

**12<sup>th</sup> CHRIS MEETING**  
**Valparaiso, Chile, 23-25 October 2000**

**Raster Chart Updating Service in the USA**  
*(by Dave Enabnit, USA-NOAA)*

The entire suite of 1,016 official NOAA nautical charts has been available in digital raster form since 1995. They are produced jointly by NOAA and Maptech, Inc. under a cooperative research and development agreement. Today, these raster charts outsell NOAA's paper charts by 8 to 5.

The final capability needed for raster charts is a practical means of applying the Notice to Mariners corrections that are issued weekly. With a reliable, officially approved update service, raster charts will be suitable for professional use and will meet the international standards for Electronic Chart Display and Information Systems (ECDIS).

NOAA compiles nautical charts from raster files with computer-assisted cartographic tools. The resulting digital files are used to make both paper and raster charts. All 1,016 charts are continually updated on a weekly basis for changes from the Coast Guard, NIMA, and the Canadian Hydrographic Service Notices to Mariners. These files are then available for printing new charts and for Maptech to make raster chart updates.

The corrected raster files are too large to be distributed as updates (about 100 megabytes per chart). Instead, NOAA and Maptech developed a special "patch" technology. In this method, a pixel-by-pixel comparison is made between the old raster chart file and the updated one. A difference file is made that contains exactly those pixels, which, if overlaid on the old raster chart, turn it into the new one.

Maptech makes this difference file, adds the geo-referencing, metadata, and information that allows an update patch to be exactly registered with the old raster file to which it will be applied. The difference file is then compressed using a special algorithm developed to create a small (1 to 100 KB with 99% smaller than 10 KB) patch for each raster chart. To update a raster chart, the old raster file is displayed from the CD-ROM and immediately overlaid with the patch file. Where no pixels were different between the old raster chart and the new, the patch acts like it has transparent pixels and unchanged pixels from the old chart show through.

The commercial updating service which distributes these patches began in January 2000. A weekly e-mail is transmitted to subscribers. In the e-mail is a hot link. When a mariner clicks on the hot link, it starts the transmission of the update patches to his computer. The transmission contains cumulative updates for all the charts on a CD. It takes 15 seconds to more than 5 minutes to download the file depending on one's modem speed. When file reception is complete, a program on the mariner's computer unpacks the updates for immediate use, or copies charts from the CD-ROM, applies the patches, and then stores the updated charts on the hard drive.

The update service costs \$300 (USD) per year for all of the charts on a regional CD – approximately 55 charts. That is about \$5.50 (USD) per chart per year for weekly updates. The CD itself sells for \$200 (USD) so the total cost is \$500 (USD). Updating is available for all regions except Alaska and Hawaii which will be made available by the end of 2000.

With the availability of the weekly update service, NOAA is permitting its logo to be used on the commercial raster chart product. Accompanying text explains that the raster charts and updates were produced under the authority of NOAA. The exact statement is:

*“Electronic Navigation Certificate of Authenticity – This electronic chart was produced under the authority of the National Oceanic and Atmospheric Administration (NOAA). NOAA is the national hydrographic office for the United States of America. The digital data provided by NOAA from which this electronic chart was produced has been certified by NOAA for navigation. “NOAA” and the NOAA emblem are registered trademarks of the National Oceanic and Atmospheric Administration. “Maptech” and the Maptech emblem are registered trademarks of Maptech, Inc.”*

This status makes them suitable for meeting the international standards for ECDIS and it is expected that the U.S. Coast Guard will amend the chart carriage regulations in 2001 to permit the use of ECDIS and the raster chart mode of operation.

This exciting U.S. raster chart update service is unique in the world. It is the first electronically delivered weekly service. It is priced substantially below the cost of the few similar services available elsewhere in the world. It is a significant step in providing mariners a professional, modern navigation service in U.S. waters.

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