



OO Contents

- Background
- S-124 NW and S-125 Marine AtoN Service
- Plan and preparation for testing the service
- The S-124/S-125 Sea trial
- Major results and Focused group workshop



01 Background

- IMO
 - IMO APPROVAL OF S-100 IN ECDIS PERFORMANCE STANDARDS
 - Approved by IMO MSC 106 on 11 November 2022
 - legal to use after 1 January 2026 and from 1 January 2029 new systems must comply with the new IMO Resolution
- IHO
 - Testing the S-101 ENC product specification
 - S-124 navigational warning product specification
 - Reviewing the S-124 documents to be edition 1.0
 - IHO NIPWG owns the S-125 and monitors the S-125 development
- IALA
 - ARM developed the S-201 ed.1.1.0
 - ARM drafted the S-125 and cooperates with IHO NIPWG
 - ENAV developed the S-124 technical service spec. and will develop the S-125 service standard
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01 Background

- SMART Aton Project
 - Research project of Korea from 2021 to 2025
 - (Theme 1) Integrated platform for AtoN system, (Theme 2) Aton Service based on S-201/S-124/S-125, MRN and technical service spec.
- **Joint IALA/IHO Workshop in 2022**
 - Two organs discussed the Aton and Navigation warning service
 - Attendance agreed with the need of demonstration project
 - MPA proposed KRISO to have the S-124/S-125 service testbed



S-100 and S-XXX Product Specifications



Maritime Services





S-124 data model and technical service specification



S-125 Marine AtoN data model and technical service spec.



Data flow of S-201/S-125/S-124



Project team





- Online meeting of project team
 - 28th Feb. 2023
 - Identification of the topics and scope for the testbed project
 - Review the test scenario
 - 4th Apr. 2023
 - S-101 ENC, Aton DB, Aton info system and User system(ECDIS)
 - Review the detailed scenario

Schedule in Singapore

Date	Day	Time (Proposed)	Activity
19 th April 2023	Wednesday	9am – 12pm	PSA Pass (To be confirmed) Set-up and Testing of Equipment on Vessel
20 th April 2023	Thursday	9am – 6pm	Sea Trial
21 st April 2023	Friday	9am – 12pm	Review findings and Mini Workshop
24 th April – 28 th April 2023	Monday – Friday		SMW Week
25 th April 2023	Tuesday	4pm – 5pm (To be confirmed)	MPA-IALA E-Nav Workshop Joint Presentation on findings





AtoN Database

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101SG005C4037 .000

101SG005C4041 .000

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Table

ting Tool

Mapping & Convertor

Structure

Table



User System



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Sea route

	Targeting Aton	s for S-124 service		Targeting At	ons for S-125 service	
West Bu	ran	POINT (103.83505 1.234	1499)	Buran	POINT (103.8486472 1.2523	35)
Sirdhana	(POINT (103.878 1.24465)	Bedok	POINT (103.9535639 1.3018	3831)
Mano 11	A	POINT (103.9225 1.2486	669)	NE Corridor	POINT (103.8968667 1.2570	972)
Forward		POINT (103.9245332 1.2	749333)	SB 5	POINT (103.8092389 1.2544	1583)
Bukom B	Berth 10	POINT (103.779 1.22664	99)	South Sebarok	POINT (103.8063806 1.1966	5472)
SB 14		POINT (103.8233202 1.2	438349)	Marina Safe	POINT (103.8673831 1.2717	7306)
Sisters		POINT (103.8128833 1.2	069832)	SIS-05	POINT (103.8335497 1.2173	331)
E Cyrene	2	POINT (103.76475 1.260	1833)	SC1	POINT (103.8315167 1.2376	5306)
SC1		POINT (103.8315167 1.2	376306)			
PUB-PSN	/IE	POINT (103.8738 1.2760	666)			





TC1. Request and receive S-124 before departure

الDe	Test Purpose.₀	Precondition	Test Procedure₀	Excepted Result.	Actual Result.	Pass/Fail₽
TC-01-001₽	Receiving test of S- 124 dataset in route + buffer@	Test target AtoN↔ [Near route]↔ - PUB-PSME↔ - West Buran↔ - Bukom Berth 10↔ - Sisters↔	 Create data in AtoN Information Management System.e¹ [Create S-124]e¹ <u>Near route: 4 cases</u>e¹ Request S-124 service from ECDIS with route + buffer polygon.e¹ 	 Service transmits data near the route to ECDIS.e¹ [Service response]e¹ <u>Near route S-124: 4 cases</u>e¹ List and symbols of data registered by ECDIS are displayed on the screen.e¹ 	5	□ Pass.↓ □ Fail↓
TC-01-002₊	Non-receiving test of S-124 dataset unrelated to route₽	Test target AtoN [Near Route] - SC1 [Out-of-route] - Forward - Forward - Sirdhana - E Cyrene [Result of TC-01-001] - <u>Near route S-124:</u> <u>4 cases</u>	The test procedure of TC-01- 001 is performed identically according to the following conditions.e [Create S-124] - <u>Near route: 1 case</u> - Out-of-route: 3 cases	 Service transmits data near the route to ECDIS. (Do not transmit out-of- route data). [Service response]. Added 1 case of S-124 near route to the result of TC-01-001. (5 cases in total). List and symbols of data registered by ECDIS are displayed on the screen 	Ę.	□ Pass≠ □ Fail≠



MPA

TC-01-003+	Receiving test of S- 124 dataset where visual range and route intersect	Test target AtoN↔ [Change visual range]↔ - E Cyrene↔ ↔ [Result of TC-01-002]↔ - <u>Near route S-124</u> :↓ <u>5 cases</u> ↔ - Out-of-route S-124:↓ 3 cases↔	 Modify the visual range of the AtoN where the out- of-route S-124 is created in AtoN Information Management System.↓ (Extend the visual range to intersect the route).↓ (Extend the visual range to intersect the route).↓ 	 Service transmits data where visual range and route intersect to ECDIS.↓ (Do not transmit out-of- route data)↓ [Service response]↓ Added 1 case of S-124 near route to the result of TC-01-002↓ (6 cases in total)↓↓ List and symbols of data registered by ECDIS are displayed on the screen.↓↓ 	ta I	□ Pass+ □ Fail≠
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- 1. Request and receive S-124 before departure
 - 1-1. Receiving test of S-124 dataset in route + buffer
 - 1-2. Non-receiving test of S-124 dataset unrelated to route
 - 1-3. Receiving test of S-124 dataset where nominal range and route intersect



ID₽	Test Purpose.₀	Precondition .	Test Procedure.	Excepted Result.	Actual Result.	Pass/Fail₽
TC-02-001₊ [,]	Receiving test of S- 125 dataset in route + buffer@	Test target AtoN. [Near route]. - Buran (Change character of light, PC). - SB 5 (Change character of light, PC). - South Sebarok. (Function Stop, AC).	 Change state of Aton in AtoN Information Management System Create data related to AtoN state [Create S-125] Near route: 3 cases ↓ (2 PC, 1 AC) Request S-125 service from ECDIS with route + buffer polygon 	 Service transmits data near the route to ECDIS.+/ Service response]+/ Near route S-125: 3 cases+/ List and S-125 state flag of data registered by ECDIS are displayed on the screen.+/ 	ę.	□ Pass≠ □ Fail≠
TC-02-002₄3	Non-receiving test of S-125 dataset unrelated to route₽	Test target AtoN↔ [Near route]↔ - Marina Safe (PC)↔ [Out-of-route]↔ - Bedok (PC)↔ - NE Corridor (AC)↔ - SIS-05 (AC)↔ ↔ [Result of TC-02-001]↔ - <u>Near route S-125:</u> ↓ <u>4 cases</u> ↔	The test procedure of TC-02- 001 is performed identically according to the following conditions.4 4 [Create S-125] 4 - <u>Near route: 1 case (1 PC)</u> 4 - Out-of-route: 3 cases 4 (1 PC, 2 AC)4	 Service transmits data near the route to ECDIS. (Do not transmit out-of- route data). [Service response]. Added 1 case of S-125 near route to the result of TC-02-001. (<u>A cases in total)</u>. List and S-125 state flag of data registered by ECDIS are displayed on the screen 	E.	□ Pass≠ □ Fail≠

- 2. Request and receive S-125 before departure
 - 2-1. Receiving test of S-125 dataset in route + buffer
 - 2-2. Non-receiving test of S-125 dataset unrelated to route







• TC 3. Update S-124 while sailing

ID	Test Purpose.₀	Precondition .	Test Procedure.	Excepted Result.	Actual Result.	Pass/Fail₽
TC-03-001₊	Receiving test of new S-124 dataset in sailing¢	Test target AtoN+ [Near route]+ - SB 14+ [Out-of-route]+ - Mano 11A+ + [Result of TC-01-003]+ - <u>Near route S-124:</u> + <u>6 cases</u> + - Out-of-route S-124:+ 2 cases+	 Create data in AtoN Information Management System.4¹ [Create S-124]4¹ <u>Near route: 1 case</u>4¹ Out-of-route: 1 case4¹ Request S-124 service from ECDIS with route + buffer polygon.4² 	 Service transmits data near the route to ECDIS. (Do not transmit out-of- route data)+/ [Service response]+/ Added 1 case of S-124 near route to the result of TC-01-003+ (7 cases in total)+/ List and symbols of data registered by ECDIS are displayed on the screen.+/ 	¢3	□ Pass≠ □ Fail≠
TC-03-002₽	Receiving test of S- 124 cancellation dataset in sailing+	Test target AtoN↔ [Near route]↔ - Sisters↔ [Out-of-route]↔ - Forward↔ ↔ [Result of TC-03-001]↔ - <u>Near route S-124:↓</u> <u>7 cases</u> ↔ - Out-of-route S-124:↓ 3 cases↔	The test procedure of TC-03- 001 is performed identically according to the following conditions. [Create S-124 cancellation] - <u>Near route: 1 case</u> - Out-of-route: 1 case	 Service transmits data near the route to ECDIS. (Do not transmit out-of- route data) [Service response] Added 1 case of S-124 cancellation near route to the result of TC-03-001 (7 cases in total) List and symbols of data excluding data canceled by ECDIS are displayed on the screen 	4	□ Pass≠ □ Fail≠

3. Update S-124 while sailing

- 3-1. Receiving test of new S-124 dataset in sailing
- 3-2. Receiving test of S-124 cancellation dataset in sailing



TC4. Transit from S-124 to S-125 while sailing

ID	Test Purpose.	Precondition	Test Procedure.	Excepted Result.	Actual Result.	Pass/Fail∂
TC-04-001₊	Transition test from S- 124 dataset to S-125 dataset in sailing	Test target AtoN+ [Near Route]+ - SC1+ Perform TC-02-002+ Perform TC-03-002+	 In the AtoN information management system, Cancel one of the S-124 near the route of the TC- 03-002 result.+ (Create S-124 cancellation data)+ Create S-125 data for S- 124 cancellation in the AtoN information management system.+ Create S-124 cancellation and S-125]+ Near route: 1 case+ Request S-124 service from ECDIS with route + buffer polygon.+ Request S-125 service from ECDIS with route + buffer polygon.+ 	 Service transmits data near the route to ECDIS. (Do not transmit out-of- route data)+/ [Service response]+/ Added 1 case of S-124 cancellation near route to the result of TC-03-002+ (7 cases in total)+/ Added 1 case of S-125 near route to the result of TC-02-002+ (5 cases in total)+/ List and symbols of data excluding data canceled by ECDIS are displayed on the screen.+/ List and S-125 state flag of data registered by ECDIS are displayed on the screen.+/ 	ş	□ Pass≁ □ Fail≁

- 4. Transit from S-124 to S-125 while sailing
 - 4-1. Transition test from S-124 dataset to S-125 dataset in sailing





BLUEMAP SURESOFT

Pre-check and discussion of the service scenario





Set up the system and test the maritime comm network









TC2. Request and receive S-125 before departure



SINGAPORE



TC4. Transit from S-124 to S-125 while sailing



TC4. Transit from S-124 to S-125 while sailing



Screen recording movie





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Attendance of the Aton service sea trial



- Major results
 - Maritime communication network was good to test the service
 - Shore side system and Ship side system were operated well
 - Nav warn and Marine Aton service need to be improved
 - User system should provide interfaces to manage the nav warn and marine aton data
 - The symbol of navigational warnings and marine Aton should be improved based on the users feedback
 - Recommendation and guideline needs to be provided to produce the nav warn and marine Aton data
 - Logical process of issuing S-124/S-125 should be defined.



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Focused group workshop



- Discussion topics
 - Symbology of NAVWARN and AtoN status; are there improvements needed to the symbols defined? Maybe transparency in NAVWARN symbol, highlight in AtoN status information etc
 - Discussion for service providers; is a description of the system dependencies useful to highlight the interdependencies between a NAVWARN system and an AtoN information system?
 - Discussion for mariners; how often should system check for updates (e.g. is more often better or is for example every 8h enough?)



- Discussion topics
 - Discussion for mariners; user system GUI, how to present new information to user? What type of functions are needed to give user sufficient tools to discover changes and what they entail for situational awareness.
 - Cognitive load; NAVWARN service and AtoN information service are both intended to improve the visual information presentation to end users. This means they intend to lessen administrative burden in information updating, and by being shown on same screen as ENC, reduce cognitive load for the user versus considering information from different sources and mentally combine the information.



- The project would provide the AtoN authorities a chance to own their datasets (i.e. S-125)
- Authorities need to consider developing a central 5-201 database to support updating service and have it operationalized before January 2026.
- The protocols for sequencing and priority to send and display S-124 and S-125 needs to be further examined using Marine Resource Names for AtoN unique identity.
- The project also demonstrated a low barrier to entry. System requires only a simple cellular network connection for a wide spectrum of users onboard to adopt and benefit from these services.
- The research team will contribute the S-124/S-125/S-201 PS and Service specification development





