Insurance Marine News

The GPS system and potential interference – MS Amlin

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Nikki Schots, Senior Contractual Loss Prevention Consultant, and Pieter Bruins, Loss Prevention Executive at MS Amlin, have written on the dangers of interference in GPS reporting.

The writers said that it was “imperative to understand how navigation systems work, and how they may be interfered with. In these times when cyber warfare is becoming standard practice, it is particularly important that shipowners are prudent when it comes to interference with the vessel’s systems.”

The GPS signal may be affected by natural causes, such as solar flares, which can temporarily disrupt the transmission of GPS signals. However, a GPS signal can also be jammed with malicious intent in order to create a false position.

A GPS jammer emits radio signals or a signal noise at the same frequency as the signal of the GPS device. This overrides or distorts the signals from the GPS satellite, and renders the GPS device unable to calculate its position. GPS signals are fairly weak, so jammers can cause problems even at low power levels, making them a relatively simple and cheap method of causing disruption.

Another way to interfere with a vessel’s GPS system is spoofing. This is an intelligent form of interference which deceives the receiver about it’s real location. During a spoofing attack, a nearby radio transmitter sends fake GPS signals to the target receiver.

Most navigation systems are designed to use the strongest GPS signal, so the fake signal overrides the weaker, legitimate, satellite signal. The fake GPS signals cause pilots, ship crew, and other operators to go off course without even being aware of it, so spoofing poses a real threat to vessel navigation.

If a vessel’s GPS system receives false signals, or GPS signals are jammed, it increases the risk of accidents. For this reason, it is important that the crew checks the vessel’s position regularly using other navigational equipment. If a false signal is suspected, the vessel’s position should be calculated using the principle of dead

reckoning. This means that the current position is calculated on the basis of the previous determined position together with estimates of speed, heading direction, and course over elapsed time. To do this, other navigational equipment such as a radar, sextant and a compass may be used.

In addition to problems with navigation, interference with the GPS system can affect other systems on board, such as the automatic identification system (AIS), which is generally used for navigation, fleet and cargo tracking, maritime security, search and rescue, and accident investigations.

The AIS collects the positioning data of the devices on the bridge, such as the GPS and gyro compass, and transmits it in combination with additional programmable AIS data, such as the vessel's MMSI number, name, call sign, destination and draught of the vessel. The data transmitted by the AIS is used by other vessels or shore-based vessel tracking services to identify vessels. These are then displayed on a digital chart or radar.

The AIS collects multiple data points, such as position, course and speed, so it can calculate a closest point of approach. It follows that interference with the GPS system will affect the data sent by the AIS system, which may cause the vessel to be displayed in the wrong place on the radar, or even disappear.

The writers noted that "unfortunately, few measures are available to prevent interference with a vessel's navigation systems". It was therefore recommended that the crew stays alert, especially in high-risk areas. If the crew decides to turn off the AIS, it was important to record the reason in the ship's log, because disabling the AIS could lead to contractual disputes and potential cover issues.

If a suspicion of interference with the AIS or GPS system arises, it would always be a good idea to document the false output of the device properly by taking a photo for evidential reasons, the writers said.