Asm3 : methodological essay - jpg87

updated the 2020.01.27 with Asm3 WB version 0.10.2 (2019.07.03)

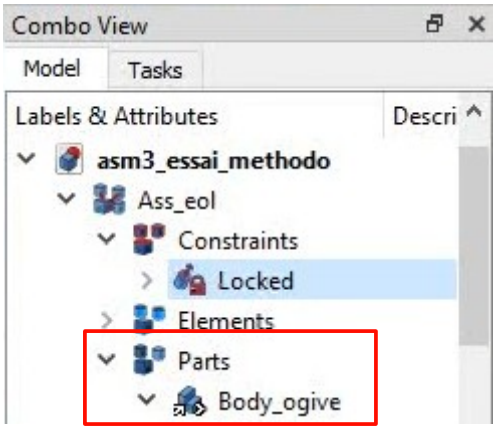
1- Create the assembly file

- Start **FreeCAD** and go to the **Asm3** WB.
- Save the file with the desired name now (here **asm3_essai_methodo**).
- Create a new document if necessary.
-  Create a **new assembly container** and rename it (for example here **Ass_eol**).
-  Check the activation of the automatic solver.

11- Import the "reference" object

- Open the file containing the "reference" object (here **ogive**).
- Make the assembly file **active** (**asm3_essai_methodo**). (To do this, click on its name in the tree structure or click on the corresponding tab at the bottom of the screen).
- While holding down the **Ctrl** key, drag and drop the object to integrate into the assembly (**Body_ogive**) onto the name of the assembly container (**Ass_eol**).

*In the assembly tree, a new object appeared in the list of parts in the assembly: **Body_ogive**.*

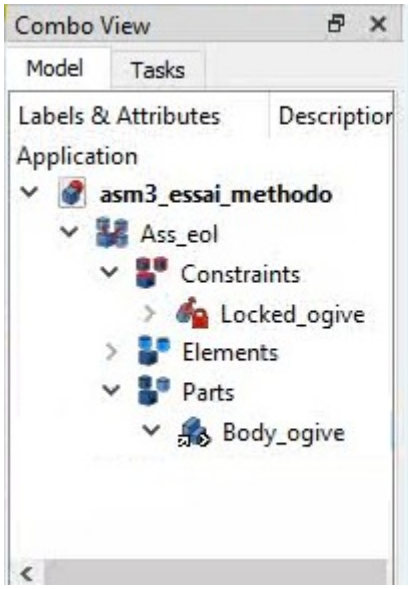


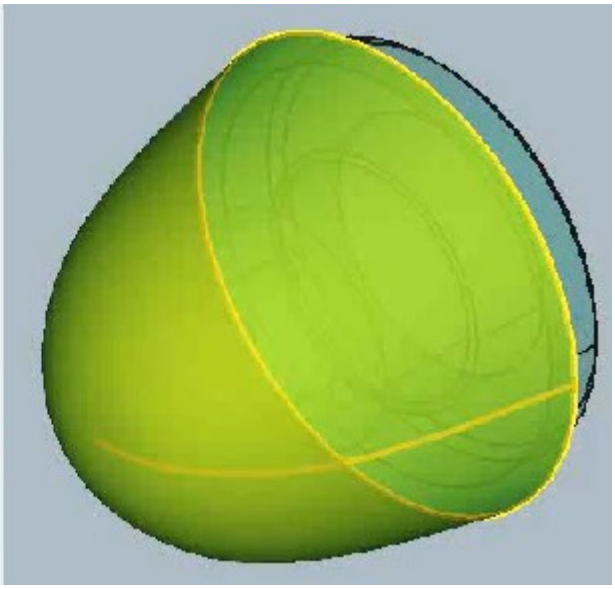
12- Immobilize the "reference" object

It is essential that a part (or sub-assembly) is immobilized in the geometric reference system so that the other objects are positioned on it and not vice versa, at the risk of having a positioning of the assembly very fanciful for possible future flat projections.

- To do this, simply select (click on) a geometric entity of the object in the 3D window, then click on the  icon.

The constraint then appears in the tree structure.





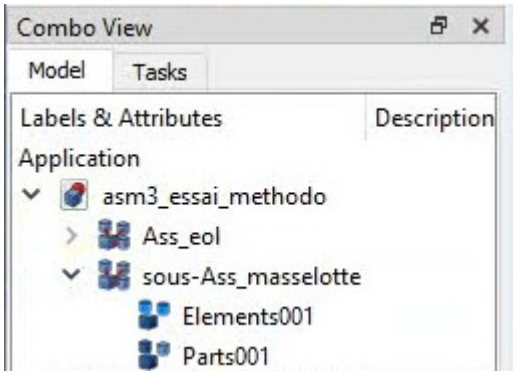
- It is strongly recommended to rename the constraint.

2- Import components into a sub-assembly

21- Import the objects of the sub-assembly

We will proceed here in the same way as before to add the necessary components (parts, body, ...).

- Open the files containing the objects constituting the sub-assembly to be built (here **masselotte** and **axe_masselotte**).
- Make the assembly file active (**asm3_essai_methodo**).
-  Create a **new container** for the sub-assembly and rename it (**sous-Ass_masselotte**).



We will insert each of the objects :

*- the "reference" piece **masselotte** ;*

*- the **axe_masselotte** part which will be used twice in the sub-assembly (two instances of the same part).*

- While holding down the **Ctrl** key, drag and drop the object to integrate into the assembly (**Body_masselotte**) onto the name of the sub-assembly (**sous-Ass_masselotte**).

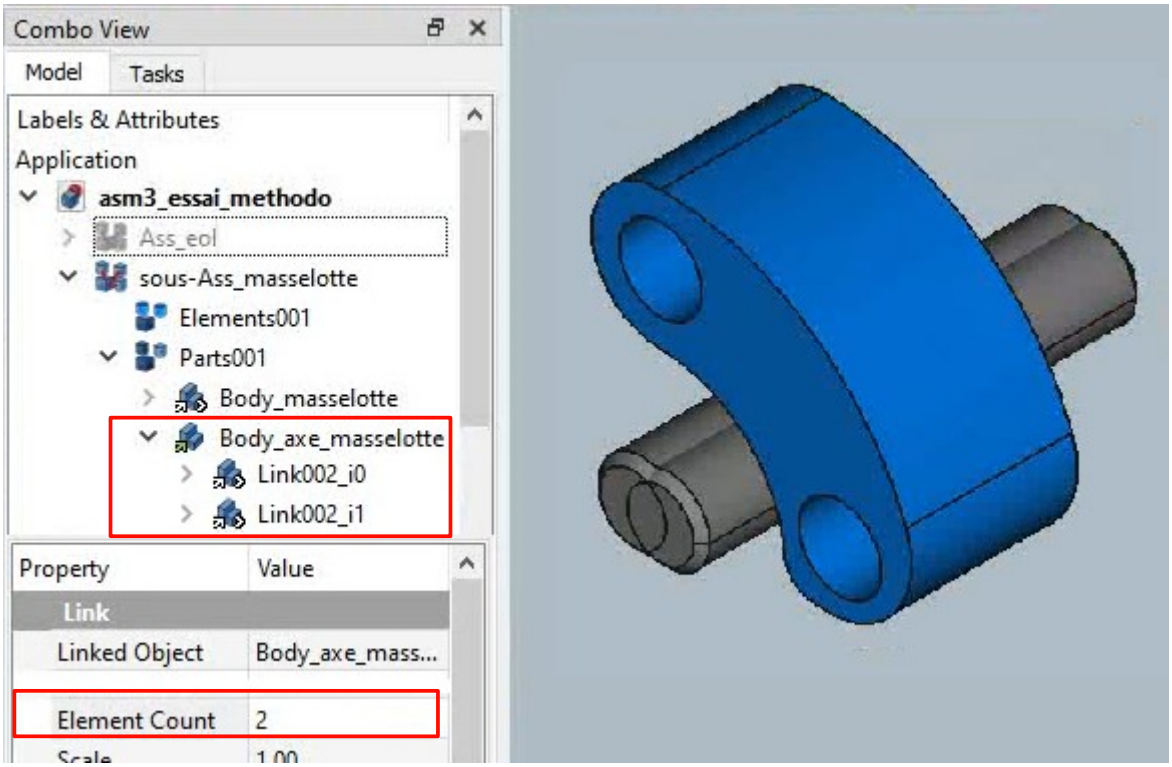
*In the sub-assembly tree, a new object appeared : : **Body_masselotte**.*

- **Proceed in the same way with the axe_masselotte object.**

*You should now have an additional link in the tree : **Body_axe_masselotte**.*

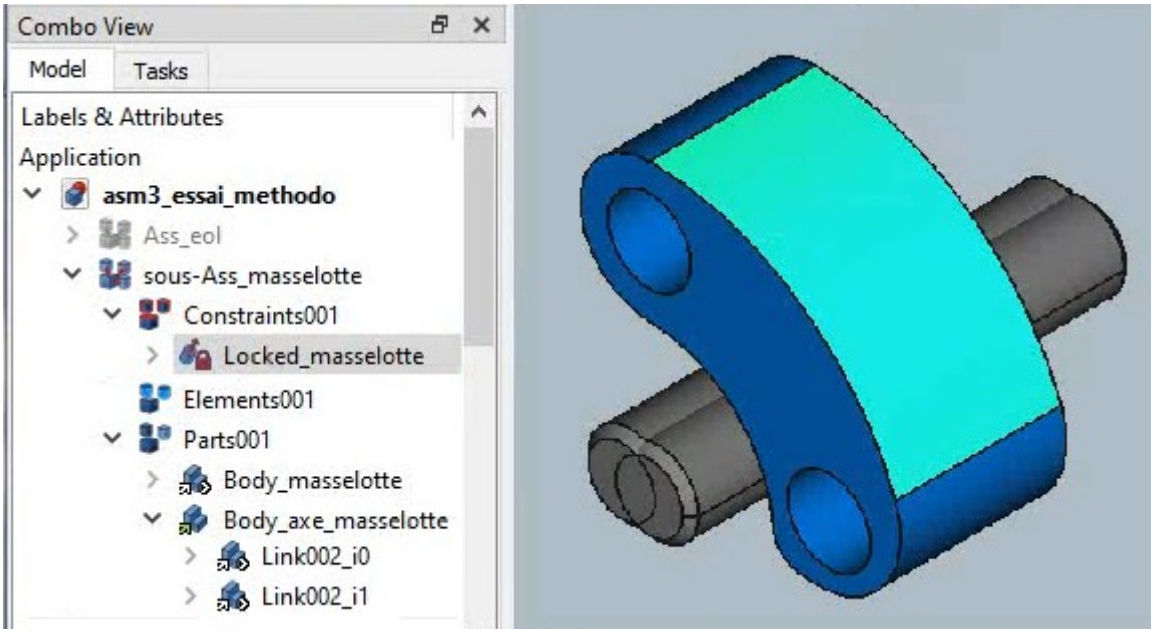
- Click on the **Body_axe_masselotte** link in the tree structure, then search for the property **Element Count** and click several times at the end of the line to bring its value to **2**.

*The **Body_axe_masselotte** link can now be expanded to show the two instances.*



22- Immobilize the "reference" object of the sub-assembly

- Select a face of the **Masselotte** object in the 3D window, then click on the  icon.
  The constraint then appears in the sub-assembly tree and can be renamed :

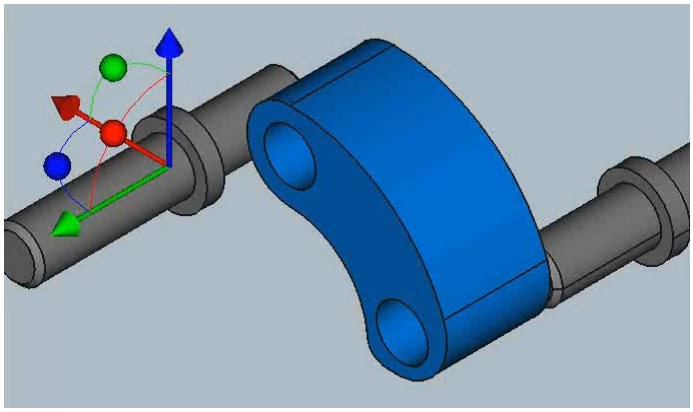


It is possible to reorder the objects in the tree structure with  *or*  *.*

3- Position (constrain) the parts of the sub-assembly

31- Pre-position objects if necessary

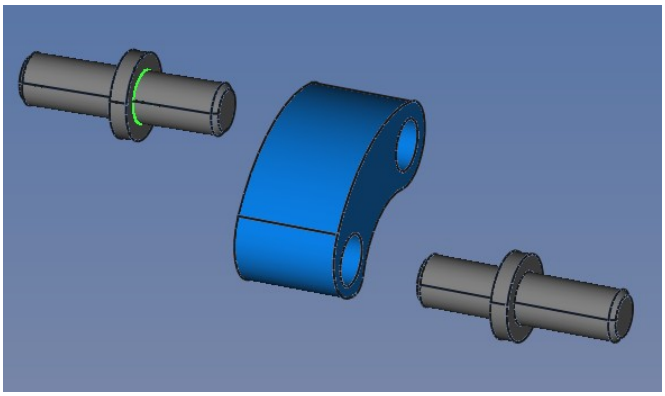
- Select one of the **axe_masselotte** objects in the tree structure, then click on the  icon : you can move the object with the mouse by clicking and dragging on the arrows or spheres of the reference frame that appeared.
- Pre-position each of the **axe_masselotte** objects as below :

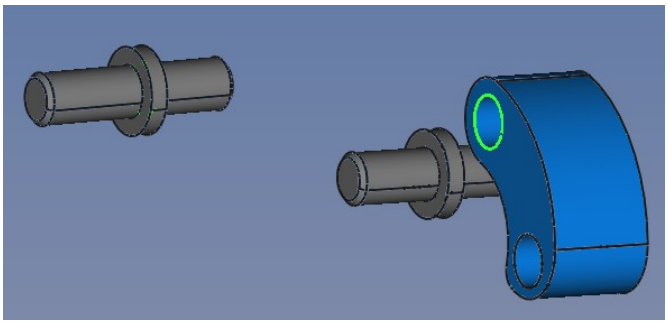


32- Install the positioning constraints

To embed one of the axes in one of the weights' housings, we will use the ***Coincident Plans*** *constraint which makes both their norms and their centers coincide (= pivot link, ie - 5 DOF).*

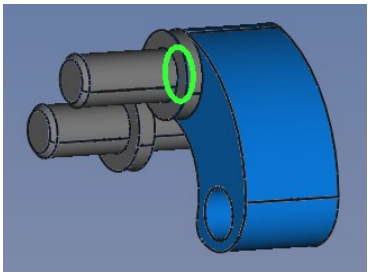
- Select the **circumference** of the base of the collar on one of the **axe_masselotte** objects in the 3D window, then while holding down the **Ctrl** key, select the **circumference** of the entry of the corresponding bore of the counterweight.





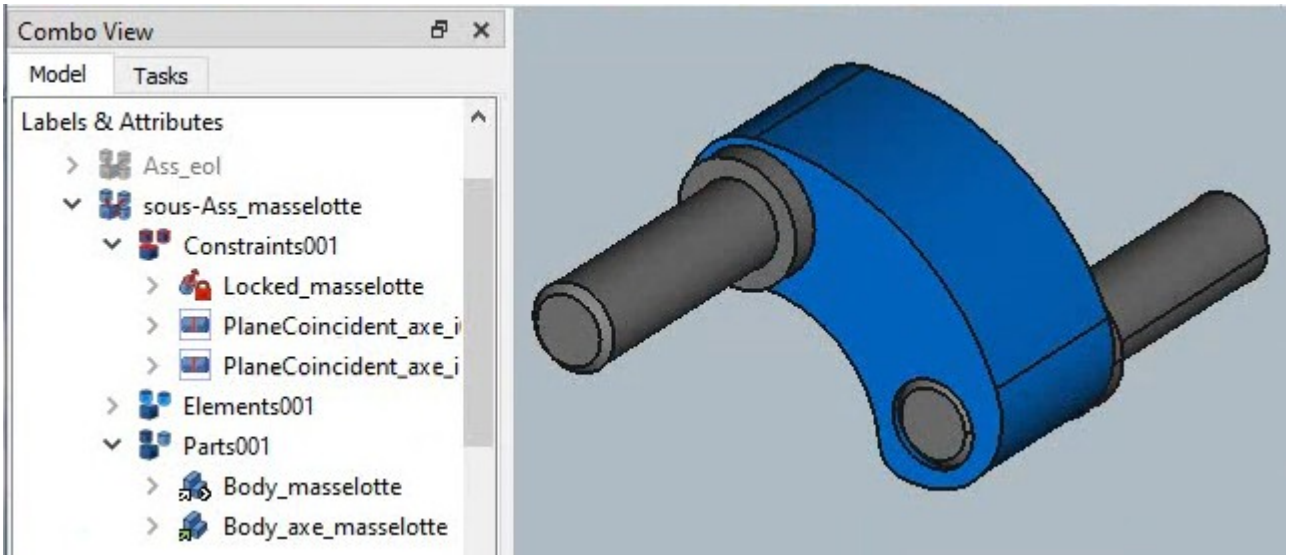
- Finally click on the  icon (coincident planes) then on the  icon to resolve the constraints (unless you have previously pressed the automatic resolution button ).

Here is the result :



- **Repeat the operation** with the second **axe_masselotte** object.
- **Rename** constraints.

Result :



*The sub-assembly **sous-Ass_masselotte** is now ready.*

We can make the global assembly visible again :

- Select the **Ass_eol** assembly in the tree structure, then activate the **space** bar.

4- Insert the sub-assemblies into the main assembly

41- Insert the “sous-Ass_masselotte” sub-assembly

- Drag and drop the **sous-Ass_masselotte** components onto the name of the general assembly (**Ass_eol**).

*In the general assembly tree, a new object appeared : **sous-Ass_masselotte**.*

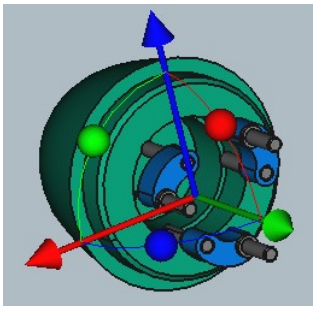
- Click on the **sous-Ass_masselotte** link in the tree structure (in Ass_eol> Parts). Note that the **Element Count** property is not available here. We must therefore proceed differently :
- Right click on the same **sous-Ass_masselotte** link in the tree structure, then click (left) on **Link actions** > **Make link**..

*The **sous-Ass_masselotte001** link appeared outside of Ass_eol > Parts.*

- Click on this link **sous-Ass_masselotte001** and set its **Element Count** property to **2** to obtain 2 instances of it.
- Insert the **sous-Ass_masselotte001** link now containing the 2 new instances of **sous-Ass_masselotte** in the general assembly (**Ass_eol**).

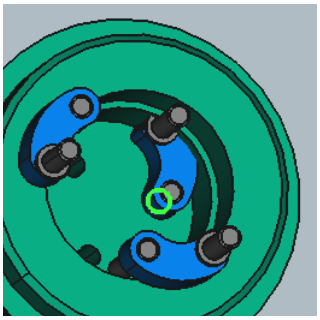
42- Pre-position the 3 instances of sous-Ass_masselotte

- Select one of the instances **sous-Ass_masselotte** in the tree structure, then click on the  icon and successively preposition each of these instances as opposite :



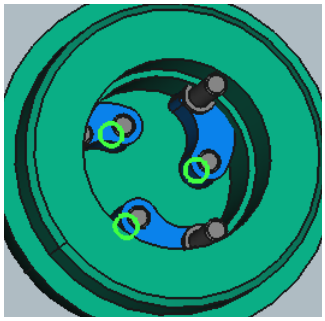
43- Install the positioning constraints

- Select the **circumference** of the base of the collar on one of the instances **sous-Ass_masselotte** in the 3D window, then while holding down the **Ctrl** key, select the **circumference** of the entry of the corresponding bore of the warhead, and finally click on the  icon (coincident planes).



After calculating constraint resolution, you will get this :

- Proceed in the same way with the two other instances of the sub-assembly **sous-Ass_masselotte** :

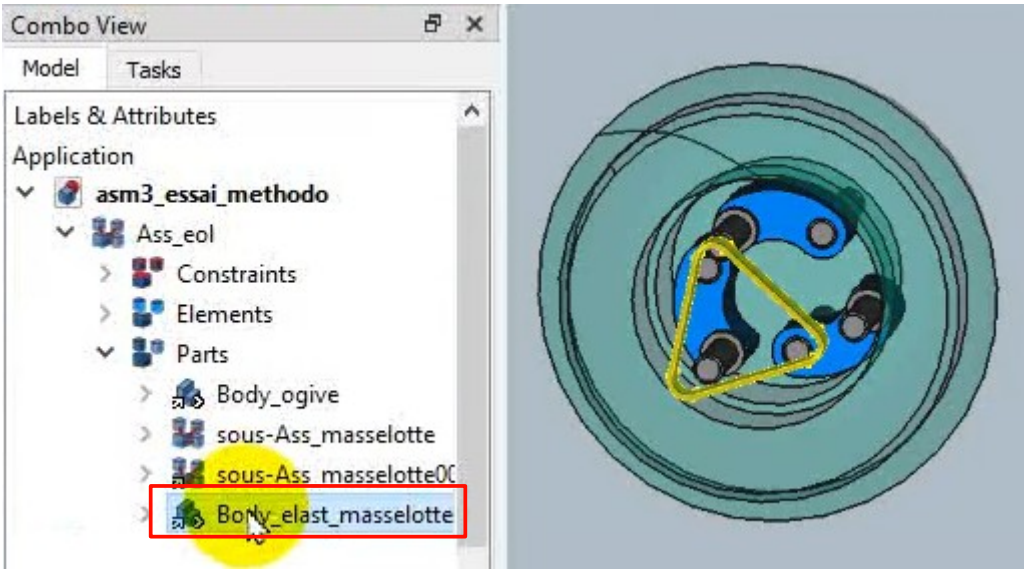


5- Import the following component

We will proceed here in the same way as before to add the necessary component (s).

51- Import the component into the assembly container

- Open the file containing the component to add (**elast_masselottes**).
- Make the assembly file active (**asm3_essai_methodo**).
- While holding down the **Ctrl** key, drag and drop the object to integrate into the assembly (**Body_elast_masselottes**) onto the name of the assembly (**Ass_eol**).



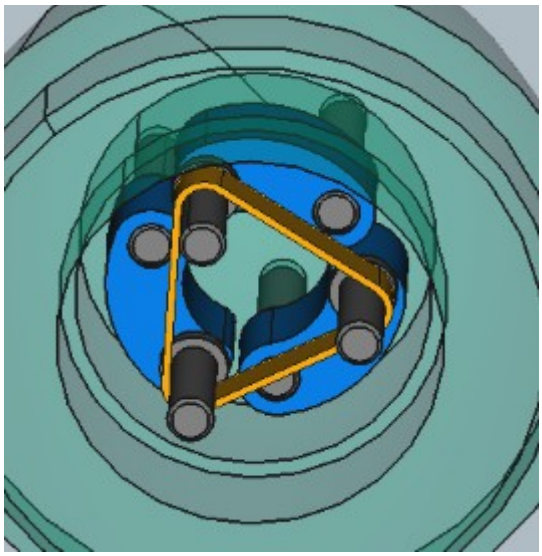
*In the assembly tree, a new object has appeared in the list of parts : **Body_elast_masselottes**.*

52- Pre-position the object to be constrained if necessary

- Select the **Body_elast_masselottes** object in the 3D window, click on the  icon and redirect the object.

53- Constrain the object as needed

- For each axis, select the **circumference** of the base of one of the rounded edges of the **Body_elast_masselottes** object in the 3D window, then while holding down the **Ctrl** key, select the outer **circumference** of the collar of the corresponding weights' axes, and finally click on the  icon (coincident plans).



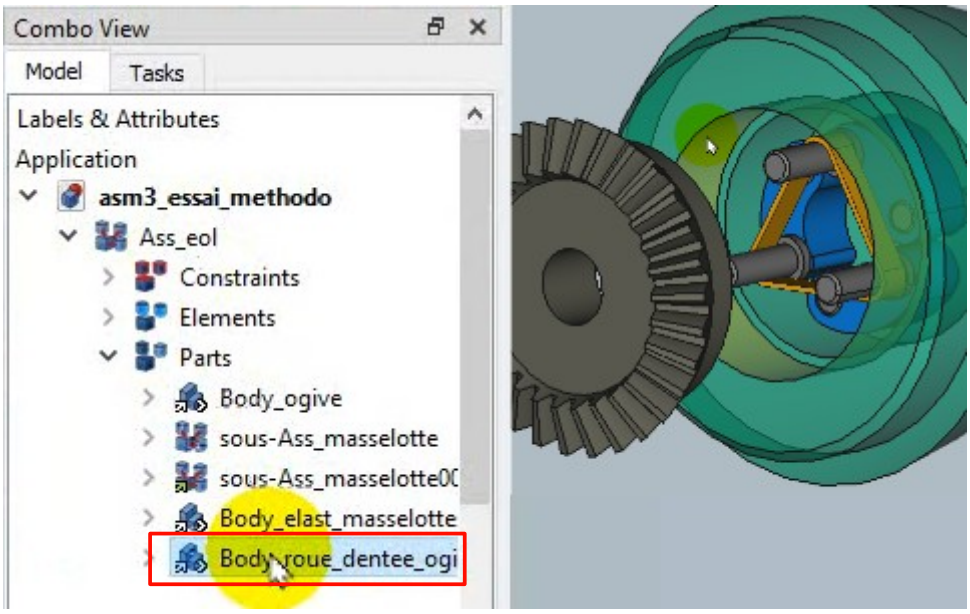
After calculating constraint resolution, you will get this :

6- Import the following component

We will still proceed in the same way as before to add the necessary component (s).

61- Import the component into the assembly container

- Open the file containing the component to add (**roue_dentee_ogive**).
- Make the assembly file active (**asm3_essai_methodo**).
- While holding down the **Ctrl** key, drag and drop the object to integrate into the assembly (**Body_roue_dentee_ogive**) onto the name of the assembly (**Ass_eol**).



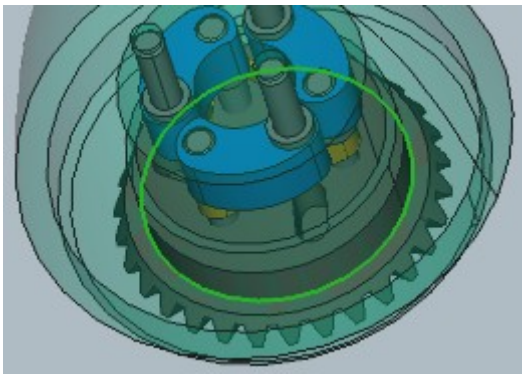
In the assembly tree, a new object appeared in the list of parts :
***Body_roue_dentee_ogive**.*

62- Pre-position the object to be constrained if necessary

- Select the **Body_elast_masselottes** object in the 3D window, click on the  icon and redirect the object.

63- Constrain the object as needed

- Select the **circumference** of the base of the shoulder of the **Body_roue_dentee_ogive** object in the 3D window, then while holding down the **Ctrl** key, select the entry **circumference** of the bore of the warhead, and finally click on the  icon (coincident planes).

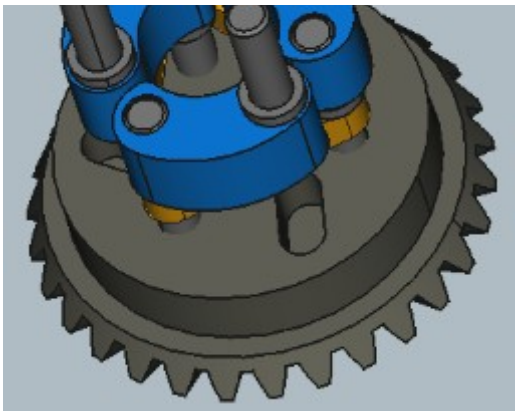


After calculating constraint resolution, you will get this :

It only remains to create the connections between the axes of the weights and the toothed wheel.

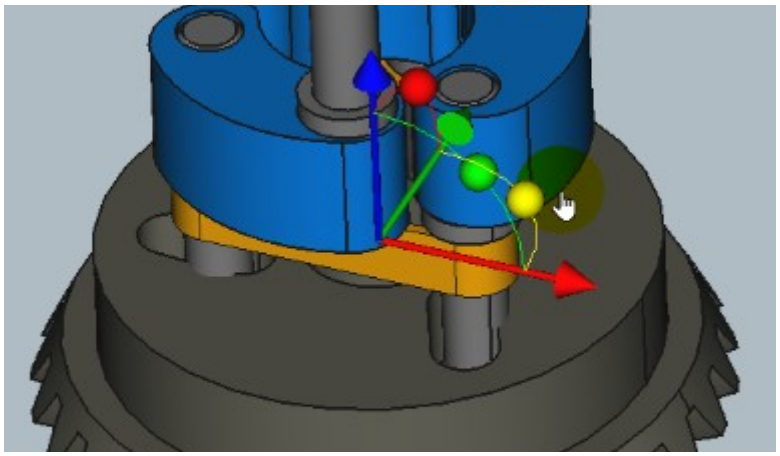
64- Install the positioning constraints between the instances of sous-Ass_masselotte and Body_roue_dentee_ogive

- Select the **Body_ogive** object in the tree structure, then press the **Space** key to hide this object.



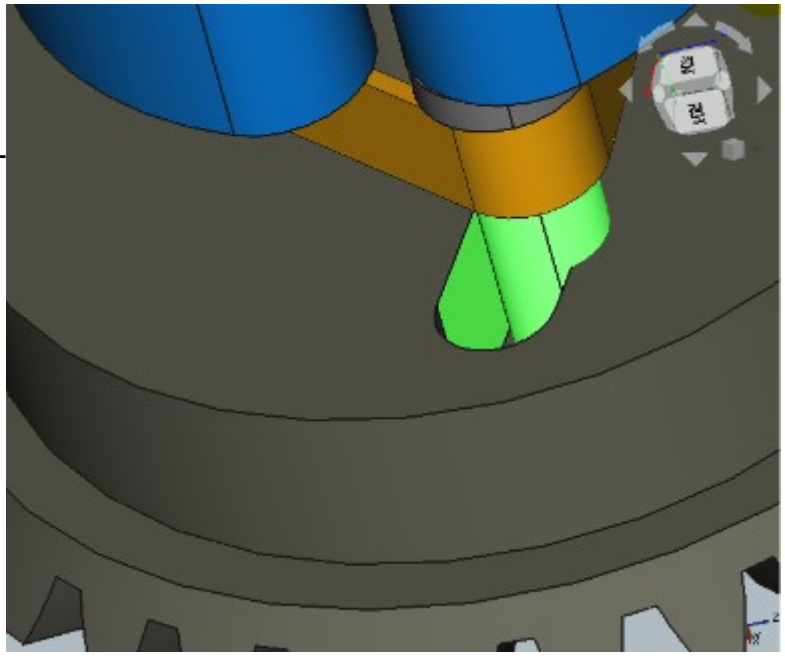
641- Pre-position the object to be constrained if necessary

- Select the object **Body_roue_dentee_ogive** in the 3D window, click on the  icon and orient the object so as to bring the cells of the toothed wheel towards the axes :



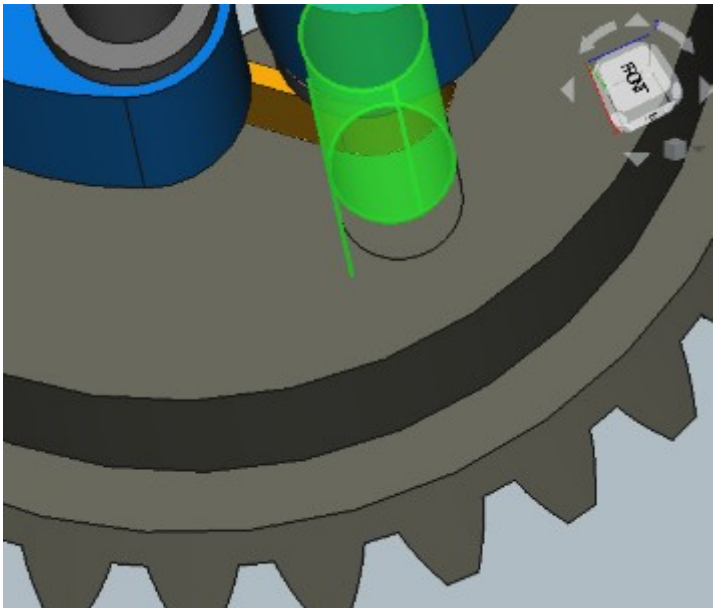
642- Install constraints

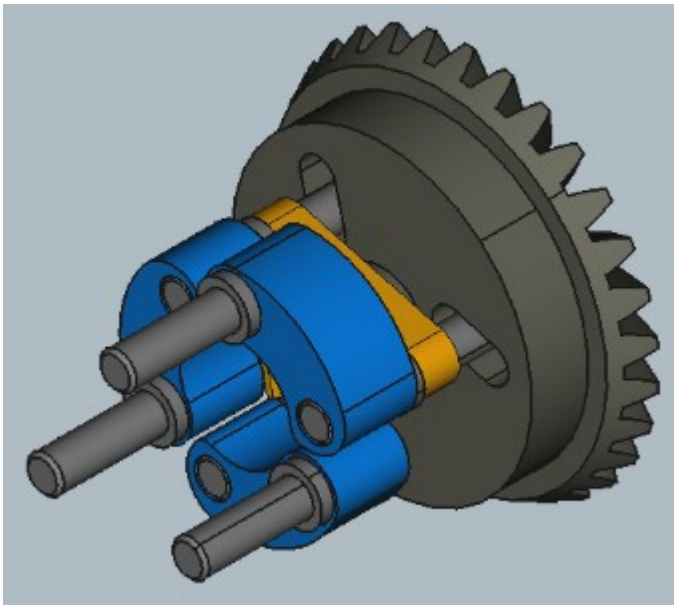
- Select the cylindrical surface of the axis of a **sous-Ass_masselotte** instance and a flat face of the corresponding oblong hole on the gear wheel, then click on the  icon (point-plane distance: - 1 DOF).



- Adjust the **distance** in the **properties** of the constraint corresponding to the radius of the axis (1.5 mm or -1.5 mm depending on the orientation of the surfaces).

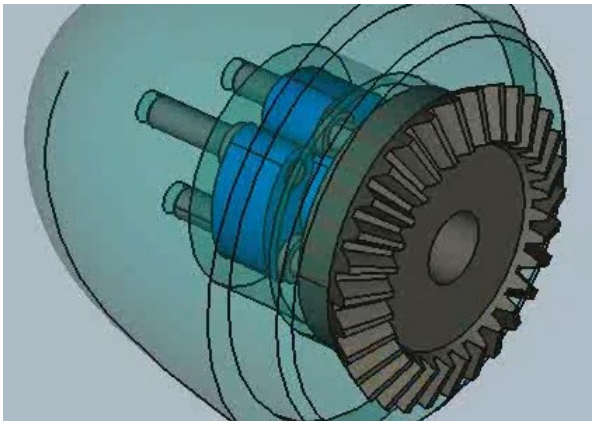
The result after recalculation of the constraint system :





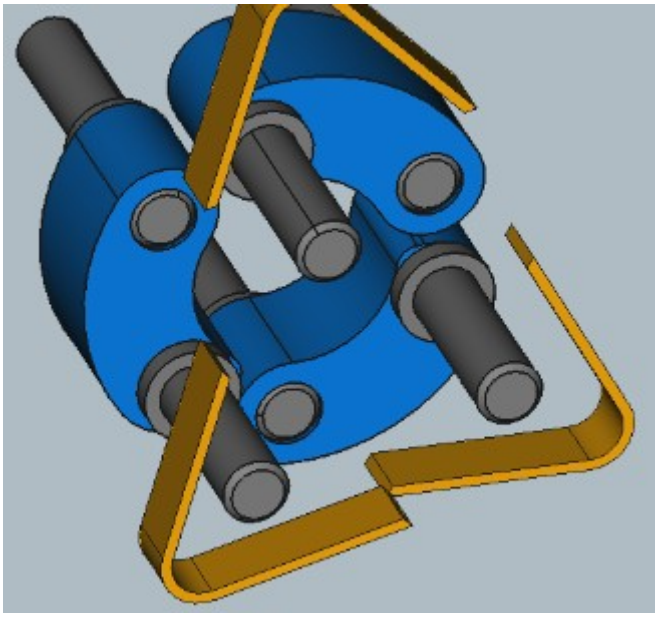
Note : It is normal that there is no longer any mobility because the **elast_masselottes** part is actually an elastic which limits the centrifugal effect on the weights, and of course here this object is not deformable.

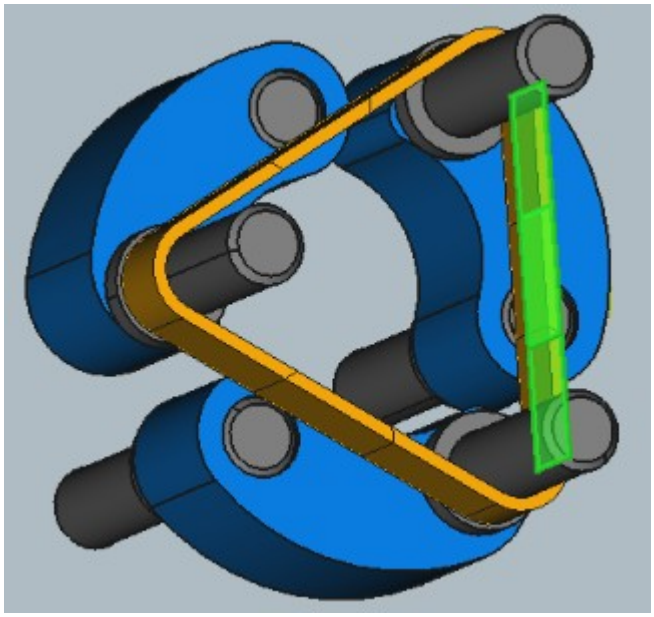
Here is the finished assembly, with a transparency of the warhead :



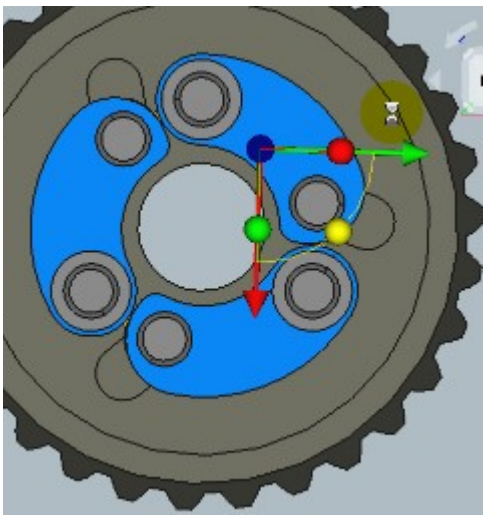
7- How to simulate the "deformation" of the elastic

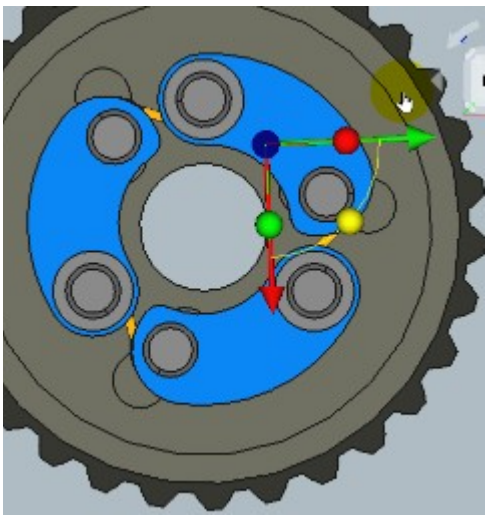
- Replace the elastic with 3 "portions" of elastic :
- Constrain the 3 objects with the axes of the weights and between them :

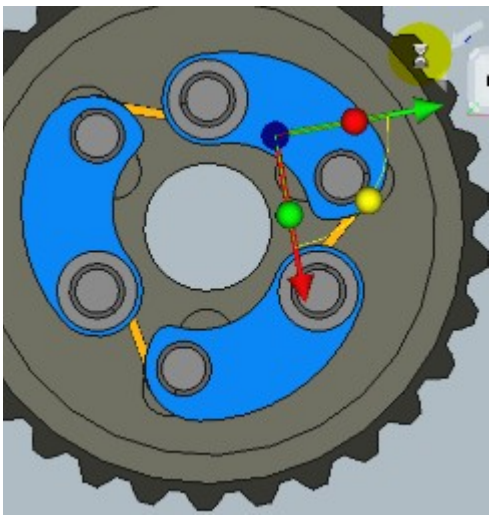




We can now simulate the deformation of the elastic and the movement of the flyweights :







See the associated video !