Chartlet Compilation and Maintenance of Digital Charts by the Electronic Navigational Chart System

Kenichiro Ishihara and Hidetoshi Ueda, Japan Coast Guard

In fiscal year 1993, the Hydrographic Department started to establish a computer supported chart production system to make both the paper nautical chart and the navigation oriented electronic nautical chart (ENC). The first paper chart produced by the system, nautical chart No. 81 'O Shima to Tori Shima', was published in fiscal year 1995. The electronic chart production system has been improved and developed to a large extent, to change the UNIX OS into Windows-NT software, and the digital chart editing process is now considerably upgraded in operability and processing speed. At present almost 100 charts are published annually. Digital chartlet editing software has also been improved, upgraded, and made applicable to real production. Furthermore all smooth sheets have been submitted in a digital form to assist in the production of a digital chartlet since fiscal year 1999 but few paper charts had been digitally edited and published until then. Chartlet production of the paper chart was found to be inefficient in digital editing procedures for correction areas in the chart, and mismatching with the old type of chart symbols and abbreviations, and removing skew of the chart sheet. In this paper, those issues are illustrated, and the chartlet production process based on the new electronic chart production system is described.

Management of Original Digital Plate and Production of Chartlet

In 1998 fiscal year, Digital Chart Original Plate Production Systems were installed in the Regional Maritime Safety Headquarters. The machine plate production system in the Oceanographic Data and Information Division/Chart Maintenance Office became out dated and a fully digital supplementary print production system was urgently required. The computer supported electronic chart production system was improved for extraction of supplementary area, adjustment of adjacent charts and output of print original, to be a fully digital production system.

Maintenance of Original Digital Plate and Production of Chartlet

The first chartlet using the electronic chart production system - Digital Chart Original Plate Production Systems produced was chart No. 1061 'Northern Part of Tokyo Wan', covering the newly built Tokyo Wan crossing road, which was attached to Notices to Mariners: 1997 No. 9, item 375. Supplementary contents include the following items; deregulation of water courses and zones, the completion of maritime construction on the Tokyo wan crossing road, deletion and re-annotation after establishment of light beacons and bridge lights. Those were relatively easy items to be corrected and supplemented as paper chart data.

In fiscal year 1998, the Digital Chart Original Plate Production Systems were installed in the Regional Maritime Safety Headquarters, and those district divisions have been able to produce electronic smooth sheets by themselves. The first chartlets made of digital smooth sheets: some parts of Chart No.1055A 'Northern Part of Nagoya Ko' and Chart No. 1055B 'Southern Part of Nagoya Ko' were described and attached in Notices to Mariners: 1999 No.22 Item 922 and Item 923. These chartlets include electronic smooth sheets: 'Offing of Tokoname' resurvey sheet (D498007A) and 'Nagoya-Ko' resurvey sheet (D499001A, D499003A). Procedures of compilation on the system begin at conversion of files from the electronic smooth sheets file to the Digital Chart Original Plate Production Systems file. The converted data files are registered on the source file archive in Digital Chart Original Print production systems. The registered source files are displayed in different colours and different layers to chart data to be distinguished. Red frameworks are drawn around the supplementing portions to show the changed portions explicitly. Edited contents of the charts are printed out on an ink-jet printer for checking and correction.

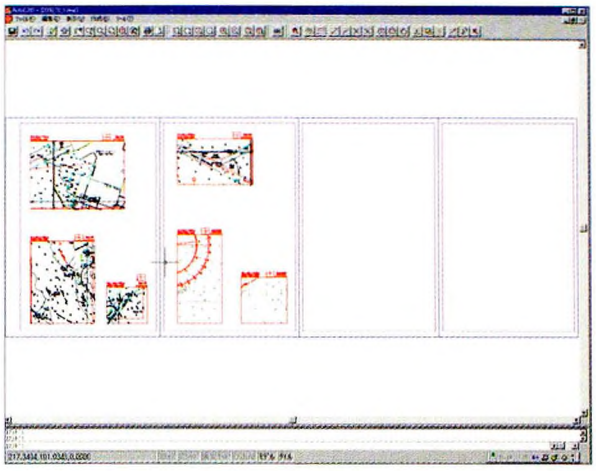

Figure 1: Screen arranging a chartlet

Supplementary Production of the Manual Paper Chart

Almost 100 digitally edited charts using the Electronic Chart System were published annually. On the other hand, most of chartlets are produced for film based manual nautical charts. Original nautical charts corresponding to the electronic survey smooth sheets sent from Regional Coast Guard Headquarters are to be digitised by the Electronic Chart System. Manually produced original prints cause dimensional changes and skews because they are made of negative films that change in the progress of time. Also the scanner itself has its own deformation which causes dimensional changes and skews on the original prints in the Electronic Chart System. To remove such deformation on the raster image data, the Electronic Chart System uses a software program VP studio (Takagi Sangyo Co.). This software program utilises a multiple point function to correct dimensional changes and skews on the film during scanning. The procedures are described as follows; File conversion from original electronic survey smooth sheet to input file in the Electronic Chart Editing System. Registration of converted original electronic survey smooth sheet on the source file archive. Reading the registered electronic survey smooth sheet file onto the paper chart editing display with changing the colours and layers to distinguish the original file from the edited file. Changed and processed portions are indicated by red outlines. Adding the adjacent parts of the paper nautical chart that are to be digitised and added on the display. Correction and checking on the plotted paper on the ink-jet printer. Additionally, because of different letter styles between hand writing and Electronic Chart System, care about continuity of depths figures and geographical names is taken. There are two types of chart symbols ; the old style and the new style. For the sake of simplicity on the nautical chart editing system, only the new style was applied, so some differences may be apparent in the adjacent part between the old and the new style.

Layout of Chartlet

Several Chartlets are attached to each Notices to Mariners. Basic size of the paper of the chartlets is A4 (297mm X 210mm) and maximum size is 4 times A4 (297mm X 800mm). To facilitate chartlet printing, frame-positioning is optimized and fitted within the printing paper (625mm X 880mm) with 4 following types:

- 8 frame-positioning: A4 (297mm X 210mm)
- 6 frame-positioning: (297mm X 280mm)
- 4 frame-positioning: A3 (297mm X 420mm)
- 2 frame-positioning: (297mm X 840mm)

Forthcoming Subjects

Digital nautical chart editing and chartlet editing have been just started and are now being introduced as production procedures. Since current chartlet editing covers not only maintaining the nautical chart data but electronic nautical chart data as well, electronic nautical chart editing technology is also needed. To maintain manually produced original nautical chart prints, those materials for chartlet data could be effectively used for the revision of digital paper nautical chart. This process requires instruction manuals and skilful cartographers for the electronic nautical chart system. Forecasting the total amount of nautical charts in the Hydrographic Department to be digitised, integrated digital nautical chart editing/production system would be required also for district-divisions. Also the historical archive about chartlet publishing and original nautical chart correction may be digitised, according to the digitisation process of nautical charts.

Biographies

Hidetoshi Ueda, Hydrographic Department, 9th Regional Coast Guard Headquarters. Hidetoshi Ueda is chief of Hydrographic Administration Division at the 9th RCGH. He has worked for the JHD since 1971 and

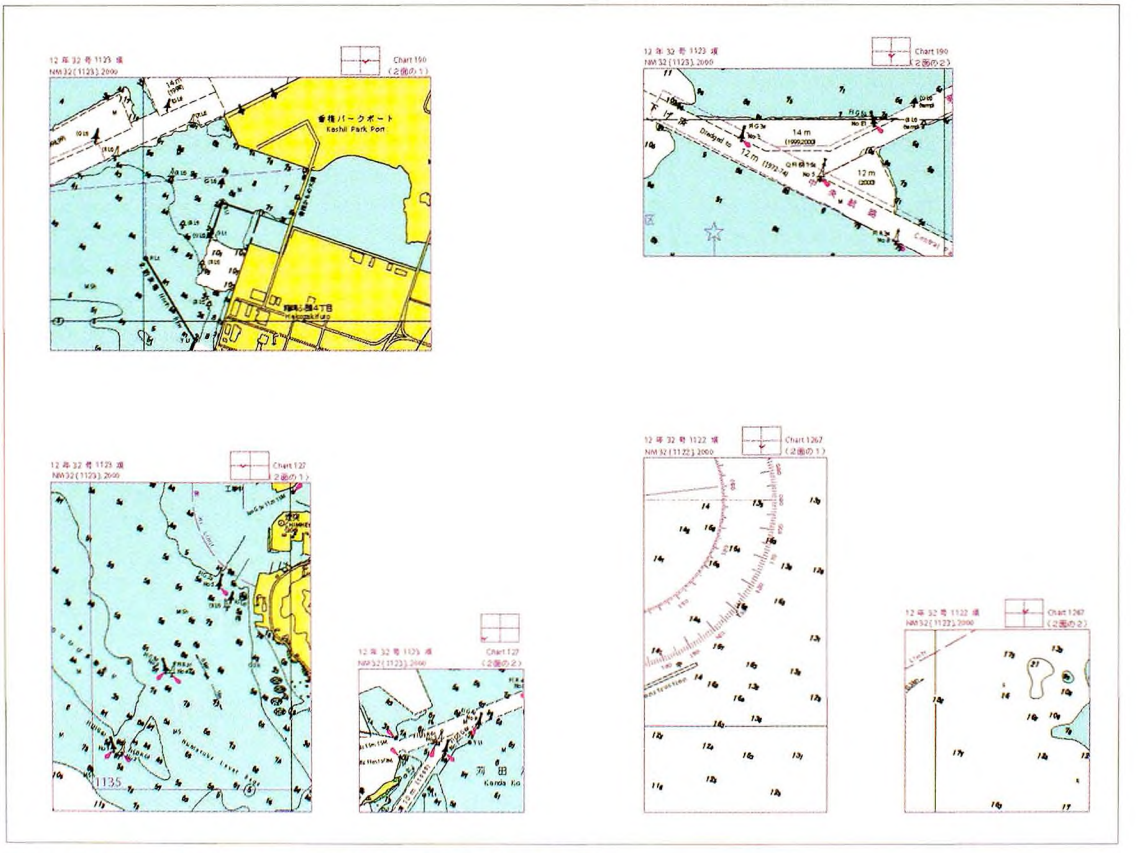

Figure 2: Image after an arrangement of positions of a chartlet

served most of the time for the Cartography Office. He attended to development of the Electronic Navigational Chart in 1993 to 2001.

Kenichiro Ishihara, Guard and Rescue Department, 1st Regional Coast Guard Headquarters. Kenichiro Ishihara is chief of countermeasures against disasters section of Search and Rescue Division at the 1st RCGH. He attended to development of the Electronic Navigational Chart in 1996 to 2001.