THE HUMAN FACTOR IN SHIPWRECKS AND OTHER ACCIDENTS TO SHIPS

ANALYSIS OF AN OFFICIAL SWEDISH SERIES

BY

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INTRODUCTION

The human factor in relation to transport accidents has continuously been investigated where aircraft, motor vehicles, railways, street-cars, and most other road vehicles have been involved. There is, however, one field where investigations with regard to the influence of the human factor in transport accidents seem not to have been carried out, *i.e.* accidents occurring to water craft, especially shipwrecks and other accidents to ships. This lack of knowledge has been underlined when discussing this question with colleagues in Great Britain as well as in the United States. At the same time it has also been stressed that this problem is of international interest and that a contribution of analyses from one country might be of value for other seafaring nations.

When investigating road accidents, a large number of authors draw attention to three groups of causal factors, *viz.* those connected with

- (1) road,
- (2) vehicle,
- (3) man.

When examining the importance of the human factor in accidents to water transport, it might be of value to focus attention on factors connected with

- (1) waterway,
- (2) ship,
- (3) man.

The Waterway.—Accidental factors may be due to the actual shipping-route (canal, river, and lake navigation, coastal and trans-oceanic navigation), the speed and position of the ship (open sea, within the coastal archipelago, in the harbour area), climate, season, time of day, wind and weather, water currents,

and tide. Unexpected changes of the bottom of the river or sea, *e.g.* the silting up of estuaries, also belong to this group. The progressive improvement of the maritime safety services (weather forecasts, charts, passage-marking, lighthouses, pilot services) is helping to decrease the number of causal factors connected with the waterway. It seems possible that factors of this kind are more frequently of principal importance in sea accidents than are the corresponding factors in casualties with motor vehicles.

The Ship.—Accidental factors are mainly due to sudden damage to the ship, such as engine or steering-gear trouble, propeller damage, and leaks. These factors vary with the type, size, age, construction, repair, technical equipment, and cargo. Regulations in the maritime law concerning the construction of ships as well as regular inspection and survey of the ships reduce the risk of sea accidents through material defects. Continual improvement of the technical equipment is reducing risks of this kind. On the other hand, the technical equipment may cause an increase in the possibility of accidents, *e.g.* by giving ships greater draught and greater speed, and adding the risk of an improper or unqualified use of new instruments for navigation.

The Human Factor.—This is more complex. The crew on board the ship and the dock workers connected with the activity of the ship have a great responsibility in this respect. The human factor is quite obvious in some cases, but in others the circumstances are more complicated, because the collaboration of several persons is needed in manoeuvring a ship. Furthermore, events at sea often take a very swift and unexpected course.

Regulations for safety in navigation are not only intended to reduce danger and risks connected with

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the ship and the waterway. They are also intended to prevent such human factors as insufficient training, under-manning, too long working hours, unnecessary risks during loading, unloading, and navigation, and poor hygiene on board. The pilotage organization reduces the risks involved in negotiating dangerous passages by providing local knowledge of navigation conditions. By medical examination of seamen, improvement of the conditions on board, voluntary training courses, instruction at sailors' and navigation schools, etc., attempts are made to reduce the risks due to bodily defects and ill-health, poor sanitation, ignorance, insufficient experience, incompetence, and lack of alertness. Among other things, the merchant navy inspectors check that the ship is sufficiently manned.

MATERIAL

With this background we planned an investigation of the influence of the human factor in water transport accidents. The necessity of a study in this connexion was obvious also to the authorities concerned, and the Swedish National Board of Shipping and Navigation kindly gave us access to its records of official investigations and reports of accidents to ships. For practical reasons the year 1953 was chosen as the starting point. In accidents involving one Swedish ship and one non-Swedish ship we were not always able to investigate the circumstances in the non-Swedish ship and are, therefore, unable to define exactly the part played by the other ship in causing the accident.

Of 357 documents placed at our disposal, 266 involved ship accidents with material damage. The accidents were divided into five groups:

- (1) Grounding.
- (2) Collision.
- (3) Engine breakdown.
- (4) Fire and explosion.
- (5) "Other damage to ship and cargo."

Grounding is used in its current sense of "running aground", independent of the extent of the damage. This group includes ships which had only run aground without serious damage. Under *collision* were included all ships involved in a collision, including those which had run aground afterwards. The collisions may have been of different kinds, with another ship, with a quay, or with an object floating in the water.

Engine breakdown includes all accidents considered to have been due to mechanical damage, including that to the propeller and steering gear.

Fire and explosion includes the cases in which the accident reports mentioned these occurrences. One case of a mine-explosion was also included here.

"Other damage to ship and cargo" includes registered damages to the hull of the ship with or without leakage and/or damages caused by shifting of the cargo.

The relevant facts for each case were transferred to register-cards.

In the primary tables, worked out from the data on these cards, the following information was set out: type and age of ship, time, and weather. The extent of the damage was roughly classified as follows:

- (1) Total shipwreck;
- (2) Considerable damage;
- (3) Moderate damage;
- (4) Minor damage.

These grades included losses due to the ship's loss of time.

The cases were then grouped according to the main causal factor under the headings waterway (W), ship (S), and man (M).

Those in which the human factor was mainly responsible for the accident were then divided into three sub-groups:

(1) *Medical* (M_1): Illness, physical defect, intoxication by alcohol, narcotics, or other drugs, and exhaustion.

(2) *Professional* (M_2): If the accident was caused by incompetence or ignorance in connexion with this lack of professional skill, the case was included in this sub-group. By incompetence is meant lack of the acquired skills tested by the necessary maritime examinations.

(3) *Psychological* (M_3): Inattention, lapse of memory, misjudgement, omission to conform to safety-rules, chance-taking and carelessness, erroneous navigation, misreading of maps, miscalculation in manoeuvring.

For every accident a *main cause* was recorded, and in addition, any contributory cause or causes (abbreviated like those used for the main factors, w, s, m, m_1 , m_2).

In some cases the circumstances leading to an accident included human acts, remote in time, which were not the principal or contributory cause of the actual accident, but nevertheless were partly to

blame: for instance, too small towing boats in certain ports, insufficiently controlled cargo, and faults of lighthouses or maps. Remote human factors of this kind were noted by the abbreviation R.

A thorough investigation and discussion of each case with various marine authorities was undertaken before the grouping was done. It is felt that examples of typical accidents illustrating the different types of causal factors need not be published in this paper, since the groups are generally fairly well defined as a result of the thorough reports.

In addition to the analysed factors, the documents also revealed a number of conditions of medical interest, whose connexion with the accidents in question it was not possible to prove. It was chiefly the question of illness, intoxication, mental stress of different kinds, and too long working hours. Some of these conditions will be dealt with in the discussion below.

In Table I the 266 accidents have been distributed by type of ship.

Collisions constitute the biggest group (or 36.9 per cent. of all accidents), followed by 27.9 per cent. of ships running aground. The groups "engine breakdown", "fire and explosion", and "other damage to ship and cargo" occur less frequently: 12.4, 8.2, and 14.6 per cent. respectively.

Of the ships referred to, 44 and 32 per cent. respectively, were motor-ships and steamers. The number of different types of ships is taken from official sources. At the beginning of 1953 the Swedish merchant navy registered 624 sailing ships with auxiliary motor (33.1 per cent.), 621 motor-ships (33 per cent.), 504 steamers (26.8 per cent.), and 133 tankers (7.1 per cent.), a total of 1,882 ships in all. The 266 accidents which caused material damage thus represent 13.9 per cent. of the total. Three ships were involved in two accidents each during the same year.

The percentual age-distribution of the ships, calculated for our series and for the whole commercial navy is given below:

Age of Ship (yrs)	0-4	5-9	10-19	20-29	30-49	50+
I Present Series (1953)	15.8	18.8	16.9	8.6	28.6	11.3
II Whole Merchant Navy (at the end of 1953)	9.5	10.4	11.0	7.3	36.9	24.9
Difference I-II	+6.3	+4.4	+5.9	+1.3	-8.3	-13.6

There is a tendency to an increase in the frequency of accidents among new ships, and a corresponding tendency towards reduced frequency in ships more than 30 years old. A difference in navigation frequency among ships of different age might account for this, but this cannot be ascertained from the available statistics.

The tonnages of the ships in our series is compared with those of the whole Swedish merchant navy as follows:

Tonnage	20-99	100-499	500-1,999	2,000-4,999	5,000-9,999	10,000
I Present Series (1953)	9.1	20.2	32.5	22.8	12.3	3.1
II Whole Merchant Navy (at the end of 1953)	34.3	29.5	17.5	10.1	6.6	2.0
Difference I-II	-25.2	-9.3	+15.0	+12.7	+5.7	+1.1

The distribution of accidents according to tonnage diverges from the corresponding distribution in the whole merchant navy. The greatest difference is seen in the group 20-99 gross registered tons, where the accident figures are as much as 25.2 per cent. lower than those of the whole merchant navy.

In the group 100-499 gross registered tons, the accident frequency was also considerably lower (-9.3 per cent.). In the middle groups (500-1,999

TABLE I
ACCIDENTS OF DIFFERENT TYPES TO SWEDISH MERCHANT SHIPS DURING 1953

Type of Accident	Type of Ship									
	Motor-sailers		Motor-ships		Steamers		Tankers		Total	
	No.	per cent.	No.	per cent.	No.	per cent.	No.	per cent.	No.	per cent.
1. Running aground	14		24		27		9		74	27.9
2. Collision	10		47		33		8		98	36.9
3. Engine breakdown	2		20		8		3		33	12.4
4. Fire and explosion	3		14		4		1		22	8.2
5. "Other damage to ship and cargo"	13		12		13		1		39	14.6
I. Present Series	42	15.8	117	44.0	85	32.0	22	8.2	266	100.0
II. Whole Swedish Merchant Navy, 1953	624	33.1	621	33.0	504	26.8	133	7.1	1,882	100.0
Difference of percentages (I-II)		-17.3		+11.0		+5.2		+1.1		

and 2,000–4,999), however, the frequency was 15·0 and 12·7 per cent. higher respectively, and in the two largest groups the difference is insignificant. It seems difficult to explain these differences, particularly as the more fatiguing double-watch system is common in ships under 500 gross registered tons. A conceivable contributory cause of the favourable figure for small ships might be that these have on an average a lower turnover than large ships.

The factors we have judged as *main causes* are listed in Table II, according to type of accident.

The main causes classed as W, S, and M occur in the whole series in 28·2, 13·1, and 58·7 per cent. of cases respectively. The human factor, accordingly, is the predominant primary factor.

If, however, we consider the types of accident, significant differences appear. The W-factor is thus the most important cause of the group "other damage to ship and cargo" (64·1 per cent.), but plays a small part in the origin of fire and explosion (5·0 per cent.). In all the other groups this factor occurs in about 20 to 30 per cent.

The S factor is predominant in the group "engine breakdown" (42·4 per cent.) and is also a frequent cause of "fire and explosion" (35·9 per cent.), but is less important for other types of accident.

The human factor (M) is predominantly concerned in collision (75·5 per cent.), running aground (70·5

per cent.) and fire and explosion (59·1 per cent.). In the groups "engine breakdown" and "other damage to ship and cargo", the M-factor was responsible for 27·3 and 20·5 per cent. respectively.

In order to ascertain whether similar differences exist in the various type of ships, this distribution is shown in Table III, which shows that the M-factor was a main cause in a little more than 80 per cent. of accidents in tankers. For other types of ships the percentages lie between 50 and 60.

The W-factor came next in importance in all types of ship, being lowest for tankers (about 14 per cent.), and averaging 30 per cent. for other types of ship.

The S-factor was the most frequent cause among auxiliaries and motor-ships (about 19 and 6 per cent. respectively) and was lowest among steamers and tankers (8·3 and 4·5 per cent. respectively).

The extent of the damage is analysed by type of accident and cause of accident in Table IV (opposite).

Slight and moderate damage were each recorded in about one-third of the cases, considerable damage in just over one-quarter and total loss in the remaining 7·8 per cent. As regards the total shipwrecks, only 21 in number, in one of which the ship disappeared without a trace, the waterway and the human factors seem to be more common as the main causes than the S-factor.

TABLE II
ACCIDENTS BY TYPE OF ACCIDENT AND PRIMARY CAUSE

Type of Accident	Primary Cause						Total Number
	Waterway (W)		Ship (S)		Man (M)		
	Number	per cent.	Number	per cent.	Number	per cent.	
Running aground	20	27·1	2	2·7	52	70·2	74
Collision	19	19·5	5	5·2	74	75·3	98
Engine breakdown	10	30·3	14	42·4	9	27·3	33
Fire and explosion	1	5·0	8	35·9	13	59·1	22
"Other damage to ship and cargo"	25	64·1	6	15·4	8	20·5	39
Total	75	28·2	35	13·1	156	58·7	266

TABLE III
ACCIDENTS BY CLASS OF SHIP AND PRIMARY CAUSE

Class of Ship							Primary Cause						Total
							Waterway (W)		Ship (S)		Man (M)		
							Number	per cent.	Number	per cent.	Number	per cent.	
Motor-sailer	..	..	..	..	..	..	12	28·6	8	19·1	22	52·3	42
Motor-ship	..	..	..	..	..	..	31	26·5	19	16·2	67	57·3	117
Steamer	..	..	..	..	..	..	29	34·1	7	8·3	49	57·6	85
Tanker	..	..	..	..	..	..	3	13·6	1	4·5	18	81·9	22
Total	..	..	..	..	..	..	75	28·2	35	13·1	156	58·7	266

TABLE IV
APPROXIMATE EXTENT OF DAMAGE IN DIFFERENT TYPES OF ACCIDENT

Type of Accident		Extent of Damage																Total
		Total Shipwreck				Considerable Damage				Moderate Damage				Slight Damage				
		W	S	M	Total	W	S	M	Total	W	S	M	Total	W	S	M	Total	
Running aground		2	—	3	5	8	—	21	29	4	1	16	21	6	1	12	19	74
Collision		1	—	4	5	1	1	13	15	4	3	21	28	13	1	36	50	98
Engine breakdown		—	1	—	1	1	6	4	11	8	5	5	18	1	2	—	3	33
Fire and explosion		—	1	3	4	—	2	6	8	1	2	2	5	—	3	2	5	22
“Other damage to ship and cargo” ..		4	2	—	6	4	2	2	8	13	—	5	18	4	2	1	7	39
Total	No.	7	4	10	21	14	11	46	71	30	11	49	90	24	9	51	84	266
	Per cent.				7·8				27·0				33·8				31·4	100·0

Of 97 registered contributory causes (Table V), 48 were connected with the waterway, eight with the ship, and 41 with the human factor. Of the latter six were medical (m_1), four professional (m_2), and 31 psychological (m_3).

TABLE V
CORRELATION OF MAIN AND CONTRIBUTORY ACCIDENTAL FACTORS

Main Cause		Contributory Cause						
		w	s	m				Total
				1	2	3	Total m	
Factor	No.							
W	75	—	5	4	—	5	9	14
S	35	4	—	1	—	1	2	6
M ₁	12	—	—	—	1	1	2	2
M ₂	13	1	—	—	—	7	7	8
M ₃	131	43	3	1	3	17	21	67
Total	166	48	8	6	4	31	41	97

Table V shows that there was a contributory human factor (m) in nine of the 75 cases in which W was the main cause (four of them on account of m_1 and five on account of m_3). In the 35 cases in which

S was the main cause, m_1 was recorded as a contributory factor in one case and m_3 in another. The human factor was thus represented in 167 cases (62·9 per cent.), 156 primary and eleven contributory.

A remote human factor (R) was discernible in a total of eighteen cases, eleven referable to W and seven to S (Table VI). Even among cases with M as a main cause, m and R were also recorded in thirty and seven cases respectively. The thirty accidents in which m was a contributory factor, included one case referred to as m_1 , four to m_2 , and 25 to m_3 .

On further analysis of the importance of the human factor, consideration was given not only to the immediate human factor, both as a primary and a contributory cause, but also to the remote human factor (R). Table VI shows the frequency of all these types of human factor; M being the main cause in 156 of the 266 accidents (58·7 per cent.), twelve (4·5 per cent.) as a consequence of M_1 , thirteen (4·9 per cent.) of M_2 , and 131 (49·3 per cent.) of M_3 .

A human factor either immediate or remote was accordingly noted in 185 of 266 shipwrecks (69·5 per cent.).

TABLE VI
HUMAN FACTOR AS MAIN OR CONTRIBUTORY CAUSE

Accidents		Human Factor																Remote R		Total M + m + R	
		Immediate																			
		Main				Contributory						Total									
		Medical	Profes- sional	Psycho- logical	Total M		Medical	Profes- sional	Psycho- logical	Total m		M + m									
Type	No.	M ₁	M ₂	M ₃	No.	Per cent.	m ₁	m ₂	m ₃	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.				
Running aground ..	74	7	9	36	52	70·2	3	0	2	5	6·9	57	77·1	4	5·4	61	82·5				
Collision ..	98	1	3	70	74	75·3	1	0	3	4	4·2	78	79·5	2	2·1	80	81·6				
Engine breakdown ..	33	0	1	8	9	27·3	0	0	0	0	0·0	9	27·3	5	15·2	14	42·5				
Fire and explosion ..	22	4	0	9	13	59·1	0	0	0	0	0·0	13	59·1	2	9·1	15	68·2				
"Other damage to ship and cargo" ..	39	0	0	8	8	20·5	1	0	1	2	5·1	10	25·6	5	12·9	15	38·5				
All Shipwrecks ..	266	12	13	131	156	58·7	5	0	6	11	4·2	167	62·9	18	6·9	185	69·8				

The distribution of accidents attributable wholly or in part to human factors (M, m, R) *by different types of employee* was as follows:

69 deck-officers (42 per cent.),
9 marine engineers (4 per cent.),
11 remaining crew (5 per cent.),
14 pilots (7 per cent.),
53 persons in other ships (28 per cent.),
22 persons on shore (11 per cent.).

Seven cases (3 per cent.) were attributable to more than one person in different groups.

The correlation between different types of accident factors and different types of accident is shown in Tables II and VI.

Thus 70.2 per cent. of the runnings aground were judged to be caused primarily by human factors. In five other cases an m-factor was included and in four cases an R-factor, so that the total with a human causal factor (M, m, or R) was 82.5 per cent. (Table VI).

In 75.3 per cent. of the collisions a human factor was found to be the main cause, 73 per cent. being assigned to persons in the other ship, 18 per cent. to persons in their own ship, seven per cent. to persons in both the ships involved, and two per cent. to persons outside both ships. Moreover, the m-factor occurred in four cases of those primarily assigned to W or S. The R-factor occurred in two cases. All the collisions with a human causal factor (M, m, or R) amounted to 81.6 per cent.

In 27.3 per cent. of the engine breakdowns the cause was the human factor. The m-factor did not occur, but the R-factor occurred in five cases, so that a human factor (M or R) occurred in 42.5 per cent. of engine breakdowns.

In 59.1 per cent. of the "fire and explosion" group the human factor was the main cause; m did not occur in the cases referred to W or S, but there were two cases with an R-factor, bringing the total M or R to 68.2 per cent.

In cases of "other damage to ship and cargo", the human factor was a main cause in 20.5 per cent., the m-factor also occurred in two cases referred to W or S, and the R-factor in five more. Thus a human factor (M, m, or R) occurred in altogether 38.5 per cent. of this group.

On looking more closely at the occurrence of a medical factor in the material, we find such a factor in eighteen cases; twelve were registered as a main

cause*, and six as a contributory cause†: four in cases attributed to W, and one in a case attributed to S. There was also one case in the group M₃ in which a contributory medical factor was found.

Another 42 cases of medical interest were noted, though other factors had actually caused the accidents. These included one case of tuberculosis, one of nose-throat infection, one of seasickness, two of night-blindness, three of alcoholic intoxication, nineteen of exhaustion, and fourteen of various mental disorders.

The information obtained by checking the material concerning medical conditions may by no means be regarded as an expression of the general state of health on board Swedish ships, but they invite certain reflections. Diseases of chronic as well as acute character must certainly imply an increased load of work and responsibility for the remaining crew. This will particularly be the case if the ill-health on board is very wide spread. In exacting situations such circumstances might contribute to overstrain in the members of the reduced staff and thus increase the risk of accidents caused by medical as well as by psychological factors. Severe forms of exhaustion are most apt to be caused by long spells of duty under adverse conditions. As sudden and exacting changes in weather often occur without warning, it is important that, at the beginning of a voyage, the crew should be thoroughly rested and in good condition. Information obtained in the course of these investigations denotes that mental stress also may arise from language difficulties.

Lack of professional skill (M₂) was the main factor in thirteen cases, and a deficiency in formal competence was noted in a further nine cases, making altogether 8.2 per cent.

"Taking a chance", carelessness, omission, inattention, forgetfulness, misjudgement, faulty navigation, or miscalculation in manoeuvring (M₃) was the primary cause in 131 cases. In addition, there was an m-factor in eleven cases, and an R-factor in eighteen cases. Errors of this type were also noted in 54 other cases, but not in connexion with the accidents.

We have purposely avoided an attempt to divide the psychological factors into groups, as the reports, coming as they did from various quarters, were not written in a uniform terminology. To attack this

* One case of heat stroke, one case of colour-blindness, four cases of exhaustion, and six cases of alcoholic intoxication.

† One case of nose-throat infection, one case of alcoholic intoxication, and four of exhaustion.

question scientifically one might be forced to collect a special series. In some of the documents it is mentioned that the person concerned had been declared responsible for the accident by a court of law, but in other cases the question of responsibility was left unanswered. Furthermore, information on this point is missing altogether in many cases. In our scrutiny we have desisted from assessing responsibility. The question of guilt is of little importance in forming an opinion about preventive measures. It is of interest to make comparisons here with the investigation of the Swedish National Traffic Insurance Association concerning motor vehicle accidents leading to personal injury; in this survey the human factor was found to be at fault in 91·9 per cent. of cases in the year 1947 and 90·7 per cent. of cases in the year 1952.

The W-factor was often observed in our investigation, which is to be expected on account of the fickleness and changing risks of the sea and the weather generally. It was a main cause in 28·2 per cent. of the cases in our series, whereas the Swedish National Traffic Insurance Association blamed the road factor for 5·3 and 4·6 per cent. of cases respectively in the investigation mentioned above.

Accidents were caused by the S-factor in 35 (13·1 per cent.) of our cases, but the vehicle factor was blamed in only 4 and 3·6 per cent. by the Swedish National Traffic Insurance Association. The ship factor in our investigation thus exceeds the vehicle factor in the investigations of the Swedish National Traffic Insurance Association by 10 per cent. This difference is due to the fact that "the vehicle" in maritime traffic is probably exposed to comparatively great strains.

Furthermore, one cannot, as for traffic accidents with motor vehicles, elicit any maximum for a certain month, etc. This applies to the whole series including the cases due to human factors. Accumulations of accidents during some stormy days at the turn of February–March, 1953 (23 cases), underline the paramount importance of good health and physique among sailors as stated above in the discussion of the medical factor.

DISCUSSION

In this investigation the influence of the human factor in shipwrecks and damage to ships at sea is studied. The data concern Swedish merchant ships and originate from the official records of the National

Board of Shipping and Navigation in Sweden for the year 1953. In reports of this kind the stress is laid upon maritime, juridical, and technical facts. The penetration of human factors relating to medical questions, such as acute or chronic illness, symptoms of disease, alcoholic intoxication, and reactions from prescribed medicines, is, however, not so detailed as might have been possible had the series been specially collected for the purpose of such an investigation. The present series must for this reason be regarded only as a pilot study.

Our results show in a convincing way, however, that the human factor is of great importance in the causation of shipwrecks and damage to ships at sea. Among various human factors—except purely medical ones—there are those connected with insufficient skill and psychological factors of various kinds.

A more complete and reliable knowledge of the medical and psychological factors contributing to the occurrence of accidents to water transport would, in our opinion, indicate measures which might help to prevent accidents of this kind.

Shipwreck and other damage to ships at sea involve heavy loss of life and large sums of money. In Scandinavia the need of preventive action has recently been strongly emphasized, and in the past two years some shipping companies have arranged special training courses in addition to the ordinary merchant navy training. Three cargo ships, operating in the ordinary trades, have been converted into training ships aboard which apprentices, in addition to the theoretical subjects required for the mates' certificates, are introduced to the constructive principles of safety at sea. The sailors' union has also arranged a number of courses, in which experienced teachers educate sailors to a sense of personal responsibility in the prevention of accidents. The navigating and engineer officers' unions, realizing the need of continuous education for their members, publish expert papers in their periodicals. The textbooks in use at the navigation schools are constantly revised. In Norway, one of the navigation instructors, Leiv Jernaes, has published a book entitled "Anti-collision" (1959). The insurance companies have also seen the importance of thorough education for seafarers, and Gustaf Ahrne, vice-president of a prominent Swedish insurance company, has published a book called "Radar on Board" (1957). A retired Norwegian insurance president, Thoralf Wikborg, has continuously followed and commented on every kind of shipwreck and other cases of damage to ships at sea in a periodical called *Tales from the Sea*. At the Department of Social Medicine of the University of

Gothenburg, investigations are in progress on subjects related to marine medicine. In May, 1959, a special conference was convened by the Swedish National Board of Shipping and Navigation at which the whole field of water transport was surveyed from

the point of view of accident prevention and several new suggestions were discussed.

In spite of what has already been done, extensive research into the causes of marine accidents and methods of prevention is an urgent task.