Achieving Operational Excellence thru Continuous PLM/CAx Improvement

PLM – it's not just a tool

Jon Jarrett
Director, Science and Engineering
Engineering Processes and Tools
ATK Aerospace

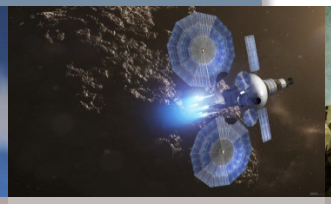
GLOBAL PRODUCT DATA INTEROPERABILITY
SUMMIT
2014

ELYSIUM Parker NORTHROP GRUMMAN BOEING

The Customers and Markets We Serve

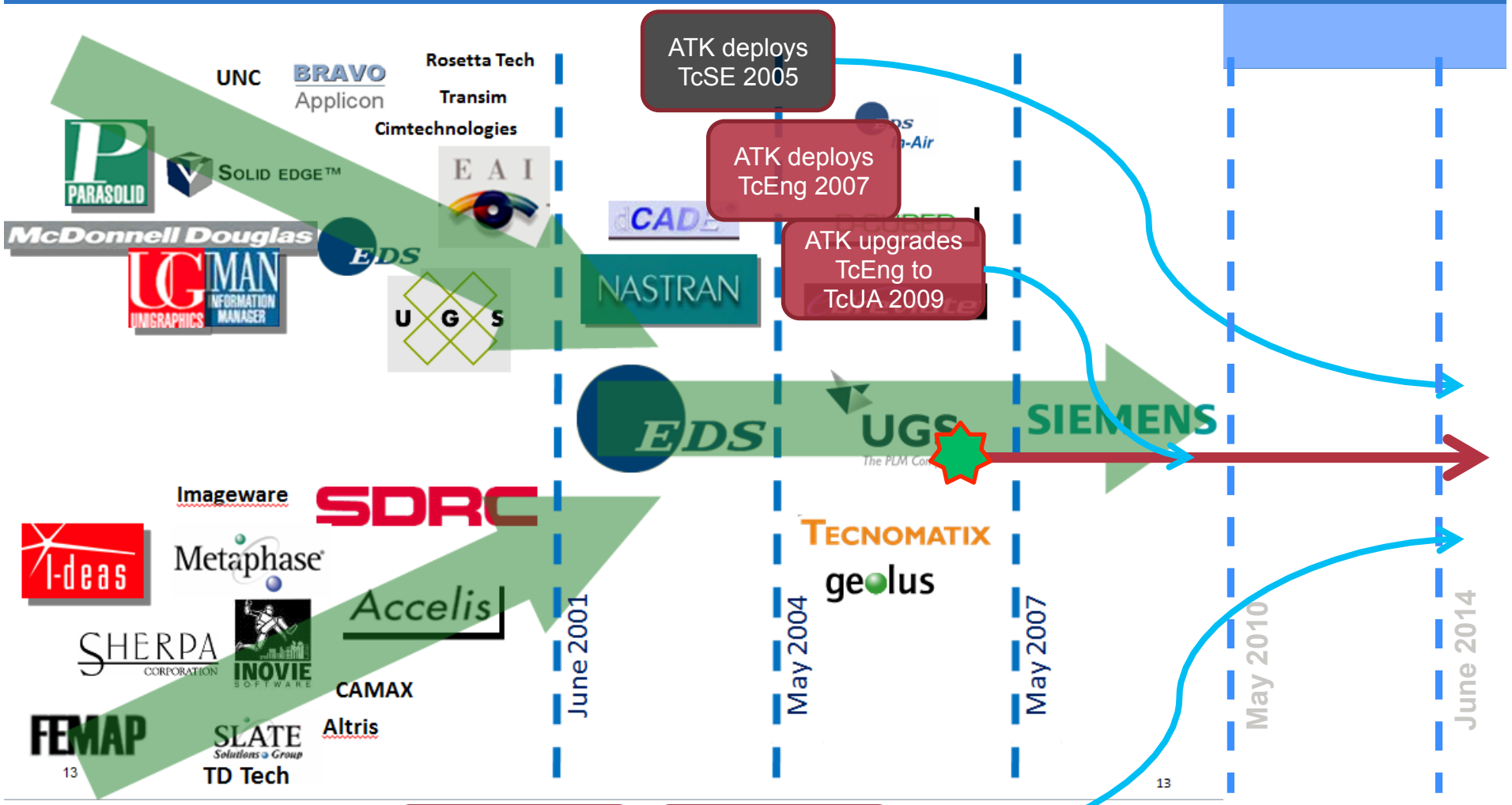
Global Product Data Interoperability Summit | **2014**

ATK's vision is to create **leadership positions** in our aerospace, defense, and sporting markets through application of **affordable innovation** and **execution excellence** in developing and manufacturing **highly engineered** products to generate **superior shareholder returns** over time.

Aerospace		Defense		Vista Outdoor, Inc.	
					
Commercial Aerospace	**Satellites, Satellite Components & Subsystems**	**Small-, Med-, Large-Caliber Ammunition**	**Precision-Guided Munitions, Fuzing, Warheads**	**Sporting Ammunition**	**Sporting & Tactical Accessories**
					
Human Space Exploration	**Satellite & Strategic Launch**	**Strike Weapons & Missile Warning Systems**	**Facility Management**	**Law Enforcement Ammunition**	**Sporting Long Guns & Range Systems**

ATK operates in 21 states, Puerto Rico, and internationally.

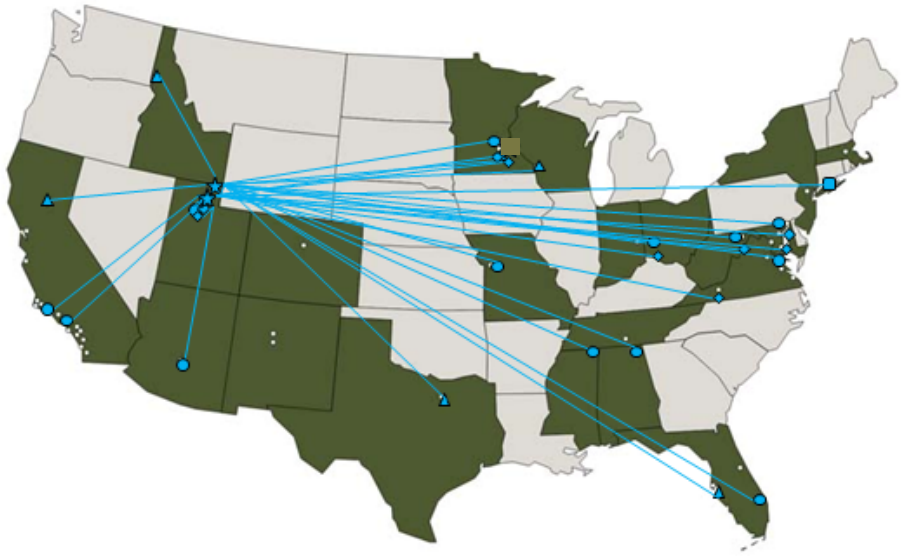
Evolution of Siemens CAx, PLM and Teamcenter



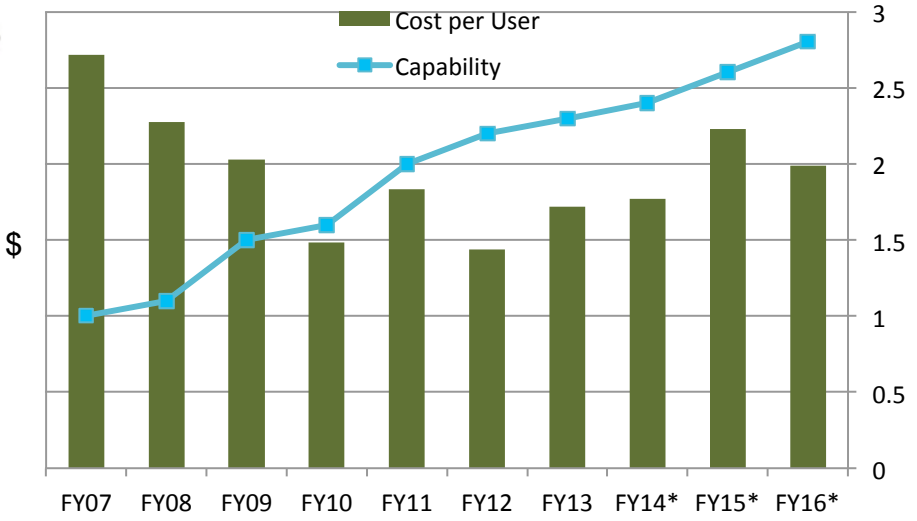
Agenda

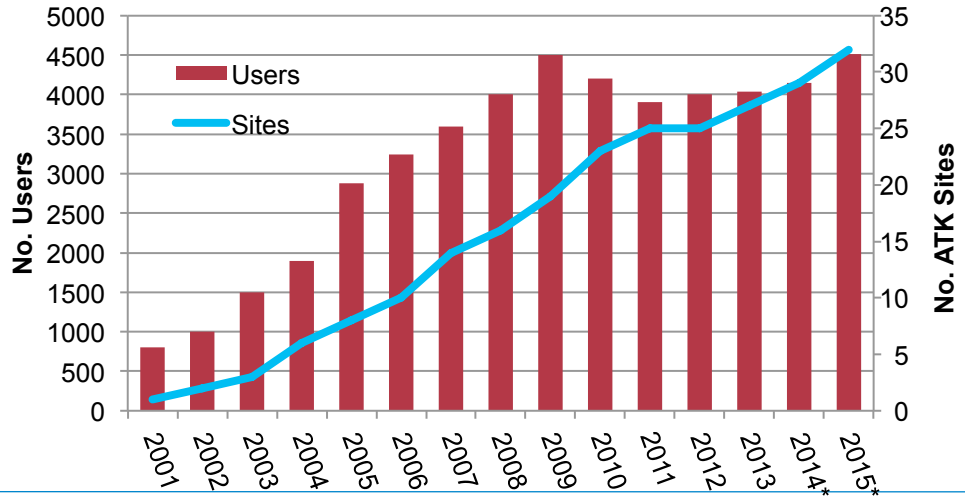
- **Center of Excellence (Organizational)**
  - **Business Challenge – Deploy a single system and single source of truth across ATK**
- **Model Based (Product) Excellence**
  - **Business Challenge – Shorten the product development lifecycle and reduce the cost of a Rocket Motor**
- **Process Excellence**
  - **Business Challenge – Shorten the product development lifecycle again**

Teamcenter, single source of truth across ATK



Cost per User and ATK System Capability

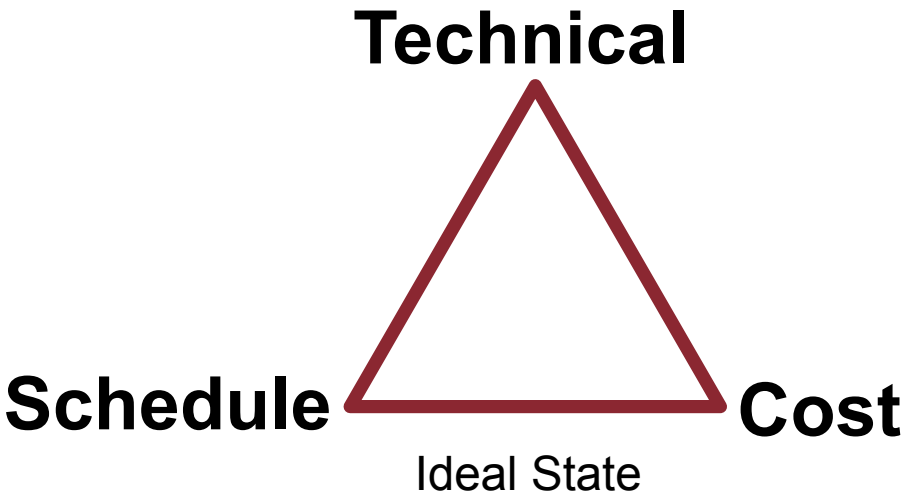




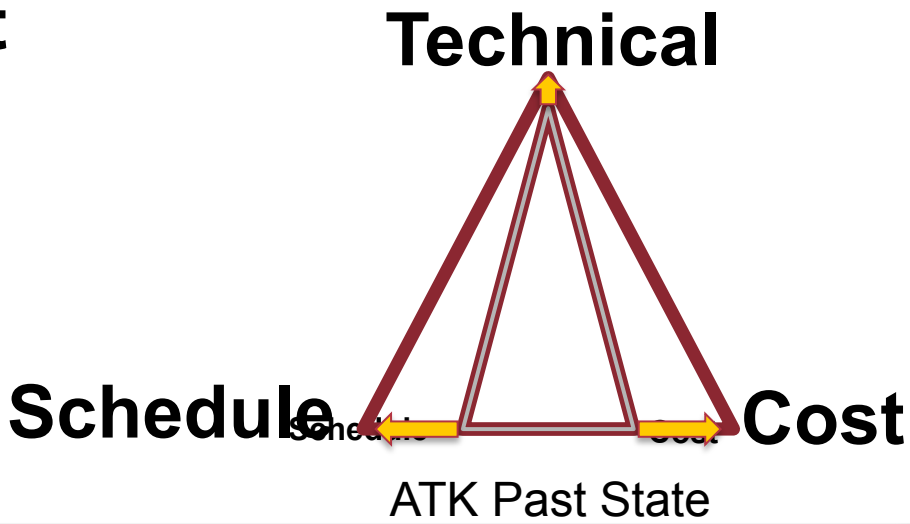
ATK Teamcenter Center of Excellence

- Strong, fully functioning ATK-wide governance model in-place
- Critical mass for effective implementation
- Rapid deployment delivers major cost savings
- Sharing of best practices and common processes
- Promotes commonality, collaboration and secure access
- Knowledge capture and sharing through single system

Competitive Triad

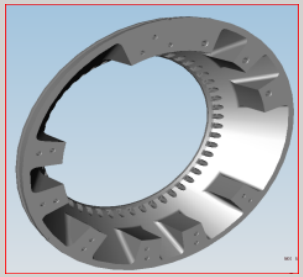


Same:
- Laws of Physics
- Materials
- Suppliers
- Tools



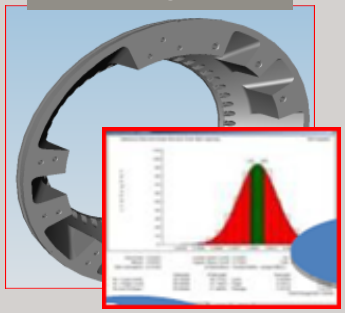
Difficult to get significant competitive advantage technically
Programs today are driven by a significant element of cost and schedule

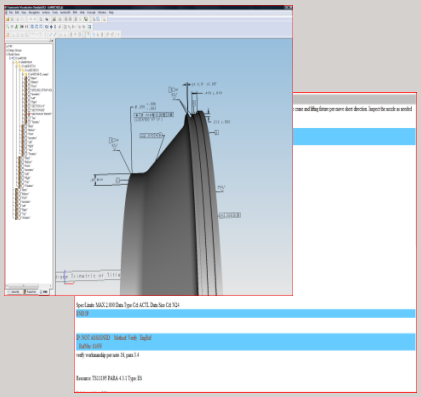
2D Drawing Delivery, Model Nightmare (DBE to MBE)



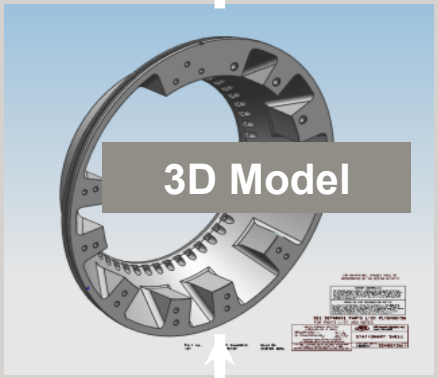
Manufacturing

Analysis

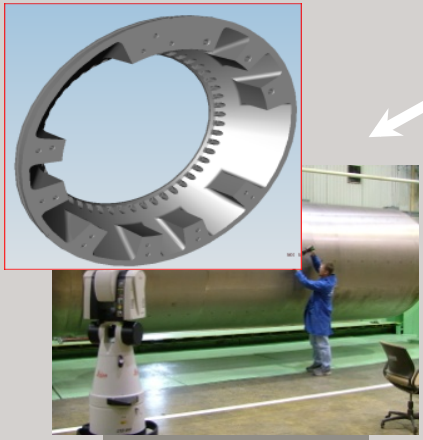




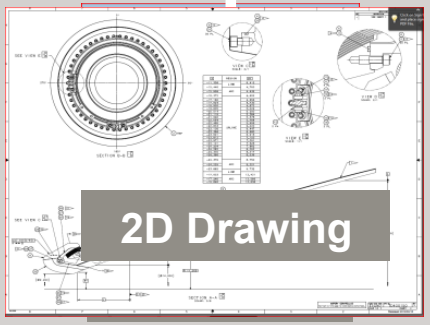
Inspection



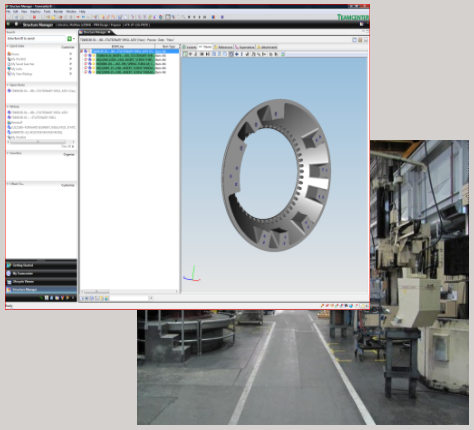
3D Model



Tooling

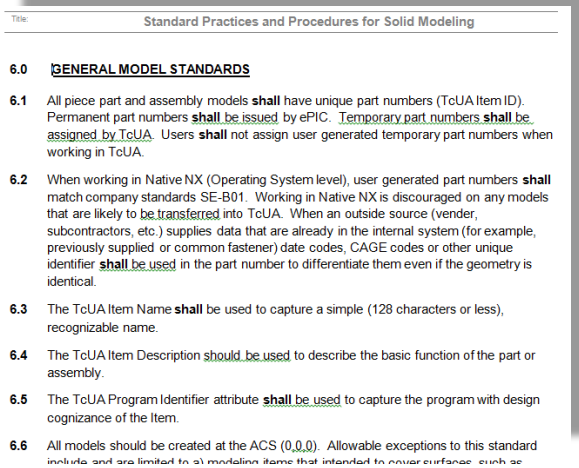


2D Drawing



Production

Source of Truth: from Drawing to "2D with 3D Model"



Title: Standard Practices and Procedures for Solid Modeling

6.0 GENERAL MODEL STANDARDS

6.1 All piece part and assembly models **shall** have unique part numbers (TcUA Item ID). Permanent part numbers **shall** be issued by ePIC. Temporary part numbers **shall** be assigned by TcUA. Users **shall** not assign user generated temporary part numbers when working in TcUA.

6.2 When working in Native NX (Operating System level), user generated part numbers **shall** match company standards SE-B01. Working in Native NX is discouraged on any models that are likely to be transferred into TcUA. When an outside source (vender, subcontractors, etc.) supplies data that are already in the internal system (for example, previously supplied or common fastener) date codes, CAGE codes or other unique identifier **shall** be used in the part number to differentiate them even if the geometry is identical.

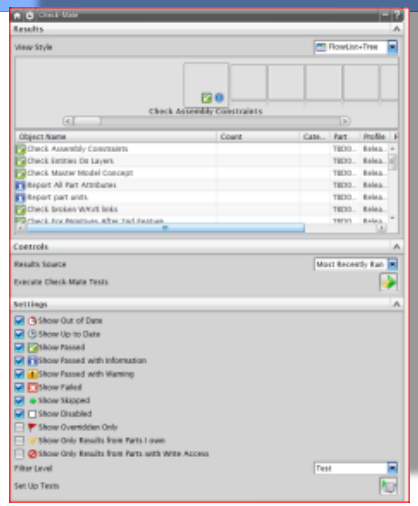
6.3 The TcUA Item Name **shall** be used to capture a simple (128 characters or less), recognizable name.

6.4 The TcUA Item Description should be used to describe the basic function of the part or assembly.

6.5 The TcUA Program Identifier attribute **shall** be used to capture the program with design cognizance of the Item.

6.6 All models should be created at the ACS (0,0,0). Allowable exceptions to this standard

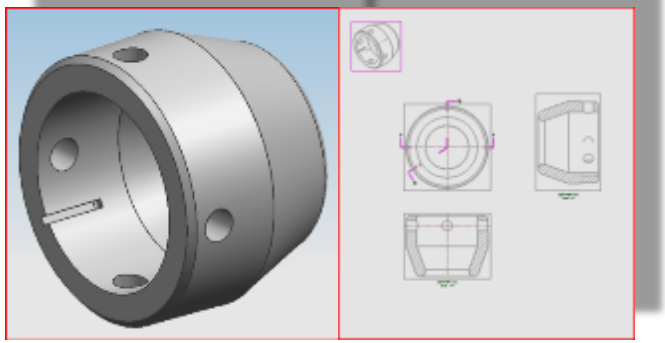
Command Media
Standard Work



Digital Verification
Checkmate

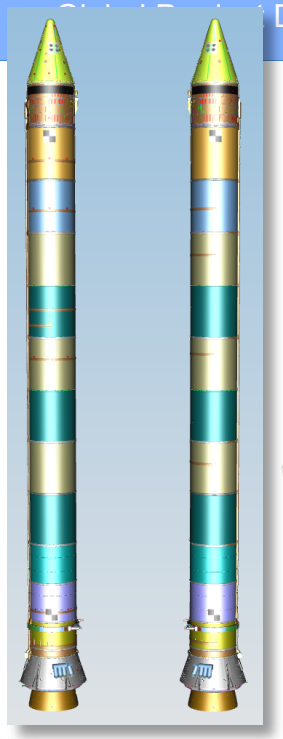
Vaulted
Checklist
Signatures

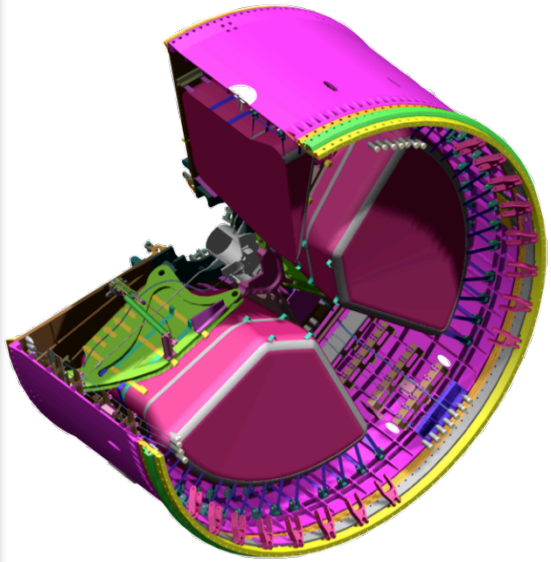
Certified Modeler
Examination
Continuing Education



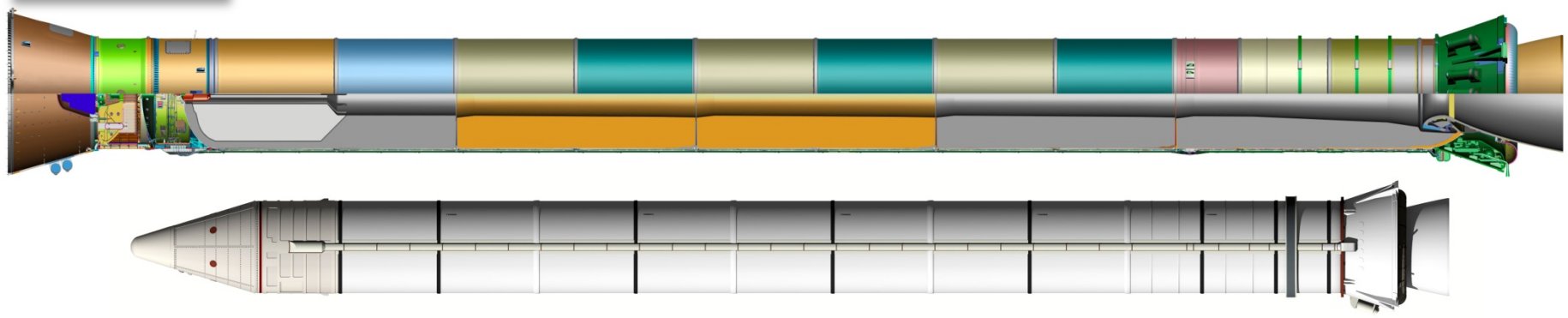
2D Associated with 3D

Delivery Change from Drawings to Models



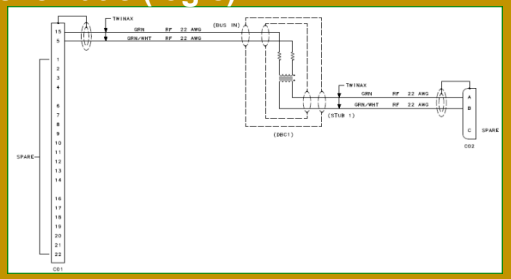


Company	CAD System	VI Modeling Time	As Received		Envelope File Size
			# Files	File Size	
Company A	ProE	16 man-weeks	8,600+	4.3 GB	47.8 MB
Company B	ProE	3 man-weeks	4,500+	3.1 GB	TBD
Company C	ProE	2 man-weeks	1,100+	274 MB	7.2 MB
ATK Aerospace	NX	1 man-week	1	29 MB	30 MB
Note: (Customer used ProE as their Native CAD System)					



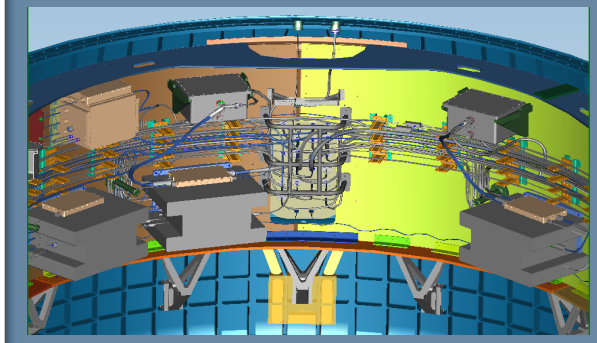
Integration of E-CAD with M-CAD

Schematic (logic) – E-CAD



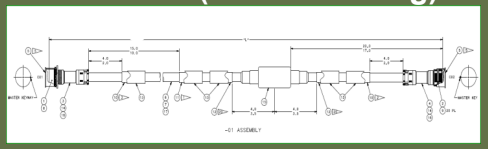
Defines
- Pin number
- Connector
- Wire type
- Data bus couplers
- Lugs
- Shields
- GEI solder shield

Model (physical) – M-CAD (NX)



Defines
- Bundle diameter
- Length/angle
- Weight
- Braid/jacket
- Parts list (BOM)
  - Connectors
  - Backshells (BD)
  - Wire (gauge, color)
  - Marker (BD)
  - Tape, solder shield, heat shrink, etc.

Formboard (manufacturing) –



Defines
- Cable manufacturing

Schematic (*.e3s)

E-CAD Logic (*.plmxml)

M-CAD Logic passes from NX (*.plmxml)

E-CAD Logic passes from Zuken E³ (*.plmxml)

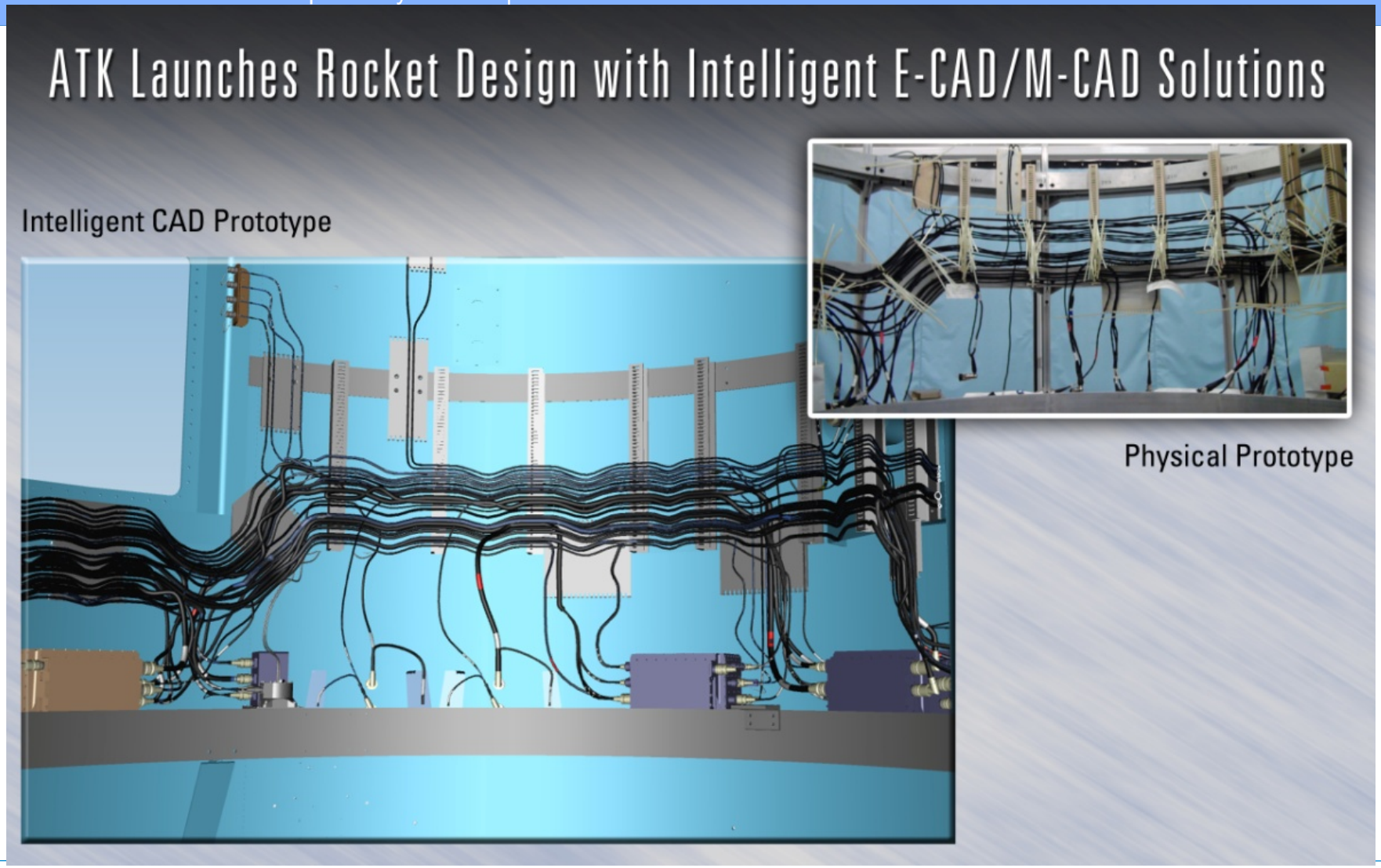
M-CAD Logic (*.xml) & NX Model

Information passes from NX model

Drawing(.prt)

Release Vault:
- -Released schematics (Zuken E³)
- -E-CAD logic file (Zuken E³)
- -M-CAD logic file (Siemens NX)
- -Released drawings (Siemens NX)
- -Released models (Siemens NX)
- -Released parts list/BOM (Siemens NX)
- -Released notes (MS Word)

Cables – Physical vs. Virtual



MBE / PMI – Great Benefits

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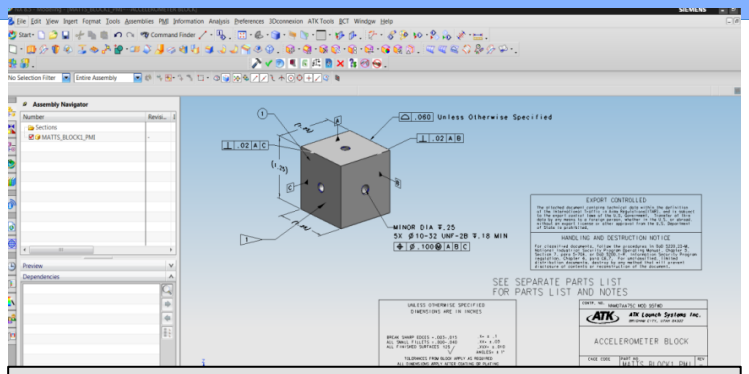
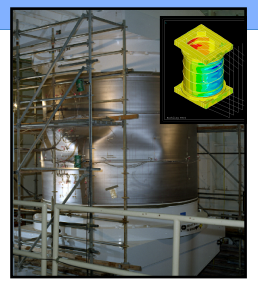
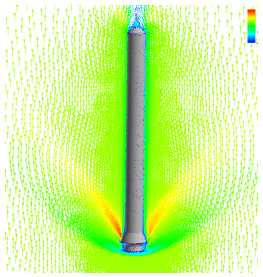


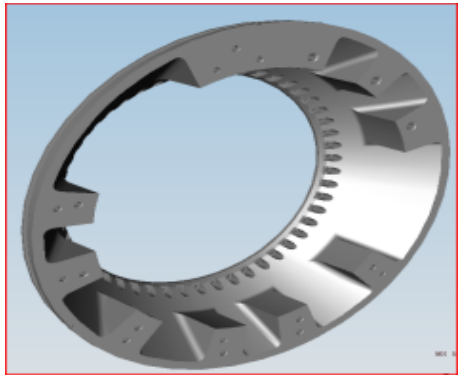
This item with Notes and Export Control Statements is shown as an example only, and is NOT ATK released Engineering definition

Contract Changes / New Programs allow PMI Delivery (and JT's)





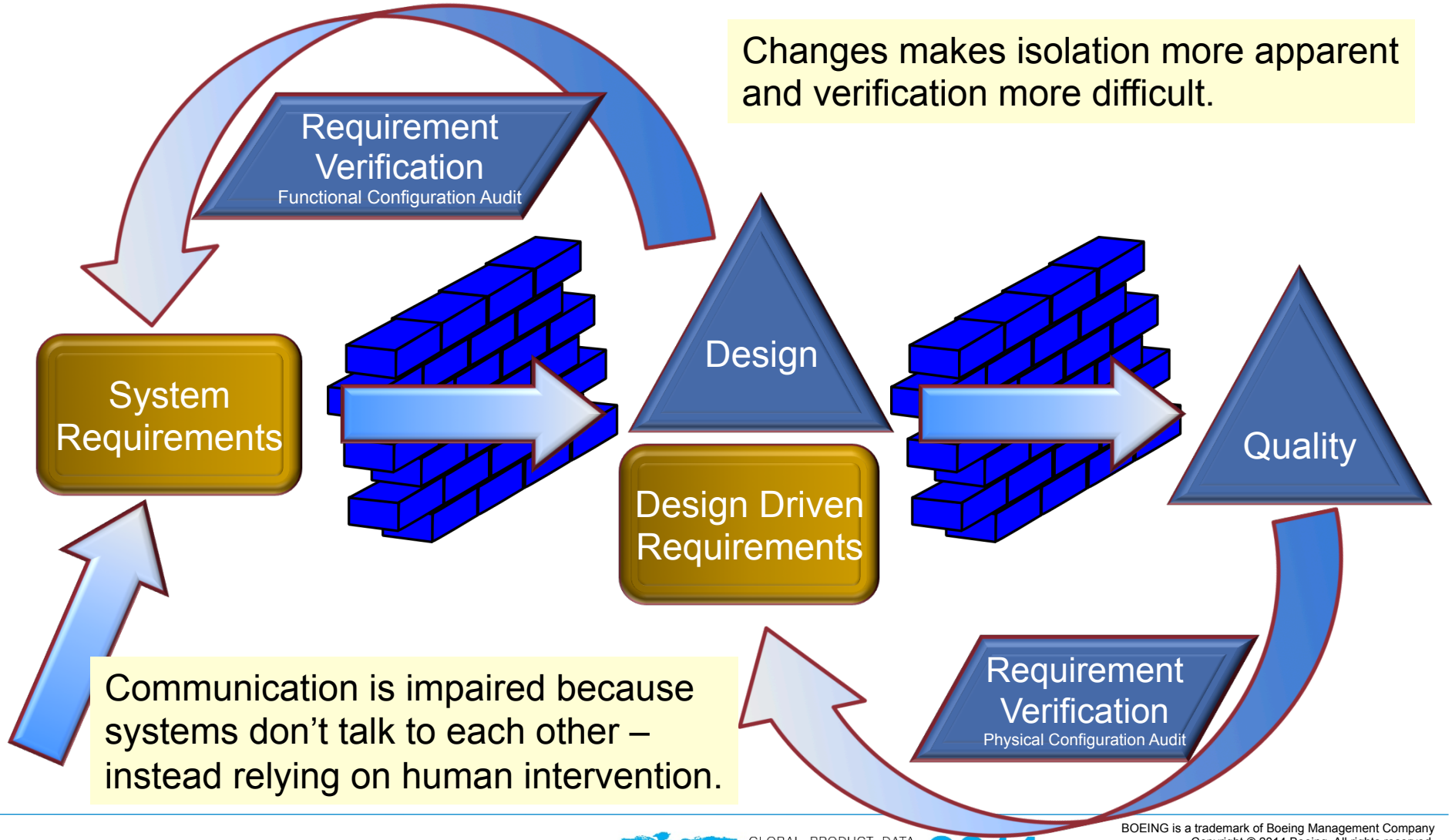
Analyses Direct from Controlled Models



Manufacturing from Released PMI Model

JT Models & tablets on Factory Floor

Requirement Flow Thru Design and Verification



Requirement Flow Through Design

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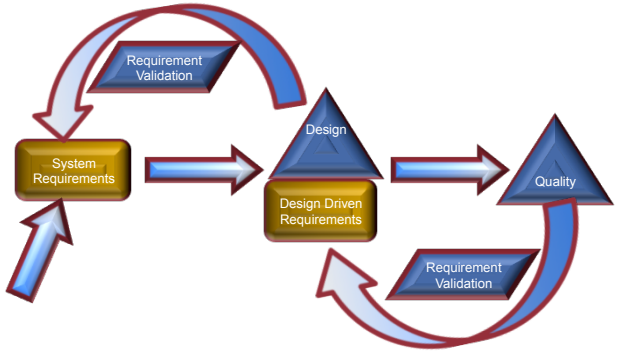

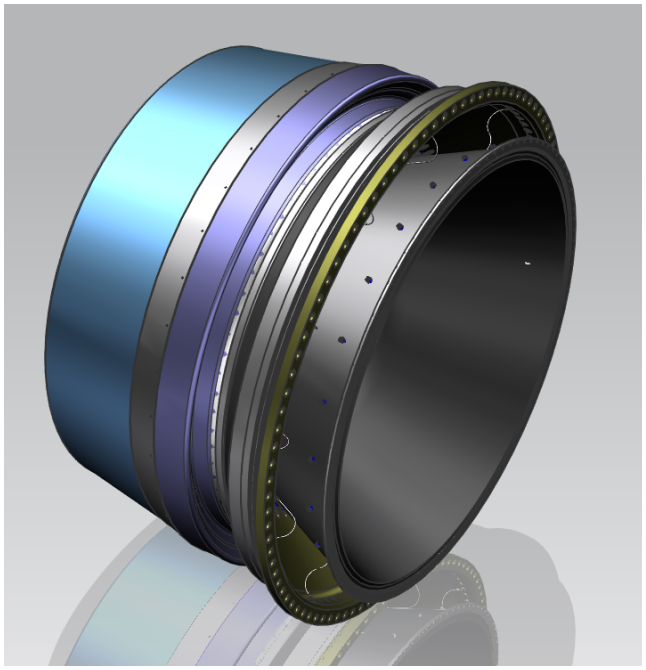

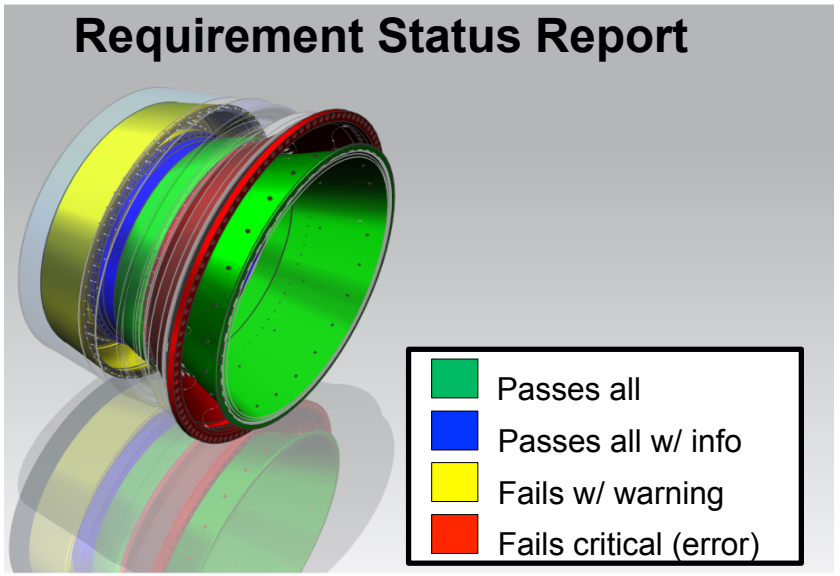

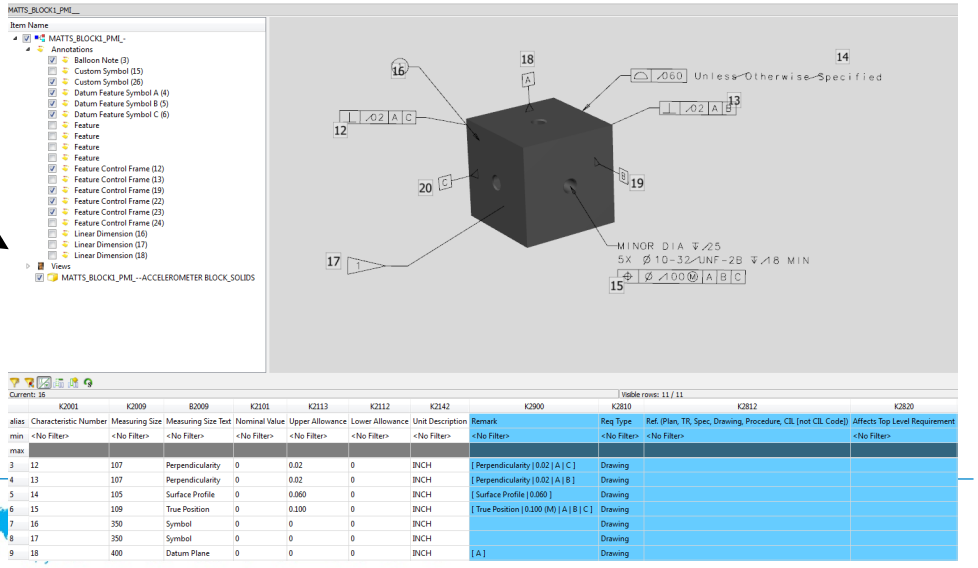

	K2001	K2009	B2009	K2101	K2113	K2112	K2142	K2900	K2810	K2812	K2820
alias	Characteristic Number	Measuring Size	Measuring Size Text	Nominal Value	Upper Allowance	Lower Allowance	Unit Description	Remark	Req Type	Ref. (Plan, TR, Spec, Drawing, Procedure, CIL [not CIL Code])	Affects Top Level Requirement
min	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>	<No Filter>
max											
3	12	107	Perpendicularity	0	0.02	0	INCH	[Perpendicularity | 0.02 | A | C]	Drawing		
4	13	107	Perpendicularity	0	0.02	0	INCH	[Perpendicularity | 0.02 | A | B]	Drawing		
5	14	105	Surface Profile	0	0.060	0	INCH	[Surface Profile | 0.060]	Drawing		
6	15	109	True Position	0	0.100	0	INCH	[True Position | 0.100 (M) | A | B | C]	Drawing		
7	16	350	Symbol	0	0	0	INCH		Drawing		
8	17	350	Symbol	0	0	0	INCH		Drawing		
9	18	400	Datum Plane	0	0	0	INCH	[A]	Drawing		

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Improving Flow – Process Excellence

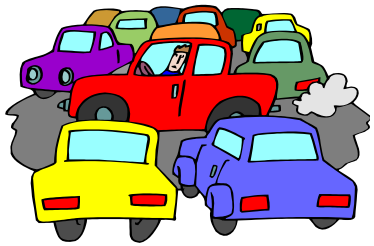
Past Condition

- Reschedule
- Date hockey
- Push harder!

We push

We multitask

Problems are not visual

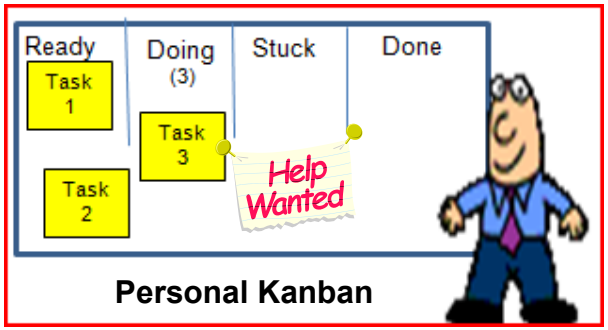


Many tasks are stopped

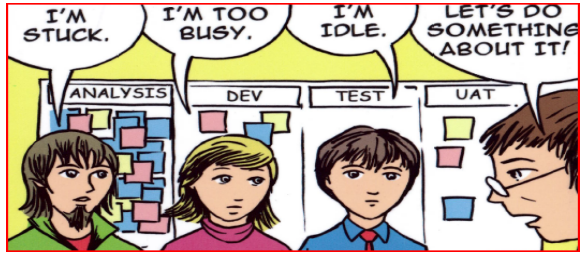
Ideal State

We pull

Tasks are visual including stops!

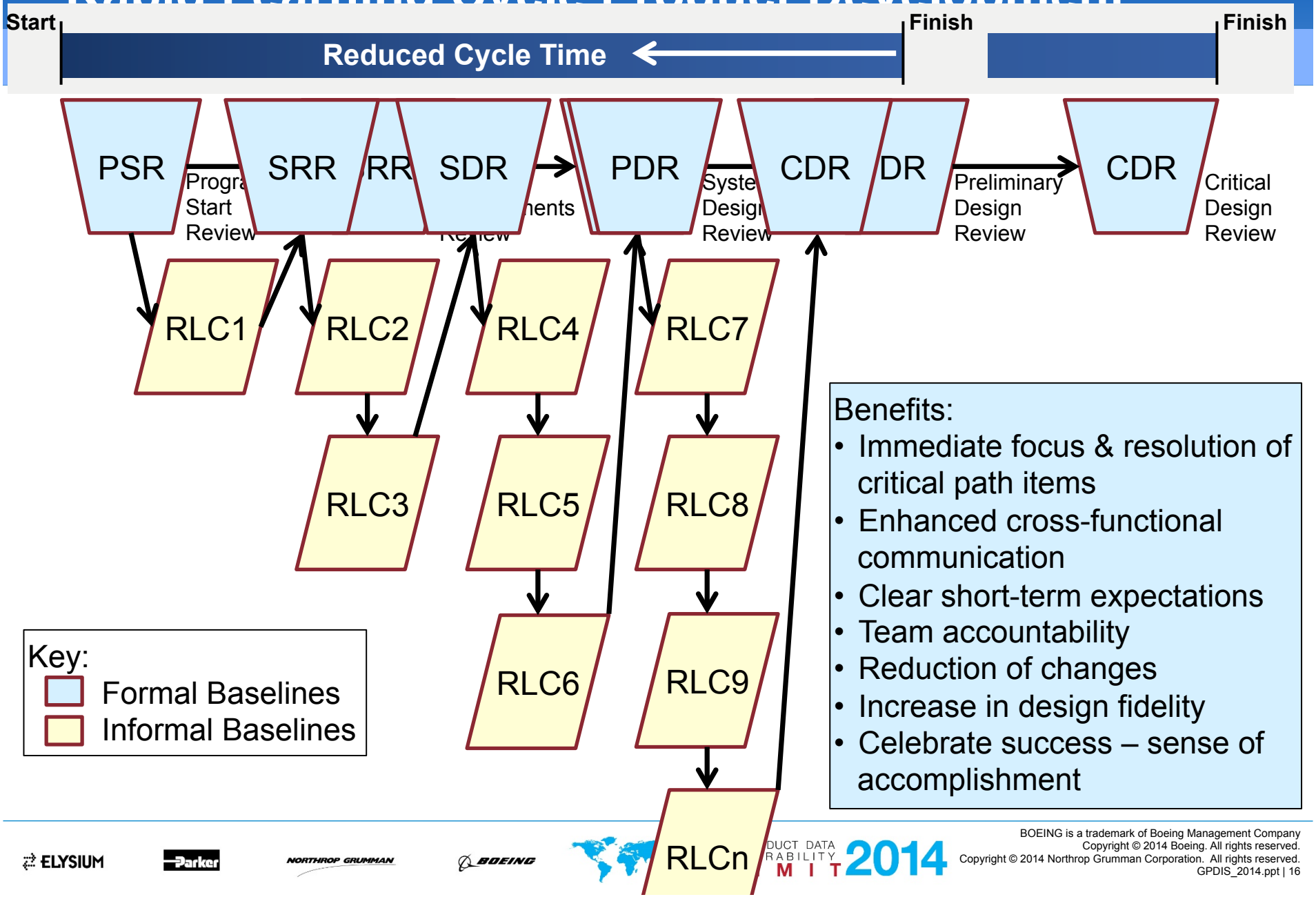


We stay on task



Leaders level work and solve problems

Rapid Learning Cycle Product Development



Benefits:

- Immediate focus & resolution of critical path items
- Enhanced cross-functional communication
- Clear short-term expectations
- Team accountability
- Reduction of changes
- Increase in design fidelity
- Celebrate success – sense of accomplishment

CM Revitalization with CMII Foundation!

Identification

- **Configuration specifications, requirements**
- **Product identification (part numbers, item master data, etc.)**
- **Change tracking**
- **Baseline records and historical**

Management

- **Change proposals (ECP, ECR, etc.)**
- **Classification**
- **Audits (internal and external)**

Misuse of part numbers

Not changing part numbers for known Non-interchangeable changes

Design numbers used for processes materials

number used for 2 different, items

Configuration Management a Business Enabler rather than a Cop

CMII +Teamcenter PLM = Business Process Excellence

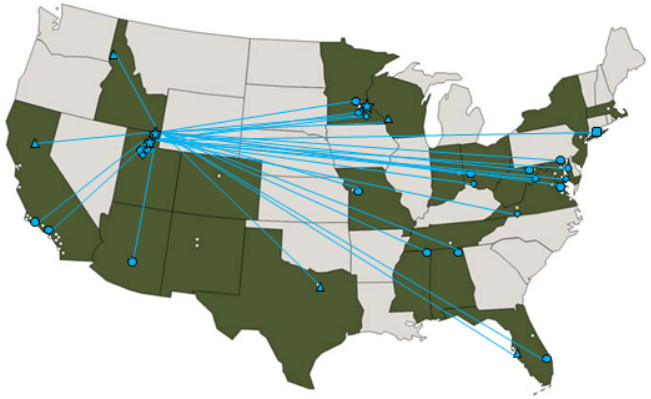
On contracts, POs, etc.

Drawing Trees / Drawing Trees are not Understood/utilized

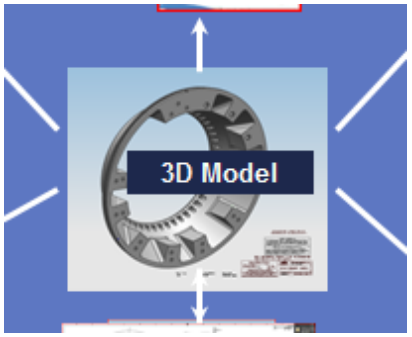
No part numbers

Drawings released as

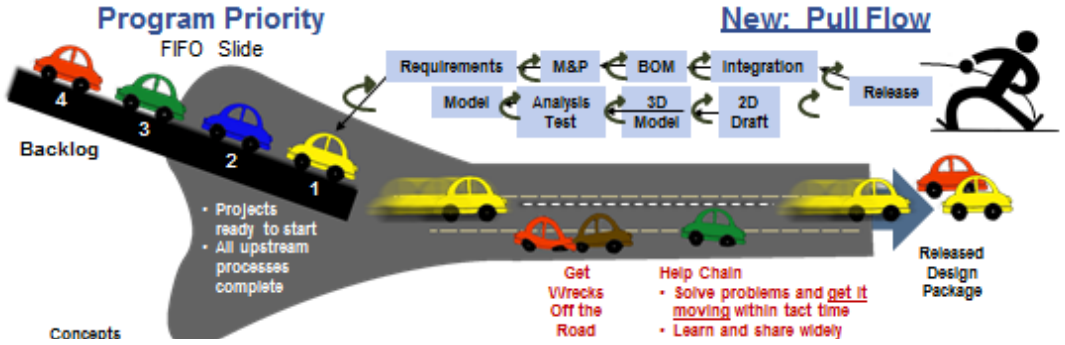
Summary



Organizational Excellence



Product Excellence (MBE)



Process Excellence

Next Steps:

- Analysis process efficiencies and configuration management
- Utilization of the rich product information on the factory floor