

**IHO CSMWG 16
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**Report on NOAA (USM) testing of visualisation of S-57 Edition 3.1.1 data
using the S-52 Presentation Library Editions 3.2 and 3.3 alternatively.**

1. Background:

There are planned modifications of the major ECDIS standards of the IHO, namely:

- the visualisation standard S-52 upgrade by the introduction of a new method to generate the safety contour and the introduction of a “no entry” symbol and others (S-52 PL Edition 3.3);
- the data standard S-57 by the proposed introduction of some new objects, attributes and values (S-57 Edition 3.1.1 enhancement)

Such changes will result in the necessity to upgrade the display routines of all ECDISes in use. It is known that all major ECDIS manufacturers currently apply upgrades to their new ECDIS sales to comply with the latest editions of the PL, however, not all of the ECDIS systems which are already in the field have been upgraded. NOAA’s investigations have highlighted some of the incompatibility issues that can be observed for ECDISes not upgraded to the new editions of the data and visualisation standards. NOAA performed their testing for three different types of ECDISes delivered by four different ECDIS manufacturers, making use of four different visualisation kernel brands. Investigations have been specifically for ECDIS devices of the following manufacturers, as these were readily available for testing. It was not intentional to select any particular brand of ECDIS, however the results of these tests are expected to apply to other brands as well. Those tested include:

- Sperry
- Raytheon Marine
- Transas
- OSL.

This report should be read in conjunction with the following papers containing plots and printouts:

CSMWG16-5.2C examples of ECDIS running on PL Editions 3.2 and 3.3 Safety Contour
CSMWG16-5.2D S-57 E3.1.1 testing for ‘unknown’ objects, including error logs.

The IC-ENC has also undertaken independent testing of the proposed new S-57 E3.1.1 objects, using Transas, Kelvin Hughes and ASPO/NAVINTRA ECDISes, with similar results to the NOAA testing. (See their separate report CSMWG16-5.2E).

2. Observations made on ECDIS systems not compliant with the planned modifications of S-52 and S-57:

2.1 Display of data adapted to the new method to generate the safety contour:

The new CSP within S-52 PL Edition 3.3 generates the Safety Contour making the encoding of the S-57 E3.1 “linear depth area” objects redundant. The use of data not containing such special objects on ECDIS systems running S-52 PL Edition 3.2 consequently does not show up the safety contour more prominent by a thick line, compared to other depth contours (see Plot No2 in CSMWG16-5.2C). The separation of safe and unsafe waters is still visible as shown by the different colours of the safe and unsafe depth areas, on either side of the safety contour, and all alarm functions triggered by the selected safety contour value are still maintained. Even though this effect is not considered as being safety critical, an upgrade to the new CSP is strongly recommended by the IHO.

2.2 Display of data containing new objects and attributes introduced by the proposed S-57 Edition 3.1.1 enhancements

On request of IMO, the technical committees of IHO involved in charting, namely CSMCWG, TSMAD and CSMWG have had to introduce means to depict a number of new chart objects, namely:

- Archipelagic sea lanes, including axis lines
- ESSAs and PSSAs

For paper charts, the CSMCWG has already adopted new symbology and published it for use in upgraded M-4 and INT1, which was issued in autumn 2005. Unfortunately digital charting cannot act that easily. There are a number of steps needed to make those new items available on ECDIS:

1. adopt new objects/attributes/values for the S-57 object catalogue and ENC product specifications
2. create new symbolisation for the S-52 Presentation Library
3. upgrade visualisation kernel software for new ECDIS sales
4. upgrade ECDIS visualisation software on existing ECDIS used in the field

As was done with the testing of the new CSP for Safety Contour on board for existing ECDIS, the second (Raytheon Pathfinder ST/ECDIS) and fourth (Tranas NavSailor 3000) examples below created the most severe problems. It is therefore vital to investigate the loading and display of “older” ECDIS and how they behave if ENCs are encoded using the proposed Edition 3.1.1 enhancements, containing the new objects. Due to the regulations of Edition 3.3 of the PresLib in place, unknown point objects and lines, whether they are axis lines or surrounding areas, should be visualised by question mark symbols. The real effects observed by NOAA investigations can be summed up as follows:

Sperry Marine VMS-VT using PL based on E3.2.

- No apparent loading issues with ‘unknown’ objects or attribute values.
- Shows that ASL and its axis lines display as expected in the PL. Content of INFORM displayed as expected for both the ASL and its axis.
- ESSA and PSSA visualised as **RESARE** object recording the new attribute value 28. Content of INFORM attribute displayed as expected.
- The ‘no entry’ symbol is displayed, when this area is only ‘entry restricted’. Perhaps there is a problem with the S-52 PL which needs to be more closely examined. According to the definition of Edition 3.3, only the entry prohibited attribute should drive the ‘no entry’ symbol on ECDIS.

Raytheon Pathfinder/ST ECDIS using PL E3.2

- The warning and error log (US3FL28M.L00) lists 2 ‘unknown’ attribute values and 7 unknown objects. The wording of both warning and error log are cryptic and does not give any useful information to the user.
- **No ASL nor its axis lines were displayed**, but could be selected using pick report if you know where they are encoded. The content of INFORM attribute displayed as expected, once the object could be found. PSSA coded as **RESARE** object with attribute value 28 was displayed, but with a line symbol similar to the paper chart ASL symbol. The attribute value 28 is correctly listed as ‘unknown’. INFORM attribute displayed as expected.
- The ‘no entry’ symbol is displayed, when this area is only ‘entry restricted’. Perhaps there is a problem with the PL which needs to be more closely examined. According to the definition of Edition 3.3 only the entry prohibited attribute should drive the ‘no entry’ symbol on ECDIS.

OSL ECPINS-W PL E3.3

- -The warning log report (stdout.log) lists 11 ‘bad’ object classes and 14 ‘bad’ attributes. The wording of both warning and error log are cryptic and do not give any useful hint to the user.
- -The ASL is portrayed as a dashed line with a single centred ‘?’, which would not be very clear if the axis line was not also encoded. Pick box states ‘invalid object’, rather than ‘unknown object’. It does however have an excellent note about the symbolization and mentions the aggregation. Content of INFORM attribute displayed as expected. The ASL axis line was displayed very well and included the INFORM.
- **RESARE** object displays as expected with a dashed line, INFORM correctly displayed.

Tranas NavSailor 3000-1 PL E3.3

- The warning and error log (US3FL28M.lst) is quite long but gives very little useful information to the user. It does however mention that **RESARE** has ‘wrong’ attribute value CATREA = 28 (twice).
- The ASL has several centred ‘?’ symbols, which is an improvement on a single centred symbol, however a serious shortfall is that the **INFORM attribute information is not provided**.
- RESARE** object for the purpose of PSSA is handled well, with INFORM coming across as expected.

Conclusion:

The decision of the involved IHO bodies to introduce new objects/attributes/values for the purpose of ESSA/PSSA and ASL was made under the assumption that different type approved ECDIS would handle ‘unknown objects’ in a similar manner, i.e. detect and report on them during installation by user friendly wording, visualise them as intended by making use of question marks, and display the attached INFORM attribute by the appropriate symbol and provide more detailed information about the “unknown” object. In view of the investigation performed by NOAA, one could conclude that this uniform behaviour is not the reality. In summary it has to be said the portrayal of an ‘unknown’ object does not meet the S-52 specifications nor does it fully meet the IEC test requirements in all cases. It is considered that the issues should be taken up with both the affected manufacturers and the type approval authorities which approved them, pointing out basic shortfalls on every particular ECDIS.

Strategy:

By the introduction of the proposed S-57 Edition 3.1.1 enhancements to ENC production by affected HOs, there should be a joint initiative to upgrade existing ECDIS to handle both new objects/attributes/values and new visualisation rules as given by S-52 PL Edition 3.3. This initiative should be backed by national authorities, i.e. national shipping and maritime administration authorities, but also appropriate information campaigns should be made by international bodies such as IMO, IHO and IEC.