Study on the Port Entry Channel Width of Very Large Container Carrier

Qing-xin Yan¹, Wei Chen¹ and Yan-min Xu¹
Navigation College, Wuhan University of Technology¹
Wuhan, Hubei, P.R.China

ABSTRACT
Ship-Maneuverability Simulation Technology, a more reasonable, more efficient and safer way with fewer budgets compared with full-scale ship experiments, could give more detailed simulation datum in the lab under complex current and wind conditions. Ship-Maneuverability Simulator was used to study new generic equations of port entry channel width of very large container carrier.

KEY WORDS: Ship-Maneuverability Simulation Technology, very large container carrier, port entry channel width, ship-trajectory width, wind drift angle, current drift angle

INTRODUCTION
To obtain port channel width, 1648 groups of ship-maneuverability simulation have been tested involving two types of ship model (100,000&150,000DWT container carrier) under 3 engine orders (Dead Slow Ahead, Slow Ahead, Half Ahead), 7 wind bear angles (0, 30, 60, 90, 120, 150, 180), 5 different wind speeds (7.9m/s, 10.7m/s, 13.8m/s, 17.9m/s and 20.1m/s), related wave heights (1.0m, 1.5m, 2.0m, 2.5m, 3.0m),7 current bear angles(0,30,60,90,120,150,180) and 8 current speeds(0.25m/s, 0.50m/s, 0.75m/s, 1.0m/s, 1.25m/s, 1.50m/s, 1.75m/s, 2.0m/s).Through validating and mathematically analyzing simulation datum, new generic equations of channel widths for typical ships were put forward, considering ship magnitude, ship speed, wind direction, wind speed, current direction, and current speed.

FORMAL DESIGN CODE
<Design Code of General Layout for Sea Port>(JTJ211-99) is the official standard design booklet in P.R.China. It can be called <Design Code> for short in the following text. The 100,000& 150,000DWT container carrier models (ship-scales are demonstrated in table 1) were renewed with the latest revise in 2006 by Ministry of Transport of P.R.China. But the channel width equations in Design Code remain the formal model.

In the <Design Code>, the channel width(W) consists with three parts:

1. the ship-trajectory width(A); 2. the safety distance between two ships(b); 3. the safety distance between the ship and channel edge line (c). The three parts can be described in figure 1.

![Figure 1: channel width parts](Image)

Table 1 ship model and scale

<table>
<thead>
<tr>
<th>ship model</th>
<th>LOA(m)</th>
<th>Breadth(m)</th>
<th>picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>150,000DWT Container carrier</td>
<td>382</td>
<td>54.2</td>
<td><img src="Image" alt="Image" /></td>
</tr>
<tr>
<td>100,000DWT Container carrier</td>
<td>347</td>
<td>42.8</td>
<td><img src="Image" alt="Image" /></td>
</tr>
</tbody>
</table>

![W](Image)

In <Design Code>, the channel width can be calculated by the equations:

One Way Channel: $W = A + 2c$  \hspace{1cm} (1)

Two Way Channel: $W = 2A + b + 2c$ \hspace{1cm} (2)

$A = n(L \cdot \sin \gamma + B)$ \hspace{1cm} (3)

$\gamma$ --wind and current drift angle(°), the value of $\gamma$ is demonstrated in table 2;

L --length overall (m); B -- ship width (m);

n --constant, the value of n is demonstrated in table 2;

b --safety distance between two ships, generally can be defined the value of B;

c --safety distance between the ship and channel edge line, generally can be defined in table 3.