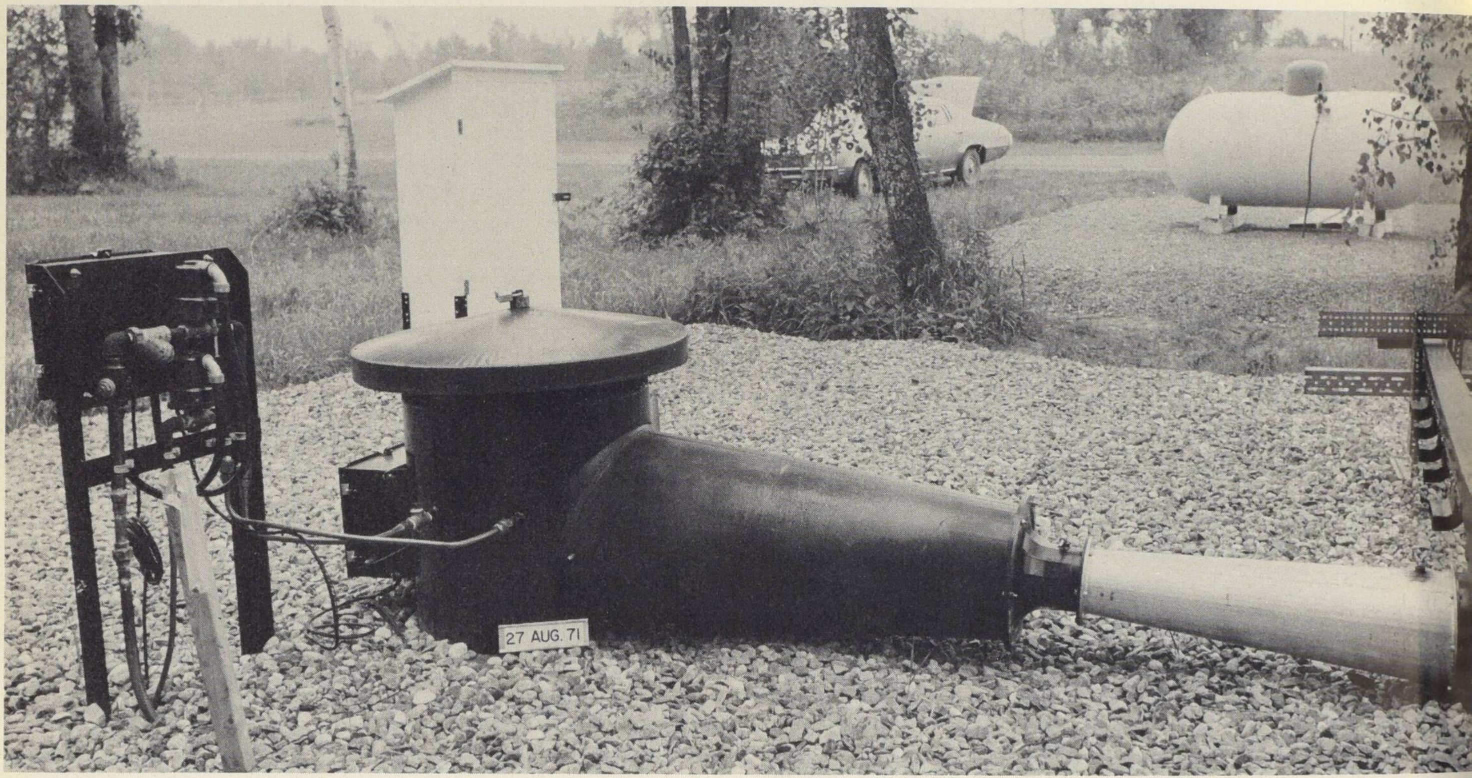

Track switch heater undergoes endurance tests at NRC's railway test laboratory near Ottawa's Uplands Airport. ● Le réchauffeur d'aiguillage aux essais d'endurance dans le laboratoire du CNRC, près de l'aéroport d'Uplands, à Ottawa.

ambient temperature of zero degrees Fahrenheit was established for cold chamber evaluation. Under the test condition it was established that a heat input of 250,000 BTU per hour was required to protect a 22-foot switch from failure within a five-hour period. A target specification for a switch heater was developed from the cold chamber work. Basic requirements were: (1) thermal capacity, 250,000 BTU per hour; (2) Fuel, propane or aviation kerosene; (3) Electrical power consumption, 100 watts.

The last requirement dictated that some means had to be found to use the energy available in the fuel for circulation of the hot air. Consideration was given to the use of both the internal combustion engine and the gas turbine. Both methods were considered too complex, expensive and unreliable.

The concept of using a pulsating combustion burner or a pulse jet to drive an air ejector pump seemed attractive. In this way both the thermal and thrust output of the pulse jet could be utilized in a device which had no moving parts.

The pulse jet as used on the German V-1 was limited in life by the intake valves employed. Pulse jets could, however, be built without valves. The NRC work was founded on valveless pulse jet research carried out initially at the U.S. Naval Research Laboratories in the 1950s. Several alternate designs were investigated and a suitable modified version developed with a 250,000 BTU rating using propane as the fuel.

The most difficult problem encountered during development of the pulse jet was that of ensuring reliable starting. Without auxiliary starting air it was impossible to start the pulse jet. The most effective means of utilizing starting air was to inject it into the intake concentric with the fuel nozzle. The starting air entrained additional air through the intake thus reducing the amou[nt] of auxiliary starting air to a minimum. Reliable starting was achieved on 0.25 cubic foot of air at a pressure of 15 pounds per square inch from air bottle or small compressor air supply systems.

A second problem was the design of an intake housin[g] and a venturi for the ejector pump. Preliminary investigation demonstrated that the acoustic coupling between the pulse jet and the housing would produce excessive deflections and fatigue stresses in flat plates. Only curve[d] surfaces proved acceptable. Problems with snow ingestion causing flameout of the pulse jet were eliminated by moving the jet farther into the intake tunnel and incorporating an automatic restarting device. A snow accumulation problem in the intake was removed by redesign. The air inlet was changed to a tapered cone elbow intake so that entering snow was continuously accelerated into the pulse jet efflux and did not have an opportunity to settle out in the intake.