

Pressure Measurement on Propeller Blade Surface and Thrust-Torque Characteristics in Low Reynolds Number Flow Field

by

Nobuyuki ARAI*¹ and Katsumi HIRAOKA*²

(Received on March 31, 2004 & accepted on June 21, 2004)

Abstract

Since the propeller is one of the useful thrust devices even today, understanding the behaviors of a propeller and optimization of propeller geometry are important. By referring to the pressure distribution on a propeller blade surface, the geometry of the propeller was designed and optimized, and the suitable state of operation was determined. Four types of propellers were made and aerodynamic performances were investigated by the direct measurement of the surface pressure of a rotating blade in a wind tunnel experiment for a low Reynolds number flow field. In addition, in order to compare with the results of the pressure measurement, thrust and torque were measured using a six-component force balance and torque meter, respectively. The relationships between propeller efficiency, thrust coefficient, and torque coefficient were obtained for several propeller types.

Keywords: Propeller, Thrust, Torque, Pressure Distribution, Wind Tunnel Experiment

* 1 Lecturer, Information Science Laboratory

* 2 Professor, Department of Aeronautics and Astronautics