

MARINE OCCURRENCE REPORT

CAPSIZING AND LOSS OF CARGO

BARGE "B-525"  
NORTH ARM, QUESNEL LAKE, B.C.  
5 NOVEMBER 1996

REPORT NUMBER M96W0250

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 5 November, 1996, at approximately 2045, after departing from the beach at Long Creek on Quesnel Lake, with five vehicles stowed on deck, the barge "B-525", being pushed by the tug "OSPIKA", capsized when approximately 150m from the beach. The vehicles fell overboard and sank. A deckhand sustained minor bruises during the accident. No pollution occurred. The overturned barge was brought back to the beach and righted two days later.

*Ce rapport est également disponible en français.*

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All times are Pacific Standard Time (UTC minus 8 hours)

## *Other Factual Information*

### Particulars of the Vessels

Name:	B-525"	"OSPIKA"
Official Number:	810162	329579
Port of Registry:	Vancouver, B.C.	New Westminster, B.C.
Flag:	Canada	Canada
Type:	Barge	Tug
Gross tonnage:	Unknown	12
Length:	19m	9m
Built:	1988, Port Alberni, B.C.	1968 New Westminster, B.C.
Propulsion:	None	One Diesel, 220 BHP
Owner:	West Fraser Mills	Empire Tug Boats, New Westminster

The "B-525" is a flat deck barge consisting of three pontoons, each of which is an all-welded rectangular box 18.29m x 2.44m x 1.22m, joined side by side.

The pontoons are topped with a common deck made of wooden planks and fitted with a loading ramp at one end. They were fabricated by a construction firm in Port Alberni, shipped by trucks to Quesnel Lake and assembled on the lake in 1988.

No drawings or other documentation allowing detailed calculation of the barge's cargo capacity or stability seem to exist. Reportedly, each pontoon is subdivided into three watertight sections and each section has a manhole allowing both access and sounding.

Neither the draughts nor any other marks allowing freeboard assessment were displayed on the barge's sides. Since 1988 the barge has been used to transport equipment between logging camps on Quesnel Lake.

The propulsion is provided by a pushing tug. For this purpose the barge is fitted with a shallow notch at its stern to accommodate the tug's bow.

The "OSPIKA" is a small tug, of a typical tugboat construction, propelled by one diesel engine driving one propeller. Since 1988 the tug's main assignment was pushing the barge "B-525", serving logging camps on the shores of Quesnel Lake. When pushing, the bow rests in the barge's notch. The stern of the tug is secured with two steel wires lengthened by chains, one on each side, running forward to the barge's stern corners. Two flexible, hydraulic hoses are run between the tug's engine and the barge's ramp-lifting mechanism.

On 5 November, 1996 the skipper of the "OSPIKA" boarded the tug at approximately 0900. Both the tug and the barge "B-525" were tied up at Beach Point on the south side of Quesnel Lake.

They were waiting for the next assignment while a welder was working on the barge to fix a rail guard on its starboard side. The skipper then worked with the welder until approximately 1545, when the deck-hand arrived.

With a back-hoe tractor already on the barge's deck, the tug and barge left for Long Creek to load some more cargo. This location is a loading site on the western shore of the North Arm of Quesnel Lake.

At 1830 they arrived at Long Creek. The barge was positioned with its bow to the beach and the ramp was lowered onto the beach.

The loading began at 1845. Four more vehicles were driven onto the barge by the skipper and the deck-hand in a time of approximately 2 hours. All five vehicles were to be delivered to Summit Creek, a camp site at the easternmost end of the lake.

The total load of the barge on departure consisted of the back-hoe tractor of approximately 40 tonnes, two 'D5' bulldozers, each weighing approximately 20 tonnes and two trucks of about 3 tonnes each. Based on the nominal weight of the vehicles, the tug's owner estimated that the total load on the barge was approximately 87 tonnes. However the vehicles were lost during the occurrence and their exact weight could not be established.

Reportedly, the vehicles were partially covered with snow and fitted with attachments.

By visual assessment, it was one of the heaviest loads ever taken by this barge. The freeboard was approximately two inches (5.1cm). It was estimated that the partially affixed steel rail-guard on one side increased the deadweight by approximately 2 tons (2 tonnes).

At approximately 2040 the loading of the vehicles was completed, the ramp was lifted and the tug backed the barge off the beach. As soon as the barge was fully afloat, the skipper noticed that it listed to starboard. Reportedly, the starboard side was approximately two inches (5.1cm) lower than the port side.

The barge was brought back to the beach, the ramp was lowered and the two bulldozers were repositioned approximately two inches (5 cm) towards the port side.

The barge was then backed off and again the skipper noticed that it was listing to starboard. He beached the barge and the vehicles were repositioned a further two inches (5 cm) towards the port side.

After this operation, when the barge was backed off the beach it was reportedly level and upright. The skipper then backed the combination approximately 100m further and turned to port with approximately 75% of the tug's power.

At 2045 it was snowing, with a near-zero visibility, a fresh breeze and a choppy lake surface. The skipper manoeuvred the tug and barge while the deck-hand was on the barge checking the load. When the turn was

almost completed, the skipper steadied the tug on a straight course without increasing the throttle. He noticed that the barge began to heel slowly and steadily to starboard. The five vehicles were reportedly not moving, nor was the tug affected. However when the barge's list increased, the fastening wires became taut and the tug, pulled by the barge, also listed dangerously to starboard.

At some point, when the tug's list kept increasing, the wires broke one at a time and the tug righted itself immediately.

The deck-hand, as well as the cargo, slipped off the capsizing barge and fell into the water. All five vehicles sank at approximately 150m from the beach where the depth of water is about 120m. The overturned barge was floating with the tug still attached to it by the hydraulic hoses.

The skipper recovered the deck-hand from the water and notified the nearby logging camp personnel by radio. A supervisor and a first-aid man arrived at the site of the accident in approximately 15 minutes.

The deck-hand was attended by the first aid man, then transported by boat to Beach Point and from there by an ambulance to the nearest hospital for a medical check-up. Two hours later he was released from the hospital. During the accident he sustained minor bruises. No pollution was observed after the accident.

On 7 November, after the barge was righted, a small amount of water was found in one of the sections of the starboard pontoon. It was not established whether the water penetrated into the pontoon after the capsizing or before.

Reportedly, the sounding and, if necessary, the pumping of the pontoons had been conducted occasionally, once every two to three months. The skipper reported that, based on his visual assessment of the barge's trim and appearance before the accident, there was no water in the pontoons when he departed from Long Creek.

On 11 December 1996, a Transport Canada Marine Safety surveyor carried out an inspection on board the tug "OSPIKA". Several deficiencies were found on the tug, one of which was the lack of certificated personnel. The surveyor issued a SI-7 citation effectively prohibiting the tug from continuing operations until the deficiencies had been remedied.

Although required by the Certification Regulations, the skipper of the tug did not hold any certificate nor had he taken any marine-oriented training.

No regulations apply to unmanned barges operating on inland waters. No inspection by the Marine Safety Branch was ever carried out on the "B-525", nor was such an inspection required and consequently no certificate was issued nor was a load line assigned for this barge.

Several Marine Safety regulations apply to the tug "OSPIKA". However, being a vessel of under 15 GRT, the tug was not subject to periodical inspection by the Marine Safety Branch of Transport Canada, and none was carried out prior to the occurrence. Consequently no certificate attesting to the tug's condition has ever been issued. Reportedly, the nearest Marine Safety office in Vancouver was not aware that the "OSPIKA" was

operating on Quesnel Lake.

Due to the possibility of pollution, the incident was reported to the Provincial Emergency Program Centre immediately after it happened. The nearest office to Quesnel Lake, the Pollution Prevention, B.C. Environment Lands and Parks Office has been monitoring the situation on the lake since the capsizing. Small pockets of oil appearing on the water surface above the sunken vehicles dispersed without trace. Until the end of March 1997, no evidence of any pollution of the environment had been observed.

Reportedly, in 1993, a barge carrying equipment between logging camps on Quesnel Lake listed heavily during loading operations. A piece of equipment slid off the deck and sank; one person was thrown into the water.

## *Analysis*

The loading of unmanned barges is not regulated in Canada. The amount of cargo carried by any unmanned barge between Canadian ports on the west coast is established by practice. The problem is augmented by the lack of the explicit authority or sufficient training, or both, on the part of some tug skippers, which would be needed to determine the limit of the load on the barge.

The statement by the crew that the barge "B-525" was carrying the second largest recorded load is based on their visual assessment.

The vehicles, especially the back-hoe and the bulldozers, may be fitted with attachments, such as grabs and blades, of various sizes. Thus their weights may differ from the nominal weights provided by the manufacturer.

The snow covering the vehicles also added some weight. It could be that the total load on the "B-525" on 5 November 1996 was the largest ever carried on this barge and produced a capsizing potential well beyond the barge's margin of righting ability.

Capsizing occurs when a vessel loses transverse stability due to an individual cause or a combination of contributory causes. In the case of an intact and initially stable vessel, capsizing is often initiated by the transverse movement of a weight already onboard or the effect of an external force greater than the righting ability of the vessel at the time.

Those attending the loading operation onboard the tug acknowledged, and further post-occurrence inspections and inquiries confirmed, that the barge was upright when loading was completed. However the barge started to heel immediately after the tug backed it off the beach. It is conceivable that the square bow of the barge was resting on the bottom during the loading operation thus preventing it from listing until it was fully afloat.

It is impossible to assess the barge's transverse stability without proper documentation, exact weights and departure draughts. However, from the reported sequence of events, it may be derived that the initial GM of the barge was oscillating about zero and, with a freeboard of only about 2 inches (5.1cm), the range of positive righting arm values was, at best, very small.

An initial small heeling moment could induce the barge to heel to such a degree that the positive righting arm

vanished. The subsequent shift of the cargo and the resultant increase in heeling moment caused the heeling to continue and accelerate, until transverse stability was suddenly overcome.

After the repositioning of the vehicles the barge seemed to be upright. Although the horizontal transfer of the cargo eliminated the list, it did not improve the barge's transverse stability.

The small moment, sufficient to overcome the initial righting ability, if there was any, could have been generated by the centrifugal effect of the turning barge, or by the weather, or by the combination of both.

The weather and handling of the tug and barge were acceptable and should not normally have caused capsizing. However the excessive amount of cargo loaded on barge's deck made it susceptible to any, even small, heeling moments, that could be induced by the wind or the turning effect.

### *Findings*

1. Neither the tug nor the skipper were certificated by the Marine Safety Branch of Transport Canada.
2. The barge was not fitted with draught marks, documentation or any other means of establishing the safe load and freeboard during loading operations.
3. The deadweight of the barge on departure was such that it did not retain sufficient intact transverse stability to withstand a small initial heeling moment.
4. All five vehicles carried on barge's deck slipped off and sank.
5. The post accident inspection by the Marine Safety Branch of Transport Canada found the tug unfit for commercial towing or pushing and suspended its operation.
6. No pollution of the environment was observed. A minor oil leak from the sunken vehicles dispersed without trace.

## *Causes and Contributory Factors*

The barge "B-525" capsized immediately after departure because its deadweight was such that it did not retain sufficient intact transverse stability to withstand a small heeling moment. The barge was heavily loaded and had it been properly measured, the established loadline would have been exceeded.

## *Action Taken*

Following this occurrence, TC Marine Safety inspected the tug and found several deficiencies. The operation was suspended until corrective actions were taken.

By June 1997 all the deficiencies on the tug had been remedied. The skipper obtained the required certificate of competency. The marks denoting minimum required freeboard have been affixed to the barge's sides.

*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 23 December 1997.*