Name of the Student: G V Krishna Kumar
Thesis title: Characterization of flow induced Nosie received by an array placed at stagnation point of an underwater axisymmetric body.

Abstract

Given the interest on underwater axisymmetric cylindrical bodies for the development of high-speed underwater weapons, characterization of the boundary layer flow-induced noise received by a Sound NAvigation and Ranging (SONAR) is very important to improve sonar detection ranges. The debate on generating mechanisms of the flow induced noise received at the stagnation point is still on as there is no experimental evidence conclusively suggesting whether it is a near-field or far-field phenomenon, thereby introducing an element of uncertainty in the prediction models. Further, the models developed thus far were based on low Reynolds numbers involving flows in water tunnels and buoyant vehicles. Therefore, the main focus of the thesis is to measure the flow induced noise using a sonar fitted at the most forward stagnation point of an underwater axisymmetric body as realistically as possible and predict the same theoretically for identifying a suitable flow noise model for future use by designers. In order to meet the stated goal, two exclusive experiments were conducted at sea using an underwater autonomous high-speed axisymmetric vehicle fitted with a planar hydrophone array (8X8) in its nose cone which measured the flow noise signature. Two different sets of existing models are used in characterizing the flow noise received by the array, while the first set comprises of models developed based on the Turbulent Boundary Layer induced noise and other is based on the transition zone radiated noise model. Through this study, it was found that the transition zone radiated noise model is in close agreement with the measured data.