Gulfstream Simplifies Type Certification with the 3DEXPERIENCE Platform

Dan Ganser
Gulfstream
The Gulfstream Product Line

G650ER  7,500 nm at M0.85
G650    7,000 nm at M0.85
G600    6,200 nm at M0.85
G500    5,000 nm at M0.85
G550    6,750 nm at M0.80
G450    4,350 nm at M0.80
G280    3,600 nm at M0.80
G150    3,000 nm at M0.75

Gulfstream Proprietary Information
3D Model Based Type Design (3D MBTD)

• True 3D electronic representation of the aircraft
  – Includes fasteners, shims, hardware, veneer, etc.

• Relies on Geometry versus text
  – No dimensions on the models
  – Users interrogate models for relevant dimensional information

• Deployed to all users in the process
  – Engineering, Manufacturing, Quality, Purchasing, Product Support, etc.
  – Supply Base

Eliminates paper, design ambiguity and many costs
3DMBTD is the Enabler
The Good!

- **No Data Conversion**
  - CATIA V5 for everyone (Read Only License)
    - Everyone sees the same thing
    - Designers Validate what Operations uses
    - “Pull up that model and look at this…”

- **Restrict the Use of CATIA V5 to entities that are supported by STEP**

- **Rules based EBOM on the fly from the CAD structure**
  - NO Synchronization (CAD – EBOM)
The Bad!

- Life of the Product – Life of the Data
  - Aircraft have a 50 – 75 year life cycle, so the data must “live” for a very long time
  - Software and hardware will continue to evolve during the life of the product
    - How will V5 data work with Vxx?
    - What happens if the software company goes out of business?
    - What hardware will we be using 50 years from now?

- Data goes corrupt
  - How do you know?
  - How does the user know?

- No Mobile Solution with CATIA V5
The Solution!

- Integrate STEP AP242 into the design process and use it throughout the build process.

- Leverage 3DExperience to manage multiple file format conversions

<table>
<thead>
<tr>
<th>Design Data</th>
<th>Derived From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native stream</td>
<td>Native CGR</td>
</tr>
<tr>
<td>STEP AP242</td>
<td>Type Data</td>
</tr>
<tr>
<td>V6 simplified</td>
<td>Presentation of Type Data</td>
</tr>
<tr>
<td>V6 simplified CGR</td>
<td></td>
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</tbody>
</table>

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Primary Goals of New 3DExperience Process

• Reduced Cost to maintain complex geometry for Life.

• Use Type Data in the process, not just an archive byproduct.

• Leverage Type Data whenever possible
  – Designer is the best validator of a conversion
    • He/She must use the Type Data early in process

• Consistent Presentation to ALL Users

• Simple Presentation to ALL Users
3D Data Consumption Modes

- **Light** – Shape Only (Facet)

- **Review** – Facet Shape (STEP)
  - PMI
  - GEOSETS
  - Wireframe Geometry (Surface, Curves, Pts, etc.)
  - Canonical/Facet Measurement

- **Review with BREP** – Exact Shape (STEP)
  - PMI
  - GEOSETS
  - Wireframe Geometry (Surface, Curves, Pts, etc.)
  - Exact Measurement

- **Design** – V6 Native Model
## 3D Data Applications

### Layer

<table>
<thead>
<tr>
<th>Native CAD</th>
<th>Web Client</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Native CAD Diagram" /></td>
<td><img src="image2" alt="Web Client Diagram" /></td>
</tr>
</tbody>
</table>

### Apps

- **Designer**
  - Reviewer
  - Inspector
- **Reviewer**
  - Inspector
  - Operations

### Roles

<table>
<thead>
<tr>
<th>Designer</th>
<th>Web Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer</td>
<td>Reviewer</td>
</tr>
<tr>
<td>Inspector</td>
<td>Inspector</td>
</tr>
<tr>
<td>Operations</td>
<td>Operations</td>
</tr>
</tbody>
</table>

### Mode

- **Light – V6 simplified CGR**
  - Review with BREP – V6 simplified
  - Design – Native stream
- **Light – V6 simplified CGR**
  - Review – V6 simplified CGR

### Interactions

- **Review** - Measure Exact (STEP)
  - Cross Highlight BOM
- **Design** - Open Light
  - Switch Modes
- **Review** – Measure
  - Canonical / Facet
  - Send to CATIA (Sync)
STEP 242
Native Integration

Brian Christensen
Dassault Systemes
September 19, 2017
STEP as a core DS strategy to support A&D Market
**3DEXPERIENCE platform: STEP integration**

- **PLM collaboration**
  - STEP AP242
  - Product Structure
  - Configuration
  - Versioning
  - Change management
  - Documents

- **3 levels of integration of STEP in 3DEXPERIENCE**

- **CAD exchanges**

- **PDM system**
  - Product Assembly structure
  - Part definition
  - * Geometry
  - * FD&T (PMI)
  - * Composite
  - * Electrical

- **3DEXPERIENCE**
  - STEP persistence in 3DEXPERIENCE
STEP AP242
CAD exchanges
STEP 3D Geometry

- 3D Explicit geometry calculated from specifications:
  - Electrical Harness
  - Piping & Tubing
  - Multidiscipline equipments
  - HVAC
  - Composite result

- Validation Properties for end to end Quality Control

<table>
<thead>
<tr>
<th>Status DS Availability</th>
<th>V5</th>
<th>V5/3DEXperience</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP242</td>
<td>V5-6R2013</td>
<td>V6R2013X</td>
</tr>
</tbody>
</table>
STEP AP242: achievements and plans

Product Structure
Exact Geometry

Graphic PMI

Composites

Compression

Tessellation & Tessellated PMI

Viewers

Composites 3D explicit

Semantic PMI

Kinematics

AP242 XML

In work

PDM collaboration

In work

Future extension
AP242 Ed2
Electrical Harness

In work

Supported Functionalities

In work

Futures extensions
Universal Extendable Viewer

3D Reviewer

Platform Contributor

V5  VPM V6  STEP
PDM Collaboration Hub with STEP
Main Objectives of Collaborative Hub

High End Integrated Value Streams across the supply chain

► Provide an affordable collaboration model by **limiting CAPEX**
► Provide a secured online environment independent from the actual Prime/Suppliers environment allowing **multi-tier collaboration**
► Normalized Data Exchange through **standard (STEPAP242)**
► Provide new ways to collaborate through **online services** and to operate a collaborative network (profiling, ratings, auditing, social collaboration,..)
► Provide **Online Authoring Applications** through **dedicated solution**
  Engineered to Fly for Suppliers
Collaborative Hub cases

Supplier 1

Supplier 2

Supplier 3

Supplier 4

Collaborative Hub

3DEXPERIENCE
On premise

3DEXPERIENCE
Cloud

OEM

CAD tool

V5

V5
Scenarios targeted with STEP AP242 XML.

- Exchange of assemblies referencing CAD files (STEP or native) and non-CAD documents (PDF, Office, …)
- STEP PDM Collaboration with lifecycle management
  - Iterative imports with data update and versions management
- STEP PDM Collaboration with effectivities management
- Exchange between customized PDM system.
STEP persistence in 3DEXPERIENCE
STEP persistence in 3DEXPERIENCE

- Ability to persist STEP files in 3DEXPERIENCE as alternate representation of native part
  - Users can work in session either with the native parts or with the STEP Parts, depending on their activity.
    - Design done with native Parts
    - Review, measurement, clash can be done directly with STEP Parts

- Long Term Archiving taken into account since the design stage
  - STEP reference data can be checked all along the lifecycle
  - Archiving can be done easily (no geometrical conversion required)
Native data – STEP data

80% of applications working with native V6 data

STEP referential certification

20% of applications working STEP AP242 referential

- Viewing
- Measurement
- Inspection (reference for CMM)
- Aircraft assembly
- Large assembly viewing
- DMU clash analysis
Type Data Scenarios

- Interference Check on step data
- Review:
  - Approximate measure on step data
  - Exact measure on native data
- FTA: Semantic PMI
  - STEP AP242
- Design activities
  - STEP generation
  - Load hybrid assembly (Visu from STEP & Visu from Native)
  - BI for visual information about data loaded (STEP vs Design)
  - Switch STEP -> Design
- Supplier Exchanges
  - Approximate measure on step data
  - Exact measure on native data
3DEXPERIENCE platform: Long Term Archiving

STEP files are persisted and certified in the 3DEXPERIENCE platform.

Certified STEP data

Archiving process

LTAR
Collaboration using STEP 242 (ISO)

1. Comprehensive Coverage
2. Supplier Collaboration Cloud
3. Native LOTAR Compliancy

ISO 10303-242:2014
Industrial automation systems and integration -- Product data representation and exchange -- Part 242: Application protocol: Managed model-based 3D engineering
The cost of maintaining Type Design Data

- Stored Data
- Presented Data
- Interpreted Data

Making sure storage and presentation do not change overtime cost millions
3D Data stream concept

Certification authorities / LOTAR

Today: V5 native
Tomorrow: STEP AP242

3D

Engineering

Today: V5 native
Tomorrow: V6 Native

Downstream users

Today: V5 native
Tomorrow: STEP AP242