BUILDING AMERICA'S AEROSPACE & DEFENSE CAPABILITIES

OUR DIFFERENTIATED APPROACH

Re:Build Manufacturing offers a unique combination of vertical integration, technical depth, and security compliance that addresses the most critical challenges facing aerospace and defense programs.

END-TO-END VERTICAL INTEGRATION

- Single-source accountability from concept through production
- Integrated supply chain: composites, metallics, electronics, batteries, wire harnesses
- Eliminates multi-vendor coordination delays and interface risks

U.S.-BASED SECURE MANUFACTURING

- AS9100 certified with ITAR, NIST 800-171, and DFARS compliance
- Domestic supply chain prioritization with vetted partners
- FEOC-ready battery and electronics solutions

RAPID DEVELOPMENT TO PRODUCTION SCALE

- Manufacturability for Design™ (MFD) embedded from concept validation
- 4-month concept-to-flight demonstrator track record (XRAE-1)
- Flexible scaling from prototype to 100K units/year rate

MISSION-CRITICAL TECHNICAL DEPTH

- 50+ aerospace customers across diverse projects
- 20 vehicle first flights and 14 full FAA/Military/LSA certifications completed
- Multi-disciplinary engineering: structures, propulsion, autonomy, electronics

EARLY-STAGE RISK REDUCTION & SYSTEMS ENGINEERING

PROGRAM STRATEGY & MISSION DEVELOPMENT

MISSION & RISK ANALYSIS

- Mission and risk analysis
- Technical risk identification with mitigation strategies
- Mission profile analysis and operational scenario modeling
- FMEA (Failure Mode and Effects Analysis)
- Cost-benefit and risk-reward trade studies
- Launch and deployment risk assessment
- Mission requirements definition

SYSTEM ARCHITECTURE DEVELOPMENT

- System architecture development
- Requirements decomposition and allocation
- Interface control document (ICD) creation
- System-level architecture for complex platforms
- Stakeholder requirements capture and traceability
- GN&C system requirements
- Structural and thermal specifications
- Power distribution architecture

TECHNOLOGY ROADMAPPING & FEASIBILITY

- Product and technology roadmapping
- Technology maturity assessment (TRL 1-9)
- Integrated master schedule (IMS) development
- Long-term technology insertion planning
- Manufacturing Readiness Level (MRL) planning
- Technology gap identification

TRADE STUDY & CONCEPT ANALYSIS

- Trade study analysis execution
- Mission-focused concept development
- Aerodynamic and structural configuration trades
- Propulsion and power system trade-offs
- Technology selection with TRL assessment
- Manufacturability and cost analysis
- Make-vs-buy analysis with ITAR compliance considerations

CFD & AERODYNAMIC ANALYSIS

- CFD and aerodynamic analysis
- Computational fluid dynamics for performance optimization
- Drag reduction and lift optimization
- Propulsion efficiency analysis
- Thermal modeling and heat dissipation

PROOF-OF-CONCEPT DEVELOPMENT

- Proof-of-concept prototype development
- AS9100 and ITAR feasibility
- Requirements validation workshops
- U.S. supply chain assessment
- System architecture planning

PRELIMINARY DESIGN REVIEWS

- Preliminary design reviews
- Design review coordination
- Stakeholder alignment sessions
- Technical baseline establishment

AEROSPACE-GRADE DESIGN, ANALYSIS & CERTIFICATION

STRUCTURAL DESIGN & ANALYSIS

STRUCTURAL DESIGN SERVICES

- Detailed airframe CAD models
- Composite and metallic structures
- Primary and secondary structure design
- Wing, fuselage, empennage engineering
- Landing gear systems design and testing
- Load path analysis and optimization
- Structural and landing gear testing

ADVANCED STRUCTURAL ANALYSIS

- High-fidelity FEM stress analysis
- Static and dynamic load cases
- Fatigue life prediction and damage tolerance
- Fracture mechanics analysis
- Impact and crash analysis

STRUCTURAL TESTING AND PROOF LOADS

- Aeroelastic & dynamic analysis
- CFD and aeroelastic modeling
- Flutter and divergence analysis
- Rotor/airframe aeroelastic coupling
- Vibration analysis and mitigation
- Gust load response
- Control surface effectiveness

CERTIFICATION & COMPLIANCE SUPPORT

- FAA 14 CFR Part 23, 25, 27, 29, 400 compliance
- Airworthiness certification support
- Military specifications (MIL-STD)
- Structural test planning and execution
- Final design reviews
- AS9100 and DFARS documentation

MECHANICAL SYSTEMS ENGINEERING

- Mechanical flight controls design
- Actuation systems (hydraulic, pneumatic, electromechanical)
- Rotor hubs and drivetrain systems
- Environmental control systems
- Payload integration mechanisms

DESIGN FOR MANUFACTURING

- DFM reviews for production
- Composite structures design optimization
- Metallic structures manufacturing readiness
- Assembly integration planning

ELECTRIC PROPULSION & ENERGY STORAGE SOLUTIONS

POWER GENERATION & STORAGE

BATTERY PACK DESIGN & DEVELOPMENT

- Battery pack and BMS design
- Custom battery pack engineering for aerospace applications
- Energy density and power-to-weight optimization
- Crash safety and structural protection design
- Thermal runaway prevention and fire suppression
- UN 38.3, MIL-STD-810 certification support

BATTERY MANAGEMENT SYSTEMS (BMS)

- U.S.-based BMS design and development
- Real-time state-of-charge (SOC) and state-of-health (SOH) monitoring
- Cell balancing and thermal management control
- Safety monitoring and fault detection
- Communication interfaces (CAN, RS-485, Ethernet)

BATTERY ASSEMBLY & TESTING

- Battery pack assembly procedures
- Cell-to-module and module-to-pack assembly
- Laser welding and ultrasonic wire bonding
- AS9100-certified production with full traceability
- Electrical performance validation
- Environmental and vibration testing
- Battery thermal performance testing
- Multimodal data capture with digital thread

ELECTRIC PROPULSION INTEGRATION

- Electric propulsion system integration
- Motor and drive system integration
- Propeller design and manufacturing
- Power electronics design and packaging
- High-voltage power distribution architecture
- Electrification of aerospace drivetrains
- Propulsion efficiency validation

FUEL CELL SYSTEMS

- PEM and solid-oxide fuel cell integration
- Hydrogen storage and distribution
- Thermal management for fuel cell stacks
- System control and monitoring

THERMAL MANAGEMENT

- Battery thermal management system design
- Active cooling (liquid, forced air) and passive cooling
- Thermal modeling and CFD analysis
- Heat exchanger design and integration
- Thermal interface materials selection

FEOC-READY SUPPLY CHAIN

- Vetted battery cell partnerships
- Domestic supply chain coordination
- Foreign Ownership, Control, or Influence (FOCI) mitigation
- Cell qualification and incoming inspection

MISSION-CRITICAL ELECTRONICS & EMBEDDED SYSTEMS

ELECTRONICS & SOFTWARE

GUIDANCE, NAVIGATION & CONTROL (GN&C)

- GN&C and sensor integration
- Autonomous navigation algorithms
- GPS/INS sensor fusion
- Vision-based navigation and SLAM
- Waypoint and mission planning software
- Real-time flight control systems
- Autonomous navigation testing

AVIONICS & FLIGHT SYSTEMS

- Flight controller hardware and software
- Autopilot system design
- Flight management systems
- Data logging and telemetry
- Ground control station (GCS) integration
- Flight testing execution

EMBEDDED SOFTWARE & FIRMWARE

- Firmware and software integration
- Real-time operating systems (FreeRTOS, Linux)
- Safety-critical software (DO-178C)
- Bootloaders and BSP development
- Low-level driver development
- Communication protocol stacks

PRINTED CIRCUIT BOARD (PCB) DESIGN

- HDI and flex-circuit PCB layouts
- High-density interconnect (HDI) layouts
- Flex and rigid-flex circuit design
- EMC-compliant wire harness engineering
- High-speed digital (100+ Gb Ethernet)
- Controlled impedance, blind/buried vias
- 2 to 24+ layer PCBs

FPGA DEVELOPMENT

- Xilinx and Intel/Altera platforms
- Image and video processing
- High-performance sensor interfacing
- Digital signal processing (DSP)
- Motion control and motor drive algorithms

ELECTROMAGNETIC COMPATIBILITY (EMC)

- EMI/EMC design principles
- Shielding and grounding strategies
- EMC verification testing
- HIRF (High-Intensity Radiated Fields) protection
- Lightning protection design

HIGH-VOLTAGE POWER ELECTRONICS

- High-voltage distribution architecture
- Power conversion (DC-DC, AC-DC)
- Motor drives and inverters
- Battery charging systems
- Arc flash and overcurrent protection

SENSOR INTEGRATION

- IMU, magnetometer, barometer integration
- Vision systems (cameras, LiDAR)
- Radar and RF sensors
- Environmental sensors
- Payload sensor interfaces
- Payload interface verification

CYBERSECURITY & INFORMATION ASSURANCE

- NIST 800-171 compliant systems
- Secure boot and firmware encryption
- Network security architecture
- Intrusion detection and monitoring
- ITAR and cyber compliance

HIGH-PERFORMANCE PRECISION MANUFACTURING

CRITICAL COMPONENTS

COMPOSITE STRUCTURES MANUFACTURING

- Composite layup and autoclave processes
- Carbon fiber/epoxy prepreg systems
- Autoclave processing (up to 400°F, 100 psi)
- Out-of-autoclave (OOA) processes
- Compression molding and RTM
- Filament winding for tubular structures
- Honeycomb and foam core structures
- Composite airframe assembly

PRECISION METALLIC FABRICATION

- Titanium and aluminum hot-forming
- Titanium hot forming and machining
- Aluminum sheet metal fabrication
- Stainless steel welding and assembly
- Hydroforming for complex shapes
- Press brake forming

MULTI-AXIS CNC MACHINING

- Multi-axis precision CNC machining
- 3, 4, 5, and 9-axis CNC capabilities
- Tight tolerance machining (±0.0005”)
- Titanium, aluminum, stainless steel, Inconel
- Complex multi-feature parts
- First-article inspection (FAI)

WIRE HARNESS DESIGN & MANUFACTURING

- Wire harness manufacturing protocols
- Wire harness installation
- Custom harness engineering
- SmartBuild automated production system
- High-voltage cable assemblies
- EMC-compliant routing and shielding
- Continuity testing and validation
- Wire harness continuity testing

THERMOPLASTIC & INJECTION MOLDING

- Structural thermoplastics
- High-temperature polymers
- Insert molding and overmolding
- Micro-molding for small components

ADVANCED MANUFACTURING PROCESSES

- Additive manufacturing (3D printing)
- Laser cutting and waterjet cutting
- Ultrasonic welding
- Friction stir welding
- Thermal spray coatings

PROPULSION COMPONENTS

- Propeller design and manufacturing
- Composite-bladed propellers
- Motor mounts and housings
- Structural components for propulsion systems

PRODUCTION INFRASTRUCTURE & COMPLETE INTEGRATION

SCALABLE MANUFACTURING & SYSTEM INTEGRATION

PROCESS DEVELOPMENT

- Composite layup and autoclave processes
- Multi-axis precision CNC machining
- Titanium and aluminum hot-forming
- Battery pack assembly procedures
- Wire harness manufacturing protocols
- Critical process parameter definition
- Process capability studies
- AS9100 and ITAR validation

INDUSTRIALIZATION & INFRASTRUCTURE

- Production tooling procurement
- CNC and composite equipment installation
- Battery assembly station commissioning
- Skilled trades work instructions
- ITAR-compliant U.S. supply chain
- AS9100 quality control plans
- Lean U-shaped cell layout
- NIST 800-171 cybersecurity infrastructure
- Facility layout and infrastructure planning

SYSTEM INTEGRATION

- Composite airframe assembly
- Electric propulsion system integration
- GN&C and sensor integration
- Wire harness installation
- Firmware and software integration
- Autonomous navigation testing
- Payload interface verification
- System functional testing
- Mechanical assembly with torque control
- Adhesive bonding and curing
- Kitting and sub-assembly management
- Clean room assembly capabilities

PILOT PRODUCTION

- Complete UAV pilot runs
- Composite cure cycle validation
- Tight-tolerance machining testing
- Battery thermal management validation
- Wire harness continuity testing
- First-article inspection data
- Manufacturing defect resolution
- MRL assessment demonstration

PRODUCTION RAMP

- Incremental UAV production scaling
- Specialized workforce training
- Sub-60 second takt optimization
- Composite and metallic yields stabilization
- Automated battery pack testing
- Lean tools implementation
- OEE and yield monitoring
- 100K units/year rate achievement

FULL-RATE PRODUCTION

- Target UAV production volumes
- Standard operating procedure execution
- AS9100, ITAR, DFARS compliance
- Defense contract delivery schedules
- JIT inventory coordination
- Flight-critical component lot traceability
- Environmental condition control
- Preventive maintenance programs

RIGOROUS STANDARDS FOR DEFENSE APPLICATIONS

QUALITY, COMPLIANCE & SECURITY INTEGRATION

QUALITY MANAGEMENT SYSTEMS

- AS9100 Rev D certified
- ISO 9001:2015 certified
- Statistical process control (SPC)
- First-article inspection (FAI) programs
- Corrective and preventive action (CAPA)
- AS9100 quality control plans
- AS9100 manufacturing documentation

REGULATORY COMPLIANCE

- ITAR registration and compliance
- DFARS compliance (Defense Federal Acquisition Regulation)
- NIST 800-171 cybersecurity
- EAR (Export Administration Regulations)
- RoHS and REACH environmental compliance
- AS9100, ITAR, DFARS compliance
- ITAR and cyber compliance

MANUFACTURING DOCUMENTATION

- Work instructions and process sheets
- Inspection and test procedures
- Configuration management
- Design history files (DHF)
- AS9100 and DFARS documentation

TRACEABILITY & DATA MANAGEMENT

- Flight-critical component lot traceability
- Serial number tracking
- Material certifications and CoC
- Digital manufacturing records
- Supply chain pedigree documentation

TESTING & VALIDATION

- Environmental testing (MIL-STD-810)
- Structural testing and proof loads
- EMC testing (MIL-STD-461)
- Battery thermal performance testing
- Flight testing and airworthiness validation
- Operational flight testing
- Mission requirements verification
- Durability and reliability testing

CYBERSECURITY INFRASTRUCTURE

- NIST 800-171 compliant IT systems
- Controlled Unclassified Information (CUI) handling
- Secure data storage and transmission
- Access control and monitoring
- Incident response procedures
- NIST 800-171 cybersecurity infrastructure

CONTINUOUS IMPROVEMENT

- Kaizen waste elimination events
- Value stream mapping
- 5S workplace organization
- Standard work development
- Overall Equipment Effectiveness (OEE) monitoring
- DFM lessons learned implementation
- Composite material waste optimization
- Battery and harness automation
- Root cause defect reduction
- MFD methodology application
- Aerospace best practice benchmarking
- Customer lean audit support