International Hydrographic Review, Monaco, LVI (2), July 1979.

THE NAUTICAL CHART : ITS PURPOSE AND CONTENT

A Report on a study by a German Hydrographic Institute Working Group

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First published in *Der Seewart*, 39 Jg. H. 2, April 1978, and reproduced here by kind permission of the editors.

INTRODUCTION

A Deutsches Hydrographisches Institut (DHI) Working Group, the members of which were all either AG/A6 Certificated Foreign Trade Masters or cartographic engineers, has studied the principal requirements that a chart must meet from the nautical point of view. The Working Group worked chiefly independently, and thus the results of its investigation do not necessarily reflect the official views of the DHI.

A chart is indispensable as a medium of information and as a tool for all maritime traffic. It must contain all data required for both position fixing and route finding, as well as for the avoidance of dangers and for the safety and ease of navigation. Information which cannot be shown on charts must be given in other nautical publications.

Charts and other nautical publications must be so harmonised that information is given once only and in the medium that is best suited for the purpose. The chart is naturally the most suitable means of representing information in pictorial or symbolic form.

THE CHART AS A MEDIUM OF INFORMATION

Shipping can be divided into four classes : merchant shipping, fisheries, naval and yachting. For the purpose of this study the following navigational subdivisions were made :

(a) Overseas navigation, comprising ocean, marginal sea and inland sea crossings, with landmarks for position fixing being used either not at all, or only to a very limited extent.

(b) Coasting, being navigation in coastal areas and entailing navigating from headland to headland in sight of land, or sufficiently often in sight of land to fix the ship's position by land features.

(c) Approach, which is steering for the coast.

(d) Entrance, which is steering into a channel or harbour.

(e) Channel navigation, which is the way through narrow channels or canals.

(f) Port navigation, includes predominantly approaching berths and the actual manœuvres of berthing and unberthing.

For the production of charts, however, there must be no strict separation between these subdivisions, for in many cases a chart must contain information regarding several of the categories.

ESSENTIAL CARTOGRAPHIC INFORMATION

Essential information is that required by all types of vessels. The importance of this information depends only to a minor extent on the class of shipping involved; rather it is determined by the vessel's navigation equipment. For this reason the basis must not be a selection of information for an individual class of shipping. Hence, it follows that all types of shipping need the following information on their charts (further tabulated in Tables I, II and III).

(a) Data for position fixing

Graticule
Magnetic variation
Coastal configuration
Land topography
Land marks
Sounding and depth contours
Marks on land and at sea
Leading lines
Radar conspicuous objects
Maritime radio, radio navigation and radio determination stations

Limits of radar stations
Hyperbolic navigation grids

(b) Data for route finding

Graticule
Magnetic variation
Coastline
Sounding and depth contours
Dangers to navigation
Currents and tidal streams
Names of ocean bottom features
Names of ocean divisions, bays, and waterways
Names of land features
Harbours, roads and anchorages
Recommended tracks, traffic lanes and waterways
Restricted traffic areas
Leading marks
Bridge or other clearances (vertical and horizontal)

(c) Data for safety and ease of navigation

Chart datum
Nature of bottom
Bridge or other clearances (vertical and horizontal)
Various limits (limits of fishing areas, customs boundaries, harbour limits, etc.)
Military artificial features
Maritime radio, radionavigation and radiodetermination stations, and various other stations (signal stations, pilot stations, etc.)
Harbour facilities
Places for clearance by Customs Authorities
Notes, warnings, remarks
Hyperbolic navigation grids

Furthermore the fishing industry requires charts portraying the bottom topography and the nature of the bottom more fully, as well as giving the names of fishing grounds. Special information on port facilities specifically for yachtsmen should also be taken into account. However, this additional information is not so comprehensive as to justify the production of special charts for these purposes. Nor is it considered necessary to publish special charts for radio navigation.

Table I

POSITION FIXING	Charts used for :							
	overseas navigation			coastal navigation				
	ocean	marginal sea	inland sea	offshore	inshore	approach	entrances, channels	port
Graticule	x	x	x	x	x	x	x	
Magnetic variation	x	x	x	x	x	x	x	
Coastal configuration[4]					x	x	x	x
Land topography[4]					x			
Detailed land topography						x	x	
Landmarks visible from afar		x	x	x				
All landmarks					x	x	x	
Landmarks								x
Soundings[1]	x	x	x	x				
All depth data					x	x	x	
Nature of bottom and depth data for echo soundings		x	x	x				
Nature of bottom					x	x	x	
Selected marks on land or at sea		x	x					
All marks on land or at sea				x	x	x	x	x
Leading lines				x	x	x	x	x
Radar conspicuous objects				x	x	x	x	
Selected maritime radio, radio navigation and radio determination stations		x	x	x	x	x	x	
Radiobeacons					x	x	x	
Limits of radar stations						x	x	x
Hyperbolic navigation grids	x	x	x	x	x	x	x	

Table II

ROUTE FINDING	Charts used for :							
	overseas navigation			coastal navigation				
	ocean	marginal sea	inland sea	offshore	inshore	approach	entrances, channels	port
Graticule	x	x	x	x	x	x	x	x
Magnetic variation	x	x	x	x	x	x	x	x
Coastline	x	x	x	x	x	x	x	x
Names of important coastal features	x							
Names of all important coastal features		x	x	x				
Names of all coastal features					x	x	x	x
Important harbours	x	x	x					
All harbours				x				
All harbours, roads and anchorages					x	x	x	
Ports, berths and landing places							x	
Port facilities and anchorages								x
Names to identify ocean bottom features	x	x	x	x	x	x	x	
Soundings and depth contours	x	x	x	x	x	x	x	x
Names of ocean parts	x	x						
Names of ocean parts and important bays		x	x					
Names of all ocean parts and bays				x				
Names of all ocean parts, bays and waterways					x			
Names of all bays and waterways						x	x	
All dangers	x	x	x	x	x	x	x	x
Ocean currents[2]	x	x	x	x	x	x	x	
Tidal streams[3]					x	x	x	
Prescribed and international routes	x	x	x	x				
Track recommendations		x	x	x				
All routes and fairways (channels)					x	x	x	
Channels								x
Areas with restricted traffic	x	x	x	x	x	x	x	x
Leading marks					x	x	x	x
Bridge or other clearances, vertical and horizontal							x	x

Table III

SAFETY AND EASE OF NAVIGATION	Charts used for :							
	overseas navigation			coastal navigation				
	ocean	marginal sea	inland sea	offshore	inshore	approach	entrances, channels	port
Military training areas[5]	x	x	x	x	x	x	x	
Limits	x	x	x	x	x	x	x	x
Submerged artificial features (pipelines, submarine cables etc.)		x	x	x	x	x	x	x
Notes, warnings, remarks	x	x	x	x	x	x	x	x
Radio direction finding stations		x	x	x	x	x		
Coast radio stations for port operations					x	x	x	x
Various stations (signal stations, pilot stations etc.)					x	x	x	x
Chart datum				x	x	x	x	x
Nature of bottom						x	x	x
Bridge or other clearances, vertical and horizontal							x	x
Harbour facilities								x
Places for clearance by the customs authority								x
Hyperbolic navigation grids[6]								x

Notes relating to the tables:

1. Soundings and depth contours must be selected so that their depiction permits the mariner to draw conclusions regarding the density of the surveys. Even very deep soundings must be shown on charts since areas without depth data will suggest incomplete surveys. The depth data must be shown for the whole area, and not be limited to certain channels.

2. The axis of permanent ocean currents must be shown (e.g. the Gulf Stream).

3. Tabular information on tidal streams at selected places must be shown, giving their direction and strength (as for example on the British Admiralty charts).

4. Coastal configuration and land topography are essential elements for position fixing and cannot be omitted, notwithstanding modern navigational methods. Topographic features extending inland from the coastal area may become necessary in the case of particularly conspicuous landmarks visible over a great distance, the depiction of spot heights alone being insufficient.

5. Military training areas and other areas of traffic restriction must indicate the kind of restriction.

6. In the case of harbours, overprinting of hyperbolic navigation grids is desirable to enable calibration of instruments before sailing.

Information to be shown on charts

The extent of information regarding position fixing, route finding and safety and ease of navigation to be shown will be determined by the chart's purpose. The above Tables give in summary form the essential information required for the various classes of shipping. Since all the information shown on charts is subject to perpetual change, the Working Group considered that too detailed a list would not serve a useful purpose. Any kind of information that can be depicted may be associated with these Tables, and for this reason the lists should not be used as check lists. They should only serve as a framework for selecting the required information.

The chart as a tool

A chart is a basic requirement for all types of shipping; only their requirements as to format differ. When establishing the format three conditions were considered essential :

(a) For ships with small chart tables it is of advantage to keep the format as small as possible;

(b) The format must, however, be large enough to permit an as large as possible geographic area to be represented on a scale suitable for navigational use;

(c) Standard formats should be aimed at, in order to facilitate the use of charts and their storage.

These requirements are largely fulfilled if only two formats are used in chart production. The neat line size of the larger chart should correspond approximately to that of the International Chart (630 mm × 980 mm). The second format should be half the size of the larger format. By folding the larger size chart in two, a convenient size for ships with smaller chart tables is obtained, and at the same time chart usage and storage is facilitated on all vessels.

Geographical area

Charts for seagoing vessels must show the complete geographical area and where necessary a complete ocean, marginal sea or inland sea. On charts for coastal navigation the transition from one chart to another must be positioned outside areas of great traffic density or with course alteration points. For coastal approach charts the neat lines must be so arranged as to allow ample coverage of the approaches and to enable the use of all objects necessary for taking bearings.

Entrance charts, and charts for channels

If, as in the case of long channels, several charts are necessary, the roads, ports, locks and course alteration points should be shown together on a separate chart. The geographical area must be so selected that these

details do not lie near the chart borders. If possible, the whole of a port must be shown on the same chart. Adjoining charts must have enough overlap so that they enable a timely transition from one chart to another, and must also take into consideration any connection points of navigational importance.

Chart projection and scale

All charts must be on the Mercator projection. The scale should be selected so that detail depicted accords with the purpose of the chart. Adjoining charts should where possible be on the same scale. To the mariner, whether or not the chart is at a round scale is of no importance.

Cartographic presentation

The presentation of data must be unambiguous, and the facts must be as clearly as possible recognisable from the symbols employed. For example, the symbols for light vessels and for buoys are unambiguous as they show the shapes of these navigational marks. However, the legend "Lotsen" (German for Pilot Station) is to be preferred to the symbol 

In certain cases, a complete colour representation of light sectors is desirable to achieve clearer treatment of this information.

The chart's neatline graduations must be so arranged as to permit accurate and easy reading of geographical values. It should also be possible to take the geographic latitude and longitude from selected grid lines within the chart.

Harbour charts with geographical reference points must show a "cable length" scale in addition to the metric scale.

All charts should show a logarithmic scale for the distance steamed in a unit of time (as for example on American plotting sheets).

Different types of lettering and different letter thicknesses should only be used for the purpose of achieving greater clarity and not to represent specific facts.

Reverse side of a chart

A chart's reverse side is not considered a suitable place for printing information. When such a chart is placed on a light table, the detail printed on the reverse side will show through. Furthermore, it is inconvenient to have to look up information on the reverse side as the chart must first be turned over.

Chart correction

The Working Group rejects completely the idea of issuing charts for which no updating is envisaged. Charts should as far as possible be updated by block corrections issued as attachments to Notices to Mariners.

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Editor's Note :

The Working Group's opinions, stemming as they do from the collective considered judgement of both mariners and cartographers, should be of interest to all hydrographers, despite the fact that they occasionally conflict with both existing IHO Technical Resolutions and the developing CSC-recommended chart specifications.