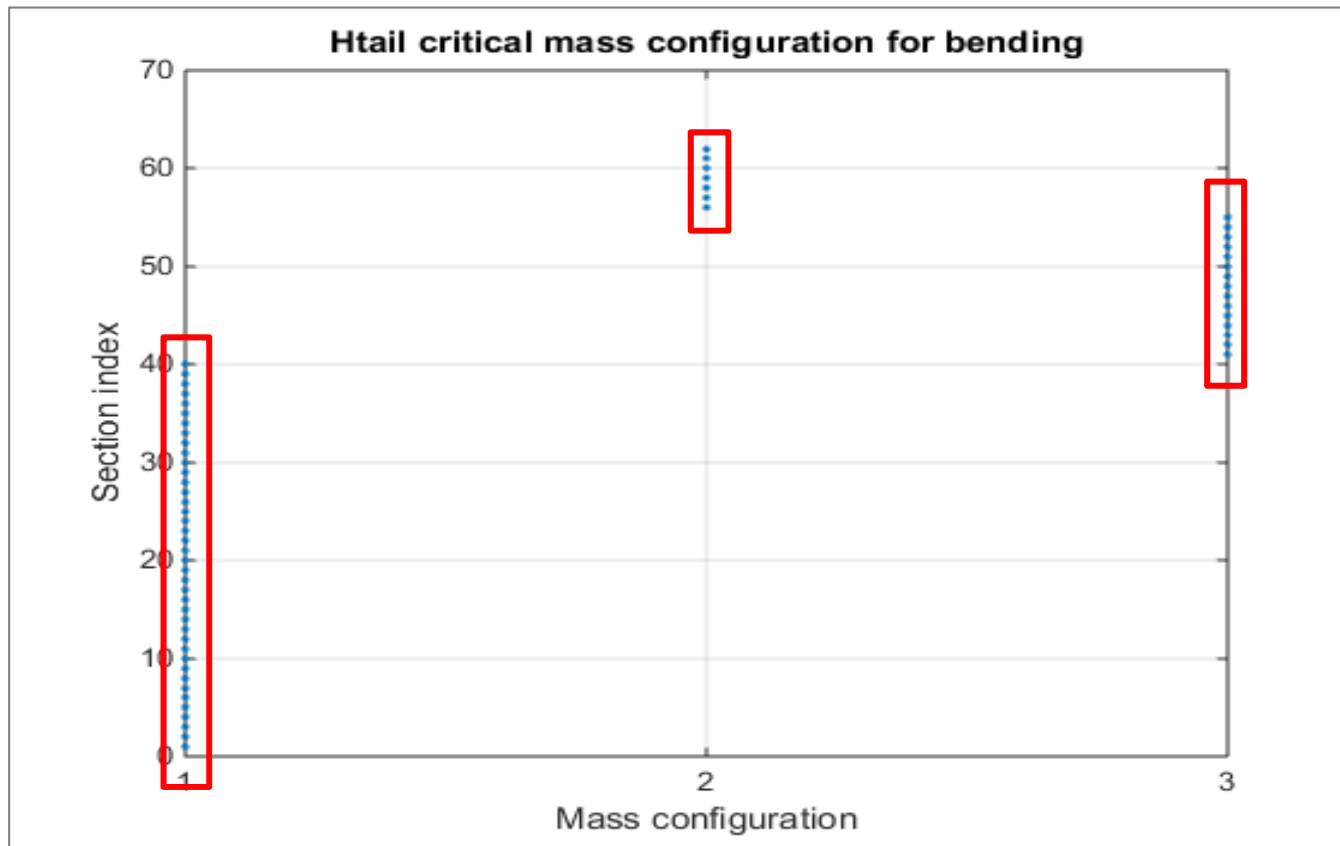
p = 2 :
wings



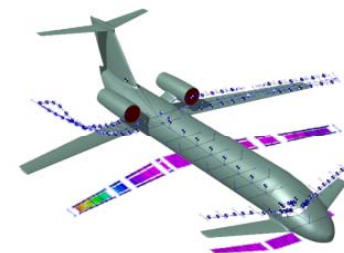
Critical Mass Configuration output



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



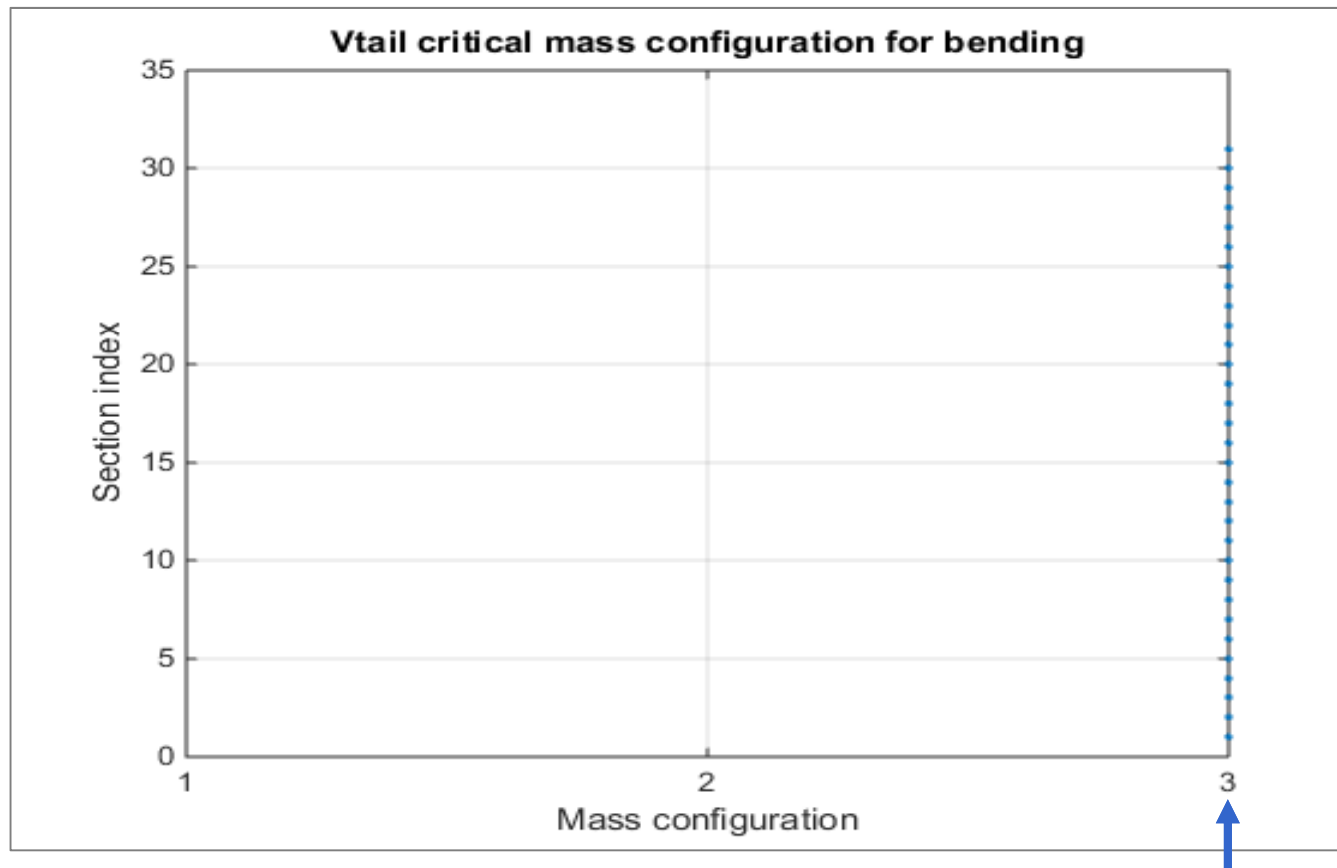
*p = 3 :
horizontal
tail*



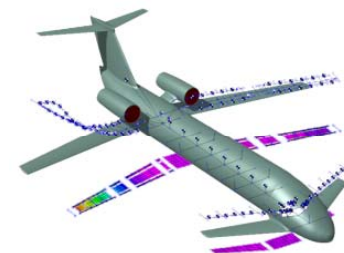
Critical Mass Configuration output



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 SMARTCAD module can process only one mass configuration and one maneuver each time.

