MARINE OCCURRENCE REPORT

SINKING

OF A CONSTRUCTION BARGE
NEAR HONEY HARBOUR, GEORGIAN BAY, ONTARIO
02 AUGUST 1996

REPORT NUMBER M96C0062

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.

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Summary

On 02 August 1996, the tug "WELDWOOD 19" was pushing a flat-topped barge with two tandem-axle dump trucks on deck. The tugmaster noticed that the barge's draught had increased and that the barge was developing a starboard list. He repositioned the trucks on the deck to counter the list and decided to turn the barge to starboard toward the shore. While making this turn, the barge developed a steadily increasing port list before striking an underwater rock and coming to a stop. The port list increased to the point where the trucks and their cargo of asphalt slid over the port side as the barge sank in about five metres of water. The tugmaster sustained a minor injury, and the asphalt caused some pollution.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessels

Name	"WELDWOOD 19"	None
Port of Registry	Vancouver, B.C.	None
Official Number	371892	None
Flag	Canadian	Canadian
Type	Tug	Barge
Gross Tonnage	4.3	Unknown
Crew	2	None
Other Personnel	2	None
Length	9.4m	13.4m
Breadth	-	7.3m
Depth	-	1.8m
Built	1976, Vancouver, B.C.	Unknown
Propulsion	One diesel engine With a fixed-pitch propeller jet drive	Non-self-propelled
Owners	A & A Services and Marine Contracting Ltd., Honey Harbour, Ont.	Mr. Gordon Brandon Honey Harbour, Ont.

Description of the Barge

The barge is a converted dump/dredging barge. A flat, bare steel plate forms the surface of the main deck. A loading/unloading ramp is at the forward end. The main deck is not bounded by safety rails nor is it fitted with cargo securing devices. The welded connection of the deck to the side shell plating was neither continuous nor watertight. The main deck plating was extensively corroded, perforated and holed. At the forward end of the barge on the starboard side, approximately 0.5 m below the hinged loading ramp, a welded seam was split, such that daylight could be seen through it from the interior of the barge.

The barge is not subdivided longitudinally or transversally. However, near each end of the barge, the internal transverse bottom framing structure is about 1 m high. Consequently, any water in the barge above 1 m in depth can flow freely throughout the hull. Any water below this level is also free to flow throughout the main parallel body of the barge.

It was reported that water, which accumulated in the barge after it had lain idle or which was shipped when underway, was occasionally pumped out using a 5 HP gasoline portable pump located on the main deck. Its flexible two-inch diameter suction was led through six-inch high, five-inch diameter, open-topped stand pipes at each end of the barge.

The barge, which has no crew, is not equipped with propulsion machinery, boilers or compressors and does not carry passengers. There is no regulatory requirement for it to be inspected or certificated by Transport Canada (TC) Marine Safety. As the barge does not normally carry a crew, there is no regulatory requirement for life-saving equipment to be carried on board.

The Voyage

The tug/barge, accompanied by a work boat, was making its second trip of the day from Honey Harbour to a construction site. On the deck of the barge, were two dump trucks loaded with asphalt, reportedly giving the barge estimated freeboards of about 0.6 m forward and 0.5 m aft. The trucks were not secured to the deck for the 45-minute trip nor were their wheels chocked. It was reported that the barge was upright and its internal spaces were dry on departure.

At 1545, the mate was operating the "WELDWOOD 19" which was pushing the barge at a speed of about five or six knots. The surface of the lake was choppy due to the wake of passing pleasure craft. At that time, the tug/barge had travelled about three-quarters of the distance to its destination. The tugmaster noticed that the barge's freeboard was decreasing and that the barge was developing a starboard list. He did not consider starting the bilge pump at this time. During the passage, the tugmaster repositioned the trucks on the deck several times to counter the list. The starboard truck and its load of asphalt (24 tons total) was repositioned closer to the asphalt-laden truck on the port side (22 tons total).

Course was altered to starboard toward the shore about 200 m off to starboard. The barge then developed a list to port which steadily increased until the deck edge was almost awash. Within two minutes of the start of the turn, the tugmaster started the gasoline-powered portable bilge pump but it did not keep up with the continuous ingress of water.

The tugmaster then instructed the truck drivers, who were travelling on the barge, to disembark from the barge to the stand-by work boat. The barge then struck an underwater rock and came to a stop approximately 10 m from shore.

The starboard dump truck slid across the deck into the truck on the port side, and the port list increased to the point where, at 1615, the barge spilled both trucks and their cargo of asphalt into four to five metres of water. The partially flooded barge continued to downflood until reserve buoyancy was lost. It then settled on the bottom, deck side up.
The system of making the tug and barge fast to each other did not incorporate a quick-release mechanism. The barge was chained to the

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

tug in the pushing mode. When the barge was heeled over and sinking, the tugmaster had difficulty disconnecting the chains, and in the process he suffered a minor back injury.

The tugmaster had approximately 10 years' experience operating small barges and tugs. He had held a Master, Small Craft certificate which had expired about a year before the occurrence. The syllabus for the oral and practical examination required for this certificate does not require an in-depth understanding of vessel stability in general or of the effect of free-surface liquids in particular.

The barge was normally pushed at a speed of about four knots by a less powerful tug.

Analysis

The opened seam about 0.5 m below the deck level forward, the non-continuous welding between the deck and the side shell plating, the perforated main deck plating and the open-topped stand pipes allowed water easy ingress to the interior of the barge. This flooding problem had existed for some time; the portable pump had been placed aboard to cope with it. Because the barge was proceeding through choppy water and at a higher speed than usual, it is likely that the bow wave water rose further up the hull than it normally did. Additionally, the higher speed would have accelerated the rate at which the barge took on water.

Although the tugmaster recognized that the barge was settling in the water some 30 minutes before it sank, he did not start the bilge pump to counter the ingress of water. It is likely that he did not appreciate the rate at which the barge was flooding. Had he started the pump at this time, the sinking may have been prevented.

The practical examination for the tugmaster's certificate did not require an in-depth understanding of vessel stability in general or of the effect of free-surface liquids on stability in particular. The tugmaster's decision to move the trucks across the deck to counter the list indicates that he did not consider that the list may have resulted from anything other than an unequal distribution of weight.

The initial list to starboard was most likely due to the accumulation of floodwater which entered the hull through the damaged and partially welded shell plating seams on that side.

The free-surface effect and weight of this floodwater would have markedly reduced the barge's transverse stability and effective freeboard. Consequently, the decision to move the vehicles across the deck, the inertial effects caused by the course alteration to starboard and the sudden upthrust due to the barge grounding on its starboard side caused the floodwater to surge to port and induce a greater list on that side.

Subsequent downflooding through the immersed open-topped stand pipes

near the main deck edge further increased the port list and caused the unsecured vehicles to self-discharge. The downflooding continued until reserve buoyancy was lost and the barge sank.

Because the system of making the tug fast to the barge did not incorporate a quick-release mechanism, the tugmaster had difficulty disconnecting the chains while the barge was heeling and sinking. It was fortunate that he succeeded in doing so as the tug was also in danger of being hove under and of sinking with the barge. It is not known if the chains would have broken had the tugmaster been unsuccessful in letting them go.

Because the barge does not carry passengers and has no crew on board, there is no regulatory requirement for safety or life-saving equipment to be carried on board the barge. However, when persons such as the truck drivers are required to work or to travel on board, the responsibility to provide safety or life-saving equipment rests with the person requiring them to do so. There was no such equipment on board.

Findings

1. The barge does not carry passengers, has no crew on board and is not subject to inspection by Transport Canada Marine Safety.

2. Life-saving appliances were not provided on the barge for the use of the truck drivers who were working and travelling on board.

3. Before the converted barge entered service, its owner did not have a competent person determine the barge's maximum deck load, freeboard or trim and stability characteristics.

4. The owner did not provide barge operators with formal guidance or instructions regarding the safe loading, trim or stability limitations of the barge.

5. The barge was highly vulnerable to downflooding through the open-topped stand pipes on the main deck.

6. The watertight integrity of the barge's hull was compromised due to non-continuous structural welding, unrepaired shell plating damage and corrosion-related perforations in the main deck plating.

7. During the passage, water ingressed through the unrepaired shell plating damage and non-continuous structural welding.

8. The tugmaster did not start the portable bilge pump to pump out the water in the barge when he first noticed that the barge's freeboard was decreasing.

9. The lack of adequate subdivision in the barge augmented the free-surface effect of the floodwater and markedly reduced the

barge's transverse stability.

10. The effect of moving the trucks to port to counter the starboard list, combined with the inertial effects of the turn to starboard, caused the water in the barge to surge to port and induce a greater angle of heel on that side.

11. The upthrust from the grounding effect increased the rate at which the port list developed, accelerated the ingress of water and the self-discharge of the trucks from the deck.

12. The increased rate in the ingress of water due to the deeper immersion of the hull and the onset of downflooding through the open-topped deck stand pipes, exceeded the capacity of the portable bilge pump. Downflooding continued until reserve buoyancy was lost and the barge sank.

13. The trucks on deck were neither chocked nor secured, nor were securing points or devices provided.

Causes and Contributing Factors.

Floodwater, which entered the hull through the damaged and partially welded seams and was not pumped out, accumulated inside the barge and induced a slight list to starboard. The resulting free-surface effect markedly reduced the barge's transverse stability to the extent that a greater list to port was caused after the trucks carried on deck were moved toward that side. After the barge grounded on an underwater rock on its starboard side, the port list increased, downflooding occurred through openings in the main deck which increased the port list and caused the trucks to slide to port and self-discharge over the side. The downflooding continued until reserve buoyancy was lost and the barge sank. Contributing to the sinking was the fact that the tugmaster did not have an in-depth understanding of vessel stability in general or of the effect of free-surface liquids on stability in particular.

Safety Action Taken

After the barge was salvaged, TC Marine Safety, Collingwood, issued a written notice to the owner requiring that repairs be carried out to make the barge watertight and seaworthy before it could re-enter service. The repairs were completed to the satisfaction of TC Marine Safety on 27 September 1996.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 19 November 1997.