

NOAA'S DIGITAL UPDATE SERVICE, PRINT-ON-DEMAND and CRITICAL CHART CORRECTION WEB SITE

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INTRODUCTION

The nautical chart is an essential tool for insuring safe navigation and as a result must be kept up-to-date. Unfortunately, a printed nautical chart is only up-to-date the day it is printed. The nautical chart depicts information vital for safe navigation such as water depths, obstructions, regulated navigation areas, buoys and landmarks. This information can change hourly. Carriage of the official National Oceanic and Atmospheric Administration (NOAA) nautical chart, produced by the National Ocean Service (NOS), is mandatory for commercial mariners, the Navy and Coast Guard. NOAA charts are also widely used by recreational boaters and others involved in research and coastal planning.

NOAA currently maintains over a thousand charts. The charts are printed using traditional lithographic processes. They are printed in batches and stored and issued from inventory through a worldwide network of 1,200 authorized agents. As a result, charts can be two or more years out of date when they are purchased and chart agents can have thousands of dollars in capital tied up in stock. Charts are not kept corrected while in stock awaiting sale so the mariner must check all Notice to Mariners subsequent to the print-date and hand annotate all applicable corrections, which is a very involved and time consuming process for the mariner.

ALTERNATIVES

In addition to the traditional paper chart, NOAA produces a digital chart product called the Raster Nautical Chart (RNC). The RNC is a digital version of NOAA's paper chart. They are marketed through a private-sector partner, Maptech Inc. NOS has a Cooperative Research and Development Agreement (CRADA) with Maptech. Maptech is forwarded the New Edition raster chart file when the paper New Edition is published. Maptech writes the charts to CD-ROM and distributes them to the mariner and other Value Added Distributors (VADs) for use in a variety of Raster Chart Display Systems (RCDS).

RNC WEEKLY UPDATE SERVICE

Unlike the traditional paper chart, today's RNCs are kept up to date between new editions. Through the process of NOAA's Update Service, RNCs are updated weekly. NOAA works directly with Maptech to provide weekly updates and Maptech distributes the updates to their subscribers.

Chart corrections are published weekly by the United States Coast Guard (USCG) and National Imagery and Mapping Agency (NIMA) via Notices to Mariners. The Canadian Coast Guard publishes their Notices to Mariners monthly. In the past, all corrections were stored and applied to the charts when a new edition of the chart was to be printed. The time between some new editions can be two years or more, leaving the mariner and NOAA cartographers a large number of corrections to apply when the chart was prepared for printing. The basic result was an out dated chart the day after it was printed.

In January 1996, the Office of Coast Survey (OCS), NOS initiated the concept of an Update Service. The Update Service evaluates and applies all contemporary published Notice to Mariners chart corrections within one week.

The result is a suite of updated RNC files that reflect the latest published USCG and NIMA Notices to Mariners. The files are divided into USCG Districts and a cartographer is assigned to each District. Work is performed on networked, desktop Pentium PCs running Windows NT. Digital chart edits are handled by Bentley's Microstation and Intergraph's IrasB software. Data processing and database functions are accomplished using SQL Server, Microsoft Access, dBase III and a variety of in-house developed Visual Basic applications.

On average, 350 Notice to Mariners applications are processed and applied each week affecting 91 NOAA charts. The USCG LNM, which accounts for 78% of the data processed, is received from the USCG via e-mail or it is downloaded from the USCG web site as a MSWord or Acrobat PDF file. This usually occurs 1-3 days after the Coast Guard District closes out the notice for the week and sends it for printing. The Canadian NM is downloaded monthly from the Canadian Marine Navigation Services Web Site. NIMA's weekly notice is also available on their web site. NOAA contributes 22% of the LNM volume: shoals, dangers, channel conditions and tabulations and chartlets.

Weekly Digital Update Distribution

When all of the critical items have been applied and certified, the updated chart is made available to Maptech. NOS generates a composite image file (.crl) of the revised chart panel (main panel, inset or extension) and places it on a server accessible by Maptech through a high speed dedicated line.

The file is then used to produce a cumulative update patch. Maptech compares the new updated RNC with the previously issued new edition (street) RNC version of the same chart. The New Edition version serves as the baseline for all comparisons. Maptech software identifies areas of pixel variation between the two raster files and creates a patch of the corrections only since the last print date. The update patch is the "difference" file generated by this comparison. A header is added to the patch for positioning purposes making the digital update patch ready for distribution.

Maptech distributes the digital updates to individual mariners and other VADs as an e-mail with a link to Maptech's internet site. The user then downloads the update patch. Subscribers to the service will automatically receive the update e-mail and patch files for the charts in their individualized chart portfolios. A simple installation procedure using Maptech provided software updates the subscriber's charts.

Additional Features of the Weekly Digital Update Service

NOAA also provides Maptech with weekly updates to charted note data. The data is used by Maptech to maintain a chart note referencing capability. When the user encounters a reference to a note on the chart (e.g., *see note A*), a simple click on the reference legend will display the note. Additional reference points have been added along channels to allow the user to pull down channel tabulations. Standard chart notes are handled by a pull down selection menu.

Subscribers are also notified of published USCG, NIMA, and Canadian NM items that may be incorrect. If a NOAA cartographer questions the validity of a published notice correction, an attempt is made to resolve the questionable item with the reporting agency. This process can take anywhere from a day to several weeks depending on the nature of the problem. Items in question will not appear on the update patch. The raster files are updated through the latest Notice to Mariners for all qualified items while the disputed item is being resolved. All items in question are forwarded to Maptech. A utility included with the Maptech updated data makes the user aware of problem items associated with the raster charts in his portfolio and indicates why they may not be applied.

PRINT-ON-DEMAND

NOS also has a Cooperative Research and Development Agreement (CRADA) partnership with OceanGrafix of Minneapolis, MN to provide weekly updated paper nautical charts printed from NOAA maintained digital files. These charts incorporate all the critical corrections from the weekly USCG and NIMA notices and like the RNC contain all NOS originated critical revisions that are forwarded to the USCG and NIMA to be published in their Notices to Mariners. The POD charts feature distinctive new colors to give better day/night readability. They provide a ready reference endorsing safety; tides, navigation and communication information and other valuable information placed in the chart margin. They are laminated to provide water and abrasion resistance and they have an easy to clean surface.

The POD charts are separated into recreational or commercial charts. The letter "R" after the chart number indicates recreational use charts. The supplemental information provided may include rules for fishing vessels, e.g. lights used and extent of gear. It also includes general information; safety and survival tips including fueling locations, ports and weather, how and when to report boating accidents, how to render assistance and the definition of certain words on the VHF radio. The letter "C" after the chart number indicates commercial use charts. The additional information includes phone numbers and Internet sites of important authorities, relevant excerpts from the Coast Pilot, tide and facility information, important bridges with their clearances and VHF radio channels in the area.

The same files maintained and forwarded for the NOAA/Maptech RNC product are used to support the POD product. These files are sent to OceanGrafix where the charts are printed to-order using digital image technology and large format plotters. Charts are shipped via next day delivery to retail chart agents for sale to mariners. This differs from the traditional chart printing process which uses offset lithographic printing presses and which are substantially out-of-date when issued and must be hand corrected by mariners.

Users can quickly verify the currency of a POD chart. If a chart's *Updated Date* in the lower left corner equals the date in the *Updated Date* column on the Web page: <http://chartmaker.ncd.noaa.gov/pod>, the chart is still current. The last USCG LNM and NIMA NM are indicated with their dates. Mariners can either obtain a subscription, purchase new POD charts as desired or correct the chart in their possession from Notices to Mariners or through NOAA's Critical Chart Corrections Web Site containing NOAA originated critical corrections: <http://critcorr.ncd.noaa.gov>.

As of this writing there are 168 charts in the POD pilot test. The majority of charts are from Maine to the Gulf Coast and Puerto Rico, with one chart in Alaska. In the near future the remaining suite of NOAA charts on the West Coast, Great Lakes and the Pacific will be added, with the exception of small craft charts. Due to their unique format, they will be available at a later date. At present eleven chart sales agents are participating as are local USCG Marine Safety Offices. The pilot test was initiated to determine mariner acceptance of the POD product. Its price is (\$20.00).

The future of POD is wide-ranging. Additional chart styles and services may be added including: a variety of paper mediums, the addition or removal of information blocks, optional removal of LORAN lines, drop-shipment directly to a location of choice, optional information printed on the back of the chart, etc. In addition, through a subscription service, quarantine, naturalization, customs and real-time tide information may be provided either on the chart, via e-mail or pager.

A weekly updated POD paper chart increases safety and confidence for the mariner. It also saves hand correction time and reduces charting errors. Despite the advent of RNCs and the eventuality of Electronic Navigation Charts (ENC), the paper chart user will continue to be important to NOAA. POD is an enhancement for the paper chart user as is the NOAA Critical Chart Corrections Web Site.

NOAA CRITICAL CHART CORRECTIONS WEB SITE

NOAA provides 22% of the chart corrections published annually by the USCG. Many of the corrections are also included in NIMA Notices to Mariners. NOAA-originated critical chart corrections deal with a multitude of dangerous items and conditions, changing channel depths and information used to update the United States Coast Pilot. Since NOAA-originated chart corrections are made available weekly through the new NOAA RNC and POD chart products and also through published USCG and NIMA Notices to Mariners, it made good sense to provide them also, as soon as discovered, to conventional paper chart users through the World Wide Web.

As NOS cartographers identify critical chart corrections, they are applied to the nautical chart database and processed for immediate release. The NOAA-originated chart corrections posted on the Critical Chart Corrections Web Site are available in advance of their appearance in USCG LNMs and NIMA NMs. Quite simply, notification of new dangers to surface navigation, e.g., obstructions, rocks, wrecks, shoals channel conditions, overhead obstructions and critical references in Coast Pilots, to name a few, are available to you via the web before your paper notice arrives in the mail. This does not mean that there is anything wrong with the notification process through conventional Notices to Mariners, it only means that technology has made it very easy to disseminate information in almost real time. Although you still have to hand correct your paper nautical chart, early notification of these critical chart corrections via the NOAA Critical Chart Corrections Web Site is extremely convenient. The web site provides a number of ways to obtain updates of NOS critical findings making it a very valuable navigation supplement for advanced warning of dangers.

The Critical Chart Corrections Web Site saw 30,000 hits its first year. NOAA is preparing for additional traffic by making improvements to the web site to make it more responsive. Additionally, later in 2001, the web site will contain USCG-originated chart corrections for aids to navigation. Since they are presently available weekly through NOAA's RNC and POD products, they will be made available through the Critical Chart Corrections Web Site also. NOAA is developing the strategy to make all updates to nautical charts, other than critical only, available through RNCs, PODs and the Critical Chart Corrections Web Site. This capability is being tested now.

The addition of published USCG aid corrections from LNMs will be of benefit to the mariner as they are applied and certified by NOAA cartographers performing chart maintenance. Discrepancies found between published LNMs and published charts are always resolved prior to application and dissemination.

Critical Chart Corrections Web Site Use

When you navigate to the Critical Chart Corrections Web Site home page, you will initially see a page with two frames: the main frame and the [Table of Contents](#) frame with links to the various pages on the web site. Through the [Table of Contents](#) frame, you are able to obtain two types of information: general nautical charting related information and critical NOAA-originated chart updates.

General Charting Links

The *New Products* link contains information about the new NOAA RNC product including the weekly Update Service.

The *Print-on-Demand Product* link describes NOAA's new and innovative paper chart product, printed from updated digital files, along with a list of charts currently available and other information about POD chart distribution.

The *Maptech Mapserver* link directs you to the Maptech Web Site where you can view and download free chart and map sections for nautical charts, topographic maps and aeronautical charts. Photos of the coastline are also available. The graphic requested can be printed, e-mailed to a friend or saved to your local computer drive.

The *Charts Affected by Multiple Districts* link provides you with a handy listing of all the NOAA charts that have overlapping coverage into two or more USCG Districts. Critical chart corrections will originate from each District.

The *Up-Coming New Editions* link is a listing of NOAA charts that have recently completed the compilation and review process and will be available soon as New Editions.

The *General Information* link provides you with various links for programs and products within the Marine Chart Division (MCD), NOS, as well as general user information related to the web site.

Related Links!! connects you to other valuable information sites, e.g., USCG, NIMA and Canadian Coast Guard.

Critical Chart Correction Links

There are five critical chart correction links on the [Table of Contents](#), *NOS Chartlets*; *Chart Search*; *USCG District Search*; *USCG District Reports* and *Coast Pilot Reports*.

The *NOS Chartlets* link allows you to view a listing of the latest NOS Chartlets. You merely need to click on the hyper-linked chart of interest and you will be linked to a .gif image of that chartlet that can be printed out to chart scale.

The *Chart Search* link allows you to query a copy of the NOAA critical chart correction database by nautical chart number. The opening page provides you with a brief description of the capabilities and how to conduct a search. You merely enter the chart number and click the *Submit* button. The response page displays a listing of all NOAA-originated chart corrections for the chart since the last edition with the most recent corrections displayed first. Also shown is the chart number, print-date and edition number. The NOS DATE is the date that the item was sent to the USCG/NIMA for inclusion in their weekly Notices to Mariners. The NOS ID is a unique number used for tracking corrections and can be used should you wish to inquire about a specific correction.

A second search option available on the *Chart Search* response page is the option to re-enter your chart number and query the database for corrections from a specified date. This will cut down on data/printout should you require a list of updates subsequent to your first request.

Another option available for charts with tabulated channels allows you to view the latest changes to depths in a channel. This hyper-link, [Latest Channel Tabulation](#), appearing on the response page, will provide you with the latest channel tabulation corrections in both .gif and .txt formats. The .gif image of the tabulation may not appear clearly on the screen. It, however, will be clear when printed. The .txt format is available for a clearer display and can be invoked by the [ascii text](#) link.

The *USCG District Search* will allow you to search for NOAA-originated critical chart corrections by USCG District. The display shows an interactive color map of the United States partitioned into USCG District outlines. Click the District that you are interested in to initiate the query. This query will require more patience as it may take more than a minute due to the amount of chart correction data being interrogated and displayed. The *USCG District Search* interrogates all USCG Districts for any charts overlapping more than one District. When completed, the display will be in a tabular format with the critical chart corrections displayed in chart numerical order, most recent first, and starting with the print-date of each chart.

The advantage of this function is that you can obtain a listing for a number of charts at one time. Also, the response page contains the option to specify a date as provided in the *Chart Search* link.

The *USCG District Reports* link includes NOS reports that are sent to the USCG Districts in USCG LNM format. The previous year's District Reports are archived in a zip file: 2000ARCHIVE, which can be accessed by clicking on it. If no corrections are issued for a District for a particular week, the date is indicated in red italic, *Jan 1, 2000*, else they appear in blue and corrections can be retrieved.

The *Coast Pilot* links for the various charting areas include advance updates and the LNM that they are eventually published in. The next scheduled *Coast Pilot* edition is also shown.

CONCLUSION

The options for receiving and using reliable up to date nautical charting information are increasing through exploitation of automated systems and the Internet. Accurate as the data may be, it only serves its purpose if made available sooner and in most charting scenarios, immediately is the key word commensurate with updates.

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