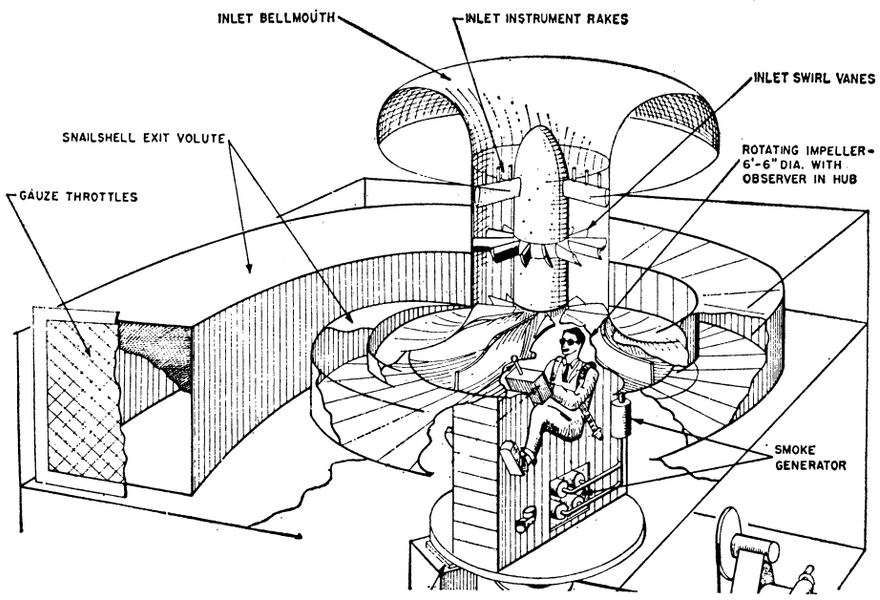

In the heart of his work, a researcher whirls to investigate airflow.

In a Spin Over Research

Flying through the eye of a hurricane to examine its structure is risky business, but it has become a fairly common occurrence. Now an engineer in Canada is examining another kind of turbulent airflow in equally spectacular fashion, by strapping himself into a room-sized working model of a gas turbine compressor and whirling around at up to 70 revolutions per minute.

The engineer, Howard S. Fowler, is attempting to improve the design of centrifugal impellers such as are currently used in many gas turbines. His data may also be of value for other devices that use impellers, including vacuum cleaners, car water pumps, hydraulic machinery, and compressors for liquefying gas.

To analyze the complex secondary air flow patterns within the impeller, Fowler abandoned the idea of planting tiny instruments in the air passages of a real, high-speed unit. Instead, he has built a model impeller 10 times the size of an actual machine. Strapped into a chair at the hub of the model, he rotates with it and plots flow streamlines by peering through a plastic window at smoke trails injected into one of the impeller passages. A hot-wire anemometer provides flow speed data.

The present model is the second to be built. In the first one, the man in the hot seat often experienced dizziness and loss of orientation after only a few minutes of rotation. The solution came from a technique developed by a Canadian scientist, Dr. Geoffrey Melvill Jones, who in turn got his idea from ballet dancers, who instead of watching the scenery flash by during rapid spins, prevent dizziness by fixing their gaze on one spot and only "seeing" when it comes around.

To avoid dizziness during sustained rotation at high speed the head must remain rock steady. What Fowler adapted from Dr. Jones' technique is a clay cast of his own teeth, rigidly mounted to the frame of the seat in the impeller model. By clamping his teeth firmly in place on the cast, thereby holding his head rigid, he has been able to spend up to half an hour at 70 rpm without any signs of dizziness.

To gain a fuller understanding of the flow patterns, the air flow in a single simplified channel is now being examined in a special impeller model built for the purpose. Its one channel is constructed of transparent plastic with the simplest possible geometry of straight sides, rather than with the curved vanes found on the conventional impeller.

While studying the boundary layer flow, Fowler will add the various geometrical complications, one after another, until he has a complete model of the practical impeller passage. This should lead to a better understanding of the fully developed flow patterns already observed, and enable manufacturers to modify their designs, if necessary, to permit best possible air flow.