ABSTRACT OF QUESTIONNAIRE ON ECDIS
From
'THE NORTH SEA PROJECT
A test project for the Electronic Navigational Chart
EXPERIENCES AND CONCLUSIONS'

———

INTRODUCTION

The North Sea Project was initiated in June 1987 by the Norwegian Hydrographic Service and the Royal Danish Administration of Navigation and Hydrography. In addition to Denmark and Norway, Sweden, the Federal Republic of Germany, the Netherlands, Belgium, France and the United Kingdom participated in the project.

The objectives were: to assess the measures required to establish an international electronic chart database to IHO standards, by assembling a data base of a limited area; to evaluate updating; and to demonstrate the electronic chart and analyse its potential usefulness.

The North Sea Project was funded and managed by the Norwegian Hydrographic Service, which also assembled the data base on its Techra relational data base management system arranged the participation of commercial electronic charts and provided the survey ship LANCE for a one-month test and demonstration cruise in October-November 1988.

The following electronic charts were operated on the LANCE for demonstration: C-MAP low-cost EC, of Italy; Disc Navigation/Marintek of Norway; Marcom QUOD 2000 from the Netherlands; Offshore Systems Ltd. PINS 9000 from Canada; Sperry Marine of the USA; and the EC Testbed from the Canadian Hydrographic Service.

The host country hydrographic service at each port of call organized a schedule for local visitors from the maritime and hydrographic community. More than 500 people from 17 countries saw the demonstrations. The majority of these people were seeing ECDIS for the first time.

In keeping with the final objective — to analyse the potential usefulness of the electronic chart, visitors were asked to give their views on a 15-point questionnaire, which combined voting check-offs with space for comments. Sixty-four responses were returned, half of them from mariners — the potential users. These are summarized below, giving about one in four of the comments received. A more complete abstract is given in the North Sea Project Report.

Although this is a 'snapshot' of opinions at an early stage of ECDIS development, and views may change when users gain operational experience, many thoughtful and interesting comments came back with these questionnaires.

BRIEF ABSTRACT OF RESPONSES TO QUESTIONNAIRE

1. WHAT IS AN ECDIS?

	Mariners	Non-mariners
1) Description stressing hydrographic information	3	10
2) 'A unified navigation information display...'	16	12

The majority view is well summarized by:

'Second version preferred; ECDIS must be more than a seachart' (M)*

'The first definition strikes me as exploiting too few of the possibilities of ECDIS. The second definition is more attractive. The critical words are 'combining --- as appropriate.'

However many of those who wrote comments registered caution:

'It is much too early to decide whether the unified display is operationally necessary or safe to use, as there is no extensive operational experience. It will take some years of exploitation by manufacturers and sea experience before we can see the way ahead'.

'--- The success of (2) depends on how practical the data-handling for (1) proves to be. If too complex (2) will only make matters worse ---.'

Some were impatient with semantics:

'It is a chart display, ECDIS. If the functions are expanded the name should be amended accordingly':

(Editor — it is also ECDIS — 'Electronic Chart Display and Information System'. The initial concept of the Electronic Chart (EC) was that it should aid safe navigation by providing a graphical summary of vital navigation information. As Rear Admiral Haslam suggested in 1984, it would more accurately have been called an 'Electronic Navigation Information Display.' The particular case of an 'ECDIS' that should be the equivalent of the paper chart was devised in 1986 as the Hydrographic Offices began drafting specifications for the chart aspects of the electronic chart. However those IHO specifications make it clear that ECDIS should not stop at chart equivalence.)

(*) The notation (M) indicates 'comment by a mariner'.

2. PRECISE POSITIONING, and
3. WHERE WILL ECDIS HELP MOST?

NAVSTAR-GPS is apparently firmly linked with ECDIS (or perhaps it is just in everyone's mind), 29 out of 31 mariners, and 30 out of 36 others, selected GPS positioning, and of those, 20 mariners chose 10m differential GPS. Opinions on where ECDIS will help most were:

	Mariners	Non-Mariners
Ocean navigation	4	8
Coastal passage	17	19
Constricted waters/traffic routeing	24	26
Harbour approach	27	26
Piloting conditions	17	14
Berthing the ship	8	5

The link between application and accuracy was summarized by:

'For ocean and coastal passages the stand-alone GPS accuracy of 100m will cover all needs. For piloting conditions or other restricted waters, that achievable by radar (±20m), or better, will be required.' (M)

Several people brought up the need for visual fixing as well as electronic.

Under 'other purposes', military uses (particularly minesweeping), and offshore oil and gas activities were the most often quoted.

4. INFORMATION SELECTION ON ECDIS

This asked for opinions on a 'Minimum Display':

	Mariners	Non-Mariners
No minimum; mariner builds own chart	0	0
Non-obligatory Minimum Display appears by default or by 'Restore'; mariner removes features if necessary.	23	19
Smaller obligatory Minimum Display	3	5
Obligatory Minimum Display as IHO list.	3	5

One suggestion was:

'The true Minimum Display should be much smaller, perhaps just the own-ship danger contour. This should never be removed. A larger 'Normal' data set would appear on switch-on and by 'Restore' command. Items of the Normal Display would have to be selectively removed to get to the Minimum Display.'

5. AUTOMATIC CHART CORRECTION

All respondents were in favour of automatic chart corrections, and 46 out of 60 checked this as 'an important and urgent step'.

6. RADAR AND ARPA ON ECDIS

The question was 'do you see any strong advantages or potential problems in having radar and ARPA as **optional** (misprint in questionnaire) display features?'. The answers came out as:

	Mariners	Non-Mariners
Advantages in radar and ARPA	23	18
Favour radar but not ARPA	1	5
Prefer selected radar targets only	1	1
Serious doubts about any radar	1	1

Many comments were brief. For example:

'I welcome this possibility of checking ships position and of interpreting the intentions of other ships'. (M);

'I believe it is essential to have ARPA vectors and radar as optional display features' (M)

'Radar overlay should be transparent; chart features should not be overlayed by rain clutter, etc.'

'There is a danger the mariner will neglect to watch his radar as well as the ECDIS, and may then fail to see important radar targets, due to chart clutter. The question of radar on the ECDIS needs extensive operational experience' (M)

7.1 WHEN YOU NEED MORE THAN ONE CHART FOR LOOK AHEAD (to see future track at smaller scale)

	Mariners	Non-Mariners
'Windows' — two charts on one screen	7	5
Alternating the charts by fast switching	15	9
Second Screen	7	16

7.2 WHERE TO PUT WRITTEN INFORMATION

(Time, position, heading, etc., chart legend, operator interaction.)

	Mariners	Non-Mariners
On separate alphanumeric terminal	9	6
On sides of main graphics display	13	11
Important information on main display, remainder on terminal	8	12

7.3 WHEN YOU NEED MORE THAN ONE CHART FOR SIMULTANEOUS ROUTE PLANN-ING AND ROUTE MONITORING (e.g. planning for a new destination while underway with the ECDIS operational)

	Mariners	Non-Mariners
One screen, using windowing/fast switching	15	11
Fit two screens	8	19
Don't need route planning underway	5	1

7.4 WARNINGS (e.g. approaching shoal water/restricted area/new chart scale)

Nearly half the votes went to using flashing or colouring to give warning, with buzzers the second favourite. Synthetic audio scored low. Warnings could be one of the significant advantages of ECDIS, but mariners have heard that before:

'Buzzers and flashing should be used very sparingly. Distinctive colours should do for most warnings' (M)

'Buzzers should be mutable' (several mariners)

'Use a combination of audio and text warnings. See RTCM 'Recommended Standards for ECDIS'.

7.5 TIDE TABLES, LIGHT LISTS, RADIO AIDS, etc.

Twenty-six mariners thought tides from ECDIS would be useful, and twenty-two were in favour of other HO publications as well. Four mariners thought tides of little use, and seven said the same for other publications.

'It would be useful to have tidal information in ECDIS. Other publications should be stored in a separate system, together with ship's particulars, masters night orders, IMO wheelhouse information, etc.' (M)

8. ECDIS ON 'LANCE'

FEATURES LIKED MOST

Specifically:

'The similarity to the paper chart of DISC and Canadian Testbed'. (M)

'The user-friendly menu of the QUOD. The additional information screen layout of DISC/MARINTEK' (Editor-MARINTEK had a small integrated bridge system)'

'Operator interactions of SPERRY and the background colours, particularly at night'.

'The ability of PINS to show large scale and small scale at the same time, i.e. the immediate navigation problem and the future track.

'C-MAP deserves congratulations for addressing the real market and achiev-ing some success.'

In general:

> 'Seeing chart and radar information on one screen; immediate appreciation of own ship's position in relation to the channel; better appreciation of own ship size and heading in plan view' (M)

> 'The ECDIS ability to delete data not relevant to the operation at hand, and to present a clear and unambiguous picture. The radar overlay for anti-collision and position verification. The facility to receive automatic corrections'. (M)

FEATURES TO BE IMPROVED

> 'Developers should aim for ease of operation and not become too sophisticated'. (M)

> 'The controls need to be standardized and simplified'. (M)

> 'The colour scheme will have to be adapted for night use. White for deep water will seriously impair night vision even at low intensity'. (M)

> 'None of the ECDIS seemed to have adequate features for doing normal chartwork'.

FEATURES TO BE REMOVED

> 'Second screen'. (M)
> 'Unnecessary 'draw your own chart' type facilities' (M)

FEATURES TO BE ADDED

> 'Capability to draw in features not on the chart'. (M)

> 'Windows showing ship conning information in graphical form' (M)

> 'The display of heading and draft vectors and prediction vectors (i.e. 1 to n minutes ahead)'.

> 'When altering course towards the edge of the channel to avoid collision, ECDIS should indicate track ahead at, say, 3-minute intervals to show how long the ship can steer away' (M)

> 'Ultimately I would like to see own ship's safety contour adjusted for tide'.(M)

'A facility to communicate passage planning details and reference targets from ECDIS to the radar display' (M)

'Take the opportunity for VTS centres to pass local warnings, traffic, and berth information for display alongside the main display.' (M)

'We should be looking at ways to get a survey of a changeable estuary into the ECDIS data-base within hours'. (M)

'I feel eventually ECDIS will have to include the manoeuvring characteristics of the ship'. (M)

9. WOULD ECDIS HELP YOUR ORGANIZATION?

Some mariners noted the improvement in safe navigation from ECDIS, especially in confined waters and poor visibility. Others pointed out that the system was limited until a substantial number of charts are digitized. Manufacturers also

wanted digital data, both for ECDIS and, more immediately, for radar, ARPA and video plotters. One hydrographer was impressed by the extra workload that ECDIS will impose; another looked on this as a stimulus for the digital conversion that is coming anyway.

10. POTENTIAL PROBLEMS

'I see no greater risk than with any other new equipment. Training will be needed, and a stock of small scale charts'. (M)

'Since by 'Murphys Law' every device will fail at a vital moment, duplication of hardware is necessary'.

'Need uninterruptable power supply, and the ability to make paper charts onboard from the data-base'

'There is a danger of mariners facing fundamentally different systems on different ships'.

'If it is too complicated to operate (including many different manufacturers controls) it could be dangerous in an emergency'. (M)

'Over-regulation inhibiting development'.

And finally, youth had its say:

'Older officers may have difficulty button-pushing unless the system is really simple'.

11. WHAT LEVEL OF ECDIS

	Mariners	Non-Mariners
Lines on dark background; position only interface ($2,500)	1	3
Colour-filled areas; position only interface ($5,000)	0	1
Colour-fill; position; radar; area detection; automatic chart correction. ($30,000)	7	9
All the above plus light list, etc. Chart equivalent ($60,000)	15	9

The dollar figures are the means of what people expected to have to pay. (The vote might have been different if a down-payment had been required).

One mariner pointed out:

'It will not be possible to specify one type of ECDIS for all users. An advantage of ECDIS is to provide relevant solutions to each user group, from VLCCs to yachts'. (M)

12. IMO ACCEPTANCE AND LIABILITY

'Authorities should concentrate on:

1) The facilities to be provided.
2) The performance to be achieved.

If IHO and IMO go into technical details, they will be out of date before the ink is dry and the mariner will get less than technology can provide'. (M)

'For ECDIS to be viable, the data must be produced by, or verified by, the responsible Hydrographic Office. Chart equivalence is a pre-requisite. However in the development of IMO/IHO specifications it seems vital not to press the issue of 'equivalence' too far, thus preventing the development of ECDIS into a better tool than the paper chart' (M)

'At this time it is better to consider ECDIS as an aid to navigation to be used with the paper chart. This will allow development while gaining experience. Full reliance on ECDIS may be 5 years away'.

13. TRAINING

Opinions were strongly in favour of training as part of the certificate curriculum, but short courses were also needed, particularly at the start, and on the job training should also be included (particularly with built-in simulator).

'Training should concentrate on 3 aspects:

— competence in operation,
— understanding the limitations,
— procedure in the event of system failure' (M)

'Only certified trained personnel should operate ECDIS (compare compulsory radar certificates)'. (M)

14. PARTICULARS OF THOSE WHO REPLIES; PLANS TO USE ECDIS?

Thirty-three mariners, and 31 hydrographers, manufacturers, consultants and academics responded to the questionnaire; most responses came from the UK. Many contributors obviously gave much time and thought to the subject.

A few people had immediate plans for ECDIS; others were more inclined to wait and see how it develops.

15. GENERAL COMMENTS

'I was sceptical at the start, but the voyage Stavanger-Goteborg convinced me that this is a unique chance to have safer navigation'.

'The ECDIS is a project which realizes the enormous step forward which will be brought about by the introduction of GPS' (M).

'The guiding principle for technology advance must be to maintain or raise safety standards. It is my opinion that providing hydrographic information on the ARPA meets a real need and can be justified on safety grounds, (but) the justification for ECDIS has not been established with the same certainty' (M).

'I feel the present systems need a great deal of development to be suitable for the marine environment' (M).

'The general feeling engendered by the North Sea Project is that ECDIS can contribute to marine safety and efficiency, but it must first attract the interest of the end user'.

'Manufacturers should look at ports with confined, shallow and congested waters, where owners of big ships would quickly get their money back by avoiding delays' (M).

'The ideal for ECDIS is that it be the 'one-stop' navigation display. But if this is to be effective (i.e. simple to operate) some compromises, some cutting back on the ideal, may be necessary'.

'There is a need to repeat this trial in two or three years with updated equipment, for the benefit of all concerned with future standards, carriage requirements, etc.' (M).