Dear students,

Due to the numerous questions we have been asked, we write to you all some advice and indications to help you in the realization of your project.

1. **Boundary conditions.** The 8 holes in red represent a threaded zone. These ones allow the fixation of the Bracket 3 to the structure of the airplane using, for example, a bolt. The blue circular surface inside the design space is the one that comes into contact with the oil tank, therefore this is where the forces are applied. The force transmitted from the oil tank to the support can be modeled in multiple ways, however, the most important thing is that you explain clearly how you modeled the load transmission.

2. **Load Cases.** The force vectors in Figure 3 are not correct. The directions of the forces should be based on the default reference system in the NX part file and not on Figure 3.

3. **Passive elements.** If necessary, you can define non-optimizable solid zones. As these solid zones are defined by Regions, you must work the geometry of the .prt file to divide the body according to your needs before defining this zone, like in the tutorial.

4. **Bracket strength.** The topology optimization problem solved by Topol-NX software is a compliance minimization subject to a volume restriction, with design variables (densities) ranging from 0 to 1. Since the problem does not consider the stresses, it is not important to consider the yield stress, the ultimate stress and/or fatigue in the optimization problem. However, to be able to analyze the structural performance of your optimized design, you will need to compare the maximum stresses of the optimized support with the strength of the material. In order to obtain the stresses of your designs you have 2 options.

    a. Activate the option "Full Analysis at the end – On Topol Model" on the Topol interface, or
    b. Post-process the optimized solution to generate a solid body, mesh it and perform a finite element analysis.

    Option b. may be difficult to perform but it will be more accurate than a. However you will have to, at least, use a. to comment on the performance of your design.

5. **Analysis and comments.** It is very important that your report includes an analysis supported by the theory presented in the theoretical course. For example, the choice of the optimization parameters should be discussed. The obtained results should be analyzed taking into consideration, for example, the amount of grey elements, the stresses reached, the quality of the mesh, functionality of the

component, etc. For example, it is possible that some of the 8 fixations are not connected to the bracket, i.e. "flying". You should comment and give us your hypothesis on each situation that you might encounter.

6. **Your contributions to the problem.** The software is limited to a maximum number of elements, which is about 120 thousand. This limitation may prevent you from generating a solid from the optimized solution. Although it is true that it is not an obligation to generate a solid component, you must try to do so, and if you do not succeed, explain why. You can reduce the design space if you like. This may allow you to reduce the size of the elements and get a solution easier to turn into a solid. If you apply a reduction in the design space, it should be clearly explained and justified.

7. **Quality of the report.** The quality of the report is evaluated. This considers, but is not limited to, the writing quality and the document format and figures. Some NX options that can help you improve the quality of your images.
    a. You can set a white background by going to: File->Preferences->Background.
    b. You can change the color of your mesh in Utilities->Mesh Display Preferences. There you can also shrink the elements to get a better view of your boundary conditions.
    c. You can change the aspect of the force vectors. To do this you should right click on the force and select "Edit Display".

Cordially yours
Eduardo Fernández (efsanchez@uliege.be)
Pablo Alarcón (palarcon@uliege.be)
Assistants