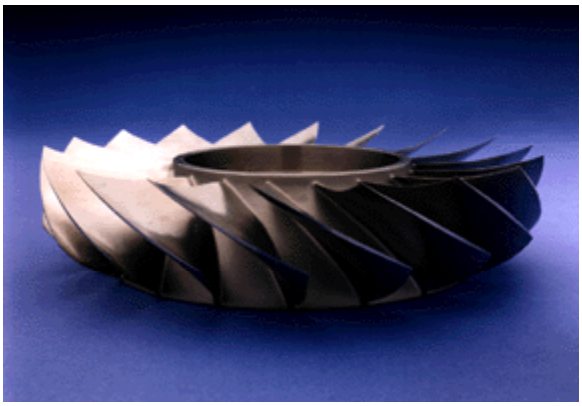
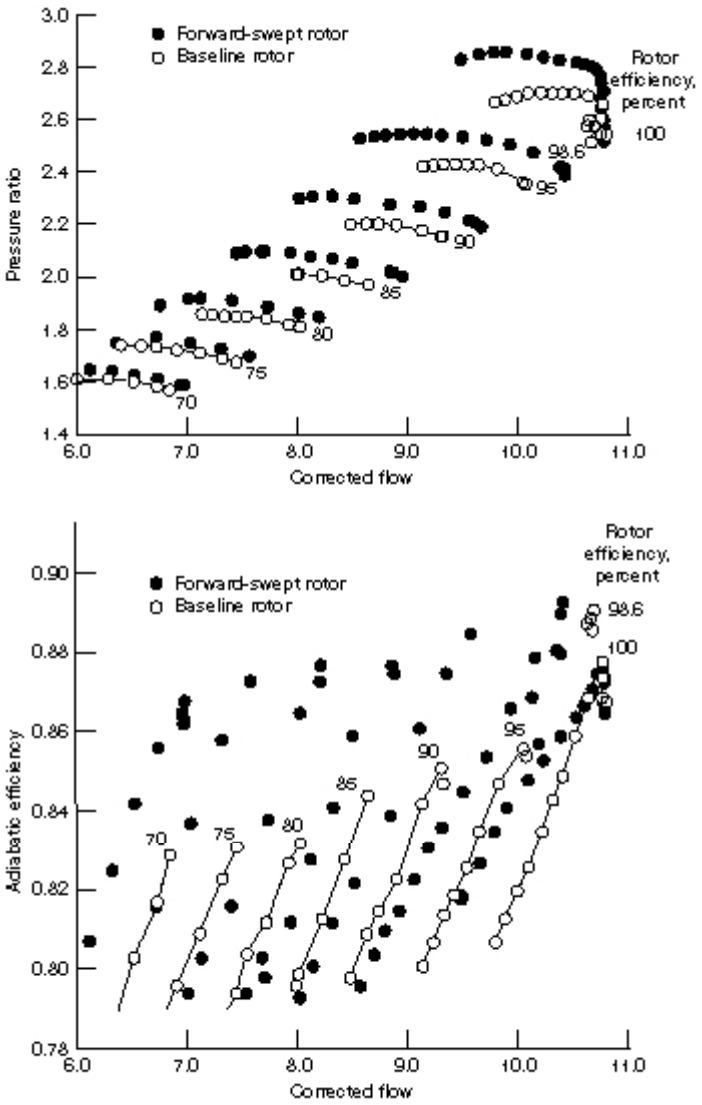
Forward Swept Compressor Testing



Forward-swept rotor design.

A new forward-swept rotor designed by Allison Engine Company was tested in NASA Lewis Research Center's CE-18 facility. This testing was a follow-on project sponsored by NASA Lewis to study range enhancements in small turbomachinery. The test was conducted against a baseline rotor design that was also tested in CE-18. The design point for the rotor was a rotor pressure ratio of 2.69, a mass flow of 10.52 lbm/sec, and an adiabatic efficiency of 89.1 percent. Test data indicate that the rotor met the pressure ratio of 2.69 with a 10.77 lbm/sec flow rate, a 87.5-percent adiabatic efficiency, and a 19.5-percent stall margin. The baseline rotor achieved a pressure ratio of 2.69 at a 10.77 lbm/sec flow rate with a stall margin of only 9.2 percent and an adiabatic efficiency of 87.0 percent. The major differences are the significant stall margin increase and the substantially higher off-design peak efficiencies of the forward-swept rotor. The substantially higher performance over the baseline rotor design makes the new design a viable technology candidate for future products.



Measured rotor pressure and efficiency maps for baseline and forward-swept rotors. Top: Rotor pressure map. Bottom: Rotor efficiency map.

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