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AN INVESTIGATION OF MARINE TRAFFIC IN
SOUTH-EAST ASIAN WATERS AND IN THE CARIBBEAN

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SUMMARY Knowledge of traffic behaviour is an essential pre-requisite for the determination of traffic safety and the finding of appropriate means for its preservation or enhancement. Subsequent to previous works, the authors in this paper present results of traffic surveys conducted in the Malacca Strait, Sunda Strait, South China Sea and in the Caribbean. The investigated areas are supposed to be much frequented. The surveys were conducted from a ship making a normal voyage. The results comprise numbers of meeting, crossing and overtaking encounters for certain periods of time, passing distances and courses and speeds of encountered ships. The results are given as graphs and in tabular form and are discussed.

INTRODUCTION A number of spectacular marine accidents at short intervals of time, including a midocean collision between two VLCCs off the South-East African coast, have caused much public concern about the status and trends of development of the safety of human life at sea and the protection of the marine environment against harmful pollution. Substantial pressure of public opinion on the governments of practically all shipping nations has produced accelerated, sometimes even hectic moves towards new rulemaking by the national as well as the international legislators as e.g. IMCO. The International Conference on Tanker Safety and Pollution Prevention and the International Conference on Training and Certification of Seafarers which are to take place in 1978 may stand as examples for these endeavours.

Some doubts have been uttered, however, particularly by the shipping industry whether the proposed rulemaking will always produce the best available solution to the safety and pollution problem. There are rather reliable and in fact very impressive estimates of the costs involved with some of the proposed new construction and equipment regulations. At least in some cases there is very little reliable evidence available regarding the prospective benefits. This deplorable situation is mainly due to the fact that the science

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of marine traffic safety is only just coming off infantile age to take care of the many tasks of problem definition, problem description and problem solving which lie at the hands of the shipping industry, the governments of maritime nations and ultimately the community of mankind in general to maintain the safety at sea and the protection of the marine environment as a vital condition for the long-term survival of the human race.

It is our objective to contribute to this task in a field which has until recently been ploughed by personal, subjective opinion instead of scientific, objective evidence. It is the field of marine traffic safety which in turn may be defined as the accumulate safety of individual vessels if, when and as long as they participate in marine traffic. Reliable information on the characteristics of marine traffic is quite obviously urgently needed to determine whether and which specific measures, technical or organisational, voluntary or mandatory should be taken to maintain and promote marine traffic safety. Such reliable information is also needed as a basis for determining the risk of a casualty, the overall costs to the community if these risks materialize and consequently the acceptable costs to reduce or even to remove such risks.

Following previous works [1][2] the authors now present results of traffic surveys conducted in some areas in South-East Asia and in the Caribbean. The investigated areas are by general opinion of the shipping community believed to be much frequented. The surveys were made from a ship sailing through the areas. The objective was to collect data regarding the type, number, distribution, speed and course of all ships and other marine craft observed.

SCOPE OF INVESTIGATION The surveys were conducted from the container carrier "TOKIO EXPRESS" (speed 27 knots) during two round trips to the Far East in spring and summer 1976. This ship will be denoted as "own ship". Traffic scenes were preserved by cinematographing the radar picture and recording on a sheet of paper further details of the traffic. The method of recording and evaluating the data has already been given in [1]. The investigated areas were the areas swept by the radar range. In the present paper we would like to give results of traffic surveys conducted in the areas specified below. The areas are all restricted in the sense that coast lines, islands, banks and shoals confine the navigable waters. The clock times given are local times.

Malacca Strait The investigated area is the main fairway in the strait extending from latitude 3°03' N, longitude 100°47' E (16 n.m. northwest of One Fathom Bank lighthouse) to latitude 1°16' N, longitude 103°23' E (8 n.m. west of Tanjong Piai, see Fig. 1 a). The area represents the narrowest part of the Malacca Strait, where on many places due to numerous banks the fairway is only about 7 n.m. wide, and is about 189 n.m. long.
One survey was conducted on Friday, March 19, 1976, from 6.55 to 14.06 o'clock while travelling in south-east direction. The survey time was 7 hours and 11 minutes. This survey is denoted "Survey A" in this paper.

A second survey was conducted on Saturday, April 3, 1976, from 0.40 to 8.29 o'clock while travelling in north-west direction. The survey time was 7 hours and 49 minutes. This survey is denoted "Survey B".

South China Sea The investigated areas comprise two shipping lanes. One of them is the lane usually used monsoon permitting from Singapore to Hongkong and vice versa and the other is the lane from the north of the Philippines to the entrance of Selat-Selat Gelasa (see Fig. 1 b). The first lane extends from lat. $1^\circ$ 27' N, long. $104^\circ$ 34' E (12 n.m. north-east of Horsburgh lighthouse) to lat. $21^\circ$ 53' N, long. $114^\circ$ 20' E (17 n.m. south of Wanglan lighthouse) and is about 1380 n.m. long.

One survey was conducted in this lane from Saturday, March 20, 1976, 20.45 o'clock, to Tuesday, March 23, 1976, 4.10 o'clock, while travelling northerly. The survey time with due regard to the time shift was 54 hours and 55 minutes. This survey is denoted "Survey C".

A second survey was conducted from Tuesday, March 30, 1976, 19.45 o'clock, to Friday, April 2, 1976, 2.23 o'clock, while travelling southerly. The survey time was 55 hours and 8 minutes. This survey is denoted "Survey D".

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**Fig. 1 a** Investigated area in the Malacca Strait
Fig. 1b
Investigated areas in the South China Sea and western Java Sea
The second lane extends from lat. 17°02' N, long. 119°01' E (80 n.m. north-westerly of San Fernando/Luzon) to lat. 2°00' S, long. 107°42' E (31 n.m. north of Langkuas/Belitung). It is about 1370 n.m. long.

A survey was conducted in this lane from Saturday, June 12, 1976, 0.00 o'clock, to Monday, June 14, 1976, 4.00 o'clock, while travelling southerly. The survey time was 53 hours and 10 minutes. This survey is denoted "Survey F".

Luzon Strait: The investigated area is the shipping lane through the Balintang Channel (see Fig. 1 b) extending from lat. 20°51' N, long 122°39'E to lat. 17°02' N, long. 119°01' E. It is about 308 n.m. long. The survey was conducted while travelling south-west on Friday, June 11, 1976, from 12.00 to 24.00 o'clock. The survey time with due regard to the time shift was 12 hours and 20 minutes. This survey is denoted "Survey E".

Selat-Selat Gelasa and Sunda Strait: The investigated area is the shipping lane extending from lat. 2°00' S, long. 107°42' E through the Selat-Selat Gelasa, western Java Sea and the Sunda Strait to lat. 6°56' S, long. 104°27' E (see Fig. 1 b). It is about 364 n.m. long. The survey was conducted...