Transform **Experience**
Transform **Business**

Aerospace & Defense
Model Based Enterprise 2.0

HCL Aerospace & Defense Story

20+ years experience in delivering business transformation programs for A&D industry leaders

Deep understanding of business functions that intersect and support core functions of engineering, and manufacturing operations within Aerospace and Defense enterprises which include - Production Control Logistics (PCL), supply chain and solution approaches that are needed in SAP (ERP) and reporting/analysis tools

Delivered 75+ SAP implementations to A&D clients worldwide

- 8 of 12 business jet and helicopter manufacturers that run SAP
- 15 of the top 20 Aerospace and Defense companies

Led development of iMRO, SAP's industry solution for aerospace MRO

SAP Pinnacle Award for Co-Innovation (2018)

Strong proven experience for strategy and implementation with Connected Machines, Industry 4.0 and Model Based Enterprise 2.0

HCL is changing the way users are performing their everyday jobs by

- Creating new frictionless and intelligent processes
- Implementing responsive and fluid UIs, RPA, chat bots, voice interaction, and augmented reality
- Implementation of braided design methodology

Business Transformation Expertise

Enterprise Business Transformation

- Procure to Pay (P2P)
- Material Handling (MHL) IM/WM logistics
- Finance (FI/CO)
- Product Design to Delivery (PD2R)
- Human (PD2R) Resources (HR)
- Quote to Cash (QTC)
- Aftermarket (MRO)
- Manufacturing (Shop Floor)
- Quality (QM)

Aerospace & Defense Specific Functionality

- Government Contracting
- Grouping, Pegging & Distribution (GPD)
- Project accounting & earned value management
- Manufacturing execution & complex assembly

Technology Enablement

- Re-platforming
- Experience Transformation
- Robotic Process Automation
- Predictive Analytics

Model Based Enterprise 2.0

- Connected Factory (Industry 4.0)
- A&D taxonomy master data management
- Disputed system territory

PLM | MES | ERP

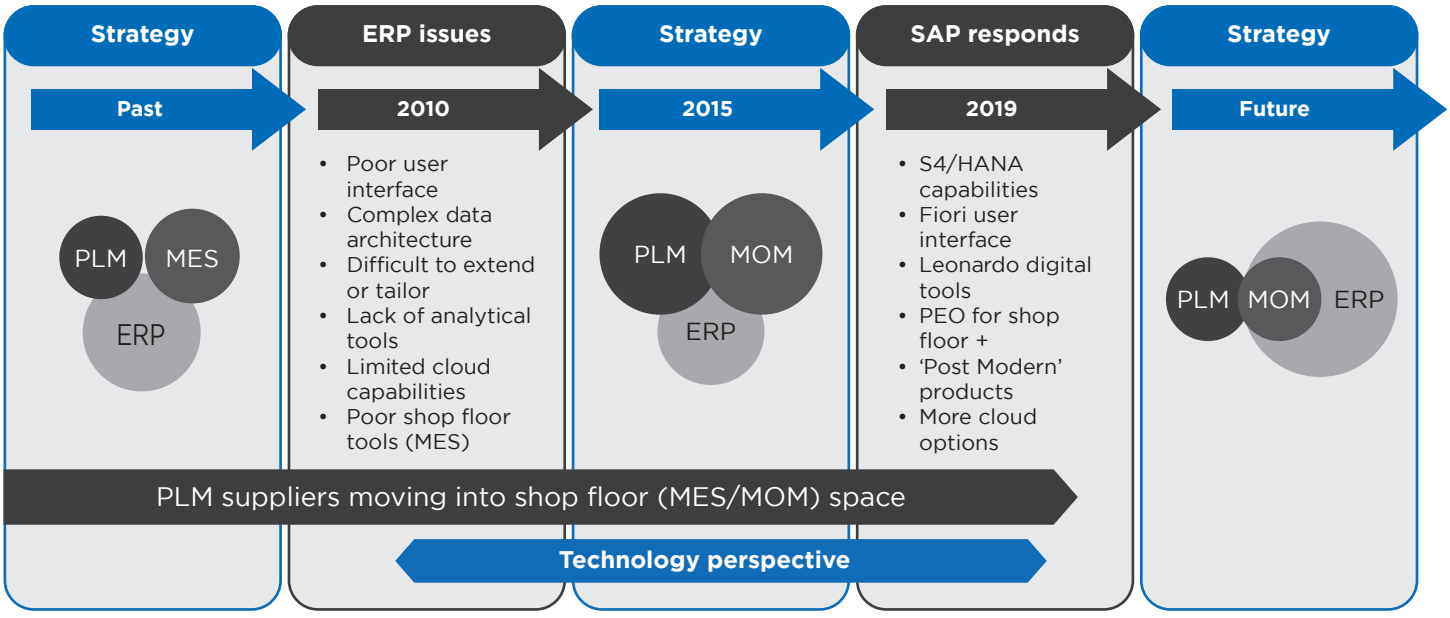
CAPP, Shop Floor, Quality, Program Mgmt, etc.

Aerospace and Defense Manufacturing Perspectives

Aerospace and Defense (A&D) industry contributes $900 billion to the world economy. The Aerospace and Defense manufacturing market segment is utilizing advanced technologies to improve production and cost in areas of:

- Increased functionality into cell or Flexible Manufacturing Systems (FMS)
- All A&D manufacturing enterprises are singing the praises of composites and reviewing the benefits over metal and are focused to address how additive manufacturing certification process can be achieved
- Non-contact point sensor {fiber-optic-laser source} to enable next-gen measurement solutions
- Innovative design concepts which involves 3D data as master
- Companies are sharing how putting knowledge workers at the center of the manufacturing enterprise empowers them
- Embed Artificial intelligence (AI)/ Machine Learning (ML) with capacity management, ERP-PLM integration, location analysis, maintenance, process optimization and supply-chain
- Enterprises that have embarked on their engineering and manufacturing digital transformation journeys (everything is model based) have already realized that communication and change management processes are just as important as the technological components

Innovation is all around and with a promising outlook, the themes for reference architectures involving digital transformation, digital thread/model based systems (engineering, manufacturing, sustainment), Connected Machines, Connected Factory/Factory of the Future/Industry 4.0 to enable the digital twin has retriggered the holy grail battle on PLM-MOM-ERP



HCL Client Offerings for A&D Manufacturing

Activity	SAP Solution Focus	Offering	Business Impact
Assessment & Strategy Consulting	Decision making framework for manufacturing digital transformation	Comprehensive assessment and report out strategy for digital continuity (PLM-MOM-ERP)	Enabling Model Based Enterprise 2.0 (MBE 2.0)
Sourcing & Procurement	Ariba	Strategic sourcing and procurement assessment with system show and tell	• Value-driven Source-to-Contract transformation • Procure to Pay
Digital Manufacturing	SAP PCO, SAP MII, DMC	Machine connectivity and capability assessment for OEE (availability, performance, and quality), Conference Room Pilot's (CRP) for use cases	Enable better decisions to meet dynamic demands
	SAP S/4HANA with Production Engineering & Operations (PEO)	Digital Thread and Industry 4.0 capability assessment for A&D business use cases and architecture, CRPs for use cases	• MoM strategy definition • Return on Investment (ROI) for manufacturing • Digital ransformation based on Model Based Enterprise 2.0 (MBE 2.0)
	SAP Manufacturing Execution (ME)		
	SAP S/4HANA with QM, Quality Issue Management (QIM), EWM, Material Req. Planning & Production Scheduling, Global Track & Trace, EH&S, PM, and AIN	Assessment of MOM capability already in ERP & review benefits of value drivers and process optimizer's use cases, and CRPs for use cases	
Enterprise User Experience	Fiori/UI5 Apps	Fiori (HTML5, CSS) assessment/ roadmap, CRPs for use cases	Performance measurement focused across levels & business interactions
Digital Enablement	SAP Cloud Migration	Cloud readiness assessment and roadmap	• Business driver's alignment • Develops IT transformation KPIs (investment metrics)
Connected Shop floor	Leonardo IoT, SAP Edge Gateway (Dynamic Edge Processing)	Design Thinking & IoT Medallion Accelerators, CRPs for use case	Enable better decisions to meet dynamic demands

Building an Intelligent Enterprise

Accelerating optimized performance

SAP/HCL approach covers A&D processes from Inception to Retirement including source decisions, production definition, process elaboration, order execution, IoT automation, asset definition, quality conformance, financial reporting, analytics and total performance management.

INCEPTION

1. Model Based Definition
- 3D models / structures
- Item master
- PMI data

2. Process simulation
- Manufacturing access
- Manufacturing simulation
- Shop automation

3. Engineering handover
- EBOM/MBOM
- Change management
- Make / buy

4. Process planning
- Routing definition
- Item master
- PMI data

5. Integrated business planning
- Real-time scenarios and simulation
- Social collaboration
- Powerful predictive analytics

6. Procurement
- Supplier management
- Strategic sourcing
- Supply chain

7. Warehouse management
- Comprehensive warehouse solution
- Fully integrated quality, production, and track-and-trace processes

8. IT/OT convergence
- IoT service
- Advanced analytics
- Connectivity options

9. Production operations
- Real time insight
- Full MES functionality
- Intelligent change management

10. Quality
- Quality planning
- Quality assurance
- Quality control

11. End item delivery
- As built history
- Cost allocation
- Contractual compliance

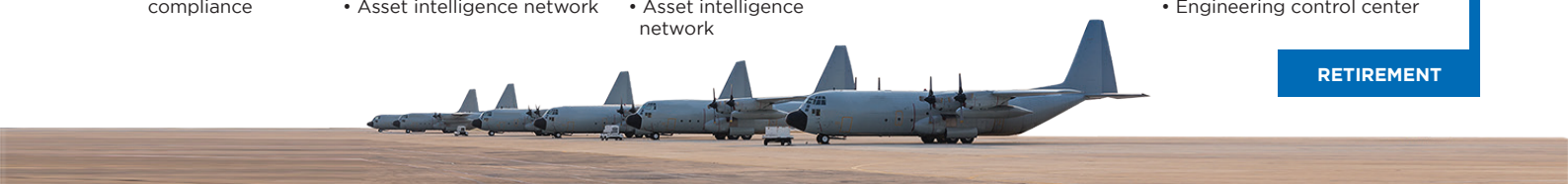
12. Product operations
- Maintenance, Repair, Overhaul
- Predictive maintenance
- Asset intelligence network

13. Services & support
- Maintenance, repair, overhaul
- Predictive maintenance
- Asset intelligence network

14. Product retirement
- Rotables
- Quality management
- MRO

15. Continuous improvement
- Intelligent engineering
- Intelligent change management
- Engineering control center

RETIREMENT



The HCL Difference

Why we make a good partner for Digital Thread and Industry 4.0/Factory of the Future/ Model Based Enterprise 2.0

4200 A&D related employees	>$500 Mn A&D related revenue	5 ITAR compliant delivery location	7 secure global defense locations

HCL creates SAP products

- SOLEX-SAP enterprise asset management, add-on for MRO by HCL for SAP S/4HANA
- HCL provides product development service to SAP Labs

HCL tailors SAP products

- BASE90: Only SAP certified extension for Aerospace and Defense
- Co-innovation: Aerospace & Defense related SAP Cloud platform solutions

HCL partners with SAP

- HCL Group is one of the largest OEM Partner of SAP Cloud platform (strategic MoU with SAP)
- Member of SAP SUGAIR Advisory Council

HCL's Model Based Enterprise 2.0 experience enabled with SAP products

- HCL deep manufacturing experience within A&D and other discrete manufacturing companies
- Innovation and IOT enablement across manufacturing

HCL's strong engineering background

- HCL provides engineering support to many of the top A&D customers that interface to SAP
- Ability to make the connection along the digital thread from engineering through manufacturing

HCL implements SAP

- Global strategic service system integrator
- Among top 3 global SI Partner for Aerospace and Defense

HCL's Experience with Manufacturing, Automation & Communication Systems

Create a 'connected shop floor' environment across factories

ISA 95 Layer 2, 1, 0 Plant Floor SCADA, HMI, DCS, PLC

Supervisory Systems

Data Collection and Controls

Physical Process

Types of control systems

PLC's (Siemens, Allen-Bradley, Mitsubishi, GE), CNC's (Fanuc, Haas, Siemens), HMI/SCADA, custom control systems, robot vision systems

Machine suppliers for A&D

Methods Machine, Absolute Machine Tools, Okuma, Sandvik, Mitsui Seiki, Chevalier, Mitsubishi, Makino, Unisig, Norton (Saint Gobain), Chiron, Bruker Alicona, JTEKT Toyoda, Zimmermann, SLM, Rego-Fix, Hurco, Mazak, DMG Mori, Haas, Thermwood, Mori Seiki, Zeiss, Campro, Chiron

A&D manufacturing

Lathes, Milling Machines, Ovens, CMM's, Grinding Machines, Coating Machines, EDMs, Multi-Axis Machines, Custom Designed Machinery & Components (Modelling of the machine, tooling, robotics, etc. Simulations for machine / robotic movement), control panels design & layout, fabrication

Types of communication protocols

Industrial Ethernet (TCP/IP- S7, ControlNet, FOCAS, Ethernet/IP, Data Highway Plus (DH+) ...) MTConnect,CNCnetPDM, OPC, Modbus, Profibus, CAN, ASCII, UNH based on open standards

IoT edge computing, dynamic edge processing platforms

SAP, Cisco, Dell, VMware, Hyperscalers (for - IoT Adapter, IoT Edge Console, streaming engine, database

LABS, PARTNERSHIP & CENTER OF EXCELLENCE

Tools & reference material

Catalogs and Configurator Software from OEM's {Selection Guides and Technical Data Publications}, PC/Servers, Regulatory Compliance (RoHS/WEEE) database

To learn more about HCL Aerospace & Defense services, please write us at sharad.maheshwari@hcl.com or roy.davis@hcl.com

HCL

HCL Technologies (HCL) empowers global enterprises with technology for the next decade today. HCL's Mode 1-2-3 strategy through its deep-domain industry expertise, customer-centricity and entrepreneurial culture of ideapreneurship™ enables businesses transform into next-gen enterprises.

HCL offers its services and products through three business units - IT and Business Services (ITBS), Engineering and R&D Services (ERS) and Products & Platforms (P&P). ITBS enables global enterprises to transform their businesses through offerings in areas of Applications, Infrastructure, Digital Process Operations and next generational digital transformation solutions. ERS offers engineering services and solutions in all aspects of product development and platform engineering while under P&P, HCL provides modernized software products to global clients for their technology and industry specific requirements. Through its cutting-edge co-innovation labs, global delivery capabilities and broad global network, HCL delivers holistic services in various industry verticals, categorized under Financial Services, Manufacturing, Technology & Services, Telecom & Media, Retail & CPG, Life Sciences & Healthcare and Public Services.

As a leading global technology company, HCL takes pride in its diversity, social responsibility, sustainability and education initiatives. As of 12 months ended June 30, 2020, HCL has a consolidated revenue of US $ 9.93 billion and its 150,287 ideapreneurs operate out of 49 countries. For more information, visit https://www.hcltech.com

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