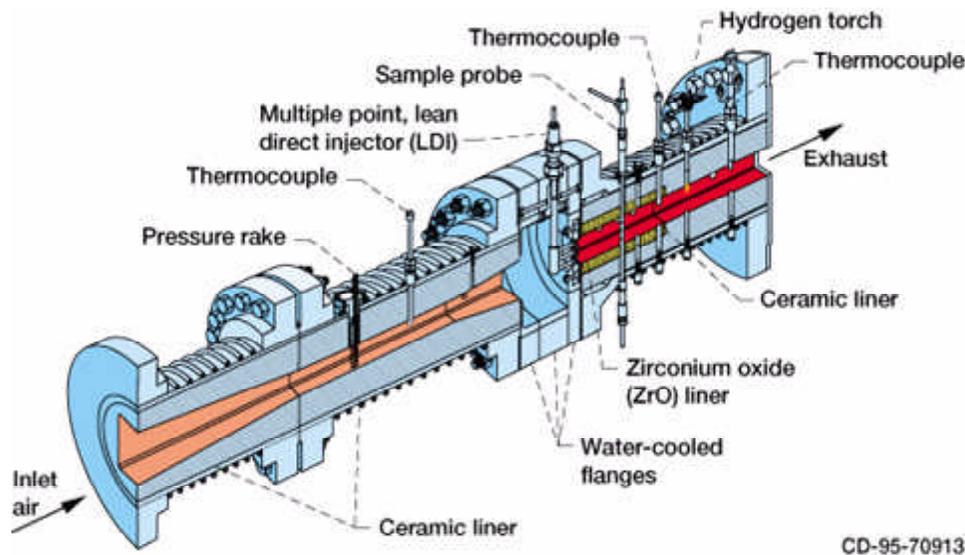


# Research Data Acquired in World-Class, 60-atm Subsonic Combustion Rig

NASA Lewis Research Center's new, world-class, 60-atmosphere (atm) combustor research facility, the Advanced Subsonic Combustion Rig (ASCR), is in operation and producing highly unique research data. Specifically, data were acquired at high pressures and temperatures representative of future subsonic engines from a fundamental flametube configuration with an advanced fuel injector. The data acquired include exhaust emissions as well as pressure and temperature distributions. Results to date represent an improved understanding of nitrous oxide ( $\text{NO}_x$ ) formation at high pressures and temperatures and include an  $\text{NO}_x$  emissions reduction greater than 70 percent with an advanced fuel injector at operating pressures to 800 pounds per square inch absolute (psia).

ASCR research is an integral part of the Advanced Subsonic Technology (AST) Propulsion Program. This program is developing critical low-emission combustion technology that will result in the next generation of gas turbine engines producing 50 to 70 percent less  $\text{NO}_x$  emissions in comparison to 1996 International Civil Aviation Organization (ICAO) limits. The results to date indicate that the AST low-emission combustor goals of reducing  $\text{NO}_x$  emissions by 50 to 70 percent are feasible.

U.S. gas turbine manufacturers have started testing the low-emissions combustors at the ASCR. This collaborative testing will enable the industry to develop low-emission combustors at the high pressure and temperature conditions of future subsonic engines.



*Advanced Subsonic Technology flametube combustor.*

The first stage of the flametube testing has been implemented. Four GE Aircraft Engines low-emissions fuel injector concepts, three Pratt & Whitney concepts, and two Allison concepts have been tested at Lewis' ASCR facility. Subsequently, the flametube was

removed from the test stand, and the sector combustor was installed. The testing of low-emissions sector has begun. Low-emission combustors developed as a result of ASCR research will enable U.S. engine manufacturers to compete on a worldwide basis by producing environmentally acceptable commercial engines.

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