Should the Model-Based Enterprise Be My Enterprise?

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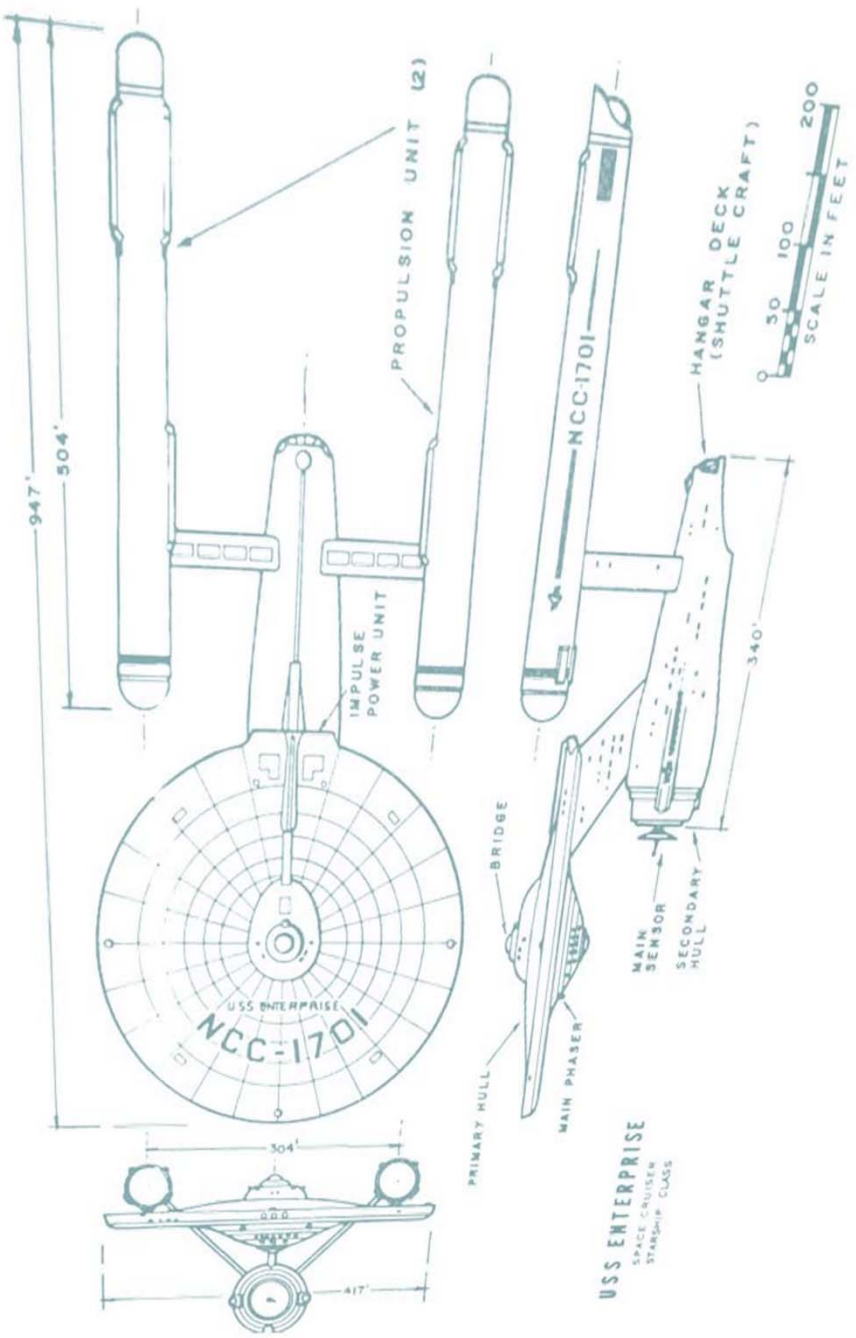
S1000D User Forum • Vienna, Austria
18 September 2013

Agenda

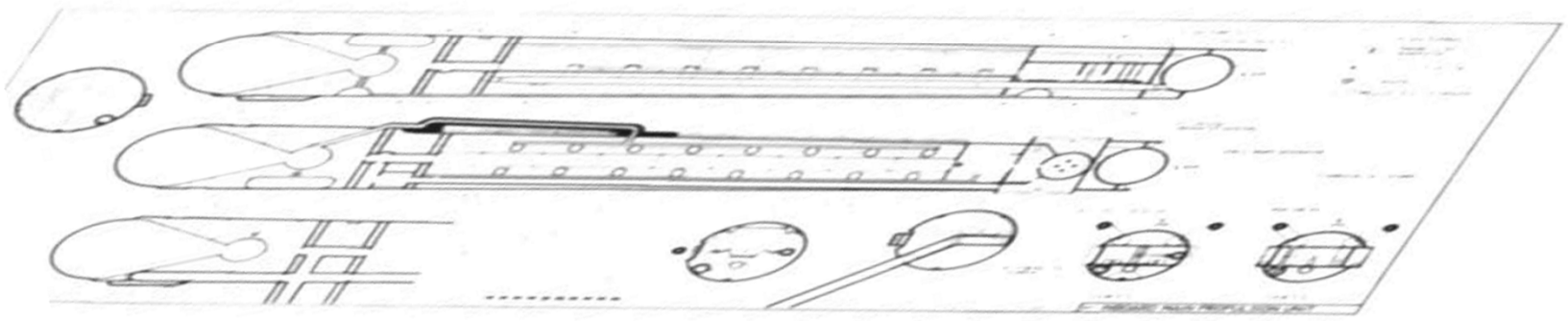
Today's Topics

- What is Model-Based Enterprise?
- Why use it?
- MBE Experience — Case Studies
- Results
- Preparing the Enterprise
- Education
- Contingencies
- Recommendations



Model-Based Enterprise

- An attempt to share the Model Based Definition across the enterprise
- Fully integrated and collaborative environment
- A process for reusing the 3D CAD Model
- Based on fully annotated 3D model (“Annotated Master Model”)
- Compliant with ASME Y14.41-2012
- 3D model a single master source for obtaining product definition data



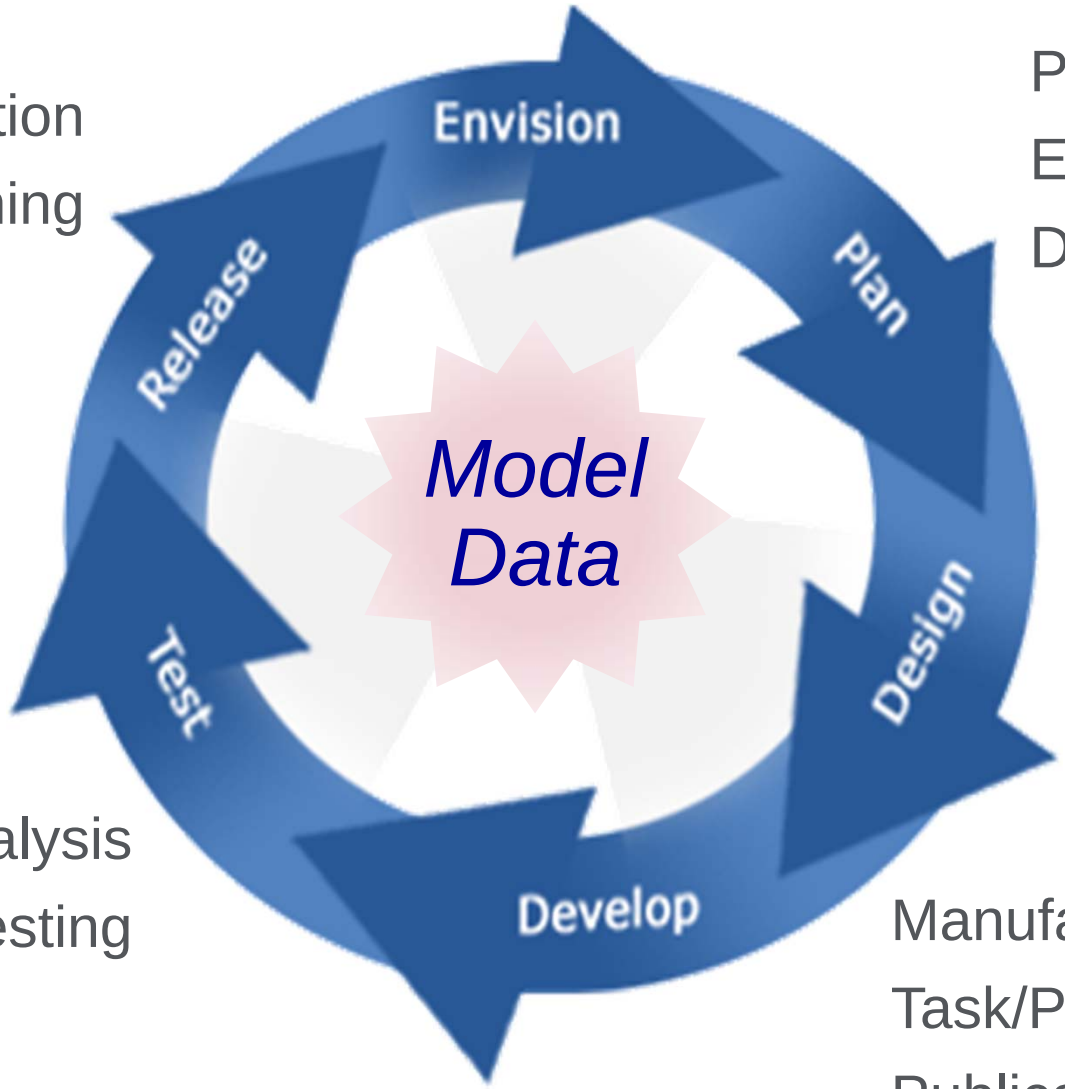
Sharing Model Data

- Why do it?
  - Promotes efficient deployment of product info in all phases of the product's lifecycle
  - Enables an authoritative source of engineering information to be communicated to all stakeholders
  - Automates reuse of product information for downstream customers
  - Standardizes internal processes
- Who uses it?
  - OEMs
  - Suppliers
  - Defense organizations

Solid Model Schema

- Provides an infrastructure to promote consistency in engineering data
- Required for the creation and subsequent presentation of data
- MBD Schema based on ASME Y14.41-2012 – Digital Product Data Practices
- Foundation for design development efforts and additional guidance to the CAD user
- Provides a complete product definition via annotations
- Organizes and structures model data for viewing by the downstream user

Integrated Product Life Cycle Support



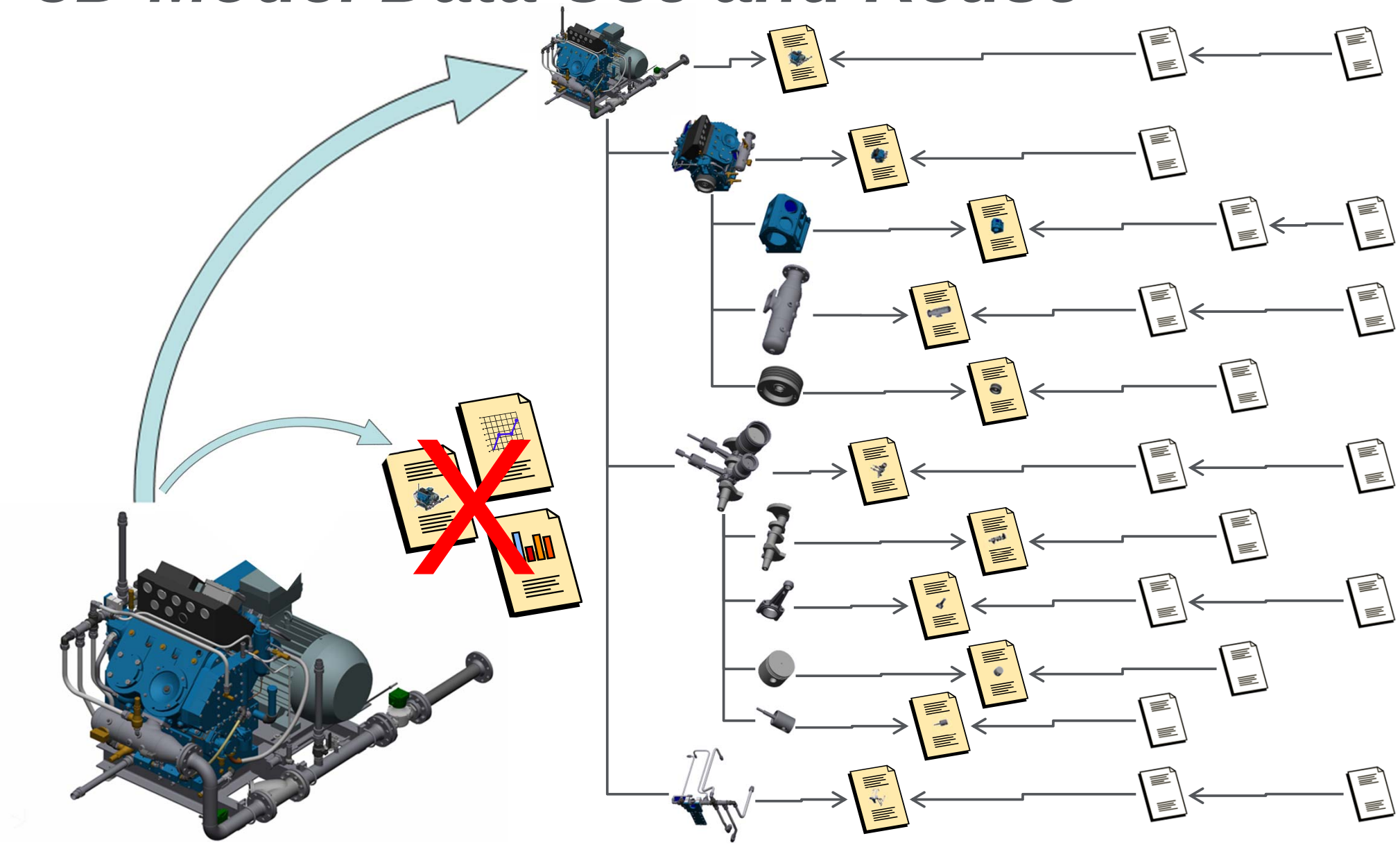
Validation
Provisioning

Planning
Engineering
Design

Analysis
Testing

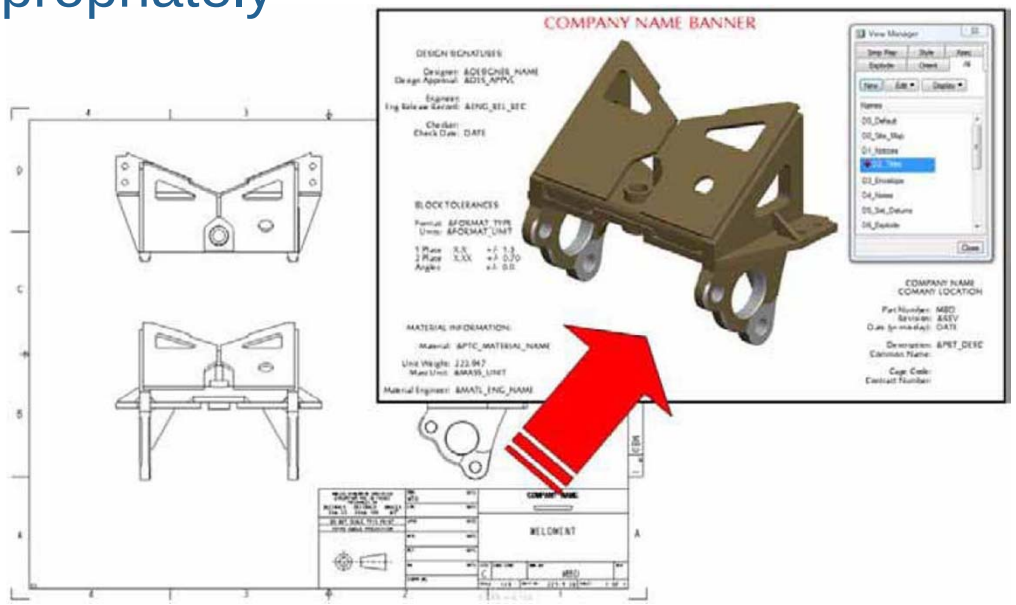
Manufacturing
Task/Procedures
Publications

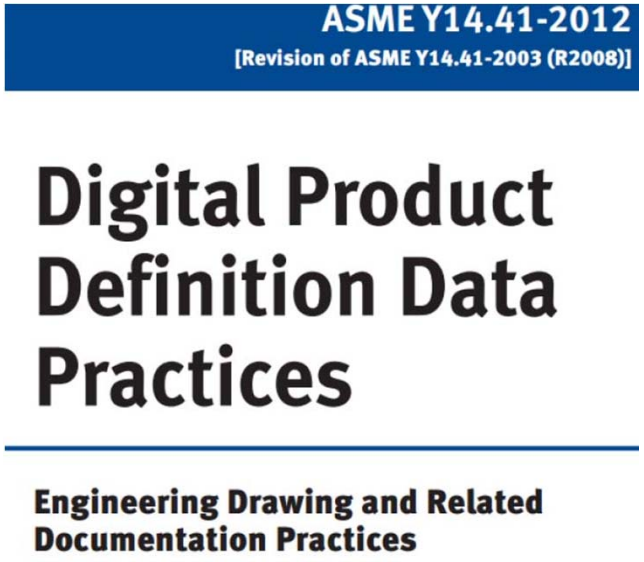
3D Model Data Use and Reuse



Downstream Users

- Provide all design and detailed information, including design intent, in the model
- Data sharing relies on consistent tool usage
- Consistent data definition essential for extraction and reuse
- Common engineering practices required to access and re-use model data appropriately





Promises Unfulfilled

- Early adopters pay a higher price
- Management-driven decision allured by promises
- Over-reliance on technology, not people
- Poor communication between stovepipes
- Process disconnect between sub-tier suppliers and OEM
- Consequences are unpredictable and expensive to correct

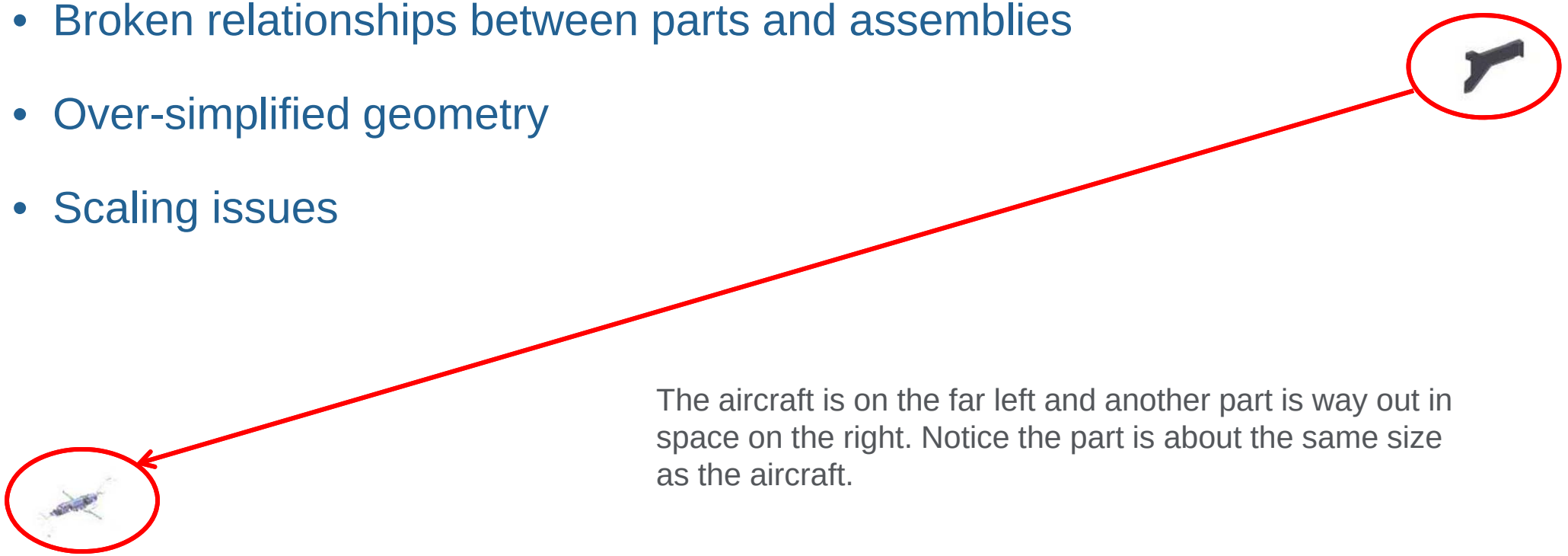
Let’s examine some case studies and see what went wrong and what went right…

Mixed Results

- Program 1
  - Aerospace manufacturer
  - Long term relationship
  - Established workflow
  - Good communication
  - Product development ongoing
- Program 2
  - Land Vehicle
  - Sub-tier supplier / integrator
  - Relatively new customer
  - New workflows
  - Add-on to OEM end item
- Program 3
  - Aircraft manufacturer
  - New customer
  - New workflow
  - Product under development

Geometry Errors

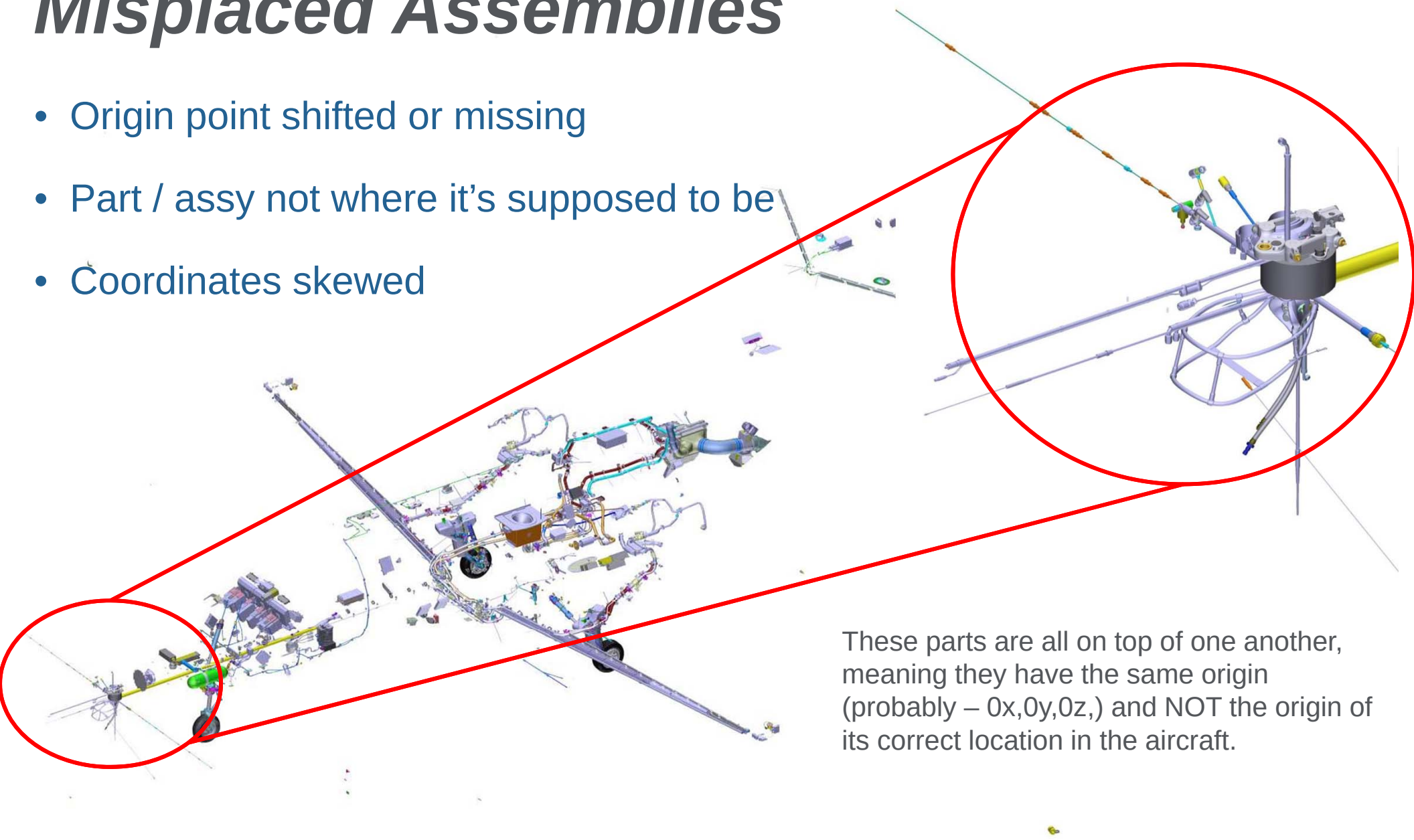
- Parts found outside of major assemblies
- Inconsistent grouping or association with NHA
- Geometry not annotated or incorrect
- Broken relationships between parts and assemblies
- Over-simplified geometry
- Scaling issues



The aircraft is on the far left and another part is way out in space on the right. Notice the part is about the same size as the aircraft.

Misplaced Assemblies

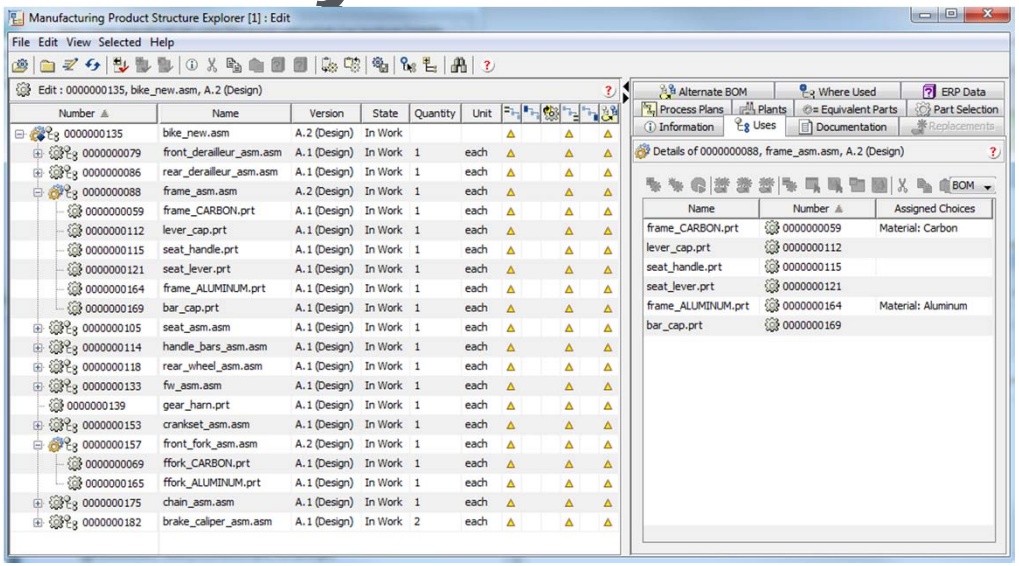
- Origin point shifted or missing
- Part / assy not where it's supposed to be
- Coordinates skewed

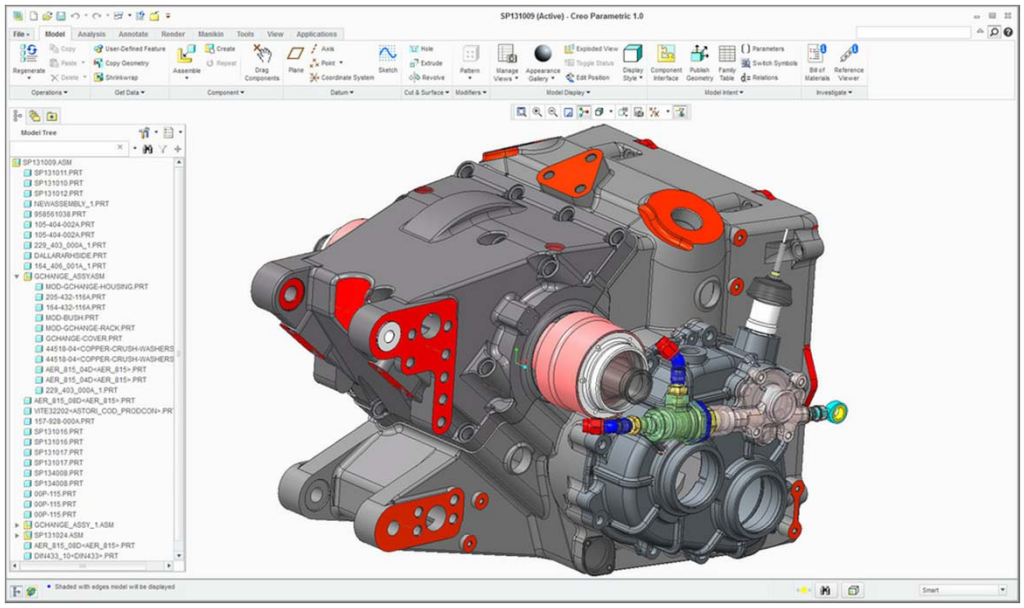


These parts are all on top of one another, meaning they have the same origin (probably – 0x,0y,0z,) and NOT the origin of its correct location in the aircraft.

Part Information Goes Awry…

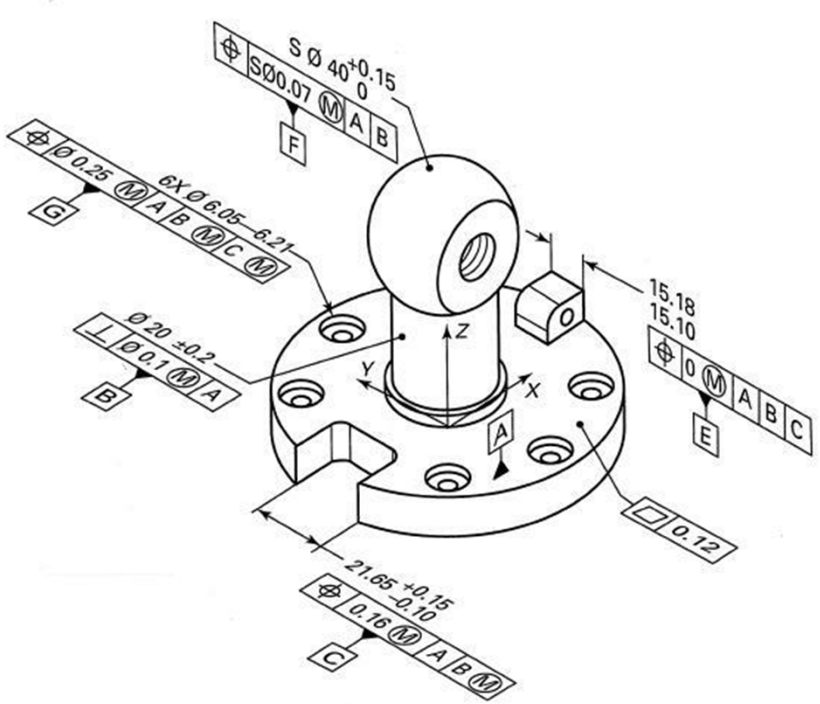
- Part numbers missing
- Part numbers do not match eBOM
- Nomenclature missing
- Nomenclature not in eBOM
- Part information location inconsistent
- Part information not updated with model
- Model data assumes live connection to PLM system
  - Not true for vendors and suppliers
  - Corporate IT prohibitions





Model Performance & Process Issues…

- Model software performance issues
  - Lengthy opening times
  - Extraction slow and cumbersome
  - Files too big
- Change process issues
  - Model updated weekly
  - All change data in the model
  - No method to indicate which data changed
- Overall process too slow and costly
  - Model data consumers complained about speed and performance
  - Consumers needed newer, bigger, faster computers
- Proprietary data rights
  - Model translations to protect data right corrupted data
  - Over-zealous intellectual property (IP) obfuscation



At the end of the day…

- We’re good people and we all try to do a good job
- We’re professional and considerate of others’ needs
- We’re all focused on making the best possible decisions
- Product design groups and engineers strive for excellence

But…

Stakeholders lost faith in model’s capability as a reliable source of information

Outcome Assessment

Poor result because of…

- MBE is very attractive to management
  - Technology focused – tools vendors provide “out-of-box” solutions
  - Makes a lot of sense – single-sourced data are good
  - Has real cost benefits – greater efficiency and productivity
- Enterprise initiatives often embrace technology at the cost of culture
- Engineering is becoming a social enterprise
- Adoptions requires cultural and technological change
  - Un-met expectations at many levels
- Product design and development cannot take place in a vacuum
  - Timing issues
  - Long lead process
  - New technology insertion
  - Lack of standards enforcement
  - Poor or missing QA

Commit Stakeholders

- Who does it affect?
  - Engineering
  - Manufacturing
  - Technical information development
  - Training
  - Support
  - Purchasing
  - Customers
  - Partners
  - Vendors

- Project planning
  - Cross-organizational and extra-organizational
  - Corral multiple stakeholders for input
  - Best done iteratively (multiple IPRs)
  - Ensure all needs are met

Sharing is Knowledge

- Knowledge is key for MBE
  - Ignorance of how MBE affects your function is dangerous
  - Make information about MBE available to all
  - Publish the MBE schema to all users
  - Share common terminology, use a single nomenclature vocabulary
- All stakeholders need to know something about MBE
  - Engineers: product definition conventions
  - Managers: timescales for effort, resource requirements
  - Writers and training: where to find information in the model
  - IT: modeling and collaboration tools
  - Software developers: customer requirements for lightweight 3D viewers
  - Vendors and suppliers: know what to expect (look and feel, review), hard and soft requirements
- Customers and end users need training
  - Manage their expectations
  - Mitigate the impact of change on their organization
  - Use outside resources wisely – educate

Contingencies

What happens when things go south…

- MBE is like chess
  - Requires thinking out a long-term strategy
  - Requires contingency planning
  - And the clock is running…
- Anticipate problems beforehand
  - Consistent modeling behavior = best practices, conventions, informal training
  - Tool knowledge = formal training
  - MBE knowledge = get stakeholders educated
  - IT issues = get IT on it, and get them educated
  - Extra-enterprise consumers = must have vendor conference, coordinate solution with them
- Unplanned events happen
  - Resource outages: need replacements fast
  - IT complications: need help for other sources (DBA, firewalls, etc.)
  - Design changes cause scope creep: sort priorities, get management consensus

Vendor and Supplier Perspective

- Don’t throw the model over the wall
- Involve vendors and suppliers early in the model definition process
- Educate vendors and suppliers about MBE
- Be receptive to vendors’ and suppliers’ needs / limitations
- Find common ground to work through issues
- Align technologies and adjust expectations accordingly
- Communicate and reach consensus
- Identify data dependencies, especially where hidden or assumed
- Prevent data disconnects and provide workarounds when encountered

MBE Champion

MBE is like a high-performance, exactingly-tuned machine:

When all the parts work together, supported by an expert team, you have a winner…

Questions?

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Thank you