

13th CHRIS MEETING

17-19 September 2001, Athens, Greece

ENC DEVELOPMENT

(September 2001)

1 - AUSTRALIA

ENC Production

1. Australia's ENC production programme remains in the first instance targeted to providing ENC coverage for those vessels and areas most likely to benefit from the early uptake of ECDIS. In Australia this is SOLAS class vessels transiting Torres Strait and The Great Barrier Reef and those entering Australia's major ports.
2. Production priorities are therefore:
 - ?? Major routes and restricted pilotage waters
 - ?? Approaches and Ports
 - ?? Coastal
 - ?? Remainder
3. The AHO compilation strategy is to work "from the part to the whole". In other words firstly to create "larger scale" ENCs of priority areas and rely on RNC coverage as a backdrop for less frequented or less critical areas. Progressively, each ENC will contain more and more detailed data through revision and the completion of more and more priority areas.
4. Detailed coverage along the Great Barrier Reef (GBR) compulsory pilotage route, its approaches and linking passages has been compiled in most instances from source survey and contains bathymetry at one metre contour intervals in the 5-20m depth band.
5. ENC data has been evaluated at sea since 1999, together with ENCs covering some of Australia's ports. ENC data is available to selected ships, organisations and manufacturers by application to the AHS (<http://www.hydro.gov.au/eproducts/echarting/enc.htm>).
6. AUS-ENCs will not be available for commercial sale before 1 July 2002, when the new SOLAS V enters force. These ENC's will be supported by an update service.
7. ENC data protection/integrity, pricing and distribution are all remain under consideration. It is unlikely that ENC prices will be significantly higher than the outlay for the paper charts that they replace. The AHS will allow its ENC data to be distributed in proprietary SENC formats.
8. Comprehensive ENC coverage of the whole of the Australian charting area suitable to support continuous ECDIS navigation is unlikely to be achieved before at least 2005.

ECDIS Implementation

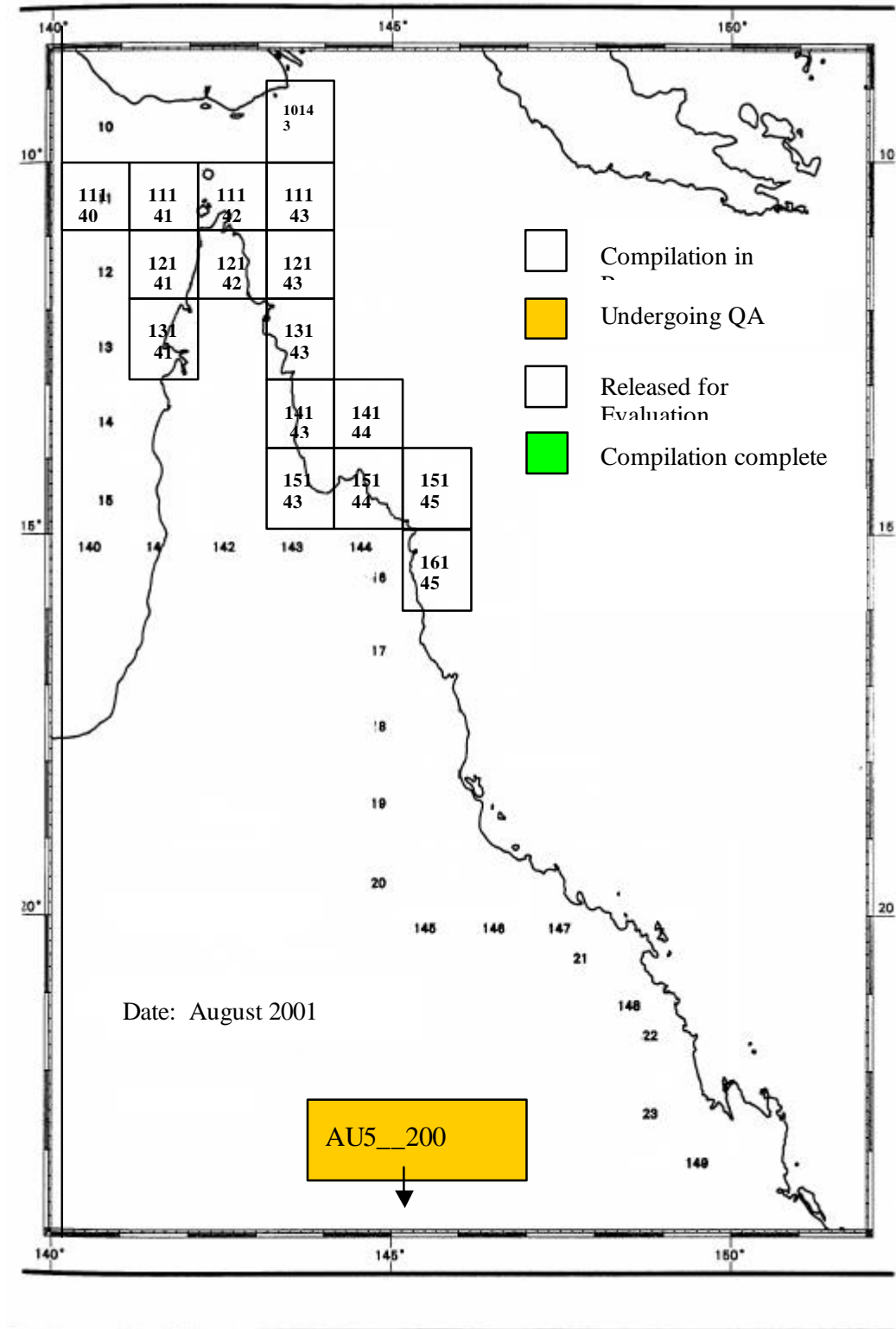
9. The Australian Maritime Safety Authority (AMSA), Australia's maritime colleges and the Australian Hydrographic Office continue to work closely together to develop the necessary regulatory framework for the introduction of ECDIS in the Australian maritime jurisdiction. AMSA have yet to declare what will be acceptable AMSA as "*adequate back up arrangements*" and what is "*an appropriate folio of paper charts*".

PROGRESS DIAGRAMS



Australian ENC Port Series

Port ENCs Completed (August 2001)



Progress of data-rich (1m contour interval) ENC of Great Barrier Reef Inner Route

2 - CANADA**ENC/RNC Report - August 2001**

As of August 20, 2001: 532 ENC's from 282 paper charts and 651 RNC's.

Paper Chart Products	Raster NC Products	S-57 ENC Products	S-57 ENC's Edtn=1	S-57 ENC's Edtn=2	S-57 ENC's Edtn=3	S-57 ENC's Edtn=4	S-57 ENC's Edtn>4	Active S-57 ENC Updates
950	651	532	410	95	16	8	3	167

CHS is in the final stages of ISO 9000/2000 certification.

Up to date information about the status of ENC's commercially available can be seen at the NDI web site <http://www.ndi.nf.ca/>

ENC's are produced using USL's CARIS Object Manager (OBMAN). We have a small pilot project to compare production efficiencies of CARIS and 7Cs software.

QA is done using a variety of packages including USL's ECVIEW and READS57 and dKart Inspector. Update messages are also verified by several ENC viewers.

3 – DENMARK

Status of the Danish ENC Production – September 2001

This report provides a status for the Danish ENC production.

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Danish waters:

The area is now covered by 320 cells. The number of produced cells will be frequently increasing in line with the production of paper charts in better scales than the current ones. The majority of the Danish cells were available by the end of July 2000. The produced cells include the following harbours:

ESBJERG, KØBENHAVN, AALBORG, KALUNDBORG, ÅRHUS, NÆSTVED, FREDERICIA, RØNNE, FREDERIKSHAVN, KORSØR, SØNDERBORG

The ENCs are updated weekly and distributed through PRIMAR.

The ENC cell scheme is based on a regular grid much like the cell structure in S-57, version 2. Within the Danish area you will find cell sizes from 1 degree, 30 minutes, 15 minutes to 7½ minutes respectively, each covering the areas where chart data in the corresponding scales are available.

The source material is 57 traditional charts (incl. 29 INT charts), produced in accordance with international standards. These charts are all in digital vector format.

Verification:

For verification the DKHO is using the programs CARIS Ecviev, dKart Inspector and 7C's ENC Analyzer and ENC Designer. An ECDIS program from Transas Marine has been installed. These programs, together with manual inspection of the cell contents, present adequate information for quality assurance. The verification is done in accordance with the PRIMAR procedures.

Greenland and Faroe Islands:

There are no immediate plans for the areas mostly due to the lack of sufficient skilled human resources.

Nevertheless during the next year, methods for changing from analogue to digital production as well as the production of ENCs is being examined in a special project

Plans for improvements of the ENC's

The next priority task is produce cells in better navigational bands than today where deemed necessary, to include the CATZOC and SCAMIN attributes into the ENC's, followed by improvement in geometric accuracy by recompilation based on source material.

Finally the production of ENC data of the Danish harbour plans (368 minor ports and marinas) remains to be done. For the time being we are not able to assess the time consumption for this work.

The production system

During 1999 the DKHO changed the production of ENC's from UNIX to Windows NT. The clients chosen were Dell 500 MHz Pentium II and the server was supplied by Intergraph. The shift to NT has shown considerable increase in performance.

However, the performance is deteriorated, to some extent, by the fact that we have to revalidate all the cells everytime we implement a new version of the validation software.

The full staff in the production line for charts (digital/analogue standard charts as well as pleasure craft charts) nautical publications and ENC's is 30, including support and development.

The Danish area of responsibility is Denmark, Greenland and the Faroe Islands.

4 – ESTONIA

ENC Development in Estonia – September 2001

At the moment 6 cells in the coastal usage bands are ready for release. Thirteen additional cells will be available by the end 2001, it means all Estonian waters will be covered with cells in the coastal usage band.

All 31 paper charts are in S-57 digital form. All different scale charts in Estonian Hydrographic Office are compiled as ENC-s: afterwards, for producing printed charts, ENC-s are converted to paper chart format.

Meanwhile for commercial distribution of ENC we use internal SENC format. Those data are used for test-beds, sea-trials and for navigation on the governmental ships (buoy tenders, hydrographic ships, coast guard ships, etc).

Data exchange for new chart production is established with Latvian and Finland.

Number of S-57 Edition 3 ENCs (listed by usage bands) :

Usage Band	ENC Cells produced	% Total ENC Coverage	Equivalent Paper Charts	ENCs in one year ahead 2 years	ENCs on the market (with updating service)
Berthing	6	15%	6	3	
Harbour				4	
Approach				25	
Coastal	6 (19)	35 (100)%	4 (9)		
General					

Complete ENCs coverage of the Estonia waters will be commercially available by the end of 2005. The main ports and shipping routes will be available by the end of 2002.

ENC and printed charts production system is under development and we are planning to compile Chart, NtM and List of Lights production systems in one system.

5 – FRANCE

ENC Development (September 2001)

1. Number of S-57 Edition 3 ENC's (listed by usage bands) for metropolitan France (up to now , no ENC was produced for other area of French responsibility):

Usage Band	ENC Cells Produced	% Total ENC Coverage	ENCs in one year ahead	ENCs on the market (with updating service)
Berthing	5	45%	3	5
Harbour	8	24%	10	8
Approach	22	31%	10	22
Coastal	39	68%	8	39
General	/	/	/	/

2. Software tools utilized for ENC production and Quality Control:

- ENC Production tools (capable of S-57 Exchange Set publishing):
 PCI2 (Poste Cartographique Interactif de 2^{ème} génération) utilizing Caris HOM functionality (10 stations)
- ENC Quality Control tools:
 Dkart Inspector, DXA, ENC Analyser ; various internal software
- ENC Maintenance tools (capable of S-57 Updating profile generation):
 PCI2 (Poste Cartographique Interactif de 2^{ème} génération) utilizing Caris HOM functionality (10 stations)

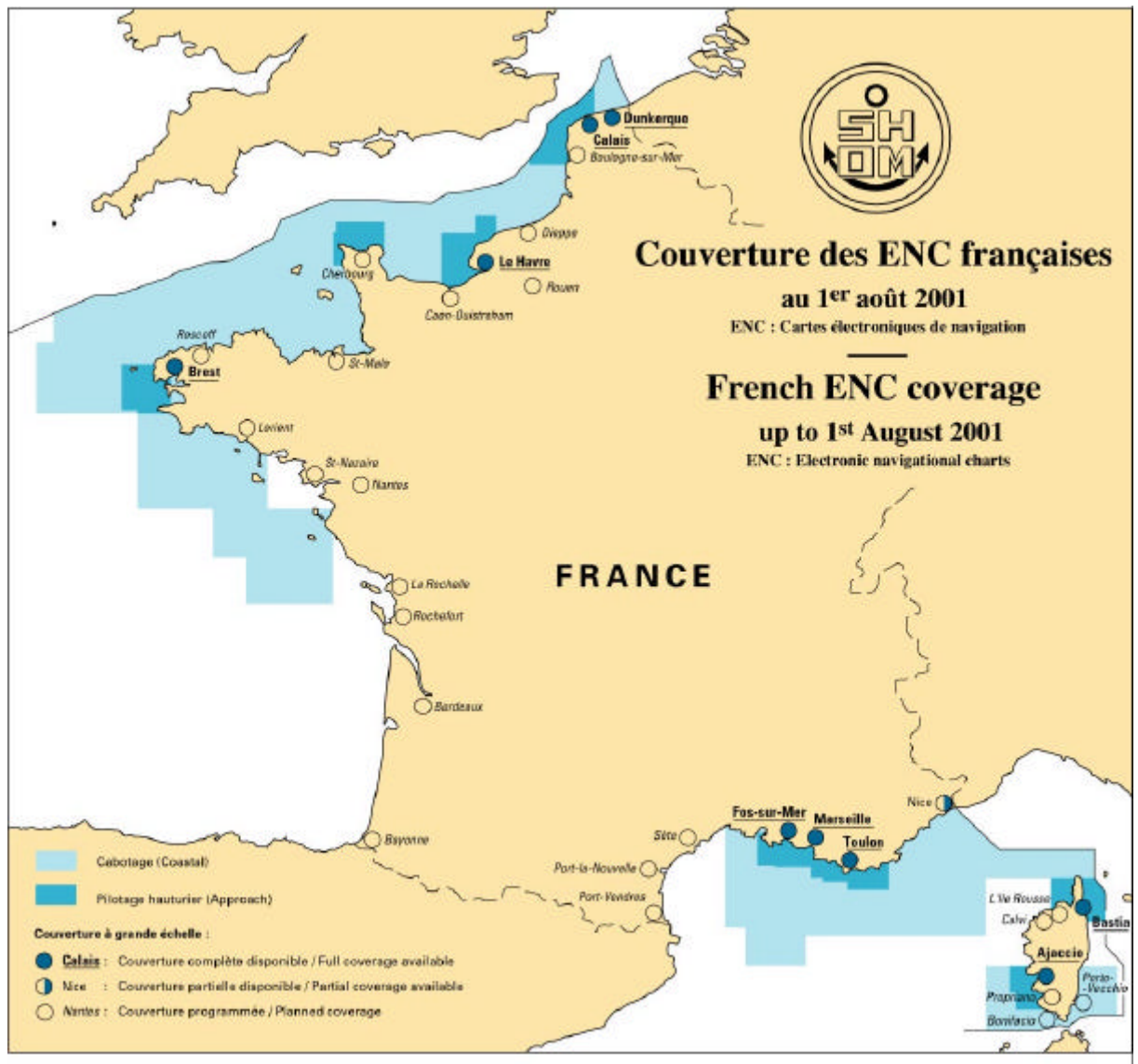
SHOM should adopt the last version of Dkart Inspector (V4.0) and ENC Analyser (V2.0) (when available) to be consistent with the tools used by PRIMAR, but internal software have the same capacity of detecting errors. The main difference is the ergonomics.

3. Personnel :

13 people directly involved in the production of ENC's.

4. View of ENC development in the future and intentions:

Priority has been given to the international traffic in Metropolitan France where more than 2/3 of the passenger and tonnage traffic can be done with an ECDIS. The production activity will now be shared between the rest of the international traffic in Metropolitan France, the ENC's of the French overseas Departments and Territories, the areas of French primary charting authority, the complements for the small ships traffic in Metropolitan France and the implementation of a layer in French. No priority between this 5 main tasks has been yet established.



1.

6 – GREECE

ENC Development in Greece

The Hellenic Navy Hydrographic Service (HNHS) has signed a contract with C-Map Norway to cooperate in the development of ENC's and Updates, which will cover the Greek area of responsibility.

The project, which is estimated to be completed within the next 3 years, has been started on March 1, 2001. According to plans, C-Map will digitize all Greek Charts from HNHS portfolio and produce the necessary ENC's to cover all Usage Bands for the area of our interest. Moreover, C-Map will create the necessary Updates based on our NtMs that are issued monthly. Of course, all produced data will be Quality Assured by HNHS before becoming available for navigation.

The Software that will be used for the Quality Control (QC) is the dKart Office. C-Map has already installed the Quality Control system comprising three (3) QC Work Stations and a Server. In addition, C-Map has offered an extensive training course (180 hours in Greece and 40 hours in Norway) to ten (10) people from our staff, covering the following subjects:

☞☞S57 Ed. 3.1 basics and ENC product specification

☞☞dKart Office System tools and utilities

☞☞Quality Control procedures and methodology

☞☞S57 Data management via dKart Office

At a later stage, a second QC Software will be procured, in order to be used as a final validation tool before the release of the ENC's for navigation.

In order to set up the procedures for the production of the ENC's and the Quality Control, the production started with a representative sample of our charts that will be used as a pilot to identify possible problems in coding, the use of the Greek language, etc. The first 2 charts have already been transformed into S57 and are now in the QC phase by our staff.

The cell scheming in the different Usage Bands, which will cover the area of our responsibility is still under discussion. It will be finalized by the end of this year, or at the latest, early next year. The ENC production will be adjusted accordingly. As indications please consult next table, which refers to the number of the paper charts, that according to plan, will be digitised by the end of 2002.

Usage Band		Available Paper charts	Paper Charts converted to S57 Ed3.1 In 2001	Paper Charts converted to S57 Ed3.1 In 2002
6	Berthing	241	0	20
5	Harbour	72	0	6
4	Approach	23	3	8
3	Coastal	40	3	26
2	General	9	3	0

7 – ITALY

1. Present status

While producing updates to be supplied to Italian Navy vessels, engaged with test-beds for ENC, software tools and tests generating and checking ER files have been refined.

An average of 200 ER files per year (ca. 2Mb data volume) has been generated on the basis of the Notice to Mariners booklet that have been published.

Two compilation strategy to produce ENCs were identified:

?? Recent paper chart production: compilation from digital data by importing the digital sources of paper charts in S57 environment;

?? Old paper chart production: digitisation of the paper charts.

Furthermore, the set up of a Bathymetric Information System will allow the compilation/substitution of S57 objects (coast line, sounding and depth contour) with more accurate data derived from survey fair-sheet digitization or more recent digital source survey.

ENC data content validation, made out by qualified internal HO departments, guarantees information correctness and completeness, and contemporarily allows the creation of the S57 objects checked database. This approach has the aim of producing a validated S57 objects database regularly maintained up to date (S57 Cartographic Information System project) in order to provide a unique source for “on demand” production of:

?? ENCs/EN profile

?? Paper charts

?? Notices to Mariners and ENC updating/ER profiles

?? Nautical publications, List of Lights, etc.

Software tools utilized for ENC production and Quality Control

- ENC Production tools (capable of S-57 Exchange Set publishing):
 - N° 4 dKart Editor/Hydroservice
 - N° 2 dKart NavAids/Hydroservice
 - N° 1 ENC Designer/SevenCs
 - N° 1 ENC Optimizer/SevenCs
- ENC Quality Control tools:
 - N° 4 dKart Editor/Hydroservice (same station above)
 - N° 1 ENC Analyzer/SevenCs
 - N° 1 ENC Optimizer/SevenCs (same station above)
 - N° 2 dKart Navigator/Hydroservice (as ECDIS simulator)
 - N° 1 Bentley Microstation CAD
- ENC Maintenance tools (capable of S-57 Updating ER profile generation):
 - N° 2 dKart Editor/Hydroservice (same station above)

Quality Control and Verification

We have progressed in optimizing the software tools in order to speed up the verification process of the spatial and feature objects strictly linked with alarms, warnings and the bathymetry in the dangerous areas. We have also recently updated these tools to conform with the new list of tests included in the new version 3.1 of S-57.

The above Quality Control software tools, together with operator visual inspection of the cell contents, provide sufficient means and information for an adequate quality assurance. At the beginning of 2001, in order to accelerate and improve the ENC quality control and validation processes, it has been purchased a new set of validation software independent from the one used for production and editing.

Furthermore, the Italian HO will achieve the ISO 9000 certification for ENC production by the end of the year.

Distribution

Italy is now ready to distribute ENC's data sets both EN profiles (base cell file) and ER profiles (update cell file) in accord with the VRENC schema.

2. Test-beds

We are conducting a Test-bed with 25 Navy ship. The aim of the test-bed is to collect feed-backs to the HO from the users in order to test the reliability of the ENC's and to define the minimum requirements of the ECDIS to be fitted on board the navy ship, planned to be completed by 2004.

The test-bed has been conducted as follows:

- ✍ Base cell files (ENC/EN profiles – New chart, New edition and reissue) has been distributed in encrypted SENC format converted from ENC inside the Hydrographic Office, packed on CD-ROMs and sent by mail.
- ✍ Updating cell files (ENC/ER profiles) has been distributed in non-encrypted ENC format, packed on floppies and sent by mail and by e-mail
- ✍ The ships have been fitted with an ECDIS compliant software installed in a common Personal computer connected with an accurate P code GPS.

The feed-backs received are very good, in particular related to the reliability of the ENC's, the WGS84 horizontal datum shift, the distribution mechanism adopted, etc.

3. Work in progress

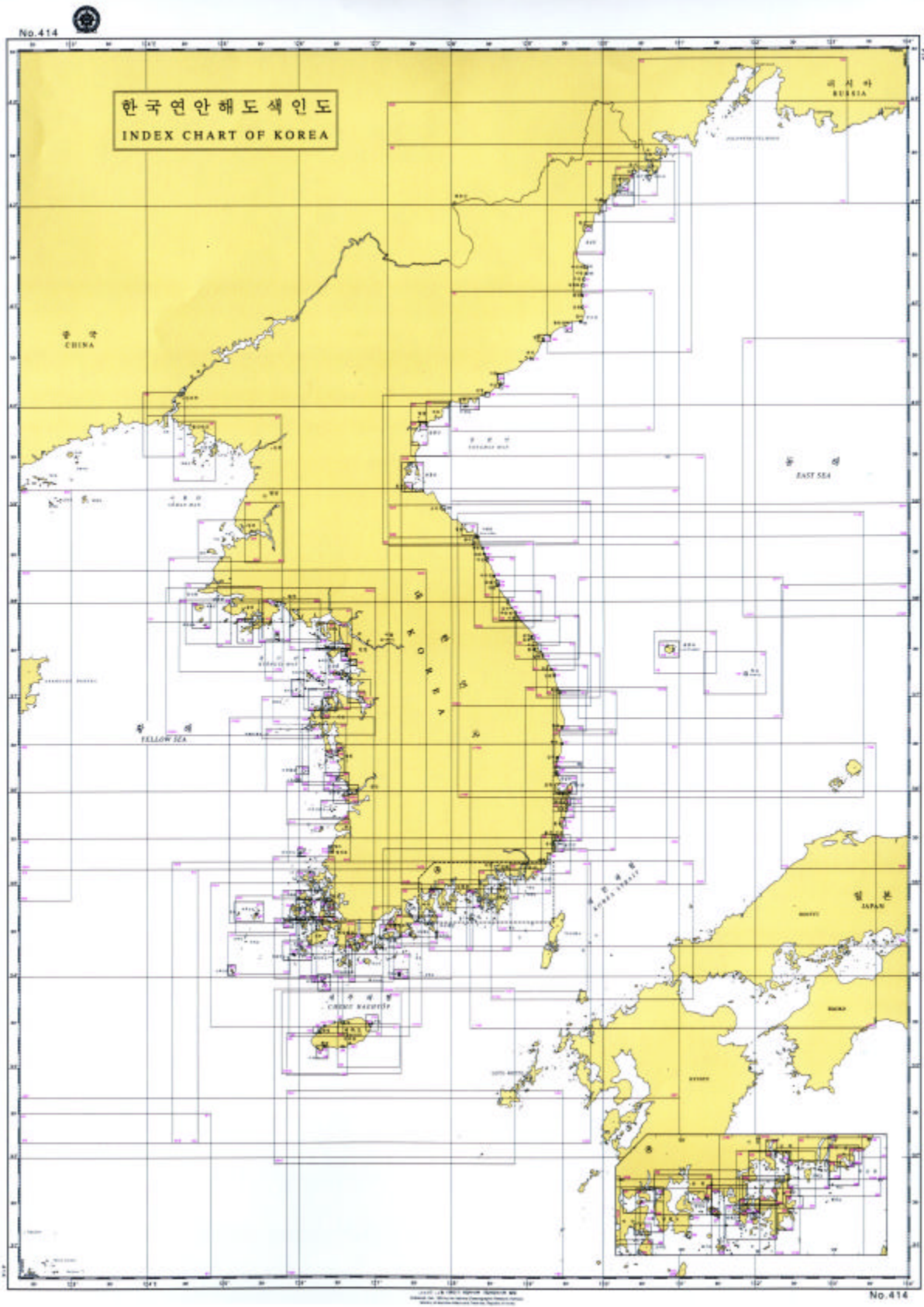
The availability in the ENC editing software of tools for importing/exporting files of various formats (DGN, DXF, and ASCII), make now possible the production of new cells, derived from digital data of surveys and paper charts.

We have first planned the compilation of harbour and approach purpose data sets, from which less detailed navigational purposes cells will be derived.

It is in progress the production in S57 of all paper chart series at scale of 1:100 000 that will be merged within the existing coastal purpose ENC cells derived from the paper chart series at scale 1:250.000. It is also in course the production of further harbour and approach ENC's.

8 – KOREA (REPUBLIC OF)

ENC Coverage (September 2001)



9 – SWEDEN

Swedish status report on chart digitising for ENC (September 2001)

Most of the Swedish charts are fully digitized into a common database from which printed charts are produced. The same database converted to S-57 is controlled and delivered as ENC's. However the controls are time consuming why the Swedish coast not are covered by ENC's with the same amount as the printed charts. Although the ENC production has been given the highest priority, it has to be conducted within the frames of available resources. The work will therefore take some time before being completed

Complete ENC coverage of all the Swedish waters will be commercially available by the end of 2005. Priority is made for ENC's in the usage band General followed by the ones for Approach and Harbour to the main ports. The status at moment is as follows:

Number of S-57 Edition 3 ENC's (listed by usage bands):

Usage Band	ENC Cells Produced	% Total ENC Coverage	Equivalent Paper Charts	ENCs in one year ahead	ENCs on the market (with updating service)
Berthing	2	4		(19) 21	2
Harbour	3	1		(47) 50	3
Approach	2	1		(38) 40	2
Coastal	5	14	1	(1) 6	5
General	42	67	8	(15) 57	42

A new system is under development which is a further development of the earlier project HIS made in co-operation between Sweden and Finland. This new system will be more suited than the old system the SMA at moment is using. Managing the data will be more efficient and the production of ENC's will increase. However the transition from the old to the new system will initially take resources from the production.

For the verification Sweden is using the dKart Inspector and ENC Analyser. The cell scheme is based on the preparatory work of S-57 ed. 3, which is an amended version 2 scheme and which allows cell sizes between 8° x 8° down to 3.75' x 3.75'.

10 - UNITED STATES (NOAA)

Vector Data Development – August 2001

2. As of the end of August, 2001, NOAA has 131 ENC's (chart equivalents) digitized, quality controlled, and loaded into the production database. These ENC's are maintained for all incoming chart source materials, including Notices to Mariners, although not on a weekly basis. The weekly application of Notices to Mariners is scheduled to begin early in 2002. Approximately 65 of the existing, earliest ENC's have reduced content and will be upgraded to full content by December 2002.
3. NOAA is releasing the ENC's on a provisional basis for free download on the Internet. Sixty-three ENC's are presently available (August 2001). Twenty ENC's are being added to the download site monthly. The free download site is <http://chartmaker.ncd.noaa.gov/mcd/enc/index.htm>. The intent of this provisional release is to allow users to gain experience with the ENC's, and to provide NOAA with feedback. The provisional status will be removed when updates are being routinely produced and released. At that time they will be declared as official ENC's, and both the ENC's and weekly updates will be available over the Internet.
4. NOAA does not plan any broadcast or push services for ENC data, but expects the private sector to provide such services. In the period of July 18 - August 28, over 7500 free ENC's have been downloaded. No restrictions are placed on the use of the ENC data in other products, and the data are not copyrighted.

NOAA's ENC's contain a mix of low priority information that has been digitized from the chart, and high priority information that was collected from source materials at high accuracy and large scale. It is NOAA's intent to produce 200 ENC's that cover the major commercial ports. Then, an evaluation of mariner's needs and preferences would be performed to guide subsequent work. It is estimated that 650 ENC's will be needed to chart U.S. waters (NOAA produces 1,016 paper charts).