Introduction to the National R&D Project for the Development of Korea Autonomous Ships

Korea Autonomous Surface Ship Project Office

산업통상자원부
Ministry of Trade, Industry and Energy

해양수산부
Ministry of Oceans and Fisheries

Project Overview

Project Name

Development of Key Technology for Autonomous Ships

Funding

Ministry of Trade, Industry and Energy, Ministry of Oceans and Fisheries

Period

2020~2025 (6 years, 1~4y development, 5~6y operation&verification)

Budget

Total 160.3Bn KRW (Gov't 119.7Bn, local Gov't 4.5Bn, Corp. 36.1Bn)

Goals

MASS Key Tech.[1] Development and Verification for Commercialization[2]

1) Key Technologies:
① Intelligent Navigation System
② Autonomous Engine System
③ Sea Test-bed & Validation Technology
④ Operation Techniques and Standardization

2) Commercialization: Medium sized MASS for International Voyage
(Ocean IMO Level3, Coastal IMO Level2)

* 2 Main(Management) Projects and 4 Main Tech., 13 Sub-projects (51 participating organizations)

Project Overview

Goals for Project

Vision of KASS Project

Vision — Taking the lead on future market share and international standards by developing technologies for the autonomous ships

Autonomous navigation systems Level 2(coastal) & 3(Ocean)	Global level reliability(99.9%) & standardizations(36cases) (IACS cert. / cyber security CS2 level)	Autonomous ship Leading on market share

National R&D project
(2020~2025)

Operation techniques
& Standardization
(3 Sub-project)

**Intelligent navigation system
(3 Sub-project)**

**Autonomous engine system
(2 Sub-project)**

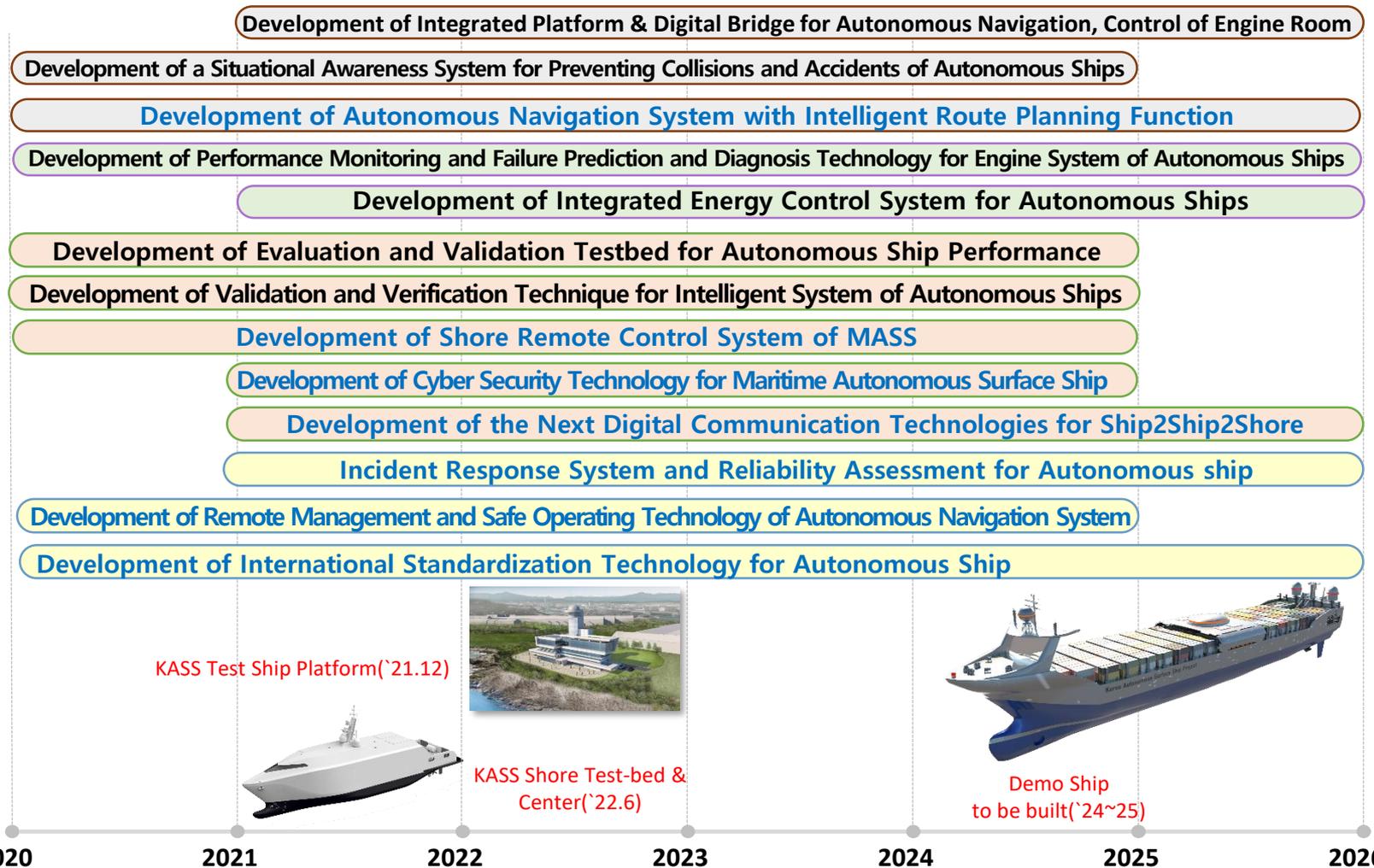**Sea Test-bed & Validation
(5 Sub-project)**

Goals for Project

◉ Core Technologies and Development Plan

1. Autonomous Navigation System

- Development of Integrated Platform & Digital Bridge for Autonomous Navigation, Control of Engine Room
- Development of a Situational Awareness System for Preventing Collisions and Accidents of Autonomous Ships
- Development of Autonomous Navigation System with Intelligent Route Planning Function

2. Autonomous Engine System

- Development of Performance Monitoring and Failure Prediction and Diagnosis Technology for Engine System of Autonomous Ships
- Development of Integrated Energy Control System for Autonomous Ships

3. Test-bed and Verification Techniques

- Development of Evaluation and Validation Testbed for Autonomous Ship Performance
- Development of Validation and Verification Technique for Intelligent System of Autonomous Ships
- Development of Shore Remote Control System of MASS
- Development of Cyber Security Technology for Maritime Autonomous Surface Ship
- Development of the Next Digital Communication Technologies for Ship2Ship2Shore
- Incident Response System and Reliability Assessment for Autonomous ship

4. Operation Techniques and Standardizations

- Development of Remote Management and Safe Operating Technology of Autonomous Navigation System
- Development of International Standardization Technology for Autonomous Ship

KASS Test Ship Platform(`21.12)

KASS Shore Test-bed & Center(`22.6)

Demo Ship to be built(`24~25)

| 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |

Research Contents and Plan

Logical Configuration for the System Integration

☑ System Interface Diagram

Performance Test & Validation Infra.

Shipboard Data
Navigation & Radio-communication Systems
Vessel Info. & Traffic Ships
Operational Systems
Main Engine & Aux. Machinery
Sensors, CCTV, Radar, Lidar
Other Equipment

Digital Bridge & Platform

Ship-Shore Data Communication & Cyber Security

ISO 19847 & 19848

Digital Twin Bridge

M/W · **Big Data Platform**

DTB/E Monitoring

VTS, Radar, AIS, VHF

Shore Remote Control

Damage Control

Autonomous Engine

Intelligence Navigation

Situational Awareness

Simulation Based Test

Autonomous Shipboard Systems

Shipboard Equipment & Systems

Shore Systems

Research Contents and Plan

🌐 Intelligent Navigation System

☑ 3 Sub Projects

Item	Contents
Project name	(1-1) Development of Autonomous Navigation System with Intelligent Route Planning Function
Total period	2020.04 ~ 2025.12 (5years 9months)
Technical overview for development	▶ Precision of Operational Model for the Development of Autonomous Navigation Algorithms ▶ Development of Path Planning Algorithms for Safe Navigation - Development of Path Planning Algorithms for Economic Navigation ▶ Development of High-Reliability Route Tracking Control Algorithm ▶ Development of a common service platform for autonomous/economic navigation [(H/W)+(S/W)] ▶ Development of Algorithms for Automatic Berthing ▶ Application and Development and of Algorithm Verification Environment
Participants	

Research Contents and Plan

🌀 Sea Test-bed and Validation Technology

☑ 5 Sub Projects

Item	Contents
Project name	(3-1) Development of Evaluation and Validation Test-bed for Autonomous Ship Performance
Total period	2020.04 ~ 2024.12 (4years 9months)
Technical overview for development	▶ Verification of safety and performance for autonomous ships, navigational equipment/devices, and cybersecurity ▶ Development and establishment of testing environment and infrastructure for testing/evaluation/verification of autonomous ships ▶ Certification of autonomous ships and systems (equipment and algorithms) ▶ Sea trials testbeds including test ships (25 meters), and infrastructure for collecting and analyzing big data to improve systems of autonomous ships, as well as equipment and human resources
Participants	

Relation between the KASS and IHO

Required system and data for MASS

☑ (Future) Hydrographic data based on S-10X and S-20X

- S-101
- S-102
- S-104
- S-111
- S-124
- S-125
- S-201

☑ (Present)

- S-52/57 ECDIS
- S-57 ENCs
- Navigational Warnings, Navtex
- Nearby ship information

Relation between the KASS and IHO

Level of Autonomous System and Ships

☑ Level 2 in Coastal & Level 3 in Ocean

- Do we really need high density or quality information?
- Level 0: Human operated
- Level 1: Human directed
- **Level 2: Human delegated**
- **Level 3: Human supervised**
- Level 4: Fully autonomous

☑ Do we really need high density or quality of hydrographic information?

☑ The KASS project shall be

- First step research for MASS to develop systems and equipment
- Start to build the MASS testbed and validation & verification
- Try to revise related law and regulations

Thanks for your attention!