

AtoN Simulator

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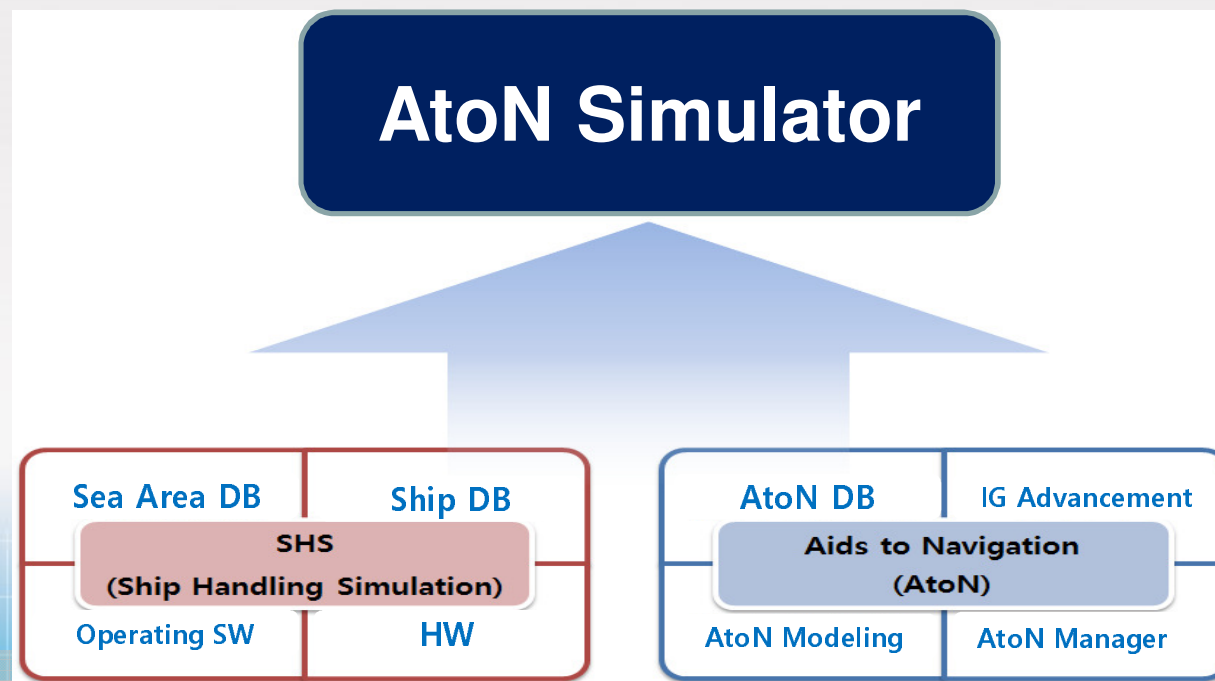
Korea Association of Aids to Navigation

Introduction of AtoN Simulator

Development Purpose of AtoN Simulator

- ◆ To assist the decision making for AtoN design and AtoN placement plan in consideration of the effects of topographical, environmental and maritime traffic characteristic of target navigation area

Configuration of AtoN Simulator



Configuration of AtoN Simulator

Simulator Room

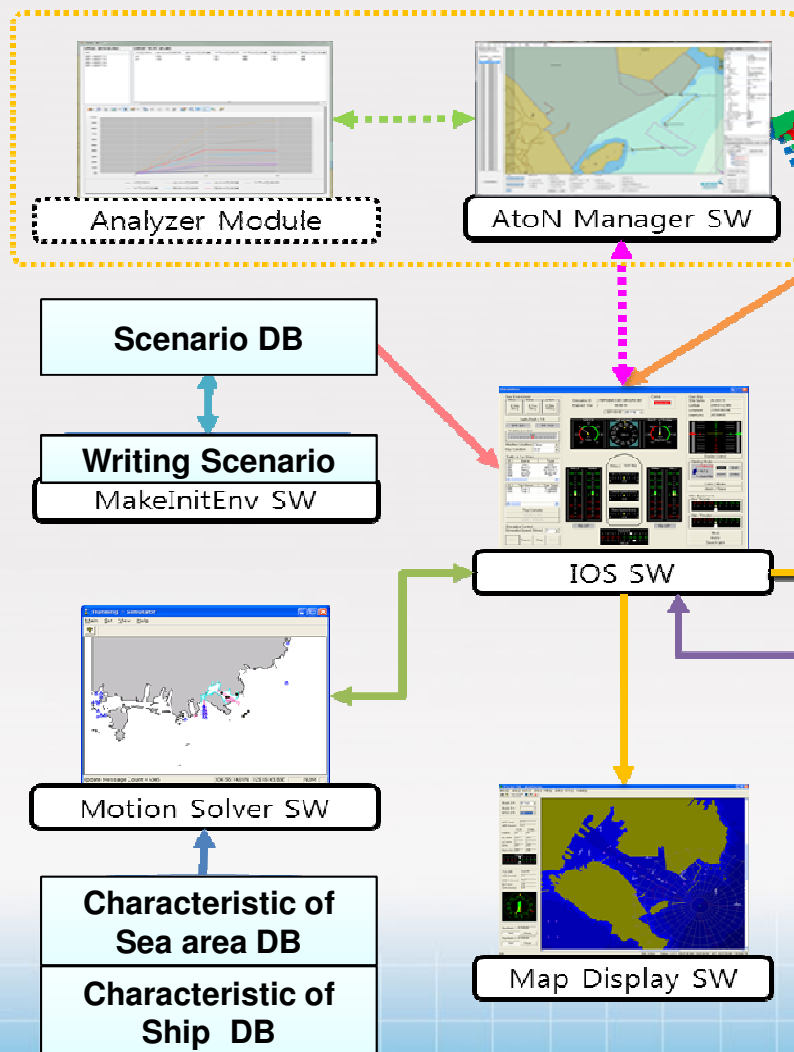


Operation Room

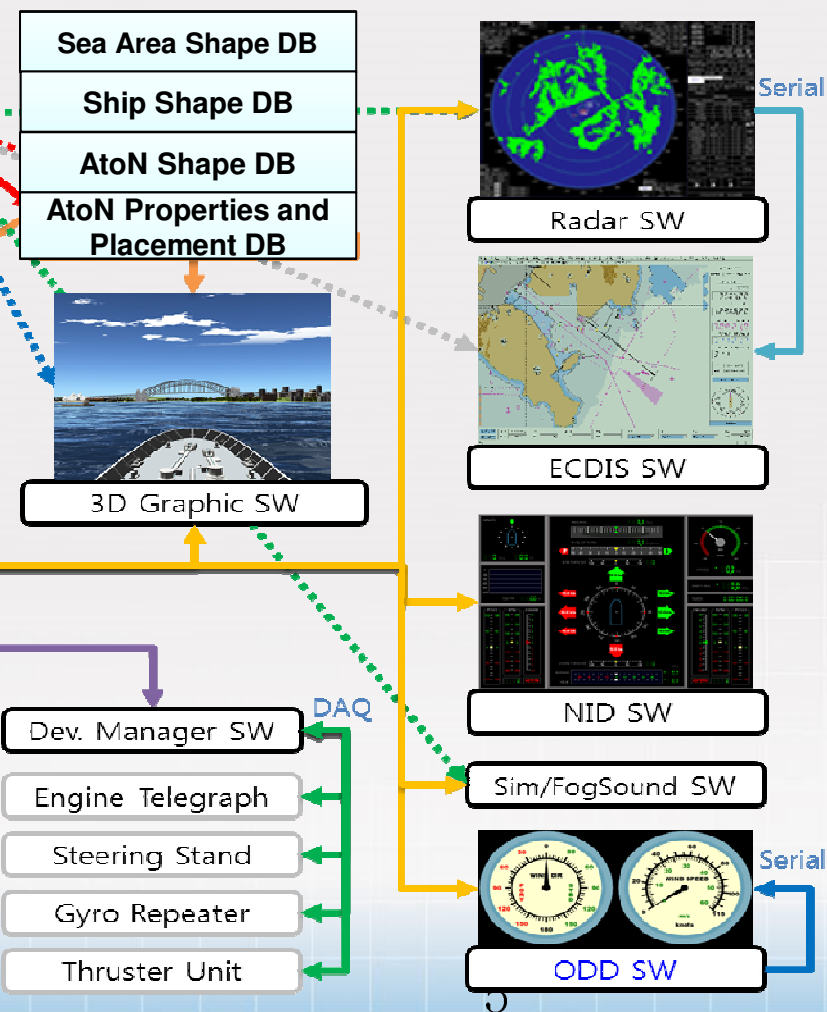


Configuration of AtoN Simulator_(sw)

The Function of AtoN Design and Operation



The Function of AtoN Verification and Training



Characteristics of AtoN Simulator

- ◆ Support function of add/delete/move/edit/search for AtoN
 - Available to simply add for copy function
- ◆ Placement and Management for AtoN
 - Display the state of AtoN such as existing, relocation using the symbol
 - Management of level such as project > scenario > layer
- ◆ Control properties of AtoN
 - Control of 19 kinds of AtoN properties based history card
 - Control of characteristics such as visibility distance
- ◆ Support virtual navigation
 - Setting the waypoint and linear movement
- ◆ Provide printing and report for scenarios

Differentiation Factor of AtoN Simulator

- ◆ Differentiation Design and built to Ship handling simulator
- ◆ Support to various kind of AtoN
 - Support 19 kinds of AtoN
- ◆ Precision Improvement for shape Database of AtoN
 - Visualization Properties Modelling for various components(top mark, lantern)
 - Support 3D Shape Database for a variety of AtoN
- ◆ Introduction Database of systematic AtoN Properties and Placement
 - Formulation systematic structure for the AtoN properties and placement for easy management
 - Construct AtoN Motion Characteristics and Quantify table

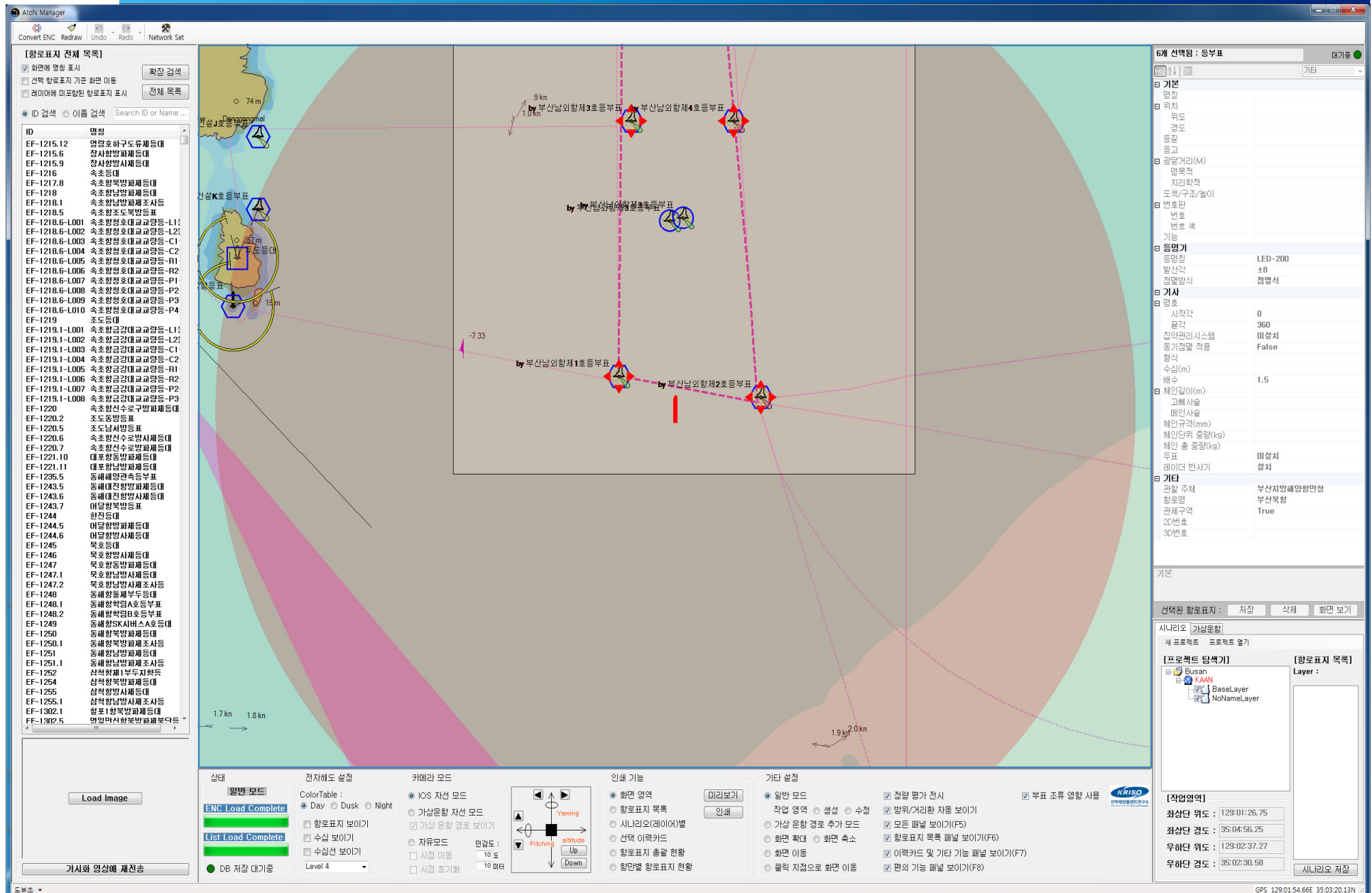
Differentiation Factor of AtoN Simulator

- ◆ Improvement accuracy of Sea Shape Modelling
 - Modelling and Control of the Current for Sea Area
- ◆ Support Software for AtoN Placement
 - Writing and Management of Unique History Card for Type of AtoN
 - Placement and Management of AtoN based on ENC
 - Real-time Control of AtoN Properties
 - Display and Management for AtoN Status(Existing, Expansion, Relocation, Revocation, Virtual)
- ◆ Application AtoN Placing Quantification Algorithm
 - Feedback Placement Quantified Score for Location-based on Placement scenarios
- ◆ Improvement Accuracy of Reproduction for AtoN Motion

Main Function of Management Software

- ◆ Support various types of AtoN
- ◆ Implementing enhanced AtoN shape through construction database
- ◆ Support detailed AtoN properties through construction database
- ◆ Sea area modeling(day&night, background light, tidal current)
- ◆ Development of software for AtoN placement
- ◆ Development of AtoN visibility quantification module
- ◆ Implement AtoN motion characteristics

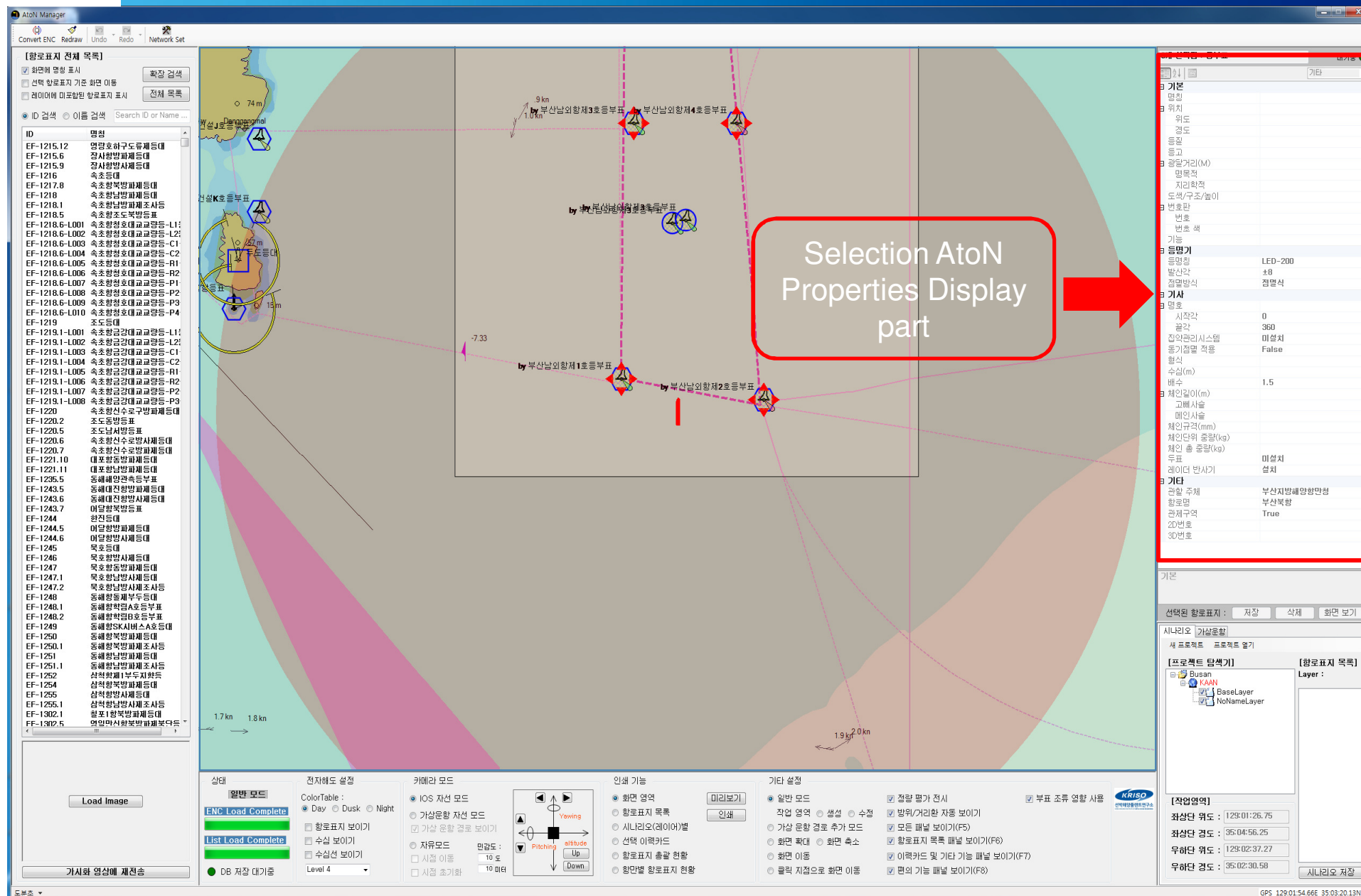
AtoN Manager Software



The screenshot displays the AtoN Manager software interface, which is used for managing navigational aids (AtoN). The main window shows a map of a coastal area with various navigational aids (buoys, lights) plotted. The interface is divided into several panels:

- Left Panel:** Contains a list of AtoN objects with their IDs and names. The list includes items like "EF-1215.12", "EF-1215.6", "EF-1215.9", "EF-1216", "EF-1217.8", "EF-1218", "EF-1218.1", "EF-1218.5", "EF-1218.6-L001", "EF-1218.6-L002", "EF-1218.6-L003", "EF-1218.6-L004", "EF-1218.6-L005", "EF-1218.6-L006", "EF-1218.6-L007", "EF-1218.6-L008", "EF-1218.6-L009", "EF-1218.6-L010", "EF-1219", "EF-1219.1-L001", "EF-1219.1-L002", "EF-1219.1-L003", "EF-1219.1-L004", "EF-1219.1-L005", "EF-1219.1-L006", "EF-1219.1-L007", "EF-1219.1-L008", "EF-1220", "EF-1220.2", "EF-1220.5", "EF-1220.6", "EF-1220.7", "EF-1221.10", "EF-1221.11", "EF-1235.5", "EF-1243.5", "EF-1243.6", "EF-1243.7", "EF-1244", "EF-1244.5", "EF-1244.6", "EF-1245", "EF-1246", "EF-1247", "EF-1247.1", "EF-1247.2", "EF-1248", "EF-1248.1", "EF-1248.2", "EF-1249", "EF-1250", "EF-1250.1", "EF-1251", "EF-1251.1", "EF-1252", "EF-1254", "EF-1255", "EF-1302.1", "EF-1302.5".
- Top Panel:** Contains buttons for "Convert ENC", "Redraw", "Undo", "Redo", and "Network Set".
- Right Panel:** Contains a table for "6개 선택됨: 등부표" (6 selected: buoy) with columns for "기본" (Basic) and "기타" (Other). The table lists various properties of the selected buoy, including "LED-200", "발산각" (Emission angle), "점멸방식" (Flashing mode), "시각각" (Visual angle), "광각" (Beam width), "진각관리시스템" (Heading management system), "동기점멸 적용" (Synchronized flashing application), "형식" (Form), "수심(m)" (Depth), "배수" (Multiplier), "체인길이(m)" (Chain length), "고베사슬" (High beam), "메인사슬" (Main beam), "체인단위 중량(kg)" (Chain unit weight), "체인 총 중량(kg)" (Chain total weight), "두께" (Thickness), "레이더 반사기" (Radar reflector), "관할 주체" (Authority), "항로명" (Route name), "관제구역" (Control area), "2D번호" (2D number), and "3D번호" (3D number).
- Bottom Panel:** Contains various settings and controls, including "상태" (Status), "전지해도 설정" (Electronic chart setting), "카메라 모드" (Camera mode), "인쇄 기능" (Print function), "기타 설정" (Other settings), and "작업영역" (Working area).

AtoN Manager Software



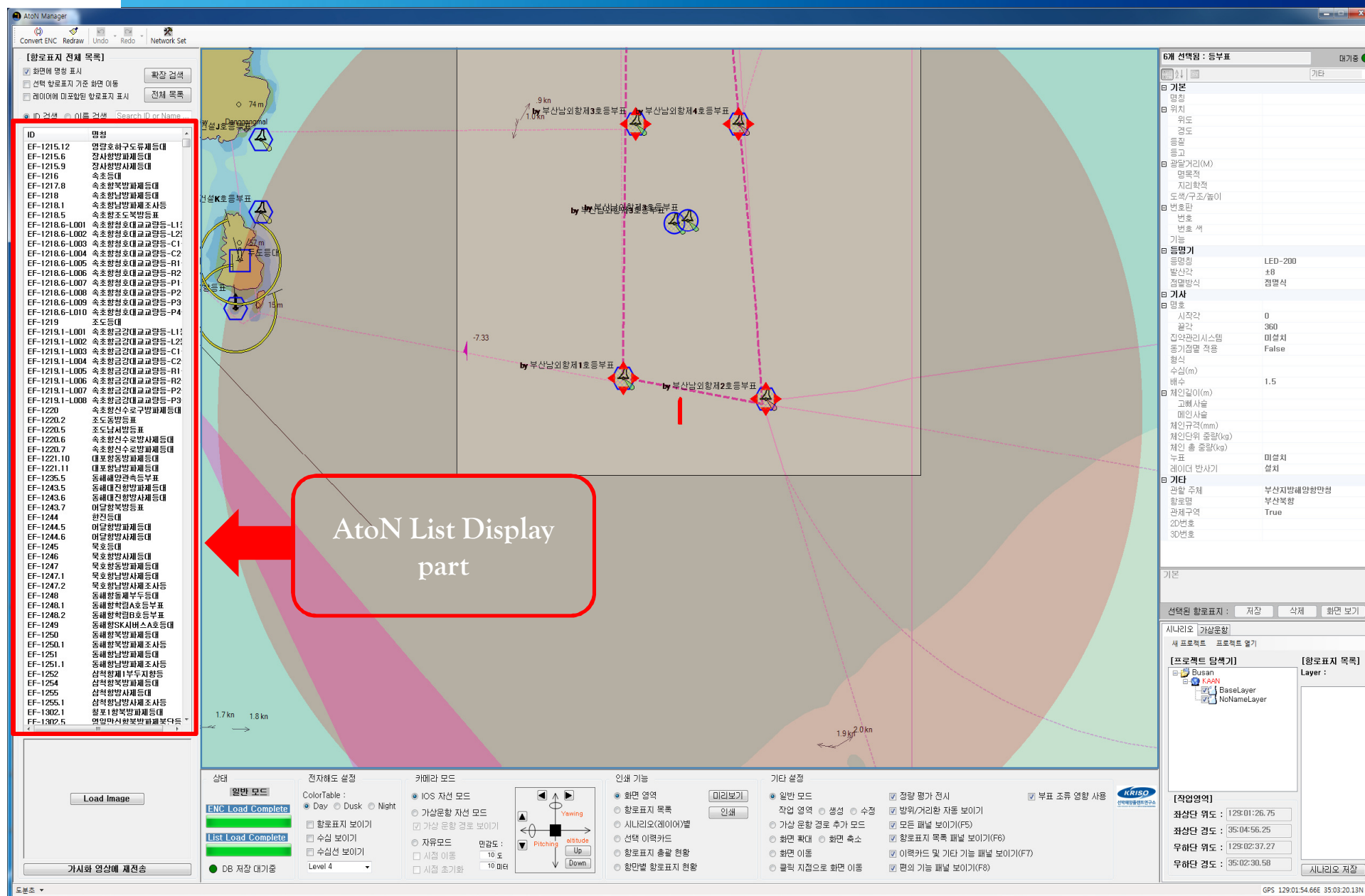
The screenshot displays the AtoN Manager Software interface. The main window shows a map with various AtoN objects (buoys, lights, etc.) plotted. A red box highlights the 'Selection AtoN Properties Display part' on the right side of the map. A red arrow points from this box to a detailed view of the properties display window on the far right.

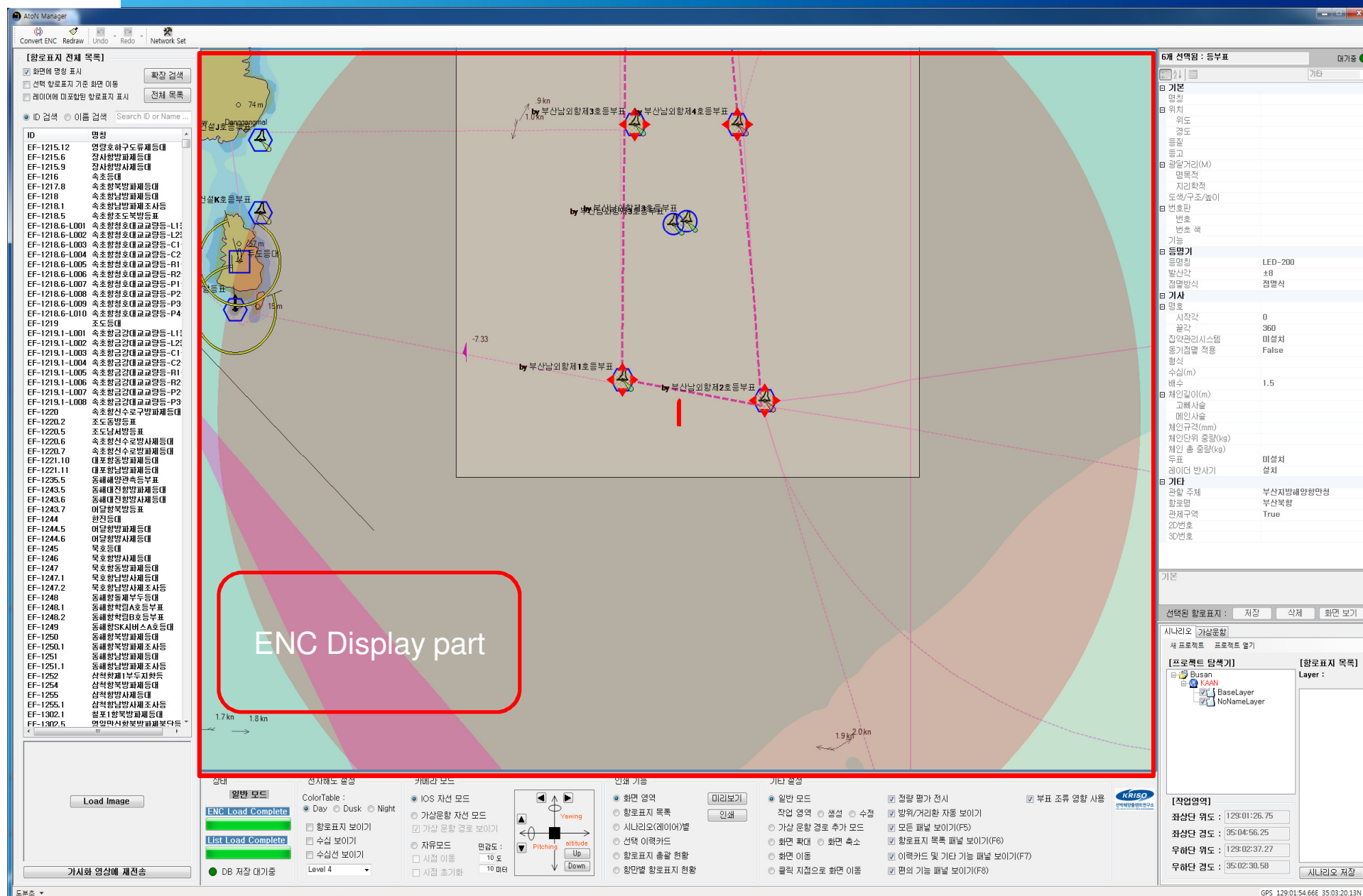
Selection AtoN Properties Display part

The properties display window shows the following information:

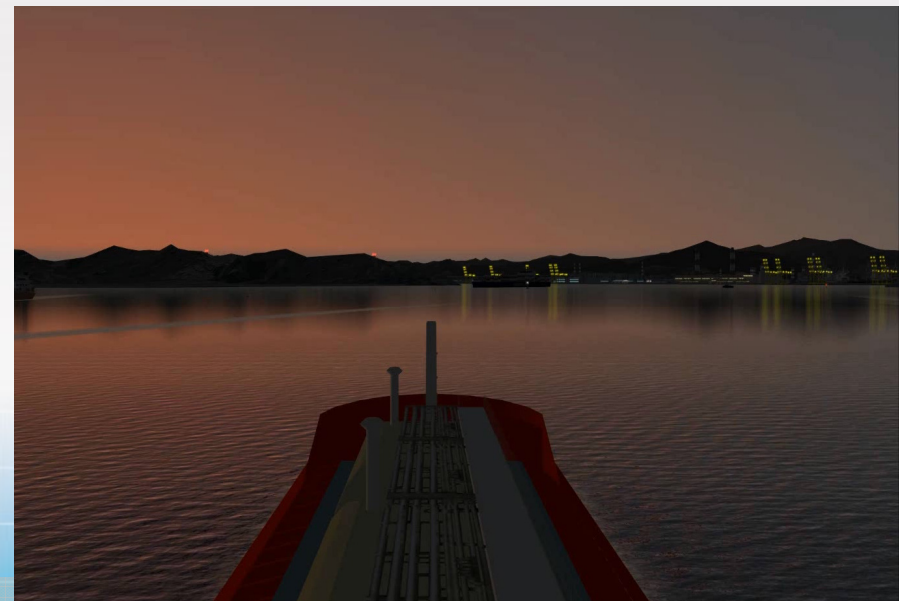
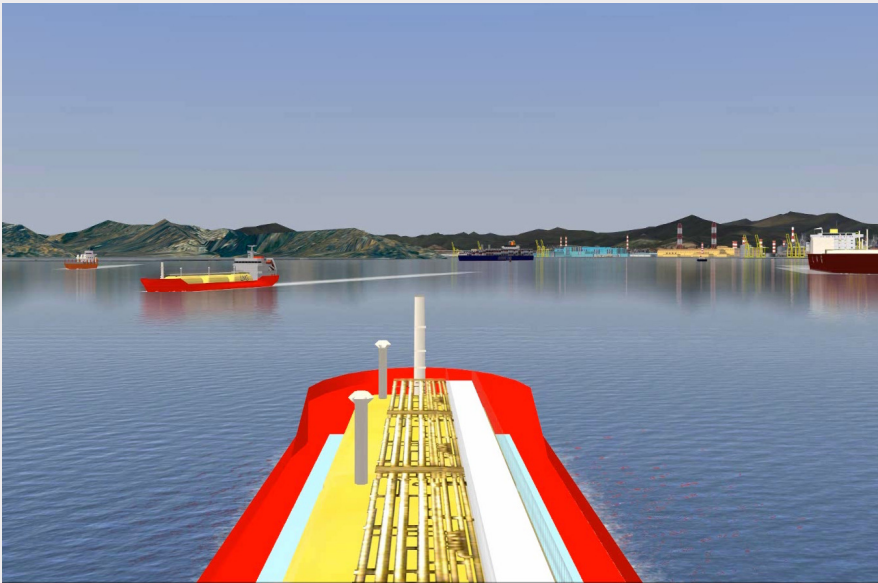
- 기본 (Basic):**
 - 명칭 (Name):
 - 위치 (Location):
 - 경도 (Longitude):
 - 도착 (Arrival):
 - 정지거리(M) (Stopping Distance (M)):
 - 명목적 (Nominal):
 - 지반확적 (Ground Clearance):
 - 도색/구조/높이 (Painting/Structure/Height):
 - 번호판 (License Plate):
 - 번호 (Number):
 - 번호 색 (Number Color):
 - 기능 (Function):
- 등명기 (Lighting):**
- 등명 (Lighting):**
 - 등명 (Lighting): LED-200
 - 발산각 (Beam Angle): 48
 - 점멸방식 (Flashing Mode): 점멸식 (Flashing)
- 기타 (Other):**
- 알호 (Alarms):**
 - 시각각 (Visual Angle): 0
 - 공간 (Space): 360
 - 신호관리시스템 (Signal Management System): 미설치 (Not Installed)
 - 동기점멸 적용 (Synchronous Flashing Application): False
 - 원시 (Original):
 - 수심(m) (Depth (m)): 1.5
 - 배수 (Drainage):
 - 재인길이(m) (Re-entry Length (m)):
 - 고배사출 (High Discharge):
 - 메인사출 (Main Discharge):
 - 채인규격(mm) (Chain Specification (mm)):
 - 채인단위 중량(kg) (Chain Unit Weight (kg)):
 - 채인 총 중량(kg) (Chain Total Weight (kg)):
 - 두표 (Two-Point): 미설치 (Not Installed)
 - 레이더 반사기 (Radar Reflector): 설치 (Installed)
- 기타 (Other):**
 - 관할 주체 (Jurisdiction): 부산지방해양수산청 (Busan Maritime and Fisheries Agency)
 - 항로명 (Route Name): 부산북항 (Busan North Port)
 - 관제구역 (Control Area): True
 - 2D번호 (2D Number):
 - 3D번호 (3D Number):

The bottom of the interface shows various settings and controls, including a 'Load Image' button, a '가시와 영상에 재전송' (Reload to Visibility and Video) button, and a 'GPS 129.01.54.66E 35.03.20.13N' status bar.





Real time Control to Environmental factor



Real time Change of AtoN Properties

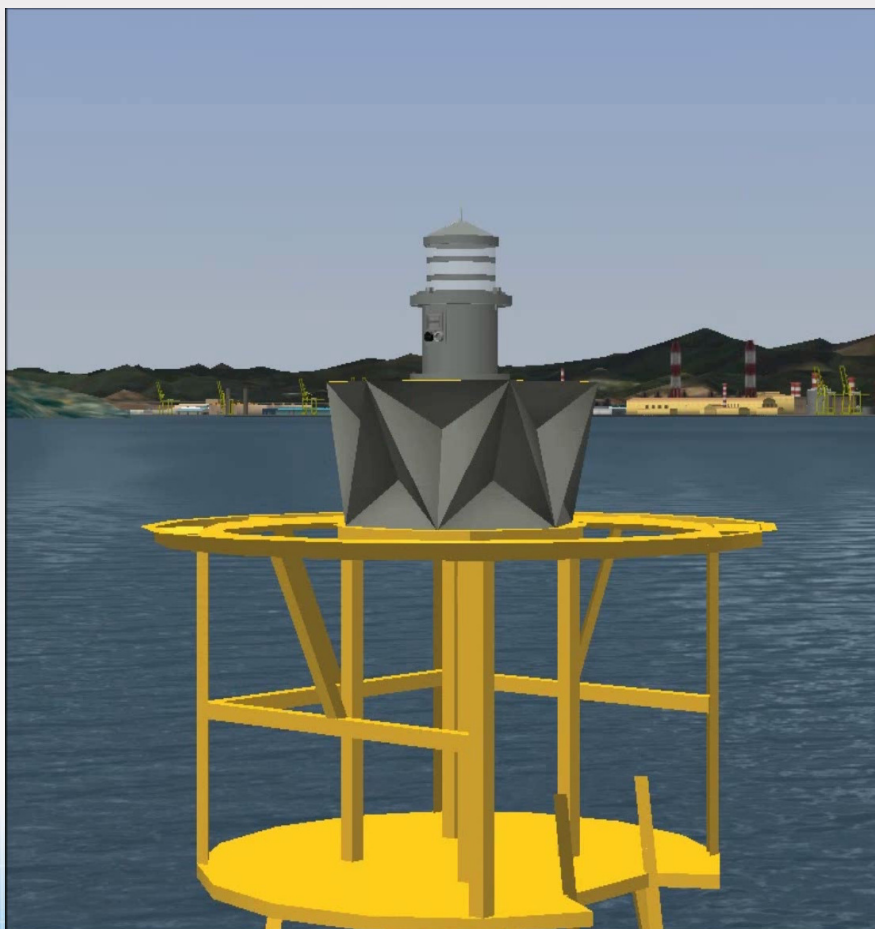
AtoN Function



광달거리(M)	7, 9.58700727241066
명목적	7
지리학적	9.58700727241066
도색/구조/높이	항 망대형 9.415
번호판	
번호	
번호 색	
기능	특수표지
등명기	
등명칭	LED-200
발산각	±8
점멸방식	점멸식
가사	
명호	0° ~ 360°
시작각	0
끝각	360
레이콘 설치 유무	미설치
해상 기상신호표지 설치 유	미설치
AtoN AIS 설치 유무	미설치
집약관리시스템	미설치
동기점멸 적용	False
형식	LL-26(M)
수심(m)	21.5
배수	1.5
체인길이(m)	총 길이 42.25m
고베사슬	10
메인사슬	32.25
체인규격(mm)	38
체인단위 중량(kg)	31.62
체인 총 중량(kg)	1335.94
두표	미설치

Real time Change of AtoN Properties

Lantern Type



▣ 광달거리(M)	7, 9.58700727241066
명목적	7
지리학적	9.58700727241066
도색/구조/높이	황 망대형 9.415
▣ 번호판	
번호	
번호 색	
기능	특수표지
▣ 등명기	
등명칭	LED-20
발산각	±8
점멸방식	점멸식
▣ 기사	
▣ 명호	0° ~ 360°
시작각	0
끝각	360
레이콘 설치 유무	미설치
해상 기상신호표지 설치 유	미설치
AtoN AIS 설치 유무	미설치
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체인 총 중량(kg)	1335.94
두표	미설치
레이더 반사기	설치

Real time Change of AtoN Properties

AtoN Type



□ 광달거리(M)	7, 9.58700727241066
명목적	7
지리학적	9.58700727241066
도색/구조/높이	황 망대형 9.415
□ 번호판	
번호	
번호 색	
기능	특수표지
□ 등명기	
등명칭	LED-200
발산각	±8
점멸방식	점멸식
□ 기사	
□ 명호	0° ~ 360°
시작각	0
끝각	360
레이콘 설치 유무	미설치
해상 기상신호표지 설치 유	미설치
AtoN AIS 설치 유무	미설치
집약관리시스템	미설치
동기점멸 적용	False
형식	LL-26(M)
수심(m)	21.5
배수	1.5
□ 체인길이(m)	총 길이 42.25m
고배사슬	10
메인사슬	32.25
체인규격(mm)	38
체인단위 중량(kg)	31.62
체인 총 중량(kg)	1335.94
두표	미설치
레이더 반사기	설치

Real time Change of AtoN Properties

Light color

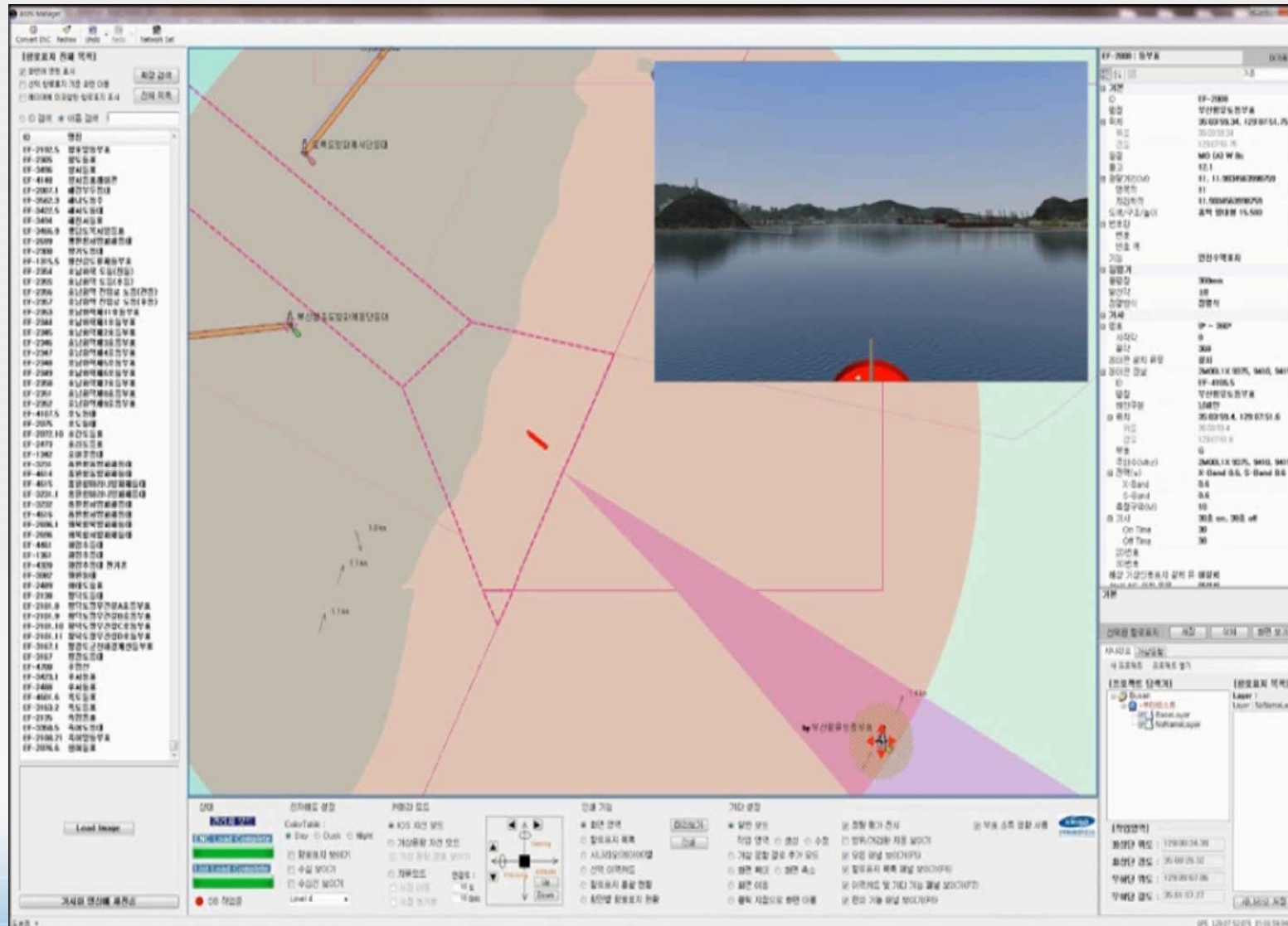
등질 주기 참고표 :

등질 : FL (3) R 7s

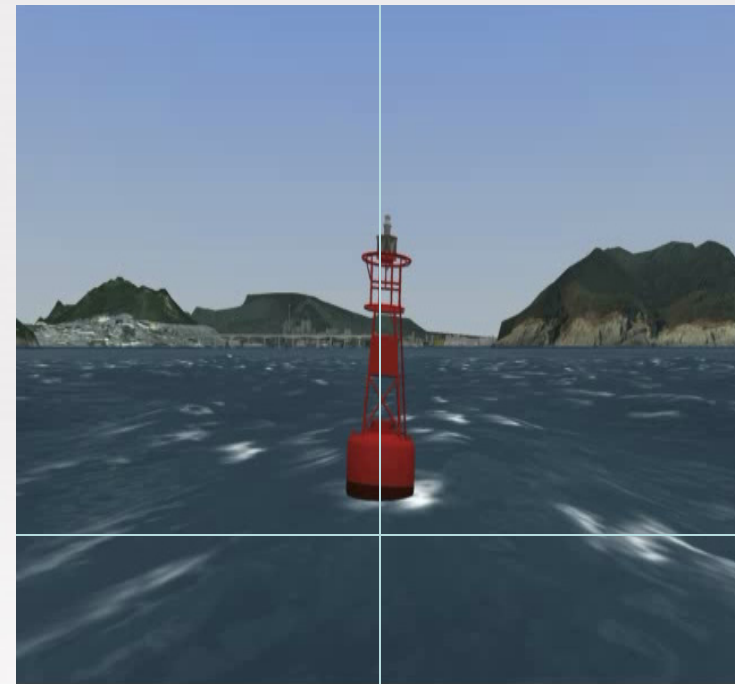
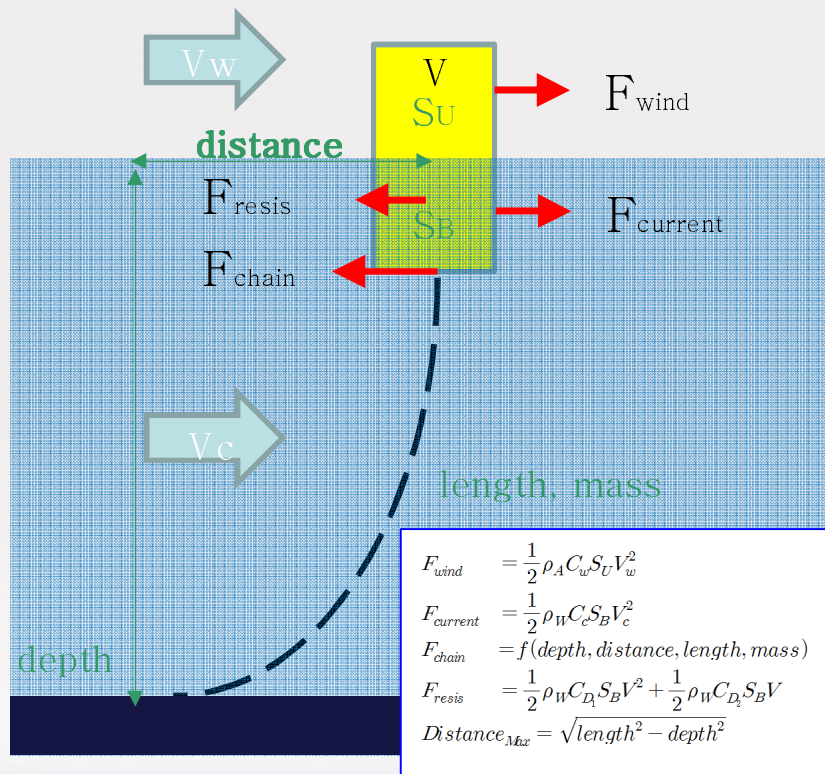
번호	등질기호	ON1	OFF1	ON2	OFF2	ON3	OFF3	ON4	OFF4	ON5	OFF5	ON6	OFF6	ON7	OFF7	ON8	OFF8	ON9	OFF9
59	FL (2) 4S	0.50	1.00	0.50	2.00														
60	FL (2) 4.5S	0.30	1.00	0.30	2.90														
61	FL (2) 4.5S	0.40	1.00	0.40	2.70														
62	FL (2) 4.5S	0.50	1.00	0.50	2.50														
63	FL (2) 5S	0.20	0.80	0.20	3.80														
64	FL (2) 5S	0.40	0.60	0.40	3.60														
65	FL (2) 5S	0.50	0.50	0.50	3.50														
66	FL (2) 5S	1.00	1.00	1.00	2.00														
67	FL (2) 5.5S	0.40	1.40	0.40	3.30														
68	FL (2) 6S	0.30	1.00	0.30	4.40														
69	FL (2) 6S	0.40	1.00	0.40	4.20														
70	FL (2) 6S	0.50	0.50	0.50	4.50														
71	FL (2) 6S	0.80	1.20	0.80	3.20														
72	FL (2) 6S	1.00	1.00	1.00	3.00														
73	FL (2) 7S	1.00	1.00	1.00	4.00														
74	FL (2) 8S	0.40	1.00	0.40	6.20														
75	FL (2) 8S	0.50	1.00	0.50	6.00														
76	FL (2) 8S	1.00	1.00	1.00	5.00														
77	FL (2) 10S	0.50	0.50	0.50	8.50														
78	FL (2) 10S	0.50	2.00	0.50	7.00														
79	FL (2) 10S	0.50	1.00	0.50	8.00														
80	FL (2) 10S	0.50	1.50	0.50	7.50														
81	FL (2) 10S	0.80	1.20	0.80	7.20														
82	FL (2) 10S	1.00	1.00	1.00	7.00														
83	FL (2) 10S	1.00	2.00	1.00	6.00														
84	FL (2) 12S	0.50	1.00	0.50	10.00														
85	FL (2) 12S	1.00	1.00	1.00	9.00														



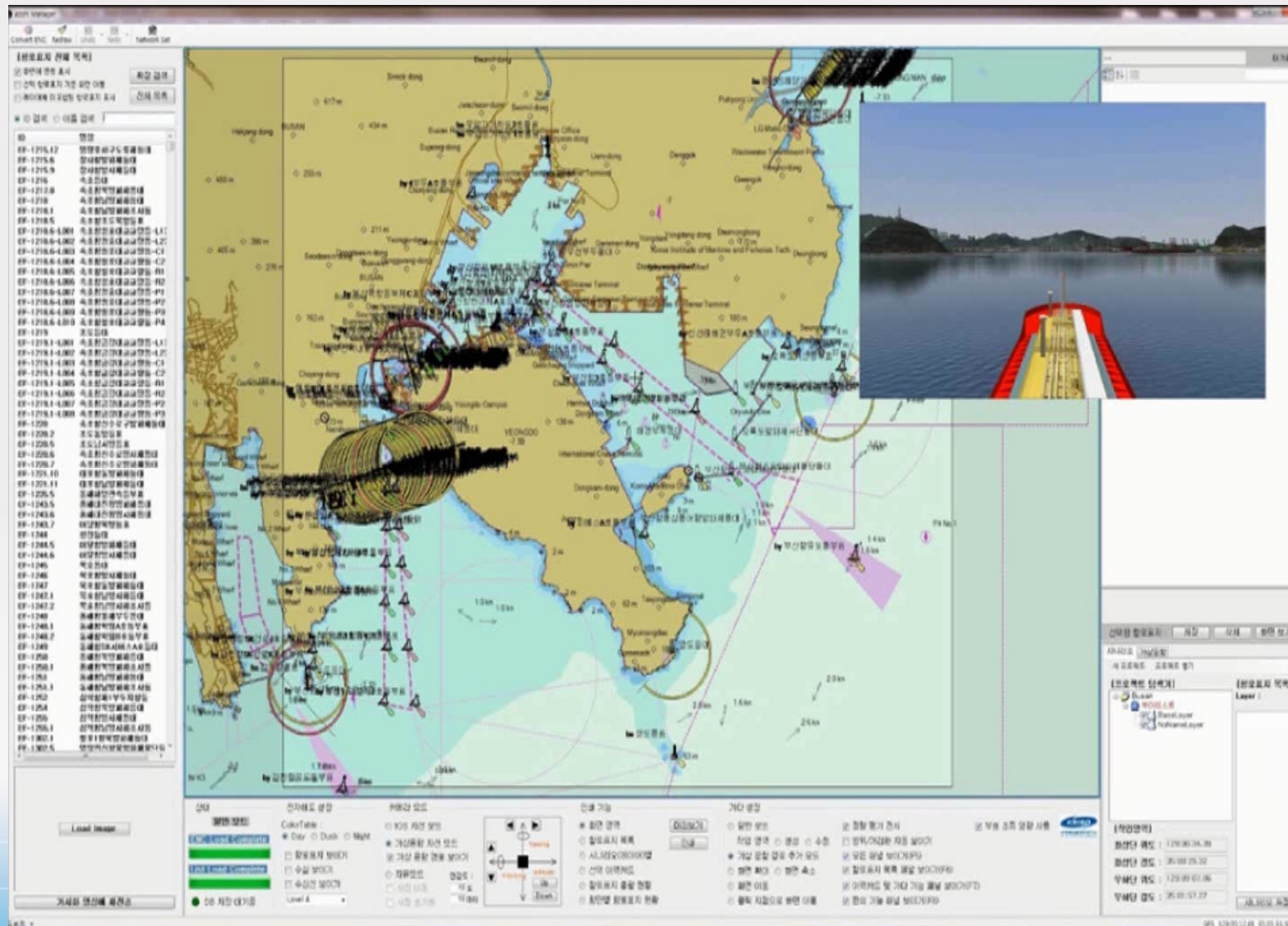
Control of AtoN Properties using AtoN Manager



Motion Characteristic of Buoys



Evaluation of AtoN Placement with AtoN Manager



Proposal Draft IALA Guideline on Operation and Management for AtoN Simulator

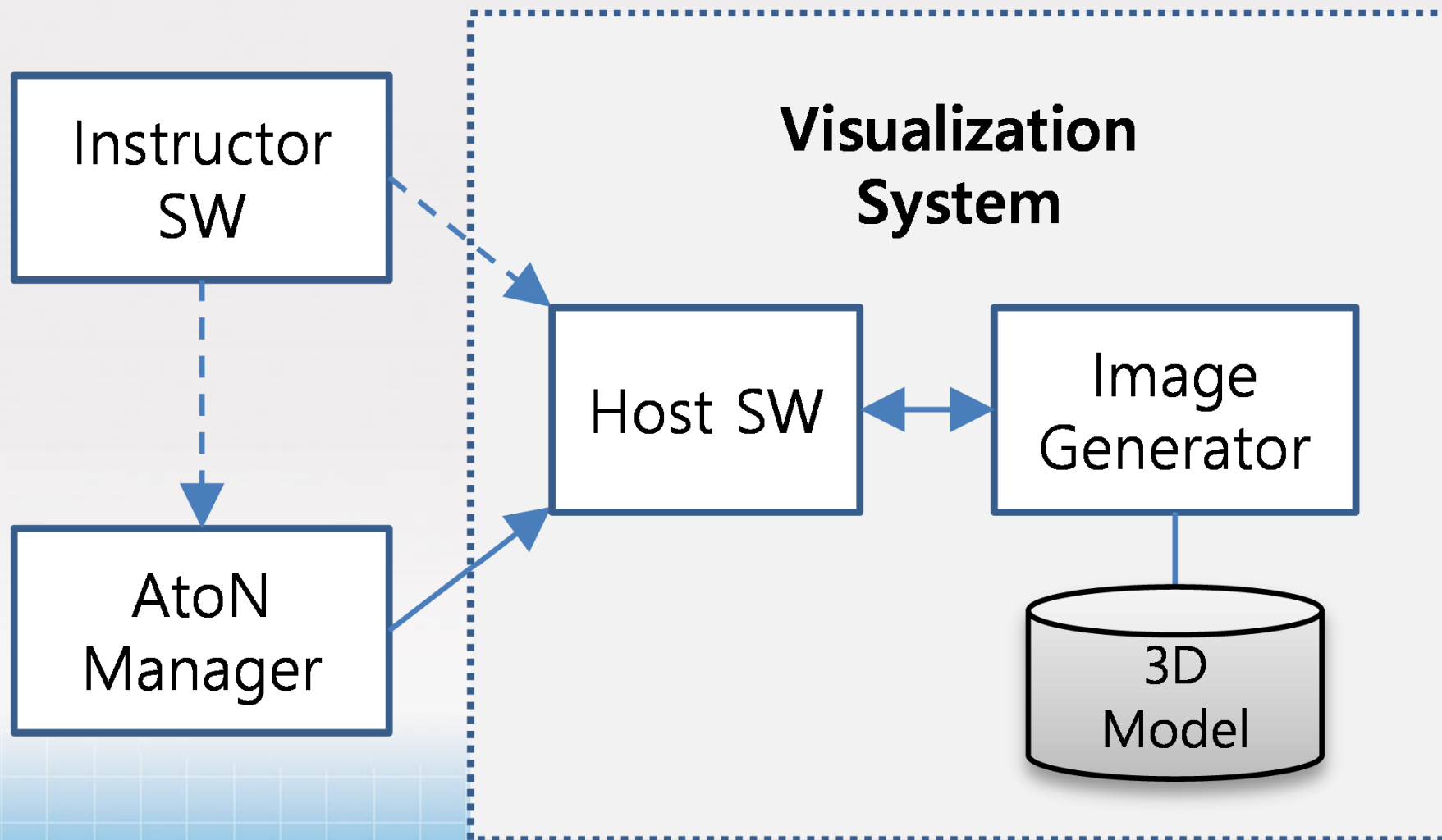
Contents

- ◆ Definitions
- ◆ System Configuration
- ◆ AtoN Modelling
- ◆ Operation factor for Simulation
- ◆ Operation Performance
- ◆ Failure Management
- ◆ Backup Management
- ◆ AtoN Placing Adequacy Module Technology
- ◆ Requirements for Analysis, Reporting and Documentation

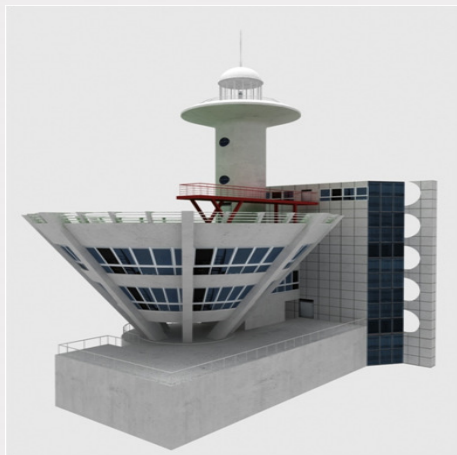
System Configuration

Division	Operation Room	Simulator Room
Function	<ul style="list-style-type: none"> Control and operation simulator 	<ul style="list-style-type: none"> Visualization verification and training space AtoN placing adequacy verification AtoN functions adequacy verification
S/W	<ul style="list-style-type: none"> AtoN Manager 3D images software IOS and Motion Solver 	<ul style="list-style-type: none"> Radar and ECDIS linkage SW Fog signal audio linkage SW
H/W	<ul style="list-style-type: none"> Operation console 5 Channel visualization display(5 EA) AtoN Manager monitor(1 EA) Simulator operation PC(3 EA) 	<ul style="list-style-type: none"> Visibility reproduction system: screen, beam projector(5 EA) Ship control room(bridge) Sailing equipment: steering wheel, engine controllers, radar, ECDIS, etc.

AtoN Modelling



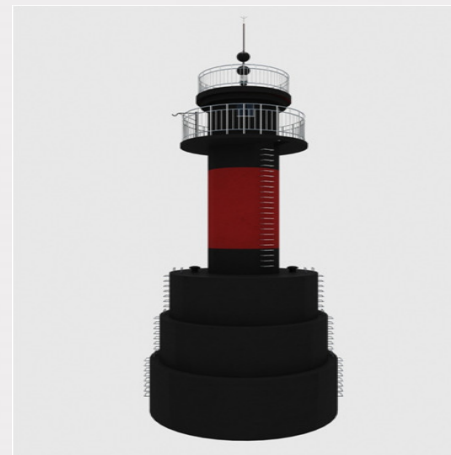
AtoN 3D Modelling



<Manned Lighthouse>



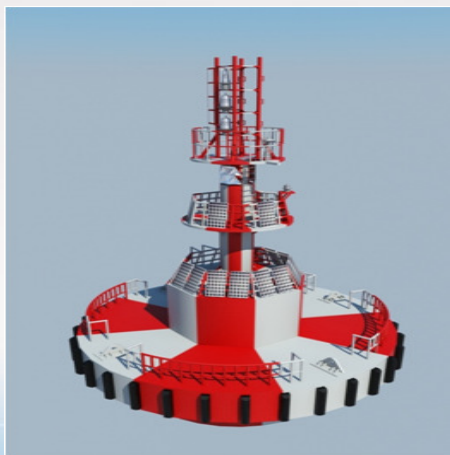
<Unmanned Lighthouse>



<Beacon>



<Light Staff>



<LANBY>

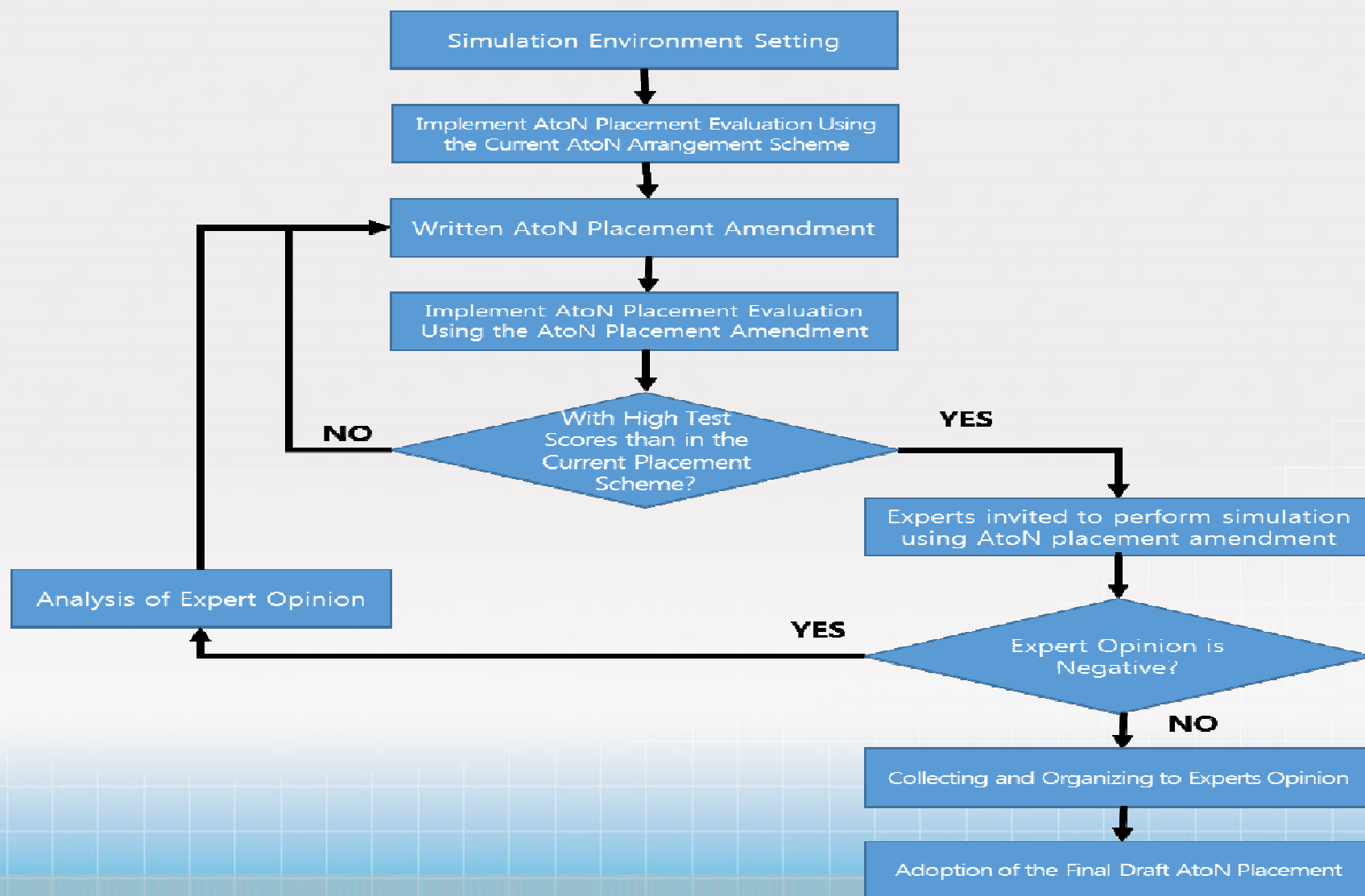


<Light Buoy>

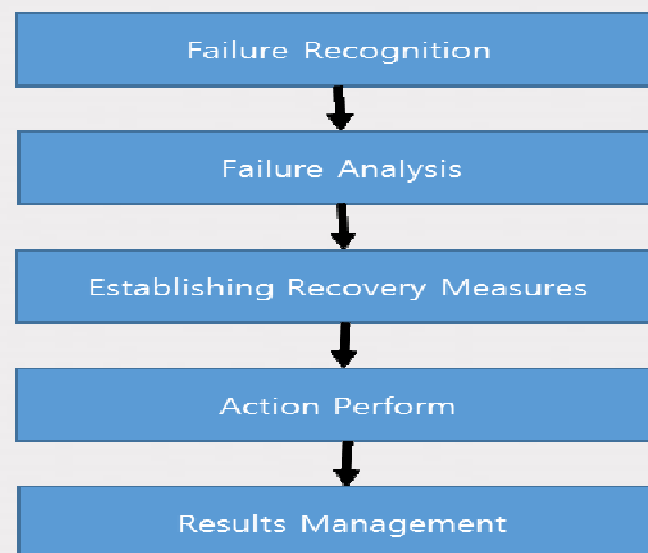
Operation factors for Simulation

- ◆ The Range of Sea Area for Simulation
- ◆ Environmental Conditions of the Sea Area
- ◆ The Main Passage of Vessels and Traffic volume of Seaway
- ◆ Determining Environmental Simulation Setting
- ◆ AtoN Placement Status of Sea Area for Simulate
- ◆ Description to result of AtoN Place Adequacy Evaluation

Operation Performance



Failure Management for AtoN Simulator

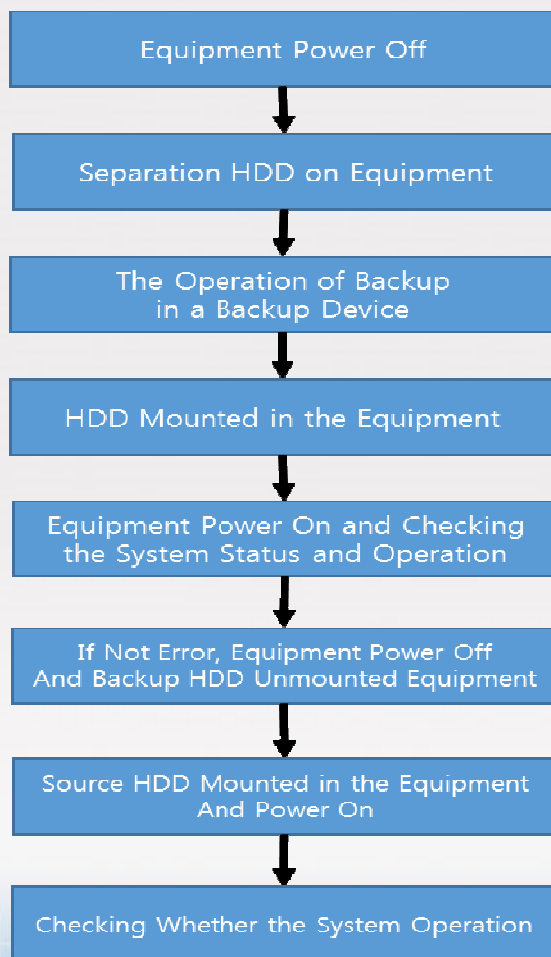


Division	Procedure Description
Failure Recognition	<ul style="list-style-type: none"> • This step is checking the failure condition through the simulator operation.
Failure Analysis	<ul style="list-style-type: none"> • This step is determine to occurring failure circumstances and causes.
Establishing Recovery Measures	<ul style="list-style-type: none"> • This step is collecting a similar failure cases and establishing failure recovery measures by notifying the appropriate person.
Action Perform	<ul style="list-style-type: none"> • This step is performing failure recovery action based on recovery measures.
Results Management	<ul style="list-style-type: none"> • This step is writing a failure management notes failure recovery and future measure

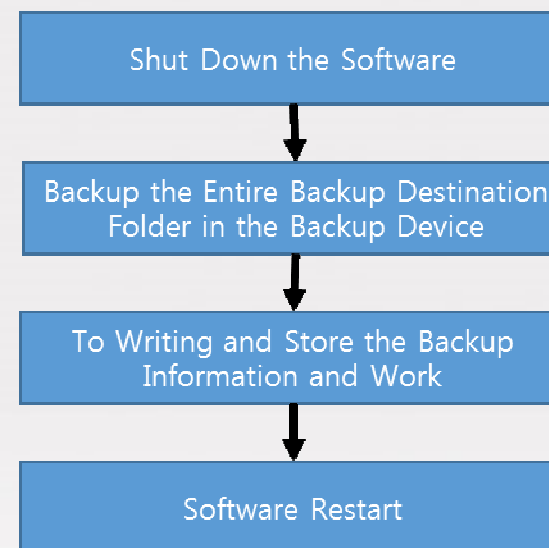
Backup Management

Equipment	Target	Backup Contents	Cycle
AtoN Manager PC	. The whole system of AtoN Manager PC	Full system	1 time / 1 month When system changes
IOS PC	. The whole system of IOS PC		
IG Server(5 EA)	. The whole system of IG Server		
Motion Solver PC	. The whole system of Motion Solver PC		
RADAR PC(2 EA)	. The whole system of RADAR PC		
NID PC	. The whole system of NID PC		
ECDIS PC	. The whole system of ECDIS PC		
ODD PC	. The whole system of ODD PC		
AtoN Manager PC	. AtoN properties database	Database	1 time / 1 month When content changes
IOS PC	. Ship motion characteristics database		
	. Scenario database		
	. Simulation results file		
IG Server(5 EA)	. Modeling and 'scd' file		
Motion Solver PC	. Motion Solver SW		
	. Host SW		
RADAR PC(2 EA)	. RADAR_host		
AtoN Database	. AtoN database for each intendance		

Backup Procedure

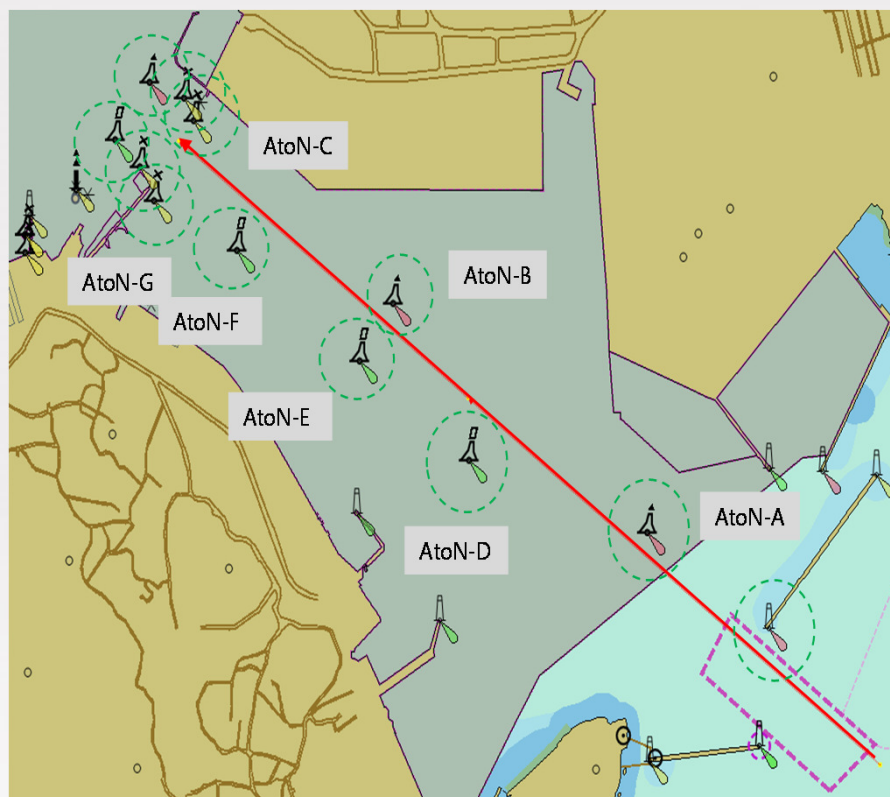


<System Backup Procedure>

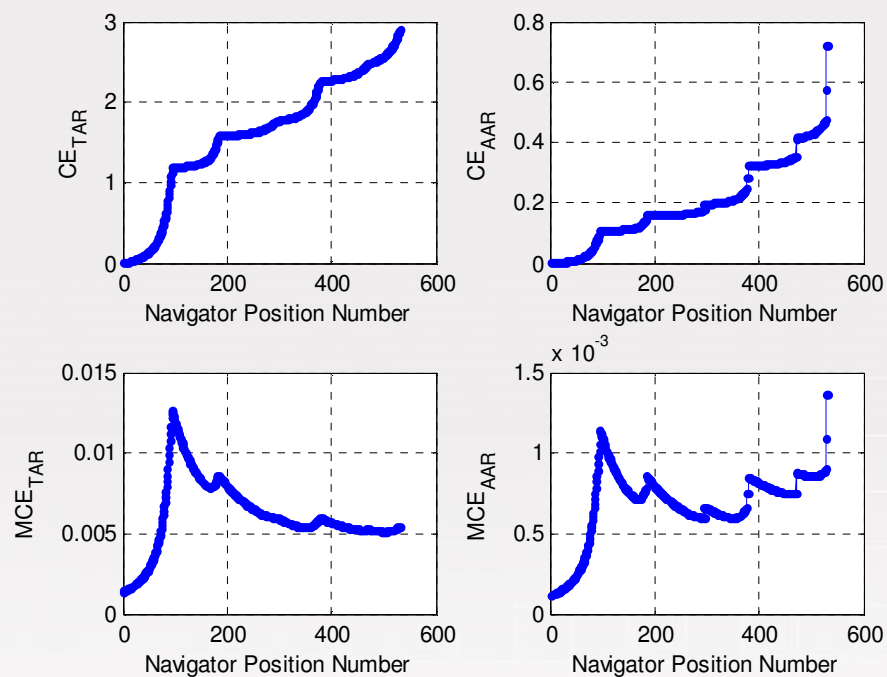


<Database Backup Procedure>

AtoN Placement Adequacy Module Technology



<Selected AtoN Placement at Busan Port(Korea)>



<Performance Measure of AtoN Placement>

Requirement for Analysis, Reporting and Documentation

- ◆ Purpose of Simulation
- ◆ Description Using Ship in the Simulation
- ◆ Description Simulator Environment Setting(Wind, Current, Wave)
- ◆ AtoN Properties Data
- ◆ Expert Opinion on the Current AtoN Placement Schema and Amendment
- ◆ Description to Result of AtoN Placing Adequacy

Thank you very much
for your attention!

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