Maritime Security, Port Protection, and International Trade

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Maritime security protects the ships, ports, people, cargo, waterways, information systems, and supply chains on which international trade depends. It is broader than preventing piracy or guarding a terminal gate. Modern ports connect vessels with roads, railways, pipelines, warehouses, customs authorities, digital platforms, financial systems, and inland distribution networks. A disruption at one terminal can therefore affect factories, fuel supplies, food distribution, retail inventories, and national economies far beyond the coastline.

Michael McNicholas's *Maritime Security: An Introduction* provides a useful foundation for understanding these relationships, but the risk environment has evolved substantially. Traditional concerns such as terrorism, smuggling, stowaways, document fraud, insider access, and piracy now coexist with cyberattack, operational-technology compromise, automated cargo systems, digital customs platforms, and increasingly interconnected port infrastructure. The International Ship and Port Facility Security (ISPS) Code remains the core international security framework for covered ships and port facilities, while U.S. facilities also operate under the Maritime Transportation Security Act and related Coast Guard regulations (McNicholas, 2016; IMO, 2026a) (International Maritime Organization, 2021).

Ports and Trade

Major seaports perform several functions simultaneously. Container terminals transfer standardized boxes among ships, trucks, and rail. Bulk terminals move grain, coal, ore, chemicals, or petroleum. Roll-on/roll-off terminals handle vehicles and wheeled cargo. Cruise terminals process passengers and baggage, while specialized facilities may serve LNG, fishing, naval, offshore, or industrial activity. Security measures should therefore reflect the facility's actual operations rather than apply one identical template to every port.

Containerization transformed maritime trade because cargo can move through several modes without being unpacked at each transfer. This reduces cost and handling but also creates a security problem: a sealed container can travel across several jurisdictions and organizations before reaching its final destination. Authorities therefore rely on manifests, shipper information, seals, customs risk analysis, scanning, inspection, and trusted-trader programs to determine which shipments require greater scrutiny.

Trade documentation is part of security because physical cargo and digital information must match. Bills of lading, manifests, customs declarations, dangerous-goods documentation, certificates, and identity records help authorities understand what is moving and who is responsible. False or incomplete documentation can support smuggling, sanctions evasion, cargo theft, or concealment of hazardous materials. At the same time, excessive inspection of every shipment would stop legitimate trade, so maritime security is fundamentally risk-based.

Canals and chokepoints demonstrate the global importance of maritime infrastructure. The Panama and Suez canals reduce sailing distances and concentrate enormous volumes of traffic through limited corridors. Expansion projects have increased capacity, but concentration also creates vulnerability because accidents, conflict, drought, mechanical failure, or deliberate interference can disrupt global schedules. The objective of security is therefore not only to prevent hostile acts but to maintain or restore trade when disruption occurs (United Nations Office on Drugs and Crime, 2023).

Intermodal connections matter just as much as the waterfront. A secure marine terminal can still suffer major disruption if rail access fails, truck gates are compromised, fuel is unavailable, or inland distribution systems collapse. Ports are nodes in larger logistics networks, and resilience depends on understanding dependencies outside the fence line.

Maritime domain awareness helps authorities connect information about vessels, cargo, crews, ownership, routes, ports, and observed behavior. Automatic Identification System data, port-call records, intelligence, satellite information, customs data, and law-enforcement reporting can all contribute. The challenge is not simply obtaining more data; it is identifying unusual patterns without overwhelming analysts with false alarms.

Layered Security

The ISPS Code, implemented through SOLAS chapter XI-2, provides an international framework for assessing ship and port-facility security risks, assigning security responsibilities, and developing security plans. IMO describes the Code as a risk-management system in which security measures change according to assessed threat and vulnerability. Port Facility Security Officers, Ship Security Officers, and Company Security Officers have defined responsibilities within this structure (IMO, 2026a) (International Maritime Organization, 2026a).

In the United States, the Maritime Transportation Security Act provides a domestic framework for regulated vessels and facilities. Facility security plans address access control, restricted areas, communications, drills, personnel duties, security incidents, and other protective measures. Transportation Worker Identification Credential requirements support identity and access control in regulated areas. These measures work best when combined with local knowledge and updated risk assessments rather than treated as paperwork completed once.

Physical security is layered because no single barrier is reliable enough on its own. Fences, gates,

lighting, cameras, patrols, locks, restricted zones, badge systems, screening, and waterside controls reinforce one another. Design should focus on detection and response as well as prevention. A camera that records an intrusion but is never monitored provides less protection than a system tied to clear alarm and response procedures.

Insider risk is especially difficult because authorized personnel already possess access and knowledge. Employees, contractors, drivers, crew members, vendors, and temporary workers may understand routines and vulnerabilities better than outside attackers. Background checks, access limitation, separation of duties, reporting mechanisms, supervision, cybersecurity controls, and a healthy security culture reduce risk without assuming every worker is a threat.

Cargo-security programs also use layers. High-risk shipments may be targeted through intelligence and data analysis, while authorized economic-operator and trusted-partner programs reward companies that maintain verified supply-chain controls. The purpose is to concentrate inspection effort where risk is greater without unnecessarily delaying ordinary trade.

Piracy and armed robbery remain regional security concerns. Responses can include route planning, watchkeeping, access control, citadels, communication, naval coordination, and industry best-management practices. Armed private security is regulated differently across flag, coastal, and port states; IMO does not impose one universal position on the carriage of privately contracted armed personnel. Security plans therefore need to account for applicable law and local threat conditions.

Organized crime uses maritime trade for narcotics, weapons, wildlife products, counterfeit goods, migrant smuggling, and other illicit flows. Criminal networks may exploit legitimate logistics companies, corrupt insiders, falsified documents, or hidden compartments. Port protection consequently requires cooperation among customs, coast guards, police, terminal operators, shipping companies, intelligence services, and international organizations.

Cyber and Digital Risk

Port security now depends on information technology and operational technology. Terminal operating systems manage container location and vessel planning; automated cranes and gates rely on networked controls; ships use navigation, engine, cargo, and communication systems; customs and port authorities exchange data electronically. A cyber incident can therefore become a physical safety and trade-continuity incident.

IMO defines maritime cyber risk as the possibility that technology assets or systems will be compromised in ways that cause operational, safety, or security failures. Its revised maritime cyber-risk guidelines emphasize identifying assets and risks, protecting systems, detecting incidents, responding effectively, and recovering operations. Cyber risk is expected to be integrated into existing safety and security management rather than treated as a separate information-technology concern (IMO, 2024, 2026b) (International Maritime Organization, 2024; International Maritime

Organization, 2026b).

The U.S. regulatory environment changed significantly in 2025. The Coast Guard's final rule on cybersecurity in the Marine Transportation System became effective on 16 July 2025 for covered U.S.-flagged vessels, Outer Continental Shelf facilities, and MTSA-regulated facilities. The rule establishes baseline cybersecurity requirements, including incident reporting, training, cybersecurity assessments, cybersecurity plans, and designation of a Cybersecurity Officer according to a phased implementation schedule. By 2026, annual training requirements were already in effect, with additional assessment and plan requirements scheduled later in the implementation period (U.S. Coast Guard, 2025, 2026).

Cybersecurity is particularly difficult in ports because modern systems often connect new cloud services and analytics with legacy operational equipment that was not designed for hostile networks. A vulnerability in an administrative system can become dangerous if segmentation is weak and attackers can move toward crane controls, gate systems, vessel interfaces, or safety equipment.

Basic resilience measures include asset inventories, access control, multi-factor authentication, segmentation, secure remote access, patch management, backups, vendor management, incident reporting, and tested recovery procedures. Operational systems may not always tolerate ordinary office-IT patching schedules, so compensating controls and engineering review are important.

The digitalization of maritime reporting also creates a governance challenge. IMO requires Maritime Single Windows for electronic exchange of information associated with ship arrival, stay, and departure. In March 2026, IMO's Facilitation Committee approved further work on cybersecurity measures for Maritime Single Windows and a broader maritime digitalization strategy. The direction of travel is clear: as maritime trade becomes more digital, cyber resilience is becoming part of core maritime governance rather than optional technical guidance (IMO, 2026c) (International Maritime Organization, 2026c).

Resilience and Governance

Security planning should be based on risk rather than fear. A credible assessment identifies assets, threats, vulnerabilities, consequences, existing controls, and residual risk. High-consequence facilities such as fuel terminals may prioritize sabotage, fire, or hazardous-material release; passenger facilities may prioritize crowd protection and identity control; container terminals may emphasize cargo integrity, smuggling, insider risk, and cyber continuity.

Security measures also create trade-offs. Extremely restrictive access can delay cargo and increase cost. Highly automated systems improve efficiency but increase dependence on electricity and networks. Detailed data sharing can improve risk analysis but create privacy, commercial, or national-security concerns. Good security does not attempt to eliminate all risk. It reduces risk to a defensible level while allowing the port to perform its commercial function.

Exercises help reveal whether plans work under pressure. A port may simulate a cyber outage, suspicious cargo, waterside intrusion, major fire, security-level increase, or communications failure. The objective is not simply to demonstrate compliance. Exercises should test decision-making, coordination, backup systems, mutual aid, public communication, and business continuity.

Recovery is part of security because successful attackers often aim to create long disruption rather than only immediate damage. Business-continuity plans should identify critical services, minimum staffing, alternate communications, manual procedures, backup data, repair priorities, and dependencies on outside utilities or vendors. A terminal that can restore safe operations quickly is less vulnerable to coercion and economic cascading effects.

International cooperation remains essential because maritime trade crosses jurisdictions continuously. One voyage may involve a ship registered in one country, owned in another, managed from a third, crewed multinationally, carrying cargo from many states, and calling at several ports. ISPS provides a common framework, but implementation quality depends on national authorities, companies, port operators, and information sharing.

The most effective maritime security model is therefore layered and resilient. Physical security, cargo controls, identity management, intelligence, customs, cybersecurity, law enforcement, international regulation, and business continuity address different parts of the same system. The goal is not to create a closed port. It is to maintain legitimate trade while making hostile or criminal exploitation difficult to conceal and limiting the consequences when disruption occurs.

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