TSMAD29/DIPWG7-10.1A

Paper for Consideration by the Digital Information Portrayal Working Group (DIPWG)

S-101 Symbols for Virtual AIS Aids to Navigation (V-AIS AtoN)

Submitted by:	DIPWG Chair
Executive Summary:	Report on the responses received from DIPWG Letter 2-2014 and proposal for DIPWG approval of V-AIS AtoN symbols for S-101.
Related Documents:	DIPWG Letter 2-2014, "Proposed New S-101 Symbols for Virtual AIS Aids to Navigation" *S-4, Regulations for International (INT) Charts and Chart Specifications of the IHO*
Related Projects:	S-100/S-101 Testbed

Introduction / Background

In July 2013, the combined DIPWG Presentation Bulletin 10 / TSMAD Encoding Bulletin 52 was posted on the IHO website. This bulletin describes an interim solution for encoding a dozen types of virtual AIS Aids to Navigation (V-AIS AtoN) using the NEWOBJ object while S-57 remains "frozen." The bulletin also specifies the symbology to be used to portray the objects, a combination of S-52 symbols that are already installed in operational ECDIS systems.

In August 2014 DIPWG Letter 2-2014 presented a number of options for DIPWG to consider for a permanent solution for portraying V-AIS AtoN. The letter provided a survey and responses were received from five member states, Australia, France, Japan, Norway and USA; from one OEM, Jeppesen; and a set of eight comments were also received through the Australian Maritime Safety Authority (AMSA) from “mariners and marine related cartographers” within the AMSA and “marine pilots” external to the AMSA. The survey results are summarized in Annex A.

Based on the feedback received, this paper presents a narrowed down set of options for consideration at the DIPWG-7 meeting for a permanent set of V-AIS AtoN symbols to be implemented in S-101.

Analysis/Discussion/Conclusions

Agreement on basic components

DIPWG Letter 2-2014 presented 2 or 3 symbol options for eleven of the twelve types of V-AIS AtoN and 10 choices for special purpose marks (see annex A). Four components of the symbol designs were nearly universally preferred by survey respondents. These were:

1. Use of the S-52 magenta circle symbol for radio station, SY(RDOSTA02).
2. Use of the S-52 traditional, "paper chart" symbols for beacon topmarks.
3. Centring the topmark elements within the magenta circle, as opposed to placing the topmark above a position circle as is specified in S-4, §B-489.1.
4. Use of the "V-AIS" label in the 3 o'clock (right side, centred vertically) position.

Although most respondents thought the size of the topmarks was acceptable, two noted that the topmarks could be made a little larger, especially the triangular, starboard lateral mark. There is room for larger topmarks within the magenta circle, so this it is recommended that they be made a bit larger, but still smaller than the simplified marks currently used for the S-57 NEWOBJ V-AIS AtoN.

Topmark Colours

Regarding the colour of the topmark, one member state preferred that all marks be magenta, stating that some marks being all-magenta and others being coloured is confusing, that use of all-magenta is the best way to distinguish a virtual AtoN from a physical one, and use of all-magenta is familiar, because it is similar to the V-AIS AtoN symbols specified in S-4.

However, a majority of the other respondents preferred the use of black topmarks for the cardinal  , isolated danger  , and emergency wreck  marks (see Table 1).

V-AIS AtoN Type	All Magenta	Magenta Circle with Black Centred Symbol	Magenta Circle with Coloured Centred Symbol
Cardinal	JPN 2	AUS FRA NOR USA 4 7 8	J 1 3 5 6
Safe Water	JPN	7	AUS FRA NOR USA J 1 2 3 4 5 6 8
Isolated Danger	JPN 2	AUS FRA NOR USA 4 7 8	J 1 3 5 6
Lateral	JPN	7	AUS FRA NOR USA J 1 2 3 4 5 6 8
Emergency Wreck	JPN NOR	AUS FRA USA 2 4 7 8	J 1 3 5 6

Table 1 – Preferences for the colour of topmarks used in V-AIS AtoN symbols
Responses from Jeppesen are indicted with "J," comments received through the
Australian Maritime Safety Authority (AMSA) are indicated with the numerals 1 through 8.

Although four of the five member states responding to the survey preferred black for these topmarks, half of the AMSA respondents preferred the use of colour (even though use of colour was not presented as an option for these three types of marks. These respondent could have been influenced by the S-57 NEWOBJ symbols, which were also shown for reference (see Annex A).

Special Purpose Mark

Several designs were offered in the DIPWG Letter for the virtual AIS special purpose mark, because it was thought that the ECDIS symbol for isolated danger  could be confused with the magenta version of the special purpose topmark  and that use of the traditional yellow colour for the topmark  might not provide enough contrast against a white background (see Table 2).

MS Org	Beacon "X" centred Symbols					Buoy "X" centred Symbols				
										
AUS	4	9	2	1	3	8	10	6	5	7
FRA	9	7	1	3	5	10	8	2	4	6
JPN	1	5	9	7	3	2	6	10	8	4
NOR	9	7	5	3	1	10	8	6	4	2
USA	9	7	3	2	1	10	8	6	5	4
*	1 3	1	3 1	4	4	1 4	4	1 1	1	1
J	3	5	9	7	1	4	6	10	8	2
1	5	4	3	2	1	10	9	8	7	6
2			1.5							1.5
3			3	1	2					
4					1					
5	9	7	2	5	1	10	8	4	6	3
6			1.5					1.5		
7	4	2	10	8	6	3	1	9	7	5
8		2				3	1			
**	1 1	2	5 2	2 1	5	2 2	2 2	1 3	1	3

Table 2 – Ranked Preferences for Special Purpose V-AIS AtoN Symbol Design Options (1=most, 10=least)

* Subtotal of Member State top 3 and bottom 3 votes
** Subtotal of OEM and others top 3 and bottom 3 votes

A tilted version of the topmark  (from the buoy topmark symbol) was offered as an option that would be more distinct from the upright X in the isolated danger symbol, but this choice was not popular. The three yellow special purpose topmark designs offered for this virtual aid were the most preferred. Of these – normal line weight  , thicker line weight  , and thicker line weight with a black outline  – the last received the most votes for 1st choice.

You are also encouraged to read "Other General Comments" in section 9 of Annex B.

Recommendations

Given the feedback received, the following symbols are recommended for adoption for the ECDIS display of S-101 ENC virtual AIS aids to navigation.

Purpose of Virtual Aid	S-101 SVG File Name	S-4	S-101
No known IALA-defined function	**VAISTM00**		
North Cardinal	**VAISTM25**		
South Cardinal	**VAISTM26**		
East Cardinal	**VAISTM27**		
West Cardinal	**VAISTM28**		
Safe Water	**VAISTM30**		
Isolated Danger	**VAISTM32**		
Starboard Lateral (IALA A)	**VAISTM22**		
Starboard Lateral (IALA B)	**VAISTM23**		
Port lateral (IALA A)	**VAISTM34**		
Port lateral (IALA B)	**VAISTM35**		
Emergency Wreck Marking	**VAISTM86**		
Special Purpose	**VAISTM85**		

Justification and Impacts

New symbols are needed to portray V-AIS AtoN for S-101 data. The recommended symbols provide distinct, unambiguous depictions for these features.

Action Required of DIPWG

DIPWG is invited to:

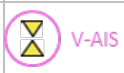
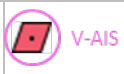
a. endorse the recommended S-101 ENC virtual AIS aids to navigation symbols

b. forward the symbols to S100WG to evaluate on the S-100/S-101 testbed

S-101 Symbol Design Options for Virtual AIS Aids to Navigation

Annex A

As presented in DIPWG Letter 2-2014

Purpose of Virtual Aid	S-52 NEWOBJ	S-101 SVG Symbol Name	S-4	S-101 Magenta	S-101 Black	S-101 Coloured		
No known IALA-defined function		VAISTM00						
North Cardinal		VAISTM25						
South Cardinal		VAISTM26						
East Cardinal		VAISTM27						
West Cardinal		VAISTM28						
Safe Water		VAISTM30						
Isolated Danger		VAISTM32						
Starboard Lateral (IALA A)		VAISTM22						
Starboard Lateral (IALA B)		VAISTM23						
Port lateral (IALA A)		VAISTM34						
Port lateral (IALA B)		VAISTM35						
Emergency Wreck Marking		VAISTM86						
Special Purpose		VAISTM85						
Special Purpose symbol option with buoy *X* shape								
Isolated Danger (shown for comparison)		ISODGR01						

S-101 Virtual AIS AtoN Symbol Feedback Form Annex B

Responses to DIPWG Letter 2/2014 were received from five member states, Australia, France, Japan, Norway and USA; and from one OEM, Jeppesen. Indicated as AUS, FRA, JPN, NOR, USA and J respectively. A set of eight comments were also received through the Australian Maritime Safety Authority (AMSA) from “mariners and marine related cartographers” within the AMSA and “marine pilots” external to the AMSA. Their responses are indicated with the numerals 1 through 8.

1. Magenta Circle Is use of the S-52 magenta circle symbol for radio station, SY(RDOSTA02), appropriate as a component of all virtual AIS AtoN symbols?

YES: FRA, JPN, NOR, USA, J, 1, 2, 3, 4, 5, 6, 7, 8

NO: AUS

If no, describe the preferred alternative

AUS: Suggest “diamond” shape as recommended by the IMO Correspondence Group on AIS Aids to Navigation for the ECDIS symbology generated by the broadcast AIS signal. This will promote familiarity and consistency between the encoded and broadcast based symbols.

2. Topmarks Is use of the S-52 traditional, "paper chart" symbols for beacon topmarks appropriate as a component of virtual AIS AtoN symbols?

YES: AUS, FRA, JPN, USA, J, 1, 2, 3, 4, 5, 6, 7, 8

NO: NOR

If no, describe the preferred alternative

NOR: Coloured topmarks for lateral, safe water marks and emergency wreck. Black topmarks for cardinal and isolated danger.
This is to avoid confusion and help the navigator to recognise the symbols quicker since yellow traditionally is associated with Special Purpose marks and red is associated with lateral marks.

3. Centred Symbols Is centring the topmark elements within the magenta circle appropriate for all virtual AIS AtoN symbols?

YES: AUS, FRA, JPN, NOR, USA, J, 2, 3, 4, 5, 6, 7, 8

NO: 3

If no, describe the preferred alternative

[1]: 1The outer edges of the respective triangle should meet or nearly meet the outer magenta circle. Otherwise, the symbol is too small to distinguish.

4. Topmark Symbol Size Is the size of the topmark used in each virtual AIS AtoN symbol appropriate?

YES: AUS, FRA, JPN, USA, J, 2, 3, 4, 5, 6, 7, 8

NO: NOR, 1

If no, describe the preferred alternative

NOR: The Starboard Lateral marks in S-101Magenta, S-101 Black, and S-101 Coloured are too small and are less visible compared to the Port lateral marks.

[1]: As per comment 3 above. The symbol needs to be large enough to distinguish.

[6]: This is a difficult one to say YES or NO due to navigators’ sight issues. However, in my opinion, a right balance has been achieved

5. Font Type Is use of upright text for the "V-AIS" label appropriate?

YES: AUS, FRA, JPN, NOR, USA, J, 1, 2, 3, 4, 5, 6, 7, 8

NO:

If no, describe the preferred alternative

[3]: [Upright text] for fixed AtoNs.

[6]: Consideration should be given (if possible) to bold the label.

6. Label Placement Is placement of the "V-AIS" label in the three o'clock position (right side, centred vertically) appropriate?

YES: AUS, JPN, NOR, USA, J, 1, 2, 3, 4, 5, 7, 8

NO: FRA

If no, describe the preferred alternative: Why will not we place it in the six o'clock position? Maybe the size of this indication plus the symbol would be less important and would hide less other objects of the chart?

FRA: Why will not we place it in the six o'clock position? Maybe the size of this indication plus the symbol would be less important and would hide less other objects of the chart?

[6]: Not sure whether we have any protocols in relation to positioning of this label from a flexibility point of view, especially when these labels obscure essential chart information, such as depth.

7. Symbol Colours In the table below, use an "X" to mark the colour for the centred symbol that you believe is best for each V-AIS AtoN type.

V-AIS AtoN Type	All Magenta	Magenta Circle with Black Centred Symbol	Magenta Circle with Coloured Centred Symbol
Cardinal	JPN 2	AUS FRA NOR USA 4 7 8	J 1 3 5 6
Safe Water	JPN	7	AUS FRA NOR USA J 1 2 3 4 5 6 8
Isolated Danger	JPN 2	AUS FRA NOR USA 4 7 8	J 1 3 5 6
Lateral	JPN	7	AUS FRA NOR USA J 1 2 3 4 5 6 8
Emergency Wreck	JPN NOR	AUS FRA USA 2 4 7 8	J 1 3 5 6

Provide any additional recommendations or remarks related to colours here:

AUS: The preferences [for question 7] are on the assumption that the coloured symbols are suitable in variable bridge lighting conditions. AU also has a concern over the possible similarity between the emergency wreck central symbol and the submerged dangerous underwater rock of unknown depth (UWTROC03), for which a satisfactory difference between the symbols would need to be established and confirmed.

An additional consideration that must be made here is the way that the mariner sets up their ECDIS display and the recommended display settings in the ECDIS. It has been conceded by the CSPCWG and TSMADWG that the reason that Virtual AIS AtoN information are required to be encoded/depicted on charts is principally to aid in route planning – when the vessel is in route monitoring mode the symbols generated by the broadcast AIS signal will be displayed on the ECDIS when the vessel gets within range of the signal. The ECDIS should therefore have as one of its default display setting options the ability to "turn off" the encoded V-AIS AtoN's when in route monitoring mode, with the possibility of an over-ride capability if the vessel is not equipped to receive AIS. The AU preferences above are based on the additional assumptions that such display settings will exist in

the ECDIS, and that for route planning the additional indication of the purpose of the aid by having the aid in the appropriate colour will aid the mariner in planning their route.

NOTE: The current S-101 modelling does not include the identification of the IALA System for lateral marks (IALA A and B). This would require an amendment to S-101.

FRA: First I preferred the S-101 magenta symbol since these symbols concern virtual AIS AtoN but I think the colour (red or green) helps the mariner for the lateral objects and the yellow colour for the special purpose. In this way, to stay coherent between all the symbols, it seems preferable to use the S-101 black symbol for the other objects.

JPN: The situation that some are all-magenta symbols and others coloured is confusing. We think consistency important.

We support the use of all-magenta as the best way to distinguish the V-AtoN from physical AtoN effectively.

The use of all-magenta is familiar because it is similar to that in S-4.

USA: We would recommend carrying forward the yellow for the cardinal V-AIS to maintain consistency. In addition, we recommend adding the black outlines to the Lateral symbol as it makes it easier to define with the human eye.

[J]: I suppose we shall use the same rules to colorize central topmarks independently on V-AIS AtoN type. If a physical AIS AtoN is shown as 'paper chart' symbol of a base structure and simplified symbols for aids are not used then we would use colour topmarks with black border for all V_AIS AtoN Types.

[2]: Use of coloured symbols will aid in quick/easy/and accurate assessment of the type of feature indicated.

[6]: In my opinion, coloured centred symbol is a good way to differentiate a virtual mark with a real mark from just a practical navigation point of view.

[7]: The all magenta symbols do work however; the magenta circle with the black centred symbol does make the symbol clearer to recognise and is more aesthetically pleasing.

8. Special Purpose V-AIS AtoN Design In the bottom row of the table below, mark your preference from most (1) to least (10) preferred symbol design for the special purpose V-AIS AtoN**.**

MS Org	Beacon "X" centred Symbols					Buoy *"X"* centred Symbols				
										
AUS	4	9	2	1	3	8	10	6	5	7
FRA	9	7	1	3	5	10	8	2	4	6
JPN	1	5	9	7	3	2	6	10	8	4
NOR	9	7	5	3	1	10	8	6	4	2
USA	9	7	3	2	1	10	8	6	5	4
1	5	4	3	2	1	10	9	8	7	6
2			1.5							1.5
3			3	1	2					
4					1					
5	9	7	2	5	1	10	8	4	6	3
6			1.5					1.5		
7	4	2	10	8	6	3	1	9	7	5
8		2				3	1			

Provide any additional recommendations or remarks related to the special purpose V-AIS AtoN here:

AUS: Refer to comments under #7 above. AU considers the use of yellow for the central symbol to be sufficiently distinct from ISODGR01 magenta isolated danger symbol.

JPN: We support the use of all-magenta as well as [in question 7].

The yellow symbols without black outline are the worst to watch.

NOR: The two (2) magenta coloured X symbols are the least preferred design since they remind too much of the Isolated Danger symbol.

[J]: Signs of all V-AIS beacons and buoys should be drawn vertical symbol based on S4 symbology. A mariner won't select AtoN as a beacon or a buoy because he doesn't need to identify if a virtual object in the sea or on shore, because it is not physically there. The mariner has to have an ability to recognize a navigational purpose of a mark on a chart (screen). Portrayal of upright topmark symbols is enough to show the purpose

[2]: having the black outline on the buoy "X" makes it obvious it is different to the beacon "X."

9. Other General Comments:

AUS: While an implementation of magenta symbols for all V-AIS AToN's would be more consistent with the symbols used for the paper chart, AU considers that an additional indication of the purpose of the aid through presentation in the correct IALA colour to be an advantage to the mariner when performing route planning. However, the display settings in the ECDIS must be taken into account in the final determination of the colour of these symbols. If the mariner does not have the capability to (easily) "turn off" V-AIS AToN's in ECDIS when in route monitoring mode, then AU preference would tend to be towards a generic colour such as magenta (but see additional comment below), so as to avoid possible mariner confusion in situational awareness when quickly comparing what is displayed in the ECDIS (in regard to similar display of physical/virtual aids) against what can be seen through the bridge window.

Another possibility that may be considered for the colour of V-AIS AToN's may be the RESBL (blue) colour token reserved for AIS features and symbols.

USA: The United States is wondering if the ruleset will continue to use the TX string to portrayal the V-AIS on the screen.

[J]: In my opinion the main rule is that all V-AIS AtoN types must be drawn with the same style. We don't have to use black central symbols for cardinal types and colour ones for lateral types. If we can potentially use yellow cross with black border for special marks, I believe, we will may use symbols like 'BCNCAR01', 'BCNCAR02', 'BCNCAR03', 'BCNCAR04' with appropriate size for cardinal marks. The using of such colour symbols allow more accurate to recognize type of V-AIS AtoN. On the one hand they will be selected by colour identification, one the other hand they won't merge into the background.

If such way is not acceptable, the alternative can be one: Magenta Circle with Magenta Centred Symbol for all V-AIS AtoN types because there is a general rule of nautical charts that virtual features are presented by magenta colour. In this case it seems to me the misgiving 'j' is not solid reason. There are negative symbols. And they can be unlikely mixed up. Besides V-AIS AtoN symbol may be with a label.

[1]: lateral buoys for port lateral (IALA-A & B) marks should be oblong with vertical sides longer that the horizontal sides; as opposed to a slanting box shape. The starboard lateral (IALA-A & B) marks should be a triange with the base horizontal and the apex centred vertically above.

The safe water mark should have a thicker black line around the red circle to distinguish it better.

On a final note and unrelated to virtual AIS marks, I would like to recommend that the symbol for a RACON be enlarged and enhanced. As it is at present, it is very difficult to identify.

[6]: A good product should assist a trained competent navigator to navigate his or her ship safely without any complexities or confusions. The focus should be this when finalize this symbols.