WOODWARD

AIRCRAFT ENGINE SYSTEMS

OFFERING OEMs VALUE THROUGH INTEGRATION

Woodward delivers complete control systems by combining our technologies and component capabilities with those of our partners and suppliers. Our integrated systems allow you to consolidate component testing, decrease development engineering resources, and simplify supply chain and system-testing activities.

SYSTEMS INTEGRATION

As a systems integrator, Woodward offers unmatched analytical capabilities, and expertise. Understanding component interactions optimizes our designs, and analytical models can be used to predict or troubleshoot engine-level performance. System rig testing in our world-class environmental facility verifies results. To simplify our customers' supply management and build-line interfaces, we provide supply chain management, logistics, and kitting.

FUEL SYSTEM

- **Fuel Metering:** Scalable platforms serve thrust ranges from 1,000 to over 100,000 pounds. We develop customized designs with standard components to reduce development time.
- **Pump:** Main fuel pumps are available as stand-alone or integrated with engine controls. Integration can reduce cost and weight and improve thermal management, reliability, and performance.
- **Actuation:** Actuators that meet a broad range of platform configurations, strokes, and performance requirements.
- **Air Valves:** Fuel-driven actuators often operate air valves for engine to airframe interaction.
- **Specialty Valves:** A wide variety of valves – flow dividers, shutoff, bypass, fuel return, and motive flow – meet unique engine requirements.

COMBUSTION SYSTEM

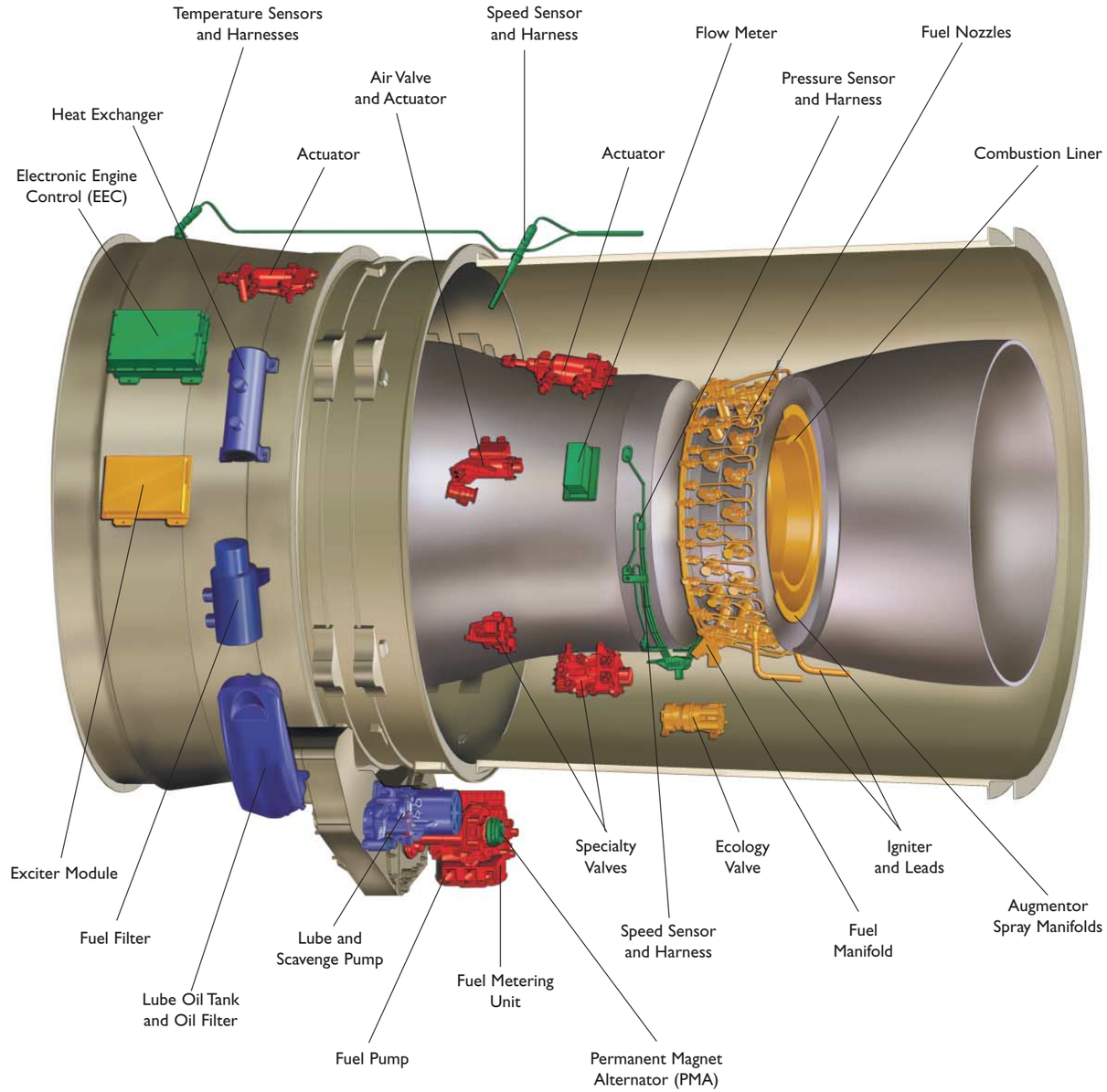
- **Fuel Injection:** A full range of main engine fuel nozzles and augmentor spray manifolds provide industry-leading technology and optimum performance. Our integrated approach for the combustion system includes specialty valves (ecology, splitting), fuel manifolds, and combustion/case liners.
- **Ignition:** Exciters, igniters, and leads comprise the ignition subsystem. Relying on our fuel spray and ignition strengths, we are developing advanced combustion systems to optimize fuel burn and control, increasing engine efficiency, and reducing emissions.
- **Manifolds:** Development has included designs both internal and external to the combustor.
- **Combustion Sensors:** Feedback from the combustion chamber can be used to optimize performance or to diagnose maintenance needs.

HEAT MANAGEMENT

- **Heat Exchangers, Lube and Scavenge Pumps, Filtration System, and Fuel/Oil Sensors:** These components comprise the heat management system. The role of the main fuel pump in generating heat during operation makes its design critical to the heat management solution.

ELECTRICAL SYSTEM

- **Electronic Control, Sensor Suite, and Power System:** The electronic engine control; starters; temperature, speed, and pressure sensors; harnesses, and permanent magnet alternator comprise the electrical subsystem.



SOLVING COMPLEX CHALLENGES

Our Commitment to You

As a systems integrator, we develop and deliver innovative fuel delivery, combustion, heat management, and electrical subsystems so you can operate cleaner, more reliable, and cost-effective engines. Our engineers team with you early in the development cycle to define, verify, and validate your requirements.

Using Six Sigma processes and lean manufacturing principles, our members solve complex technical problems.

With our customer e-Business Center website, you have access to order status, invoices, real-time schedule/demand scorecard performance, specifications and drawings, corrective action requests, and shipment triggers.

Our Broad-Based Engine Component Applications

COMMERCIAL

For regional jets and narrow- and wide-body airliners

MILITARY

For helicopters, fighters, bombers, and mission support aircraft

BUSINESS/GENERAL AVIATION

For the business jet and general aviation markets

AERODERIVATIVE

For aeroderivative platforms such as power generation, marine, and mechanical-drive machines

WOODWARD

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