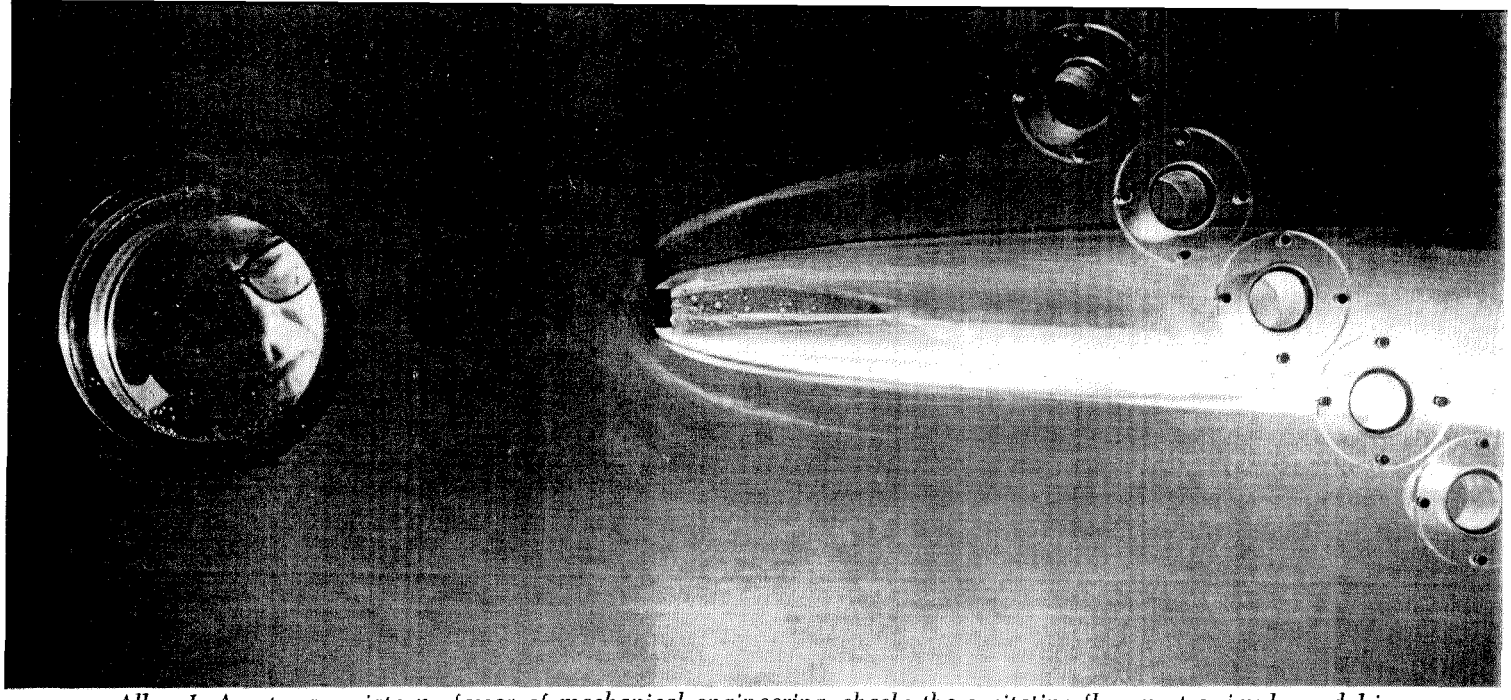


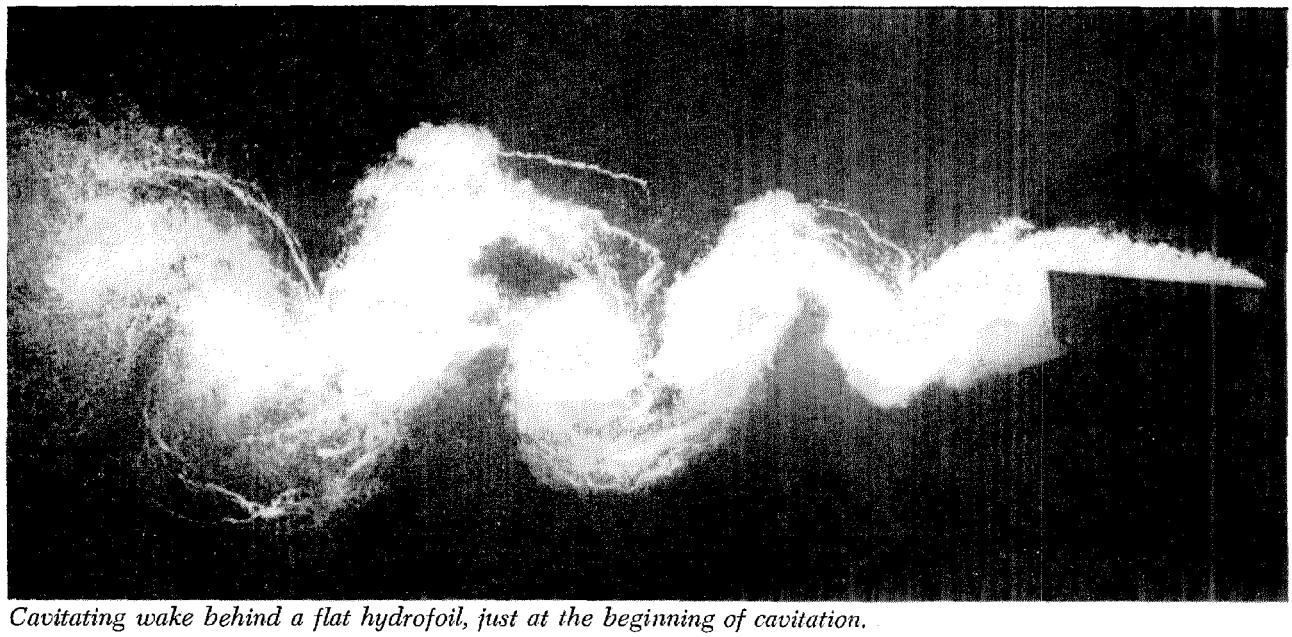
Allan J. Acosta, associate professor of mechanical engineering, checks the cavitating flow past a simple model in the new working section which is installed in the high speed water tunnel. The curved halo in front of the model is the result of cavitation caused by secondary motion of the boundary layer on the sides of the tunnel.

WATER TUNNEL

A unique new water tunnel in Caltech's Hydrodynamics Laboratory is furnishing new fundamental information on the behavior of water flows. At the same time, it is directly useful for applied problems arising from the hydrofoil boats now being developed by the U.S. Navy.

What makes the new tunnel unique is its size and shape. The four-ton test section, which is installed in the existing high speed water tunnel in the Hydro Lab, is 6 inches wide, 30 inches high, and 4 feet long. Though it is not the first two-dimensional (or rectangular) test section to be used in hydrodynamic research, it is the largest.

Designed specifically for hydrofoil testing, it permits flows which are flat, rather than round, and makes it possible to measure the flow around two-dimensional sections such as propellers or portions of hydrofoil wings. Previous studies have been made



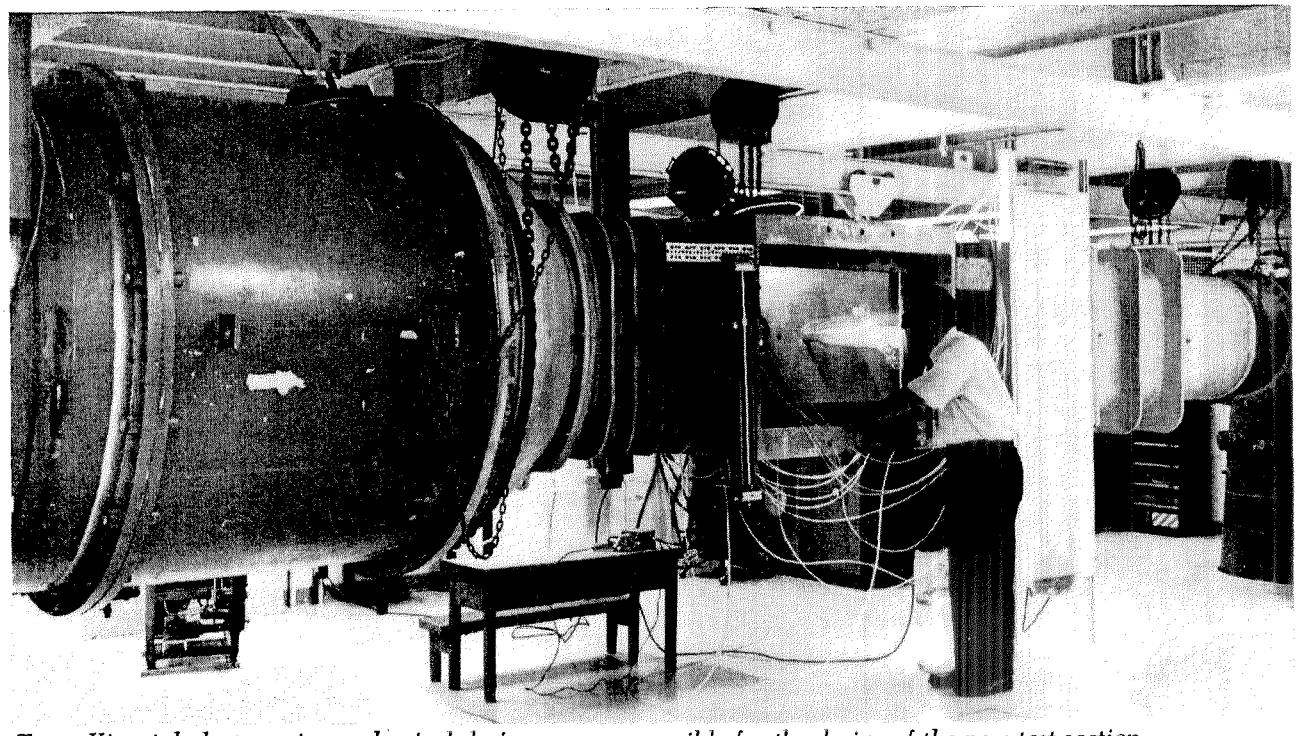
Cavitating wake behind a flat hydrofoil, just at the beginning of cavitation.

Ray DeLong, graduate research assistant, describes the flow to freshman Sam Logan, who is doing honors research.

at Caltech in a small temporary test section 3 inches wide and 14 inches high, which was inserted into the existing test section. The new section can accommodate larger and more complex bodies and makes it possible to probe and examine the flow in greater detail than ever before.

When a solid body moves rapidly through a liquid, cavitation — or vaporization — takes place. The vapor bubbles that are produced not only damage the toughest metals as they collapse violently, but change the entire flow field in important ways.

The new water tunnel is essential for studies of the development and structure of the cavitating wake behind various types of bodies. Current work includes a study of the optimum shape of a hydrofoil to give the least drag force for a given lift, and research on flapped hydrofoils to assist hydrofoil boats in taking off at low speeds. Studies are also under way on the non-steady motion of hydrofoils, and on a group of hydrofoils called a cascade, arranged like the slats in a venetian blind. These studies are important in the flow of water through pumps and propellers, as well as in certain hydrofoil lifting systems.



Taras Kiceniuk, lecturer in mechanical design, was responsible for the design of the new test section.