



IMHA, URV, UB
SFMM, SMMM

Technologies et innovations en santé maritime

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**ATELIER SUR LA PRÉVENTION DES ACCIDENTS DE TRAVAIL
ET DES MALADIES PROFESSIONNELLES DES GENS DE MER**

AI Solutions Map for Maritime Occupational Medicine

Key Functional Areas Where AI Transforms Seafarer Health & Safety

1. Health Surveillance & Medical Exams

- Automated fitness-to-embark assessments
- AI-driven planning of periodic exams
- Predictive follow-up for sensitive crew

2. Occupational Diseases & Accidents

- Enhanced detection & causal analysis
- Automated notification & reporting
- Fatigue monitoring via wearables & AI

3. Medical-Legal Reports

- AI-assisted drafting of incapacity reports
- 75% reduction in report writing time
- MLC & STCW compliance documentation

4. Risk Assessment & Updates

- Continuous monitoring of emerging risks
- Bibliographic AI-powered literature reviews
- Proactive alerts to ship operators

5. Ethics, GDPR & Data Protection

- Secure handling of sensitive health data
- Regulatory compliance automation
- Ethical AI frameworks for maritime health

Remote Telemedicine at Sea

- AI triage & diagnostic support onboard
- Real-time remote consultation support
- Medical chest inventory management

Target Audience: Maritime Occupational Health Specialists | Prevention Services | Mutuels | Health Administrations

Expected **Impact of AI** in Maritime Occupational Health

75%

Reduction in Medical-Legal Report Writing Time

Improved

Consistency & Accuracy in Aptitude Assessments

Proactive

Alerts & Early Detection of Occupational Risks

Robust

GDPR & Ethical-Legal Compliance at Sea

Key AI Tools & Applications at Sea

- **NLP-powered report generators** for medical-legal documentation
- **Wearable sensors + AI algorithms** for fatigue & vital sign monitoring
- **Predictive analytics** for occupational disease early detection
- **Telemedicine AI triage** for remote consultation onboard
- **Automated GDPR compliance** for cross-border crew health data

Maritime-Specific Challenges Addressed

- **Isolation at sea:** AI bridges the gap to shore-based specialists
- **Multi-flag crews:** Automated compliance with ILO/IMO standards
- **Limited onboard resources:** Smart medical chest management
- **Crew mental health:** AI-driven wellness & stress monitoring
- **Repatriation decisions:** Data-driven clinical support systems

Recommended AI Tools for Maritime Occupational Medicine

Practical AI solutions organized by functional area, training modules

Health Surveillance & Exams

- **ChatGPT / Claude** – Aptitude assessment checklists
- **Wearable AI platforms** – Real-time vitals & fatigue tracking
- **Predictive scheduling AI** – Automated exam planning

Reports & Documentation

- **NLP report generators** – Medical-legal & incapacity reports
- **Compliance engines** – MLC & STCW auto-verification
- **Smart templates** – Accident notification & causal analysis

Telemedicine & Risk

- **AI triage systems** – Remote diagnostic support onboard
- **Literature review AI** – Emerging risk bibliographic alerts
- **GDPR compliance tools** – Cross-border data protection

SaludIA.Academy – Competency Training Modules

Each functional area maps to specific training modules so practitioners can build AI competency progressively:

- **Module 1 – AI Fundamentals:** Prompt engineering, data literacy, and AI ethics for occupational health professionals
- **Module 2 – Clinical AI Applications:** Automated health surveillance, predictive diagnostics, and telemedicine triage
- **Module 3 – Reports & Compliance:** NLP-powered report writing, MLC/STCW compliance, and GDPR for maritime health data
- **Module 4 – Advanced Integration:** Wearable data pipelines, digital twins, and leading AI transformation in organization

Goal: Empower maritime occupational health specialists to lead the digital transformation with practical AI competencies

Advancements in Maritime Health Studies: Proposal of a Research & Education Net and Agreements e.g:



Exploring Innovative Research Techniques

Discover how new methods in research are revolutionizing maritime health studies today.

Collaboration Among Healthcare Experts

Networking among professionals is essential for advancing maritime medicine through shared insights.

Integrating Digital Solutions Seamlessly

Unveiling the role of digital tools in enhancing research and healthcare delivery and specially POSTGRADUATE EDUCATION in maritime settings.



Maritime Health Group-net

Scientific Medical Societies

Universities Agreement - Int

Spanish & English versions

+ FRENCH

online



Canals ML & SEMM. Libro de Resúmenes del 7ISMH 2003 (Simposio Internacional) y las 25JNMM (Jornadas Nacionales) 2023 en Tarragona. Conmemoración de la Sociedad Española de Medicina Marítima (SEMM) \ "20 años de Diplomas de Postgrados en Medicina Marítima" **20 Years of U. Postgraduate Diplomas Commemoration Book**” DL T. 286-2024, ISBN 978-84 1174 6939.

[25 Years Update Annex Abstracts book of this book], CC BY-NC-SA 4.0.

Future Trends in Maritime Medicine Exploration

Quality Audit Centres Looking for well trained staff, Updated technologies, Continuing Education

1

Anticipating Changes in Healthcare Practices

Staying ahead by embracing emerging trends will drive progress in maritime health practices.

2

Engaging Experts in Future Research

Collaboration with industry professionals ensures that research remains relevant and impactful.

3

Digital Transformation's Role in Medicine

The ongoing digital transformation is setting new benchmarks in the maritime healthcare sector.

4

Innovative Educational Frameworks

Implementing cutting-edge educational approaches will cultivate future leaders in maritime medicine.

SPAIN: Integration SS 1983 Programa de Sanidad Marítima

cohort studies from:

- The medical fitness examinations (1985)
- The Radiomedical consultations (from 1979)
- Hospital Ships following the fishing fleet (Europe & Africa 1982)
- Inspections on board fishing ships, Sanitation & Risk Prevention Training Programmes (1989)



* Free Occupational Maritime Health system in Spain

* Integrated in REM= Social Security System for Seafarers

Smartphone: "ISM in my pocket"
Medical Fitness Exam online??



→ Complete digital transformation:
Reminding validity date by e-mail, online certificate & [appointment](#) etc.

- Free Remote Consultation and medical care onboard and Ashore.
- Safety work and Prevention Resources Including Free Occupational Health **Risk Prevention, Fitness Medical Examinations to Embark, Repatriation, Inspection of the conditions on board MLC Declaration, Medical Chest, Guide on board, Training in First care and Medical care (STCW)**, according ILO, IMO Conventions, **Social Resources**

Cita Previa Sin Certificado

Datos personales

Organismo ISM

Motivo de la cita

Motivo de la cita

reconocimiento medico embarque

En caso de informarse el Motivo de la cita, debe tener una longitud mínima de 25 caracteres y máxima de 500

(*) Búsqueda de citas por código postal, provincia y centro (*) Provincia

Elegir yo: centro - día - hora en esta provincia

TARRAGONA

Quality System Control & Metric Indicators for evaluation Data Protection & safety verification of documents online

Vía online:

<https://w6.seg-social.es/ProsaInternetAnonimo/OnlineAccess?ARQ.SPM.ACTION=LOGIN&ARQ.SPM.APPTYPE=SERVICE&ARQ.IDAPP=AFHS0002>

REFERENCIAS ELECTRÓNICAS			
Id. CEA:	Fecha:	Código CEA:	Página:
F98XTR4E3PVV	09/05/2017	ZUKQ4-7SSXU-YG7YQ-7KBK7-54ZMA-AC7RM	1

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Evaluation, metrics, analysis, re-evaluation

Denominación	Fórmula
Tiempo medio de lista de espera	$[\sum(N^{\circ} RMEM * \text{tiempo de ESPERA}) / N^{\circ} \text{ de RMEM}]$
Tiempo medio de RMEM	$[\sum(\text{Fecha finalización RMEM} - \text{Fecha solicitada para RMEM}) / N^{\circ} \text{ de RMEM}]$

CERTIFICADO MÉDICO DE APTITUD PARA EMBARQUE MEDICAL EXAMINATION FOR SEA-SERVICE

Conforme al CTM 2006/017 y STCW 78/10 (recomendado) OMI y al RD 1496/2007, de 14 de diciembre, sobre reconocimiento médico de embarque marítimo.
In accordance with ILO MCL 2006 and IMO STCW 78 (as amended) and RD 1496/2007, December 14th, maritime shipping medical examinations.

D./Dña.: **ARMANDO BERTOMEU TOMAS** Sexo: **masculino** D.N.I. / N.I.E. / Pasaporte: **040933663B**
 Fecha de nacimiento / Date of birth: **31/01/1969** Sex: **male** Nacionalidad / Nationality: **ESPAÑA**
 Puesto de trabajo / Working place: **MARINERO**

Documentos de identidad verificados en el lugar del examen: Sí No
 Identification documents checked at the point of examination: Yes/No

En el Reconocimiento Médico efectuado se comprobó que el interesado presenta:
 In the Medical Examination it is found that the seafarer concerned presents:

- * Agudeza Visual satisfactoria: Sí No * Audición satisfactoria (sin ayudas auditivas): Sí No
 Satisfactory visual acuity: Yes/No Satisfactory hearing (unaided): Yes/No
- * Visión cromática satisfactoria: Sí No Fecha de la última prueba de visión cromática: **05/02/2015**
 Satisfactory Chromatic vision: Yes/No Date of the last chromatic vision test
- Está exento de cualquier afección médica que pueda verse agravada por el servicio en el mar, discapacitarle para el desempeño de tal servicio o poner en peligro la salud de otras personas a bordo.
 Is free of any medical conditions that could be worsened by service at sea, and incapacitate him from performing such duties or endanger the health of the other people on board: Sí No
- Reine las condiciones médicas requeridas para las funciones de vigía:
 Assembles the medical conditions needed for lookout duties: Sí No

En base a la encuesta de salud, el examen clínico y los resultados de las pruebas diagnósticas realizadas, se declara al interesado:
 Based on the health declaration, the clinical examination and the results of the diagnostic test made, the interested party is declared:

APTO/A (FIT FOR SEA-SERVICE)

La vigencia de este Reconocimiento caduca el día / (The validity of this certificate expires on) **19 de octubre de 2018**
 En TARRAGONA, a 20 de enero de 2017
 (Done at / on)

Sello del Centro
Medical Center stamp

Fdo.: **Dr. M. Luján Camalá - Colaborador nº 2022**
 Approved Doctor's signature
 Registración en **43002H1728**
 34-A-Registro

MINISTERIO DE EMPLEO Y SEGURIDAD SOCIAL
 INSTITUTO SOCIAL DE LA MARINA
 SERVICIO DE SANIDAD MARÍTIMA
 CENTRO DE SANIDAD MARÍTIMA DE TARRAGONA

Confirmando que he sido informado sobre el contenido del presente certificado y sobre el derecho a solicitar una revisión del mismo en el momento de la salida a la mar.
 Confirming that I have been informed of the content of this certificate and of my right to request that the results be revised in accordance with that set forth in paragraph 8 of article 4.3 of the STCW 78/10.
 Considero la inclusión de los datos vertidos que figuran en este certificado.
 I consider to the inclusion of the medical data appearing on this certificate.

Firma del marino:
(Seafarer's signature)

Si el periodo de validez del certificado expira durante una travesía, el certificado seguirá siendo válido hasta la fecha de llegada al próximo puerto de escala desde el cual el interesado pueda obtener un certificado médico de su medicina local, o cualquier otro que sea prolongación de validez en escala de sus países. (If the period for which a certificate is valid ends during a crossing, the certificate will continue to be valid until the date of arrival at the next port of call where the interested seafarer can obtain a medical certificate from a qualified doctor, as long as the extension of the period of validity does not exceed three months.)

REFERENCIAS ELECTRÓNICAS			
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39CQKPA8SPW	04/04/2017	EVTUN-XGV36-XLTCO-LXFOL-P6YZR-INIKY	1

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Digitalization & Personal Follow up of medical records

a. Individuales:

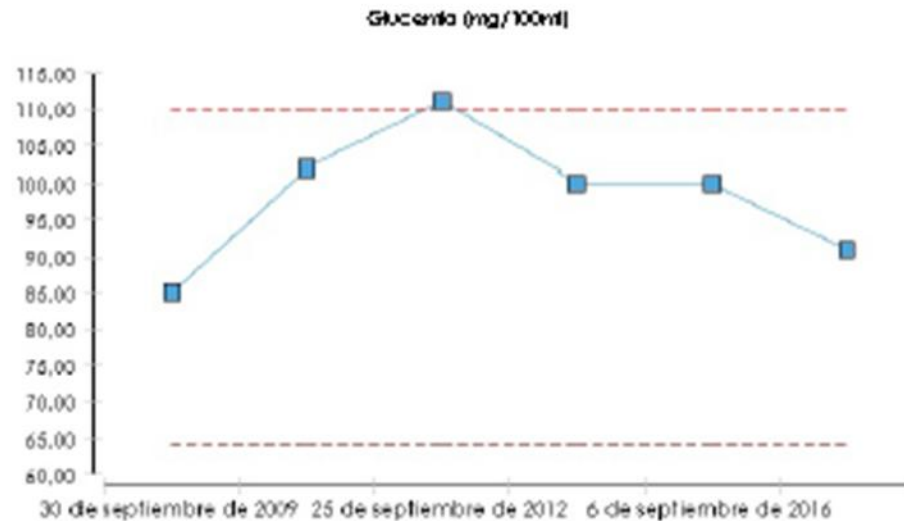
- Consejo sanitario
- Inmunizaciones

b. Colectivas:

1. Campañas informativas mediante la elaboración de folletos, artículos, charlas, etc.
2. Elaboración de programas sanitarios
3. Diseño y elaboración de estudios epidemiológicos

[+] Resultados de búsqueda

		Analítica
Sel.	Fecha cierre RM	Glucemia (mgr/100ml)
<input type="radio"/>	13/07/2017	91
<input type="radio"/>	06/09/2016	100
<input type="radio"/>	19/09/2014	100
<input type="radio"/>	25/09/2012	111
<input type="radio"/>	07/10/2010	102
<input type="radio"/>	30/09/2009	85



Health Parametres consultation: individuals, collectives → Epidemiological studies

[+] Analítica

<input type="checkbox"/> Glucemia	<input type="checkbox"/> Triglicéridos	<input type="checkbox"/> Colesterol	<input type="checkbox"/> Colesterol HDL
<input type="checkbox"/> Colesterol LDL	<input type="checkbox"/> Ácido úrico	<input type="checkbox"/> GOT	<input type="checkbox"/> GPT
<input type="checkbox"/> GGT	<input type="checkbox"/> Creatinina	<input type="checkbox"/> Hemoglobina glicosilada	<input type="checkbox"/> Hematíes
<input type="checkbox"/> Leucocitos	<input type="checkbox"/> Plaquetas	<input type="checkbox"/> HTO	<input type="checkbox"/> HGLO
<input type="checkbox"/> CHCM	<input type="checkbox"/> VCM	<input type="checkbox"/> V.S.G. 1ª Hora	<input type="checkbox"/> Urea
<input type="checkbox"/> Drogas en orina	<input type="checkbox"/> Fórmula leucocitaria C	<input type="checkbox"/> Fórmula leucocitaria S	<input type="checkbox"/> Fórmula leucocitaria M
<input type="checkbox"/> Fórmula leucocitaria B	<input type="checkbox"/> Fórmula leucocitaria L	<input type="checkbox"/> Fórmula leucocitaria E	

[+] Exploración

<input type="checkbox"/> Tensión Sistólica	<input type="checkbox"/> Tensión Diastólica	<input type="checkbox"/> Frecuencia cardíaca	<input type="checkbox"/> Perímetro abdominal
<input type="checkbox"/> Índice de masa corporal	<input type="checkbox"/> Peso		

[+] Espirometría

<input type="checkbox"/> Elemento FEV1	<input type="checkbox"/> Elemento CVF	<input type="checkbox"/> División FEV1 entre CVF	<input type="checkbox"/> Elemento FEF25-75
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[+] Audiometría vía Aérea

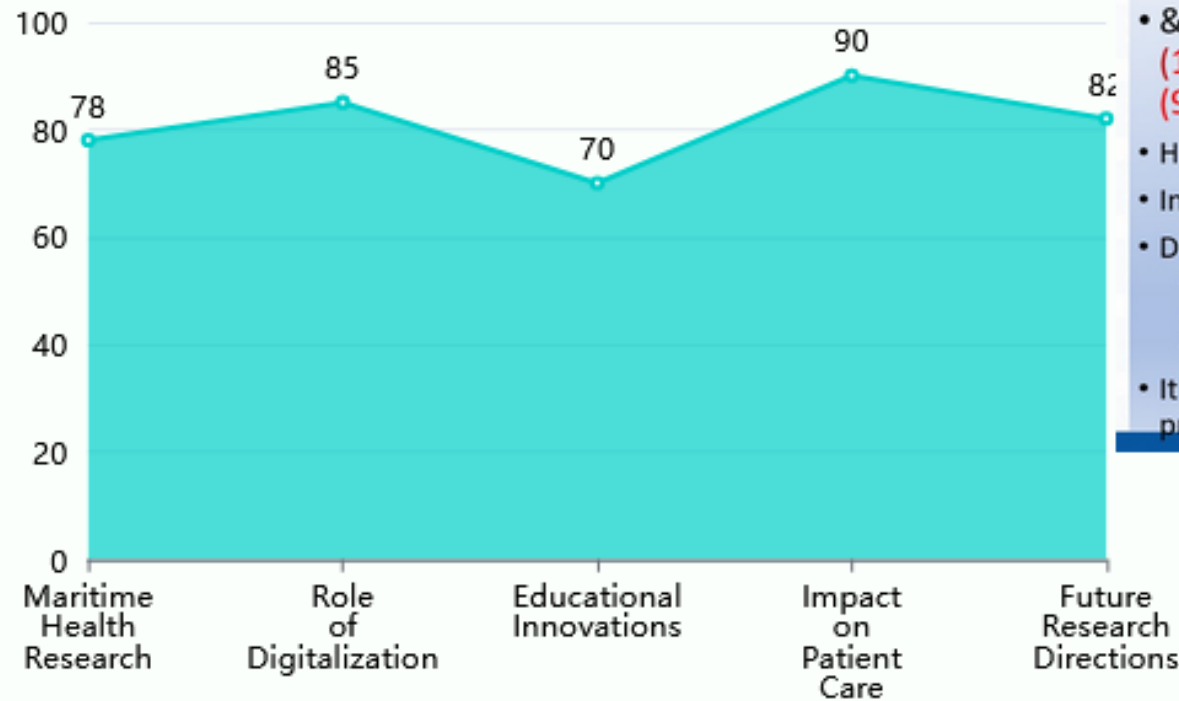
<input type="checkbox"/> Pérdida monoaural oído derecho	<input type="checkbox"/> Pérdida monoaural oído izquierdo	<input type="checkbox"/> Pérdida biaural
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[+] Oftalmología

<input type="checkbox"/> Visión lejana ojo izquierdo con corrección	<input type="checkbox"/> Visión lejana ojo derecho con corrección	<input type="checkbox"/> Visión lejana ojo izquierdo sin corrección
<input type="checkbox"/> Visión lejana ojo derecho sin corrección	<input type="checkbox"/> Visión lejana binocular con corrección	<input type="checkbox"/> Visión lejana binocular sin corrección
<input type="checkbox"/> Visión proxima ojo izquierdo con corrección	<input type="checkbox"/> Visión proxima ojo derecho con corrección	<input type="checkbox"/> Visión proxima ojo izquierdo sin corrección

Advancements in Maritime Health Studies

Cohort Prospective longitudinal big data studies



The transformative power of digital tools in maritime health(Percentage)

RESULTS basic starting points (1)

- Subject Diabetes (1780) = 3,6% (95% CI:3,47%-3,81%)
- & Obesity: From 49022 seafarers: (10445 obese) = 21,3% (95%CI:20,95%-21,68%).
- Higher than in General Population
- Increased with age >55y
- Differences by
 - positions on board,
 - fishing/merchant,
 - regions in Spain
- It allows to create maps for preventive campaigns

Retrospective: 3-1-98 a 3-1-2000;3y criteria: at least 2 periodical fitness exams; quantitative variables WHO...



Figura 2. Prevalencia de obesidad en trabajadores del mar según lugar residencia

2 Digital Education Strategies for Maritime Health Professionals

Postgraduate Courses & Diplomas e.g:

- Continuing Education
- Modular Courses
- Webinars online
- In Spanish / English
- French... Agreements



This block contains logos for UCA (Universidad de Cádiz), IMHA (International Maritime Health Association), and SEMM (Sociedad Española de Medicina Marítima). To the right is a poster for the 'XVI Master in Lifelong Learning in Maritime Health' for the year 2024-2025, featuring a white sailboat with a red cross on its sail against a blue sky and sea.



Spain eg.:

- 1989 Expert ULL
- 2003 SEMM-IMHA
- 2003 SEMM-URV
- 2009 SEMM-UCA
- 2026 SEMM-UPV

• Master / Specialists / Expert U. Diplomas/

- Microcredential (micro-certification EU partially granted)

An advertisement for a 'Medical Examination Report' course. It features a ship at sea, a clipboard with a magnifying glass, and a 'Medical Examination Report' form. Text includes 'Evaluación de exámenes médicos previos al embarque' and '27 abril a 15 junio 2026'. Logos for UCA, IMHA, SEMM, and MAHRE-net are present. At the bottom, it mentions 'Financiado por la Unión Europea NextGenerationEU' and 'Plan de Recuperación, Transformación y Resiliencia'.

3 Challenges in Maritime Health Digitalization

Integrating Technology in Maritime Health

Transformative Technologies in Maritime Medicine

E.g. Integration of telemedicine and data analytics

Collaboration of Professionals in Health Integration

Technology integration and enhance patient experiences.

Adaptability in Digital Practices for Health

Improve efficiency in maritime health operations.

Future of Maritime Health with Technology

Robust systems for education, research, and patient care.



Overcoming Barriers to Digital Adoption:

1 Navigating Digital Transformation Challenges

Embracing digital tools can revolutionize Maritime Medicine, yet barriers persist. Understanding these challenges is crucial for successful implementation.

2 Empowering Healthcare Professionals through Tech

Training healthcare professionals in new technologies fosters confidence and efficiency, ultimately enhancing patient care in maritime settings.

3 Innovative Solutions for Maritime Healthcare

Exploring innovative digital solutions can bridge gaps in maritime healthcare, making services more accessible and effective for all.



Merci

- <https://>
- semm.org
- <https://>
- www.mahrenet.com

RESEARCH & EDUCATION



Formation en médecine maritime adaptée à vos besoins

Nous sommes MAHRE.net, un réseau de professionnels de la médecine maritime. Nous proposons des ateliers, des formations, des adhésions et des publications pour accompagner votre développement professionnel. Un simple abonnement vous donne accès à des formations rigoureuses et actualisées, axées sur l'amélioration de la santé et de la sécurité en milieu maritime.

En lien avec une formation de qualité

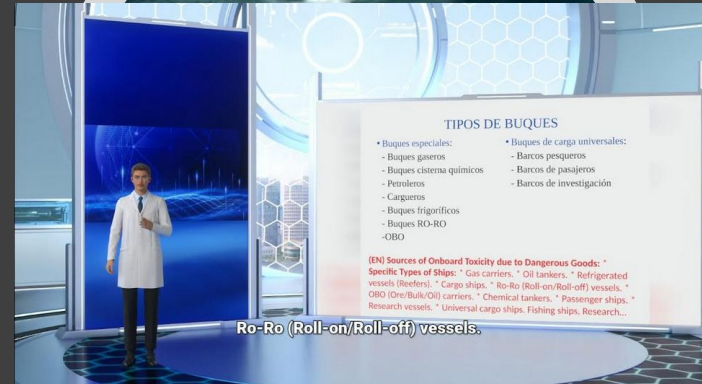
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TIPOS DE BUQUES

• Buques especiales:	• Buques de carga universales:
- Buques guerra	- Barcos pesqueros
- Buques cisterna químicos	- Barcos de pasajeros
- Petroleros	- Barcos de investigación
- Cargueros	
- Buques frigoríficos	
- Buques RO-RO	
- OBO	

(EN) Sources of Onboard Toxicity due to Dangerous Goods: " Specific Types of Ships: " Gas carriers, " Oil tankers, " Refrigerated vessels (Reefers), " Cargo ships, " Ro-Ro (Roll-on/Roll-off) vessels, " OBO (Ore/Bulk/Oil) carriers, " Chemical tankers, " Passenger ships, " Research vessels, " Universal cargo ships, Fishing ships, Research... "

Ro-Ro (Roll-on/Roll-off) vessels.



**Thank You
GRACIAS**