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Agenda item [[2]](#footnote-3) 8

Technical Domain / Task Number 2 …………………………………

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S-201 implementation and proposed improvements

# Summary

With projects to update Aids to Navigation (AtoN) databases, S-201 should be viewed as an important requirement in establishing successful sharing of AtoN information between AtoN authorities and partners. Canada and Republic of Korea have both initiated such projects and have therefore closely reviewed S-201 since these projects are now moving ahead to final planning or are already in execution phase. These reviews of S-201 have highlighted some areas where S-201 can be enhanced.

## Purpose of the document

This input paper intend to share the lessons learned so far in including S-201 in the process of renewing the Canadian Aids to Navigation database, named SIPA and the Korean Aton database. These lessons also include the discovery of possible gaps and useful improvement to S-201 Edition 1.0.0.

## Related documents

S-201 Edition 1.0.0

# Background

In 2017 Canadian Coast Guard conducted a review of its SIPA AtoN database to evaluate how it compares with the S-201 data model. The review outcome concluded that the database model could in most cases be mapped to S-201. With this information in mind a SIPA renewal project has been started. S-201 and S-100 compliance is an integral part of the project goal. S-201 is being looked at to guide the database model creation and as a means of exchanging AtoN information internally and between Coast Guard and Canadian Hydrographic Service.

Republic of Korea’s MOF (Ministry of Oceans and Fisheries) has been maintaining an Aton information management system, it has recognized the need for improvement. In order to address the IALA’s recent development like G1143 MRN and S-201 Product specification, it was decided to redevelop the Aton information management system. In 2019 MOF conducted a mapping study between Aton database and S-201 data model. Proposed improvement of S-201 was identified.

# Discussion

In formulating the database structure, S-201 has been closely reviewed for its ability to support the current and planned operations of the organizations. In Canada a review of the current AtoN system requirements have been done and these requirements are in the process of review for relevance for future system and how these work with S-201. S-201 implementation is an integral part of the Canadian project and the project has a requirement to support the S-201 data model in the database core. Korean AtoN is working on a similar exercise.

While working on the new CCG AtoN database and Korean AtoN database some potential gaps in the S-201 data model have been identified. Additionally, improvements to S-201 that could help support operational requirements have been noted. Proposed improvements that may fill these gaps and enrich the data model are listed following section of this document.

## Potential gaps in S-201

Potential gaps identified in the preparatory work for creating new AtoN databases include missing definitions, filtering enumerated values to only relevant values, and omissions of classes in the Feature Catalogue. Moreover, functional gaps have been noted and these may be viewed as potential improvements to the data model to reflect more of the AtoN functions currently in use.

### Missing definitions

Several items in the feature catalogue lack definitions. Investigating theses against the IHO GI Registry it appears that the many of the gaps are in the S-201 Feature Catalogue document, and should be added for completeness. Others are missing and should be added to the GI Register.

|  |  |
| --- | --- |
| Feature Catalogue Item | GI Registry Definition |
| 'categoryOfAggregation' | Missing, should be submitted to GI Registry |
| 'categoryOfAssociation' | Missing, should be submitted to GI Registry |
| 'atoNMaintenanceRecord' | A reference following the Uniform Resource Identifier (URI) principles to a record of maintenance. |
| 'aidAvailabilityCategory' | A Category denoting the significance of an Aid to Navigation, expressed in terms of the probability that an AtoN or system of AtoN, as defined by the Competent Authority, is performing its specified function at any randomly chosen time. This is expressed as a percentage of total time that an AtoN or system of AtoN should be performing their specified function. |
| 'jetski prohibited' | A mark indicating a jetski prohibited area. |
| 'likely to change but significant shoaling unlikely'  Note: Should be ‘Likely to Change But Significant Shoaling Not Expected’ | Continuous or frequent change (for example sand wave shift, seasonal storms, ice bergs, etc) that is not likely to result in new significant shoaling. |
| 'colour' | The property possessed by an object of producing different sensations on the eye as a result of the way it reflects or emits light. |
| 'inspectionFrequency' | A statement of how frequently an item is inspected. |
| 'inspectionRequirements' | A statement of what requirements are in place for how inspection of an item is carried out. |
| 'installationDate' | The date when an item was installed. |
| 'lightCharacteristic' | The distinct character, such as fixed, flashing, or occulting, which is given to each light to avoid confusion with neighbouring ones. |
| 'natureOfConstruction' | The buildings primary construction material. |
| 'radarConspicuous' | A feature which returns a strong radar echo. |
| 'status' | The condition of an object at a given instant in time. |
| 'topmarkDaymarkShape' | The shape a topmark or daymark exhibits. |
| 'trafficFlow' | Direction of vessels passing a reference point. |
| 'typeOfEnvironmentObservationEquipment' | Type of sensor used to observe the environment. For example Anemometer, fog monitor, etc. |
| 'visuallyConspicuous' | Term applied to a feature either natural or artificial which is distinctly and notably visible from seaward. |
| 'peer' (role) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'parent' (role) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'child' (role) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'navigableTrack' (role) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'navigationLine' (role) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'RangeSystem' (association) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'Aggregations' (association) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'Associations' (association) | need to be specified in Feature Catalogue. Can use IHO FCB for this. |
| 'SpatialUncertainty'  Note: Should be changed to ‘horizontal position uncertainty’ | The best estimate of the accuracy of a position. |
| 'EnvironmentObservationEquipment' | A sensor used to observe the environment. |
| 'LocalDirectionOfBuoyage' | An area within which the navigational system of marks has been established in relation to a specific direction. |
| 'QualityOfNonBathymetricData' | An area within which a uniform assessment of the quality of the non-bathymetric data exists |

### Filtering of enumerate values

Currently all enumerated lists retain all available values for all classes. S-100 has the option to restrict enumerated lists to only values that are applicable in the class they are used. It would be worthwhile to do this also for S-201 since it can simplify the choices and lower the learning curve for new users of the product specification.

For example, colour has the possible values; 1 : white, 2 : black, 3 : red, 4 : green, 5 : blue, 6 : yellow, 7 : grey, 8 : brown, 9 : amber, 10 : violet, 11 : orange, 12 : magenta and 13 : pink. Since the class Light has a binding to the colour attribute without restrictions, all these values are possible for lights. However, values like black, grey, brown, pink and likely others, are not appropriate for navigation lights. These should be restricted from permitted values.

If this proposal is accepted, a review would be necessary of all enumerate attributes consisting of an assessment of class definition and context of use of each enumerated list. Any changes to the lists will necessitate a new version of the Feature Catalogue and the GML Schema.

### AIS feature types are missing in DCEG (Annex A) and Feature Catalogue (Annex D1)

The three feature types VirtualAISAidToNavigation, SynteticAISAidToNavigation and PhysicalAISAidToNavigation seems to be missing from the DCEG/Annex A document and the human readable feature catalogue in Annex D1. Propose these are added.

## Proposed extensions to the data model

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| --- |
| Mooring component of buoys are not covered by S-201. Mooring components would include components like anchor/sinkers, chains/ropes, swivels and shackles. Attributes would include weight, material, size and length. It may also be important to model how the different components are combined, e.g. see image |
| Buoy counter weight is not covered by S-201. There is external counterweight (balls) added by the ship crew on site and there is internal ones, rings at the base of the buoy. Maybe a distinction would be useful. Could be an attribute on the buoy or a new class or equipment. |
| AtoN equipment sometimes has some required seasonal actions, e.g. remove lantern at end of season. To capture this, it would be beneficial to have an attribute on both structure and equipment. |
| Currently it is possible to add some information about batteries. However a more comprehensive set of information on power source would be useful. Suggest to amend the model to add a power source attribute where, e.g. battery, diesel generator, solar, electrical service, etc details could be captured. |
| Mooring buoys are not covered by S-201, only mark indicating moorings. Suggest to add mooring buoys (MORFAC in S-57). |
| Add emergency wreck marking buoy to S-201. Could be added as a separate class or as a category of special purpose mark. S-57 does not support this, while S-101 has added it as a new class. Propose to align with S-101 methodology. |
| To add emphasis some of our AtoN have fluorescent colour. Suggest to add attributes to indicate a colour being florescence. |
| Sometimes the colour pattern on an AtoN is non-standard, and it would be good to have an option in the colourPattern attribute to indicate this. Could be combined with an indication of looking to information attribute for additional information. The attribute ‘topmarkDaymarkShape’ already does something similar. |
| It would be helpful to add an option to capture day board (Daymark) orientation from true north. |
| Daymarks can be solid or slatted, should this be added as a Boolean attribute or does it need to also include the ratio between board and spacing? |
| Lights are often specified using target candela. An attribute to capture this in the Lights class would be beneficial. |
| Consider a review of the ‘remotelyMonitored’ attribute and ‘status’ values ‘watched’ and ‘unwatched’. These seem to overlap somewhat and it would be beneficial to harmonize these with sufficient use guidance added. |
| Consider adding means to capture buoy fixing methods and positioning information. |
| We frequently test AtoN equipment. During tests the aid and or equipment being tested may not be in a full operation capacity and the reliability may be less than other aids. It would be useful to add ‘experimental’ as a value in the ‘status’ enumeration to capture that an aid is experimental. |
| Bridge lights should be considered as category of light. Also should be possible to be one aggregation per direction and association to group per bridge. DCEG should be updated with guidance for encoding these.   |  |  |  | | --- | --- | --- | |  | Real Image | ENC | | Port  Busan  Bridge |  |  | | Port  Gunsan  Bridge |  |  | |
| The highest category of AtoN is to determine if it’s management is public or private responsibility. Currently this is captured in the status attribute, which also has include numerous other possible values. Need to consider moving to a new attribute for public or private for added emphasis. |
| Status of AtoN : Korea use the following status (Installed, Planned, Removed, Not operational, New), it seems that Current status doesn’t fit with AtoN all Korean status use. Suggest to consider the filter or amend the Status attribute. |
| categoryOfSpecialPurposeMark : consider adding new attributes like wrecks, marine construction/operation, Facility protection, Oil pipeline protection, Marine cable protection. Suggest to filter and add listed values. |

Several of these proposed changes do not map immediately to S-57. Therefore, and any change should consider how these proposals can impact conversion to S-57 ENC. Where helpful, a mapping to S-57 should be provided.

# Action requested of the Committee

The Committee is requested to:

1. Note this paper.
2. It is recommended that ARM review the proposals and assign actions as appropriate.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-2)
2. Leave open if uncertain [↑](#footnote-ref-3)