

# **Weight & Balance for ENOVIA V5 (WC9)**

***BPA Delivery 8 for V5R20 (V5.8)***

## ***User Guide***

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**V5R20**



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# ***Introduction***

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This document describes the user guide for the Weight & Balance for ENOVIA V5 (WC9) Business Process Accelerator.

This manual aims at providing the users information on how to use Weight & Balance for ENOVIA V5.

## ***Related Documentation***

- WC9\_InstallationGuide
- WC9\_ImplementationGuide

## ***Prerequisite for Weight and Balance for ENOVIA V5***

ENOVIA V5 platform is the main prerequisite for WC9 on the server side.  
A functional installation of ENOVIA VPM Navigator on the client side is also a prerequisite.

### **Information**

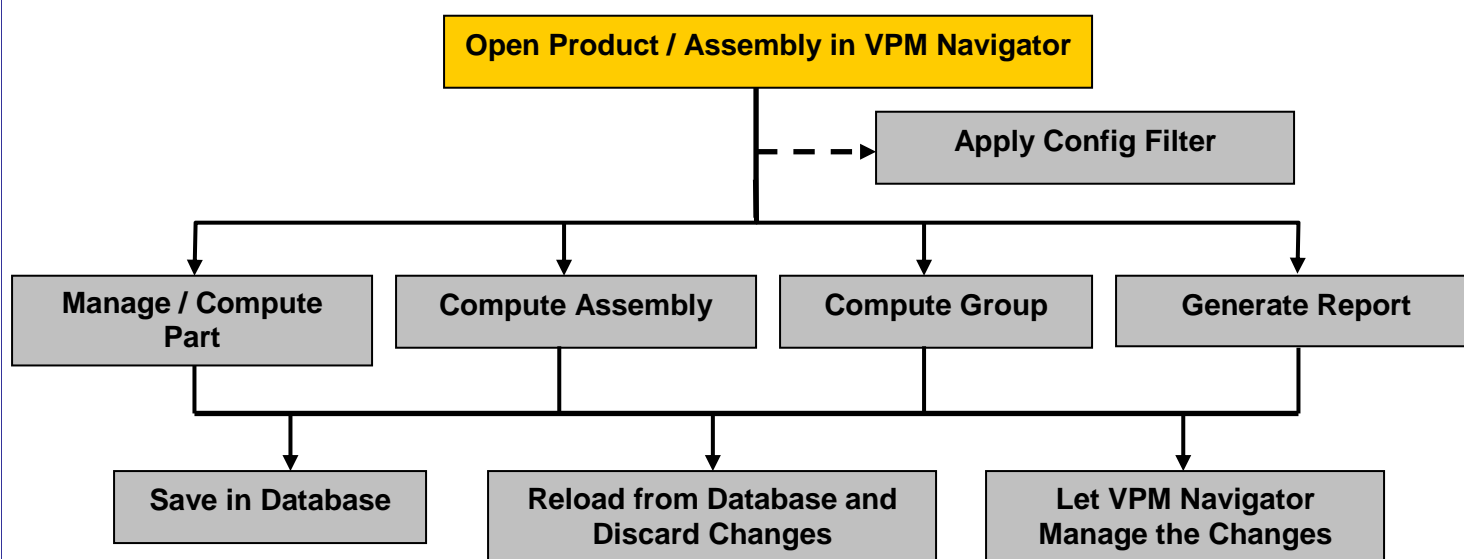
ENOVIA V5 R20, CATIA V5 and ENOVIA VPM V5 (i.e. VPM Navigator).

# Weight & Balance for ENOVIA V5

The Weight & Balance product for ENOVIA VPM Navigator is composed of a toolbar available in the VPM Navigator workbench, a batch program available on the server side and the settings editor interface to be launched by the administrator on the server side.

## Process Flow

The flow chart below illustrates how the W&B product interfaces with VPM Navigator.



## Launching Weight & Balance

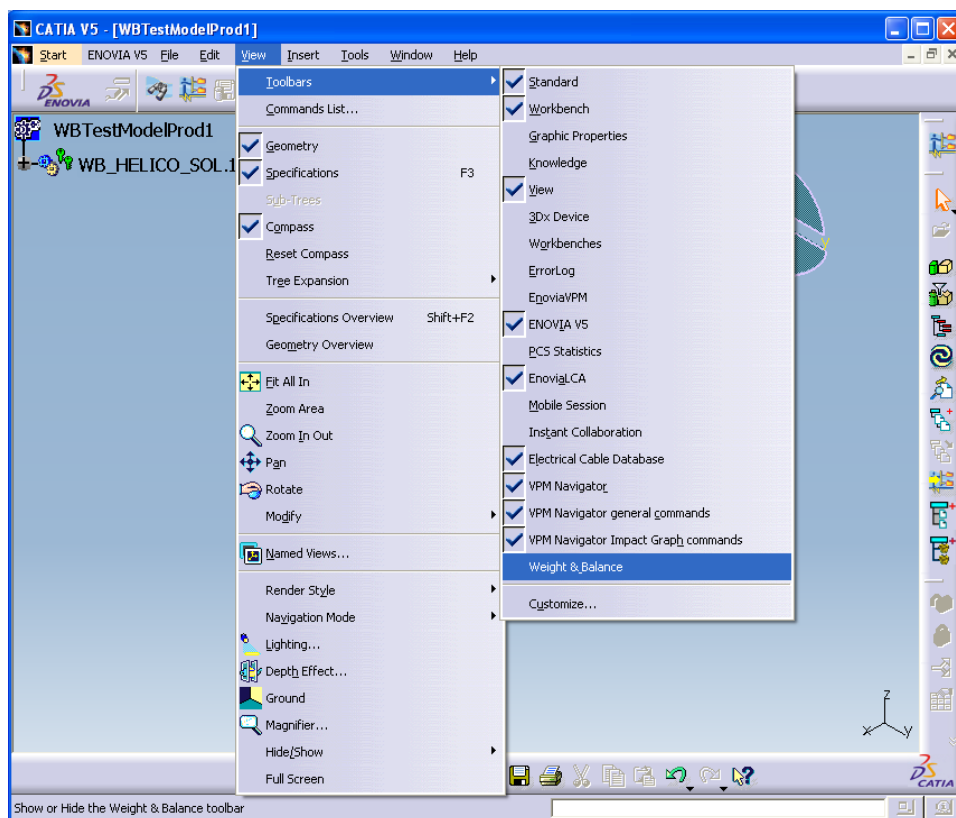
### From VPM Navigator

The toolbar is available in every workbench but commands will only respond in a VPM Navigator context. Make sure the Weight & Balance toolbar is available by clicking on:  
Views / Toolbars / Weight & Balance



## Connection to ENOVIA Database

W&B is an application integrated in ENOVIA VPM Navigator. The toolbar containing the six W&B commands is called "Weight & Balance". If the toolbar is not displayed, click on "View / Toolbars / Weight & Balance".



The toolbar should appear like this:

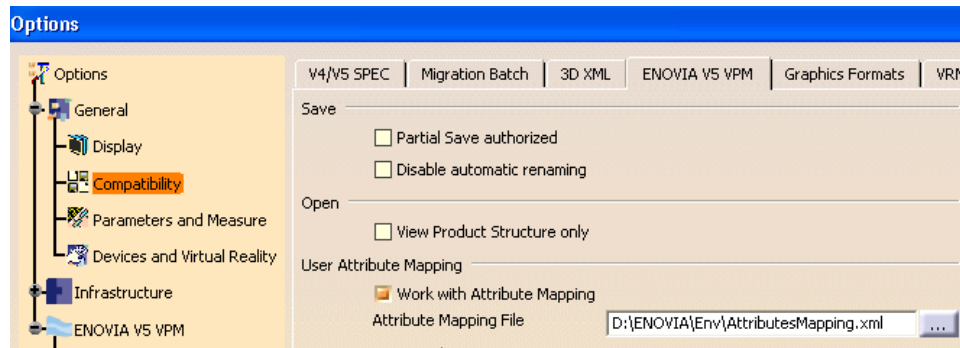


To be able to use the commands, a connection to the ENOVIA database needs to be established. Once the connection is completed, open a VPM Navigator window to access PRCs stored in the ENOVIA database.

## Save assemblies in ENOVIA

If an assembly is saved from CATIA to ENOVIA, make sure that the attribute mapping is activated. Otherwise, a standard assembly with no W&B metadata will be created in the ENOVIA database.

Make sure the check box "Work with Attribute Mapping" is checked and that a valid XML file is loaded by specifying its location in the attribute mapping field. Click on "Tools / Options / General / Compatibility / ENOVIA V5" to set these options:



Example of XML file:

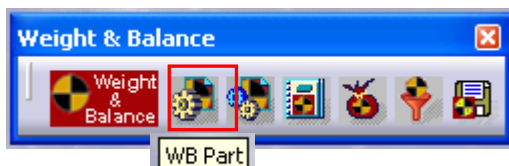
```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE MappingDescription SYSTEM "C:\Program Files\Dassault
Systemes\B18\intel_a\code\dictionary\AttributesMapping.dtd">
<MappingDescription>
  <DomainDef EntityType="Part" DefinitionType="FixedValue" Name="WBProduct"/>
  <DomainDef EntityType="Document" DefinitionType="FixedValue" Name="WBDoc"/>
  <AttributesMapping EntityType="Part" DomainName="WBProduct">
    <Attribute Name="Revision" Type="STRING">
      <CATIAInfo Name="Revision" Editable="No" Visible="Yes" />
      <DBInfo Name="V_version" LCASubEntity="PV" Editable="Yes" Visible="Yes"
    />
    </Attribute>
  </AttributesMapping>
  <AttributesMapping EntityType="Document" DomainName="WBDoc">
    <Attribute Name="Revision" Type="STRING">
      <CATIAInfo Name="Revision" Editable="No" Visible="Yes" />
      <DBInfo Name="V_version" LCASubEntity="DV" Editable="Yes" Visible="Yes"
    />
    </Attribute>
  </AttributesMapping>
</MappingDescription>
```

# The Weight & Balance Toolbar

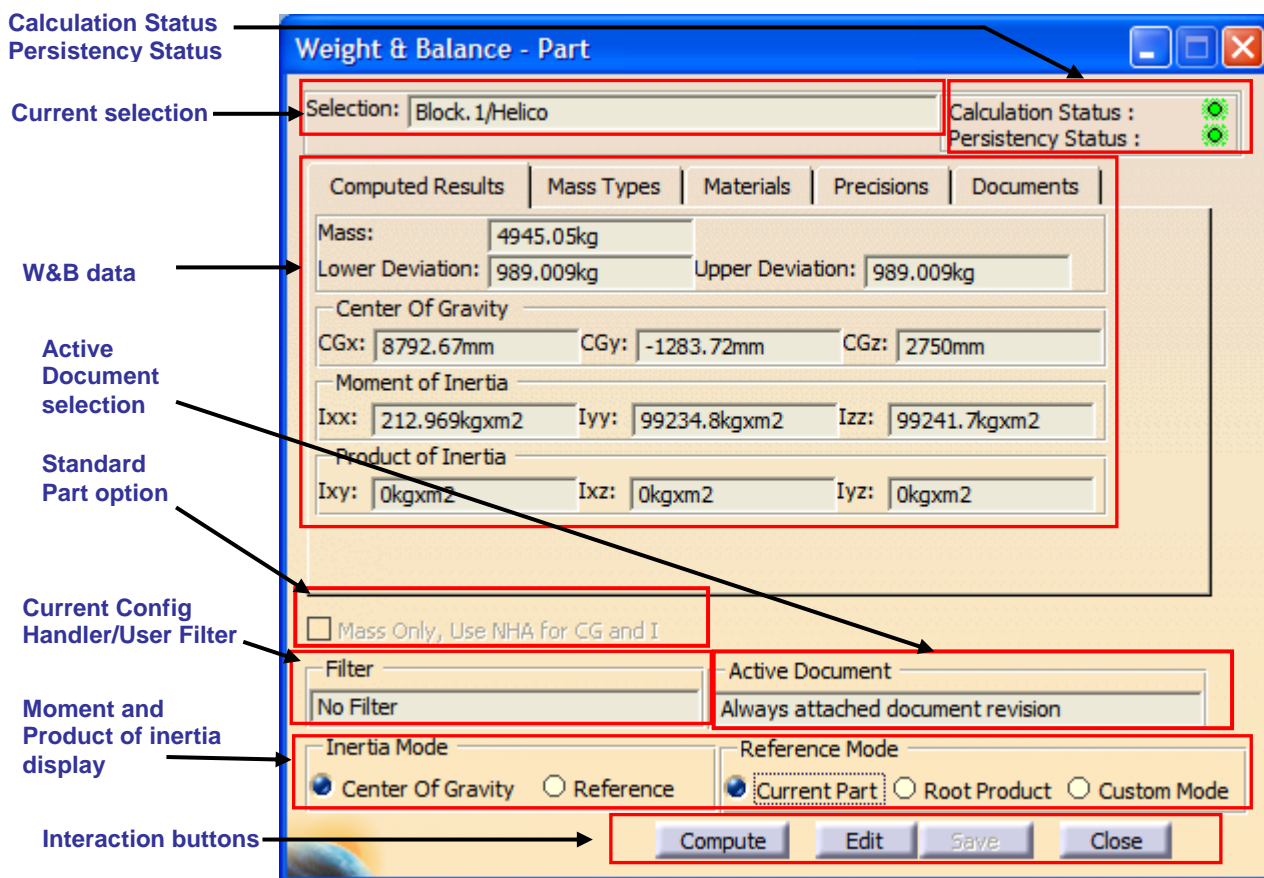
## The WB Part Command

The WB Part command enables to analyze the product's mass properties at all assembly level.

To display the W&B Part panel, a part instance needs to be selected in the prc tree.



Upon launching the W&B Part panel for the first time for a specific part, the W&B Part panel will look like the following:



**Calculation Status:** Shows the user that the last calculation date is lesser than the date of the last modification on the part. These modifications may have an impact on the W&B computed results.

**Persistency Status:** Shows the user that the modifications on the part will not be stored by default by VPM Navigator. However, the changes can still be made persistent with the WB Save Command.



**Current selection:** Indicates the name of the part that has been selected.

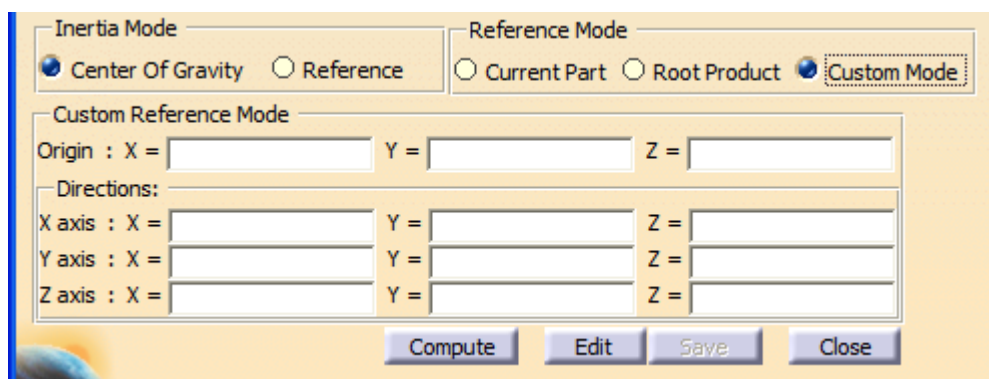
**W&B Data:** Displays the W&B data.

**Moment and Product of inertia display:** Radio button to display the inertia matrix with the part center of gravity or its center as reference.

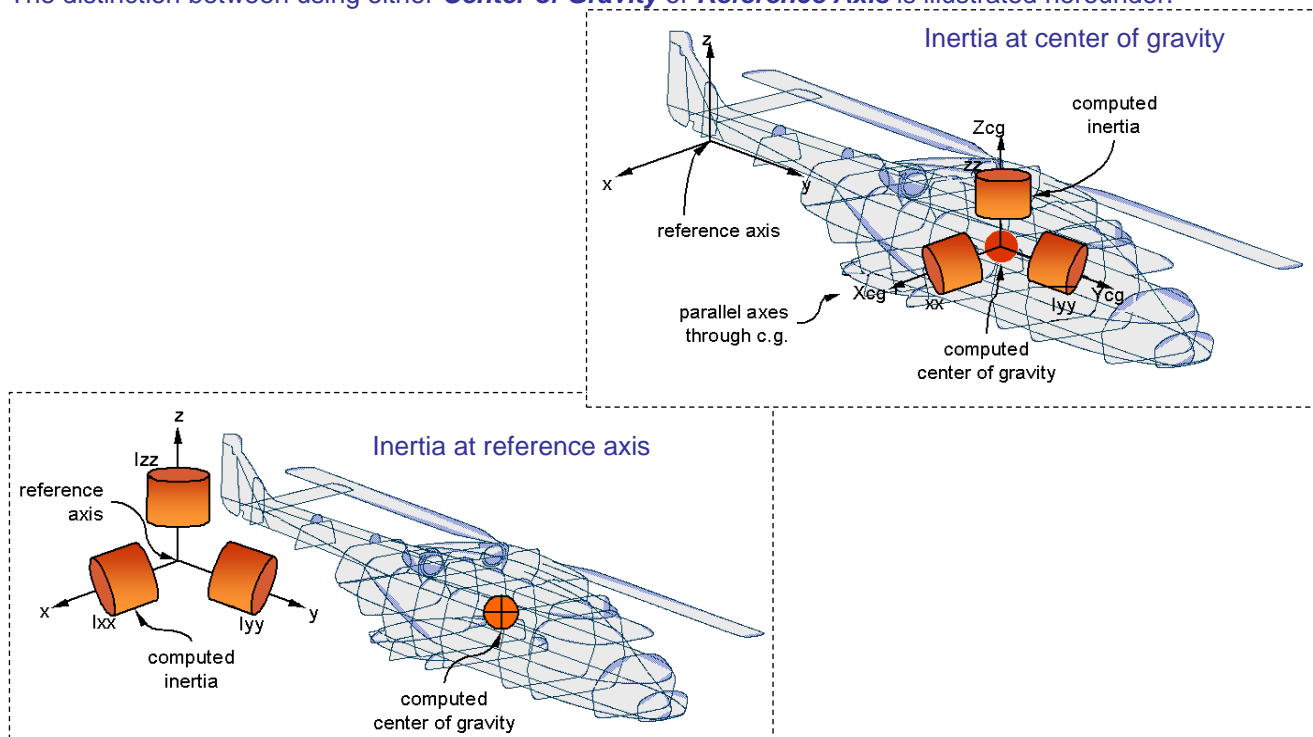
**Standard Part option:** Defines and displays whether the currently selected part is a Standard Part or not.

**Current Config Handler/User Filter:** Displays the name of the currently selected config handler. If VPM Nav Filters are selected, displays “User Filter”

**Reference Mode:** Defines the reference mode for computation. If Custom Mode is selected, a custom reference frame is displayed to allow user to enter the Custom Origin and directions coordinates.



The distinction between using either **Center of Gravity** or **Reference Axis** is illustrated hereunder.



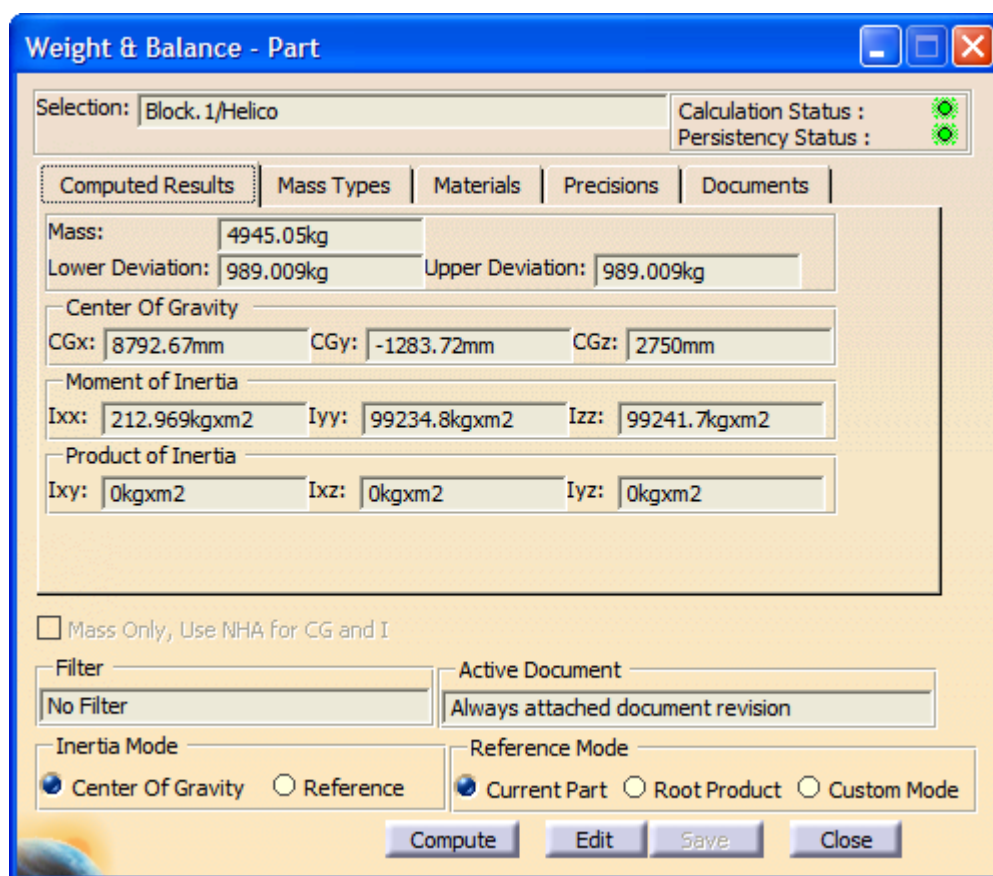
**Interaction buttons:** delete, compute, edit and save W&B data. The close button closes the W&B Part Panel.

The W&B Part panel has 5 tabs to display data

1. Computed Results tab
2. Mass Types tab
3. Materials tab
4. Precisions tab
5. Documents tab

## Computed Results tab

The Computed Results tab displays computed data only and is updated when the “Compute” button is clicked.



The screenshot shows the 'Weight & Balance - Part' dialog box with the 'Computed Results' tab selected. The 'Selection' field is set to 'Block. 1/Helico'. The 'Calculation Status' and 'Persistency Status' are both indicated by green checkmarks. The dialog displays various computed values for mass, center of gravity, and moments of inertia.

Computed Results		
Mass:	4945.05kg	
Lower Deviation:	989.009kg	Upper Deviation: 989.009kg
Center Of Gravity		
CGx:	CGy:	CGz:
8792.67mm	-1283.72mm	2750mm
Moment of Inertia		
Ixx:	Iyy:	Izz:
212.969kgxm2	99234.8kgxm2	99241.7kgxm2
Product of Inertia		
Ixy:	Ixz:	Iyz:
0kgxm2	0kgxm2	0kgxm2

Below the data fields, there are several options and filters:

- ☐ Mass Only, Use NHA for CG and I
- Filter: No Filter
- Active Document: Always attached document revision
- Inertia Mode: ☒ Center Of Gravity, ☐ Reference
- Reference Mode: ☒ Current Part, ☐ Root Product, ☐ Custom Mode

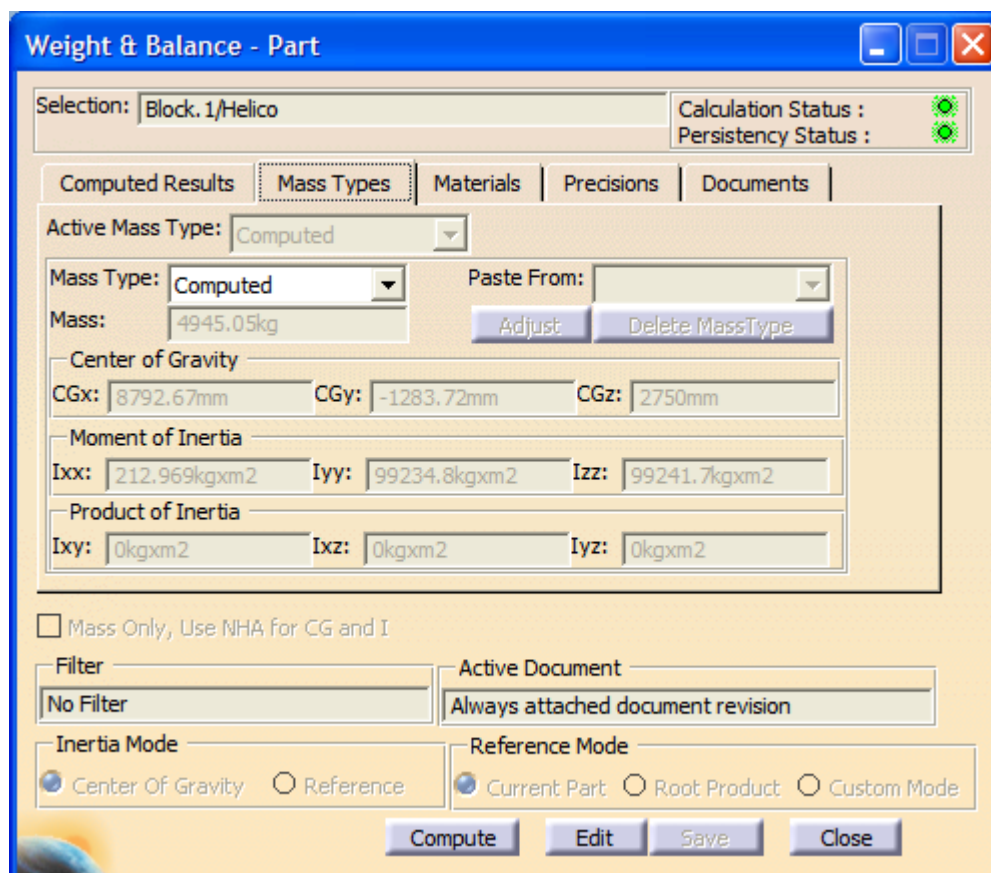
At the bottom, there are four buttons: Compute, Edit, Save, and Close.

A green calculation status means that the data displayed is up to date and in line with the last modification performed on the part.

Inertia and Reference Mode are only available on the computed results tab. Inertia mode is set to center of gravity and reference mode to Current Part for all other tabs.

## Mass Types tab

The Mass Types tab displays available mass types and properties according to administrator settings.



The screenshot shows the 'Weight & Balance - Part' dialog box with the 'Mass Types' tab selected. The 'Selection' field is set to 'Block.1/Helico'. The 'Calculation Status' and 'Persistency Status' are both green. The 'Active Mass Type' is 'Computed'. The 'Mass Type' dropdown is also set to 'Computed', showing a mass of 4945.05kg. The 'Center of Gravity' fields are CGx: 8792.67mm, CGy: -1283.72mm, and CGz: 2750mm. The 'Moment of Inertia' fields are Ixx: 212.969kgxm2, Iyy: 99234.8kgxm2, and Izz: 99241.7kgxm2. The 'Product of Inertia' fields are Ixy: 0kgxm2, Ixz: 0kgxm2, and Iyz: 0kgxm2. There are buttons for 'Adjust' and 'Delete MassType'. At the bottom, there are checkboxes for 'Mass Only, Use NHA for CG and I', 'Inertia Mode' (Center Of Gravity selected), and 'Reference Mode' (Current Part selected). There are also buttons for 'Compute', 'Edit', 'Save', and 'Close'.

Only the Mass type combo box is sensitive in this mode. Depending on the mass type selected, information displayed below this combo boxes are updated.

If the "Edit" button is clicked, the fields become updatable if the selected mass type is not of type Computed. The Active Mass Type combo box also becomes available.

If the "ByActiveType" option is selected during an assembly calculation, the W&B processor will take the values of the active type selected on this tab for this specific part. Make sure to click on the save button before closing the window or all modifications will be lost.

The Paste From combo allows to Paste value from another Mass Type in the Current one.

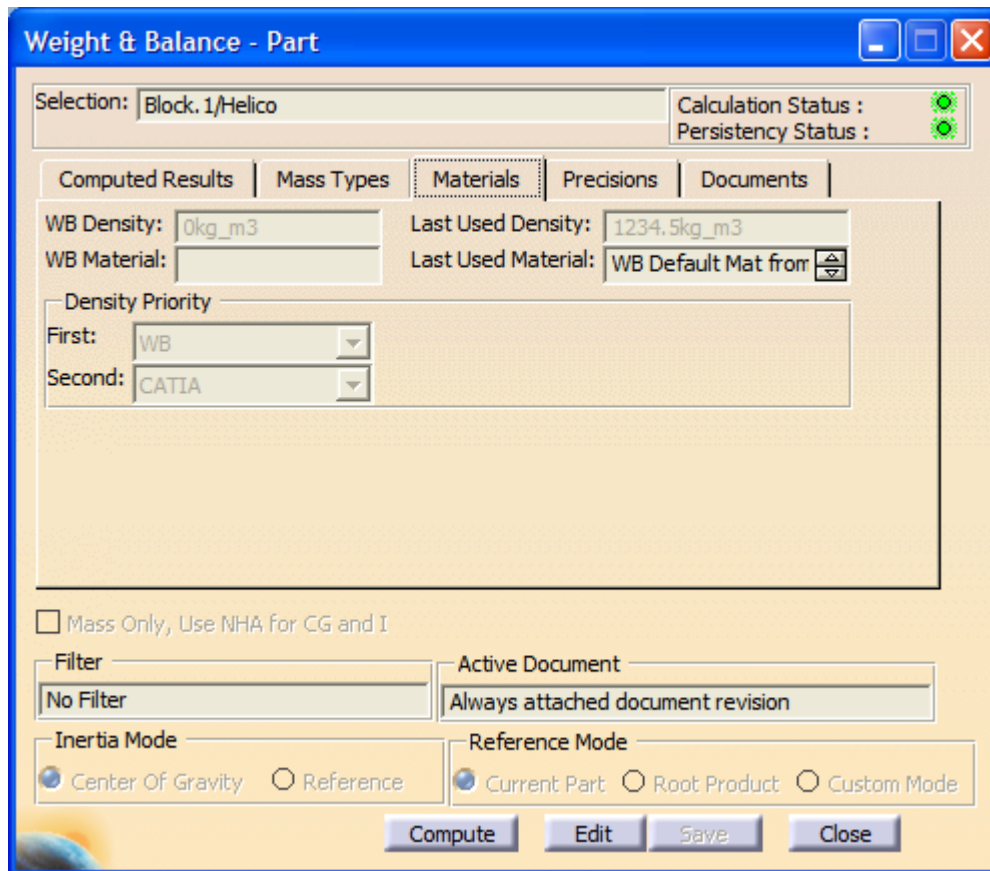
The Adjust button is available right after the values have been pasted. When the user modifies the Mass from the previously copied value, this command will adjust the moment and product of inertia proportionally to this new mass.

The Delete button becomes active when an assigned mass type value has been entered. Clicking on this button deletes de W&B data entered for this mass type.

To define the currently selected part as a Standard Part, go to edit mode by clicking on the "Edit" button and check the "Mass Only, Use NHA for CG and I" check box..

## Materials tab

The Materials tab displays the part's material, density information and the density priority.



The image shows the 'Weight & Balance - Part' dialog box. At the top, the 'Selection' field contains 'Block. 1/Helico'. To the right, 'Calculation Status' and 'Persistency Status' both show green checkmarks. Below this is a tabbed interface with 'Materials' selected. The 'Materials' tab contains fields for 'WB Density' (0kg\_m3), 'WB Material' (empty), 'Last Used Density' (1234.5kg\_m3), and 'Last Used Material' (WB Default Mat from). Below these are 'Density Priority' dropdowns for 'First' (WB) and 'Second' (CATIA). At the bottom, there are checkboxes for 'Mass Only, Use NHA for CG and I', 'Filter' (No Filter), 'Active Document' (Always attached document revision), 'Inertia Mode' (Center Of Gravity selected), and 'Reference Mode' (Current Part selected). At the very bottom are 'Compute', 'Edit', 'Save', and 'Close' buttons.

User defined material name and density can be entered if the density priority is set to first priority for WB. The Edit button must be clicked to be able to modify these fields.

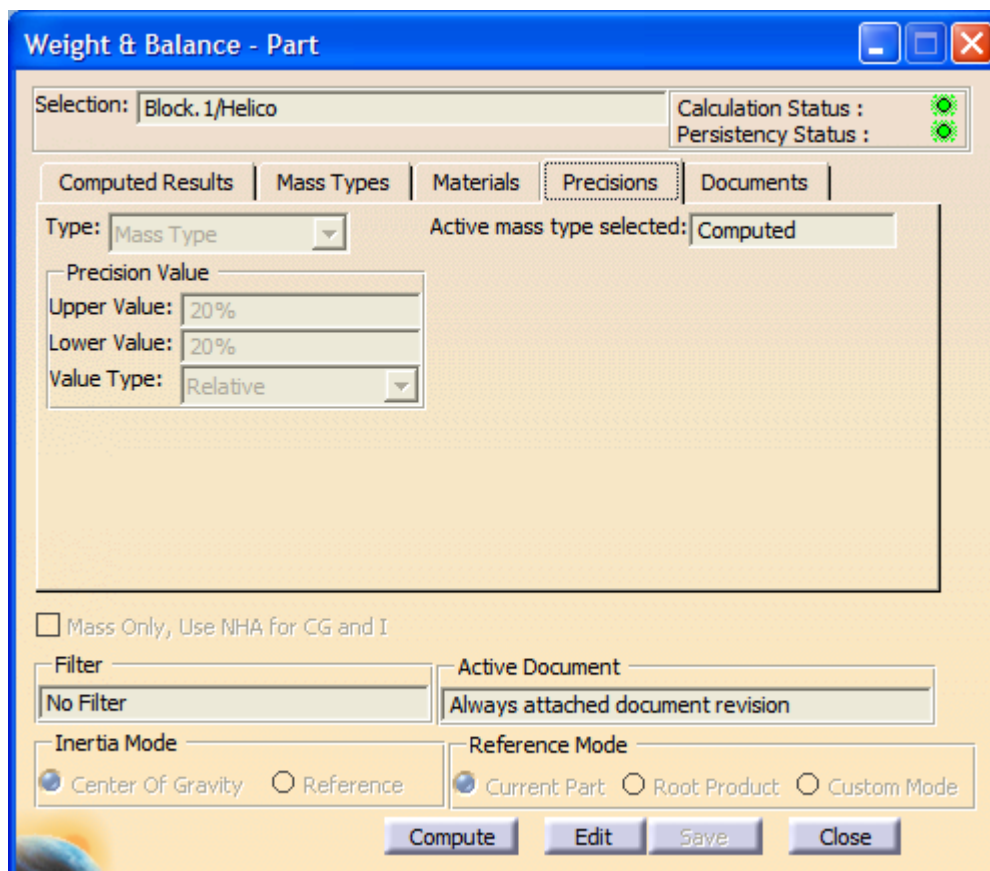
If a non-zero value has been entered and if the density priority is set to WB then the CATIA density will be taken by default.

The Last Used Density and Last Used Material are available for information purpose. They correspond to the material used in the last computation. They may correspond to a material defined in Weight & Balance, a material defined in CATIA Material, an imposed Mass Type or a Default Material.

When modifying attributes in the Material Tab, the last calculation date is removed to make sure that the part will not be up to date. This is linked to the WC9UpdateToleranceDelay (see installation guide for more details).

## Precisions tab

The Precisions tab displays the precision information for the calculations of deviations.



The screenshot shows the 'Weight & Balance - Part' dialog box with the 'Precisions' tab selected. The 'Selection' field is set to 'Block. 1/Helico'. The 'Calculation Status' and 'Persistency Status' are both indicated by green checkmarks. The 'Type' dropdown is set to 'Mass Type', and the 'Active mass type selected' is 'Computed'. The 'Precision Value' section includes 'Upper Value' (20%), 'Lower Value' (20%), and 'Value Type' (Relative). The 'Mass Only, Use NHA for CG and I' checkbox is unchecked. The 'Filter' dropdown is set to 'No Filter', and the 'Active Document' dropdown is set to 'Always attached document revision'. The 'Inertia Mode' section has 'Center Of Gravity' selected, and the 'Reference Mode' section has 'Current Part' selected. At the bottom are buttons for 'Compute', 'Edit', 'Save', and 'Close'.

If the Edit button is clicked, the “Type” combo box will become editable.

If the User defined value is chosen, the fields in the “Precision Value” frame will become editable.

Depending on the “Value Type” chosen, the Lower and Upper values entered by the user will be taken as a mass for “Absolute” value and a percentage for the “Relative” value.

## Documents tab

This tab is only available if the “Use Documents” option has been enabled through the “ENOWBSettingsEditor” by the Administrator. Through this tab, it is possible to select the active document revision that will be used for the computation of the part.

The “Document mode” enables to choose if the document should always be the latest revision (either the latest revision attached on the part or the latest revision available in the database depending on the setting defined by the Administrator) or a selected revision of the document currently attached to the part.

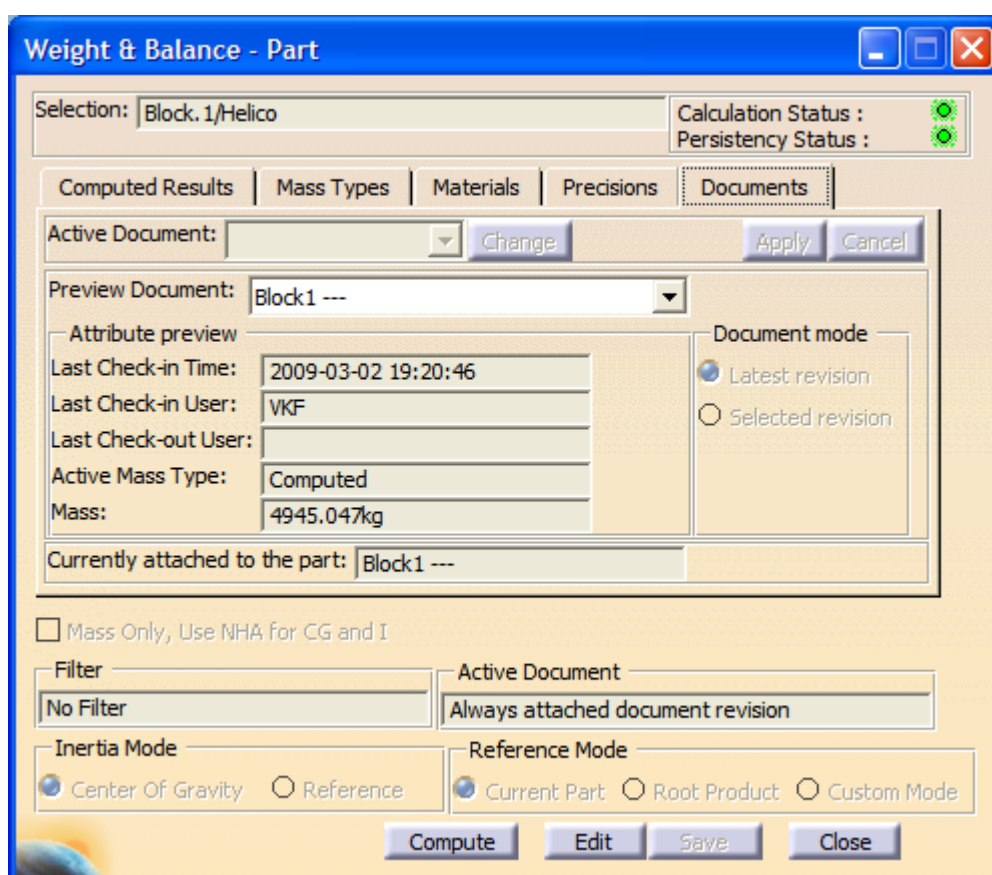
The “Preview Document” dropdown menu allows the user to preview some attributes of the available document revisions.

To change the document revision, the user must follow these steps:

1. Click on the “Edit” button,
2. Select the “Selected revision” button,
3. Click on the “Change” button,
4. Select the new Active Document,
5. Click on the “Apply” button and click on the “Save” button.

To default back to the Latest revision, the user must click on the “Edit” button, select “Latest revision” and click on the “Save” button to save changes.

**Note:** Other tabs of this panel will show the “Active Document” field when the “Use Documents” has been enabled by the Administrator.



The image shows the 'Weight & Balance - Part' dialog box. At the top, the 'Selection' field is set to 'Block.1/Helico'. To the right, 'Calculation Status' and 'Persistency Status' both show green checkmarks. Below this is a tabbed interface with 'Computed Results', 'Mass Types', 'Materials', 'Precisions', and 'Documents'. The 'Documents' tab is active, showing an 'Active Document' field with a dropdown arrow, a 'Change' button, and 'Apply' and 'Cancel' buttons. Below this is a 'Preview Document' field set to 'Block1 ---'. To the left of the 'Document mode' section is an 'Attribute preview' section with fields for 'Last Check-in Time' (2009-03-02 19:20:46), 'Last Check-in User' (VKF), 'Last Check-out User' (empty), 'Active Mass Type' (Computed), and 'Mass' (4945.047kg). The 'Document mode' section has two radio buttons: 'Latest revision' (selected) and 'Selected revision'. Below this is a 'Currently attached to the part:' field set to 'Block1 ---'. At the bottom left, there is a checkbox 'Mass Only, Use NHA for CG and I' which is unchecked. Below this is a 'Filter' dropdown set to 'No Filter' and an 'Active Document' dropdown set to 'Always attached document revision'. There are two sections for modes: 'Inertia Mode' with 'Center Of Gravity' (selected) and 'Reference' radio buttons, and 'Reference Mode' with 'Current Part' (selected), 'Root Product', and 'Custom Mode' radio buttons. At the very bottom are 'Compute', 'Edit', 'Save', and 'Close' buttons.

## Support for paint, coating and other Standard Parts

Standard parts like paint coating are distributed all over the body of the assembly and have certain mass. Assuming they are distributed all over the assembly evenly, it is not justified to compute their CG and Inertia even they should be contributing to the assembly inertia and CG differently in reality.

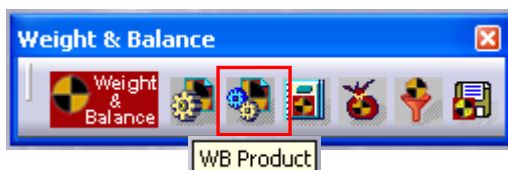


A new option is added to the instance in the WB Part command to identify a particular instance as a Standard Part. During report generation, the mass of the standard part will be taken into account for the NHA CG and Inertia computation. The proportionate Inertia will be applied for Standard parts. The CG of the standard part is same as it NHA. The formula for Inertia of Standard part is

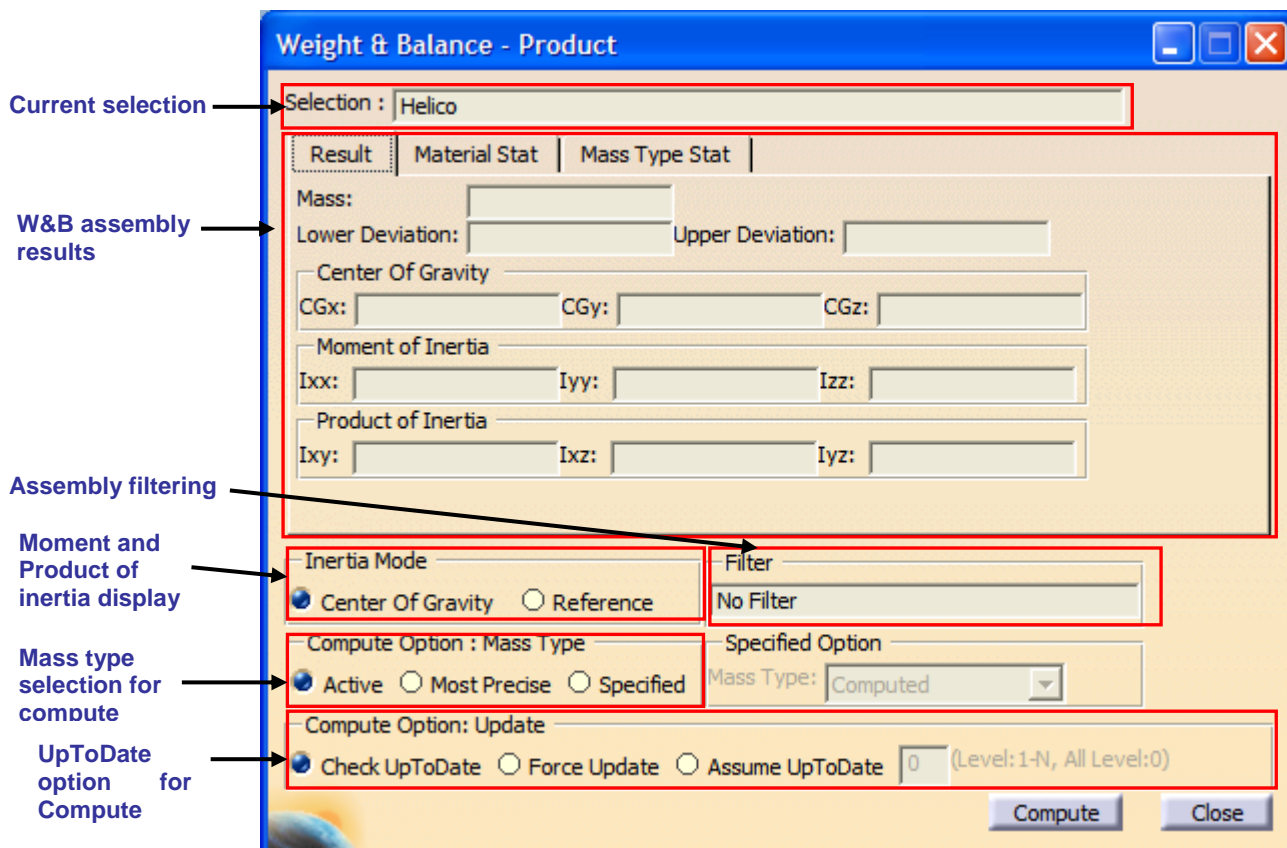
$$INERTIA_{Std} = INERTIA_{NHA} * \frac{MASS_{Std}}{MASS_{NHA}}$$

## The WB Product Command

To display the assembly calculation, the user only needs to click on the “WB Product” command button.

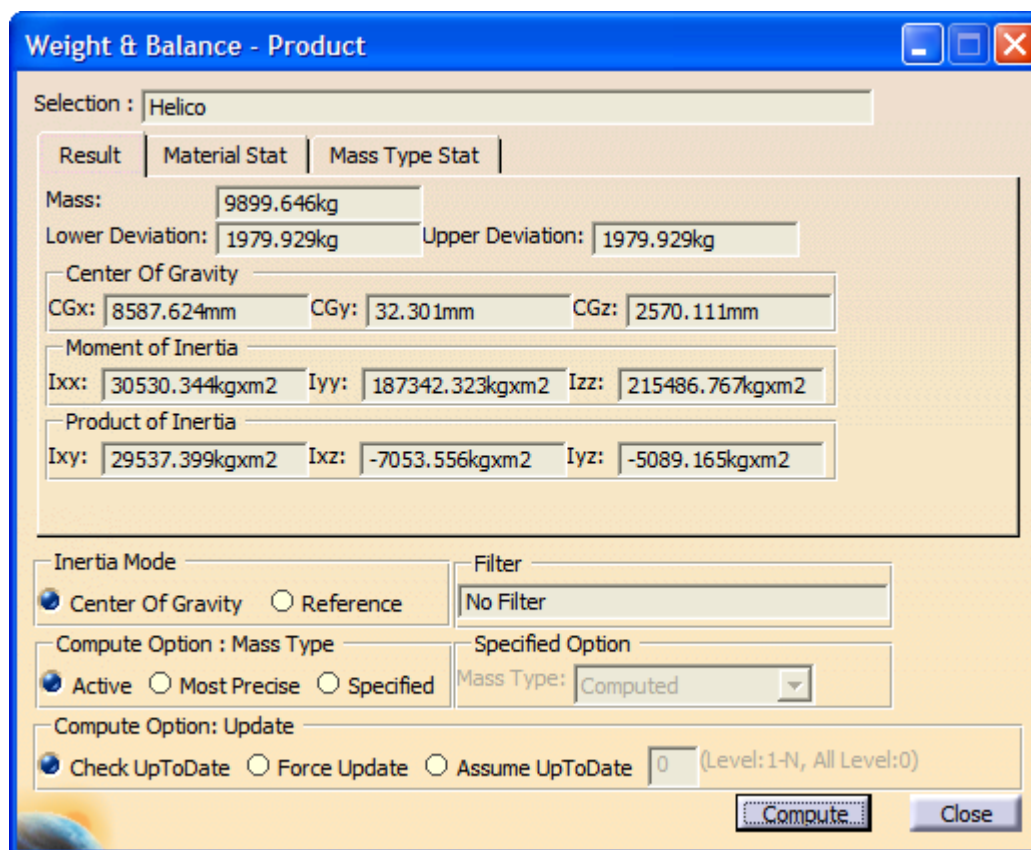


The root of the VPM Graph window is automatically selected.



## Result tabs

The Result tab displays the result of the W&B compute on the assembly.



**Weight & Balance - Product**

Selection : Helico

Result	Material Stat	Mass Type Stat
Mass:	9899.646kg	
Lower Deviation:	1979.929kg	Upper Deviation: 1979.929kg
Center Of Gravity		
CGx:	8587.624mm	CGy: 32.301mm CGz: 2570.111mm
Moment of Inertia		
Ixx:	30530.344kgxm2	Iyy: 187342.323kgxm2 Izz: 215486.767kgxm2
Product of Inertia		
Ixy:	29537.399kgxm2	Ixz: -7053.556kgxm2 Iyz: -5089.165kgxm2

Inertia Mode: ☒ Center Of Gravity ☐ Reference

Filter: No Filter

Compute Option: Mass Type ☒ Active ☐ Most Precise ☐ Specified

Specified Option: Mass Type: Computed

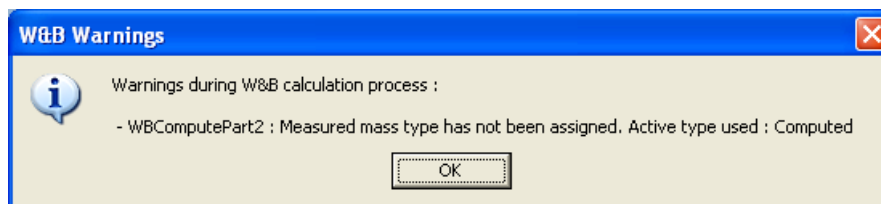
Compute Option: Update ☒ Check UpToDate ☐ Force Update ☐ Assume UpToDate 0 (Level: 1-N, All Level:0)

**Compute** **Close**

This tab is updated when the “Compute” button has been clicked. The results displayed can be modified depending on the Inertia selected.

The “Compute Option” offers 3 possibilities:

1. Active: the mass type chosen for every part is the Active one (see chapter 3.4.2)
2. Most Precise: the mass type defined as most precise in the administrator settings is chosen for every part. If the most precise setting has no values assigned for a single part, the second one is taken and so on and so forth...
3. Specified: if this option is chosen, the “Specified Option” frame become sensitive. A list of mass types from the administrator settings is available. If the mass type chosen has no values assigned, the active mass type is chosen. A warning message is displayed to warn the user.



**W&B Warnings**

Warnings during W&B calculation process :

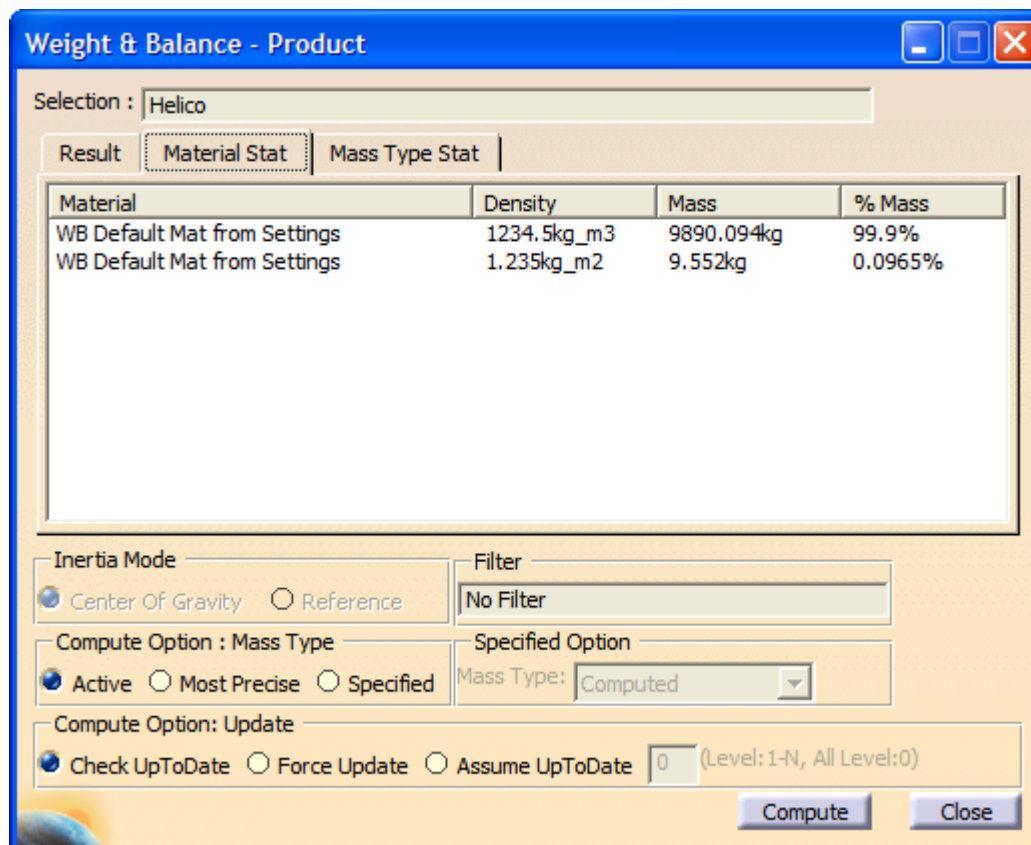
- WBComputePart2 : Measured mass type has not been assigned. Active type used : Computed

**OK**



## Material Stat tab

The Material Stat tab displays the material statistics after a calculation.



Weight & Balance - Product

Selection : Helico

Result | **Material Stat** | Mass Type Stat

Material	Density	Mass	% Mass
WB Default Mat from Settings	1234.5kg_m3	9890.094kg	99.9%
WB Default Mat from Settings	1.235kg_m2	9.552kg	0.0965%

Inertia Mode: ☒ Center Of Gravity ☐ Reference

Filter: No Filter

Compute Option : Mass Type: ☒ Active ☐ Most Precise ☐ Specified

Specified Option: Mass Type: Computed

Compute Option: Update: ☒ Check UpToDate ☐ Force Update ☐ Assume UpToDate 0 (Level: 1-N, All Level:0)

Compute Close

The first column displays the name of the material. When a mass type is displayed, several parts have values assigned. If a W&B mass is assigned by the user to a part, the density is not taken into account by the calculation.

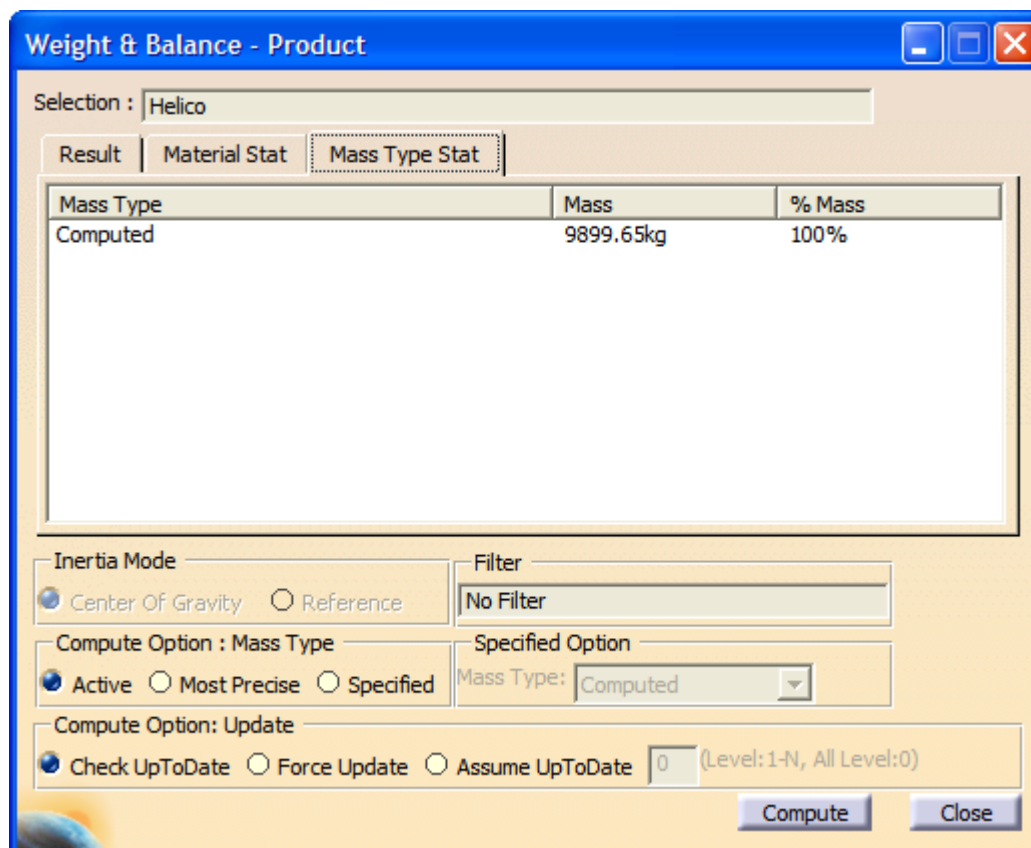
The second column displays the density used for the computation. Note that the density displayed can have different origins from 1 row to another. In the example above, the density of the second row has been assigned by the user, while the one from the third row has been evaluated from CATIA.

The third column displays the mass used for the computation. Each material is displayed only once and the mass displayed is the result of the addition of all the masses from the same material.

The last column displays the percentage of the material present in the part.

## Mass Type Stat tab

This tab displays the mass type distribution after a calculation.



Weight & Balance - Product

Selection : Helico

Result | Material Stat | **Mass Type Stat**

Mass Type	Mass	% Mass
Computed	9899.65kg	100%

Inertia Mode: ☒ Center Of Gravity ☐ Reference

Filter: No Filter

Compute Option : Mass Type: ☒ Active ☐ Most Precise ☐ Specified

Specified Option: Mass Type: Computed

Compute Option: Update: ☒ Check UpToDate ☐ Force Update ☐ Assume UpToDate 0 (Level: 1-N, All Level:0)

Compute Close

The first column displays the different mass type used in the calculation of the W&B data for an assembly.

The second column displays the total mass of each mass type.

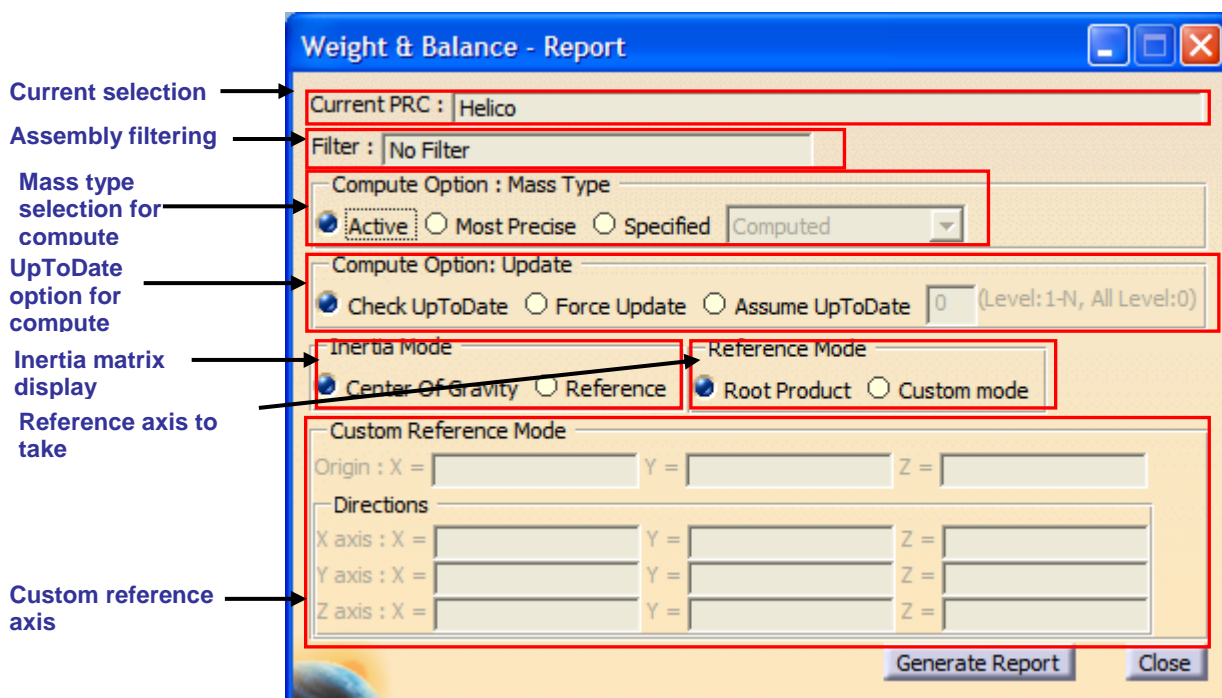
The third column displays the percentage of each mass types present in the assembly.

## The WB Report Command

In order to generate a report of the assembly calculation, user needs to click on the “WB Report” command button.



The root of the VPM Graph window is automatically selected.



The report will display W&B computations for the assembly and for each part.

Every option is the same as the ones for the calculation of the assembly. Only the “Reference Mode” has been added to display the moment and product of inertia of each part in 3 different kinds of axis.

1. Root Product: The reference axis is the one of the PRC.
2. Custom Mode: The user can add its own reference axis and point of origin.

**Note:** if the Custom Mode is selected and blanks are left in one or several fields, the system will assume they are 0 values.

Once every option has been set, the user will click on the “Generate button”. A preview panel will appear showing every Weight & Balance Attributes. Warning messages are displayed in case of wrong specified mass types.

Example:

Report Preview

Current PRC : Helico

Report

II Level	V ID	WB Mass	COGx	COGy	COGz	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz	WB Lower deviation	WB Upper deviation
0	Helico	9899.646	8587.624	32.301	2570.111	30530.344	187342.323	215486.767	29537.399	-7053.556	-5089.165	1979.929	1979.929

II Level	V instance ID	V ID	WB Mass	COGx	COGy	COGz	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz	Density	Material
1	Block.1	Block	4945.047	8792.675	-1283.725	2750	212.969	99234.771	99241.697	0	0	0	1234.5	WB Default Mat from Settir
1	Block.2	Block	4945.047	8386.607	1349.256	2393.405	12833.129	87261.126	98595.182	32171.76	-7444.72	-2775.279	1234.5	WB Default Mat from Settir
1	SurfacePart.1	SurfacePart	9.552	6499.136	-449.061	922.483	0.689	56.661	57.292	-0.429	0.237	0.004	1.235	WB Default Mat from Settir
1	WMM - Helico.1	WMM - Helico	0	0	0	0	0	0	0	0	0	0		

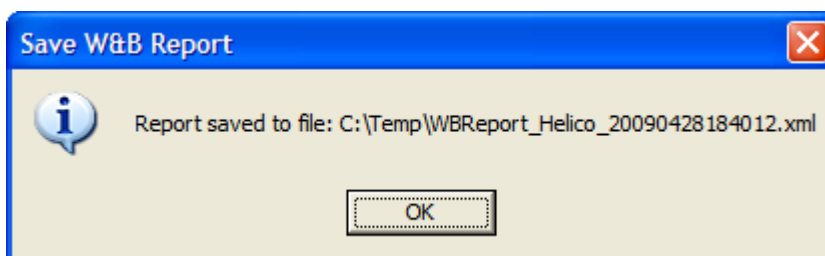
☐ Display Units Next to Values ☐ Display Trailing Zeros

Save Save As Close

The user can choose whether the report should be saved in an xml format or not.

If the Save button is clicked, a notification window will appear showing the path where the report has been generated.

Example:



**Note:** The folder where the report is generated corresponds to the temporary directory assigned to the variable REPORTPATH

User can also choose his own directory and file name for saving the report using the “Save As” button.

The generated report is an XML file. A style sheet (XSL) is provided, as an example, to render the report as HTML. W&B data and other attributes (see chapter on administrator settings) defined by the administrator are displayed. The user is free to create his own XSL to display W&B results according to his wishes.

XML Report architecture:

```
<?xml version='1.0' ?>
<?xml-stylesheet type="text/xsl" href="C:\Temp\WBReport_StyleSheet.xsl"?>
<Report Title = "Report W&B" .....>
  <PRC .....>
    <PartInstance ..... />
    <PartInstance ..... >
      <PartInstance ..... />
    < / PartInstance >
  < / PRC>
< / Report>
```

Example of XML with Weight & Balance style sheet applied:

WB Report - Windows Internet Explorer

C:\SPWC9WBClient\Reports\WBReport\_BracketAssembly\_20082115521.xml

Google

File Edit View Favorites Tools Help

WB Report

Page Tools

Computation Units	Mass	Density	Center of gravity	Moment of inertia	Product of inertia	Inertia Reference Point	Inertia Reference Axis
	kg	kg_m3	in	kgxm2	kgxm2	Center of gravity	Root Product

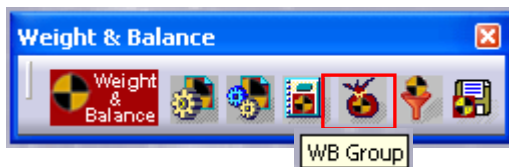
PRC V_ID	WBMass	WBLowerDeviation	WBUpperDeviation	CGx	CGy	CGz	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz
BracketAssembly	0.779046	0.0590608	0.0590608	3.70635	1.01709	0.62902	0.001	0.002	9.809e-004	-1.634e-007	-3.256e-004	1.698e-004

Part Instance level	Instance ID	Part ID	WBMass	Material	Density	WB Lower Deviation	WB Upper Deviation	WB Density	WB Active Mass Type	WB Last Imposed Mass Type	WB Last Calculation Date	CGx	CGy	CGz	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz
1	BracketIntermediary.1	BracketIntermediary	0.389523			0.0295304	0.0295304	0	Computed	Computed	08-02-01 15:05 18s	3.70635	1.01709	0.62902	5.952e-004	8.955e-004	4.5			
2	Bolt.1	Bolt	0.00543496	WBMaterial	1384	0.0005435	0.0005435	1384	Computed	Computed	08-01-31 13:35 16s	3.12069	1.02953	2.39208	1.495e-007	7.233e-007	7.2			
2	Bolt.2	Bolt	0.00543496	WBMaterial	1384	0.0005435	0.0005435	1384	Computed	Computed	08-01-31 13:35 16s	5.60098	1.01665	-0.10792	7.233e-007	7.233e-007	1.4			
2	Bracket.1	Bracket	0.188439	Measured	0	0.00942195	0.00942195	0	Measured	Measured	69-12-31 19:00 00s	3.90445	1.01631	0.59538	1.598e-004	3.126e-004	1.6			
2	Plate.1.1	Plate1	0.103463	Aluminium	2710	0.0103463	0.0103463	0	Computed	Computed	08-01-31 12:18 34s	2.54982	1.01823	1.76867	1.752e-004	1.445e-004	3.1			
2	Plate.2.1	Plate2	0.0867515	Magnesium	1798	0.00867515	0.00867515	0	Computed	Computed	08-01-31 12:18 35s	4.57331	1.01665	-0.72138	5.769e-005	8.541e-005	1.4			
1	Product.2.1	Product2	0.389523			0.0295304	0.0295304	0	Computed	Computed	08-02-01 15:05 19s	3.70635	1.01709	0.62902	5.952e-004	8.955e-004	4.5			
2	Product3.1	Product3[1]	0.389523			0.0295304	0.0295304	0	Computed	Computed	08-02-01 15:05 19s	3.70635	1.01709	0.62902	5.952e-004	8.955e-004	4.5			
3	Bolt.1	Bolt	0.00543496	WBMaterial	1384	0.0005435	0.0005435	1384	Computed	Computed	08-01-31 13:35 16s	3.12069	1.02953	2.39208	1.495e-007	7.233e-007	7.2			
3	Bolt.2	Bolt	0.00543496	WBMaterial	1384	0.0005435	0.0005435	1384	Computed	Computed	08-01-31 13:35 16s	5.60098	1.01665	-0.10792	7.233e-007	7.233e-007	1.4			
3	Bracket.1	Bracket	0.188439	Measured	0	0.00942195	0.00942195	0	Measured	Measured	69-12-31 19:00 00s	3.90445	1.01631	0.59538	1.598e-004	3.126e-004	1.6			
3	Plate.1.1	Plate1	0.103463	Aluminium	2710	0.0103463	0.0103463	0	Computed	Computed	08-01-31 12:18 34s	2.54982	1.01823	1.76867	1.752e-004	1.445e-004	3.1			
3	Plate.2.1	Plate2	0.0867515	Magnesium	1798	0.00867515	0.00867515	0	Computed	Computed	08-01-31 12:18 35s	4.57331	1.01665	-0.72138	5.769e-005	8.541e-005	1.4			

See [Description of report basic attributes](#)

## The WB Group Command

This command is used to compute and generate reports on a group of part instances.



A part instance needs to be selected in order to display the Weight & Balance - Group panel. There are three tabs in this panel.

The **Search Criteria** tab presents the list of criterias to be used for querying instances from the current Product.

The *Remove* button is used to remove selected criterion from the list.

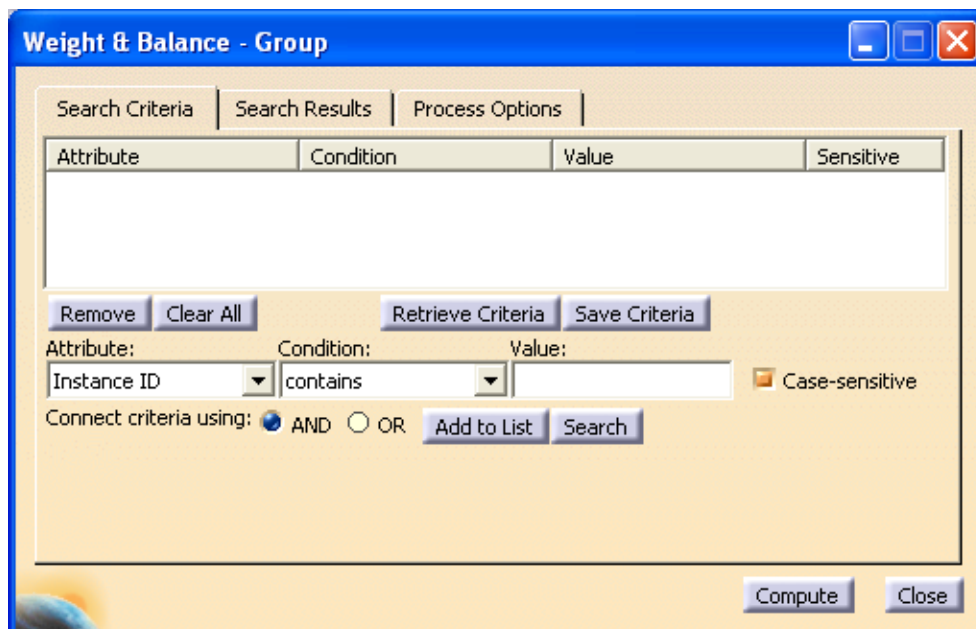
The *Clear All* button is used to remove all the criteria from the list.

The *Retrieve Criteria* button allows the retrieval of the last group of criteria previously saved locally by the current user on the current Product with the same Config Handler applied.

The *Save Criteria* button allows the save of the current group of criteria by the current user on the current Product with the same Config Handler applied.

The *Add to List* button is used to add a criterion to the list.

The *Search* button is used to search in the database for instances corresponding to the current criteria.



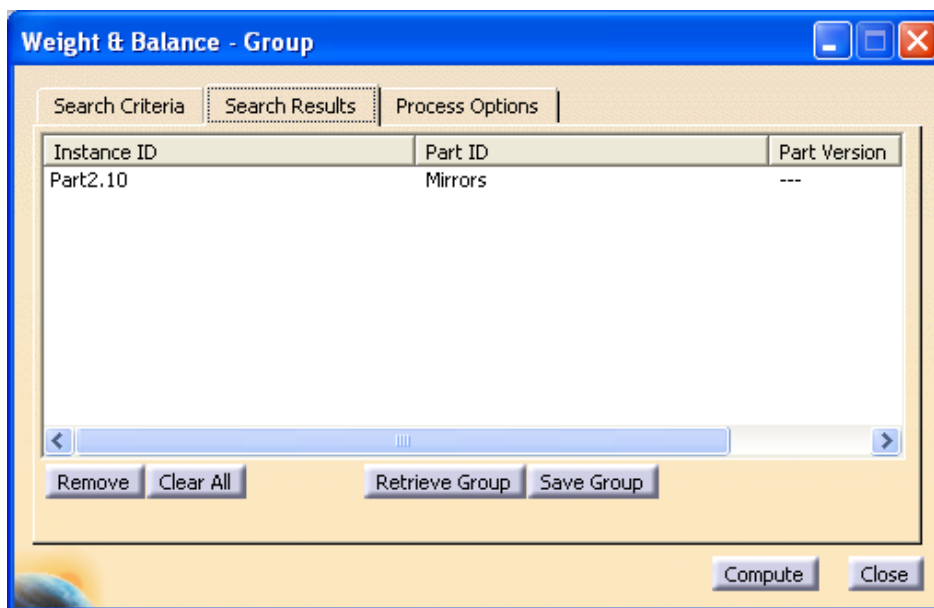
The **Search Results** tab presents the list of instances currently selected.

The *Remove* button is used to remove selected instances from the list.

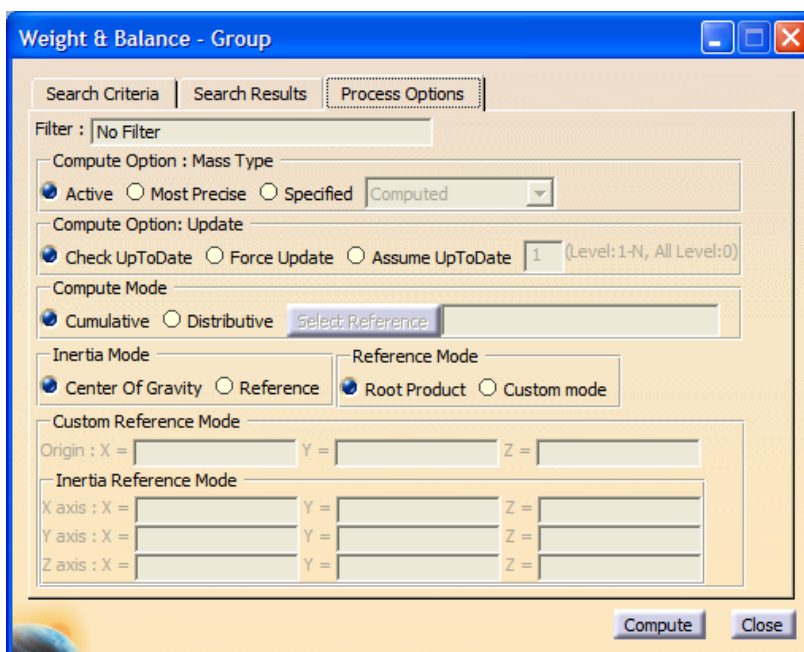
The *Clear All* button is used to remove all instances from the list.

The *Retrieve Group* button allows the retrieval of the last group of instances previously saved locally by the current user on the current Product with the same Config Handler applied.

The *Save Group* button allows the save of the current group of instances by the current user on the current Product with the same Config Handler applied.



The **Process Options** tab presents the same compute options then with the WB Report command.





When clicking on the compute button, a preview report will be open showing the instances of the subassembly selected under the current PRC.

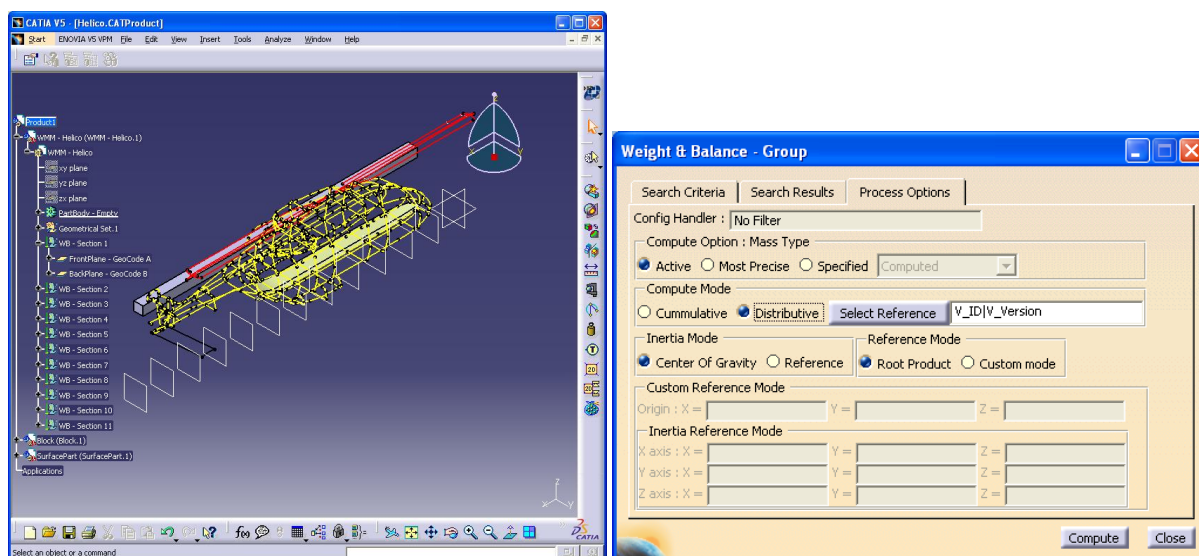
## Distributive Analysis

Distributive Analysis consists of sectioning the geometry of non-composite Parts and returning the results corresponding to the portions completely included in the section.

This method of analysis is one of the most used by aircraft manufacturers. Typically, they are not only interested in computing the mass properties of parts but they also want to obtain the mass properties according to various sections of the airplane.

A Weight Master Model must be defined associated to the distributive Analysis:

- The V\_ID and V\_version are keyed in or the Part containing the WMM is selected from the current VPM Navigator window.
- The WMM contains several section definitions.
  - Each section is defined by planes.
  - These elements are properly oriented to point the inside of the section.



A section-wise report is generated for each selected instance and a cumulative for the PRC. Part instances with CGR representation are not processed.



Report Preview													
Current PRC : ODT_Helico													
Report													
	WB Mass	COGx	COGy	COGz	Name	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz	WB Lower Deviation	WB Upper Deviation
1	991.069	2236.4	-1282.92	2748.5	WB - Section 1	3.381e+006	2.886e+006	1.009e+006	-243738	455646	1.406e+006	198.214	198.214
2	991.837	3790.8	-1282.37	2747	WB - Section 2	6.62e+006	7.043e+006	2.666e+006	33899.1	-75059.3	2.484e+006	198.367	198.367
3	991.944	5345.39	-1282.3	2746.79	WB - Section 3	7.027e+006	1.434e+007	9.612e+006	133587	-301792	2.601e+006	198.389	198.389
4	991.945	6900	-1282.3	2746.79	WB - Section 4	7.032e+006	2.68e+007	2.208e+007	211422	-477544	2.603e+006	198.389	198.389
5	991.945	8454.61	-1282.3	2746.79	WB - Section 5	7.032e+006	4.481e+007	4.009e+007	288400	-651411	2.603e+006	198.389	198.389
6	991.99	10009.2	-1282.27	2746.8	WB - Section 6	6.861e+006	6.816e+007	6.366e+007	354900	-779605	2.587e+006	198.398	198.398
7	990.393	11564.2	-1283.56	2749.73	WB - Section 7	575473	9.201e+007	9.174e+007	156868	-263781	252802	198.079	198.079
8	990.225	13119.1	-1283.72	2750	WB - Section 8	42.646	1.26e+008	1.26e+008	-3.085	-2.874	-1.588e-022	198.045	198.045
9	990.225	14673.8	-1283.72	2750	WB - Section 9	42.646	1.661e+008	1.661e+008	-3.085	-2.874	-1.588e-022	198.045	198.045
10	693.483	15892.1	-1286.5	2747.42	WB - Section 10	22119.8	3.112e+007	3.112e+007	606605	565000	-11017.2	138.697	138.697
11	15.2	16523.8	-1283.72	2750	WB - Section 11	0.655	0.32	0.341	0	0	0	3.04	3.04

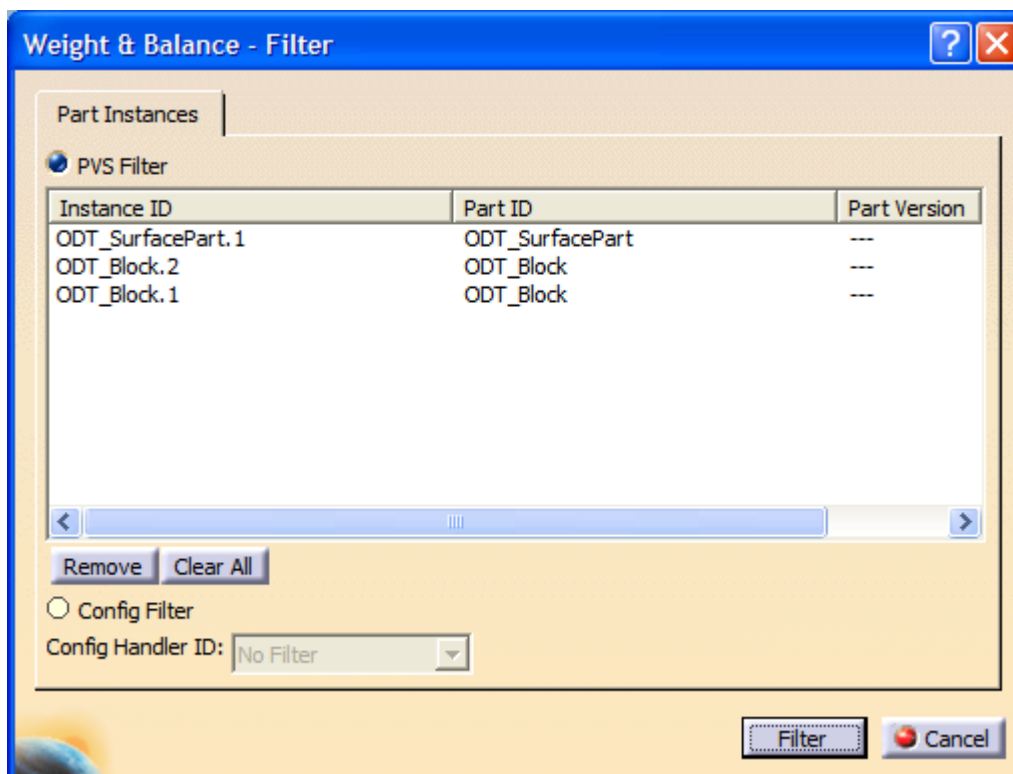
  

Sr.No.	COGx	COGy	COGz	Name	V ID	MOIxx	MOIyy	MOIzz	POIxy	POIxz	POIyz	Density	WB Mass	Material
1	2250	-1283.72	2750	WB - Section 1	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
2	3750	-1283.72	2750	WB - Section 2	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
3	5250	-1283.72	2750	WB - Section 3	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
4	6750	-1283.72	2750	WB - Section 4	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
5	8250	-1283.72	2750	WB - Section 5	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
6	9750	-1283.72	2750	WB - Section 6	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
7	11250	-1283.72	2750	WB - Section 7	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
8	12750	-1283.72	2750	WB - Section 8	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
9	14250	-1283.72	2750	WB - Section 9	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
10	15750	-1283.72	2750	WB - Section 10	ODT_Block	20.597	99.634	100.304	0	0	0	1234.5	478.244	WB Default
11	16523.8	-1283.72	2750	WB - Section 11	ODT_Block	0.655	0.32	0.341	0	0	0	1234.5	15.2	WB Default
12	2223.19	-1283.72	2750	WB - Section 1	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
13	3829	-1283.72	2750	WB - Section 2	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
14	5434.81	-1283.72	2750	WB - Section 3	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
15	7040.62	-1283.72	2750	WB - Section 4	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
16	8646.43	-1283.72	2750	WB - Section 5	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
17	10252.2	-1283.72	2750	WB - Section 6	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
18	11858.1	-1283.72	2750	WB - Section 7	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
19	13463.9	-1283.72	2750	WB - Section 8	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
20	15069.7	-1283.72	2750	WB - Section 9	ODT_Block	22.049	122.294	123.011	-3.085	-2.874	0	1234.5	511.98	WB Default
21	16207.8	-1292.65	2741.69	WB - Section 10	ODT_Block	9.238	12.981	13.28	-0.644	-0.6	0.016	1234.5	215.239	WB Default
22	0	0	0	WB - Section 11	ODT_Block	0	0	0	0	0	0	1234.5	0	WB Default
23	2542.05	-339.723	985.242	WB - Section 1	ODT_SurfacePart	0.038	0.069	0.104	0.012	0.009	-5.735e-004	1.235	0.845	WB Default
24	3765.61	-448.859	901.682	WB - Section 2	ODT_SurfacePart	0.103	0.302	0.404	0.012	0.006	0.003	1.235	1.612	WB Default
25	5250.53	-464.716	899.803	WB - Section 3	ODT_SurfacePart	0.124	0.322	0.446	-5.936e-005	-2.175e-004	7.462e-005	1.235	1.719	WB Default
26	6750	-464.66	900	WB - Section 4	ODT_SurfacePart	0.124	0.323	0.447	0	0	0	1.235	1.721	WB Default
27	8250	-464.66	900	WB - Section 5	ODT_SurfacePart	0.124	0.323	0.447	0	0	0	1.235	1.721	WB Default
28	9763.36	-466.327	954.452	WB - Section 6	ODT_SurfacePart	0.137	0.345	0.463	-0.004	-0.049	0.004	1.235	1.766	WB Default
29	10579.1	-339.443	1162.19	WB - Section 7	ODT_SurfacePart	0.009	5.684e-004	0.009	-8.487e-004	-1.362e-004	4.154e-004	1.235	0.169	WB Default

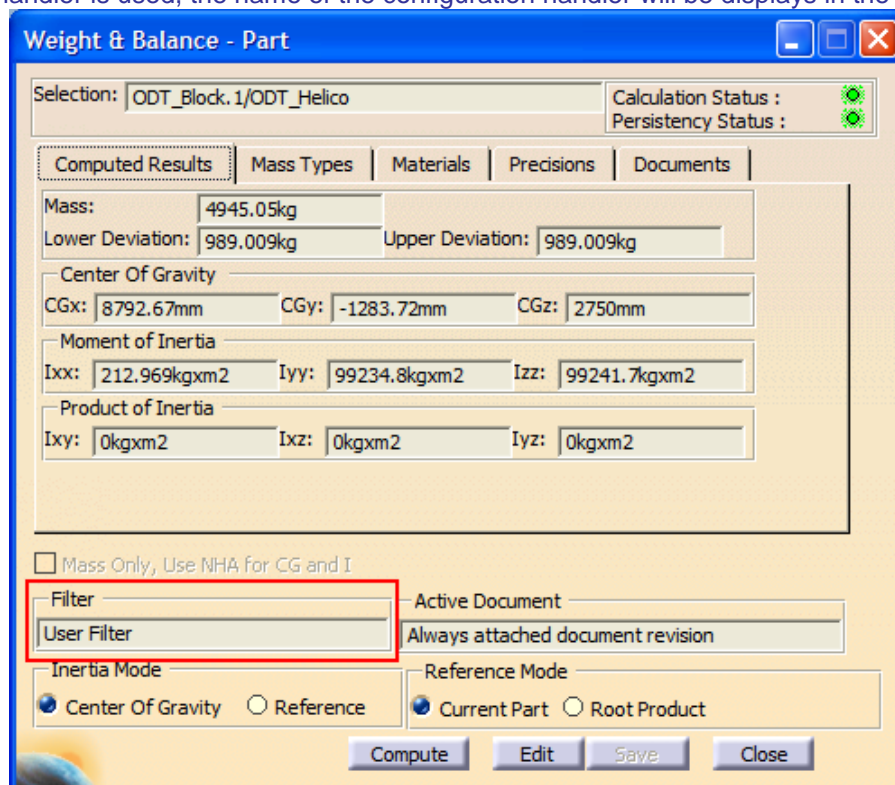
☐ Display Units Next to Values ☐ Display Trailing Zeros

Save Save As Close





When a PVS filter is set, W&B commands will display “User Filter” in the Filter text box. In other cases where a configuration handler is used, the name of the configuration handler will be displayed in the filter text box.

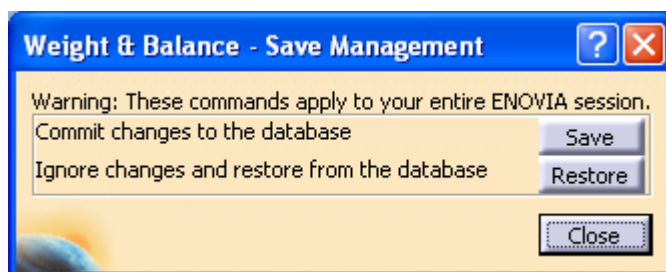


## The WB Save Command

The Save Management allows the user to commit the change to the database or to restore the values from the database. (See Process Flow for more details)



**Note:** Save or Restore commands apply to the entire ENOVIA session and not only to the current VPM Navigator window.



# Weight & Balance batch processor

W&B can be used as a batch program and is independent from the VPM Navigator environment. Using the application **ENOWBComputeAssembly**, the batch takes several parameters as inputs.

```

C:\Documents and Settings\ukf\Desktop>ENOWBComputeAssembly -h
=====
DSTracing object informations
=====
Version level                : 2.07
DSTRACE_ELAPSED              : Unset, elapsed time will be printed. Set DSTRACE_ELAPSED variable
DSTRACE_DUMP_ENU            : Unset, no environment variable will be printed. Set DSTRACE_DUMP_E
DSTRACE_ALL_ACTIVATED        : Not Activated
DSTRACE_LEVEL Variable value : 1
=====
Return code values:
=====
S_OK                         : 0
E_FAIL                       : -2147467259
S_FALSE                      : 1
E_ABORT                      : -2147467260
E_HANDLE                     : -2147024890
E_POINTER                    : -2147467261
E_NOTIMPL                   : -2147467263
E_UNEXPECTED                 : -2147418113
E_INVALIDARG                 : -2147024809
E_NOINTERFACE                : -2147467262
=====
Dassault Systemes Release Informations
=====
Dassault Systemes Release level : B19
Dassault Systemes Service Pack level: 4
Dassault Systemes HOT Fix level : None
=====
WBBatchProcessor main(
WBBatchProcessor | Starting Weight & Balance Batch...
WBBatchProcessor | Enter : ENOWBComputeAssembly [-h !! -help] to access help menu
WBBatchProcessor | ArgumentParse(
WBBatchProcessor | | PrintHelp(
WBBatchProcessor | | | HELP
WBBatchProcessor | | | | Weight & Balance : Version 2.2
WBBatchProcessor | | | | Computation of W&B data on an assembly
WBBatchProcessor | | | |
WBBatchProcessor | | | | How to use the batch :
WBBatchProcessor | | | |
WBBatchProcessor | | | | HELP: ENOWBComputeAssembly -PRC filename [-COpt -CHID -Report [-RefPoint]]
WBBatchProcessor | | | | HELP: ENOWBComputeAssembly -Part filename [-COpt -CHID -Report [-RefPoint]]
WBBatchProcessor | | | | HELP: ENOWBComputeAssembly -ALL [-COpt -CHID -Report [-RefPoint]]
WBBatchProcessor | | | |
WBBatchProcessor | | | | -PRC : The path where the file containing PRC U_IDs.
WBBatchProcessor | | | | | OR
WBBatchProcessor | | | | -Part : The path where the file containing PRC U_ID
WBBatchProcessor | | | | | and list of Parts
WBBatchProcessor | | | | | OR
WBBatchProcessor | | | | -ALL : All PRCs in the database are computed
WBBatchProcessor | | | |
WBBatchProcessor | | | | -COpt : Compute Option (optional,default = 0)
WBBatchProcessor | | | | | Possible values : By active type = 0
WBBatchProcessor | | | | | | By most precise = 1
WBBatchProcessor | | | | | | By Computed type = 2
WBBatchProcessor | | | | -Force : Force computation of the assembly (optional, default = 0)
WBBatchProcessor | | | | | Possible values: Check UpToDate = 0
WBBatchProcessor | | | | | | Force Update = 1
WBBatchProcessor | | | | | | Assume UpToDate = 2
WBBatchProcessor | | | | -Level : Tree Level for Assume UpToDate (optional, default = 0)
WBBatchProcessor | | | | | Possible Values: Any Level : 1 - N
WBBatchProcessor | | | | | | All Level : 0
WBBatchProcessor | | | | -CHID : Config handler ID to be applied on assembly (optional)
WBBatchProcessor | | | | -Report : A report is generated (optional,default = 0)
WBBatchProcessor | | | | | Possible values: TRUE = 1
WBBatchProcessor | | | | | | FALSE with Units = 0
WBBatchProcessor | | | | -RefMode : Inertia reference point for Report values
WBBatchProcessor | | | | | (optional,default = 0)
WBBatchProcessor | | | | | Possible values: Center of gravity = 0
WBBatchProcessor | | | | | | Reference = 1
WBBatchProcessor | | | |
WBBatchProcessor | | | | HELP: ENOWBComputeAssembly [-h !! -help]
WBBatchProcessor | | | | -h : This help
WBBatchProcessor | | | | -help : This help
WBBatchProcessor | | | |
WBBatchProcessor | | | )
WBBatchProcessor | )
WBBatchProcessor | )
=====
DSTrace Name activation information
=====
Trace name : WBBatchProcessor : Enabled
=====
C:\Documents and Settings\ukf\Desktop>

```

The **PRC** or **Part** or **ALL** option is mandatory.

Setting the **PRC** option followed by the path of a file in the file system will allow the batch to open the specified file and extract every single PRC V\_ID found in this file (following the rule that only 1 PRC V\_ID will be taken per line).

For example:

```
>ENOWBComputeAssembly -PRC C:\PRC_VIDs.txt
With PRC_VIDs.txt containing following lines:
WBPRC01
WBPRC02
Etc...
```

Similarly, setting the **Part** option followed by the path of a file in the file system will allow the batch to open the specified file and extract every single PRC V\_ID followed by the part instances from the assembly found in this file (following the rule that only 1 PRC V\_ID will be taken per line).

Example:

```
>ENOWBComputeAssembly -Part C:\Parts.txt
With Parts.txt containing following lines:
WBPRC01
WBPart1.1
WBPart2.1
Etc...
```

If the **ALL** option is selected then all PRCs in the database will be updated.

Several other non mandatory options are available as explained in the screenshot above.

New computation modes are now available in batch processing to make it compatible with interactive commands:

*Force parameter* provides the option to choose between Force Update, Assume-UpToDate and Check-UpToDate options.

*Level option* is used in Assume UpToDate mode for defining the level at which the assembly is assumed to be up-to-date.

*Report parameter* provides an extra option to save the report with local Units defined on the server.

## ***Stop Restart of Batch for very large assembly***

The new batch architecture facilitates computing very large assemblies without dividing it in small batches.

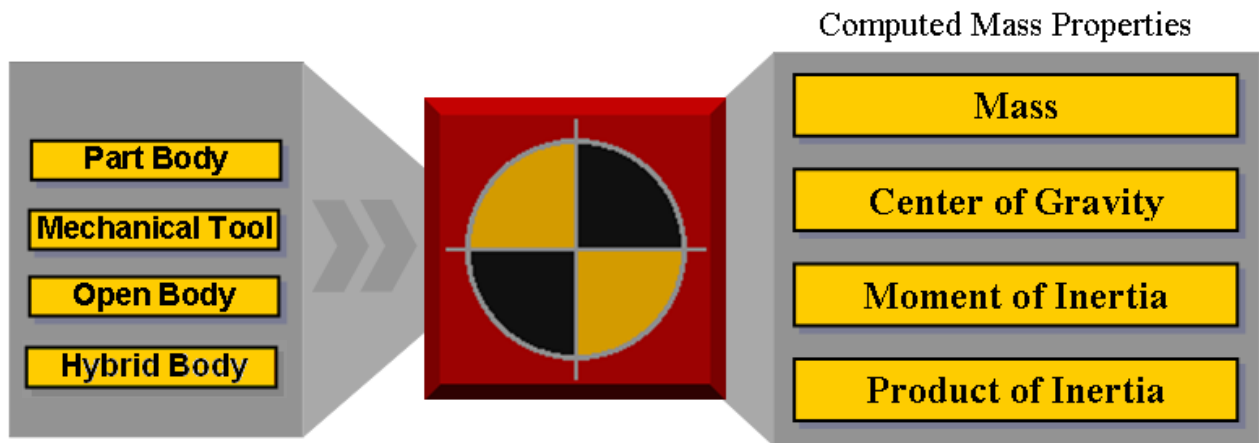
It is required to set **WC9\_BATCH\_MEMORY\_LIMIT** environment variable on the server side to the maximum allowed memory for the batch. The minimum value is set to 300 MB, otherwise the batch will exit.

As soon as the memory is reached in between the computation, the temporary report is saved and the batch is launched again to continue from the previous state of the batch.

# The Model Processors

The CATIA V5 processor computes the mass properties of selected CATPart, CATShape and CATProduct documents. The elements that can be processed and properties that can be computed are illustrated below.

## Processed V5 Elements



The CATIA V5 processor also processes CGR and V4 Model files. However, the results do not offer the same level of granularity than for the CATPart (show / no-show, pick / no-pick, element type). They are returned by a service provided by DMU-SpaceAnalysis corresponding to the Measure inertia command.

## Processing parameters

The input parameters of the Model Processor are the following:

CATIA V5 CATPart, CATShape or CATProduct.Assigned Density

## Processing the CATIA geometry

The CATIA V5 geometry is processed using standard CATIA methods.

## Processing the assigned Density (Density Priority)

The Weight & Balance V5 Processor uses the density assigned to V5 CATDocuments unless it finds a density assigned (using W&B for CATIA). If no density is found either in the Document or on a W&B attribute, a default density defined by the Administrator through the W&B Settings is used.

The density priority is set through the Material tab of the WB Part Command.

## CATProduct BlackBox Processing

BlackBoxes are processed either in exposed mode or in summary mode depending on the WB admin settings.



# Appendix:

## Description of report basic attributes

The following attributes are returned by the application.

### - Report

- Title
- MassUnit
- LengthUnit
- DensityUnit
- InertiaMomentUnit
- SurfacicDensityUnit
- InertiaReferenceAxis
- InertiaReferencePoint

### - PRC

- COGx
- COGy
- COGz
- MOIxx
- MOIyy
- MOIzz
- POIxy
- POIxz
- POIyz
- WB\_Mass
- WB\_Lower\_deviation
- WB\_Upper\_deviation

### - PartInstance

- COGx
- COGy
- COGz
- V\_ID
- MOIxx
- MOIyy
- MOIzz
- POIxy
- POIxz
- POIyz
- Density
- WB\_Mass
- Material
- WB\_Density
- V\_instance\_ID (BB\_Instance\_ID in case of BlackBox document)
- WBMaterialName
- Density\_dimension
- WBActiveMassTypeID
- WB\_Lower\_deviation
- WB\_Upper\_deviation
- WBLastCalculationDate
- WBLastImposedMassTypeID
- WB\_Mass\_Details



Note that the *V\_ID* of the part and the *V\_instance\_ID* of the instance will be replaced by the name corresponding to the mask.

When the “Use Documents” mode is enabled, three new attributes will be visible in the report under the Part Instance:

- WBActiveDocumentID
- WB\_Latest\_doc\_revision
- WB\_Currently\_attached\_doc\_revision

Other attributes on the Part or the Item Instance may be also reported if they have been declared the W&B setting by the Administrator.