

TRANSAS ELECTRONIC CHARTS

by E. KOMRAKOV ¹

Transas Marine started the production of electronic charts in 1990. The technology was developed in 1989-1990. In the first few months only three operators worked for the company.

The initial reason for starting the chart production was the necessity to have some test charts for trials of the company's electronic chart systems. When, however, it was realised that the official DX-90 charts would not appear for a long time, and it saw seafarers favourable reaction to its charts, the company changed the concept and decided to manufacture a complete chart collection.

From the very start the company was concerned with the problem of chart quality control. At first it used the experience of three ship masters who worked at the Chart Supply and Updating Department of the Baltic Shipping Company. Later the company came to understand that in order to produce top-quality charts one must use the experience and knowledge of professional hydrographers.

In 1991 the chart production Department began to grow and, since 1992, there have been 22 operators and 15 hydrographers. Chart production, updating and distribution are constantly supported by 5 software engineers and 2 hardware engineers.

Chart production technology is quite simple, reduces unnecessary steps for the operators, has powerful mathematical facilities for re-calculation of various projections, provides compensation of paper chart defects and distortions, as well as a facility for preliminary mathematical check of charts, e.g., zero depth, empty text entries, soundings beyond the depth zone range in the given area. The accuracy of object position is assessed at 0.2 mm.

User friendly technology allows the operator to make the charts quickly and without any preliminary preparation of the paper charts.

The chart production is organised on 7 digitisers in two shifts (from 0900 until 1500 and from 1500 until 2100) without days off or holidays due to the availability of the third shift. The work is so arranged that each shift works 4 days

and then has two days off, and so on. There are 6 or 7 operators, 3 hydrographers and the shift supervisor, also a hydrographer, in each shift works 4 days and then has two days off, and so on. An updating support group of three works separately. The whole chart production Department, developers and the ready product Department are linked by a powerful computer network. The hydrographers' work consists in giving help to operators on various problems and controversial matters, in the close control of the chart referencing to the digitiser coordinate grid and of the chart data base input, and, naturally, in the thorough product quality control. The company's wide chart production experience has shown that the proper check of an electronic chart takes up as much as 50 per cent of the time required for its manufacture. The ratio between the number of operators and hydrographers is based on this experience. The last inspection of the chart, which may take up several hours, is made by the Department manager. The chart is not placed in the archive until this is done. In the archive the charts are stored in their original ellipsoid, their updating being stored separately. It is only when the chart is to be delivered to the customer that it is converted to WGS-84 and updated with stored corrections.

TRANSAS technology was approved by the commission which was formed by the Hydrographic Office of Russia specifically for the purpose. It was noted that the technology fully complied with the commonly accepted notions of the accuracy, correctness of re-calculations for various projections and adequacy of compensation for chart distortions and defects. Transas Marine holds license No. RK-10010 issued by the Federal Service of Geodetics and Cartography of Russia and certificate of the Department of Marine Transport of Russia N 02/93 issued on 1 February 1993 with the permission to produce electronic charts. The quality of some of the charts has been checked by several Hydrographic Offices who thought highly of them.

The system of selecting paper source materials for chart production is based on common sense and analysis of charts by several Hydrographic Offices. There are only three Hydrographic Offices in the world which print charts for the whole globe: British Admiralty - 3000 charts, USA Hydrographic Office - 4600 charts and the Hydrographic Office of Russia - 6500 charts. It is clear, however, that if the company had based its production on any of these collections it could not have met all of its customers' requirements. For example, the Finnish or Swedish Coast Guard will not buy a system utilizing charts by any Hydrographic Office but their own. For the territorial waters of many States who have their own charts, TRANSAS makes their larger scale charts. These are Finland, Sweden, Norway, Denmark, Germany, the Netherlands, USA, South Korea, and New Zealand. For digitising small scale transit charts, and charts for the areas which are adequately covered by BA and Russian Hydrographic Office's charts the company uses their charts for the source material. Up to date the company has digitised about 1000 charts by the Russian Hydrographic Office, 750 BA charts, 170 American charts, 80 South Korean charts, 45 Swedish charts, 25 Finnish charts, 40 Danish and German charts, 30 Dutch charts, 15 Norwegian charts, 60 Australian and New Zealand charts. All charts are delivered to the users in a single standard irrespective of the source: the projection is always Mercator, depths and heights are always in metres, datum is always WGS-84, the language is always English.

Before the end of 1995, it is expected to complete coverage of Finland, Sweden and Holland with charts by their national Hydrographic Offices; to continue working on the coverage of US waters, bringing the number of charts in the American collection to 350; the company will keep on covering the rest of the world with charts of other Hydrographic Offices at the production rate of about 70 charts per month.

The fact that some Hydrographic Offices have charts in the digital form is of great help. TRANSAS has been using charts of the Finnish Hydrographic Office (12 charts in FINGIS format); it is not planned to digitise charts of South Africa, Canada and Norway, as there are good prospects for obtaining these charts in digital form directly from these countries. It should, however be noted, as an example, that some charts of the Canadian Hydrographic Office do not yet contain all information required to comply with our standard. There is also some information missing in the Finnish charts (e.g. the information on the lighthouse is neither complete nor vectorised) which has to be added manually after the conversion.

The TRANSAS MARINE database is quite unique. It took about one third of million man/hours to compile it. More than 2000 paper charts have been digitised. The database size would be more than 4 gigabytes in the terms of DX-90 format and corresponds to 6000 cells calculated with regard to scale factor and chart's middle latitude (in accordance with S-57). The database consists of more than 30 million points of polygons and lines, approximately 3 million depths, 700 000 rocks, 100 000 buoys, 40 000 lighthouses with all pertinent data from Lists of Lights. It should be noted that chart quality control by the professional took more than 80 000 man/hours.

The charts include practically all the information available on the water part of the paper charts and that information on the shore which is important from the point of view of navigation. This are more than 100 layers of information. So the charts digitised at TRANSAS MARINE include up to 300 000 points of polygons, 12 000 depths, 8 000 rocks, etc.

Despite the above the company is fully aware of the fact that its charts can under no circumstances replace paper charts and must not be used other than together with paper charts.

They can and should, however, be used in ECDIS systems during the transfer period until official DX-90 charts appear. ECDIS in this case will operate in the ECS mode and the use of paper charts will be compulsory.

RTCM has practically completed its ECS standard. In September 1994, a national ECS standard was adopted by the Transportation Department of Russia. The company's charts are more than suitable for the ECS systems, if it is appreciated that the international requirements to the systems where TRANSAS charts can be used, exist, but the databases provided by hydrographic offices are not available (and will most probably not be available in the next 10 years), the attitude of some Hydrographic Offices is really confusing. Some Hydrographic Offices (Australian, Japanese, Chilean) do not give permission to any commercial companies to digitise charts of their waters. They do not, however, supply their own digital databases either. Under these circumstances a navigator who uses ECS approved on the basis

of international requirements will be able to use it anywhere, but not in the territorial water of these countries. Is this acceptable from the point of view of safety at sea?

At present we cannot sell already digitised charts and are not making new charts covering territorial waters of some countries. TRANSAS MARINE, as well as other manufacturers of electronic charts, certainly has its commercial interests. At the same time, however, it is trying to improve safety of navigation by producing a good database for ECS and ECDIS in the ECS mode. In this connection it would like to apply to IHO, IMO, RTCM for help in setting matters involved in obtaining permission to digitise charts. We do hope that the efforts of our company will facilitate the solution of problems connected with the use of most up-to-date navigational aids, and the work which has been done and will be done, will not be in vain, but will serve to the good of mankind.