PLM Road Map™ & PDT North America 2023

The Digital Thread in a Heterogeneous, Extended Enterprise Reality

A call for PLM Professionals to share their knowledge & experience

May 3 & 4

CIMdata -eurostep-

AEROSPACE & DEFENSE PLM ACTION GROUP

Roadmap for Enabling Global Collaboration

Rob Gutwein – Associate Director, PLM Collaboration & Data Exchange, Pratt & Whitney Canada
Ansel Koehler – Digital Enterprise Capabilities Specialist, The Boeing Company

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Agenda

- Collaboration Team
- AD PAG History Global Collaboration Paper Edition 2
- AD PAG CMS Global Collaboration Paper and Guidelines
- Digital CMS Application
- AD PAG Next Steps

Presenters Bio

Robert Gutwein
PLM - Digital Technologies (DT)
Email: Robert.Gutwein@pwc.ca

Pratt and Whitney Canada

Robert Gutwein joined P&WC in 1983 as a Design Engineer.

His interest in new technology morphed into his current role as the DT-PLM Collaboration and Data Transfer Subject Matter Expert (SME) and Team lead.

He has lead projects establishing PLM connections with customers, partners, suppliers and P&WC Satellite Engineering Office (SEO) sites worldwide.

He is involved with P&WC teams developing strategies to improve collaboration internally and externally following the TDP, LOTAR, MBD and industry guidelines and best practices.

Robert has a Bachelor of Applied Science in Mechanical Engineering and a Bachelor of Computer Science from the University of Windsor.

He is the Project Manager of the Global Collaboration Working Group within the Aerospace & Defense PLM Action Group.

Presenters Bio

Ansel Koehler
Supplied Parts Capabilities and Solution Development
Email: Ansel.A.Koehler@Boeing.com

Ansel has 9 years at the Boeing company with experiences from Supply Chain Management, Value Engineering, IT Management and Core Engineering to now more specifically manage BCA Supplied Parts processes, data and tool development.

He represents Boeing as part of the A&D PLM Collaboration Team where he is also responsible for helping lead and deploy Global Collaboration Business Process and Tool Strategies.

Aerospace & Defense PLM Action Group

Founded in February 2014

Mission

An association of aerospace & defense companies within CIMdata's globally recognized PLM Community Program, which functions as a ***PLM advocacy group*** to:

- Set the direction for the aerospace & defense industry on PLM-related topics that matter to members
- Promote common industry PLM processes and practices
- Define requirements for common interest PLM-related capabilities
- Communicate with a unified voice to PLM solution providers
- Sponsor collaborative PLM research on member-prioritized industry and technology topics

Website: www.ad-pag.com

Members

AIRBUS, BOEING, EMBRAER, GE Aerospace, Gulfstream A General Dynamics Company, Pratt & Whitney, Rolls-Royce, SAFRAN

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A&D PLM Global Collaboration

Abstract (1 of 2)

- Collaboration among Original Equipment Manufacturers (OEMs) and their product design and manufacturing engineering partners and suppliers is key to any major aerospace and defense (A&D) program.
- Process analysis by an A&D PLM Action Group (AD PAG) project team has shown that the exchange of product data, such as 3D-MBD, Bill of Materials (BOM), and Model-Based Engineering (MBE), between multiple OEMs and suppliers presents a challenge within the industry.
- Currently, the exchange methods for long-term collaboration between OEMs and suppliers are independent and utilize exclusive environments and protocols, each unique and complex. Improving the consistency and efficiency of establishing and managing OEM-supplier collaboration can significantly improve cost, schedule, and quality across all phases of the product lifecycle.

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A&D PLM Global Collaboration

Abstract (2 of 2)

- This presentation offers a new “Desired State” for OEM-supplier collaboration through the application of and adherence to a set of guidelines defined by the project team.
- The A&D PLM Collaboration Guidelines lay out eight standard and repeatable steps for establishing and managing the environment where OEMs and suppliers collaborate.
- To facilitate the adoption of the A&D PLM Collaboration Guidelines, the project team has developed an open-service Collaboration Management System (CMS) web application.
- The CMS encapsulates and provides navigation through the eight-step guidelines and offers the potential to improve OEM-supplier collaboration consistency and efficiency within the A&D community.

A&D PLM Global Collaboration

Participants

AIRBUS
BOEING
Gulfstream A GENERAL DYNAMICS COMPANY
Rolls-Royce
PRATT & WHITNEY DEPENDABLE ENGINES
SAFRAN

Project Lead: Robert Gutwein, Pratt & Whitney Canada

Project Specialist: Ansel Koehler, The Boeing Company

CIMdata Team Coordinator: Ken Versprille, CIMdata

A&D PLM Global Collaboration

Team Objective

- The Aerospace and Defense Product Lifecycle Management Action Group (AD PAG) is an association of aerospace Original Equipment Manufacturers (OEMs) and aircraft engine manufacturers within CIMdata's globally recognized PLM Community Program, which functions as a PLM advocacy group.
- One of the key business issues (i.e., pain points) identified by this industry group is that collaboration within a large, global, distributed supply chain of design and development partners is seriously hindered by relying on traditional, document-based development processes. As such, a major business challenge identified by the group is to achieve OEM and supply chain collaboration through bi-directional exchange of Technical Data Packages (TDPs) via digital tools and model-based processes.
- In response, a project team of domain experts from the AD PAG member companies was established to evaluate current collaboration practices.

A&D PLM Global Collaboration

Ontology

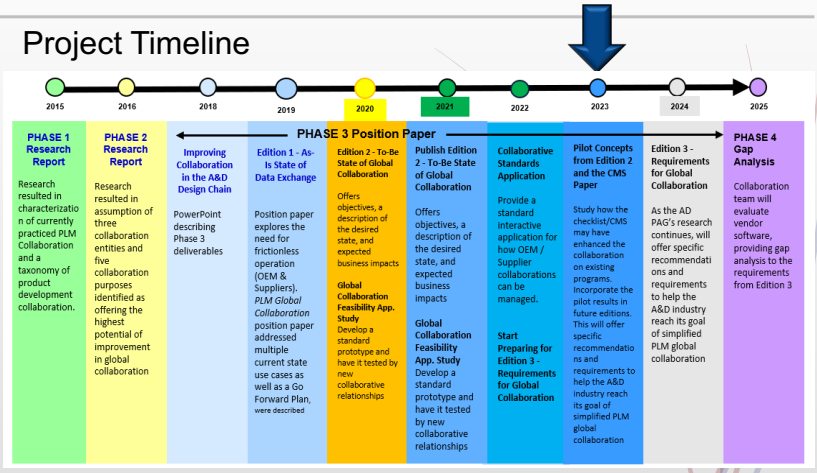
- The **original use cases and collaborative concepts were evaluated** in the development of desired collaboration framework.
- To better understand the context of collaboration framework, **the key terms** that the team considered are identified in a word cloud.

A&D PLM Global Collaboration

Timeline and Status

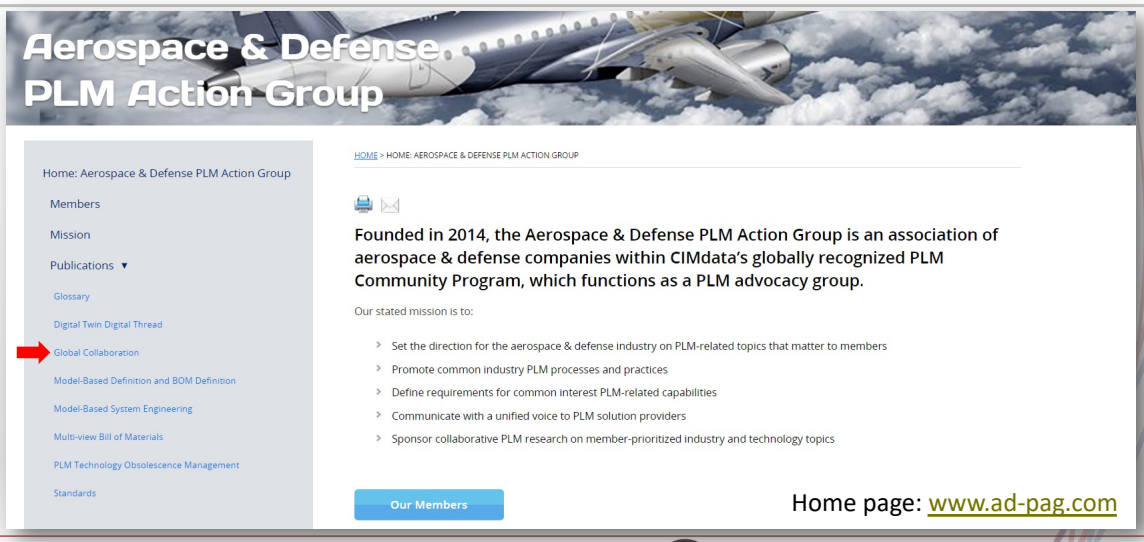
- **Edition 2** describing the **To-Be State of Global Collaboration** published supporting Standards and Aerospace Guidelines
- **Collaboration Management System (CMS) Paper and Web application** published to help digitize and implement Collaboration Guidelines

Project Timeline



A&D PLM Global Collaboration

Publications & Teams



Home page: www.ad-pag.com

A&D PLM Global Collaboration

Collaborative Communities

- A collaborative community is **two or more people from different groups or companies working jointly** on a project.
- As shown in the following figure, a collaborative community's main **objective is to efficiently design, manufacture, and support components throughout their lifecycle.**

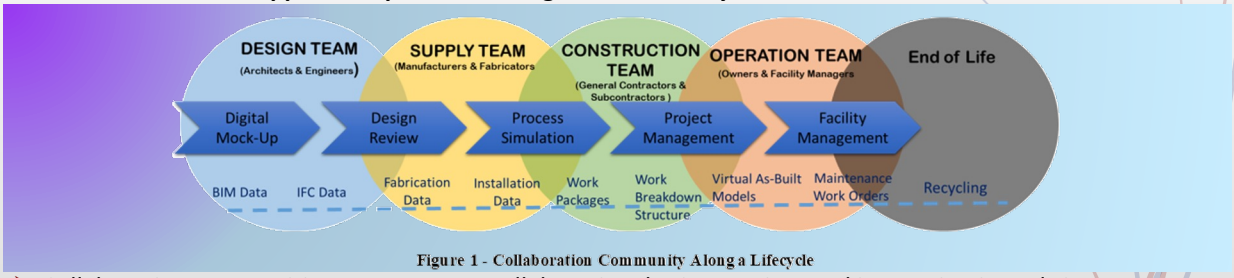


Figure 1 - Collaboration Community Along a Lifecycle

- Collaborative communities must support collaboration, brainstorming, and innovation in real-time.
- As stated in the Overview of the Desired Interactions between Business Entities section, collaborative community participants must also respect a common agenda to reach program milestones.

A&D PLM Global Collaboration

Evolution

SUPPLIER AGREEMENTS

NEED TO EVOLVE INTO FLEXIBLE CONTRACTS SUPPORTING MODEL-BASED DEVELOPMENT WITH ADVANCED COLLABORATION METHODS

DOCUMENT BASED DEFINITION of product with limited distribution and delayed communication through (paper, mail, scan/fax)

ELECTRONIC DEFINITION of product disrupted decades of industry standard practice with data transfer

CONNECTIVITY TECHNOLOGY, DATA FORMAT, intellectual property, and level of detail quickly rose as inhibitors to electronic data definition and transfer

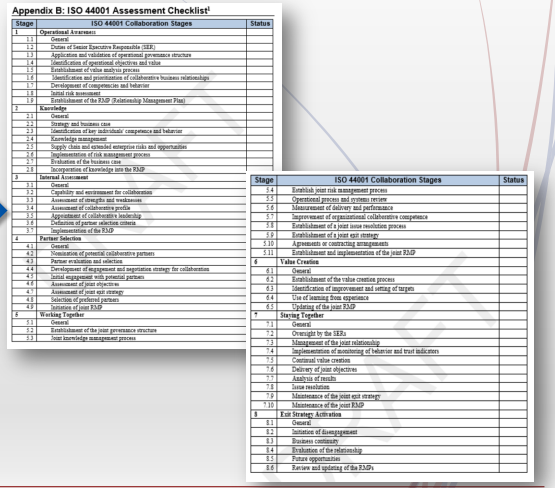
COLLABORATION IS NEEDED during all phases of program lifecycle. Levels of frequency and volumes will vary at each phase, which will determine the level of interconnectivity and interoperability.

A&D PLM Collaboration

Industry Standards

Standard	Publication Year	Title
ISO 11354	2011	*Advanced automation technologies and their applications — Requirements for establishing manufacturing enterprise process interoperability*
ISO 11354-2	2015	*Advanced automation technologies and their applications — Requirements for establishing manufacturing enterprise process interoperability — Maturity model for assessing enterprise interoperability*
ISO TR44000	2019	*Principles for successful collaborative business relationship management*
ISO 44001	2017	*Collaborative business relationship management systems — Requirements and framework*
ISO 44002	2019	*Collaborative business relationship management systems — Guidelines on the implementation of ISO 44001*
ISO 44003	2021	*Collaborative business relationship management — Guidelines for micro, small and medium-sized enterprises on the implementation of the fundamental principles*
ISO 44004	2021	*Collaborative business relationship management — Guidelines for large organizations seeking collaboration with micro, small and medium-sized enterprises (MSMEs)*
Mil Std 31000	Rev - 2009 Rev A - 2013 Rev B - 2018	Provides requirements for the deliverable data products associated with a TDP and its related TDP data

ISO 44001 Checklist



Appendix B: ISO 44001 Assessment Checklist[1]

Stage	ISO 44001 Collaboration Stages	Status
1	**Operational Arrangers**	
1.1	General	
1.2	Duties of Senior Executive Responsible (SER)	
1.3	Application and validation of operational governance structure	
1.4	Identification of operational objectives and value	
1.5	Establishment of value analysis process	
1.6	Identification and prioritization of collaborative business relationships	
1.7	Development of competencies and behavior	
1.8	Initial risk assessment	
1.9	Establishment of the RMP (Relationship Management Plan)	
2	**Knowledge**	
2.1	General	
2.2	Strategy and business case	
2.3	Identification of key individuals' competence and behavior	
2.4	Knowledge management	
2.5	Supply chain and extended enterprise risks and opportunities	
2.6	Implementation of risk management process	
2.7	Evaluation of the business case	
2.8	Incorporation of knowledge into the RMP	
3	**Internal Assessment**	
3.1	General	
3.2	Capability and environment for collaboration	
3.3	Assessment of strengths and weaknesses	
3.4	Assessment of collaborative profile	
3.5	Appointment of collaborative leadership	
3.6	Definition of partner selection criteria	
3.7	Implementation of the RMP	
4	**Partner Selection**	
4.1	General	
4.2	Nomination of potential collaborative partners	
4.3	Partner evaluation and selection	
4.4	Development of engagement and negotiation strategy for collaboration	
4.5	Initial engagement with potential partners	
4.6	Assessment of joint objectives	
4.7	Assessment of joint exit strategy	
4.8	Selection of preferred partners	
4.9	Initiation of joint RMP	
5	**Working Together**	
5.1	General	
5.2	Establishment of the joint governance structure	
5.3	Joint knowledge management process	
5.4	Establish joint risk management process	
5.5	Operational process and systems review	
5.6	Measurement of delivery and performance	
5.7	Improvement of organizational collaborative competence	
5.8	Establishment of a joint issue resolution process	
5.9	Establishment of a joint exit strategy	
5.10	Agreements or contracting arrangements	
5.11	Establishment and implementation of the joint RMP	
6	**Value Creation**	
6.1	General	
6.2	Establishment of the value creation process	
6.3	Identification of improvement and setting of targets	
6.4	Use of learning from experience	
6.5	Updating of the joint RMP	
7	**Staying Together**	
7.1	General	
7.2	Oversight by the SERs	
7.3	Management of the joint relationship	
7.4	Implementation of monitoring of behavior and trust indicators	
7.5	Continual value creation	
7.6	Delivery of joint objectives	
7.7	Analysis of results	
7.8	Issue resolution	
7.9	Maintenance of the joint exit strategy	
7.10	Maintenance of the joint RMP	
8	**Exit Strategy Activation**	
8.1	General	
8.2	Initiation of disengagement	
8.3	Business continuity	
8.4	Evaluation of the relationship	
8.5	Future opportunities	
8.6	Review and updating of the RMPs	

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A&D PLM Global Collaboration

Guidelines

A&D Collaboration Guidelines

1a. Prepare Recommended Collaboration for the Data Exchange Process

1b Assess Supplier Capabilities (4)

2. Commercial, Contractual and Legal Relationship

Done in parallel and can be done multiple times

3. Set up Governance (5)

4. Project management (1)

5. Set up Interfaces & organization (3)

6. Setup Collaboration Environment for Program Life

7. Program Review Process

8. End State (8) LoTAR

Objectives

- To optimize Collaboration supporting aerospace the A&D team developed and defined Aerospace Collaboration guidelines in Edition 2 paper
- These Guidelines evolved into a checklist which has been digitized into a web application Collaboration Management System (CMS)

Appendix A: A&D Collaboration Guidelines Checklist

Step	Global Collaboration Team Guidelines for A&D	Status
1	**Prepare for Collaboration and Data Exchange**	
1.1	Define Type and Scope of Data	
1.2	Define Recommended Way of Collaboration	
1.3	Define Recommended Project Management Terminology and Tool Set	
1.4	Define IP-Compliant Process	
1.5	Assess Collaboration Capability	
1.6	Supplier Selection Announced	
1.7	Data Collaboration Agreement	
1.8	Audit and Follow-Up	
2	**Establish Commercial, Contractual, and Legal Relationships**	
2.1	Define Data Exchange Rules and Processes	
2.2	Define Project Management Terms	
2.3	Monitor and Manage Contract Execution and Contractual Coverage of	
2.4	Anticipate and Mitigate Contractual Risks	
2.5	Amend the Contract	
3	**Set Up Governance**	
3.1	Establish Import/Export Guidelines	
3.2	Determine Intellectual Property (IP)	
3.3	Implement Security Protocol(s)	
3.4	Protect Personal Identifiable Information	
3.5	Conduct Collaboration Platform Review(s)	
4	**Establish Project Management**	
4.1	Supply Chain Management	
4.2	Authority Delegation	
4.3	Planning and Measuring	
4.4	Risk Analysis	
5	**Set Up Interfaces and Organization**	
5.1	Nominate Focal Points	
5.2	Provide Access	
5.3	Define a Support System	
6	**Set Up Collaboration Environment for Program Life**	
6.1	Preparation	
6.2	Initialization	
6.3	Operation	
7	**Conduct the Program Review(s)**	
7.1	Prepare the Optimized Program Review	
7.2	Conduct the Program Review	
7.3	Follow Up and Close the Program Review	
8	**Perform End State Tasks**	
8.1	Review Data for Archiving	
8.2	Archive the Data	
8.3	Decommission the Program/Project Collaboration Space	
8.4	Manage the Contract Expiration and Close and Terminate the Contract	

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A&D PLM Global Collaboration

Guidelines

The Collaboration Standard Methods

Example Step 4

Step 4
Establish Project Management

Step 4. Establish Project Management

Purpose: Establish a common means of collaborating and managing the engineering activity, including scheduling of activities, delivery, and performance measurement

Prerequisites:

- Type of contract has been determined (see Step 2)
- Contractual agreements include what types of data are exchanged, delivery dates, and costs
- Statement of Work is the technical work description

4.1 Supply Chain Management

A dedicated organization shall be put in place by Tier 1 for Tier 2 management with specific resources as applicable; the organization will:

- Manage the flow down of OEM requirements
- Deploy all applicable tools, methods, and training
- Commit to controlling and securing quality, on-time delivery of deliverables
- Demonstrate capabilities and practices for adequate control and management of deliverables

4.2 Authority Delegation

- Determine what tasks are to be performed
- Delegate those tasks as applicable

4.3 Planning and Measuring

- Provide reporting of deliverable progress (metrics)
- Define the term *late* (how does the OEM determine when items are late?)
- Plan for end-of-life of the program collaboration (see Step 8)

4.4 Risk Analysis

- Determine and mitigate any risks

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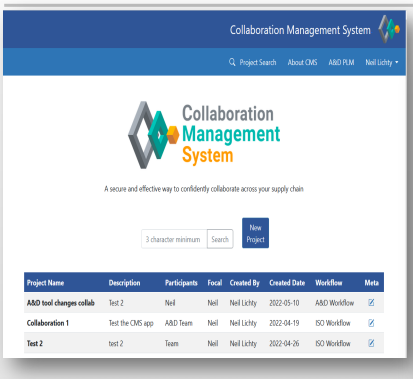
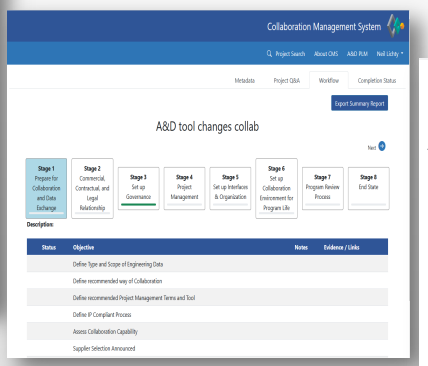
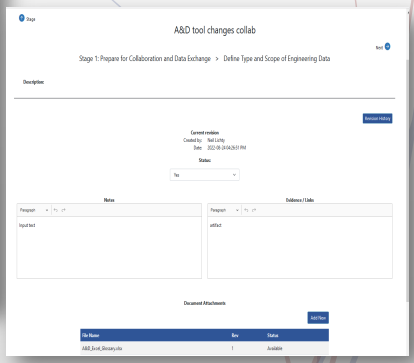
Application



Project work queue
(initial window upon login)



Collaboration status view showing progression of project stages



Individual collaboration objectives showing evaluation details including notes, deliverables and attachments

Images courtesy of Talisen Technologies

A&D PLM Global Collaboration

Application

Collaboration Test 1

Next

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8
Prepare for Collaboration and Data Exchange	Establish Commercial, Contractual, and Legal Relationships	Set Up Governance	Establish Project Management	Set Up Interfaces and Organization	Set Up the Collaboration Environment for Program Life	Conduct the Program Review(s)	Perform End State Tasks

Description:

Purpose: To define and describe the data to be exchanged, the capabilities required for an efficient collaboration, and the project management rules. To select a supplier based on data exchange and project management capabilities (all other criteria are not part of Step 1) or to define what is awaited from the supplier already selected.

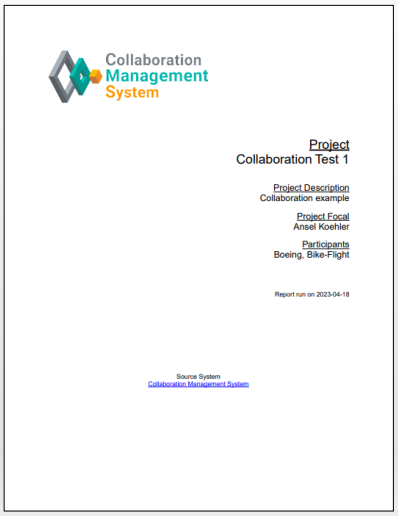
Prerequisites:

- Applicable regulations are identified, supporting the project (consider worldwide business relationships, governments, and regional authorities)
- Statement of Work has been defined (work scope defines category of supplier relationship, such as design and build to spec, design or other intellectual services, equipment)
- Export control and Intellectual Property (IP) agreement concerns are part of Step 3, and export control rules are not to be discussed but only observed
- Conditions to select a supplier are known

Status	Objective	Notes	Evidence / Links
Complete	Define Type and Scope of Data	to build a flying bicycle	
Complete	Define Recommended Way of Collaboration	bi-weekly meetings for 1 hour	
Complete	Define Recommended Project Management Terminology and Tool Set	MS Azure	

A&D PLM Global Collaboration

Application Reporting


Collaboration Management System

Project
Collaboration Test 1

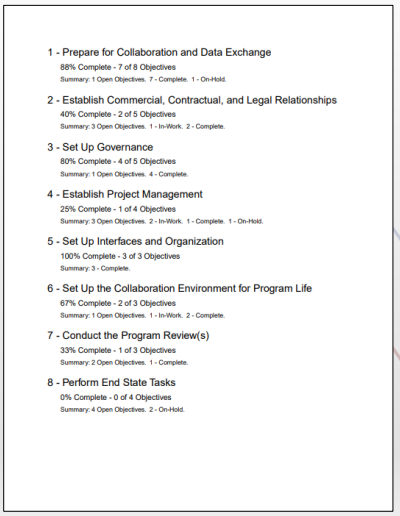
Project Description
Collaboration example

Project Focal
Ansel Koehler

Participants
Boeing, Bike-Flight

Report run on 2023-04-18

Source System
Collaboration Management System


1 - Prepare for Collaboration and Data Exchange
88% Complete - 7 of 8 Objectives
Summary: 1 Open Objectives. 7 - Complete. 1 - On-Hold.

2 - Establish Commercial, Contractual, and Legal Relationships
40% Complete - 2 of 5 Objectives
Summary: 3 Open Objectives. 1 - In-Work. 2 - Complete.

3 - Set Up Governance
80% Complete - 4 of 5 Objectives
Summary: 1 Open Objectives. 4 - Complete.

4 - Establish Project Management
25% Complete - 1 of 4 Objectives
Summary: 3 Open Objectives. 2 - In-Work. 1 - Complete. 1 - On-Hold.

5 - Set Up Interfaces and Organization
100% Complete - 3 of 3 Objectives
Summary: 3 - Complete.

6 - Set Up the Collaboration Environment for Program Life
67% Complete - 2 of 3 Objectives
Summary: 1 Open Objectives. 1 - In-Work. 2 - Complete.

7 - Conduct the Program Review(s)
33% Complete - 1 of 3 Objectives
Summary: 2 Open Objectives. 1 - Complete.

8 - Perform End State Tasks
0% Complete - 0 of 4 Objectives
Summary: 4 Open Objectives. 2 - On-Hold.

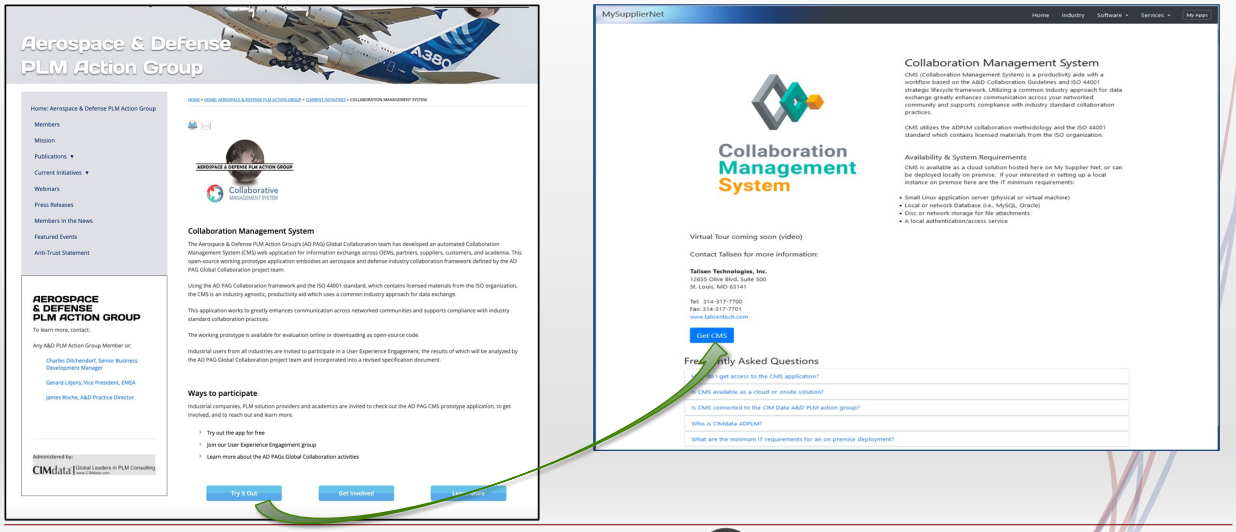
A&D PLM Global Collaboration

App and Documentation

- A&D Collaboration team worked with 3rd party (Talisen Technologies) to build the CMS Application to facilitate digital collaboration
- CMS Provides an optimized solution for how OEM/Supplier collaborations can be managed
- CMS Manages the 8 Step collaboration guidelines as a digital solution
- The CMS application is an open service solution supporting A&D Collaboration team strategy for digital collaboration industry engagement in a free cloud-based service via Talisen or an on-site solution with software licensing
- Requests from other software providers for Collaboration specifications and/or applications are welcome

A&D PLM Global Collaboration

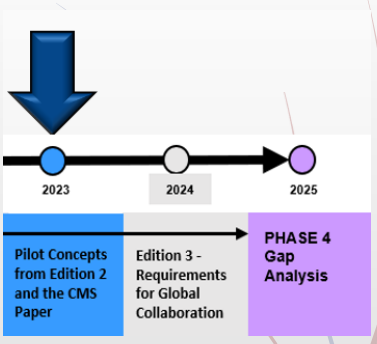
CMS Web Application Information



A&D PLM Global Collaboration

Next Steps

1. CMS Document & Application
   - Target release May 2023
2. A&D PAG internal Pilots
   - A&D PAG Member Pilot completed on a current project, CMS feedback captured for use on future programs
   - A&D PAG Member retrospect Pilot started to identify Benefits and Gaps if the CMS tool had been available at the start of the Joint Collaboration program
3. A&D PAG – SW Provider Requirements for Global Collaboration
   - Target release 2024
4. Following up with a GAP Analysis
   - Target release 2025



Visit us at the A&D PLM Action Group Booth in the Collaboration Café