SP-20

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation LOGM-355B

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In reply refer to: M-89-79 through -83

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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 bridgewing 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°.

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[1] For 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^{o} to 77^{o} 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 bridge draw, 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^{o} to 75^{o}. 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 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 bridgewing. 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.

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 bridge draw. Therefore, the Safety Board believes that the Coast Guard should provide details to the National Oceanic

and Atmospheric Administration on the vertical clearances of bridgeleafs in the fully open position and that such information should also be included on charts.

The Coast Pilot of the Great Lakes, including the St. Lawrence River, which the master of the PONTOKRATIS studied en route, contains about 400 pages. Since the vessel traversed the St. Lawrence River and four of the five Great Lakes, the master would have had to devote a considerable amount of time to absorb just those portions of the publication covering the vessel's route. According to the master, he had studied the Coast Pilot but he mostly relied on the charts and he thought the information provided was adequate. While the vessel was transiting the Calumet River, the master did not verify the identification of every bridge shown on the chart because "there isn't much time to do so." The vessel would have transited 12 bridges while outbound before reaching Lake Michigan, and the trip would have taken about 2 hours. However, since the Calumet River is narrow and winding, the master would have had to devote a significant part of his time to observing the maneuvering of the vessel and the tugs. Consequently, any review of charts or publications by the master while en route could only have been cursory.

The general information section at the front of the Coast Pilot contained a caution that "For bascule bridges whose spans do not open to a full vertical position, unlimited overhead clearance is not available for the entire charted horizontal clearance when the bridge is open...." The Safety Board believes that such important information should be more appropriately included in the tables that provide bridge data.

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.

The skew between the CSXT bascule bridge and the Calumet River channel was large. Therefore, although the vertical clearance at the south truss was relatively high when the bridge was fully open, the north truss posed a hazard to high freeboard vessels transiting the draw. To a mariner on a southbound vessel, the hazard posed by the bridge could be readily noticed because the pivot point of the bridge was close to the fender, and the bridgeleaf's encroachment over the waterway could easily be seen. However, on a northbound vessel, a mariner could see that there was a large setback from the fender to the bridgeleaf's pivot point. Therefore, the closer bottom chord of the south truss would give the appearance of, and actually provide, relatively high clearance over the waterway. Consequently, although the mariner on a southbound vessel might readily perceive the danger posed by the raised bridgeleaf, he might not as readily perceive the danger when proceeding northbound. The chart shows only a planar portrayal of the CSXT bridge at an angle to the channel, and it would be difficult for the mariner to visualize the bascule bridge in a fully open position from such portrayal. The Safety Board notes that Coast Pilot includes photographs of approaches to various harbors and waterways; however, there are no such photographs of bridges over the Calumet River. Such photographs of the CSXT and Conrail bridges in particular, and the Calumet River in general, would have been helpful to the mariner.

The chart of the Calumet River (Calumet and Indiana Harbors, NOAA, NOS 14929), contained information concerning the types of bridges, horizontal clearances, vertical clearances for open and closed condition on lift bridges, but only the closed condition clearance for bascule bridges. Therefore, even though mariners may look at the bridge information printed on the chart, they may not be able to determine whether a bascule bridge in its raised position encroaches over a waterway and, if so, what vertical clearance is available at the fender to the raised leaf(s), or at the leaf ends. Further, the chart does not contain information, drawings, or photographs of the angle of bascule bridge openings or on which side of the channel a single-leaf bascule pivot is located.

Although navigation charts normally contain various precautionary and other informative notes that the mariner might need, the cautionary note contained in the Coast Pilot concerning bascule bridges was not printed on NOAA, No. 5 Chart No. 14929. The Safety Board believes that since mariners would more likely refer to charts while navigating, rather than to the Coast Pilot, special cautionary notes contained in the Coast Pilot that can

suitably be printed on charts should also be included on the chart where they are more likely to be seen by mariners.

The Safety Board notes that NOAA, NOS charts generally contain extensive, detailed graphics related to road and rail networks and buildings which have no relevance to waterway navigation. The Safety Board believes, to some extent, that these graphics clutter the chart and divert attention from, and tend to interfere with, printed matter concerning important navigational aids and their related notations. Much of the extraneous matter is useless to the mariner, increases the time needed to produce and correct charts, unnecessarily increases production costs, and, consequently, the cost to mariners. For example, the extraneous highway and similar information presented on the chart is readily available on local road maps of the area should a mariner have need for it after going ashore. The Board believes that nautical charts should emphasize nautical features needed by the mariner for the safe navigation of his vessel and that cautionary and other notes should be printed in easily readable type, conveniently located for ready reference, and arranged in an orderly sequence so that they can be readily located. Text should be oriented so that it may be read without having to turn the chart. The Board further believes that pictoral information of bridges that include clearance heights should be located near the charted bridge information so that the mariner may easily and quickly check them while the vessel is en route, particulary when numerous bridges are located along a waterway and such information is quickly needed.

Therefore, the National Transportation Safety Board recommends that the National Oceanic and Atmospheric Administration, National Ocean Service:

> Include on structures tables and charts the precaution on bridge and cable clearances currently contained in the general information section of the Coast Pilot publications so that such cautionary information is readily available to the mariner while navigating. (Class II, Priority Action) (M-89-79)
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> Coordinate with the U.S. Coast Guard to incorporate on National Ocean Survey nautical charts the following information concerning each bascule bridge over U.S. navigable waters:
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> a the vertical height from the water level datum 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 fully open end of the bascule bridgeleaf; (Class II, Priority Action) (M-89-80)

b. the extent of horizontal channel clearance over which full skyward clearance is available from the raised end of the fully open bascule bridgeleaf(s); (Class II, Priority Action) (M-89-81)

c. the angle of bascule bridgeleafs when in the fully open position; (Class II, Priority Action) (M-89-82)

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-89-83)

Also, the Safety Board issued Safety Recommendations M-89-69 through -77 to the U.S.Coast Guard; M-89-78 to the Federal Railroad Administration; and M-89-84 through -87 to the U.S. Army Corps of Engineers. The Safety Board also reiterated Safety Recommendations M-85-14 through -16 to the U.S.Coast Guard.

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

By: James L. Kolstad
Acting Chairman