

Towing Tanks

Towing tanks have been built around the world in order to measure and evaluate the design of ships and other marine structures. Because of the scaling issues discussed in the introduction they have tended to be larger and larger in order to get closer to the prototypical dimensions. However, this increased the cost of the model and the testing and so some of the largest facilities have now been abandoned. Towing tanks are equipped with rails and carriages that travel above the surface and drag the model along at controlled speeds. Some of the facilities have also been equipped with wave makers at one end in order to examine the model performance in waves.

Scaling is one of the most difficult issues associated with towing tank experiments for it is impossible to simultaneously scale the Reynolds Number, Re , and the Froude Number, Fr , of the tests. In most experiments, it is essential to scale with the Froude Number in order to appropriately model the wave production and drag and therefore some special additional techniques are used in order to try to approximate some of the Reynolds number effects. For example, roughness elements are added at the bow of a ship model to induce boundary layer transition and analytical estimates are made of the viscous drag in order to correct for the differences between the model and prototype.

One of the largest towing tanks was the now demolished Large Towing Tank at the National Physical Laboratory (NPL), Ship Division, in Feltham outside London (Figures 1). This towing tank was $1300ft$ in length, $48ft$ wide and $25ft$ deep and was equipped with a towing carriage capable of speeds up to $50ft/s$ and a wavemaker that could generate trains of both regular and irregular waves up to $2ft$ in height. The predecessor of that facility was the smaller Alfred Yarrow Towing Tank built at the original NPL Ship Division location in Teddington (Figure 2). This towing tank was $680ft$ long, $20ft$ wide and $9ft$ deep and was equipped with a towing carriage capable of speeds up to $30ft/s$. This older facility is famous as one of the locations where the “bouncing bombs” of World War Two were tested and where the movie on that subject was later filmed (Figure 2).



Figure 1: The Large Towing Tank at N.P.L.Ship Division (Feltham).

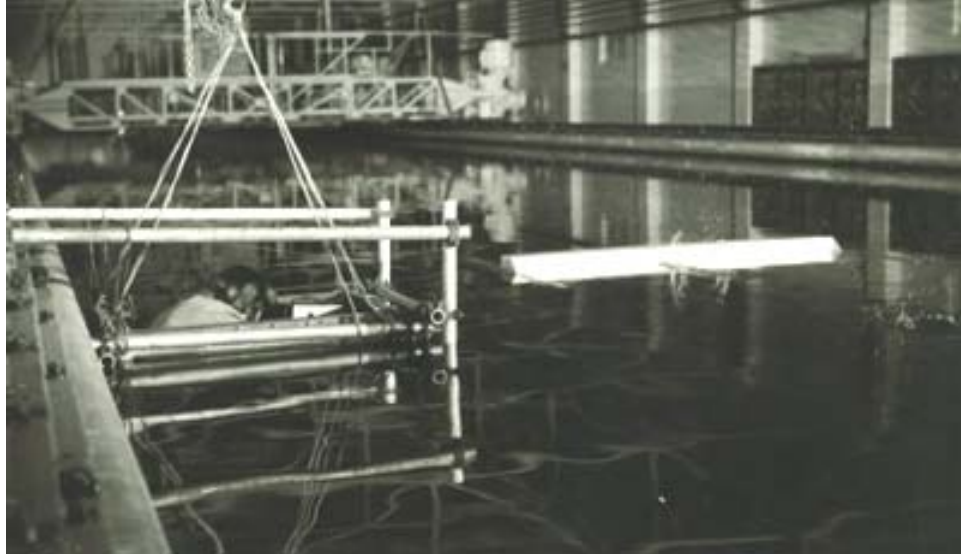


Figure 2: The smaller Towing Tank at N.P.L.Ship Division (Teddington).