and set down in place at a drilling site. Designed to be as versatile as possible, it could be refloated and moved from one offshore drilling site to another.

Towing such a heavy structure in the open sea over a distance of several thousand miles with the possibility of stormy weather is a serious technical challenge. As well, there will be a need to use a safe set-down procedure and ensure that, once on location, the monocone can resist the storm waves predicted for the Beaufort sea.

To find answers to these questions, tests were carried out at the NRC by two laboratories using scale models. The Marine Dynamics and Ship Laboratory headed by Sidney Mathews concerned itself with towing, seakeeping and setdown of the monocone while the Hydraulics Laboratory, headed by Joe Ploeg, dealt with wave loads on the platform.

At the Marine Dynamics and Ship Laboratory, project team members were Dr. Robin Browne and technicians Peter Beauséjour and Louis Vézina. According to Dr. Browne, "the monocone tests were a good example of the type of work we can do. We built a 1/60 scale plexiglas model with accurate dimensions, both externally and internally, and fully floodable; it was also loaded with fixed weights to match the weight distribution of the full-sized monocone. On top of the superstructure, instruments were fitted, including reference gyroscopes and acceleration sensors."

Towing experiments were carried out in the Laboratory's 135-m long towing tank, an installation equipped with a pneumatic wave generator at one end and a specially designed beach at the other to damp out the waves, thereby preventing wave reflection interference. The model was towed along the tank by an electrically driven towing carriage straddling the tank on rails. Experimental data for a range of typical sea conditions were monitored and stored in a minicomputer mounted on the towing carriage. After each experiment, computer programs were used to convert the raw data into a form that applied to the full scale monocone. "That allowed us to predict accurately the actual towing motions and accelerations, and the drift forces in waves," explains Dr. Browne. "We can thus tell how many tugs would be required, what their horsepower rating would have to be and, in general, whether special towing problems are to be expected."

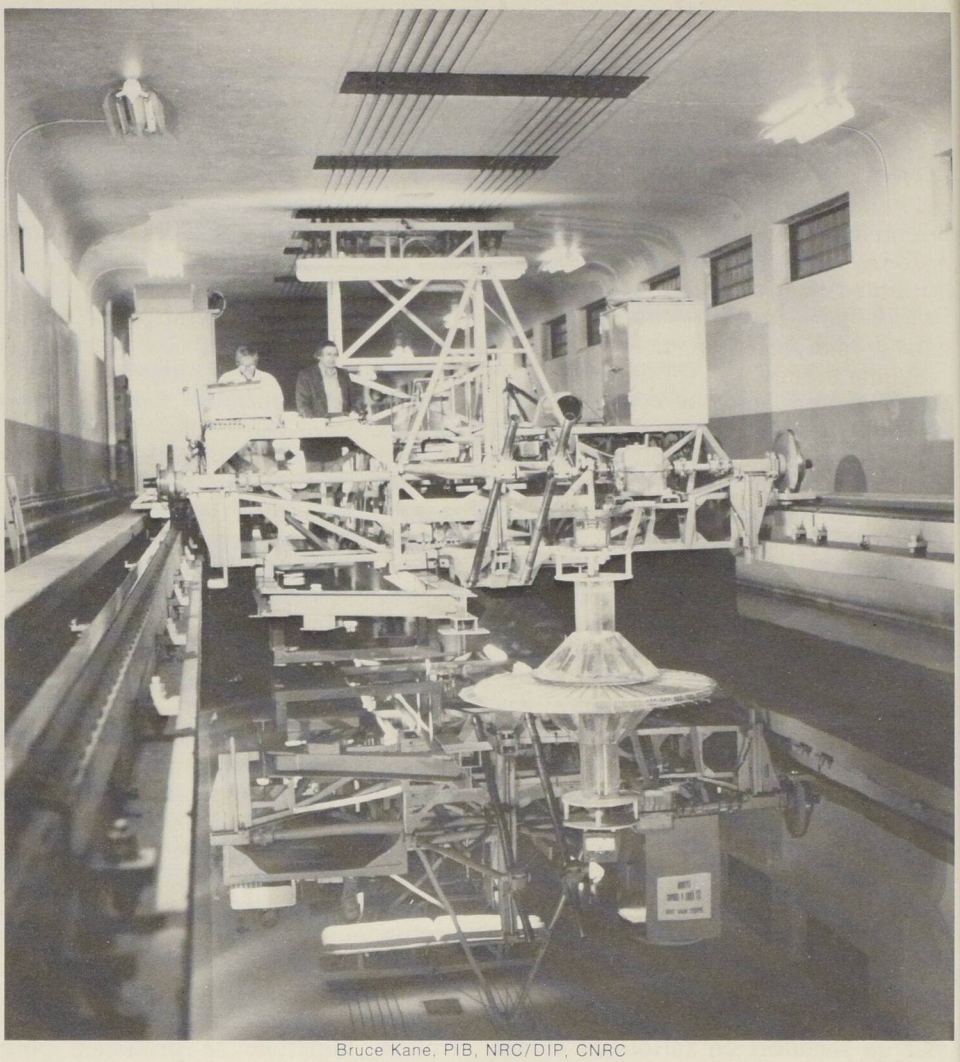
The NRC group also developed safe procedures for setting the monocone down in water depths varying from 19 m to 41 m by controlled flooding of the floatation tank, both with and without the support of auxiliary stabilizing crane barges. Procedures were also developed for raising the structure by sequentially pumping out the floatation tanks. Finally, experiments were undertaken to establish the feasibility of moving the monocone a short distance on the seabed by pumping out some of the floatation tank water and dragging the unit along the bottom.

At the same time, two scientists from the Hydraulics Laboratory, Dr. Geoffrey Mogridge and Dr. William Jamieson, were asked to determine the effect of waves on the monocone while it rested on the seabed.

As Geoffrey Mogridge explains it, "data were needed on the horizontal and vertical forces and the overturning moments acting on the monocone. For a simple structure such as a circular cylinder, wave loads can be predicted mathematically, but the determination of wave effects on the monocone was too complex for a purely mathematical approach and experiments with scale models were necessary.

"Our experiments simulated, at an appropriate scale, possible conditions in the Beaufort Sea", continues Dr. Mogridge, "which could involve wave heights of up to 12 m and water depths from 21 to 41 m. Carefully calibrated load cells were used to measure vertical and horizontal forces on the model and the corresponding overturning moments. These experimental data were later processed and scaled-up, using a specially programmed computer. Knowing the nature of the foundation on which the monocone will rest, Imperial Oil engineers will then be able to use these data to design against the structure being pushed sideways or overturned by waves during actual operation." □

Michel Brochu



Bruce Kane, PIB, NRC/DIP, CNRC

A scale model of the monocone drilling platform undergoes towing tests in the towing tank of the Marine Dynamics and Ship Laboratory of NRC. The experiment is controlled by a computer mounted on the left of the towing carriage.

Essais de remorquage de la maquette du monocône, dans le bassin d'essais des carènes du Laboratoire de dynamique marine et de construction navale du CNRC. On peut voir, à gauche de la photo, l'ordinateur qui fait l'enregistrement et le traitement des données expérimentales.