One valuable design technique is the use of effusion cooling holes in an engine. These very small holes (0.5 to 0.75 mm) are placed at acute compound angles as low as 10 degrees from the surface in high-temperature alloys. Newer engines will demand denser patterns and more complex holes for more efficient cooling. The aerospace industry has long relied on the precision of laser technology over traditional metal forming, metal cutting, or drilling process options to create these effusion cooling holes.

To meet customer demand for a smaller footprint, Prima Power Laserdyne created the LASERDYNE 430 BeamDirector®. This system incorporates the unique BeamDirector® rotary tilt laser processing head. The BeamDirector® produces precise effusion cooling holes at shallow and complex angles in a smaller, more floor-space-efficient system platform.

Creating a smaller machine meant that the components within the control cabinet needed to be compact and easy to use but still maintain the high reliability and accuracy for which the company is known. The cabinet required numerous cables and bundles of wire, together, the components save space and create synergy within the control cabinet.

Customer profile
Prima Power Laserdyne, based in Champlin, Minn., is a world leader in precision standard, multi-axis laser material processing (cutting, welding, and drilling) systems.

Challenge: Improve energy and fuel efficiency
Like businesses in many industries, aerospace companies are looking for ways to improve energy and fuel efficiency and reduce emissions. According to the International Air Transport Association (IATA) website, airlines have adopted a voluntary goal to reduce fuel consumption and lower CO₂ emissions by at least 25 percent from 2005 levels by 2020.¹

Many factors can affect the amount of fuel an aircraft burns, so airlines have taken a multifaceted approach to identifying technologies that will help them to use fuel more efficiently.

To meet customer demand for a smaller footprint, Prima Power Laserdyne wanted to create a more compact version of its BeamDirector® laser machine. The result was the LASERDYNE 430 BeamDirector®. This system incorporates the unique BeamDirector® rotary tilt laser processing head. The BeamDirector® produces precise effusion cooling holes at shallow and complex angles in a smaller, more floor-space-efficient system platform.

Creating a smaller machine meant that the components within the control cabinet needed to be compact and easy to use but still maintain the high reliability and accuracy for which the company is known. The cabinet required numerous cables and bundles of wire,
so the wiring had to be compact and modular. A quick disconnect would make the end machine much easier to ship to the customer.

**Solution: Safety and reliability are critical**

Prima Power Laserdyne turned to Phoenix Contact to help meet these requirements. The LASERDYNE 430 incorporated numerous Phoenix Contact products, but one of the key components was PT spring COMBI plugs. Technicians at

Prima Power Laserdyne especially liked the ease of the push-in spring technology, which allowed for quick and easy actuation when terminating wires. The PT terminal blocks’ quick disconnect also added modularity, making it easy to disconnect the control panel from the machine for shipping.

Of course, safety and reliability are critical to the end customer. The PSR-TRISAFE safety controller was chosen for its small footprint and the ability to monitor the motion control watchdog pulse of the Computer Numerical Control (CNC). The SAFECONF software program monitors laser integration, emergency stop, and door safety switches for a safe machine environment. The 24 V QUINT SFB power supply, in combination with UT6-TMC circuit protectors, increases the reliability of the entire system. PLC relays are bused together to reduce wiring and to switch the heavier loads on the machine. The system relies on FL SFN Ethernet switches for machine status and communication.

Better fuel efficiency means higher profits for the airline industry. As fuel prices increase, laser processing will become even more important. The LASERDYNE 430 BeamDirector® will help aerospace manufacturers minimize floor space without sacrificing the quality and precision they need.

**References**