

ELECTRONIC CHARTS –  
LEGAL ISSUES

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# ELECTRONIC CHARTS: LEGAL ISSUES

## Chart:

A geographical map or plan, esp. for navigation by sea or air"

[F *charte* f. L. *charta* CARD]

Concise Oxford Dictionary

## Introduction

Although this paper deals with legal issues associated with the use of electronic charts it may be of interest to record something of the history of charts and the statutory requirement for a ship to carry them.

## Historical

The seafarer has been provided with hydrographic information of some description for many centuries. Early Greek and Roman writers do not allude to the existence of charts in their day, but descriptions of the Mediterranean coasts, evidently for the seaman's use, were published in the years before Christ and are still extant; it is possible that these were intended to be used in conjunction with maps now no longer in existence. The compass was applied to nautical use as early as the 12<sup>th</sup> century, and from that time onwards voyages became longer and the need of special types of maps for nautical purposes more essential.

Charts were drawn in Italy in the 14<sup>th</sup> century. At that time there were no very fixed ideas as to the shape of the earth and charts were not drawn on any projection which could represent more than a small part of the earth's surface with any degree of accuracy. The cartographers of those days endeavored to show the various known parts of the land in some approximately true relation to each other: soundings were not given though sometimes shallows might be indicated, and small islands and points were usually exaggerated out of their true proportions.

Charts were first printed towards the end of the 15<sup>th</sup> century and were being engraved on copper by 1560. Nine years later Mercator published his well-known 'Universal Map' of the world, the first real attempt to produce a map on a mathematical projection. In the following centuries a great number of charts of a private or semi-official character were produced. These were usually accompanied by written Sailing Directions, and in most cases were remarkably inaccurate though the titles and letterpress did not hesitate to extol their merits. They were, of course, based on very sketchy and imperfect information, the results of mariners' observations on voyages of commerce and exploration. By the middle of the 17<sup>th</sup> century the Dutch were publishing charts under Government authority, and in 1720 the French also established for this purpose a central chart office in Paris. The exploratory voyages of Cook, Vancouver, and many others, soon provided a wealth of hydrographic information and material on which the publication of more dependable charts could be based. Towards the end of the 18<sup>th</sup> century this material had accumulated to such an extent at the Admiralty that in 1795 the Hydrographic Department was founded 'to take charge and custody of such plans and charts as then were, or should thereafter be, deposited in the Admiralty, and to select and compile such information as might appear to be requisite for the purpose of improving navigation'.

## Chart Usage and Access

Even after charts were produced officially by various Hydrographic Offices (most of whom used their own prime meridian from which to measure longitude) they were still jealously guarded by the master, who usually purchased them out of his own pocket, and who would not always give even his officers access to them. The ability to use charts bestowed upon a master both control and mystique.

Neil Hanson in his recent book "Custom of the Sea", which is the true story of cannibalism amongst the survivors of a yacht which foundered en-route from Southampton to Sydney in 1884 notes:

*"Ordinary seamen like Parker and Brooks had no knowledge of navigation, particularly the complex process of establishing longitude. Few seamen had the education or interest in it and fewer still had the necessary funds, for ships officers had to purchase their own navigation equipment. The expense of sextants and chronometers meant that sometimes even officers responsible for the navigation of their ships did not carry them, and one expert witness to the 1836 Select Committee investigating the causes of shipwrecks admitted "very many" instances of ships being 300 or 400 miles from their estimated position.*

*It was also the deliberate policy of ship owners and officers to keep their crew in ignorance. The one means by which a ship's Captain ensured that his men could not rise up in mutiny against an often tyrannical rule was that only he and his senior officers had the necessary skills to navigate the ship safely back to port. The mysteries of navigation were therefore strictly controlled; it was an offence punishable by flogging for an ordinary seaman to attempt to keep his own log (still not allowed in the 1960's) or to take his own sightings".*

Captain Squire Lecky, in his famous book "Wrinkles in Practical Navigation", first published in 1881, states in a later edition.

*Charts and Sailing Directions are as much part of the ship's equipment as the Compass or the Lead, and should be provided by the owner. When the Captain no longer has to pay for them, he will keep a better stock, and not take his ship all over the world by one or two general charts, to the manifest risk of life and property. Mr Henry McIver, a Liverpool shipowner, so long ago as 1885, in a letter to the Times, pointed out inter alia that "reliable charts and chronometers are more conducive to safe navigation than lifebuoys, foghorns and other paraphernalia to which Board of Trade surveyors devote so much attention, and owners should be compelled by law to furnish their vessels with all that may be required". Many shipowners, he said, "required their masters to provide charts and chronometers, the latter have to economise by reasons of small salaries, and accidents frequently happen in consequence".*

### **Statutory requirement to provide/carry charts**

Early statutory references to charts are to "access to charts" and provide that navigating officers" are to have access to the charts belonging to the ships".

A court of enquiry into the loss of the British sailing ship **G W Wolff** in the 1880's commented severely upon the fact that the navigating charts were not accessible to the officers and expressed an opinion *"that masters for sea-going ships should be compelled by law to have the chart by which a vessel is being navigated accessible at all times for reference by the navigating officers"*.



A search of the British Merchant Shipping Act of 1894, upon which comparable maritime legislation in many western countries including New Zealand was based, reveals no reference to the requirement for a ship to carry charts. This requirement does not appear until the Merchant Shipping Act of 1970.

The New Zealand Shipping and Seamen Act of 1908 stated:

*"All officers who take part in the navigation of any vessel propelled by sail or steam shall have access to the charts belonging to the ship in use during any voyage."*

The New Zealand Shipping and Seamen Act 1952 stated; under the same heading of Access to Charts:

*"All officers who take part in the navigation of any ship shall have access to the charts belonging to the ship in use during any voyage".*

It wasn't until the Shipping and Seaman Act amendment (No. 2) 1969 that a requirement was made which stated, *inter alia*:

*"providing that ships to which this section applies shall carry navigating instruments, adequate and up-to-date charts, sailing directions, lists of lights, notices to mariners, tide tables, etc."*

It appears that masters were still jealously guarding the charts as the amendment still included a requirement for officers to *"have access during the voyage to such instruments, charts, and other publications as are required to be carried by rules made pursuant to this section"*.

## **Electronic Charts**

As with almost every facet of our daily lives, developments in charts have happened exponentially over the last few years as a direct result of rapidly developing computer technology.

There are still masters, hopefully retired, who have been known to refuse officers access to charts, and it was a requirement for many seafarers still at sea today, to provide their own sextant and navigational tables; none were provided by the shipping company.

However, with the impending wide use of electronic charts, it would be very difficult for any master to restrict access to information which will be the centre-piece of the ship's Electronic Chart Display and Information System (ECDIS).

## **<sup>1</sup>Definitions**

Before discussing legal issues associated with electronic charts it is necessary to have an understanding of the many terms and acronyms associated with them; in order at least that "raster" charts do not conjure up a vision of a dreadlocked navigator.

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<sup>1</sup> All definitions are from the Glossary of ECDIS – Related terms, 3<sup>rd</sup> Edition 1997, published by the International Hydrographic Organisation (IHO).

## Chart

A chart specifically designed to meet the requirements of marine navigation, showing depths of water, nature of bottom, elevations, configuration and characteristics of coast, dangers and aids to navigation.

**Note:** The carriage of up-to-date charts (plus certain other nautical publication's) by vessels at sea is a mandatory requirement of SOLAS regulation V/20. The term nautical chart may be applied also to a specially compiled data base (e.g. the ENC) from which such a map can be displayed.

## Electronic Chart

Very broad term to describe the data, the software, and the electronic system, capable of displaying chart information. An electronic chart may or may not be equivalent to a paper chart required by SOLAS.

## Electronic Chart Data Base (ECDB)

The master data base for Electronic Navigational Chart Data (ENCDB), held in digital form by the national hydrographic authority, containing chart information and other nautical and hydrographic information.

## Electronic Navigational Chart (ENC)

The database, standardised as to content, structure and format, issued for use with ECDIS on the authority of government authorised hydrographic offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation.

## Electronic Chart Display and Information System (ECDIS)

A navigation information system which with adequate back up arrangements can be accepted as complying with the up-to-date chart required by regulation V/20 of the 1974 SOLAS Convention, by displaying selected information from a System Electronic Navigational Chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required display additional navigation related information.

### Electronic Chart System (ECS)

Generic term for equipment which displays chart data but which is not intended to comply with IMO Performance Standards for ECDIS, and is not intended to satisfy the SOLAS Chapter V requirement to carry a navigational chart.

### Raster data presentation (Raster Chart Display Systems – RCDS)

Method of representing all, or part, of a chart digitally by a matrix-like scheme of "pixels" (picture elements- which are the smallest element resolvable by electronic raster devices such as scanner, display and plotter).

(A raster chart is basically just a visual scan of a paper chart. It is a computer based system which uses charts issued by, or under the authority of, a national hydrographic office; together with automatic continuous electronic positioning, to provide an integrated navigational tool).

### Vector data presentation (Vector Electronic Chart System)

Method of representing individual chart features digitally by points, lines and polygons given through their co-ordinates and appropriate codes.

(A vector chart is more complex. Each point on the chart is digitally mapped, allowing the information to be used in a more sophisticated way, such as clicking on a feature (e.g. a lighthouse) to get the details of that feature displayed.

The international standard for vector charts has been finalised by the International Hydrographic Organisation, and IMO adopted performance standards for ECDIS, using vector charts, in 1995 by Assembly Resolution A.817(19)).

### **Developments at International Maritime Organisation (IMO)**

SOLAS V/20 requires:

*"All ships shall carry adequate and up-to-date charts, sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage".*

IMO Resolution A.817(19) of 1995 notes:

*"that the up-to-date charts required by SOLAS regulation V/20 can be provided and displayed electronically on board ships by electronic chart display and information systems (ECDIS), and that the other nautical publications required by regulation V/20 may also be so provided and displayed" and*

*"recommends Governments to ensure that ECDIS used on ships entitled to fly their flag, conform to performance standards no inferior to these set out in the annex to (Resolution A.817(19))"*

The Annex to A.817(19), in introductory paragraph 1.2 states:

*"ECDIS, with adequate back-up arrangements, may be accepted as complying with the up-to-date charts required by regulation V/20 of the 1974 SOLAS Convention."*

Annex 6, of 1996/7, then amended A.817(19) with the addition of performance standards for ECDIS back-up requirements, and, on the basis of A.817(19), the International Electro-technical Commission developed their standard IEC 6117 for ECDIS.

The Maritime Safety Committee of IMO at its 70<sup>th</sup> session in December 1998 adopted amendments to the performance standards for ECDIS to include the use of Raster Chart Display Systems (RCDS). These amendments permit ECDIS equipment to operate in two modes:

- The ECDIS mode when ENC data (Vector Chart) is used.
- The RCDS mode when ENC data is not available.

When used in RCDS mode, ECDIS equipment must be used together with an up-to-date folio of paper charts.

### **Acceptance of ECDIS**

It is still not entirely clear whether IMO has fully accepted electronic charts as meeting the requirements of SOLAS v/20, although acceptance of IEC 61174 as a standard for type approval of ECDIS should seem to have overcome the final barrier, provided there are back up systems in place.

Draft amendment to SOLAS Chapter V has been approved in May 2000 and V/20 has now become V/27 but the original wording of V/20 largely remains unaltered, and no mention is made of electronic charts.

There are strong indications of a general international acceptance of electronic charts, and strong indications of a belief that V/20 (27) is met when the electronic chart is backed up, especially when backed up with a paper chart.

The US Navy has promulgated minimum standards for what they refer to as ECDIS-N and have a goal of complete fleet implementation by 2007. Meanwhile, they require one of three alternate back-up systems including:

- Dual redundant ECDIS-N systems
- Primary ECDIS-N system with paper chart back-up.
- Primary ECDIS-N with ability to print colour charts at an acceptable size and scale prior to each passage.

Australia has stated:

### **Legal Status of ECDIS**

**Certified ECDIS equipment and official government electronic charts (ENC and RNC) can be used in ships as an alternative to the official Australian paper charts required under SOLAS regulations V/20**

Australia has produced a nationwide folio of raster charts which are scanned images of official Australian paper charts and are published by the Australian Hydrographic Office on CD-Rom. They are supported by an electronic Notice to Mariners service.

The UK Hydrographic office is also developing a range of digital products known as ARCS, an electronic facsimile (Raster chart) of the Admiralty chart. They also plan to introduce Electronic Navigational Charts (ENC).

New Zealand's move towards production of electronic charts, both Raster and Vector has been delayed through the devolution of responsibility for hydrographic matters from the RNZN to Land Information New Zealand (LINZ).

### **Legal Issues in New Zealand**

The Shipping (Nautical Publications) Regulations 1988 were made pursuant to section 504 of the Shipping and Seamen Act 1952 and reflect New Zealand's ratification of the Safety of Life at Sea (SOLAS) Convention that year.

These regulations, are shortly to be replaced by Maritime Rule Part 25 – Nautical Publications, which must come into effect by 01 February 2001. Draft Part 25 perpetuates the requirements of SOLAS V/20 but also recognises electronic charts by defining ECDIS and including an electronic operation in the definition of a nautical chart and states *inter alia*:

*Every nautical chart carried to meet the requirements of this Part must –*

- (a) be of the largest scale available*
- (b) if electronic, be an ECDIS system that meets the requirements of IMO Resolution A.817(19) including Annex 6*
- (c) if electronic, have paper back-up charts; and*
- (d) if electronic, the persons using those charts (must) have received training in their use approved by the Director; and*
- (e) be maintained in a fully correct condition using all chart corrections produced for that purpose by the publisher of the chart.*

It is proposed that Part 25 applies to:

- (a) New Zealand ships; and
- (b) Foreign ships that operate on the New Zealand coast; and
- (c) Foreign ships at a New Zealand port or offshore terminal

Part 25 does not apply to:

- (a) vessels that only operate on rivers
- (b) vessels of less than 12 metres in length that operate only within enclosed water limits.
- (c) Fishing vessels of less than 6 metres in length overall that operate within enclosed water limits or less than 2 miles from the coast of New Zealand; and
- (d) warships; and
- (e) pleasure craft

### **Summary**

With the introduction of Maritime Rule Part 25 by 01 February 2001, New Zealand will allow the use of electronic charts and ECDIS, with adequate back-up and training of operators.

There is no statutory requirement for pleasure vessels to carry charts of any kind, paper or electronic.

Electronic charts are here to stay and present a navigator with tools undreamed of by seafarers only a few years ago.



ECIDS is much more than simply images of a chart on a computer screen. It provides a powerful decision making tool on the bridge of a ship by combining satellite and other position fixing with ships sensors, and a sophisticated electronic database containing charting and other navigation information.

The chart information on ECDIS is continuously analysed and compared with a ships position, intended course and its maneuvering characteristics to give warning of approaching dangers. ECDIS also provides alerts and prompts for planned course alterations.

Additional material, such as photographs and views, as well as navigational notices and cautions can be accessed instantly and displayed as required on high resolution full colour screens. In addition, ECDIS provides many other sophisticated navigation and safety features including continuous data recording for later analysis.

In the near future ECDIS will also incorporate and display information contained in other nautical publications such as Tide Tables and Sailing Direction, and incorporate additional maritime information such as radar information, weather, ice conditions and automatic vessel identification (AIS).

ECDIS also permits automatic and immediate application of correction instead of waiting for Notice to Mariners to arrive by post and be hand applied.