Powering Transformation using Dassault Systèmes’ 3DEXPERIENCE Platform
UNITED TECHNOLOGIES CORPORATION

Pratt & Whitney
- Commercial Engines
- Military Engines
- Aeropower

UTC Aerospace Systems
- Aircraft Systems
- Power, Controls & Sensing Systems

Sikorsky Aircraft

Otis
- A UTC Technologies Company

Export Classification: No technical data
INTERESTING FACTS

• Every second a Pratt & Whitney Canada powered airplane takes off or lands somewhere in the world

• Over 80,000 engines produced with more than 50,000 engines in service

• Over 10,000 operators in 195+ countries

• Over 30 major aircraft OEMs and 700 airlines
P&WC KEY BUSINESS SEGMENTS

**Business**
- Cessna Sovereign
- Dassault F7X

**General aviation**
- Beechcraft King Air 350
- Cessna Caravan EX

**Regional**
- ATR 72
- Bombardier Q400

**Civil helicopters**
- AgustaWestland AW139
- Eurocopter EC135

**Military**
- Beechcraft T-6A
- Pilatus PC-21

**Aftermarket**
- Fleet Management Services
- Customer First Centre
- Spare Parts Services
- Maintenance, Repair & Overhaul

Export Classification: No technical data
POWERING OUR FUTURE

Leading R&D investor in Canadian Aerospace

Most diverse product and services portfolio

Multiple new products in development

SUSTAINED R&D INVESTMENT
100+ engines certified in the last 25 years

R&D INVESTMENTS
Over 1,400 engineering staff in Canada

$ CAD Millions

POWERING OUR FUTURE

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SO WHY TRANSFORM?

Business realities:
- Eroding margins
- Increasing complexity
- Plateau-ing capabilities
- Capacity to invest
- Aging infrastructure
- Geometric growth
- Global collaboration
- Tribal knowledge
- Export controls

Transformation of:
- People
- Process
- Tools

Deliver:
- Business benefits
- User experience
Reducing complexity
Transforming for competitive advantage
BUSINESS INNOVATION

# of Iterations

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Now</th>
<th>Future</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hand-Offs</td>
<td>5,101</td>
<td>1,551</td>
<td>70%</td>
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<tr>
<td>Total Systems</td>
<td>40</td>
<td>27</td>
<td>33%</td>
</tr>
<tr>
<td>Total Time (effort)</td>
<td>25k hours</td>
<td>9.5k hours</td>
<td>62%</td>
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</table>

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ARCHITECTURE SIMPLIFICATION

Current State

51 tools with 25+ disconnected BOM’s

160 applications

Aging toolset

Age in years

5 10 15 20 25

Not adapted to today’s challenges (collaboration & export control)
Minimal systems integration
Lost ability to sustain

Future State

1 PLM platform with 3 authoring tools and single BOM with multiple views

80 applications

Modern tools

Age in years

5 10 15 20 25

State-of-the-art technology (collaboration & export control)
Single global product platform
Ability to leverage Global Work Share support

Export Classification: No technical data
<table>
<thead>
<tr>
<th>TARGETED IMPROVEMENTS</th>
<th>Percent</th>
<th>Indicator</th>
<th>Percent</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual data entry</td>
<td>50%</td>
<td>↓</td>
<td>R&amp;D productivity</td>
<td>20%</td>
</tr>
<tr>
<td>Data search time</td>
<td>20%</td>
<td>↓</td>
<td>Capacity utilization</td>
<td>10%</td>
</tr>
<tr>
<td>BOM generation</td>
<td>50%</td>
<td>↓</td>
<td>Scrap and rework</td>
<td>15%</td>
</tr>
<tr>
<td>Change order volume</td>
<td>5%</td>
<td>↓</td>
<td>Development inventory</td>
<td>5%</td>
</tr>
<tr>
<td>Change order throughput</td>
<td>20%</td>
<td>↑</td>
<td>Tooling spend</td>
<td>15%</td>
</tr>
<tr>
<td>Warranty processing</td>
<td>50%</td>
<td>↓</td>
<td>Supplier recoveries</td>
<td>25%</td>
</tr>
</tbody>
</table>
WHY DASSAULT SYSTÈMES

PT6
JT15D
PW901
PW118-19
PW121-25

~1987
1st CAD based design
CATIA V2 CADAM

PW200
PW127
PW305

~1990
Elimination of drawing boards
3D Surfacing
CATIA V3 CADAM

PW306

~1996
3D Solids
Parts & Assembly Design
CATIA V4 CADAM

PW150
PW308

~1998
Introduction of DMU
NC Manufacturing
Finite Element Analysis
CATIA V4

PW307
PW600

~2004
Full DMU
Supplier Collaboration
From UNIX to PC

PW210

~2012
PLM
Requirements Management
Integrated Process Planning
Quality

PW800

~2014+
3DEXPERIENCE
Winning Program
Co-Design-To-Target
Aftermarket

CATIA V5 ENOVIA V6

3DEXP Platform
CATIA V6 ENOVIA V6 DELMIA V6

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TODAY’S PROCESS

Product Life Cycle = 30 yrs

Birth
Passport 0 – Study
Passport 1 – Offer
Passport 2 – Launch Detail Design
Passport 3 – Order Production Hardware
Passport 4 – Deliver Production Engines
Passport 5 – Lessons Learned
Retirement

Export Classification: No technical data
TOMORROW’S PROCESS

Passport 0
– Study

Passport 1
– Offer

Passport 2
– Launch Detail Design

Passport 3
– Order Production Hardware

Passport 4
– Deliver Production Engines

Passport 5
– Lessons Learned

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3DEXPERIENCE IMPLEMENTATION

**LICENSE TO FLY**
- Phase 3: Regulatory Compliance Certification Process

**BUILT-IN CONFORMANCE**
- Phase 1: Integrated Process Planning, First Article Inspection

**VIRTUAL ROLLOUT**
- Phase 2: PPAP / APQP MBOM
- Phase 2: DBOM Test Development
- Phase 3: Planning SOM

**SECURE GLOBAL COLLABORATION**
- Phase 1: IP Export Control
- Phase 3: Design for Sourcing, Suppliers Management

**TEST TO PERFORM**
- Phase 2: DBOM & Test Development Simulation Lifecycle Mgt
- Phase 3: Requirements Engineering, Behavior Modeling, Behavior Simulation

**KEEP THEM FLYING**
- Phase 1: Product Issue Management
- Phase 2: Manage Warranty, SCO & SBOM Unified Instructions

**CO-DESIGN TO TARGET**
- Phase 2: Configured DMU EBOM Mgt, Enterprise Change Control Design for Cost & Weight
- Phase 4: Systems Level Architecture

**GIVE THEM MORE VALUE**
- Phase 4: Predictive Support, Predictive Quality, Resource Forecasting

**WINNING PROGRAM**
- Phase 1: Requirements Management
- Phase 3: Program & Portfolio Mgt, RFD Mgt, Resource Mgt

Export Classification: No technical data
**Integrated Project Plan with Real Time Dashboards**

**As-Is**
- Separate planning activities and gates for each group leading to a lack of communication between teams.

**To-Be**
- One common passport process to ensure cross-organization program activities are managed.

**Single integrated program plan across all functions**

**Current Program Status**

**Program Impact Analysis**

**Program Metrics**

**Resource Mgmt.**

**Risks & Issues Mgmt.**

**Portfolio Dashboards**

Visibility across all programs.
Standardized and Unified Instructions

**As-Is**
- Requirements
- Design
- Production
- Field Support
- Shop Support

**To-Be**
- CATIA
- Solumina
- SAP
- EXCEL

**DUPLICATE EFFORT, INEFFICIENT CHANGE CONTROL, INCONSISTENT STANDARDS, ERRORS, TOOL PROLIFERATION**

Most of the content is recreated in Aftermarkets
Various Authoring environments (Solumina)

**INTEGRATED INSTRUCTION TEAM ACROSS ENGINEERING, MANUFACTURING AND AFTERMARKET**

- Incremental Content Development
- Elimination of duplicate effort
- Efficient change control
- Consistent standards
- Reduction in errors & inaccuracies
- Systems rationalization

**One Source**

- To-be design aligned with leading practices for Instructions

**Unified Instructions Team**
- Requirements
- Design
- MRO
- Etc..

**One Tool**

- CATIA
- Solumina
- SAP
- EXCEL

**Minor Publications:** 7+

**Prat Headcount:** 72

**Contractors:** 300+

**Various Authoring environments (Solumina)**

**AIS**

**MOS**

**OHM**

**CIR**

**SPV**

**SPM**

**DUPLICATE EFFORT, INEFFICIENT CHANGE CONTROL, INCONSISTENT STANDARDS, ERRORS, TOOL PROLIFERATION**
**BENEFITS**

- New, differentiating customer products & services
- Full enterprise view
- Hard benefits at each phase
- Real time 3D environment
- Step change in productivity & asset utilization
- Continuity, connectivity, collaboration