Radar overlay brings benefits to ECDIS

Vladimir Fadeev, Jeppesen senior developer, puts the case for radar overlay as the best way to verify cartographic data

The step-by-step introduction of ECDIS as mandatory equipment aboard sea vessels will be completed by 2018. By then, navigators should be familiar with the fundamental principles for using ECDIS as a part of an integrated shipboard navigational system and be able to react promptly to system malfunctions.

Although attempts have been made to combine different types of navigational information with radar images, ECS (electronic chart system) became the first full-featured integrator of this kind. Whereas early ECS could only display GPS locations, today's ECDIS can integrate course data from gyro, satellites, and magnet compasses, as well as information from echo sounders, wind sensors, AIS, ARPA, and other sources.

However, the apparent seamlessness of integrated navigational data may lead the navigator to place excessive trust in technology and to fail to recognise malfunctions. To reduce this risk the Manila amendments to the STCW Code place particular emphasis on a navigator's skills in determining probable system errors and reacting to them. This, in turn, requires a clear understanding of the fundamental principles of ECDIS performance and of dedicated technological aids.

> **Key points**
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> - ECDIS can lead navigators to trust technology too much
> - Radar data on a chart backdrop can reveal confusing effects

Radar overlay (a raw radar image overlaid on an electronic chart) is the best means of verifying cartographic data and the output of navigation sensors. The radar overlay feature of an ECDIS not only duplicates the radar itself but can also be used to verify the entire navigational system, as this article explains.

Radar-ECDIS integration technologies include 'digital NMEA integration' and radar processors. The former allows for input of tracked target data into ECDIS provided the radar has ARPA; the latter allows analogue-digital transformation of the video signal from the radar and input of this signal into the ECDIS. With radar data on a chart backdrop, potentially confusing effects that would remain unnoticed on a radar screen become visible. There are three main effects to consider.

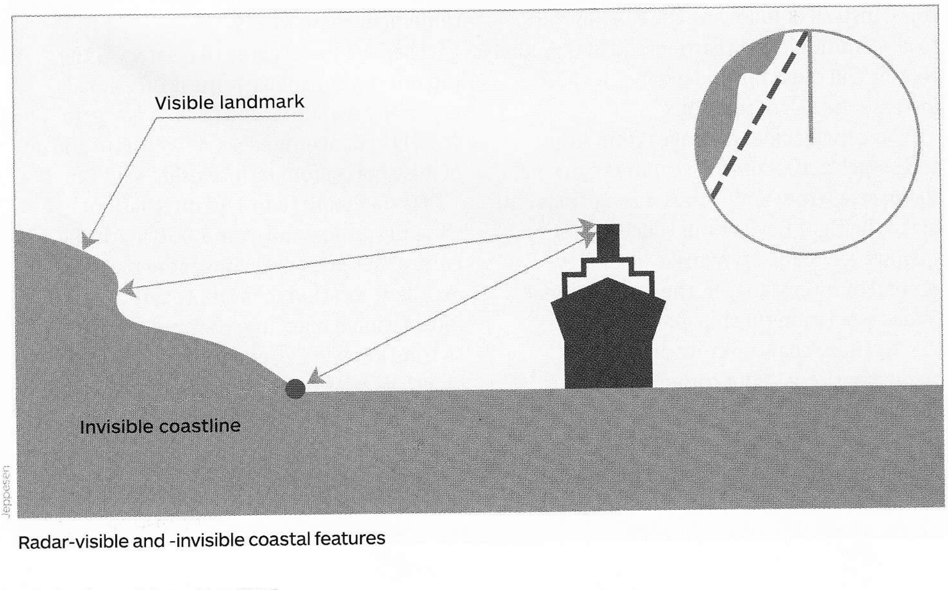
The first is due to radars having an antenna pattern width: the bigger the antenna's physical size, the narrower the pattern. The result is that any object, even a point object such as a buoy, is enlarged by that same value on the screen. For instance a buoy 1 mile from a radar with a 1° antenna pattern seems 30 m in size on the chart, and the further from the radar, the bigger it will be.

So, a point object looks much bigger than its true physical size on the radar image and a navigator must remember that the true location is in the middle of the mark's front.

The same causes give rise to another confusing visual effect: reflections from a coastline that are generated at sharp angles appear further from shore than they actually are. Coastline reflections generated at near-right angles show no such distortion.

This takes us to a significant practical conclusion: sailing along a coastline, the navigator can trust only those reflections from the coastline that come from segments currently observed at near-right angles. The same effect can also be observed right on the radar screen, but maybe not so clearly. It is the chart background under a radar image that helps to reveal the effect.

The third effect to be taken into account is that the coastline reflection does not necessarily come from the coastline itself. This happens because most reflections come from sharp slopes or massive on-shore objects, while gentle slopes produce poor reflections. It is important that a navigator is not confused by the discrepancy between the coastline as



Radar-visible and -invisible coastal features