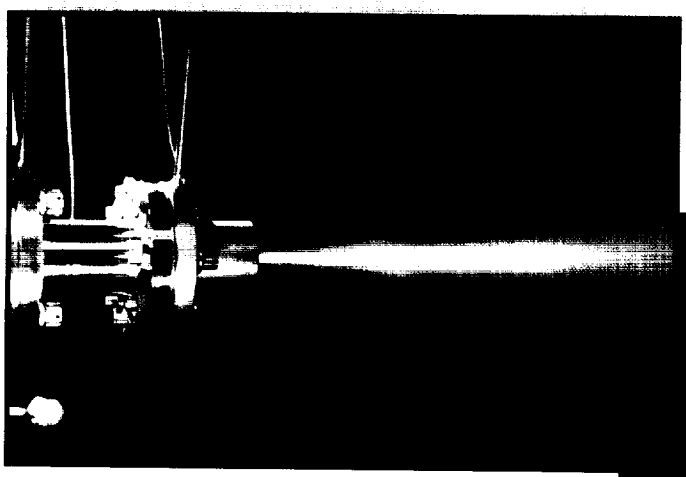
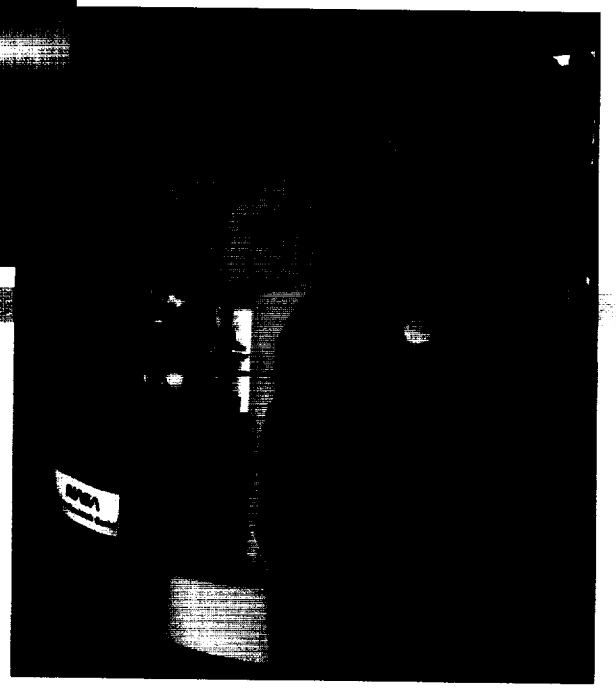
Rocket Laboratory





Above: *Rocket Laboratory.*
Left: *Low-thrust methane-oxygen rocket engine test.*
Below: *Engineers study the heat transfer properties of cryogenic droplets.*
Right: *Metallized-propellant rocket engine test stand.*

The Rocket Laboratory is a complex of nine independent and unique test facilities that support research in diverse areas of space power and space propulsion. Facilities are available to test rocket engine components and materials at thrust levels ranging from 5 to 1000 lbf, at sea level and at altitude pressure conditions, with a variety of chemical propellants. In a separate test rig, a hydrocarbon/air burner is used to investigate fuel-rich combustion processes. Also, hydrocarbon-lubricated bearings can be tested at speeds up to 25 000 rpm. Several of the facilities are engineered as cold-flow test rigs wherein flows and sprays of fluids such as liquid nitrogen, metallized propellant, and two-phase solid-gas aerosols are analyzed. There is an optical laboratory to develop optical measurement technologies.

The Rocket Laboratory can support all aspects of chemical combustion, rocket engine components testing, and fluid flow systems development. Test articles can be provided with reactants such as gaseous hydrogen, oxygen, and carbon monoxide, hydrocarbons, and metallized propellants, as well as more general services such as gaseous nitrogen and helium, compressed air, and domestic water. Although each of the separate facilities has unique features, all of them have advanced data acquisition and control techniques that enable them to quickly and easily adapt for changes in research programs or program requirements. Such flexibility promotes high productivity and high facility utilization.

The laboratory has recently witnessed the first successful combustion of carbon monoxide and oxygen in a rocket engine—one step toward developing this propellant combination for Mars missions. Also, prototype turbine blades fabricated from ceramic matrix composites were successfully tested in severe heat flux environments, thereby demonstrating their ability to withstand the thermal loads of the space shuttle main engine turbopumps. One of the future objectives for this laboratory is the construction of a completely new rocket engine test cell in which the capabilities of existing rocket engine test stands will be combined with a laser-based diagnostics laboratory in which a variety of nonintrusive measurements can be taken.