Strategic View: Delivering Product Standards Data in Multiple Forms to Multiple Platforms from a Single Source of Data

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Product Standards

- **Standard parts (bolts, nuts, electrical connectors, Hydraulic fittings, etc.)**
- **Manufacturing processes (sealing , painting, heat treating, fastener installation, etc.)**
- **Materials (metal alloys, composite materials, sealants, insulation, etc.)**
- **Tooling**
- **Test methods**
- **Other categories that define products**

Product Standards

Standards have been an integral part of our business for a long, long time.

Product Standards

Product Standards Data:

- used across Boeing products
- used across the product lifecycle
- used throughout the Supply Chain

Product Standards "in" Products:

- Parts
- Materials
- Processes

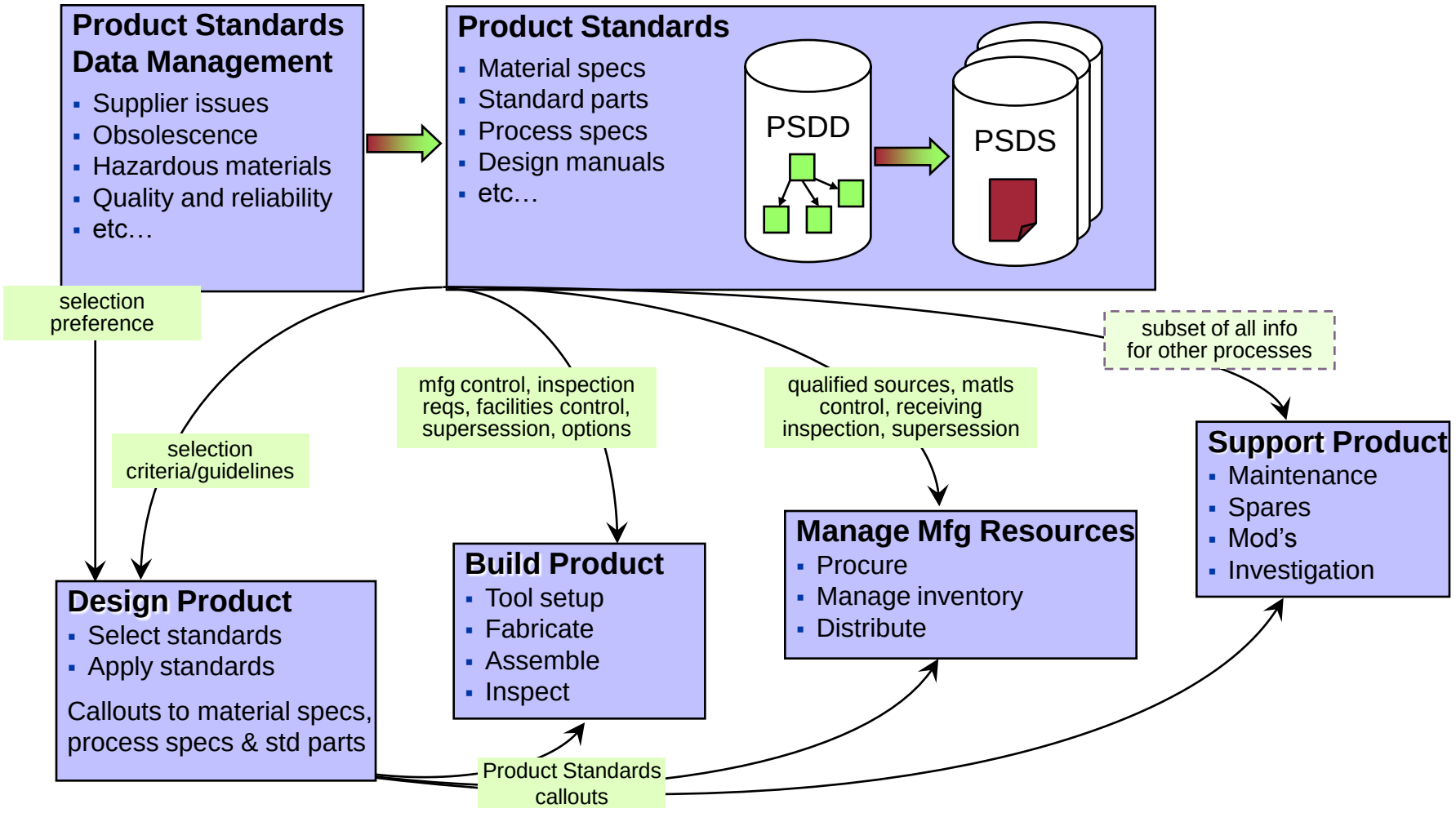
39% Engineering Data
38% Operations Data

Defined by 10's of thousands of documents.

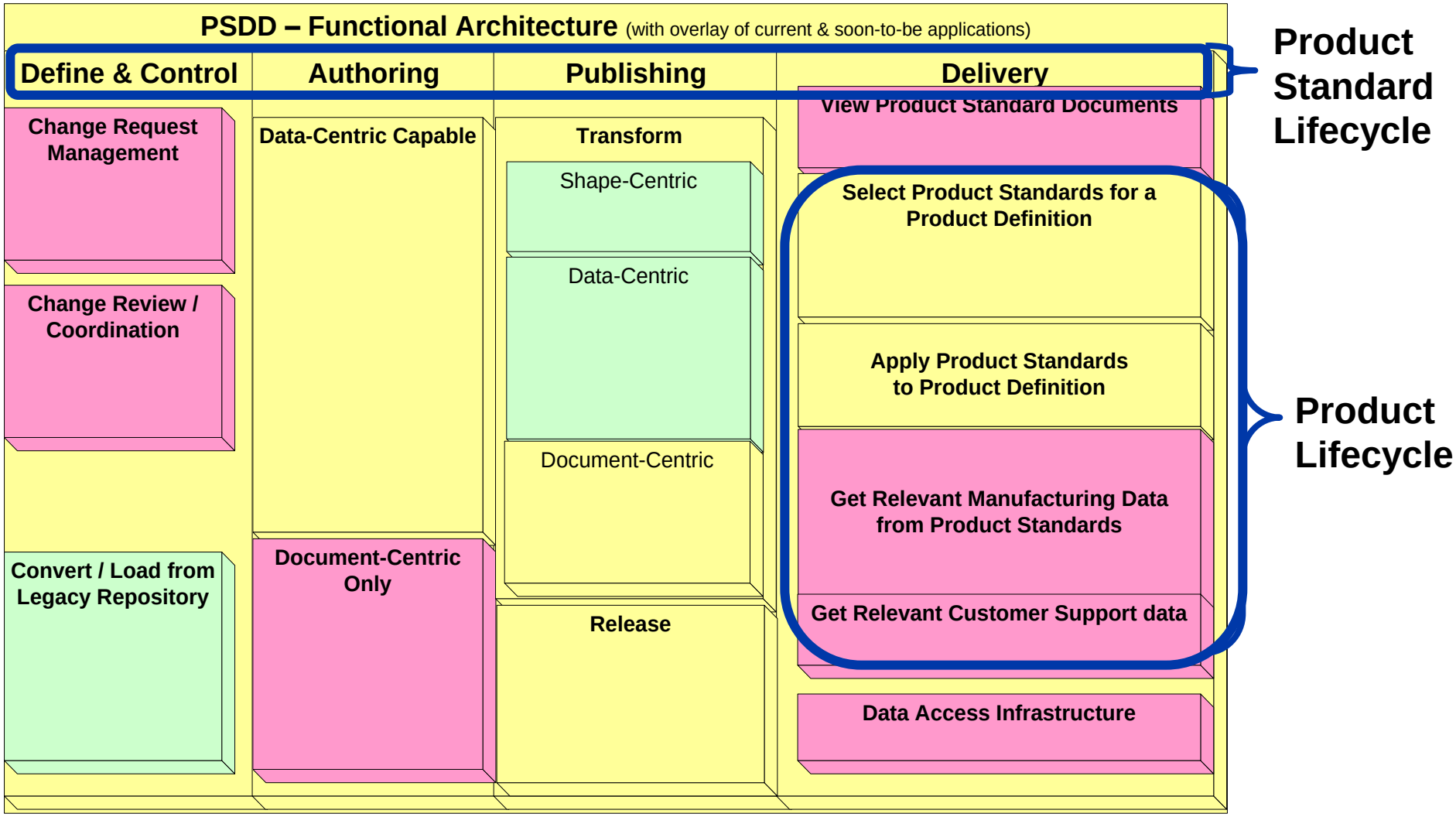
Product Standards

- **Authoritative Type Design product definition when invoked by a drawing or dataset**
- **Product standards lifecycle is independent of other product specific product definition data (CAD – Computer Aided Design, PDM – Product Data Manager, etc.)**
- **Product Standards provide standardized product definition across multiple products**
- **Product Standards comprise roughly 40% of the product definition data on Aerospace products**
- **Higher use of standards reduces product costs**
- **Product Standards data needs to be digital as is the CAD/PDM data and needs to be interoperable with it**

Product Standard in a Product's Lifecycle



Product Standards vs. Product Lifecycle

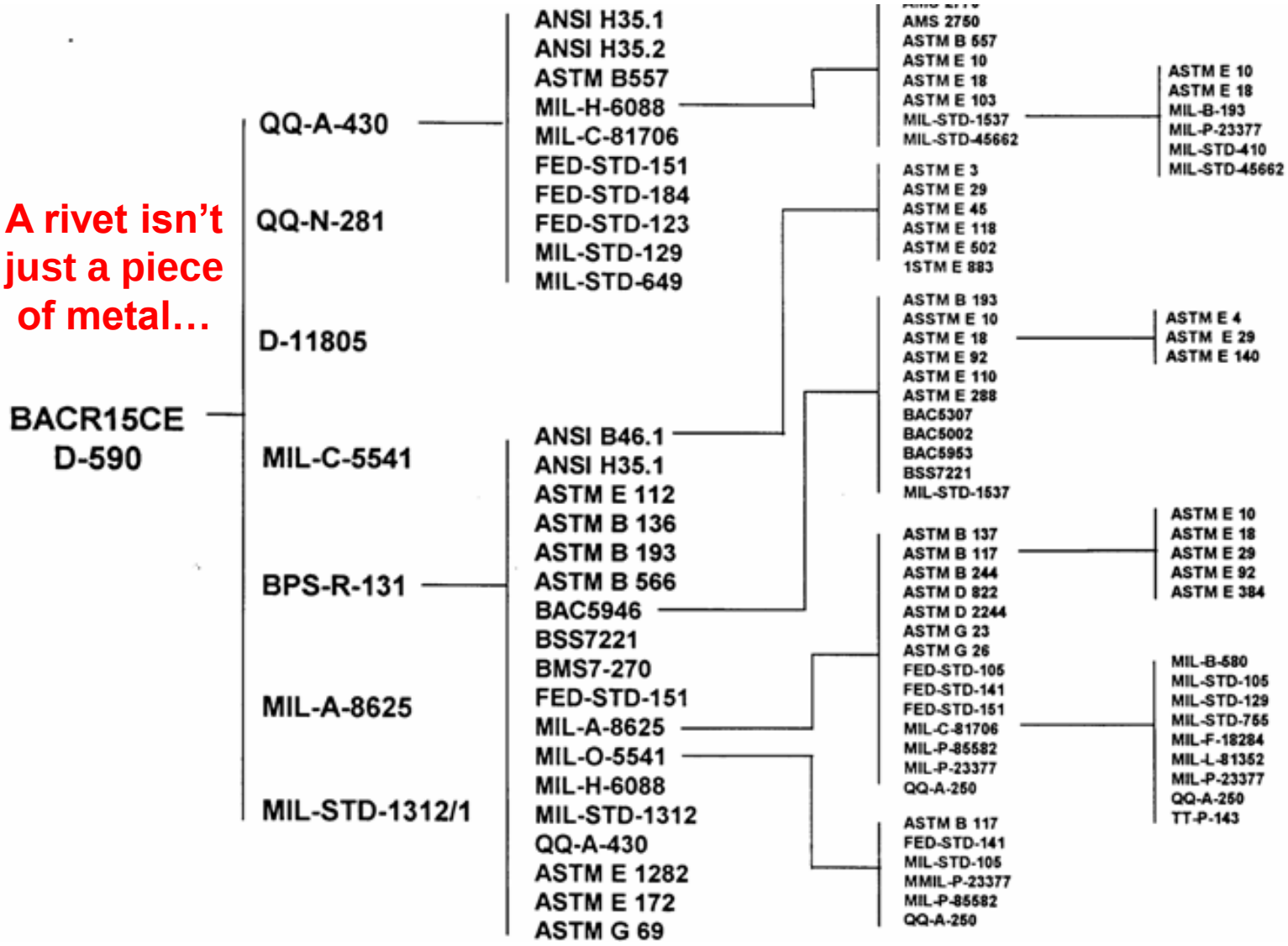


Product Standards

- **Product standards are typically Paper documents**
  - **Some are being converted to digital files**
- **Authors of standards**
  - **The government**
  - **Industry "SDO" organizations (SAE, ASTM, etc.)**
  - **Companies (Boeing has ~114,000 in 17 collections)**
- **When invoked by a drawing or dataset**
  - **Only part of the standard is needed**
  - **Standards invoke other standards creating a chain or tree of standards information**
- **User Responsibilities for "Paper" Standards**
  - **Read and manually interpret ALL information in the invoked standards**
  - **Determine what part of a standard is needed for a specific application**

Product Standards

A rivet isn't just a piece of metal…



FAA requires that we can audit this web of product standards

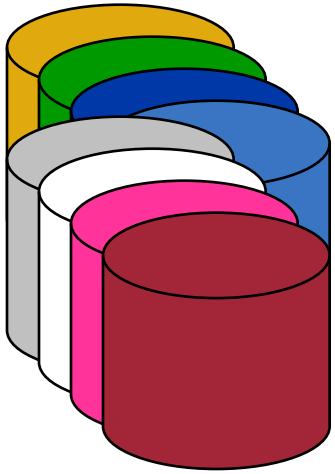
Current Situation

- **Standards data comprises almost half of our product definition**
- **Standards are typically paper documents**
  - **Must be manually navigated and interpreted**
  - **Are not digitally interoperable with the product specific product definition data (CAD, PDM, etc.)**
- **Standards data cannot be managed in the product specific product definition tools (CAD, PDM, etc.) because it has a different lifecycle**
- **Navigation and interpretation of product standards and re-keying of standards data into other systems is expensive, error prone, and presents configuration management issues**

Product Standards as Documents

Many document publishing systems

Documents are interpreted and re-keyed into different formats **$Ms/year**



Several applications make data usable although 2nd source

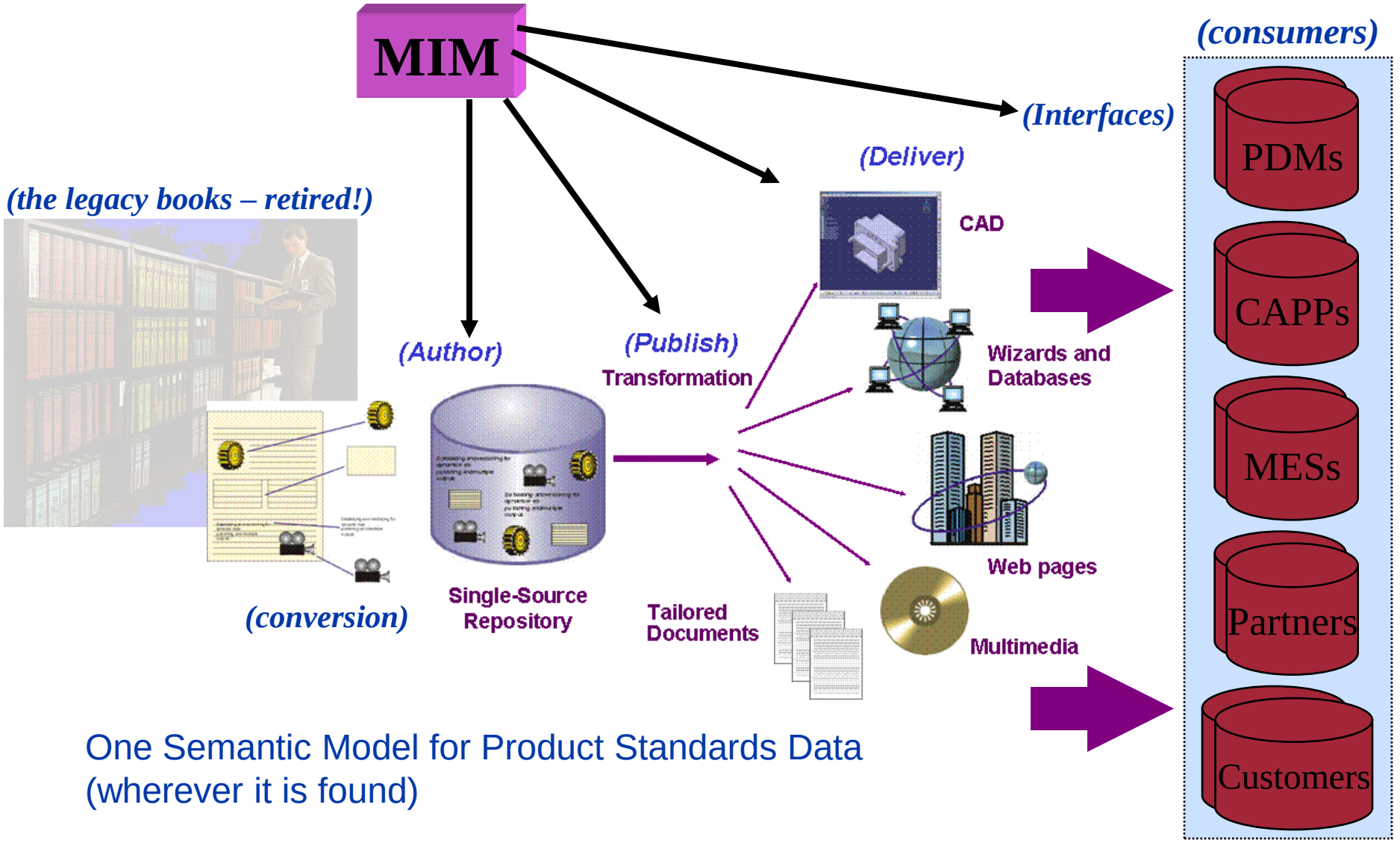
Many different users, processes, & environments

Strategic Goals

Standards users will not need to access a PDF document for a standard. Instead, the optimum amount of specification information will be delivered in a role-based format to the point of use when needed with little or no manual intervention.

Government and industry wide common data model and hierarchical ontology for product standards.

Master Information Model

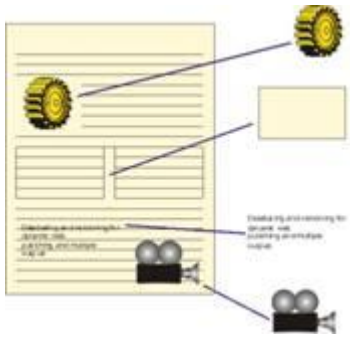


One Semantic Model for Product Standards Data (wherever it is found)

Strategic Plan

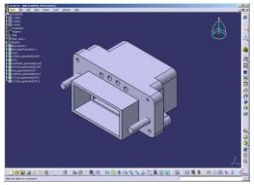
- **Raise product standards technology to the level of product design technology (CAD, PDM, etc.)**
  - **Author standards as digital files**
  - **Ensure that the data is interoperable with other product definition data and systems**
- **Manage and deliver product standards from single authoritative source**
  - **Standards are authored once and data is drawn from the single authoritative source (different standards may come from different single sources)**
  - **Never re-key data**
  - **Use a schema that allows multiple format publishing of standards data**
    - **PDF document views, CAD models, knowledge based interpretation and delivery systems, tools to feed data to design (CAD, PDM), procurement, manufacturing, and product support systems**
  - **Automatically feed data to all delivery systems on publishing**
- **Use SOA to facilitate data interoperability**

Product Standards as Digital Data



Repository of Content Components

Transformation at publish



CAD

Databases

Internet and Intranet

Multimedia

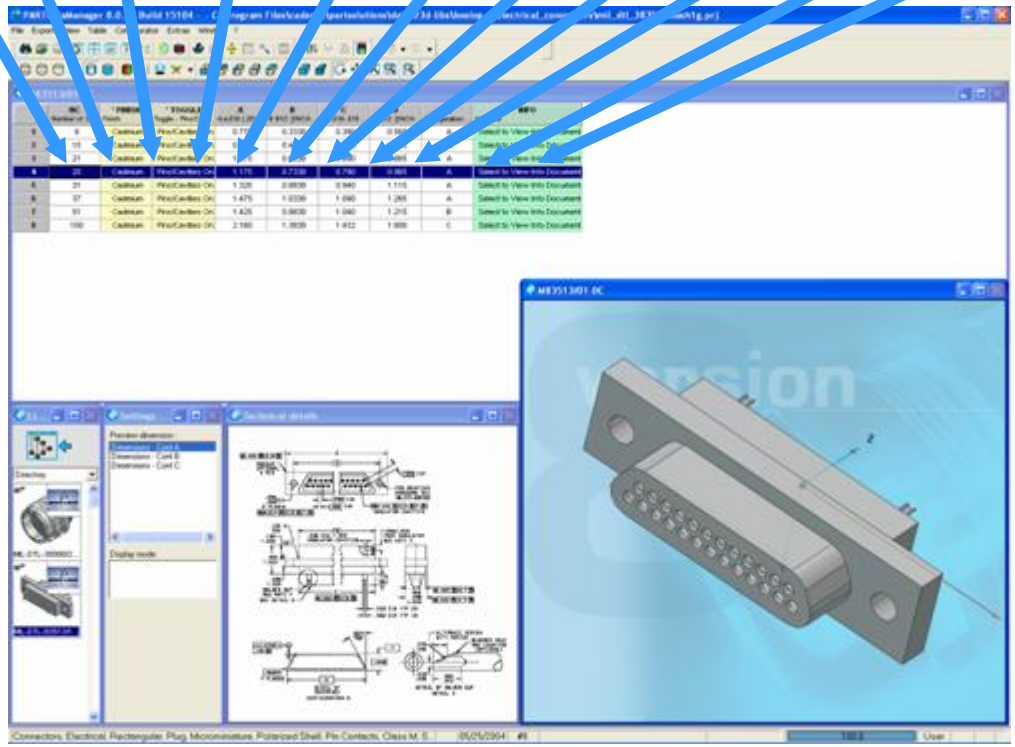
Assembled Documents

Requirements

- **Secure and reliable data management and configuration control system**
- **Software and schema that allows digital definition of standards data (numbers, formulas, conditions, logic, etc.)**
- **Software and schema that allows publishing of the standards data in all necessary formats (PDF documents, digital files, logical and conditional interpretations for “smart’ systems, CAD models, etc.)**
- **Increased authoring resources dedicated to standards**
- **SOA architecture to facilitate system interface**
- **Robust data model and hierarchical ontology to facilitate data interoperability**

CAD Shape Data - Driven from Single Authoritative Source

PartNumber	Length	Width	Height	Flange Thickness	Flange Corner	Shell Length	Shell Width	Shell Height	Insert CL	Block Length	Block Width
BACC65AN2B10	1.323	2.165	0.92	0.433	0.119	0.421	1.215	0.549	-0.117	0.469	1.457
BACC65AP2B16	1.41	2.165	0.92	0.486	0.119	0.453	1.334	0.687	-0.117	0.471	1.457
BACC65AV2C10	0.91	2.165	0.92	0.522	0.119	0.45	1.334	0.687	-0.117	0.469	1.754
BACC65AW2C16	0.897	2.16	0.92	0.476	0.119	0.421	1.21	0.549	-0.117	0.471	1.754



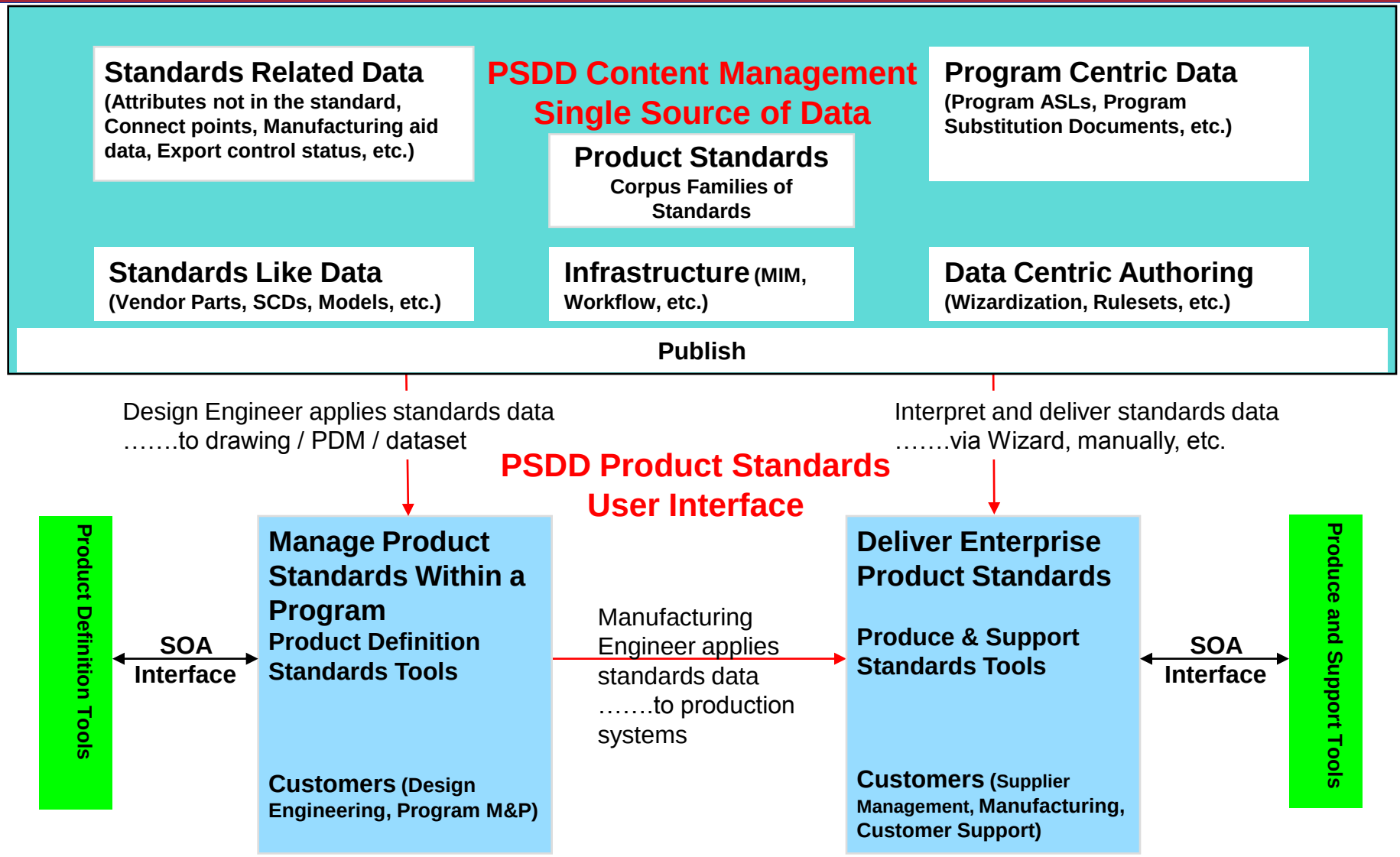
Benefits

- **Greatly reduced recurring manufacturing and product support costs (orders of magnitude greater than increased authoring costs)**
  - **Reduction in time needed to navigate and interpret standards**
  - **Elimination of data re-keying**
  - **Reduced rework due to interpretation errors**
- **Increased data quality**
  - **All standards data comes from the authoritative single source with no manual intervention**
- **Increased data interoperability**
  - **Easy and accurate analysis using standards data integrated with design, manufacturing, procurement, and product support data and systems**
- **Benefits extend across the supply chain**

Current Situation at Boeing

- **Everything described here is currently in production at Boeing**
  - **Digital authoring, content management, and delivery system (PSDD – Product Standards as Digital Data)**
  - **Knowledge based standards tools for design (ESDS KB – Engineering Standards Distribution System Knowledge Bases, iPSMG – integrated Product Standards Management Gateway, EGS – Enterprise Geometry Service)**
  - **Knowledge based tools to digitally interpret and deliver standards data for manufacturing (Wizards)**
  - **Various data feeds to PDM, Procurement, and Product Support systems**
- **Boeing has a long term strategic plan for standards that incorporates the elements described here**

Product Standards as Digital Data (PSDD)



iPSM Gateway

- **Product Standards selection service draws data from single source (PSDD)**
- **Constrains selection to control proliferation**
- **Process notes can be linked directly to product standards Wizards to automatically interpret standards**
- **Produces CAD models of standard parts “on the fly” from the single source (PSDD)**
- **Automatically applies standards to the digital design dataset (CAD/PDM)**

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The Long Inputs Page

Re-Answer

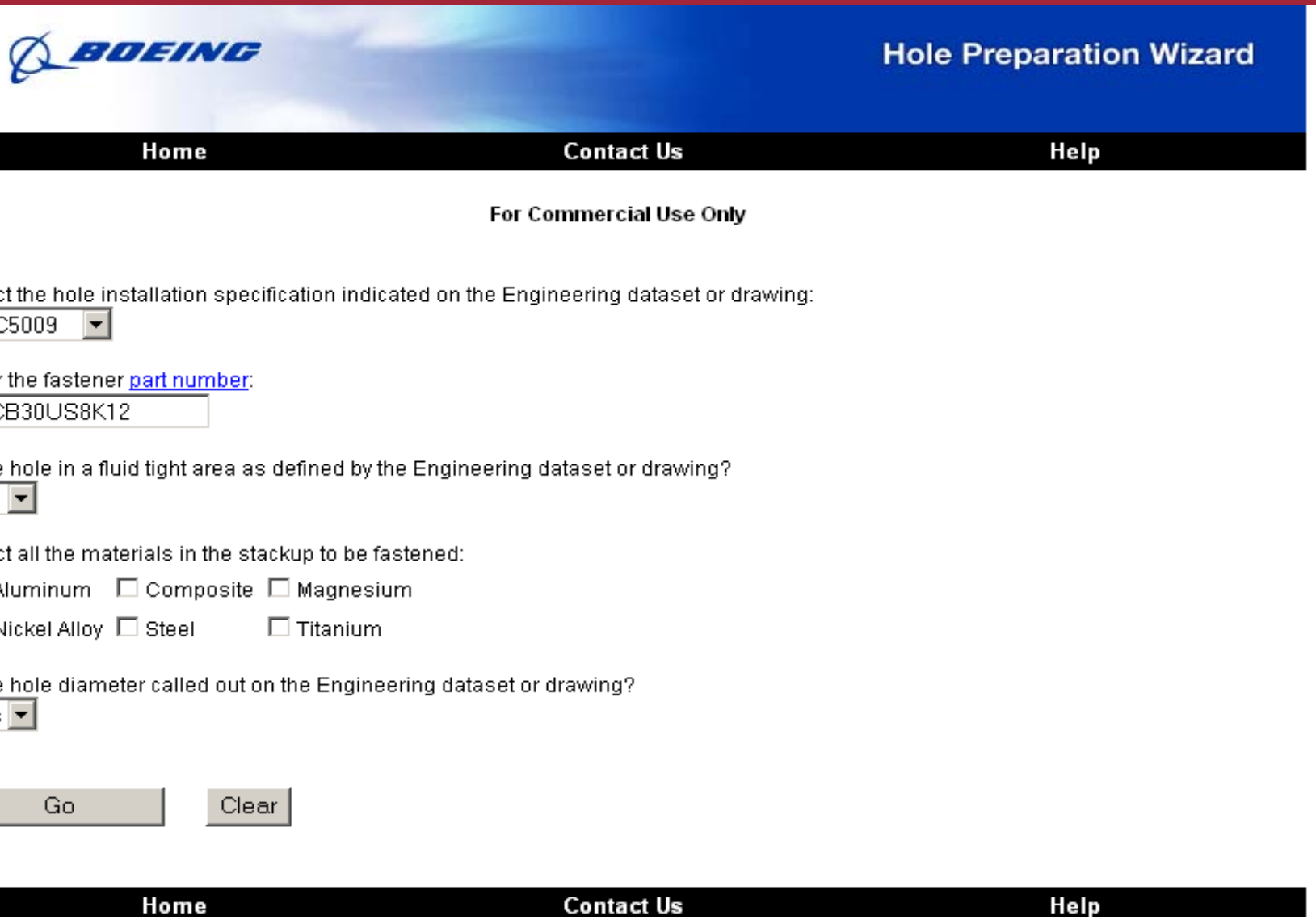
☐	Select the functional use category for this part.	**Category 1**
☐	Select the range which the maximum service temperature (F) of this part falls within.	**-65 to 180**
☐	Is this a welded or brazed assembly?	**No**
☐	Select the product form from which this part will be fabricated.	**Sheet (Thickness < .250)**
☐	Select one of the following joining methods, if required for this detail or for any other subsequent assembly using this detail.	**None**
☐	Select the alloy desired for this Sheet (Thickness < .250).	**2024**
☐	Does this design require clad material?	**No**
☐	Is this a standard part formed shape with a D-590 Standard Part number?	**Yes**
☐	Select the Aircraft Model.	**787**
☐	Select the condition of the material for forming.	**Form in O-Condition**
☐	Enter the purchased Sheet stock thickness (in inches).	**.1**
☐	Is this part located in a sonic fatigue environment, such as in the engine support area?	**No**
☐	Select the applicable fatigue design criteria for this part.	**Not Designed for Fatigue**

iPSM Gateway

Wizards

- **Web-based tools that use the digital standards structure to:**
  - **Interpret standards**
  - **Identify relevant information for a specific application**
  - **Provide the user with the optimum, sufficient data from the standard**
- **Capabilities:**
  - **Automatically generate authoritative, detailed, role based work instructions for the installation plans used by Manufacturing, Quality, Procurement, etc.**
  - **Automatically produce raw data from standards to be used directly by other systems or applications**

Wizards



Wizards

BOEING

Hole Preparation Wizard

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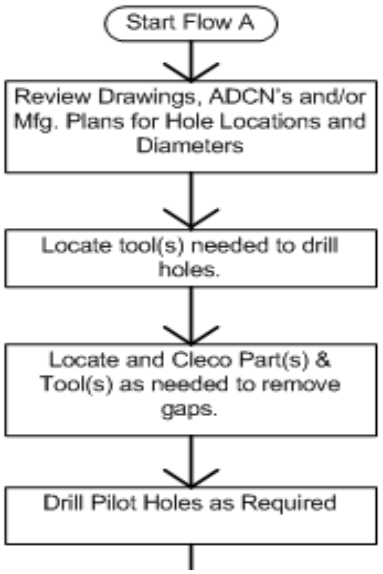
BAC5009 **BACK** (Restore Inputs)

For Commercial Use Only

Work Instructions: Critial Sequential Operations

All text in this font is product definition data from BAC specifications

Fastener = **BACB30US8K12** Nominal diameter = **0.5000**



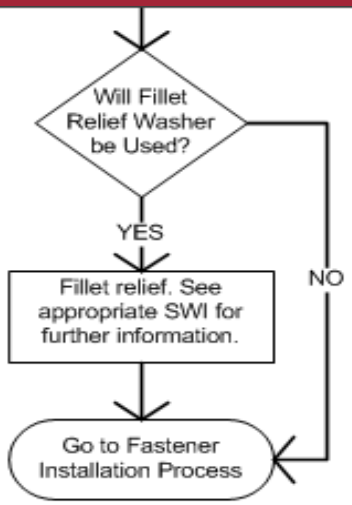
IRR sample size	Hole diameter min	Fillet relief rad max	Fillet relief rad min	Hole diameter max	*HP Reamer ST1864L-*	*HP Go - No Go Gauge ST8725D-*	*HP Pilot ST7099-*
All	0.5000	0.067	0.057	0.5050	*5000-468*	*	*4688-434*

HP Pilot COTS	*HP Csk ST1221JD-*	*HP Pilot DM-*	*5009 Max DRILL RPM for Al & Mg*	*5009 Max RPM REAMING Al & Mg*
15/32	*-7-498*	*NA*	*5000*	*500*

HP Reference: Class I, Refer 5009 AIM Table 2, Hole Preperation AIM Table 12, BAC5004-2 Table XIV

All linear dimensions in this specification are in inches.

Wizards

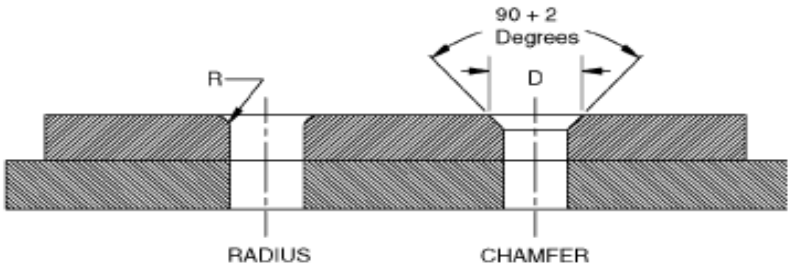


Pilot holes for reamers can be made with any type of cutter.

Fillet relief is required for protruding head fasteners as shown in BAC5009 Figure 5. Head to shank fillet relief can be accomplished by one of the following three methods:

- Provide a radius around the hole.
- Add a 45 degree chamfer around the hole.
- Install the fastener with a countersunk washer under the head according to Section 8.1.4a.

Reference BAC5009 table I for surface quality.



BAC5009 - FIGURE 5

Inputs Selected: Fastener=**BACB30US8K12**; Minimum diameter=**0.5000**; Maximum diameter=**0.5050**; Nominal diameter=**0.5000**; Head type=**PROTRUDING**; Washer on drawing=**No**; Lot size=**Up to 17**; Titanium or Steel=**No**; wzhm_specSelect=**bac5009**; wzhm_fluid_tight_hole=**No**; wzhm_matl_stackup=**Aluminum**

SWI Number : **SWI NOT AVAILABLE**

Please click on the "Submit to CAPP" button to create a SWI and send it to CAPP.

Submit to CAPP **Note:** Only authorized users can send SWIs to CAPP.

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Boeing Enterprise

Boeing Product Standards Long Range Strategic Plan

Boeing Product Standards Office

Revision C
June 2010

Revised by: Al Sanders, Ross Downing

Questions?