

Ship Manoeuvrability, Control and Safety

Kazuhiko Hasegawa

Department of Naval Architecture and Ocean Engineering, Osaka University, 2-1, Yamada-oka Suita, Osaka, Japan

Abstract

IMO Manoeuvrability Standard is adopted in 2002 to eliminate poor manoeuvring ships. This standard is based on one of author and his co-authors' research works done in late 1970 to early 1980s. He introduces the background of the work. Then the mathematical model for ship manoeuvrability and the captive and free-running model tests for ship manoeuvrability are also explained. So-called MMG model is developed in Japan also in 1980s. It is now widely adopted and recognised in Korea and China, too. The strong feature of this model compared with so-called Abkowitz model, which is still popular in Europe and the U.S., is the treatment of interaction between the hull(s), the propeller(s) and the rudder(s). He was, at that time, one of the youngest members of this MMG (Mathematical Model Group in Japanese Society of Naval Architects) and it was the top period in Japanese shipbuilding industry. All major shipyards as well as universities have constructed towing tanks and manoeuvring and/or offshore basins. Recently some commercial CFD tools are also eligible to be considered as a tool to estimate ship manoeuvrability. Mostly in many Asian countries, they use these tools, because they don't have towing tanks or manoeuvring basins, which is necessary to estimate so-called hydrodynamic derivatives used in the mathematical model, although there are some empirical formulae to estimate them. As for the control, he is one of the pioneers to engage in autonomous surface ship project which is now one of hottest trend mainly in Europe. He has established automatic collision avoidance system and automatic berthing system in 1990s. He has reproduced marine traffic flow of most busy waterways such as Tokyo Bay, Malacca/Singapore Straits and off Shanghai area to utilize for the safety assessment. AIS has also mandatory regulated to be installed over 300 tonnage ocean-going ship in 2004 to make effective ship-to-ship and ship-to-shore communication which improve ship safety. He worked for this new system, too. Several researches and activities related to AIS are also introduced. IMO Manoeuvrability Standard and AIS are effective for ship safety, however still may ship accidents occur due to ship collision and stranding. Ship safety issues cannot be solved only by ship manoeuvrability nor by navigational aids, but also by taking in to account of its control, human factors and the system including society. He finally demonstrates the importance of the research on safety and its implementation to the real world.