

# SAWE Conference – W&B Tool Overview



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# SUMMARY

- **W&B Tool Requirements** **5min**
- **W&B Tool Functionalities Overview** **15min**
- **W&B Tool on CSeries Program** **10min**
- **Discussion/Questions** **30min**

# W&B Tool Requirements

## ■ Why was the tool requested

- This tool has been developed based on:
  - The Mass Properties Technical Requirement Document (PLMP/Core Eng)
  - The CSeries Requirements (CSeries MASS/PLMP/IBM)
- It basically answers to the need of having a solution to compute and track Weights and Inertias of an Aircraft based on the Engineering database.
  - It allows to control Supplier/Partner data
  - It allows to generate Mass and Inertia reports
  - It allows the Mass Properties group to get involved with design earlier in the development phase

## ■ Developed for the CSeries

- Selected by the CSeries Program out of 3 other similar tools, the W&B Tool has been developed by Dassault System and deployed on the CSeries by IT/IBM
  - Integrated in VPM Nav interface (CATIA V5 R19 required)
  - Based on the ENOVIA Database

## ■ What are the challenges for using it on Legacy Programs

- The Product Structure have to reside in ENOVIA
- VPM Nav and CATIA V5 R19 installation
- Mass can be tracked at the node level in ENOVIA but Mass computation and distribution requires to have 3D models in CATIA V5 format

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# W&B Tool Functionalities Overview (1/5)

- Mass Accounting – Preliminary Analysis
  - **JCDP**
  - **JDP**
- Mass Computation
  - **DDP**
- Mass Distribution Analysis
  - **DDP**
- Mass and Inertia Reports
  - **All phases**

# W&B Tool Functionalities Overview (2/5)





## Weight & Balance Toolbar

- The commands used for W&B Analysis are available within the W&B Toolbar.
- The usage and details of the commands are presented in the related BMs.

- WB Part
- WB Product
- WB Report
- WB Group
- WB Filter
- WB Save

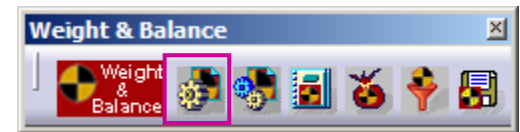
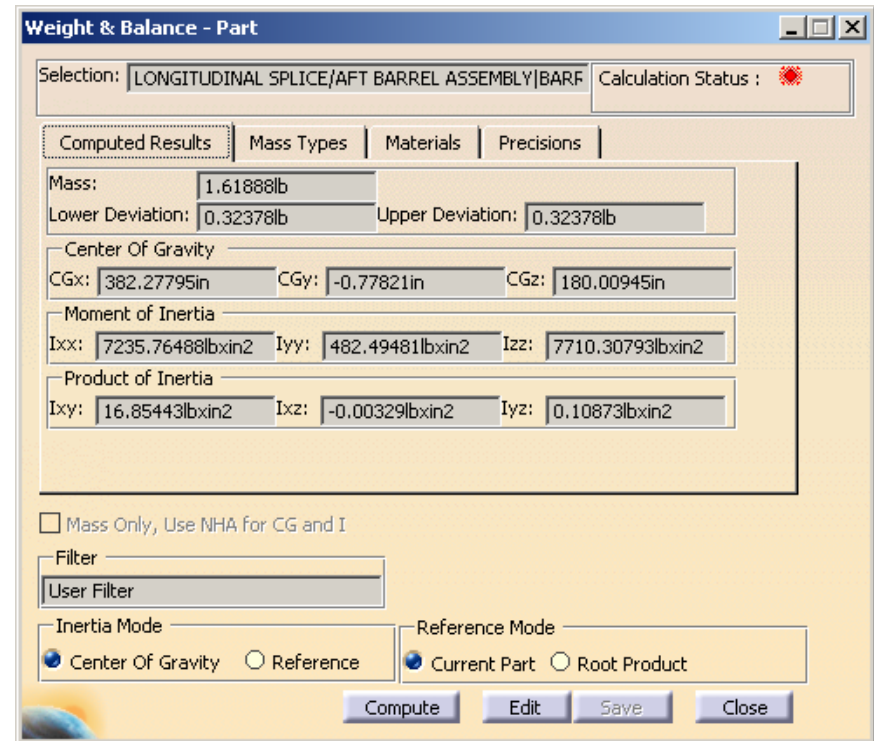


- A correspondence between these commands and the W&B process can be found accordingly:

	Assign Density and Material	Specify Density Priority	Specify Active Mass Type and Mass Properties	Specify Deviations	Perform Detail Weight Analysis	Perform Assembly Weight Analysis	Material and Mass Type Statistics	Generate Report
WB Part 	✓	✓	✓	✓	✓	✓		
WB Group 					✓	✓		✓
WB Product 					✓	✓	✓	
WB Report 								✓

# W&B Tool Functionalities Overview (3/5)

- **WB Part** is the command that allows Weights user to:
  - Browse the Mass Properties
  - Update the Mass Properties
  - Specify the Mass Type Active
  - Define Mass Type
  - Assign Mass Properties
  - Specify WB Density, Material and Priority
  - Define specific deviations
  - Perform Detail or Assembly Weight Analysis



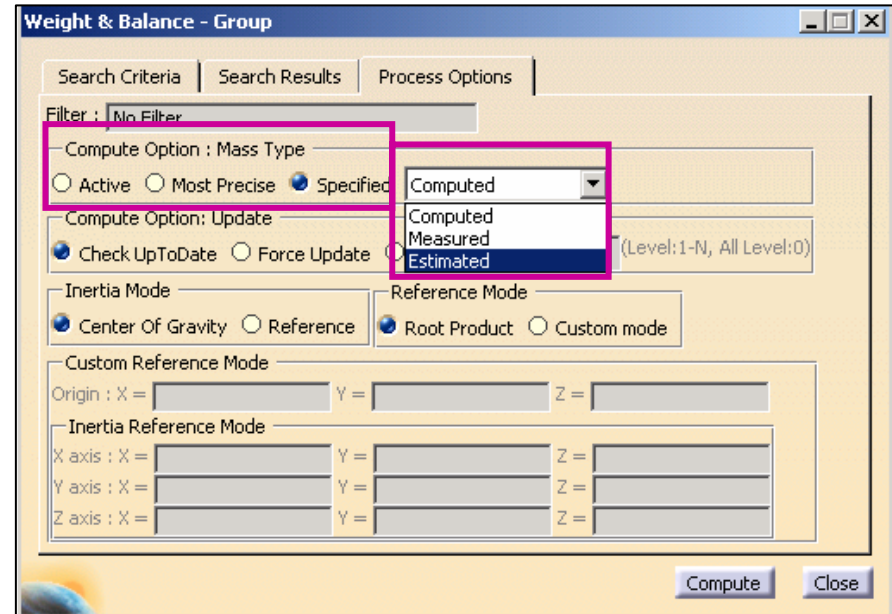
# W&B Tool Functionalities Overview (4/5)

## ■ **WB Group:** Mass Type Compute Option

- Three mass types are available: **Active**, **Most Precise** and **Specified**.
- **Specified** Mass Type: Can be chosen by the user from the pick list: **Computed**, **Measured** or **Estimated**.

## ■ **WB Group:** Computation rules

- If **Active** Mass Type is set, the corresponding Active Mass type for each part is used.
- If **Most Precise** is selected, the non null Mass Type with the lowest deviation for each part is considered in computation.
- If **Specified** is set to **Computed**, **Measured** or **Estimated**, all parts from the group are analyzed based on the specified Mass Type.

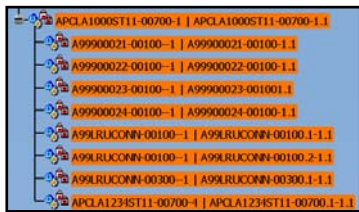


If a non computed Mass Type is selected and this is Null for a Part, the Active Mass Type will be used instead. If this is also Null, a warning message is displayed to the user (see Hints and Tips for more details).



# W&B Tool Functionalities Overview (5/5)

## ■ Reporting principle



Report Preview

Current PRC : CL-668

Report

Level	V ID	WB Mass	COGx	COGy	COGz	MOIxx	MOIyy	MOIzz	POIxx	POIyz	POIyy	WB Lower deviation	WB Upper deviation
0	CL-698	607.11207	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238	137.42257	137.42257
Level	Instance ID	WB Mass	COGx	COGy	COGz	MOIxx	MOIyy	MOIzz	POIxx	POIyz	POIyy	Density	Mat
1	CL-698_WP5_3-1.1	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238		
2	WP5_3_COM110-1.1	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238		
3	APCLA1000ST11-00700-1.1	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238		
4	A99900021-00100-1.1	636.75627	28.371	7.4062	-1.0467	31993.02514	90871.26478	95993.52238	-959.40276	6919.97999	-1428.73551	0.10271	Alum
4	A99900022-00100-1.1	19.03806	53.4612	6.9925	0.0029	76.31621	143.73951	147.89562	5.05263	-0.16026	-1.10035	0.10271	Alum
4	A99900023-00100-1.1	16.06171	19.9119	6.5999	-0.9489	111.43283	57.60062	105.67864	0.03510	2.57997	0.03793	0.10296	Alum
4	A99900024-00100-1.1	15.11337	19.5801	-5.1851	-5.6644	77.50915	72.90514	-0.57958	8.62708	0.07193	0.10271	0.10271	Alum
4	A99900025-00100-1.1	0.03643	17.2112	-8.7041	-7.0454	0.05689	0.05689	0.00244	-0.09642e-018	0.00079	-0.28217e-016	0.10271	Alum
4	A99900026-00100-1.1	0.03643	20.8078	6.7327	-11.8125	0.0561	0.00243	0.05689	0.00045	-1.17031e-017	1.96036e-015	0.10271	Alum
4	A99900027-00100-1.1	0.0905	51.4063	3.3893	-0.0116	0.03213	0.01724	0.01724	1.64601e-015	-3.94351e-016	-2.13446e-020	0.10271	Alum
4	APCLA1234ST11-00700-1.1	0	0	0	0	0	0	0	0	0	0		

3D Model

Compare Options | Update Options | Export reference point location reference axis

Compare Units: Mass Density Surface density Center of gravity Moment of inertia Product of inertia

Product ID	Mass	Lower deviation	Upper deviation	COGx	COGy	COGz	MOIxx	MOIyy	MOIzz	POIxx	POIyz	POIyy
CL-698	607.11207	137.42257	137.42257	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238

Part	Instance ID	Part ID	Mat	Material	Density	Lower Deviation	Upper Deviation	WB	WB	WB	WB	WB	WB	WB	WB	WB	WB	
Inst	Inst	Inst						Center	Center	Center	Center	Center	Center	Center	Center	Center	Center	
Inst	Inst	Inst						Mass	Mass	Mass	Mass	Mass	Mass	Mass	Mass	Mass	Mass	
Inst	Inst	Inst						Type	Type	Type	Type	Type	Type	Type	Type	Type	Type	
1	CL-698_WP5_3-1.1	CL-698_WP5_3-1				137.42257	137.42257	687.11287	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238
2	WP5_3_COM110-1.1	WP5_3_COM110-1				137.42257	137.42257	687.11287	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238
3	APCLA1000ST11-00700-1.1	APCLA1000ST11-00700-1				137.42257	137.42257	687.11287	687.11287	28.6669	7.0993	-1.3224	36184.09967	106960.91857	112221.96801	786.1772	9354.36752	-999.13238
4	A99900021-00100-1.1	A99900021-00100-1		Aluminium	2700	137.42257	137.42257	636.75627	636.75627	28.371	7.4062	-1.0467	31993.02514	90871.26478	95993.52238	-959.40276	6919.97999	-1428.73551
4	A99900022-00100-1.1	A99900022-00100-1		Aluminium	2700	137.42257	137.42257	19.03806	19.03806	53.4612	6.9925	0.0029	76.31621	143.73951	147.89562	5.05263	-0.16026	-1.10035
4	A99900023-00100-1.1	A99900023-00100-1		Aluminium	2700	137.42257	137.42257	16.06171	16.06171	19.9119	6.5999	-0.9489	111.43283	57.60062	105.67864	0.03510	2.57997	0.03793
4	A99900024-00100-1.1	A99900024-00100-1		Aluminium	2700	137.42257	137.42257	15.11337	15.11337	19.5801	-5.1851	-5.6644	77.50915	72.90514	-0.57958	8.62708	0.07193	0.10271
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4	A99900027-00100-1.1	A99900027-00100-1		Aluminium	2700	137.42257	137.42257	0.0905	0.0905	51.4063	3.3893	-0.0116	0.03213	0.01724	0.01724	1.64601e-015	-3.94351e-016	-2.13446e-020
4	APCLA1234ST11-00700-1.1	APCLA1234ST11-00700-1				0	0	0	0	0	0	0	0	0	0	0	0	0

➔ Report in Excel based on a customizable Style Sheet

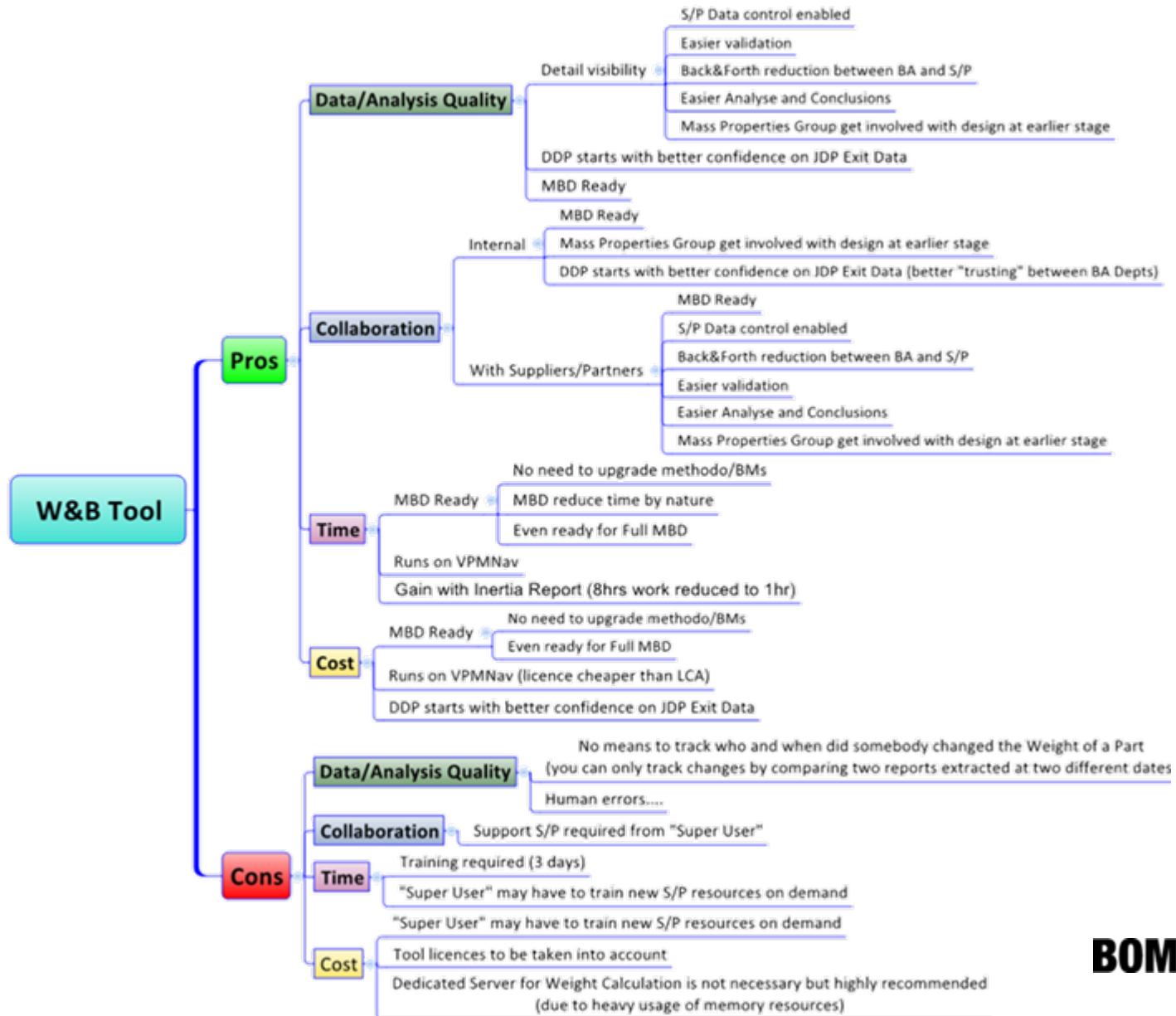
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# W&B Tool on C Series Program

- **The W&B Tool has been selected by the C Series Program out of 3 other similar tools**
- **The first drop of the deployment project was done in early JDP and allowed:**
  - Mass Accounting – Preliminary analysis
  - Mass Computation
  - Mass and Inertia Reports
  - Batch Computation
- **A second drop was delivered for beginning of DDP allowing:**
  - Mass Distribution Analysis
  - Mass Types and Material Statistics Reports
  - Data Import/Export with Partners and Suppliers
- **A major fix was released a few months ago allowing:**
  - Computation of Assemblies containing “Ghost Links”
  - Reports generation when errors occurs (list of errors displayed to the user)

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# Discussion/Questions

