

3D Electronic Model Based Design

Go All The Way!

James DeLaPorte

james.delaporte@gulfstream.com





Combat Systems
\$9.6 Billion



Information Systems
\$10.8 Billion



Marine Systems
\$6.4 Billion

GENERAL DYNAMICS



AEROSPACE
\$5.2 Billion

Leading Market positions in Business Aviation and Aircraft Services, Land and Amphibious Combat Systems, Information Systems, and Shipbuilding and Marine Systems

GULFSTREAM COMPANY OVERVIEW



Gulfstream[®]
A GENERAL DYNAMICS COMPANY



Gulfstream sets the World Standard in Business Aviation

50 years of satisfying the world's most demanding travelers with...



- Performance & Operational Flexibility
- Comfort & In-Flight Productivity
- Safety & Security
- Reliability & Exceptional Quality
- Unmatched Product Support



Gulfstream

Gulfstream Expanded Product Line

G150



2,950 nm (5,463 km) at M0.75

G200



3,400 nm (6,297 km) at M0.75

G250



3,400 nm (6,297 km) at M0.80
Entry into Service in 2011

G350
G450



G350: 3,800 nm (7,038 km) at M0.80
G450: 4,350 nm (8,056 km) at M0.80

G500
G550



G500: 5,800 nm (10,742 km) at M0.80
G550: 6,750 nm (12,501 km) at M0.80

G650



7,000 nm (12,964 km) at M0.85
Entry into Service in 2012

Gulfstream

Gulfstream Current Manufacturing Facilities



Long Beach, California

Completions
Paint/Stripping Facility
335,000 ft² (31,123 m²)



Mexicali, Mexico

Sub-Assembly Support
and Spares
294,000 ft² (27,313 m²)



Appleton, Wisconsin

Completions
Paint/Stripping Facility
260,000 ft² (24,155 m²)



Dallas, Texas

Completions
Paint/Stripping Facility
403,561 ft² (37,492 m²)



Savannah, Georgia

Corporate Headquarters
Major Assembly, Engineering,
and Completions
Paint/Stripping Facility
2,404,745 ft² (223,408 m²)



Brunswick, Georgia

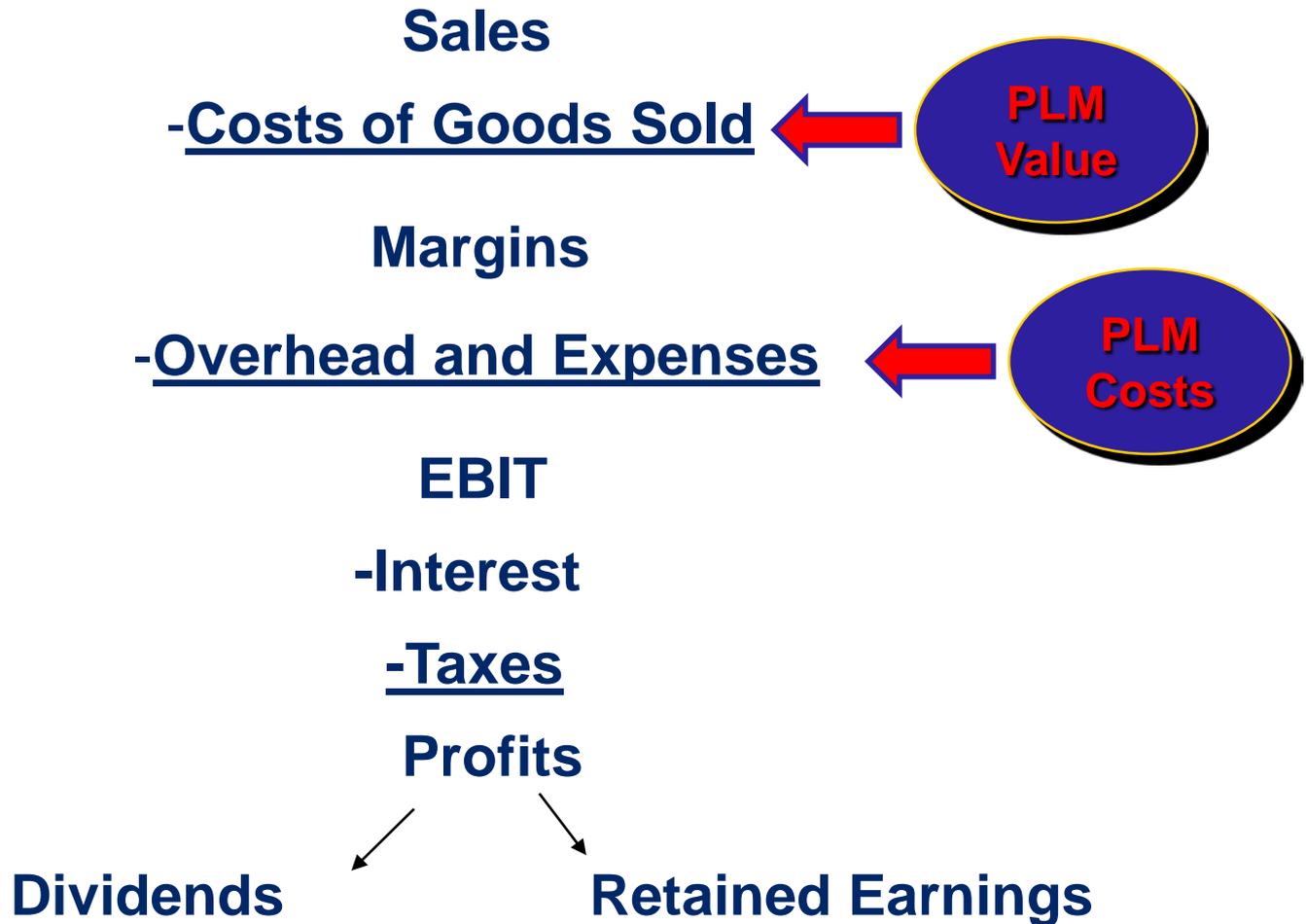
Completions
110,070 ft² (10,226 m²)



Nearly 4.0 million total square footage with over 10,000 employees

Gulfstream

Economics 101 Review – Define the PLM Value

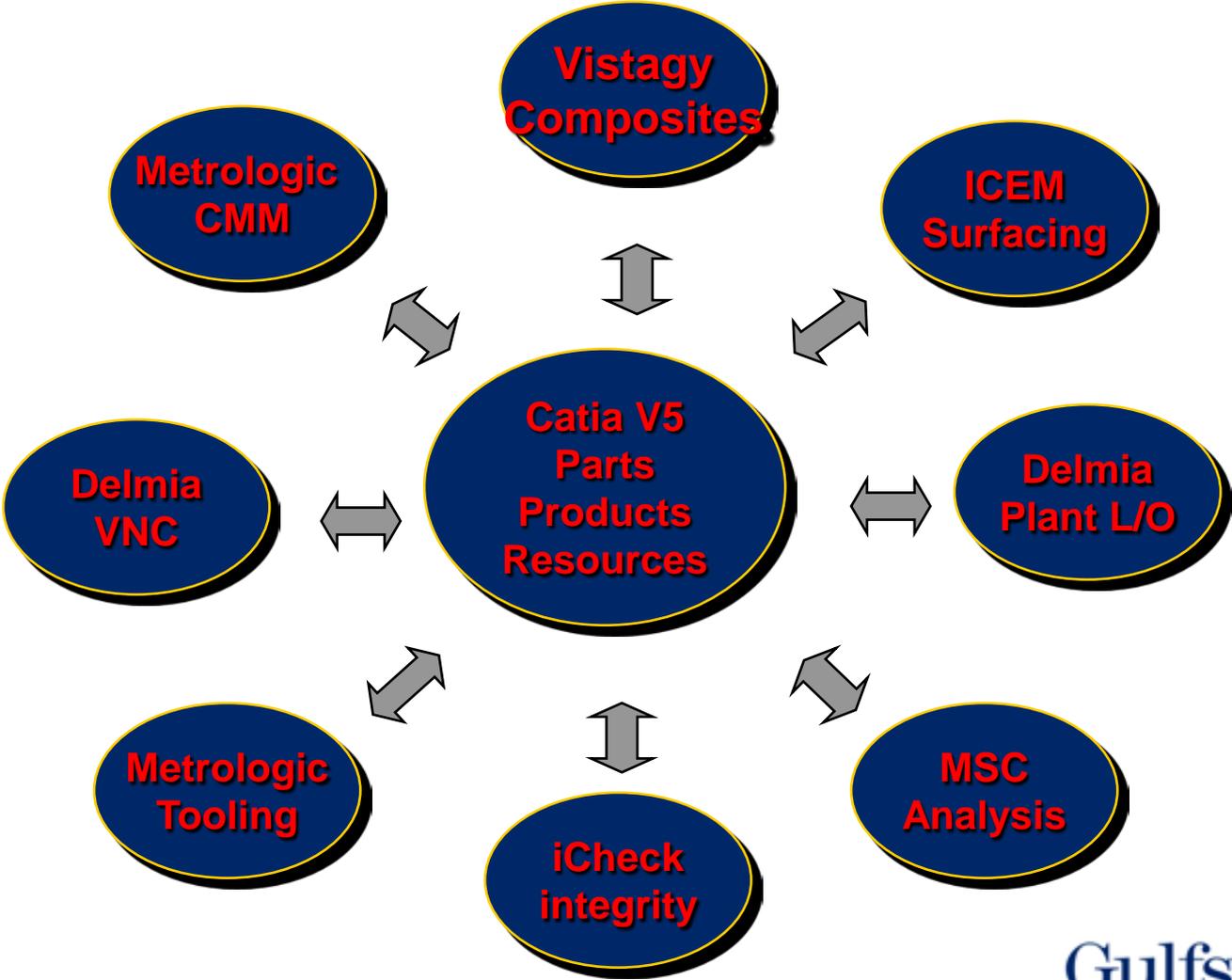


What is 3D MBTD?

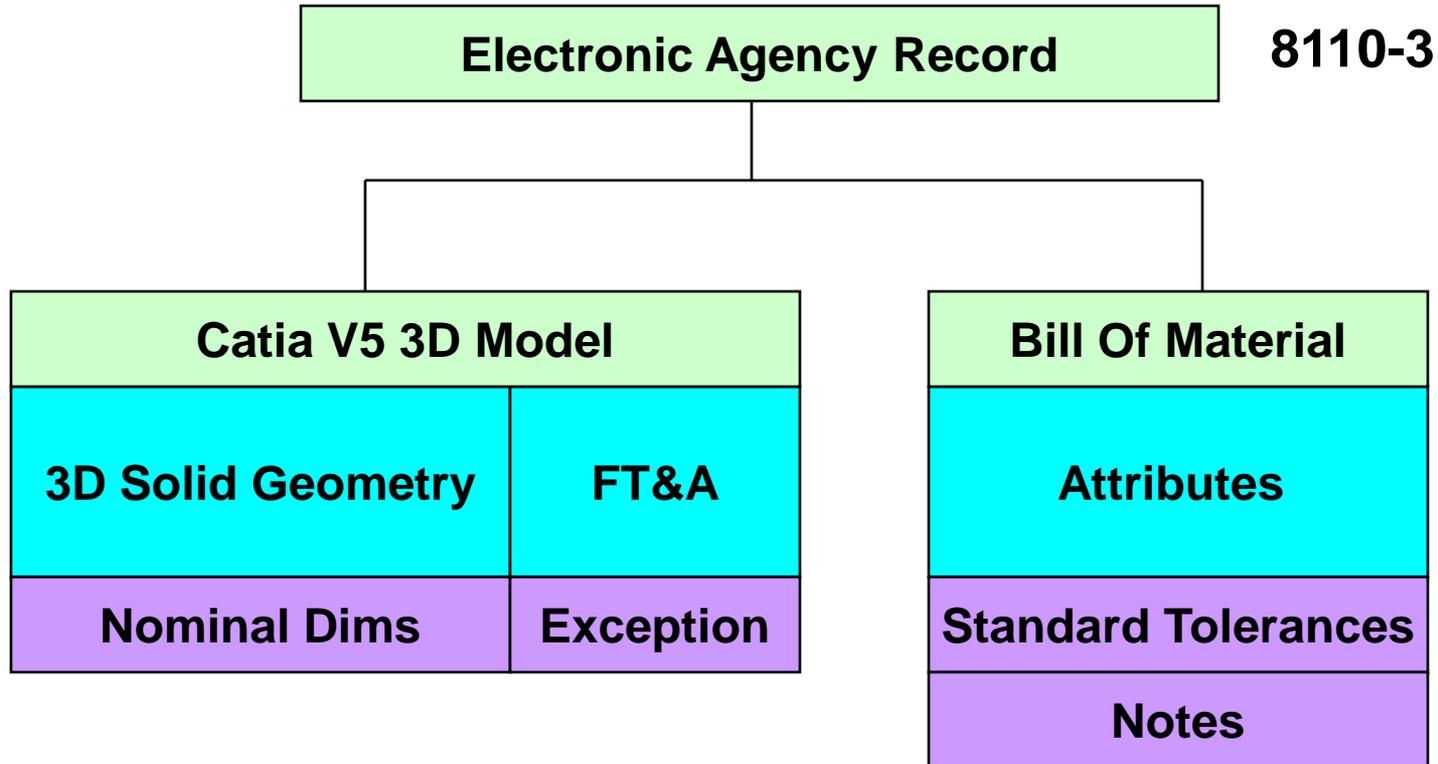
- **True 3D electronic representation of the aircraft**
 - Includes fasteners, hardware, veneer, hoses, etc.
- **Deployed to all users in the process**
 - Engineering, Manufacturing, Quality, Purchasing, Product Support, etc.
 - Supply Base
- **Relies on Geometry versus text**
 - No dimensions on the models
 - Users interrogate models for relevant dimensional information

Eliminates paper, design ambiguity and many costs

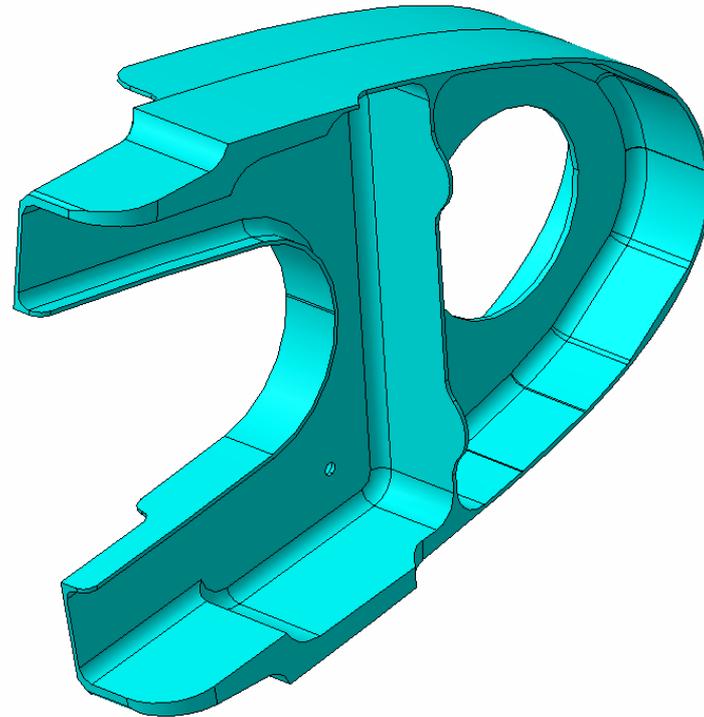
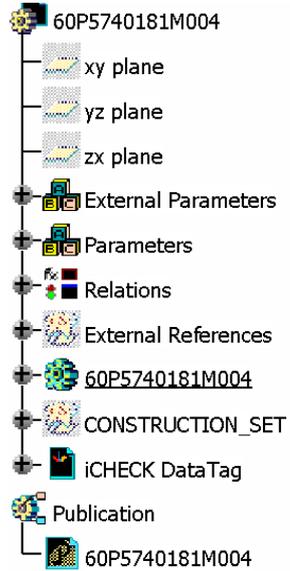
Dassault Integrated Suite of Products



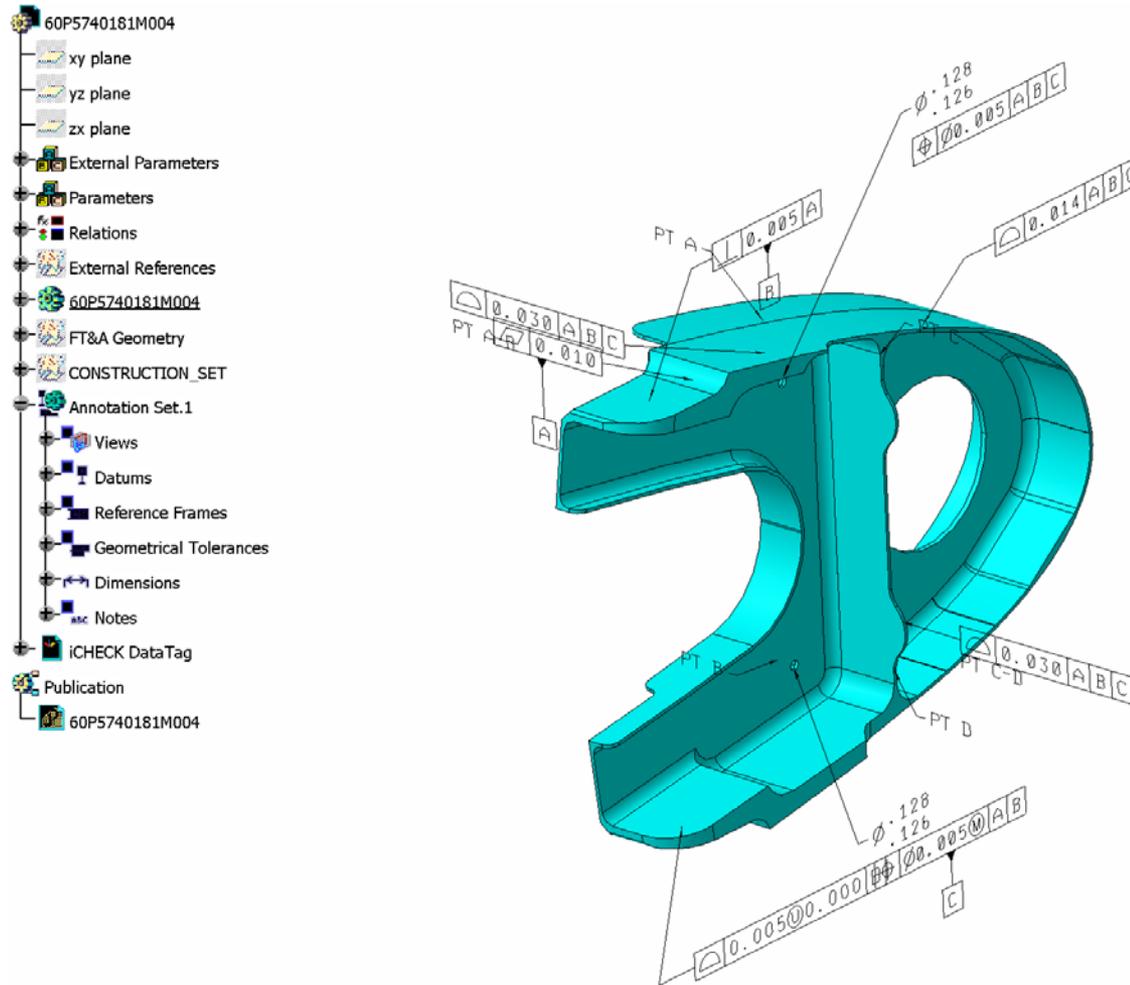
3D Data Package Format



Where does it start? *Catia V5 Part Design*



What Tolerances? *Catia V5 FT&A Tolerance Advisor*



Gulfstream

Vault the Configuration *Enovia SmarTeam*

TC Product

Part Number

Revision **State**

Effectivity -

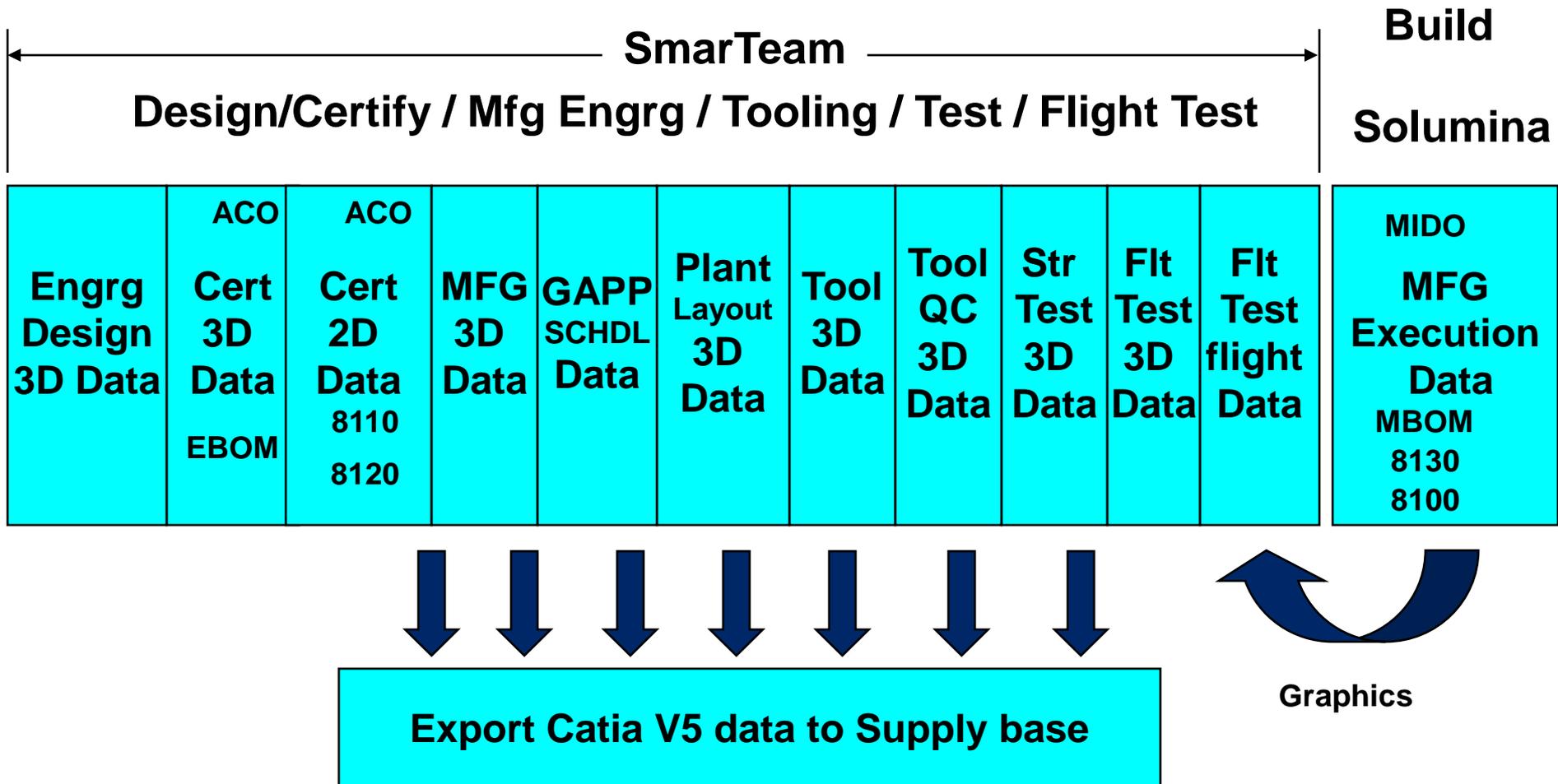
Nomenclature

Process Codes

Finish Codes

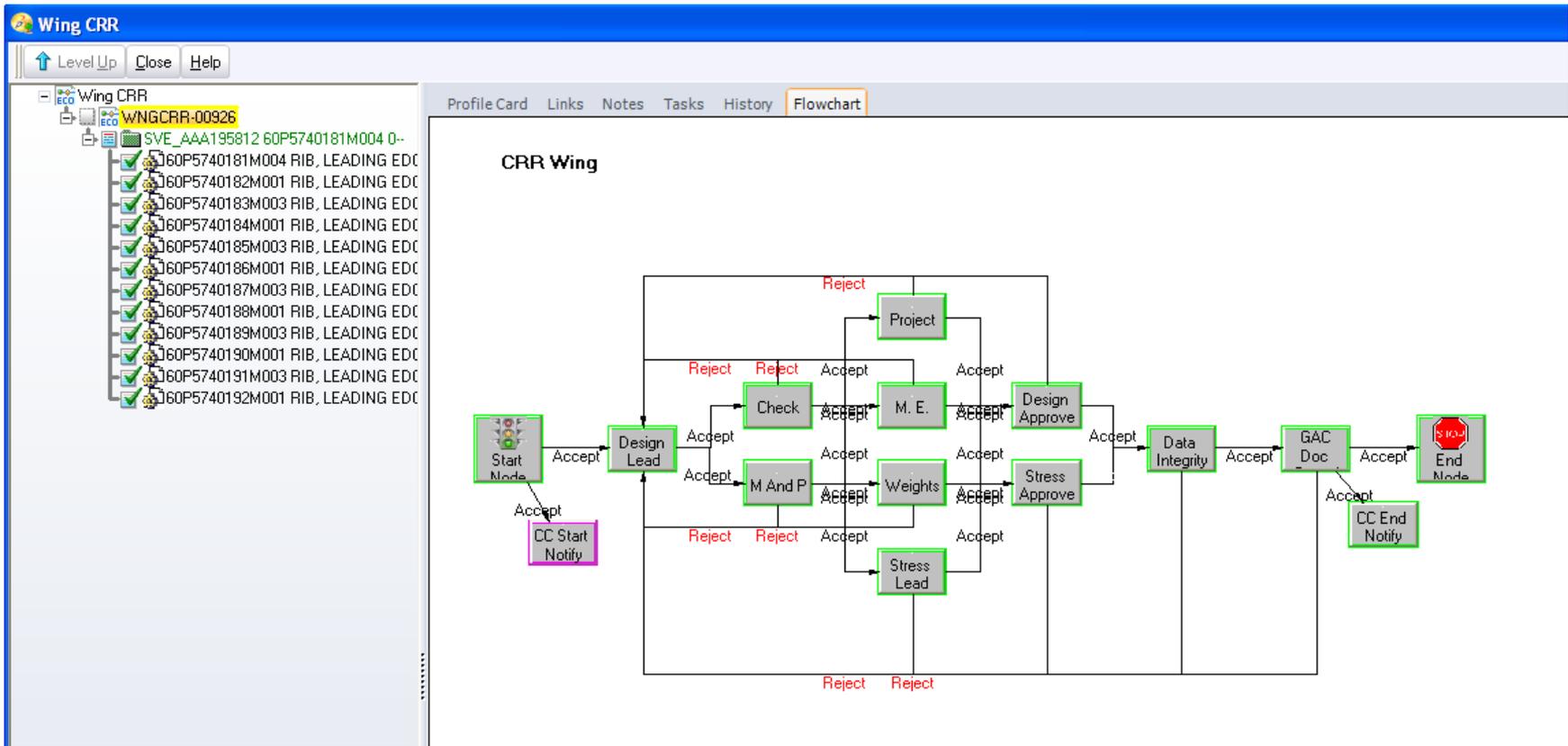
IAPF Codes

Run the Business in SmarTeam



Gulfstream

Workflow Approval *Enovia SmarTeam*



Release the FAA Approved Data *Enovia SmarTeam*

1		60P5740005N003
2		60P5740005N003

ENOVIA

TC Product

Part Number 60P5740005N003

Revision A **State** Released

Effectivity C01 6001 - 6999

Nomenclature LEADING EDGE INSTL - 03, LH

Process Codes ASH

Finish Codes

IAPF Codes
60-FST05260-MS20426AD3, P, AD
60-FST05260-MS20426AD3, P, SMZ
NAS1791C3-2, P, SMAH
NAS8803A4, P, AI
NAS8804A12, P, AI

Generate Bill of Material Report *Gulfstream BOM*

Gulfstream	CAGE 59734	PARTS LIST - SECTION A PRODUCT CONFIGURATION	PL- 60P5740005N003	CFG C01	Revision Letter A
Parts List Title: LEADING EDGE INSTL - 03, LH			CAD File: SVE_AAA192616-C01		

Index	Part Number
1	60P5740005N003
1.1	60P5740005A006
1.1.1	60P1157405S002
1.1.2	60P5740151M006
1.1.3	60P5740153M008
1.1.4	60P5740155M008
1.1.5	60P5740157M006
1.1.6	60P5740159M006
1.1.7	60P5740161M005
1.1.8	60P5740233S006
1.1.9	60P5740235S008
1.1.10	60P5740237S008
1.1.11	60P5740239S001
1.1.12	60P5740241S006
1.1.13	60P5740431S004
1.1.14	60P5740545S003
1.1.15	60P5740547S001
1.1.16	60P5740549S001
1.1.17	60P5740551S003
1.1.18	60P5740555S003

Gulfstream	CAGE 59734	SECTION 1 APPROVAL SHEET	PL- 60P5740005N003	CFG C01	Revision Letter A																																																								
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Send to Supplier *Gulfstream Bulk Export*

Supplier Portal

Welcome to the e.Gulfstream login page for Gulfstream personnel.

User Name:

Password: [Need Help?](#)

Please be advised that if you are a user of Livelink with with Microsoft IE 7.0, you could experience difficulties v

We are asking you to consider, 1) not upgrading; 2) inst upgrade of IE7.0, or 3) users that have upgraded should older version of IE.

Should you have any questions, please direct them to y



WinZip - AllInOne.zip

File Actions View Jobs Options Help

New Open Favorites Add Extract Encrypt View Ch

Name	Type	Modified
60P5312001N021_-.pdf	Adobe Acro...	9/29/2009 8:52 AM
SVE_AAA157087.CATPart	CATIA Part	4/3/2008 3:32 PM
SVE_AAA158770.CATPart	CATIA Part	4/3/2008 11:39 AM
SVE_AAA271386.CATPart	CATIA Part	4/2/2008 10:47 AM
SVE_AAA296177.CATPart	CATIA Part	4/1/2008 3:54 PM
SVC_AAA105097.CATProduct	CATIA Product	4/3/2008 2:34 PM
SVC_AAA105097.CATProduct.rh	Right Hemis...	8/9/2009 4:00 PM

Selected 0 files, 0 bytes Total 11 files, 10,696KB

60P5740005N003

60P5740005N003

ENOVIA

BOM from Documents

+ Add

Delete

Update

Life Cycle

File Operation

Initiate Process

Open views

Grid Properties

+ Add Ag Copy

Gulfstream Tools

Send To

User Defined Tools

Product

60P5740005N003

A State Released

C01 6001 6999

LEADING EDGE INSTL - 03, LH

ASH

Session Mgmt

Reports

New Part From

60P5740005N003

NAS8804A12, P, AI

BOM Compare

BOM Compare - Flat

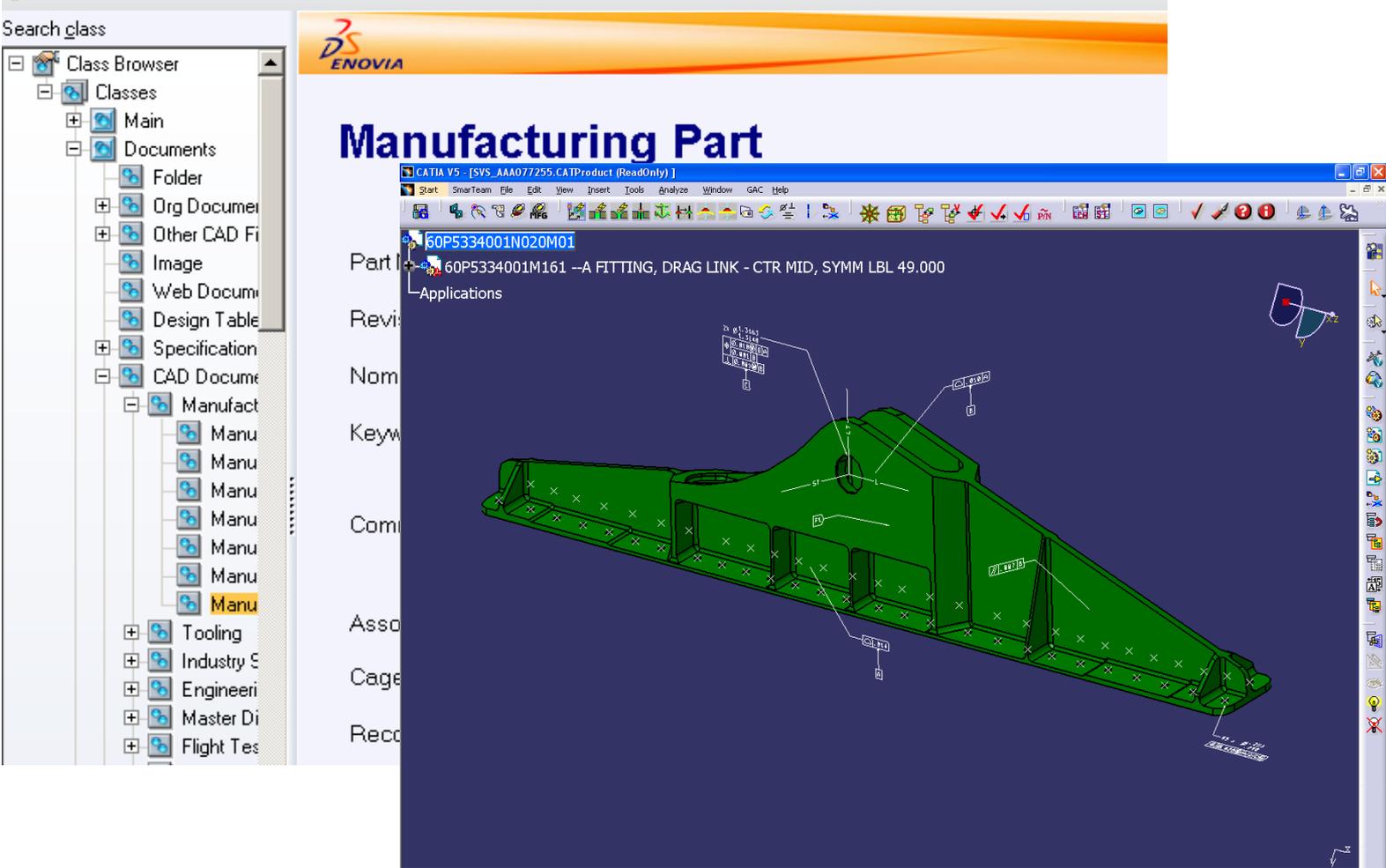
Bottom Up Report

Bulk Export



Gulfstream

Manufacturing Planning *Catia V5 / Enovia SmarTeam*



Gulfstream

Manufacturing NC *Delmia VNC / Enovia SmarTeam*

Data		Chart		Profile Card		Links	Notes	Revision	Viewer
	Class	State	Part Number						
1		✓	60P5347002A001M0						
2		✓	60P5347001A001M0						
3		✓	60P5329001N006						
4		✓	60P5312001N426						
5		✓	60P5312001N426						
6		✓	60P5210200N001						
7		✓	60P5210200N001						
8		✓	60P3810200A117						
9		✓	60P3810200A117						
10		✓	60P4912100N004						
11		✓	60P5332001N015						
12		✓	60P5332001N003						
13		✓	60P5332001N008						
14		✓	60P3810200A118						
15		✓	60P3810200A118						
16		✓	60P5332001N048						
17		✓	60P5332001N049						
18		✓	60P5332001N063						
19		✓	60P5338001A025						
20		✓	60P5332001N041						
21		✓	60P5332001N042						
22		✓	60P5332001N043						
23		✓	60P5332001N044						
24		✓	60P5328001A024						
25		✓	60P5332001N007						
26		✓	60P5332001N072						
27		✓	60P5332001N002						
28		✓	60P5333001N019						

The image shows a 3D CAD model of a Z-Tower machine. The machine is primarily blue with yellow accents. A red and yellow workpiece is mounted on the machine's bed. The machine has two vertical towers labeled 'Z-Tower' and 'W-Tower'. The workpiece is a long, cylindrical component with a series of red and yellow segments. The machine is shown in a perspective view on a grey grid floor.

On the right side of the image, there is a vertical toolbar with various icons and text labels, including 'Define', 'Swap', 'Retrive Tooling', 'Snap', 'SETP', 'Read Fat', 'New', 'to TAG', 'Jog Axis', 'New VisPort', 'Curv', 'NC-P', 'BA-CLP', 'Animat', 'Collor', and 'Optio'.

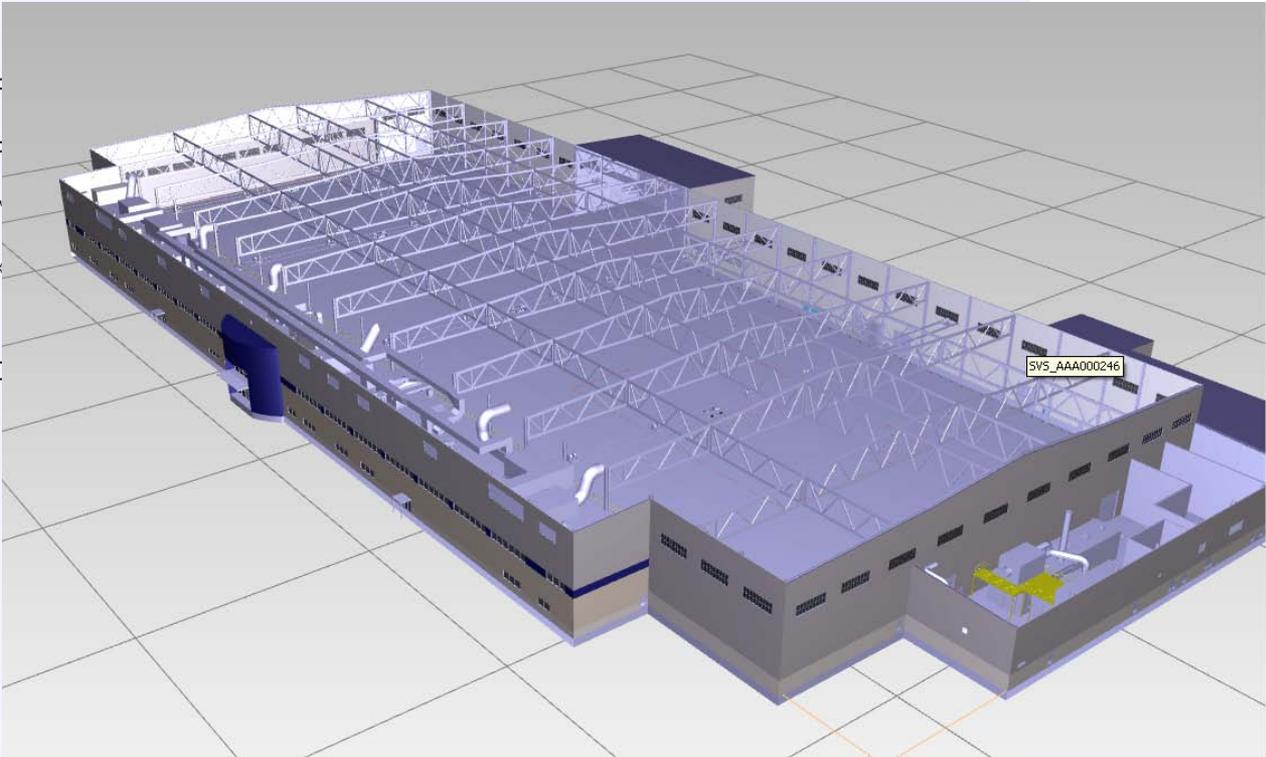
At the bottom of the image, there is a horizontal toolbar with icons for 'Light', 'Camera', 'Rotate', 'Cruse', 'View', 'Display', and 'Modes'.

Building X Delmia Plant Layout / Enovia SmarTeam

	Data	Chart	
	Class	State	Part I
1		<input checked="" type="checkbox"/>	SVS_
2		<input checked="" type="checkbox"/>	SVS_
3		<input checked="" type="checkbox"/>	SVS_
4		<input checked="" type="checkbox"/>	SVS_
5		<input checked="" type="checkbox"/>	SVS_
6		<input checked="" type="checkbox"/>	SVS_
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9		<input checked="" type="checkbox"/>	SVS_
10		<input checked="" type="checkbox"/>	SVS_
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21		<input checked="" type="checkbox"/>	SVS_
22		<input checked="" type="checkbox"/>	SVS_
23		<input checked="" type="checkbox"/>	SVS_



Plant Layout Product



Manufacturing Tooling Catia V5 / Enovia SmarTeam

Chart

State	Part Number
	G60299-0003A
	G60124-0114A
	G60124-0113A
	G60124-0112A
	G60124-0111A
	G60124-0110A
	G60124-0091A
	G60124-0090A
	SVS_AAA105590
	G61055-0003A
	G61055-0004A
	G61054-0033A
	G61054-0039A
	SVS_AAA170549
	G60610-0001A
	G60664-0001A
	G60378-0001A
	G60734-0001A
	G60733-0004A
	G60377-0001A

Profile Card | Links | Notes | Revision | Viewer

Tooling Product

Part Number: **G60124-0114A**

Revision: G60124-0247A ASSEMBLY

Name: CL-5A-HK4T 0-- HAND KNOB ASSY

Tool: CL-38-LP L-PIN, CL-38-LP L-PIN, CL-40-LP L-PIN

Applications:

Tooling Verification Metrolog V5 / Enovia SmarTeam

The screenshot displays the CATIA V5 software interface. On the left, a tree view shows a project structure with folders like 'Industry Stand', 'Engineering S', 'Master Dimen', 'Flight Test', 'Structural Tes', 'Supplier', 'Engineering R', 'Plant Layout', 'Record Condit', 'Aircraft Servic', 'CAD Tool Rec', 'Tooling Stand', 'Flight Test Ele', 'Mfg Verificatio', 'Mfg Verific', 'Mfg Verific', 'Mfg Verific', 'Mfg Verific', 'Mfg Verific', 'NC Mex Progr', 'Flight Test Lec', 'MRB', 'Service Engin', 'Tech Pubs', 'Ground Suppc', 'Structural Tes', and 'Flight Test Ste'. The main window shows a 3D model of a curved metal frame with various measurement points labeled 'FRAMECD_01' through 'FRAMECD_15' and 'OFFSETALIGN_01' through 'OFFSETALIGN_04'. A 'ProcessList' on the left side of the main window details the measurement process, including steps like 'Activate Probe 0.51 SVX', 'Measure Point OFFSETALIGN_01', 'Create Best-Fit Alignment PCS1', 'Associate CAD Alignment With PCS1', 'Measure Point NOMINALALIGN_01', 'Create Best-Fit Alignment PCS2', 'Associate CAD Alignment With PCS2', and 'Measure Point FRAMECD_01' through 'FRAMECD_15'. The top of the interface features the Enovia logo and the text 'Manufacturing Product'. The bottom of the interface shows the 'ProductList' with the file path 'I:\02P5310001\00029001_AC_STG1'.

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Shop Floor Execution Solumina / Enovia SmarTeam

Work Plan - Instructions

Part No	Oper	Step	Plan Ver	Plan Rev	Part Type	Program
G60MS9500	060	010	1	3	A	ANY

Plan Revision Status=PLAN RELEASED

Claim Task Release Task Complete Task

Task Worked by: _____

Plan Title: STATION, MFG - BARREL JOINING

The text of this plan was changed on 2009/01/20 08:41:33 by U600000 (Martin R. Bell)
[Additional Plan Text](#)

THIS PLAN COLLECTS THE FWD, FWD-MID, CTR-MID, AFT-MID, AFT FUSELAGE BARREL A PARALLEL WORK FLOW FOR JOINING AND VERIFIES THE COMPLETION OF EACH ACTUAL INSTALLATION INSTRUCTIONS ARE IN THE SPLICE INSTL WORK PLANS FOR 529.000, FS 747.750, FS951.310

REFERENCE TOOLING: G60MS9500AF ASSY FIXTURE, FUSELAGE JOINING
 G60MS9500SCD JOIN TOOL SCAFFOLD
 G60MS9500SCD3 JOINING SCAFFOLD SINGLE SPLICE
 G60MS9500SCD4 CROSSWALK -JOINING FIXTURE
 G60MS9500HOE HOISTING EQUIPMENT
 G60MS9600SCD5#2 SCAFFOLD FUSELAGE MATE AFT

[060] INSPECT INSTALLATION OF FS 324.500 SPLICE

[Oper Info](#)

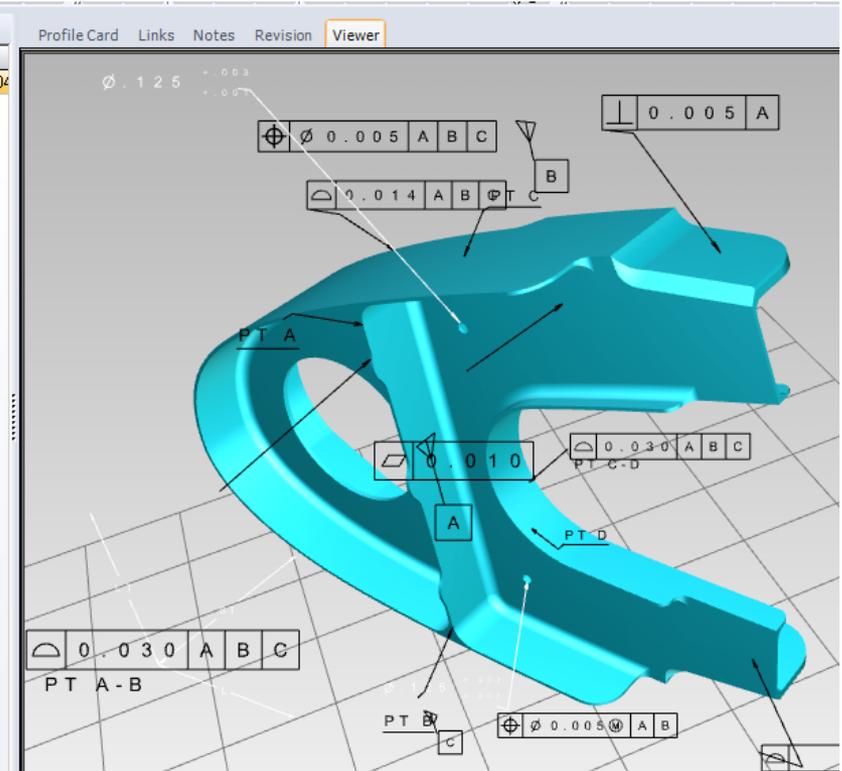
The text of this operation was changed on 2008/12/22 12:21:52 by U802049 (Billy Wilk)

INSPECT INSTALLATION OF FS 324.500 SPLICE AND OK TO LOAD CENTER - MID SECTION IN ASSY FIXTURE.

Buyoff Type	Certification	User ID	Time Stamp
QA	PQ STAMP	U802049	12/19/2008 13:06:58

Models
 | Model | Update | Time

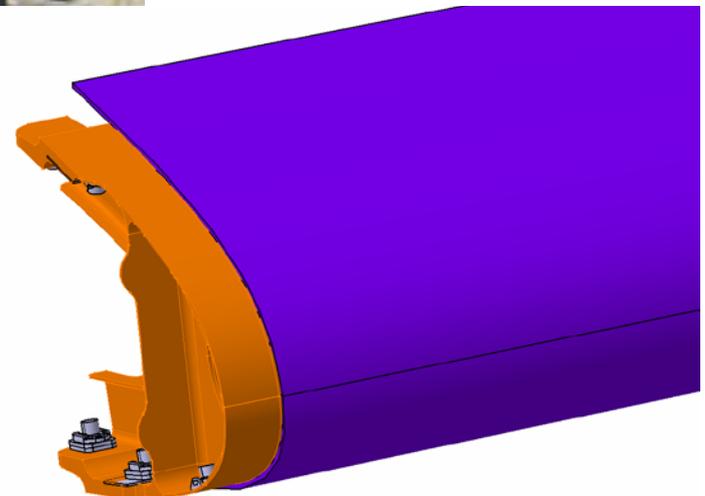
Class	State	Part Number
1	✓	60P5740181M004



Manufacturing Execution System

Gulfstream

Shop Floor Assembly *Viewing with Catia V5*



Gulfstream

Final Installation



Gulfstream

T1 Roll Out *On Schedule*



Gulfstream

The Gulfstream 3D MBD Business Model

- Business Model will therefore need to manage:
 - Design application set and application revision levels
 - Hardware configuration requirements
 - Software updates and deployments
 - Security issues
 - Data formats
 - Data feeds to Manufacturing
 - Design business processes
 - Manufacturing business processes

Discussion Points

Questions and Answers