



UNITED STATES COAST GUARD
U.S. Department of Homeland Security

MARINE SAFETY ALERT

Inspections and Compliance Directorate

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Washington, DC

Safety Alert 04-96

GPS NAVIGATION SYSTEM USE

On October 22, 1995 a 35' vessel owned by the State of Maine and operated by a seasoned captain ran aground and sank on Seal Ledge in Penobscot Bay near Vinalhaven Island. The incident occurred at night in clear visibility in moderate sea and wind conditions. The three people onboard were able to successfully abandon the vessel and were rescued without injury after approximately one hour. During an investigation of the incident conducted by the U.S. Coast Guard it was determined that the operator of the vessel was navigating with a recently installed GPS system. The operator was utilizing the GPS unit's "course to steer" function along a set of waypoints previously entered into the GPS system.

The waypoints in use had previously been entered by the operator through a practice known as **relative navigation**, which involves observing a position with an electronic navigation system and entering that position as a waypoint. On future voyages the vessel is navigated to that previously observed waypoint utilizing that electronic navigation system. At the time the waypoints were observed, the operator of the vessel had unknowingly observed and entered an erroneous position recorded at that moment by the GPS system. When attempting to return to that position, the GPS unit calculated the entered position correctly, and the "course to steer" function took the vessel across a submerged ledge. Had the waypoints in use been plotted on a chart prior to the voyage the GPS system error would have been discovered by the vessel operator.

Navigators of vessels equipped with GPS units are advised that the **current system accuracies for GPS units are approximately 328 feet** (100 meters) when attempting to navigate to a known geographic point (latitude and longitude calculated from a nautical chart) and **approximately 463 feet** (141 meters) when attempting to return to a position previously observed with a GPS unit. These distances are 95% accuracies, meaning that 95% of received position fixes will fall within 100 meters of calculated geographic points (specific navigation), and within 141 meters of observed geographic points (relative navigation). More accurate position fixes may be obtained but mariners should allow for the 95% accuracy values. Mariners familiar with Loran-C navigation systems are specifically cautioned that the Loran-C system provides slightly better repeatable accuracies when utilizing relative navigation practices. Care should be taken when switching to GPS units to insure that appropriate system accuracies are compensated for. All mariners are advised that when operating in the vicinity of navigational hazards vessels must be navigated with regard for the vessels position in relation to the hazard. Any electronic navigation system including GPS, may be subject to occasional errors in excess of designed system accuracies and should not be solely relied upon to determine a vessel's position.

The U.S. Coast Guard advises against the use of relative navigation practices in the vicinity of navigational hazards. The recommended methods for calculating voyage waypoints is to calculate the positions directly from a nautical chart.

For additional information of electronic navigation systems contact the U.S. Coast Guard, Portland Marine Safety Office Prevention Department at (207) 780-3251 extension 173. For information on navigation courses offered by the U.S. Coast Guard Auxiliary in your area call 1-800-336-BOAT. This safety alert is provided for informational purpose only and does not relieve any domestic or international safety, operational or material requirement. Developed by the Office of Investigations and Casualty Analysis. For questions or concerns please email hqs-pf-fldr-cg-inv@uscg.mil.