

# 28th International Towing Tank Conference

Proceedings-Volume I



China Ship Scientific  
Research Center

Wuxi, China

September 17-22, 2017

**China Ocean Press**

2017 · Beijing

图书在版编目(CIP)数据

28届国际船模拖曳水池会议文集: 28th International Towing Tank Conference Proceedings:  
英文/中国船舶科学研究中心编. —北京: 海洋出版社, 2017.9

ISBN 978-7-5027-9917-5

I. ①2… II. ①中… III. ①船舶工程-拖曳水池-国际学术会议-文集-英文  
IV. ①U661.71-53

中国版本图书馆 CIP 数据核字(2017)第 208004 号

责任编辑:方 菁

责任印制:赵麟苏

**海洋出版社 出版发行**

<http://www.oceanpress.com.cn>

北京市海淀区大慧寺路 8 号 邮编:100081

北京朝阳印刷厂有限责任公司印刷

2017 年 9 月第 1 版 2017 年 9 月第 1 次印刷

开本:880mm×1230mm 1/16 印张:53.75

# Contents

## Preface

## Volume I

Report of the Executive Committee .....	(1)
Report of the Advisory Council .....	(13)
Report of the Resistance Committee .....	(17)
Report of the Propulsion Committee .....	(69)
Report of the Manoeuvring Committee .....	(131)
Report of the Seakeeping Committee .....	(213)
Report of the Stability in Waves Committee .....	(275)
Report of the Quality Systems Group .....	(337)
Appendix 1: Committees of the 28th ITTC .....	(369)
Appendix 2: Tasks and Structure of the 28th ITTC Technical Committees and Groups ...	(377)
Appendix 3: Proposed Tasks and Structure of the 29th ITTC Technical Committees and Groups .....	(393)
Appendix 4: Proposed Revised Description and Rules of the ITTC .....	(409)
Appendix 5: Member Organizations .....	(425)
Appendix 6: Designated Representatives (R), Committee Members (M) and Observers (O) invited to attend the 28th ITTC Conference .....	(437)

## Volume II

Report of the Specialist Committee on Performance of Ships in Service .....	(447)
Report of the Specialist Committee on Hydrodynamic Noise .....	(503)
Report of the Specialist Committee on Hydrodynamic Modelling of Marine Renewable Energy Devices .....	(579)
Report of the Specialist Committee on Ice .....	(639)
Report of the Specialist Committee on Energy Saving Methods .....	(661)
Report of the Specialist Committee on Modelling of Environmental Conditions .....	(721)
Report of the Working Group on “Future of ITTC” .....	(779)
Report of the Ocean Engineering Committee .....	(789)

# 28th ITTC International Towing Tank Conference

## Organizing Committee

HU Wenming	President of China Shipbuilding Industry Corporation
WENG Zhenping (Chairman)	China Ship Scientific Research Center
HE Chunrong	Director of China Ship Scientific Research Center
WU Yousheng	Honorary Director of China Ship Scientific Research Center
YAN Kai	Deputy Director of China Ship Scientific Research Center
DONG Shitang	China Ship Scientific Research Center
NI Bing	Assistant Director of China Ship Scientific Research Center
WU Baoshan	Deputy Technical Director of China Ship Scientific Research Center

## Secretariat

YING Liangmei	China Ship Scientific Research Center
WANG Daming	China Ship Scientific Research Center
KANG Bolin	China Ship Scientific Research Center
ZHANG Ming	China Ship Scientific Research Center
ZHAO Jiayi	China Ship Scientific Research Center
YU Bin	China Ship Scientific Research Center
ZHU Shengjie	China Ship Scientific Research Center

## Editors

WU Baoshan	China Ship Scientific Research Center
ZHANG Ming	China Ship Scientific Research Center
WANG Wentao	China Ship Scientific Research Center

## Sponsors

China Shipbuilding Industry Corporation  
Chinese Society of Naval Architects & Marine Engineers

# Preface

It is our great pleasure and honor to warmly welcome all the participants to attend ITTC2017 in Wuxi, China, which is the second time for China Ship Scientific Research Center to host ITTC conference. Since the shipbuilding deliveries of China have maintained a leading position in the world for years, the development of the Chinese shipbuilding industry has ushered in a new era of technology transformation and upgrading. We believe the convention of this conference will greatly promote and benefit such transformation development.

It was thirty-nine years ago that the first delegation from the Chinese shipbuilding community was invited to attend the 15<sup>th</sup> ITTC in 1978 in the Hague, the Netherlands. At the Conference, CSSRC made public for the first time its facilities and model test capabilities and was approved to be member of the Advisory Council of the 16<sup>th</sup> ITTC. Since then, CSSRC has been making continuous support and contributions to the ITTC. CSSRC, together with its counterpart of South Korea, co-hosted the 22<sup>nd</sup> ITTC, the latter half of which was held in Shanghai, China in 1999. During that conference, all the participants and accompanying persons were invited to Wuxi to visit CSSRC facilities.

Wuxi is situated to the North of Taihu Lake and to the south of Yangtze River, while the ancient Grand Canal flows through its downtown area. Wuxi was settled in the Zhou Dynasty (11th-3rd Century. BC) and the current name came into use in the Han Dynasty (2nd-1st Century BC).

Wuxi has a long history of waterway transportation and is closely related to the maritime trade. About 100 km away from Wuxi is Liujia Port by Yangtze River, from which a fleet of 62 “Treasure Boats” led by Zhenghe, a famous officer of Ming Dynasty, set sail in 1405 for the first time to South Asia. In the following more than twenty years, Zhenghe had led fleets for six more times to the west Pacific and Indian oceans, establishing friendship with over 30 countries and carving out the then “Maritime Silk Road”.

Wuxi is now one of the core cities in the Yangtze River Delta region where the shipbuilding completion in 2015 accounted for more than 65% of China’s total. As one of the top 10 tourist cities in China, Wuxi looks forward to an excellent ITTC conference.

The proceedings contain very high quality reports produced by the 28th ITTC General and Specialist Committees and the Quality System Group. We would like to express our sincere thanks to the Chairmen and the Members of the Committees and Group for their excellent contributions and for their time and effort in producing these most valuable reports.

Finally we would like to thank regional representatives for their support and all my colleagues of the Organizing Committee and the Secretariat who have been sparing no effort to plan and ar-


range this Conference.

We wish this conference to be perfect and successful and hope that you all will have a fruitful, pleasant and unforgettable time during the conference, enjoy the social programme and your stay with us.

Wuxi, China, July 15, 2017



Prof. Zhenping Weng  
Chairman  
28<sup>th</sup> ITTC Executive Committee



Dr. Chunrong He  
Director  
China Ship Scientific Research Center