

3. NASA LEWIS RESEARCH CENTER

Liquid fluorine pump tests were conducted at the "I" Site of the NASA Lewis Research Center Plumbrook Station. The pressure and flow capabilities of the system were suitable for testing of modified RL10 oxidizer pumps, which made it possible to accomplish the pump testing required for the program without constructing new facilities.

The propellant system of the facility is shown schematically in figure B-8. It consists of a closed liquid fluorine loop incorporating the pump, a liquid nitrogen heat exchanger, a liquid fluorine accumulator, and necessary shutoff and control valves. Liquid nitrogen troughs are provided to cool all horizontal runs of fluorine piping.

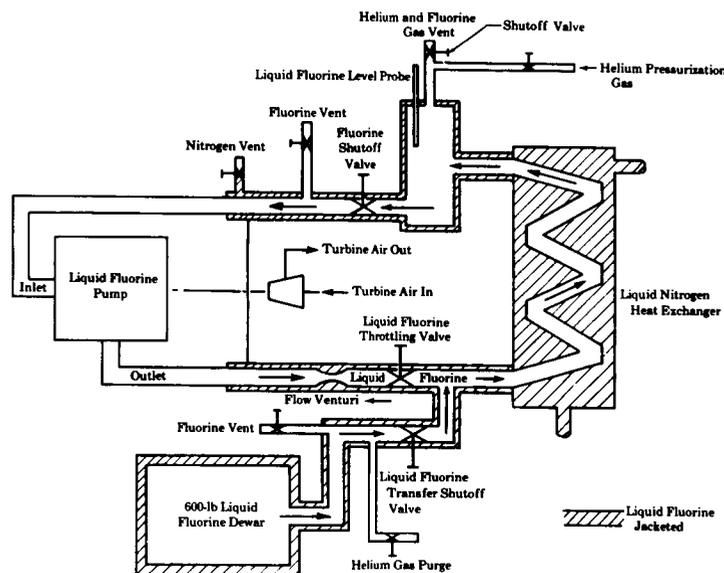


Figure B-8. Liquid Fluorine Pump Loop Facility

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The closed fluorine loop has the advantage of permitting pump tests to be accomplished with commitment of a minimum amount of liquid fluorine. The total capacity of the system is approximately 500 pounds.

Automatic closed loop controls available at the facility permitted complete programming of pertinent pump parameters to obtain standard pump performance data. Typical operation of the RL10 oxidizer pump included a controlled speed ramp to operating conditions, and automatically controlled flow excursions at constant controlled inlet total pressures. Tests were limited to static pump inlet pressures at or above ambient pressure to preclude the possibility of leakage into the system.

Data acquisition systems available to "I" Site include a low-level input analog-to-digital converter system with magnetic tape recording as well as

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several types of direct inking recorders and oscillographs necessary for test monitoring purposes. In testing of the RL10 oxidizer pump, all pertinent parameters were monitored on low-speed recorders during the entire period that fluorine was in the pump. The analog-to-digital data system was used only periodically to obtain performance data at selected points.