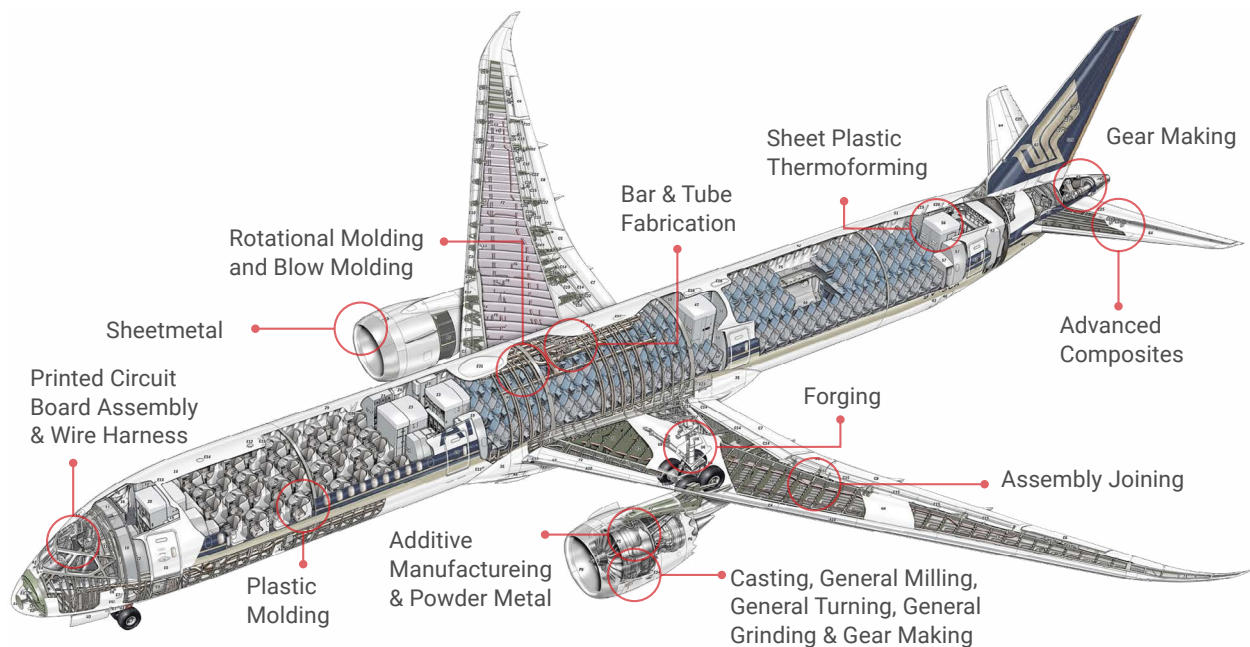




Manufacturing Process Models for Aerospace








Physics-Based Process Models








Overview




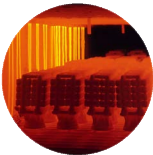
aPriori's Manufacturing Process Models simulate manufacturing processes and deterministic routings to optimize production based on cost, sustainability, and manufacturability requirements. Our physics-based manufacturing process models allow engineering, manufacturing, and purchasing professionals to explore production alternatives down to the machine level. Use aPriori to unlock insights during early design stages to accelerate time-to-market and address market needs rapidly.

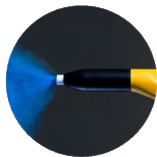


Manufacturing Process Group	Supported Sub Processes and Operations	Aerospace Application and Example Components
Sheetmetal 	<ul style="list-style-type: none"> • Stretch Forming • Hydroforming • Roll Bending (2, 3, 4 Rollers) • Soft Tooling Processes • Basic Stamping • Elesto-Forming* 	Airframe Substructure Frames, Clips, Shear Ties, Skins, Fairings, Leading and Trailing Edges
Chemical Milling 	Cleaning, Identing, Masking Operations (Spraying, Curing, Scribing, Line Sealing, Spark Testing, Removal), Etch Cycle Operations (Mask Peeling, Etching, Rinsing, Depth Inspection), Final Inspection	Fuselage Panels, Wing Skins, Horizontal and Vertical Stabilizer Skins

Manufacturing Process Group		Supported Sub Processes and Operations	Aerospace Application and Example Components
Machining: General Milling 		<ul style="list-style-type: none"> • 3-4-5 Axis CNC Milling • Sawing/Cut-to-Length • Gun Drilling • Wire EDM • Drill Press • Deburring • Jig Boring • Assembly Milling (User-Guided) 	Wing Ribs and Spars, Fuselage Frames, Bulkheads, Fittings, Brackets, Seat Tracks, Landing Gear Components, Gearboxes, Transmissions
Machining: General Turning 		<ul style="list-style-type: none"> • 2-3-Axis CNC Conventional Lathes • 2-3-axis Bar Feed lathes • Mill-Turn • Deep Bore/Trepanning • Lathe Roughing (on castings) • Lathe Finishing • Single Point Threading • Single Plunge Grooving • Multi-Plunge Grooving 	Engine Components, Fluid Handling Systems, Actuation Systems, Couplings, Valves, Sensors
Machining: General Grinding 		<ul style="list-style-type: none"> • OD Grinding • ID Grinding • Surface Grinding • Rotor Grinding • Jig Grinding • Cylindrical Grinding 	Close Tolerance Engine Components, Landing Gear Components, Fluid Handling Systems, Couplings, Valves, Sensors
Casting 		<ul style="list-style-type: none"> • Sand Casting • High Pressure Die Casting • Gravity Die Casting • Investment Casting 	Engine Components, Interior Components, Exterior and Interior Sensors, Motion Control and Actuation Systems, Hydraulic Fluid System Components, Cargo Systems, Landing and Braking Components
Bar & Tube Fabrication 		<ul style="list-style-type: none"> • Bar Forming • Expansion • Flanging • Flaring • Flattening • Knurling • Notching • Reduction • Slotting 	Hydraulic and Pneumatic Systems, Fuel Lines, Structural Tubing
Aluminum Extrusion Fabrication 		<ul style="list-style-type: none"> • Die and Billet Preheating • Release Agent • Application • Cooling • Rough Cutoff • Straightening • Racking • Aging • Secondary Material Removal 	Structural Components in Wings and Fuselages, Trim Pieces Inside Fuselage
Forging 		<ul style="list-style-type: none"> • Closed Die Hammer Forging • Ring Rolled Forging 	Pylons, Landing Gear Axles, Structural Frames, Bulkheads, Turbine Cases, Transmission Components

Manufacturing Process Group		Supported Sub Processes and Operations	Aerospace Application and Example Components
Gear Making		<ul style="list-style-type: none"> Die and Billet Preheating Release Agent Application Cooling Rough Cutoff 	Structural Components in Wings and Fuselages, Trim Pieces Inside Fuselage
		<ul style="list-style-type: none"> Straightening Racking Aging Secondary Material Removal 	
Advanced Composites		<ul style="list-style-type: none"> Hand Layup Automated Tape Layup Automated Fiber Placement 	Fairings, Wing Ribs, Stringers, Shear Ties, Frames, Door Panels, Skin Panels, Control Surfaces
Additive Manufacturing		<ul style="list-style-type: none"> SLA SLS DMLS Material Jetting SLM* 	Engine Components, Nozzles, Mounting Brackets, Jigs and Fixtures, Prototypes
Powder Metal		<ul style="list-style-type: none"> Compaction Pressing, Furnace Sintering 	Aircraft Engine Components
Plastic Molding		<ul style="list-style-type: none"> Single Shot Injection Molding Over-Molding Insert Molding Structural Foam Molding Reaction Injection Molding Rubber Molding (Small Plugs for Holes, Grommets, O-Rings, Seals)* 	Housings, Lenses, Panels, Enclosures and Containers, Seat Components, Galley Equipment
Rotational Molding and Blow Molding		<ul style="list-style-type: none"> Extrusion Blow Molding Material Grinding/Pulverizing Trimming/Routing 	Ducting/Ventilation Systems, Ram Air Inlets, Avionics Cooling Systems
Sheet Plastic Thermoforming		<ul style="list-style-type: none"> Vacuum Forming Drape Molding 	Interior Panels, Seat Shells, Tray Tables, Armrests

Manufacturing Process Group		Supported Sub Processes and Operations	Aerospace Application and Example Components
Printed Circuit Board Assembly 		<ul style="list-style-type: none"> • Component Preparation • Kitting • Surface Mount Assembly • Plated through Hole Assembly • Depanelization • Testing • Conformal Coating 	Cockpit Instrumentation, Navigation Systems, In-flight Entertainment Systems, Avionics, Power Management Systems, Control Systems, Lighting
Wire Harness 		<ul style="list-style-type: none"> • Wire/Bundle/Conduit Prep • Wire Termination • Connector Assembly • Splice • Branch Covering • Braid • Harness Layout • Labeling • Testing 	Cockpit instrumentation, Navigation systems, In-Flight Entertainment, Power Management Systems, Control Systems, Lighting
Assembly Joining 		<ul style="list-style-type: none"> • Riveting • Lock Bolts • Nutplate Installation • Adhesive Bonding • Manual MIG Welding • Manual Spot Welding • Robotic MIG Welding • Robotic Spot Welding • TIG Welding, Laser Welding • Electro-Beam Welding • Resistance* • Ultrasonic and Friction Welding* • Brazing* • Soldering* 	Fastened Substructure and Skin Assemblies, Turbine Component Welding, Airframe Structure
Heat Treatment 		<ul style="list-style-type: none"> • Aging • Annealing (3 types) • Cryogenic Freezing • Solutioning • Stress Relieving • Surface Hardening (3 types) • Tempering (2 types) • Through Hardening (4 types) • Hot Isostatic Pressing • Normalization* • Chromizing* • Borizing* • Most Heat Treatments—both whole part and localized* 	Engine components, Airframe Structure

Manufacturing Process Group	Supported Sub Processes and Operations	Aerospace Application and Example Components
Surface Treatment 	<ul style="list-style-type: none"> • Shot Blast • Degreasing • Basic Painting • Anodizing • Powder-Coat • Cart Painting • Wet-Coat Line Painting • One-Sided Fraction Painting • Plating (4 types) • Silk Screening • Passivation • Vibratory Deburr • Chem Film* • Booth Painting* • Protective Coat* • Most Surface Treatments—both whole part and localized* 	Structural components, Skins, Interior, Propulsion Systems
User-Guided Processes (for costing without CAD)	<ul style="list-style-type: none"> • Turret Press • Bend Brake • Stage Tooling • Progressive Die • Injection Molding 	Early Costing with Minimal CAD Definition

* Additional cost required to develop and deliver the processes listed with an asterisk. The aPriori Applied Services team may also be able to deliver processes not in this list after evaluating the requested processes and confirming the capability to develop a solution.

WANT TO LEARN MORE?

CLICK HERE to schedule a demo of the aPriori Manufacturing Insights Platform.

Corporate Headquarters USA

Concord, MA | hello@apriori.com

APAC

Tokyo, Japan | apac@apriori.com

EMEA

Belfast, Northern Ireland | emea@apriori.com

DACH

Munich, Germany | dach@apriori.com

aPriori