

# **SINGAPORE'S ROLE IN PROMOTING THE USE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM (ECDIS) TO ENHANCE NAVIGATIONAL SAFETY**

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## **Abstract**

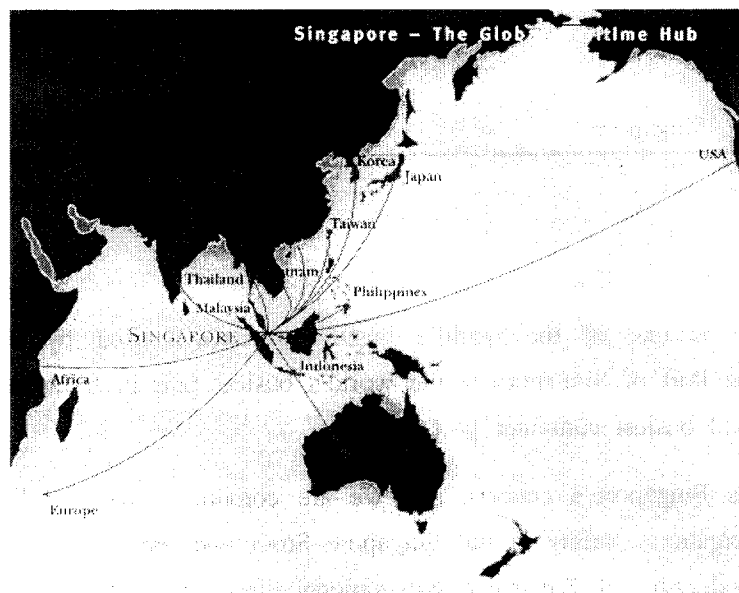
The Singapore Strait is one of the world's busiest waterways used by international shipping. Coupled with this, the Port of Singapore is the world's busiest port in terms of shipping and cargo tonnage and the second busiest container port.

Navigational safety is Singapore's concern and we are convinced that the ECDIS is the key to further enhancing navigational safety in the Singapore Strait and the port waters of Singapore. We have initiated the production of Electronic Navigational Chart data and invested in infrastructural supporting facilities such as DGPS broadcast service for use with ECDIS as well as other maritime systems.

## **INTRODUCTION**

1. Singapore is the focal point for some 400 shipping lines and has been the world's busiest port in terms of shipping tonnage since 1986. In 1996 the Port of Singapore handled 117, 723 ship movements or an average of 300 to 400 ships a day. The presence of some 800 ships anchored or berthed within our Port Limits has added to the complex movements of vessels in the Port.
2. Besides handling 12.94 million TEUs and 314.2 million tonnes of cargo in 1996, close to 800,000 passengers used the Singapore Cruise Terminal while 3.71 million passengers passed through the regional ferry terminal to Malaysia and Indonesia.
3. To manage and enhance navigational safety within our Port Limits and in the Singapore Strait, a Vessel Traffic Information System (VTIS) was established in 1989. It is operated by the Maritime and Port Authority of Singapore (MPA). The information from the VTIS is integrated with a computerised Port Traffic Management System (PTMS) which provides port users with essential shipping information.

4. The VTIS and PTMS are shore based systems and they assist port controllers in the management of the port waters. A missing piece is a ship-borne system to assist ship-masters or pilots to navigate ships safely. Such a ship-borne system is the Electronic Chart Display and Information System or ECDIS.



**SINGAPORE - THE GLOBAL PORT**

5. The acceptance, promotion and application of ECDIS are complex as the issues involve and affect the whole international maritime community. Singapore recognises these complex and difficult issues involved in the promotion of the use of ECDIS with official Electronic Navigational Charts (ENC). The task ahead is not easy and together with like-minded Hydrographic Offices we will initiate programs and discussions to meet these challenges. In short, Singapore is committed to promoting awareness and the use of ECDIS and ENC through :-

- organising events and demonstrations to promote the awareness and benefits of ECDIS and ENC.
- collaborating with other like-minded Hydrographic Offices to provide official data for better coverage;
- providing infrastructure to support ECDIS eg. Differential GPS (DGPS) broadcast service and real-time tide gauges for use with ECDIS;
- providing training courses on the use of ECDIS and also ENC data production;
- participating at regional and international fora to contribute to drawing up of standards; and
- providing one stop centre for ECDIS and official ENC, including updating service.

## **CHALLENGES CONFRONTING THE USE OF ECDIS**

### **Changing the mindset**

6. Since its inception in the early 1980's, ECDIS has faced many challenges and problems ranging from the traditional to technological, both on the individual and organisational levels. However, all these factors have one common denominator and that is a fixed MINDSET resisting changes from traditional practice to new system. The challenge involves the changing of the mindset to accept the use of ECDIS and ENC data as an alternative to paper charts and as an essential navigational tool.

7. The difficulty in accepting ECDIS on board ships is almost analogous to the introduction of radar as a navigational tool in the 1950s. It is therefore important that the concept, functionalities, capabilities and limitations of ECDIS be carefully explained and its application as a new generation navigational tool be marketed through widely publicised information programs and formal training courses. Singapore plans to host or participate in workshops, seminars and conferences to promote the awareness, level of understanding and use of ECDIS. These information programs and training courses would be directed at every sector of the maritime community from the mariners, shipowners, shipbuilders, insurers, port authorities and particularly the educationists who will mould future generation of mariners. Singapore would also participate with like-minded countries to jointly promote the use of ECDIS. Locally, MPA is encouraging the development of ECDIS by the local industry and research institutions.

### **Conflicting Interests**

8. Acceptance of ECDIS is only one of the many complex problems as each sector of the maritime community has its own and sometime different interest.

9. In this respect, the port authorities could play the role of mediator by highlighting the benefits of ECDIS to the different sectors of the industry. A good example is the collaboration between the Canadian Hydrographic Service and the Canada Steamship Lines (CSL) whose fleet adopted a fleet wide implementation of ECDIS. As a result of the collaboration the CSL reported increase in safety, profits and decrease in insurance. Similar model with adaptation to local conditions could be used.

## **Funding Support**

10. Inevitably, funding is an important component in the use of ECDIS and ENC. Funding is required at all levels of the projects ranging from the establishment of complementary infrastructure and support like the DGPS broadcast service to training courses on the use of ECDIS and to the production of official ENC data. It is recognised that due to the lack of funds some national ECDIS and ENC programs have to be aborted or delayed as these projects are given lower priority.

## **Choosing the Right Partner**

12. Amidst the challenges outlined above, it is important that the right partners be chosen for collaboration on ECDIS. In the case of Singapore, different partners have been identified to meet the objective of promoting the use of ECDIS :-

- British Admiralty for the integration of ENC and raster data for world wide data coverage;
- Private sector for designing, development and marketing of ECDIS and ENC products and services;
- Shipping lines to test and evaluate ECDIS and ENC;
- Higher educational institutions to train future mariners; and
- Research institutions to assess new technologies to further enhance ECDIS.

13. A well chosen partnership could deliver good results. Authoritative public statements by users will further enhance the adoption of ECDIS and go a long way in promoting ECDIS.

## **ROLE OF HYDROGRAPHIC OFFICES**

14. The traditional role of Hydrographic Offices is to provide paper charts to ships for safe navigation and this has not changed. With the advent of the computers and information technology, changes in the way the maritime industry operates are inevitable. Even though the use of ENC and ECDIS has been slow, we are optimistic that ECDIS will be accepted, as the radar was accepted in the 1950s, when mariners understand and appreciate the usefulness of ECDIS. When that happens, there would be demand for better quality and more detailed data and wider data coverage.

15. Singapore is convinced that ECDIS is an essential tool for safe navigation. This is particularly

so in confined and heavy traffic areas like the Singapore Strait and its approaches. The challenges have to be confronted and a pro-active attitude taken to promote the use of ECDIS and ENC. Therefore, Singapore has adopted the following action plan :-

- a. Collaboration with Hydrographic Offices and organisations like GEF, IMO to produce ENC data for use with ECDIS

Shipping is a global business. Making available ENC data of the Singapore waters alone cannot persuade mariners to switch from paper charts to ECDIS. There must be adequate official ENC data covering major shipping routes, with regular updating services before the maritime industry will use ECDIS. Singapore has also initiated the concept of an integrated ENC and raster database.

In March 1997, Singapore and the British Admiralty collaborated to demonstrate the use of the world's first ENC/raster database onboard two international containerhips ie. *Katrine Maersk* and *Shenzhen Bay*. The project was named SHARED (Singapore, Hong Kong, Admiralty, Raster & ENC Demonstration) and the integrated ENC / raster database was successfully demonstrated on these two vessels. The ECDIS is still onboard the vessels and regular invaluable user feedback is received and analysed.

Singapore, Indonesia and Canada have also submitted a joint project proposal to the World Bank to fund the establishment of a Marine Electronic Highway (MEH) for the South China Sea, Malacca Strait and Singapore Strait. The MEH project proposes to fund ENC data production and to assist in the development of an international network of the resultant database. The World Bank is considering the project proposal and is in close consultation with the GEF and IMO.

Singapore is also considering a proposal to link Hydrographic Offices in Asia through the Wide Area Network on the Internet. The website will be jointly owned by all participating Hydrographic Offices who can gain access to the information.

- b. Setting up infrastructure to support the use of ECDIS

In November 1995, IMO made a landmark decision when ECDIS was adopted as an equivalent to paper charts under the SOLAS Convention. The advantage ECDIS has over paper charts is that if used with official ENC data and integrated with marine equipment it provides real-time positioning, anti-grounding and anti-collision warnings, and it enables software systems to be developed for route planning, monitoring and other functions. In other words, the ECDIS is a dynamic navigational tool if linked with appropriate data input eg. DGPS, official ENC data, etc.

In preparation for ECDIS, Singapore has already invested substantially to set up a marine beacon DGPS broadcast service covering the Singapore Strait and its approaches and signals can be received up to a distance of at least 200 km from Singapore. The DGPS signals are transmitted on 298.0 Khz and international standard message ie. RTCM SC-104 Version 2.0 is adopted.

Besides DGPS and ENC data production, Singapore has also invested in setting up infrastructure to provide timely dissemination of ENC data updates. The Internet technology was selected as our study revealed that a growing number of ships equipped with ECDIS also have access to this technology for communication.

Some of Singapore's investments are also directed at meeting medium term objectives, for example, the setting of a network of new generation real-time acoustic tide gauges and current meters within our waters which would be included as supporting information in the ECDIS.

c. Training courses on use of ECDIS and ENC production

Parallel to the promotion on the use of ECDIS, training courses to educate mariners on the capabilities and limitations of both ECDIS and ENC data should also be addressed. On this issue, Singapore plans to organise training courses covering the theoretical and practical applications of ECDIS.

The standards and specifications for ENC data have been defined by the IHO. However, there are only few Hydrographic Offices producing ENC data and the non-availability of more ENC data could be one of the causes for the slow growth in ECDIS usage. The hesitation by Hydrographic Offices to embark on the ENC data production is understandable as its development is not easy but it can be overcome using appropriate software tools to produce ENC. Singapore can assist in this area and is preparing training courses to aid Hydrographic Offices to produce official ENC data.

d. Organising ECDIS events and demonstrations

Besides the SHARED project with the British Admiralty, demonstrations on the use of ECDIS are also conducted to the maritime community in Singapore. To-date the demonstrations have been shown to oil companies operating VLCCs, bunker vessel operators, training institutions, ferry operators and law enforcement agencies. In addition, we have also arranged for ECDIS to be installed onboard ships for evaluation purposes.

To complement the demonstrations, workshops and seminars at national level have been planned to promote ECDIS and ENC. Singapore will organise and host an International ECDIS Conference in

late 1998 or early 1999 and this would be targeted at various sectors of the maritime community such as mariners, shipowners and port authorities and research institutions.

## **PUBLIC AND PRIVATE SECTOR SYNERGY**

16. The role of the chart agent is changing. In the paper chart business, the roles and liabilities of the Hydrographic Office and the chart agent are clearly defined. However, in the case of ECDIS and ENC, the boundary is less clear and in such a situation a new acceptable arrangement would have to evolve to meet the needs and concerns of the Hydrographic Offices, ENC data distributors and mariners. We are at present working with the private sector to define the new roles to foster a closer business relationship.

17. Synergy between the Hydrographic Offices and the ENC data distributors is important to serve the maritime community more efficiently and effectively. Involvement of Hydrographic Offices with the private sector will help to identify new opportunities and potential such as to identify and develop new products and services to meet the needs of the industry. Unlike paper charts the ENC and ECDIS could be customised to meet the requirements of the users.

## **BEYOND ECDIS**

18. The strength of the ECDIS lies not only in its Geographic Information System capability but also in its versatility. It could be used in any country so long as IHO S57 data is available. ECDIS could also be a basic system upon which higher level products could be developed. Some of the more common systems are :-

- a. Port information such as newly reported navigational hazards or new navigational aids installed in the port could be promulgated through this system .
- b. Tidal overlay to provide real-time or simulated tidal information.
- c. Vessel management could be enhanced as vessels with ECDIS could be linked to the port control centres via Internet. Vessel information such as position, course and speed could be transmitted to a shore-based Vessel Management System dynamically so that the information is almost real-time.

## **CONCLUSION**

19. ENC and ECDIS are new generation technology and are useful to the maritime community as they will further enhance navigational safety.

20. Hydrographic Offices throughout the world should co-operate to develop ENC of their waters and to promote the use of ENC and ECDIS.

21. If every ship is fitted with ECDIS using official ENC data, then collisions and groundings could be minimised or avoided and marine environment pollution averted.

22. Recognising that ENC and ECDIS are essential tools for safe navigation, Singapore will promote their development and application. Singapore will work with like-minded countries or organisations to make ENC and ECDIS part of the shipborne equipment within the next few years.