



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Log M-353

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In reply refer to: M-89-69 through -77

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On May 6, 1988, the 500-foot-long Cyprian Bulk Carrier PONTOKRATIS was proceeding outbound in the Calumet River under the control of a Canadian pilot with the assistance of two harbor tugs. While transiting the CSXT bridgedraw, the navigation bridge of the PONTOKRATIS struck the CSXT railroad bascule bridgeleaf, and the bridgeleaf collapsed atop the vessel's wheelhouse, about 2009. The pilot, the master, and crewmembers exited the wheelhouse and ran onto the stern of the vessel. No one was injured as a result of the accident. The CSXT bridge was a total loss, estimated between \$10 and \$12 million. The navigation bridge of the PONTOKRATIS was crushed, and the damage to the vessel was estimated to be about \$2.5 million.¹

Because 11,000 tons of steel coil was unloaded at the Calumet Lake berth, the draft of the PONTOKRATIS was decreased and the top of the port side bridgework rail/windbreak was 69.8 feet above the water level (about 6 feet higher than it had been on the inbound trip). If the CSXT bascule bridgeleaf was opened to the normal "fully open" design angle of 77°, the PONTOKRATIS could not clear the bridgeleaf if the vessel was closer than about 2 feet to the west fender.

The CSXT bridgeleaf as originally designed in 1911, was capable of opening to 82° 30' before reaching a stop bumper, and 83° with no bumper; however, an electrical automatic cutoff limited the fully open angle of the bridgeleaf to 77° during normal operations. The bridgeleaf was raised beyond 77° only for inspection or maintenance purposes. Therefore, the Safety Board does not believe that the bridgeleaf had been raised to greater than the fully open angle of 77°.

¹For more detailed information, read Marine Accident Report--"Ramming of the CSXT Railroad Bridge by the Cyprian Bulk Carrier M/V PONTOKRATIS Calumet River, Chicago, Illinois, May 6, 1988" (NTSB/MAR-89/05)

Based on the bridgeleaf having been open to an angle of 76° to 77° and on the location of the damage on the truss from the initial contact, the PONTOKRATIS must have been about 2 feet from the west fender when the vessel contacted the bridgeleaf, despite the estimates of the master and the pilot that the port side of the vessel was from 3 to 4 meters (9 feet 10 inches to 13 feet 1 inch) and 12 feet, respectively, from the west side bridge fender as the vessel transited the draw. Had the stern of the PONTOKRATIS at the time it passed through the draw been at the distances from the fender estimated by the master and the pilot, it would safely have cleared the bridgeleaf. Consequently, the after end of the vessel was either closer to the fender than the estimated distances (when the observations were made by the pilot and the master) or the after end of the vessel moved closer to the fender after they made their observations.

The pilot believed that the vertical clearance at the fender line when the bridge was open was "120 feet", and that it was impossible for the PONTOKRATIS to strike the CSXT bridgeleaf. His major concern about the bridge would have been to avoid striking the protective fenders. Since he was satisfied that the vessel was not likely to strike the fenders, he did not order any changes to the vessel's track. The Safety Board concludes that since the pilot believed that it was impossible for the PONTOKRATIS to strike the raised CSXT bascule bridgeleaf, he did not concern himself sufficiently about keeping the vessel a greater distance from the west fender.

The master had sufficient time aboard the PONTOKRATIS to be familiar with the vessel and its handling characteristics; also he had sufficient experience as master aboard a variety of vessels to have been familiar with many of the problems that might be encountered on a voyage. However, his knowledge and experience with vessel operations on the Great Lakes and in the bordering ports were limited.

The pilot on the inbound transit to the Calumet River berth had advised the master of the PONTOKRATIS that some of the river passages were narrow with bends. The master had studied the Coast Pilot en route, but he mostly relied on the charts which he thought provided adequate information. The master stated that he did not verify the identification of every bridge shown on the chart because "there isn't much time to do so." However, even if the master had verified the identification of the CSXT bridge, the information presented on the chart would not have provided him with information needed to warn him about the bridgeleaf clearance.

While the PONTOKRATIS was approaching the CSXT drawbridge, the master was standing on the port side wing of the navigation bridge to observe the clearance between the vessel side and the bridge fender, and he occasionally looked at the bridgeleaf which he estimated was at an angle of 70° to 75° . However, the angle would have had little significance to the master since he did not know what the open position angle of the bridgeleaf should be, and the chart did not provide any information concerning the angle of the bascule bridgeleaf when in its fully open position. Since the vessel had safely transited the CSXT bridge inbound, the master did not become concerned about the angle of the bridgeleaf or the vessel's location in the channel.

The tugs FLORIDA and SOUTH CAROLINA were contracted to provide tug assistance to the PONTOKRATIS and, according to the contract, did not provide pilotage but were the "servants of the vessel and their owners." While assisting the PONTOKRATIS, the tugs were under the command of and subject to the direct supervision and control of the person directing the movement of the vessel. The Safety Board believes that the operators of the tugs FLORIDA and SOUTH CAROLINA performed their duties properly while assisting the PONTOKRATIS outbound in the Calumet River.

The bridge operating instructions posted in the CSXT bridge tower for the bridgetender, the control apparatus, and the bridge wreckage were reviewed by Safety Board investigators. No exceptions were noted between operating procedures for the equipment and the CSXT bridge instructions which would show that the bridgeleaf had not been raised according to the instructions. However, the bridgetender was unaware of the discrepancy between the labeling on the control console indicating the fully raised position of 83° and the 77° angle of the bridgeleaf at which the bridge controls were actually set to automatically stop. The posted bridge instructions to the CSXT bridgetender were inaccurate and misleading concerning the actual angle of the bridgeleaf when fully opened.

On the night of the accident, the CSXT bridgetender had received adequate advance notification that the PONTOKRATIS would be transiting the bridge outbound which required that the bridge be fully raised, and he raised the bridge to what he believed to be the fully open position before the PONTOKRATIS arrived at the draw. There was no evidence that the bridge operator was hurried or under pressure to lower the bridge after the PONTOKRATIS had passed clear of the draw. Based on the evidence, the Safety Board finds that the CSXT bridgetender raised the bridgeleaf to the largest angle the bridge controls would normally allow, and that he did not lower it. The Safety Board finds that the CSXT bridgetender performed his duties properly, and that there was no action that he could have taken which could have averted the accident.

The bridge permit for the construction of the CSXT bascule bridge specified a clear channel of 140 feet between the fenders, but there were no requirements in the permit concerning the vertical clearances to be provided at the draw opening. Because of the skew angle of the CSXT bridge to the channel, the north truss of the bridgeleaf was vulnerable to damage from transiting vessels. Had the fender been positioned a few feet further into the channel, the vertical clearance under the raised bridgeleaf at the fenderline would have been great enough to have averted this accident.

Although the Coast Guard is required to enforce the laws and regulations concerning bridges, owners, operators, and agencies controlling the bridges are required to properly maintain and operate the bridges. Currently, Coast Guard personnel do not conduct routine or periodic inspections as a policing activity. Therefore, the bridge owners, operators, and agencies are left to self police their actions concerning bridge operations and maintenance. Further, they are not required to report the results of their efforts to the Coast Guard. In the investigation of this accident, no records were provided by CSXT to show that periodic or annual inspections were made, and there were

no records of mechanical or electrical inspections having been accomplished after October 1987. The Safety Board believes that the Coast Guard should conduct periodic or occasional random inspections to determine if bridges it regulates are being properly operated.

Title 33 CFR 118.80 requires that bascule bridge lift spans be marked on each side by a green light that shows only when the span is fully open for the passage of a vessel. The investigation revealed that the CSXT bridge green bridgeleaf light activated about 48° and stayed on until the bridgeleaf was raised to its fully open position at 77°. Therefore, it was possible for the CSXT bridgeleaf to be raised and stopped at any position between 48° and 77° and the light would indicate that the bridge was fully open. The Safety Board could not determine how long the condition existed, and there were no records in the Coast Guard files to show that authorization had ever been requested or approved for the lights to activate before the bridgeleaf had reached its normal fully open position.

A review of the Ninth Coast Guard District's "Report of Inspection of Bridge Lights" (CG-2541) files revealed that the last inspection of the CSXT bridge lights had been made on October 9, 1980. Although the report form contained information as to the number, placement, kind, intensity and condition of the lights, no provision had been made on the form to require that lights be checked for activation at the fully open leaf position. The Safety Board believes that proper lighting on bridges over navigable waterways is critical to safe navigation, and that the Coast Guard should inspect drawbridges over water to determine that bridge lighting is properly maintained.

Since it is not uncommon for bascule bridgeleaves to overlap a waterway and pose an obstruction to transiting vessels, the bottom of bridgeleaf(s) should be marked with caution light(s) and daytime markers at elevation points on bridgeleaves where they protrude over navigable channels to identify to mariners the point at which full skyward channel clearance is not available. An amber or other colored, readily identifiable, light would serve the purpose. Had such a light been installed on the CSXT bridgeleaf at the points where the bridge extended past the fender and into the channel, both the master and the pilot would have been aware that the north chord of the bridgeleaf did not provide unlimited vertical clearance, and they would have been aware of the point on the bridge leaf at which the vertical clearance became obstructed. In this instance, one light would have been located on the bottom chord of the north truss close to eye level and directly ahead in the master's line of vision and, therefore, he could readily have seen that the bridgeleaf posed a hazard as the vessel approached the bridge. Additionally, the light would easily have been seen by the pilot from his conning location. The Safety Board believes that had a light been installed on the CSXT bridgeleaf at the point where the bridgeleaf intruded over the drawbridge, the pilot may have maneuvered the PONTOKRATIS further toward the eastern side of the drawbridge and the accident may have been averted.

The CSXT bascule railway bridge had been designed in 1911 and built to replace a swing bridge that was considered to be an unreasonable obstruction to navigation. When the bridge design was under consideration, the largest size Great Lakes vessels then being built that might use the Calumet River were 600 feet long with a beam of 60 feet. Currently, the largest Great Lakes vessels are about 1,100 feet long and 105 feet wide. The Saint Lawrence Seaway opened the Great Lakes to navigation by a variety of domestic and foreign seagoing vessels which range in size up to 750 feet in length and 76 feet in breadth. Although most of the Great Lakes vessels are bulk carriers, seagoing vessels are designed for a variety of cargoes and have configurations different from the Great Lakes bulk carriers, even though such vessels may also be capable of carrying bulk cargoes. The design of the PONTOKRATIS with its full-width, high navigation bridge was representative of such change. Therefore, although the CSXT bridgeleaf was at a high angle when fully open, it posed an obstruction to the PONTOKRATIS because of the high elevation of the vessel navigation bridgework. Considering the large number of vessels similar to the PONTOKRATIS that regularly transit the Calumet River, the ramming of the CSXT bascule bridge was an accident waiting to happen. The Safety Board believes the Coast Guard has not maintained accurate information on bascule bridge clearances and this deficiency needs to be corrected in publications and on charts.

On February 1, 1985, following the collision of the AMPARO PAOLO with the Danziger Bridge, the Safety Board issued Safety Recommendations M-85-14 through -17 concerning bascule bridges to the Coast Guard. A Coast Guard letter to implement the recommendations was issued to the districts on March 25, 1985. However, at the time of the accident, the Ninth District had not received the recommendations. Consequently, no action was taken within the Ninth district to implement the recommendations until after the accident. The Safety Board further notes that the review of the NTSB bridge recommendations at Coast Guard Headquarters revealed that the first, fifth and ninth districts had not been responsive to the Coast Guard's letter of March 25, 1985, which implemented the Board's recommendations, and no follow-up action had been taken at headquarters to determine why the districts had not responded.

As a result of the investigation of the PONTOKRATIS accident, the Ninth Coast Guard District conducted a survey of bascule bridges in its area and found four other bascule bridges that encroached the waterways when their bridgeleaves were in the fully open position. Finally, on March 10, 1989, the Commander, Ninth Coast Guard District, issued a Local Notice to Mariners which contained pertinent information concerning the encroachment of the channel of the above cited bascule bridges. Although the ninth district has taken action to publish information concerning these bridges to mariners, such conditions may still exist at other bascule bridges over U. S. navigable waters. Therefore, the Safety Board concludes that the Coast Guard should conduct a complete survey of bascule bridges under its cognizance (Safety Recommendation M-85-14). The Board also believes that had its bascule bridge safety recommendations M-85-14 through -16 been expeditiously implemented and appropriate nautical charts had been revised to show actual clearances, this accident may have been averted. Therefore, the Board reiterates Safety Recommendations M-85-14 through -16.

The Coast Guard publication, Bridges Over the Navigable Waters of the United States, provides information on the horizontal and vertical clearance of the CSXT bascule bridge; however, the vertical clearance information applies only to the bridge in its closed position. The publication does not indicate that the leaf of the bridge when in the fully open position encroached the waterway, nor does it specify the angle of the bridgeleaf in the fully open position. Since the master of the PONTOKRATIS observed the angle of the bridgeleaf as the vessel approached, knowledge that the bridgeleaf encroached the water and of the angle of the bridgeleaf in the fully open position would have been useful to him. A note in the publication describing movable bridges (which includes bascule bridges) states that "The vertical clearances when bridge is in a raised or open position are assumed to be unlimited unless otherwise indicated...." There was no indication in the data concerning the CSXT bridge that vertical clearance was not unlimited. Therefore, the published information would lead the mariner to conclude that the CSXT bascule bridge had unlimited vertical clearance above the full horizontal width of the channel, or draw.

Neither the Coast Pilot nor the charts indicated that the vertical clearance at the CSXT bridge was limited, although the Coast Pilot did contain a general caution concerning vertical clearance at bascule bridges. The pilot of the PONTOKRATIS said that he was aware that the CSXT bascule bridge overlapped the channel at the draw; however, none of the publications available to him would have provided any information concerning the vertical clearance at the CSXT bridge. The Safety Board believes that had published information concerning the vertical open clearance at the CSXT bridge been available to the master and pilot of the PONTOKRATIS and the tug operators, such information would have been helpful to them when considering and during their maneuvering through the CSXT bridgedraw. Therefore, the Safety Board believes that the Coast Guard should provide details to the National Oceanic and Atmospheric Administration on the vertical clearances of bridgeleaves in the fully open position and that such information should also be included on charts.

According to the Coast Pilot, the information contained therein concerning bridge clearances is supplied by the Coast Guard. The Coast Guard publication, Bridges Over the Navigable Waters of the United States, shows the CSXT bascule bridge with a horizontal clearance of 135 feet, the Coast Pilot shows the CSXT bascule bridge to have a "Clear width in feet of draw or span openings" of 135 feet, and the COE publication shows a horizontal clearance of 135.7 feet. The Coast Guard bridge administration manual defines horizontal clearance as "the horizontal distance, measured normal to the axis of the channel, through which the stated vertical clearance is available." However, the Coast Pilot specifies that it is "clear width in feet proceeding upstream." The Safety Board believes that the inconsistencies in text and data, although minor in this instance, could be confusing to the mariner and cause him to question the accuracy of the data. Therefore, closer coordination between the Coast Guard, the NOAA, and the COE should be instituted to provide more consistent data.

The PONTOKRATIS was required by 33 CFR 164.33 to have a U.S. Coast Pilot publication on board; however, the vessel was not required to carry the Coast Guard publication, Bridges Over the Navigable Waters of the United States. Therefore, if the master had studied the general information section of the Coast Pilot he could have been alerted by the caution that unlimited overhead clearance was not available for the entire horizontal clearance when the bascule bridge was in the open position. However, except for vertical clearances when bascule bridges are in a closed position, neither the Coast Pilot nor the Bridges Over the Navigable Waters of the United States provided information concerning the minimum vertical clearance available at the CSXT bascule bridge when the bridge was fully open. Neither did the publications specify the angle of the bascule bridgeleaf in its fully open position. Consequently, a mariner who studied the Coast Pilot, or the Coast Guard bridge publication if it were available, could not have determined in advance the vertical clearance available at the fenderline when the CSXT bridgeleaf was in its fully open position. The Safety Board finds that there is a lack of language conformity by NOAA when publishing Coast Guard bridge information in the Coast Pilot, and that the information published in both publications concerning the CSXT bascule bridge was inadequate.

Therefore, the National Transportation Safety Board recommends that the U.S. Coast Guard:

Require owners/operators of bascule bridges to install caution lights and daylight markings at elevation points on bridgeleaves where they protrude over navigable channels to identify to mariners the point at which full skyward channel clearance is not available to transiting vessels; the lights should activate when the bridgeleaves are in the normal fully open position. (Class II, Priority Action) (M-89-69)

Require that bridge owners/operators provide in bascule bridge permit applications the angle of the bridgeleaf(s), the maximum vertical clearance at the fenders and at the bridgeleaf ends, and the extent of horizontal channel clearance over which full skyward clearance is available when the bridgeleaves are in the fully open position. (Class II, Priority Action) (M-89-70)

Issue a notice to mariners stating that because some bascule bridgeleaves protrude over the waterway in the fully open position, unlimited skyward clearance may not be available to vessels with high freeboard, full width superstructures for the entire charted horizontal clearance. (Class II, Priority Action) (M-89-71)

Coordinate with the National Oceanic and Atmospheric Administration and the U. S. Army Corps of Engineers to incorporate the following information concerning each bascule bridge on charts and in nautical publications

available to mariners of vessels operating in U. S. navigable waters:

- a. the vertical height from the datum water level at the bridge to the point where a bascule bridgeleaf begins to protrude over draw fenders or the edge of the channel, and the vertical height from the datum to the end of the fully open bascule bridgeleaf; (Class II, Priority Action) (M-89-72)
- b. the extent of horizontal channel clearance over which full skyward clearance is available from the raised end of fully open bascule bridgeleaf(s); (Class II, Priority Action) (M-89-73)
- c. the angle of bascule bridgeleafs when in the fully open position; (Class II, Priority Action) (M-89-74)
- d. depictions showing whether a bascule bridge over a navigable waterway is single- or double-leaf and, if single-leaf, on which side of the waterway the base pivot point of the leaf is located. (Class II, Priority Action) (M-89-75)

Conduct a one time survey of drawbridges to determine that the green navigation lights activate, but only when drawbridges are at their normal fully open positions. (Class II, Priority Action) (M-89-76)

Conduct periodic inspections of drawbridges over U.S. navigable waters to determine that they are being properly operated and their navigation lights are being properly maintained. (Class II, Priority Action) (M-89-77)

In addition, the Safety Board reiterates the following safety recommendations to the U.S. Coast Guard:

M-85-14

Require bridge owners to conduct a one-time survey of each bascule bridge of the navigable waters of the United States to determine its actual open span clearance and the extent of any intrusion on the published horizontal clearance of the span, and initiate revision of nautical publications and nautical charts as necessary so that the

published horizontal clearance correctly reflect the actual clearances.

M-85-15

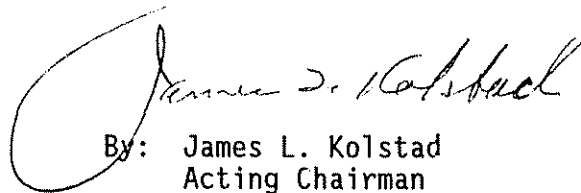
Require bridge owners to verify periodically the accuracy of the setting of the controls of the navigation lights which indicate to transiting vessels that bridge spans are fully opened.

M-85-16

Require bridge owners to verify periodically the accuracy of the setting of the controls of indicating devices installed at bridge control stations to show bridgetenders that a bridge is fully opened for vessel transit.

Also, the Safety Board issued Safety Recommendations M-89-78 to the Federal Railroad Administration; M-89-79 through -83 to the National Oceanic and Atmospheric Administration, National Ocean Service; and M-89-84 through -87 to the U.S. Army Corps of Engineers.

KOLSTAD, Acting Chairman, and BURNETT, LAUBER, NALL and DICKINSON, Members, concurred in these recommendations.



By: James L. Kolstad
Acting Chairman