Transportation Safety Board of Canada

Bureau de la sécurité des trar du Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Marine Occurrence Report

Grounding

Loaded Bulk Carrier "ZIEMIA CIESZYNSKA" Bridge 11, Welland Canal, Ontario 22 September 1993

Report Number M93C0002

Synopsis

After clearing Bridge 11 during an upbound transit of the Welland Canal, Ontario, at night and in thick fog, the "ZIEMIA CIESZYNSKA" veered to starboard and grounded on the western bank. The vessel was under the conduct of a pilot. Soon after, she was refloated, unassisted, and proceeded, under her own power, to a lay-over berth in the canal. The vessel sustained considerable damage to the forward underwater area. There was neither pollution nor injury as a result of this occurrence.

The Board determined that the "ZIEMIA CIESZYNSKA" grounded because the pilot, while disorientated, made an unexpected and erroneous alteration of course. The sudden formation of advection fog and the fact that there was no continuous exchange of information between the pilot and the master also contributed to the grounding.

Ce rapport est également disponible en français.

Table of Contents

1.0 *Factual Information*

1.1 *Particulars of the Vessel*

"ZIEMIA CIESZYNSKA"	
Official Number	4311
Port of Registry	Szczecin, Poland
Flag	Polish
Type	Bulk carrier
Gross Tons[1]	17,464
Length	172.45 m
Breadth	23.10 m
Draught	F[2]: 7.95 m A: 7.95 m
Cargo	17,939 tonnes of steel slabs
Crew	23
Passengers	1
Built	1993, Istanbul, Turkey
Propulsion	One six-cylinder Sulzer diesel engine driving a single fixed-pitch propeller, rated 5,425 kW
Owner	Polish Steamship Company Szczecin, Poland

1.1.1 *Description of the Vessel*

The "ZIEMIA CIESZYNSKA" is a typical bulk carrier with bridge, engine-room and accommodation located aft. The wheel-house is equipped with a complete computer-assisted bridge instrumentation control centre. Radars are sited at the port and starboard extremities of the forward control console.

---

[1] Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System (SI) of units.

[2] See Glossary for all abbreviations and acronyms.

1.2 *History of the Voyage*

The "ZIEMIA CIESZYNSKA" departed from Lock 7 in the Welland Canal at 2315[3], 21 September 1993, continuing her upbound (north to south) transit. The vessel was under the conduct of a Seaway pilot who had recently boarded. At 2352, the vessel passed through Bridge 10 and, shortly thereafter, there was a change of navigation bridge personnel. In addition to the pilot, the master, an officer of the watch (OOW), a helmsman and ship's electricians were on the bridge at midnight.

As the "ZIEMIA CIESZYNSKA" was approaching Bridge 11 (see Appendix A), the master was monitoring the starboard radar and the pilot was navigating by visual aids. The pilot glanced at the radar for periods of two to three seconds occasionally.

North of Bridge 11, the pilot requested that an all round white light be fitted to the crosstrees of the foremast to aid him with his navigation. The vessel cleared Bridge 11 at 0013, 22 September. Suddenly, dense fog obscured the white light on the foremast and reduced visibility in the channel, except for a narrow area along the west bank which was illuminated by lights, two of which were visible. The pilot ordered hard-a-starboard helm explaining that the vessel had to pass between the two white lights. The speed of the vessel was estimated to be four to five knots.

The master, observing by radar that the vessel was centre channel, countermanded the order and ordered hard-a-port helm, but there was insufficient time to prevent the vessel from running aground. The master, perceiving that the pilot was totally disoriented, took over the conduct of the vessel and verbally relieved the pilot of his duties.

The pilot initially could not remember and later denied giving the hard-a-starboard order, but the bridge course recorder clearly shows a dramatic alteration of course to starboard at 0013. The vessel's original heading was 188° (G), and she grounded heading 248° (G) (see Appendices A and B). The helmsman testified that he had been ordered to alter course to starboard by the pilot and that there had been no inadvertent movement of the helm.

The pilot further surmised that perhaps the vessel had taken a sheer due to bank suction caused by a change in the profile of the underwater area of the canal. An underwater survey of the area conducted at a later date did not discover anything to support this conjecture.

As the bridge operator was lowering the bridge, he saw the stern of the "ZIEMIA CIESZYNSKA", approximately 60 m distant, moving rapidly toward the east. He estimated that the bow of the vessel was 45 to 50 degrees from the centre line of the channel toward

[3] All times are EDT (Coordinated Universal Time (UTC) minus four hours) unless otherwise stated.

the western shore, near a spar buoy. The vessel grounded at 0014 in position 43°04'24" N, 79°12'36" W.

The "ZIEMIA CIESZYNSKA" was quickly refloated and resumed her passage under the conduct of the master. Soundings of compartments were taken. These revealed that the forepeak tank and the starboard No. 1 double-bottom tank had been breached. The vessel's pumps were unable to contain the inflow of water. Because of the deepening forward draught, the vessel was directed to tie-up at Wharf No. 10, a berth which is located in a basin outside of the canal itself. When she was secured there at 0320, the draught was read and found to be 8.35 m forward, 8.2 m amidships and 7.95 m aft.

1.3 *Injuries to Persons*

No one was injured.

1.4 *Damage to the Vessel*

The vessel sustained considerable damage to the underwater plating and to the frames of the forepeak tank and the starboard No. 1 double-bottom tank.

1.5 *Certification*

1.5.1 *Vessel*

The vessel was certificated, manned and equipped in accordance with existing regulations.

1.5.2 *Personnel*

Both the master and the OOW held qualifications appropriate for the class of vessel on which they were serving and for the voyage being undertaken. The pilot was duly licensed by the Great Lakes Pilotage Authority.

1.6 *Personnel History*

1.6.1 *Master*

The master had served in this capacity for 15 years. He had been in command of the "ZIEMIA CIESZYNSKA" since her delivery in March 1993.

1.6.2 *Officer of the Watch*

The OOW had served in his present capacity for two years and he also had been on the "ZIEMIA CIESZYNSKA" since her delivery.

1.6.3 *Pilot*

The pilot had been handling vessels in the Great Lakes area for 20 years. Previously, he had been master of vessels in Canadian waters and had the appropriate certification. Before this particular assignment, the pilot had been off duty for 72 hours.

The pilot has since retired from the Great Lakes Pilotage Authority.

1.6.3.1 *Medical Requirements*

As the pilot was over 55 years of age, he was required to undergo a complete medical examination every year. His last such examination was conducted in February 1993 at which time he was reported to be fit for duty.

1.7 *Environmental Information*

1.7.1 *Weather*

Advection fog is prevalent in the area in autumn. During the evening, there had been intermittent light rain with a visibility of seven to eight miles. After 2300 on 21 September, the air temperature and the dew point coincided at 10°C and fog was observed to develop ashore. Shortly after midnight, the channel became obscured in dense fog. Wind was from the NW at about two knots.

1.7.2 *Flow of the Canal*

On the west bank of the canal, approximately 230 m south of Bridge 11 and marked by two spar buoys, there is a hydro weir. This weir controls the level of water in the canal between Locks 7 and 8 by regulating the amount of water flowing out of that section of the canal. The outflow at the weir varies from 10 m^3 to 12 m^3 per second. Reports indicate that, at the maximum discharge, there is little or no lateral effect on the north/south flow of the canal.

1.8 *Navigation Equipment*

1.8.1 Vessel

The "ZIEMIA CIESZYNSKA" is equipped with a full range of ultra-modern navigational aids including a course recorder. The sophisticated starboard radar is equipped with an Automatic Radar Plotting Aid (ARPA).

The steering control is a small hand-operated wheel. At the time of the incident, two steering motors were running, providing a wheel-over time of 14 seconds from hard-a-port to hard-a-starboard.

1.8.2 Canal Lighting

South of the position of the grounding, on the eastern shore, between Bridge 11 and Mile 11, two lights are set well back from the canal edge. At the turn in the canal at Mile 11, there is a white light on the eastern bank.

Lights on the western shore of the canal are spaced approximately 100 m apart and set some 15 m from the canal edge. At Mile 11, a white light on the western bank is positioned higher than the white light on the eastern bank.

The intensity of the canal lighting is controlled by the operator at Bridge 11. As the visibility decreases, the candle-power can be increased. However, with maximum power in reduced visibility, the glare caused by the diffusion of light in the suspended water particles of the fog may obscure the edge of the canal. At the time of the occurrence, the candle-power of the lights was nearly at maximum, the east bank of the canal was not visible and the first two lights south of Bridge 11 on the west bank of the canal were barely visible.

1.9 *Radio Communications and Television Monitoring*

The St. Lawrence Seaway Authority Welland Canal Traffic Control Centre (Seaway Welland) co-ordinates vessel traffic through the canal. The controller monitors very high frequency radiotelephone (VHF R/T) channel 14 (in sector 2) and, during adverse weather conditions, monitors television video units to advise shipping of local conditions such as high winds and/or reduced visibility. Transiting vessels have to report to Seaway Welland and advise of their progress.

At 2300, 21 September 1993, Seaway Welland advised of areas of ground fog but, at the time, these areas were not considered to be significant enough to affect vessel movement.

1.10 Canal Traffic Control

Whenever fog is present, certain areas of the canal may be shut down and, if the visibility is reduced to less than one-quarter of a mile, the whole system may be shut down.

At 2400, the "ZIEMIA CIESZYNSKA" was in fog but was committed to continue ahead since she was transiting a "no meeting area" where there are no tie-up facilities.

The "ZIEMIA CIESZYNSKA" ran aground at 0014. This information was relayed to Seaway Welland at 0030. Downbound traffic from Lock 8 was stopped to permit the "ZIEMIA CIESZYNSKA" to proceed to Wharf No. 10, near Mile 17, after the grounding.

1.11 Interaction Between the Pilot and the Bridge Personnel

The pilot is responsible to the master for the safe navigation of the ship. He has a duty to inform the master or his representative of the action he will take to accomplish this task.

There was no language difficulty in communicating the necessary orders.

Apart from helm orders being given by the pilot and being acknowledged, conversation on the bridge was kept to a minimum. There was little exchange of information between the master and the pilot.

The master retained control of the radar, a type with which the pilot was not familiar. The pilot was navigating by visual means.

1.12 Health Concerns

Following the incident, the pilot was unable to recall the events leading up to the grounding. The moment of disorientation leading to the extraordinary helm order which resulted in the grounding gave rise to concern for the medical condition of the pilot.

The TSB Safety Medicine Branch conducted a review of the pilot's medical records. At the time of the review, the records indicated that the pilot was fit for duty.

2.0 *Analysis*

2.1 *Navigation Equipment*

The "ZIEMIA CIESZYNSKA" is a new ship equipped with ultra-modern navigational instruments requiring that the bridge team assigned to the vessel has comprehensive knowledge of the use and operation of the equipment.

The pilot boarded the vessel and was confronted with a radar that may have looked familiar but, due to its sophistication, would have required prior instruction in its operation to enable him to use it as the major aid to navigation in fog. Consequently, the pilot looked at the radar infrequently, preferring to pilot by visual means.

Although it was found that the fog was increasing suddenly as the vessel was in the area of Bridge 11, the master was able to recognize by radar that the vessel had left her intended track. Because he was able to do this, it is evident that the condition of the radar was not a factor in the grounding.

2.2 *Communication Between the Master and the Pilot*

Because the pilot was not familiar with the sophisticated radar, he made little use of it. Once the vessel was in fog, the radar became the main viable aid to navigation. The master assumed control of the operational set, a situation which could potentially discourage the pilot from using the radar.

The master reported that he recognized almost immediately by radar that the vessel was swinging toward the bank but was unable to countermand the pilot's helm order in time to avert the grounding.

On the basis of the visual clues available to him, the pilot believed that the starboard alteration was necessary. Each man was aware of a part of the whole picture; had they been communicating effectively before the perceived need to alter course, the grounding could have been averted.

2.3 *Reason why the Transit was not Aborted*

Under the Seaway Regulations, whenever fog is forecast, navigation may be suspended. Vessels go either to anchor or they make fast at a nearby mooring facility. Because the "ZIEMIA CIESZYNSKA" was in a "no meeting area" shortly after midnight, she was committed to proceed in spite of the sudden appearance of advection fog.

After the grounding and with downbound traffic stopped, the "ZIEMIA CIESZYNSKA" was directed to proceed to Wharf No. 10, a berth outside the Seaway channel, because of her deepening forward draught.

2.4 *Situational Awareness and Information Processing*

Situational awareness can be defined as all the knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation. To maintain situational awareness, a person scans for signals or cues which can be interpreted to reveal important information, such as location, speed, and the presence of hazards. A marine pilot has to maintain situational awareness to maintain safe control of the ship.

When performing tasks with which they are familiar, persons know the normal flow of activities and action alternatives and, therefore, do not always consult the complete set of defining attributes before acting.

There is a natural tendency to refrain from using all the cues available. Instead, a person who expects certain cues will use those cues to quickly confirm his/her assessment of the situation and take what is apparently appropriate action without referring to other information which may corroborate or conflict with the evaluation.

When persons are stressed, there is a tendency for their attention to become even more narrowed so that even the cues which are present are missed, ignored or discounted. Stress can also affect the perception of time. Under stressful conditions, people overestimate the amount of time which has passed.

2.5 *Reason for the Alteration of Course*

When the "ZIEMIA CIESZYNSKA" cleared Bridge 11, the ship's head was steady. According to the road bridge operator, when the vessel's stern was about 60 m from his position, it was already swinging quickly to port. Therefore, the hard-a-starboard helm order and the pilot's indication to the master that the vessel had to pass between the two white lights must have been given immediately after the stern cleared the bridge.

The pilot knew the area well. He knew that no large alteration of course was required there. Rationally, he also knew that the course steered through the bridge had been correct and that no major alteration was called for in this position. The next major alteration of course should have been to port, about a mile further up the canal.

In the dense fog, it is likely that the pilot, without the benefit of continuous radar information, lost his situational awareness and became visually disorientated. Furthermore, it is likely that he was also disorientated in time because he altered course long before the

alteration was required. A further indication of disorientation was that the pilot was unable to recall the events which led to the grounding.

The fact that the lights on the western bank of the canal had been increased to maximum intensity may have been a factor in this disorientation because the pilot mistook the lights for white lights at Mile 11.

The lights at Mile 11 could not have been visible in the fog.

3.0 Conclusions

3.1 Findings

1. The sudden worsening of advection fog obscured the Welland Canal in the area of Bridge 11.

2. There was a minimum of communication between the pilot and the bridge personnel.

3. The pilot did not request nor was he offered pre-departure instruction on the operation of the bridge radar.

4. The master retained control of the radar when fog descended rapidly over the canal as the "ZIEMIA CIESZYNSKA" cleared Bridge 11.

5. The pilot made infrequent use of the radar by glancing at the screen over the shoulder of the master.

6. When 60 m south of Bridge 11, the vessel was observed to be making a large alteration of course to starboard; as a result; the vessel ran aground.

7. The alteration is clearly visible on the course recorder trace.

8. The pilot could not recall the events leading to the grounding, including giving the order to alter course to starboard.

9. The master countermanded the pilot's order to alter course to starboard, discharged him from his duties and ordered "hard-a-port" helm but there was insufficient time for this correction to affect the outcome.

10. The master assumed the conduct of the vessel because he perceived that the pilot was disorientated.

11. Once refloated, because of her deepening forward draught, the vessel was directed to continue her transit and secure at Wharf No. 10.

3.2 Causes

The "ZIEMIA CIESZYNSKA" grounded because the pilot, while disorientated, made an unexpected and erroneous alteration of course. The sudden formation of advection fog and the fact that there was no continuous exchange of information between the pilot and the master also contributed to the grounding.

4.0 Safety Action

4.1 Action Taken

4.1.1 Bridge Resource Management (BRM)

Following a previous grounding occurrence involving a Canadian vessel (TSB Report No. M93L0001), the Canadian Coast Guard (CCG) drafted a Bridge Resource Management (BRM) discussion paper. It is presently being reviewed by selected marine schools and pilotage authorities. Once finalized, the paper will form the core for the development of an optional training course on BRM.

In addition, the Board recently published *A Safety Study of the Operational Relationship Between Ship Masters/Watchkeeping Officers and Marine Pilots* which identified deficiencies in teamwork on the bridge, including communications between marine pilots, masters and watchkeeping officers. In the study, the Board recommended that:

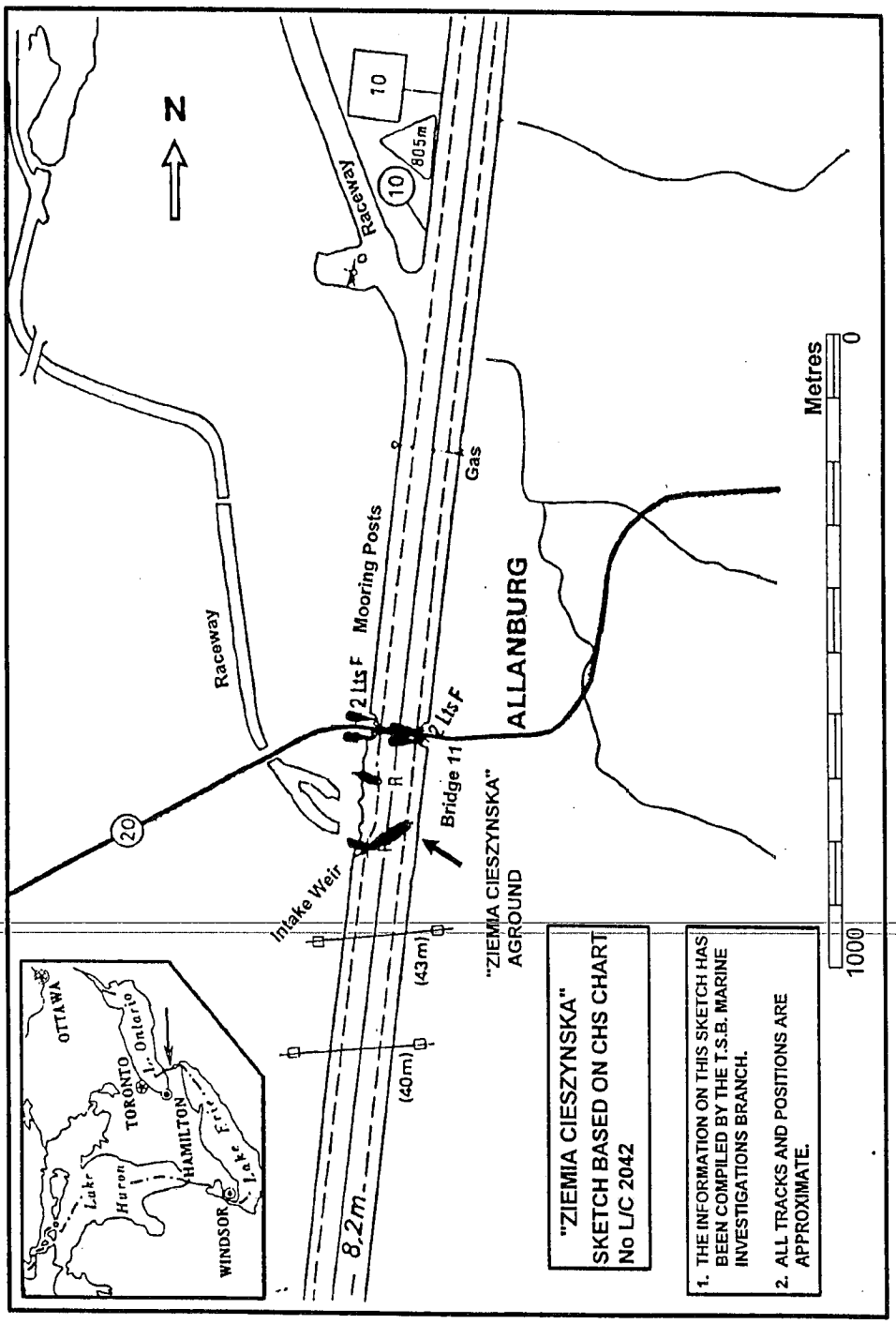
> The Department of Transport require that the initial training syllabus for all ship officers be modified to include demonstration of skills in Bridge Resource Management.
>
> (M95-09, issued October 1995)

and that:

> The Department of Transport require that all ship officers demonstrate skills in Bridge Resource Management before being issued Continued Proficiency Certificates.
>
> (M95-10, issued October 1995)

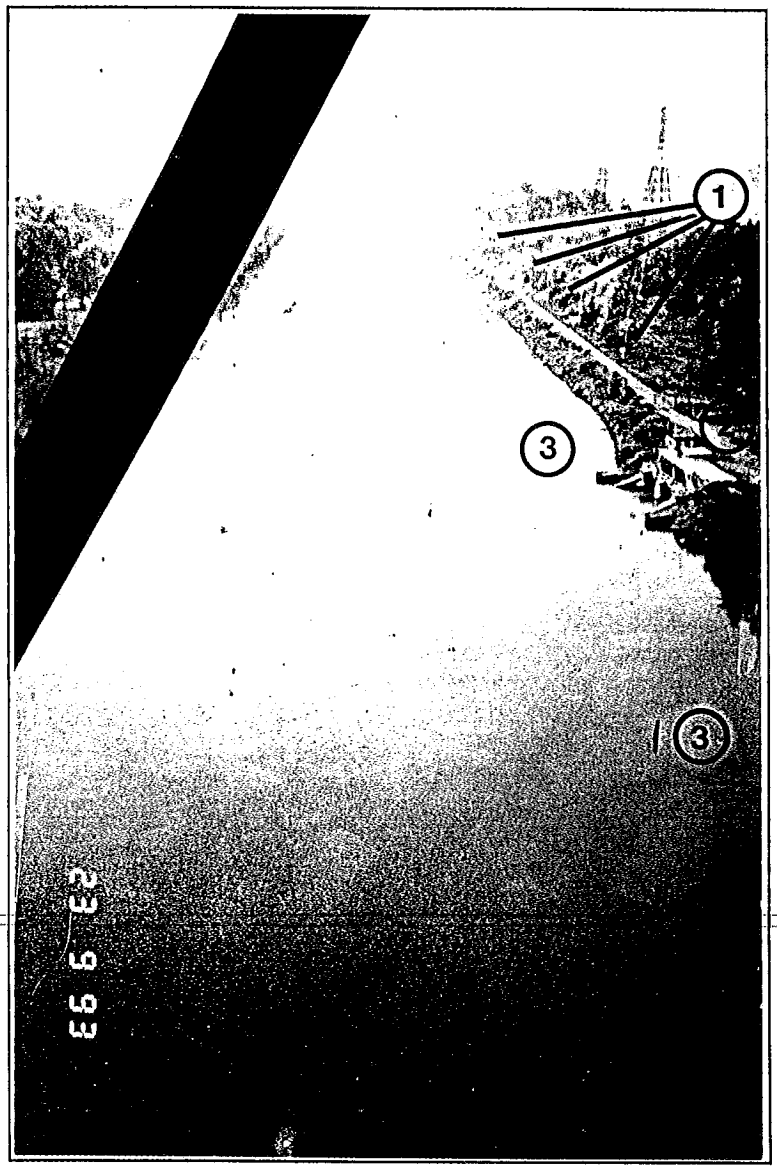
This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Zita Brunet and Maurice Harquail, authorized the release of this report on 22 November 1995.

Appendix A - Sketch of the Area of Occurrence

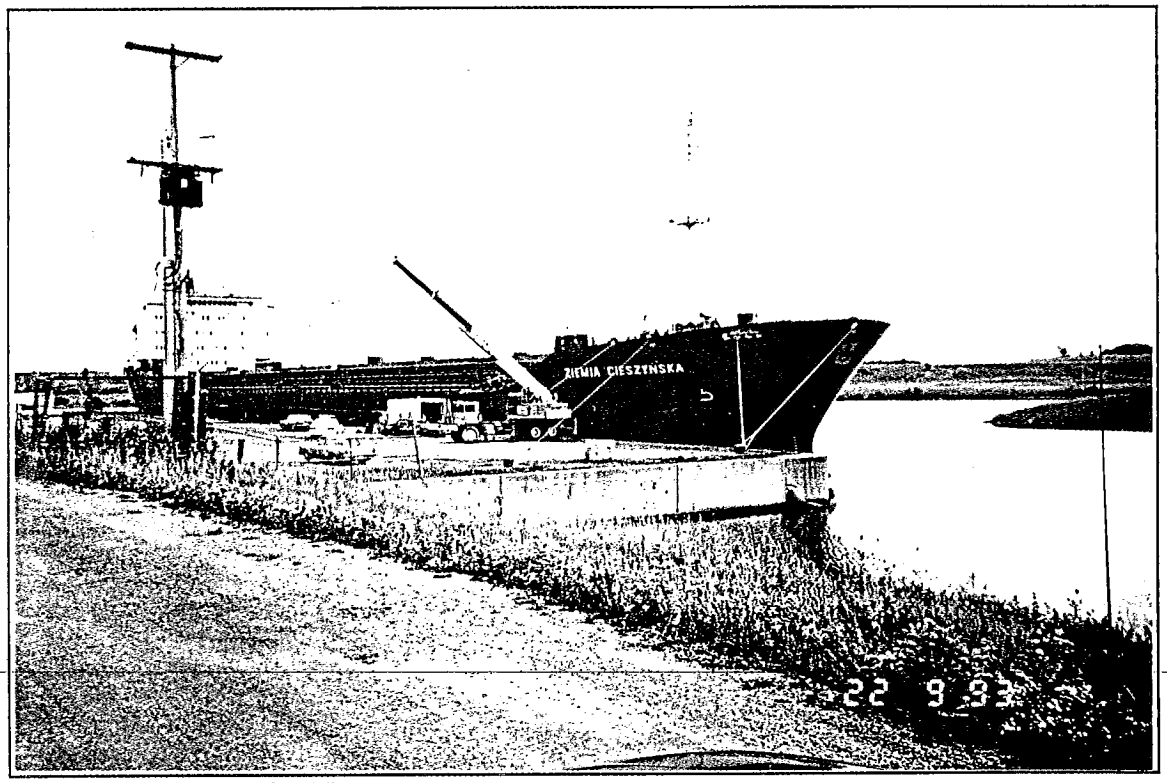


Appendix B - Photographs

Bridge operator's view toward the south from Bridge 11 at Allanburg.



1. West bank lights lit
2. Intake weir
3. Spar buoys



"ZIEMIA CIESZYNSKA"

Appendix C - Glossary

A	aft
ARPA	Automatic Radar Plotting Aid
BRM	Bridge Resource Management
C	Celsius
cable	one tenth of a nautical mile
CCG	Canadian Coast Guard
EDT	eastern daylight time
F	forward
G	Gyro (degrees)
IMO	International Maritime Organization
knot	one nautical mile per hour
kW	kilowatt(s)
m	metre(s)
m^3	cubic metre(s)
N	north
NW	north-west
OOW	officer of the watch
Seaway Welland	St. Lawrence Seaway Authority Welland Canal Traffic Control Centre
SI	International System (of units)
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF R/T	very high frequency radiotelephone
W	west
°	degree(s)
′	minute(s)
″	second(s)