

SP 20
Log M-273

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: JULY 2, 1985

Forwarded to:

Admiral James S. Gracey
Commandant
U.S. Coast Guard
Washington, D.C. 20593

SAFETY RECOMMENDATION(S)

M-85-45 and - 46

About 1130, on July 7, 1984, the uninspected excursion vessel M/V SCITANIC was down bound on the Tennessee River, near Huntsville, Alabama, when strong winds generated by severe thunderstorm activity caused the vessel to capsize. Of the 15 passengers and 3 crewmen aboard the vessel, the crew and 4 passengers were able to escape from the capsized vessel; 11 passengers were trapped inside the vessel and drowned. The damage to the SCITANIC was estimated to be about \$65,000. 1/

When the SCITANIC got underway, there were no observable signs of inclement weather. The 1000 weather forecast obtained by the captain before he departed the vessel's berth had indicated that thunderstorms could be expected in the afternoon. There were no indications in the weather forecast up to the time the vessel got underway which would have alerted a mariner to the probability of severe thunderstorm activity in the area within the hour. However, the use of one of the two portable radios located in the pilothouse to monitor the latest National Oceanic and Atmospheric Administration (NOAA) weather forecasts would appear to be a reasonable precaution for a vessel carrying passengers in an area of frequent thunderstorm activity, and where thunderstorms can build up quickly. If the captain had been monitoring the weather broadcasts, he could have learned as early as 1050 that thunderstorms could be affecting the area during the next hour. At 1050, it would have been possible for the vessel to return to its berth before the storm broke.

By the time the captain and first mate recognized that the SCITANIC would encounter a thunderstorm, the vessel was about 1.3 miles from its berth at Ditto Landing and the closest refuge. To continue to proceed down the river toward the marina would have resulted in exposing the vessel's port side with its extensive sail area to the increasingly strong westerly winds generated by the approaching thunderstorms. The captain reacted by turning the vessel to head into the wind--a maneuver which had been used successfully on several past occasions when the vessel encountered passing thunderstorms. Turning the vessel into the wind probably would have been successful on the day of the accident except for the occurrence of four microbursts, one about 1/4 mile away, which produced a sudden wind shift with exceptionally strong winds.

1/ For more detailed information, read Marine Accident Report--"Capsizing of the Excursion Vessel M/V SCITANIC on the Tennessee River, near Huntsville, Alabama, July 7, 1984" (NTSB/MAR-85/05).

The microburst phenomenon first was identified as a cause for some types of wind shear in 1976. It involves a narrow downward moving column of air generally less than 2 1/2 miles (4 km) in diameter associated with the rain shower developed by a thunderstorm. The column of air is generated by the rapid evaporation of water droplets or rain within the thunderstorm. In some microbursts, known as dry microbursts, the shower evaporates before reaching the ground. The evaporative cooling causes the density of air to increase and causes the column to accelerate downward. When a microburst reaches the ground, it spreads out beneath and beyond the thunderstorm cell, causing high and often damaging winds to flow radially from the thunderstorm cell. The horizontal surface winds radiating from a thunderstorm are a vector combination of the outflow of the microburst and the motion of the thunderstorm. Consequently, the strongest winds are usually in the direction of the thunderstorm movement. Microburst winds have been estimated in some instances to exceed 100 knots.

The SCITANIC's GM exceeded the U.S. Coast Guard (USCG) criterion found in 46 CFR 170.170; it had 11 feet of GM, and only 9.7 feet would have been required had it been a vessel of usual proportions. However, the SCITANIC was not a vessel of usual proportions, and if operated under Coast Guard standards, it probably would have been required by the USCG to meet additional criteria similar to that contained in 46 CFR 170.173. Below is a comparison of the USCG requirements in 46 CFR 170.173 with the approximate righting characteristics of the SCITANIC on July 7, 1984, which indicates that the vessel did not meet all of the requirements.

	<u>SCITANIC</u>	<u>USCG Criteria 46 CFR 170.173(b)</u>	<u>USCG Criteria 46 CFR 170.173(e)</u>
Minimum angle of maximum righting arm	10°	25°	15°
Area under righting arm curve up to maximum righting arm (foot-degrees)	8	-	14

Although the calculations show that the SCITANIC met the provisions of 46 CFR 170.170 as loaded on July 7, 1984, they also show that the overturning moment of the 70-knot wind experienced by the SCITANIC would exceed its righting moment and the vessel would capsize. Also, the calculations show that the vessel probably would not have capsized at wind velocities less than 65 knots. However, if the SCITANIC had met the USCG criteria in 46 CFR 170.173, it may not have capsized.

The Safety Board has investigated two other accidents ^{2/} in recent years in which small passenger vessels capsized in winds exceeding the criterion contained in 46 CFR 170.170. On June 9, 1977, the charter fishing vessel DIXIE LEE II capsized in the

^{2/} Marine Accident Report--"Charter Fishing Boat DIXIE LEE II, Capsizing in Severe Thunderstorm in the Chesapeake Bay near Norfolk, Virginia, June 6, 1977" (NTSB-MAR-79-1), and Marine Accident Report--"Showboat WHIPPOORWILL Capsizing Pomona Lake, Kansas, June 27, 1978" (NTSB-MAR-79-2).

Chesapeake Bay with the loss of 13 lives in about 60- to 85-knot winds; the USCG criterion being based on 43-knot winds. On June 17, 1978, the uninspected showboat WHIPPOORWILL capsized on Lake Pomona, Kansas, with the loss of 15 lives in 50-knot winds; it met the USCG criterion based on 37-knot winds as applied to protected waters. The USCG criterion for the waters in which the SCITANIC operated is based on 37-knot winds; the SCITANIC capsized in 70-knot winds. All three accidents occurred when thunderstorm activity was approaching the general area, but the operator did not anticipate encountering any unusually severe weather. Thunderstorms are a common phenomenon during the summer months on protected and partially protected waters in the United States. Although operators should be cognizant of weather forecasts, some types of thunderstorm activity, such as tornadoes and microbursts, are unpredictable. It would be infeasible for small passenger boat operators to tie up every time thunderstorms are forecast in their general areas of operation. Therefore, the USCG should reevaluate its stability criterion for small vessels, like the SCITANIC, contained in 46 CFR 170.170 on the maximum winds speeds of about 37 knots for protected waters and about 43 knots for partially protected waters because these values can easily be exceeded in thunderstorms.

Most operators of recreational vessels are probably aware that weather information is readily available by listening to the NOAA weather broadcast which may be received on either a marine radio or a weather radio. Inexpensive, battery powered weather radios are available to the boating public and are used by many operators of recreational vessels. Also many operators of recreational vessels have some knowledge of the hazards posed by thunderstorms, such as high winds, hail, and lightning; however, very few mariners, including operators of recreational vessels, are knowledgeable about microbursts, which were not identified as a distinctive phenomenon until about 1976 when a microburst was identified as a causal factor in a 1975 commercial air accident, ^{3/} and know that such a phenomenon may be generated by thunderstorms, or know that microbursts can result in winds exceeding 100 knots. The capsizing of the SCITANIC is the first accident investigated by the Safety Board where the occurrence of a microburst was identified to be a causal factor; however, it is probable that microbursts have caused other capsizings where strong wind forces were a factor. The exceptionally high velocity winds generated by microbursts can pose a severe threat to recreational vessels, especially those with marginal stability or those with extensive sail area. Since the survivability of any vessel caught in a thunderstorm may be dependent upon the adequacy of the vessel's stability, it is important that operators of recreational vessels be informed about factors affecting stability. Operators need to know the procedures to take to insure that their vessels have optimum stability; know the conditions to avoid, such as slack tanks and loading stores and equipment on upper decks; and know the alterations which may result in shifting the vessel's center of gravity.

The Safety Board believes that information about the SCITANIC's accident should be disseminated to the boating public in order to apprise operators of recreational vessels about the existence of the microburst phenomenon, the importance of listening to the NOAA weather broadcast, and the importance of understanding the stability characteristics of their vessels.

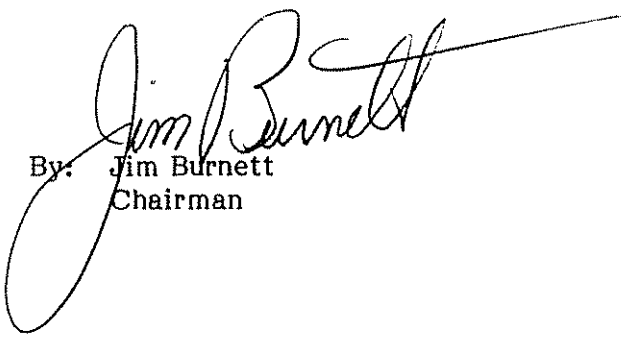
^{3/} Aircraft Accident Report-"Eastern Airlines Inc., Boeing 727-225, N884E, John F. Kennedy International Airport, Jamaica, New York, June 24, 1975" (NTSB-AAR-76-08).

As a result of its investigation, the National Transportation Safety Board recommends that the U.S. Coast Guard:

Review and reevaluate the basis for stability criteria contained in 46 CFR 170.170 which are a maximum wind speed of about 37 knots for protected waters and about 43 knots for partially protected waters for small vessels, since these values frequently are exceeded during thunderstorm activity. (Class II, Priority Action) (M-85-45)

Disseminate information about the circumstances of the accident involving the SCITANIC, near Huntsville, Alabama, on July 7, 1984, to the boating public, by all available means, citing the importance of listening to the National Oceanic and Atmospheric Administration weather radio channels, the dangers of microbursts that may be generated by thunderstorms, and the importance of adequate vessel stability to resist the force of high winds. (Class II, Priority Action) (M-85-46)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.


By: Jim Burnett
Chairman