UNITED AGAINST NUCLEAR IRAN

OCEANS OF DECEIT:

IRAN'S DECEPTIVE SHIPPING PRACTICES AND EXPLOITATION OF THE MARITIME INDUSTRY

CONTENTS

ABOUT UANI

UNITED AGAINST NUCLEAR IRAN

United Against Nuclear Iran ("UANI") is a nonprofit and non-partisan policy organization formed to combat the threats posed by the Islamic Republic of Iran.

UANI educates the public, policymakers, and businesses about the danger posed by the Iranian regime and designs programs to ensure the regime's economic and diplomatic isolation until it abandons its pursuit of nuclear weapons, support for terrorism, regional destabilization, and human rights violations.

UANI's diverse Advisory Board includes policy experts and distinguished former government officials.[1]

EXECUTIVE SUMMARY

The Islamic Republic of Iran has pursued a wide range of deceptive practices in the shipping industry to evade international sanctions on Iranian oil products. The regime's deceptive shipping activities compromise the safety and integrity of the international maritime industry.

U.S. sanctions impose penalties on individuals and entities that knowingly engage in significant transactions for the purchase, acquisition, sale, transport, or marketing of petroleum or petroleum products from Iran – or knowingly provide significant support to an Iranian person on the Office of Foreign Assets Control (OFAC)'s List of Specially Designated Nationals and Blocked Persons (SDN List), such as the National Iranian Oil Company (NIOC) and the National Iranian Tanker Company (NITC). These sanctions apply to ship group and registered owners, managers, operators, brokers, ship chandlers, flag states, port operators, shipping companies, freight forwarders, classification service providers, commodity traders, insurance companies (protection and indemnity (P&I) clubs), and financial institutions. These entities should therefore be aware of the deceptive shipping practices used by Iran to evade sanctions. Additional details regarding sanctions on Iran's shipping and oil industry can be found in the appendix.[2]

Iranian schemes and deceptive practices to evade sanctions have become increasingly widespread and complex. In response, UANI developed its own ship tracking methodology to detect these practices and obtain an accurate account of Iran's crude oil, gas condensates, and petrochemical exports.

This report provides an explanation of the different types of deceptive shipping schemes that Iran exploits and demonstrates how such activities can be detected by analyzing vessel traffic data, or Automatic Identification System (AIS) data, and satellite imagery.

The report also provides a history of Iran's fraudulent shipping practices via selected case studies to illustrate methods of evasion and deception, including the use of various 'spoofing' techniques and Iran's manipulation of vessels' AIS data. The report concludes with policy recommendations on how to counter Iran's illicit activities at sea and prevent the regime from evading international sanctions, including by strengthening due diligence measures.

GLOSSARY

Aframax: A vessel of 70,000 to 119,000 deadweight tonnage (dwt) capacity. Capable of carrying approximately 700,000 barrels of crude oil.[3]

Automatic Identification System (AIS) Transponder: A system used principally by ships and Vessel Traffic Service (VTS) to identify and locate vessels. AIS provides a means for ships to electronically exchange ship data, including: identification, position, course, and speed, with other nearby ships and VTS stations.[4] In 2000, the International Maritime Organization (IMO) adopted a requirement for all ships at or above 300 gross tonnages and engaged in international voyages to be equipped with an AIS transponder, effective December 2004.[5]

Bill of Lading (B/L): A document that establishes the terms of a contract between a shipper and a transportation company. It serves as a document of title, a contract of carriage, and a receipt for goods.[6]

Cargo: Freight loaded into a ship.

Certificate of Origin: A certified document showing the origin of goods; used in international commerce.[7]

Classification Society: The requirement of a classification society is to provide classification, statutory certification, and services as a recognized organization acting on behalf of a flag state, and assistance to the maritime industry and regulatory bodies as regards maritime safety and pollution prevention, based on the accumulation of maritime knowledge and technology. Classification societies establish and maintain technical standards for the construction and operation of a vessel and ensure that the ship's design and workings are in accordance with the standards set by their class.[8]

Cover/Disguise Identity: Any physical, digital, or registered identity fraudulently adopted by a vessel to obfuscate its true identity.[9]

Dark Voyage or Signal Gap: Period of time during a voyage when a vessel has no AIS transmission. Typically, a tanker loads its cargo while offline (i.e., during signal gap) and then comes back online once its loading is complete.

Deceptive Shipping Practices: Tactics employed by bad actors in the shipping industry to avoid detection, identification, and recognition, as well as possible international sanctions.[10]

Due Diligence: The practice by organizations of prudent and careful screening for sanctions compliance and identifying sanctions-related risks through its customer, supplier, and vendor relationships, as well as in transactions being conducted by business lines, counterparties, and intermediaries.[11]

Fabricated Identity: An identity assumed by a vessel that corresponds to a fraudulently obtained, registered IMO number.[12]

False Flag: A false flag occurs when a vessel falsely represents that it is registered under a flag state without that flag state's consent and often without its knowledge. Any vessel which transmits, broadcasts, displays, or otherwise engages in the misuse of flag details which the authorized flag administration confirms as not being legally registered under the flag in question is designated as false. The false designation shall only be removed upon confirmation by all applicable entities that the designated vessel has met all legal requirements for registration and use of the flag.[13]

Flag Hopping: Flag hopping refers to the practice of repeatedly changing the flag state of the vessel, often to avoid being identified by the relevant authorities.[14]

Flag State: The country with whom a commercial ship is registered or by which it is licensed. The flag state has the legal authority and responsibility to enforce regulations upon vessels registered under its flag.[15]

Global Integrated Shipping Information System (GISIS): The GISIS is a website developed and maintained by the IMO to assist the global shipping industry and maritime professionals in due diligence, complying with different types of rules and regulations, global and local.[16]

Global Navigation Satellite System (GNSS): Refers to a constellation of satellites providing signals from space that transmit position and timing data to GNSS receivers. The receivers then use this data to determine the location of vessels.[17]

Group Owner: This is the parent company of the registered owner. It is the controlling interest behind its fleet and the ultimate beneficiary from the ownership. A group beneficial owner may or may not directly own ships itself as a registered owner. It may be the manager of its fleet, which is in turn owned by subsidiary companies. A third party may also manage its ships under contract.In some circumstances, a ship may be owned by a financial organization that has no operational involvement.[18]

Hezbollah: A Lebanon-based transnational Shiite Islamist group founded by Iran in 1982, following the ideology of absolute Wilayat al-Faqih, as expounded by Tehran's late Supreme Leader, Ayatollah Ruhollah Musavi Khomeini. Since its inception, Hezbollah has engaged in terrorist activities, targeting its own and Iran's enemies, both in Lebanon and abroad. Its activities have earned the organization and many of its members terror designations by the U.S. Departments of State and Treasury, as well as by other countries.[19]

Illicit Activities: Activities that are illegal and prohibited by international law, including international conventions.[20]

International Convention for the Safety of Life at Sea (SOLAS): An international maritime treaty that establishes the minimum safety measures required in the construction, equipment, and operation of merchant ships.[21]

International Maritime Organization (IMO): The IMO is the United Nations specialized agency responsible for the safety, security, and environmental protection of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted, and implemented.[22]

IMO number: A unique seven-digit number (preceded by the letters "IMO") issued on behalf of the IMO by IHS Maritime & Trade, a company based in the U.K., to vessels which is used never changed, regardless of the ownership of the vessel, flag state, or name. IMO numbers are intended to provide an independent audit trail for each vessel.[23]

Islamic Republic of Iran Shipping Line Group (IRISL): IRISL is Iran's national maritime carrier, a global operator with a worldwide network of subsidiaries, branch offices, and agent relationships. It provides a variety of maritime transport services, including bulk, break-bulk, cargo, and containerized shipping. These services connect Iranian exporters and importers with South America, Europe, the Middle East, Asia, and Africa.[24]

Islamic Revolutionary Guard Corps (IRGC): The premier military institution in the Islamic Republic of Iran tasked with defending the "revolution and its achievements." The IRGC only answers to the Supreme Leader and no one else in the government, including the presidency. It is constituted by four branches: Ground Forces, Aerospace Forces, Navy, and the Quds force.[25]

Laden: Indicates a vessel is loaded with cargo. The opposite of in ballast.[26]

Maritime Mobile Service Identity (MMSI) Number: A unique nine-digit number assigned to a vessel. The MMSI number is entered into the Automated Identification System (AIS) unit used on that vessel. MMSI numbers are managed and regulated internationally by the International Telecommunication Union and allow maritime communication equipment to be uniquely identified as a ship or coast radio station. The numbers are issued and associated to ships upon registration of equipment by authorized bodies, including ship registries. MMSI numbers are unique for the identification of a vessel.[27]

National Iranian Oil Company (NIOC): NIOC, overseen by the Iranian Ministry of Petroleum, is responsible for the exploration, production, refining, and export of oil and petroleum products in Iran.[28]

National Iranian Tanker Company (NITC): NITC, a subsidiary of NIOC, is responsible for the transportation of Iranian crude exports. NITC and NIOC provide both the oil and tankers for the sale of Iranian oil by the IRGC-QF.[29]

Office of Foreign Assets Control (OFAC): OFAC is a financial intelligence and enforcement agency of the U.S. Treasury Department. OFAC administers and enforces economic sanctions programs primarily against countries and groups of individuals, such as terrorists and narcotics traffickers.[30]

Operator: The company responsible for the commercial decisions concerning the employment of a ship and, therefore, who decides how and where that asset is employed. The direct beneficiary of the profits from the operations of the ship, this company may also be responsible for purchasing decisions on bunkers and port services.[31]

P5+1: The P5+1 refers to the U.N. Security Council's five permanent members (China, France, Russia, the United Kingdom, and the United States; plus Germany).

Physical Identity: A vessel's physical identity is determined by its observable features, which can include cosmetic (e.g., paint scheme), structural (e.g., hull design, deck configuration, pipelines, engine, etc.), and measured (e.g., length and breadth) characteristics.[32]

Protection and Indemnity (P&I) Clubs: Provide protection and indemnity insurance to shipowners against third-party liabilities and expenses. These include cargo loss or shortage; pollution from the ship and/or its cargo; cargo damage; loss of life and injury to crew members or passengers; wreck removal; collisions with other ships.[33]

Quds Force: The Quds (Jerusalem) Force is a distinct branch of the IRGC tasked with external operations.[34]

Registered Identity: The suite of information linked to a vessel's IMO number. As the international regulator of maritime and shipping affairs, the IMO ship registration and number system are considered authoritative.[35]

Registered Owner: The legal title of ownership of the vessel that appears on the ship's registration documents. It may be an owner/manager or a wholly owned subsidiary in a larger shipping group; or a bank or one-ship company vehicle set up by the bank; or of course, it may be a "brass-plate" company created on paper to legally own a ship and possibly to limit liability for the "real" owners and/or benefit from off-shore tax laws. It may anyway be a legal-requirement of the flag-state with whom the ship is registered for the legal owner to be a company registered in that country.[36]

Satellite Images: Photographs of Earth captured by satellites.

Shell Identity: An identity assumed by a vessel that corresponds to a fraudulently obtained registered IMO number.

Ship Manager: The company designated by the ship owner or charterer to be responsible for the day-to-day commercial running of the ship and the best contact for the ship regarding commercial matters.[37]

Ship-to-Ship (STS) Transfer: The transfer of cargo between two vessels positioned alongside each other.

Ship-to-Ship (STS) Transfer Zone: A designated area where vessels can engage in STS transfers.

Specially Designated Nationals and Blocked Persons List (SDN List): As part of its enforcement efforts, OFAC publishes a list of individuals and companies owned or controlled by, or acting for or on behalf of, targeted countries. Collectively, such individuals and companies are called "Specially Designated Nationals" or "SDNs." Their assets are blocked, and U.S. persons are generally prohibited from dealing with them.[38]

Spoofing: The intentional manipulation of AIS data to transmit false information regarding a vessel's location.

Timeline Alert: A notification from IHS Maritime that details any AIS message changes for all ships in a dedicated watchlist.

Vessel Traffic Service (VTS): The purpose of a VTS is to provide active monitoring and navigational advice for vessels in particularly confined and busy waterways. Surveilled VTS systems consist of one or more land-based sensors (i.e., AIS), which output their signals to a central location where operators monitor and manage vessel traffic movement.[39]

Very Large Crude Carrier (VLCC): A tanker of 200,000 to 319,000dwt. It can carry about 2 million barrels of crude oil.[40]

HISTORY OF IRAN'S DECEPTIVE SHIPPING PRACTICES

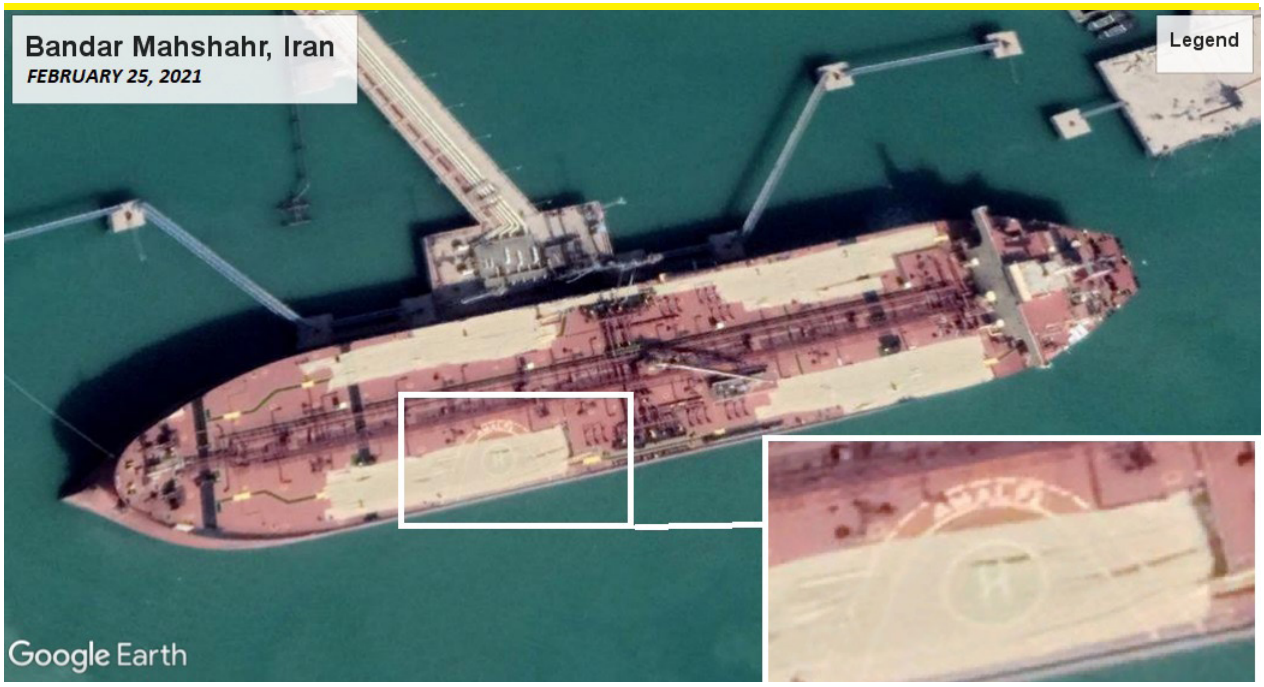
IN 2020, THE U.S. DEPARTMENT OF THE TREASURY OUTLINED THE MOST COMMON TACTICS USED BY IRAN, NORTH KOREA, AND SYRIA TO FACILITATE SANCTIONABLE MARITIME TRADE.[41] BELOW IS A DESCRIPTION OF EACH TACTIC AND RECENT REAL-LIFE ILLUSTRATIONS.

Physical Identity Alterations

Every vessel is required to display its name and IMO number in a prominent and visible location on the vessel's hull or superstructure. Ships involved in illicit activities often paint over vessel names and IMO numbers to obscure their identities and pass themselves off as different vessels. Similarly, oil tankers in Iran and Venezuela are deploying large sheets of nylon tarpaulin as coverings to conceal names and IMO numbers.[42]

Case Study SONA STAR

On February 26, 2021, crude oil tanker SONA STAR (formerly known as LIDINIA and AMALFI) (IMO: 9263643) engaged in several deceptive practices to disguise itself as it loaded oil from Iran. First, on February 26, 2021 – the date the vessel is suspected of loading fuel oil from Bandar Mahshahr, Iran – SONA STAR was engaged in a dark voyage in which the AIS transponder for SONA STAR was turned off. While the AIS transponder was off, the vessel went to Bandar Mahshahr, Iran. Satellite imagery below shows a tarp placed on the vessel's deck to disguise it. However, a close-up shot shows the former name of the vessel, AMALFI, painted on the helipad.



(Source: Google Earth)

Falsifying Cargo and Vessel Documents

Bills of lading, certificates of origin, invoices, packing lists, proofs of insurance, and lists of last ports of call are examples of documents typically used in shipping transactions. U.S. authorities have found that sanctions evaders have falsified shipping documentation pertaining to petrochemicals, petroleum, petroleum products, metals (steel and iron), or sand to disguise their Iranian origin.

Case Study GRACE 1

In August 2019, the U.S. Department of Justice issued a warrant to seize the detained Iranian oil tanker, ARMAN 114 (formerly known as GRACE 1) (IMO: 9116412), carrying 2.1 million barrels of Iranian oil to Syria. According to the complaint filed in the U.S. District Court for the District of Columbia, as part of the seizure, "Individuals associated with the *Grace 1* provided those parties who participated… with fraudulent shipping documents stating that the *Grace 1* had obtained oil and departure from the Iraqi shipping port, Basra Oil Terminal. These shipping documents were forged as a means to conceal the fact that the *Grace 1* had actually obtained oil and departed from Iran. Relevant authorities in Iraq have confirmed that the documents were fraudulent. These fraudulent documents were created not only to deceive the parties involved…but also may have been created to deceive any financial institutions involved in the related financial transactions."[43] UANI has similarly identified numerous cases of vessels using forged documents to mask the true origin of their cargo.

Ship-to-Ship Transfers

Ship-to-ship (STS) transfers of cargo between vessels at sea are routinely used by Iran to muddy the transfer trail in order to evade sanctions on its oil products. Through these transfers, vessels attempt to conceal the true Iranian origin or ultimate destination of surreptitiously transferred petroleum, coal, and other goods. These transfers of Iranian oil typically occur in the Persian Gulf, Gulf of Oman, east of Singapore, or in the South China Sea.

Case Study Maersk Tankers and STS Transfers

In separate incidents in December and January 2021, UANI identified two vessels managed by Maersk Tankers, DIAMONDBACK (IMO: 9315446) and CELSIUS EVERETT (IMO: 9410870), that were about to load oil – whose Iranian origin was concealed – via STS transfers.[44] The STS transfers were halted after the company was alerted by UANI of the cargo's true source.[45]

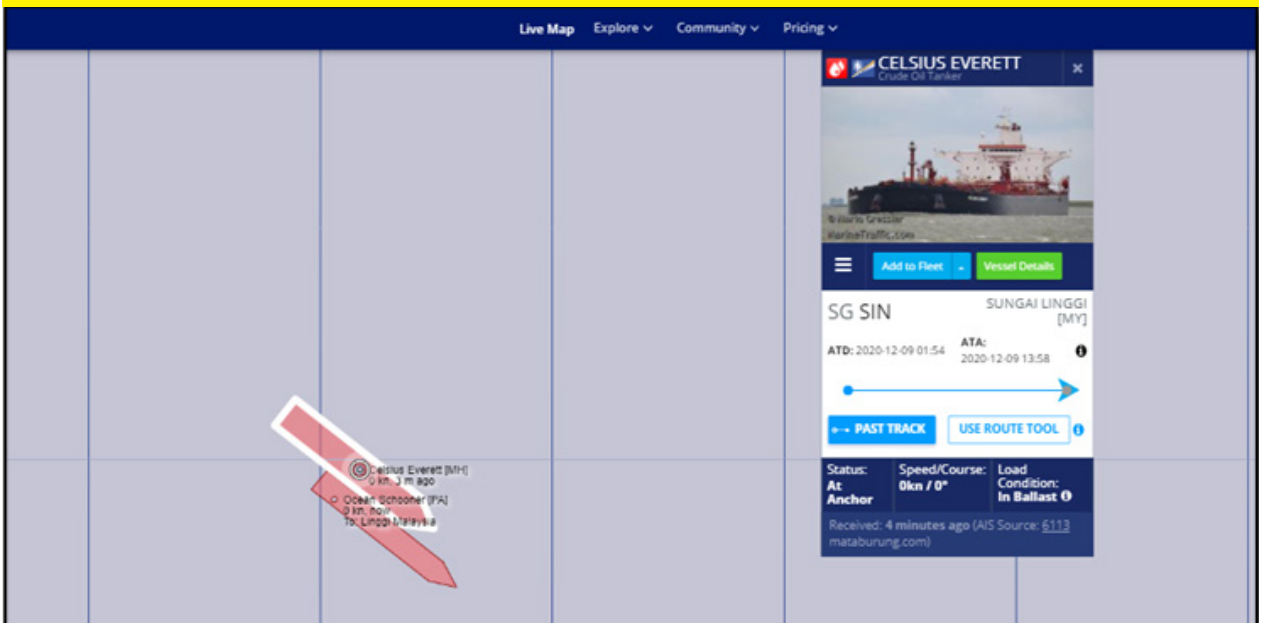


Image believed to show OCEAN SCHOONER (vessel transporting Iranian petroleum) in an STS transfer with CELSIUS EVERETT (Maersk Tankers operated vessel) on December 10, 2020. (Source: Marine Traffic)

False Flags and Flag Hopping

Those looking to evade sanctions and engage in deceptive shipping practices may transmit, broadcast, display, or otherwise engage in the misuse of Flag details (i.e., false flag) in order to mask the vessel's trading activities. Typically, these flag states provide no easy means of communication, making it difficult to verify details and allow the falsely flagged vessel to continue engaging in sanctions evasion.[46] Alternatively, to avoid detection, vessels and the associated companies looking to evade sanctions may use otherwise legitimate registration processes quickly and repeatedly to move their registration to new flag states (i.e., flag hopping). Flag states often lack the resources or the will to enforce international law effectively. As a result, flag hopping allows the vessel to avoid prosecution and laws by a single flag state.

UANI regularly corresponds with flag states to confirm the accuracy of the information a vessel is broadcasting. From the list of tankers UANI suspects to be engaged in the transport of Iranian petroleum,[47] at least eight vessels are operating under false flags. Similarly, IHS Maritime has confirmed that the eight vessels listed below are not legally registered under the flag in question and therefore are designated as false.

#	IMO/LR/IHS No.	Name of Ship	Flag
Apply			Samoa False
☑	9196644	EKATERINA	Samoa False
☑	9293741	ETHAN	Samoa False
☑	9162916	HANA	Samoa False
☑	9203277	VERA	Samoa False
☑	9229439	CERES I	Sao Tome & Principe False
☑	9052331	DOLPHIN	Sao Tome & Principe False
☑	9224295	JUDY II	Sao Tome & Principe False
☑	9102239	PENNY H	Tanzania False

List of vessels on IHS Maritime that are confirmed as using false flags (Source: IHS Maritime)

Complex, Front, and Shell Ownership and Management

The U.S. Treasury Department has issued warnings over complex ownership or management of shipping companies and managers as well as vessels to obfuscate who is responsible for illicit activities. Specifically, "bad actors attempt to take advantage of this complexity through the use of complex business structures in jurisdictions with limited public information regarding ownership, including using shell companies (companies whose sole activity is to hold ownership of one or more assets, including other shell companies) and/or multiple levels of ownership and management, to disguise the ultimate beneficial owner of cargo or commodities in order to avoid sanctions or other enforcement action. Bad actors may also engage in a pattern of changes in the ownership or management of companies or in the International Safety Management Code (ISM) management companies used."[48]

Case Study Quds Force, Reach, Donghai

In 2019, the United States levied sanctions on a network, run by Rostam Qasemi, of ship managers, vessels, and facilitators, employing complexity tactics to conceal illicit activities.[49] Rostam Qasemi, Iran's minister of roads and urban development and who previously served as an oil minister, used a complex network of intermediaries which featured dozens of ship managers, vessels, and facilitators, to enable the IRGC-QF to obfuscate its involvement in selling Iranian oil. The Treasury Department determined, "in spring 2019 alone, this [Quds Force]-led network employed more than a dozen vessels to transport nearly 10 million barrels of crude oil, predominantly to the Syrian regime. These shipments, taken collectively, sold for more than half a billion dollars." Additionally, the network attempted to mask Iranian cargo as Iraqi origin.[50]

In another instance, in October 2020, the United States sanctioned entities and individuals in China and Hong Kong, where an Iranian firm used Chinese front companies to disguise activities for the Islamic Republic of Iran Shipping Line Group (IRISL). One of the entities, Reach Holding Group Company Ltd., working on behalf of IRISL, lied to Chinese companies about IRISL's role in shipments and falsified documents to conceal the true nature of cargo from the Chinese government.[51] The Treasury Department did not specify the cargo in this instance. However, "the international community has long recognized that the Iranian regime uses IRISL to transport proliferation-sensitive items intended for Iran's ballistic missile and military programs."[52]

In December 2020, the Treasury Department revealed that China-based Donghai International Ship Management Limited operated a vessel that carried tens of thousands of metric tons of petrochemicals worth millions of dollars from Iran to China for a deal brokered by Triliance Petroleum Co. Ltd. The United States accused Triliance of using front companies to help facilitate Iran's petrochemical exports. Alpha Tech Trading FZE, based in the United Arab Emirates (UAE), was also used as a front company.[53]

Disabling or Manipulating the Automatic Identification System (AIS) on Vessels

UANI research demonstrates that the most sophisticated efforts to mask the origin of Iranian oil products involve the manipulation of vessel AIS data. This section describes in detail the different ways in which Iran has taken advantage of the manipulation of vessels' AIS to evade sanctions.

AIS and How it Works

AIS is an essential apparatus installed in ships to provide ship information to other ships and shore organizations such as the Vessel Traffic Services (VTS). AIS is also used by maritime authorities such as flag states and P&I clubs to identify and monitor ships' movements.[54]

Moreover, AIS data can be used to identify abnormal behaviors, often connected to suspicious maritime activities such as: illegal, unreported, or unregulated fishing; illegal immigration; drug smuggling; marine pollution and waste dumping; prohibited imports and exports; piracy; and maritime terrorism. In addition, AIS can be intentionally manipulated to transmit false information regarding vessel location, a phenomenon known as spoofing. Sanctions evaders can use machine-generated location tampering to falsify a vessel's Global Positioning System (GPS) reading. This false GPS reading is then recorded and transmitted via its AIS transponder and broadcasts a different location than the vessel's actual whereabouts.[55]

Vulnerabilities of AIS

AIS was originally created for maritime safety purposes and not necessarily for monitoring sanctions evasion or illegal activities. Additionally, AIS was not initially designed to resist interference by vessel owners and managers. The data transmitted by AIS transponders are therefore not subject to any control or verification. AIS data can be manipulated, spoofed, or hacked by individuals and entities seeking to utilize the technology for deceptive purposes.[56]

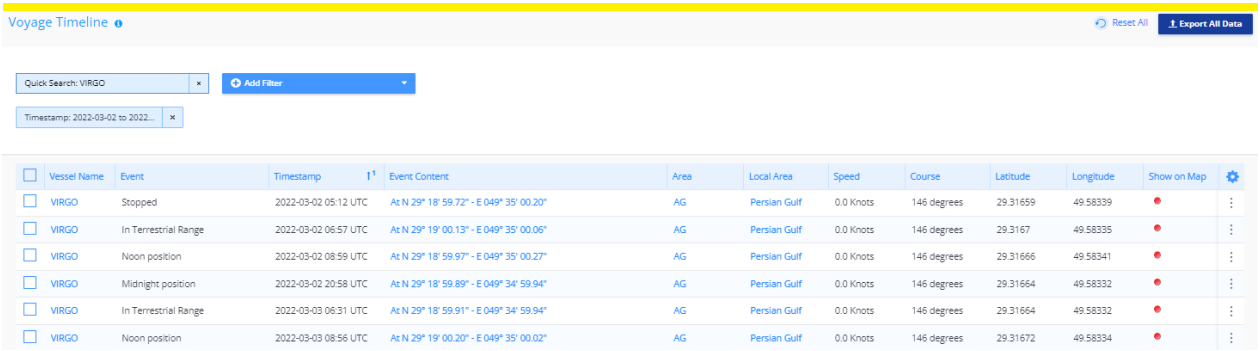
Iranian Misuse of AIS

UANI researchers have uncovered various Iranian techniques to manipulate vessels' AIS data in order to facilitate the trade of prohibited Iranian cargo.

GNSS Manipulation

GPS and GNSS are widely used across industries, including in cellular communication networks, basic consumer goods, high-end military systems, and stock-trading inputs. According to the Center for Advanced Defense Studies (C4ADS), "GNSS spoofing is the deliberate transmission of signals designed to emulate the authentic satellite systems that underpin much of the world's critical infrastructure."[57]

In GNSS spoofing, sanctions breakers will falsify the position broadcast by vessel AIS to disguise a vessel's accurate location. When a vessel is anchored and not spoofing, it moves with the wind, and therefore, the course – the direction in which the ship moves – also changes in its AIS messages. However, in most instances of GPS/GNSS spoofing, the vessel transmits AIS messages repeating the same GPS coordinates with no movement in the course. For example, on March 2 – 3, 2022, the VIRGO (IMO: 9236250) repeatedly transmitted the same GPS coordinates and course. In comparison, a vessel not spoofing its AIS would show movements in the course to correspond with the wind.



Vessel Name	Event	Timestamp	Event Content	Area	Local Area	Speed	Course	Latitude	Longitude	Show on Map
VIRGO	Stopped	2022-03-02 05:12 UTC	At N 29° 18' 59.72" - E 049° 35' 00.20"	AG	Persian Gulf	0.0 Knots	146 degrees	29.31659	49.58339	
VIRGO	In Terrestrial Range	2022-03-02 06:57 UTC	At N 29° 19' 00.13" - E 049° 35' 00.06"	AG	Persian Gulf	0.0 Knots	146 degrees	29.3167	49.58335	
VIRGO	Noon position	2022-03-02 08:59 UTC	At N 29° 18' 59.97" - E 049° 35' 00.27"	AG	Persian Gulf	0.0 Knots	146 degrees	29.31666	49.58341	
VIRGO	Midnight position	2022-03-02 20:58 UTC	At N 29° 18' 59.89" - E 049° 34' 59.94"	AG	Persian Gulf	0.0 Knots	146 degrees	29.31664	49.58332	
VIRGO	In Terrestrial Range	2022-03-03 06:31 UTC	At N 29° 18' 59.91" - E 049° 34' 59.94"	AG	Persian Gulf	0.0 Knots	146 degrees	29.31664	49.58332	
VIRGO	Noon position	2022-03-03 08:56 UTC	At N 29° 19' 00.20" - E 049° 35' 00.02"	AG	Persian Gulf	0.0 Knots	146 degrees	29.31672	49.58334	

Timestamp	Event Content	Area	Local Area	Speed	Course	Latitude	Longitude	Show on Map
2022-03-03 08:40 UTC	At N 25° 36' 44.51" - E 056° 57' 18.52"	AG	Oman Gulf	0.1 Knots	55 degrees	25.61237	56.95515	
2022-03-03 08:04 UTC	At N 25° 36' 43.85" - E 056° 57' 16.92"	AG	Oman Gulf	0.0 Knots	72 degrees	25.61218	56.9547	
2022-03-02 19:58 UTC	At N 25° 36' 44.81" - E 056° 57' 09.89"	AG	Oman Gulf	0.0 Knots	123 degrees	25.61245	56.95275	
2022-03-02 10:37 UTC	At N 25° 36' 43.14" - E 056° 57' 16.19"	AG	Oman Gulf	0.1 Knots	80 degrees	25.61198	56.9545	
2022-03-02 08:04 UTC	At N 25° 36' 43.14" - E 056° 57' 16.92"	AG	Oman Gulf	0.1 Knots	58 degrees	25.61198	56.9547	

(Source: Marine Traffic)

More sophisticated examples can produce very real signals, including changes in the course, and can only be identified through comparison with additional independent data such as satellite imagery, physical sightings of the vessel, or synthetic aperture radar (SAR) tracks.[58]

Until recently, signal generators capable of spoofing a GNSS position were only available for military vessels. However, such signal generators are now less expensive and commercially available. Devices capable of mimicking the signals produced by multimillion-dollar GPS satellite systems can be purchased for under $300.[59]

Case Study DOMINAR (IMO: 9194139)

Vessel Information

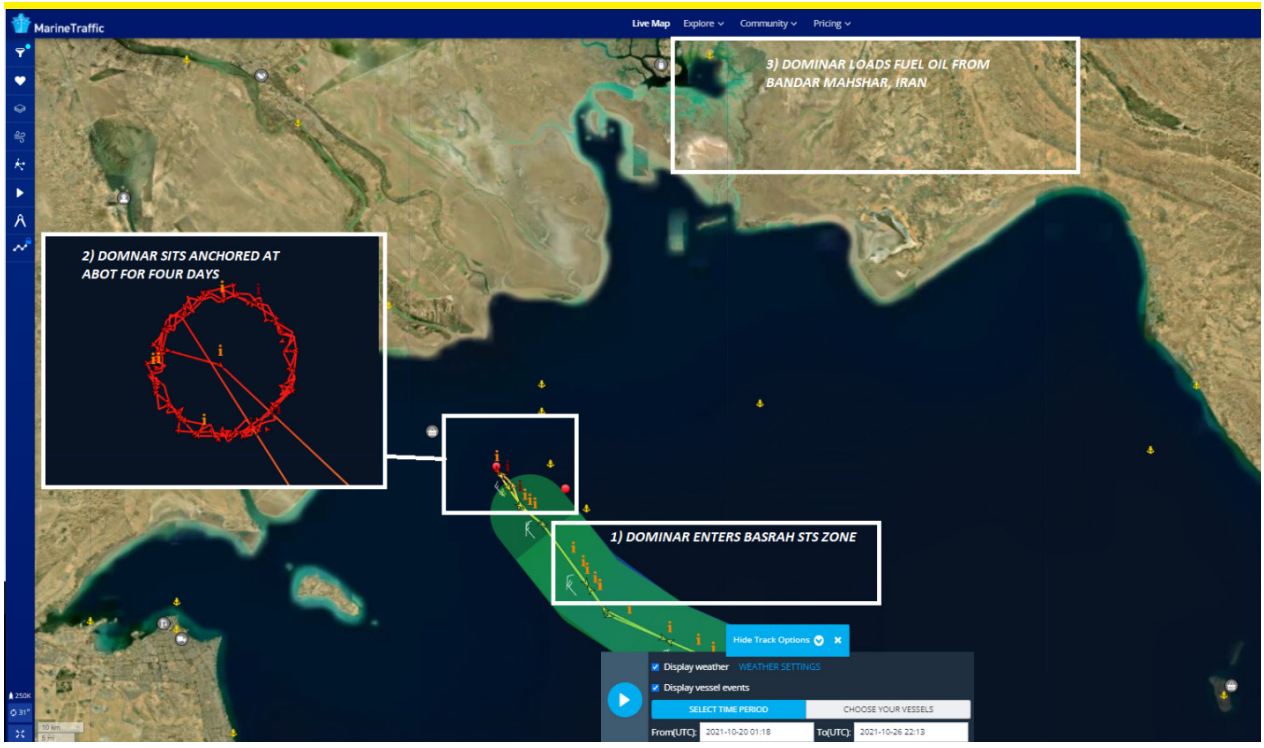
NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
DOMINAR	9194139	511982000	248 meters by 43 meters	October 23 – 25, 2021	Bandar Mahshahr, Iran

Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
October 21, 2021	DOMINAR entered Basrah Oil Terminal (ABOT), a known STS transfer zone.	Same as reported.
October 21 – 25, 2021	According to AIS data, DOMINAR sat anchored at ABOT (29.670, 48.709) for four days.	Satellite image does not show any vessel at the location where DOMINAR is reportedly anchored. UANI identifies DOMINAR loading fuel oil at Bandar Mahshahr, Iran.
October 25, 2021	DOMINAR updated its load condition from in ballast to laden. DOMINAR then proceeded to leave the Basrah STS transfer zone for Fujairah, UAE.	Same as reported.

Analysis

DOMINAR loaded fuel oil at Bandar Mahshahr while its AIS transponder broadcast its location as anchored in Iraqi waters. DOMINAR's signal generator was likely manipulated to transmit a fake GPS signal that the AIS transponder locked onto, which generated an inaccurate vessel location via AIS.



Voyage history for DOMINAR shows the vessel anchored at ABOT, Iraq, on October 21 and departing on October 25, 2021. (Source: Marine Traffic)

Satellite image shows DOMINAR loading fuel oil at Bandar Mahshahr, Iran, on October 24, 2021. (Source: Sentinel Hub)[60]

Satellite image at 29.67003, 48.70999, where DOMINAR should have been anchored on October 24, 2021. DOMINAR is a green Aframax tanker with a length of 248m. The vessel shown in this image is a red handymax at 184m. (Source: Sentinel Hub)

Metadata/Data Manipulation

Metadata is data about other data (such as where and whom data was generated) and is part of a computer user's digital trail in the online and offline information space. Examples of metadata include email subject lines, file creation dates, file access, and smartphone location data.

Ship-specific metadata includes the information produced by a vessel's AIS transponder. Every vessel gives off an AIS message carrying metadata that is then collected and simplified by ship-tracking websites such as Marine Traffic and IHS Maritime & Trade for a user to easily understand.[61]

MMSI, LAT, LON, SPEED, HEADING, COURSE, STATUS, TIMESTAMP, SHIPNAME, SHIPTYPE, TYPE_NAME, AIS_TYPE_SUMMARY, IMO, CALLSIGN, FLAG, PORT_ID, PORT_UNLOCODE, CURRENT_PORT, LAST_PORT_ID, LAST_PORT_UNLOCODE, LAST_PORT, LAST_PORT_TIME, DESTINATION, ETA, ETA_CALC, LENGTH, WIDTH, DRAUGHT, GRT, NEXT_PORT_ID, NEXT_PORT_UNLOCODE, NEXT_PORT_NAME, NEXT_PORT_COUNTRY, DWT, YEAR_BUILT, DSRC

310627000,-35.564580,126.044800,226,89,89,0,2017-02-14T16:14:00,QUEEN MARY 2,60,Passengers Ship,Passenger,9241061,ZCEF6,BM,,,,768,AUFRE,FREMANTLE,2017-02-12T12:47:00,ADELAIDE,2017-02-15T23:00:00,2017-02-15T21:30:00,345.03,48.7,103,148528,890,AUADL,ADELAIDE,AU,19189,2002,SAT

Example of an AIS message with its metadata.

The deliberate manipulation of metadata involves modifying known vessel details such as the vessel's name, MMSI, cargo, position, speed, course, and destination with fictitious information.

The deliberate manipulation of metadata indicates that a vessel is engaged in spoofing activity. The metadata manipulation can be seen in the AIS messages when a vessel turns off one AIS transponder and turns on its secondary transponder, discussed more below. In addition, a vessel may change its metadata or completely omit its metadata in order to conceal its activities. By changing the metadata, a vessel can deny that it engaged in illicit behavior.

Case Study 1. AVITAL (IMO: 9246279)

AVITAL engaged in metadata manipulation while loading crude oil from Kharg Island, Iran, on two occasions during December 2021.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
AVITAL (EX: LAVAL)	9246279	561601060	333m meters by 60 meters	December 13 and December 23, 2021	Kharg Island, Iran

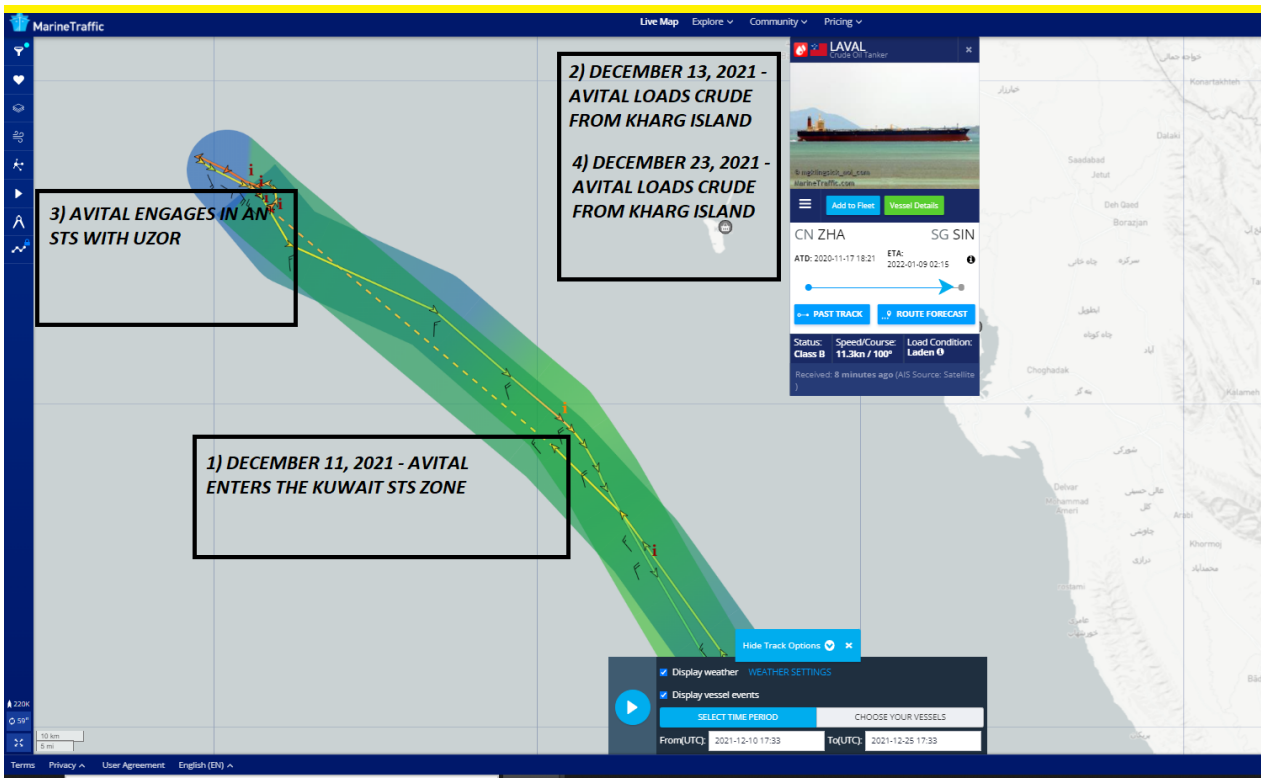
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
December 11, 2021	AVITAL entered the Kuwait STS transfer zone.	Satellite image did not show any vessel at the location where AVITAL is reportedly anchored.
December 13, 2021	According to AIS data, AVITAL sat anchored at 29.29, 49.34 for thirteen days.	UANI identified AVITAL loading crude oil at Kharg Island, Iran.
December 15, 2021	According to AIS data, AVITAL still sat anchored at 29.29, 49.34.	AVITAL engaged in an STS transfer with crude oil tanker UZOR (IMO: 9224805).
December 23, 2021	According to AIS data, AVITAL was still sitting anchored at 29.29, 49.34.	UANI identified AVITAL loading crude oil at Kharg Island, Iran.
December 24, 2021	AVITAL departed and updated its load condition to laden.	Same as reported.

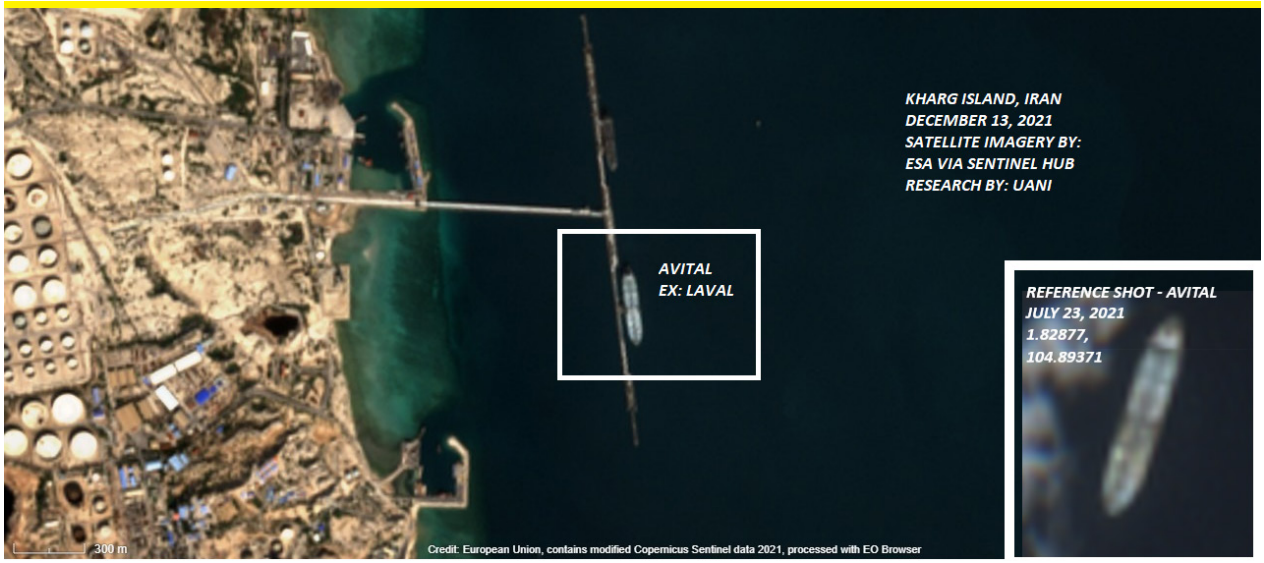
Analysis

On December 13, 2021, at 4:45 UTC, AVITAL stops transmitting an AIS signal. Just before the vessel stopped transmitting a signal, the tanker transmitted one single AIS message where the metadata differed from AVITAL's 'real' metadata. The metadata of this AIS message, sent at 22:51, claimed AVITAL had a width of 58m instead of 60m.

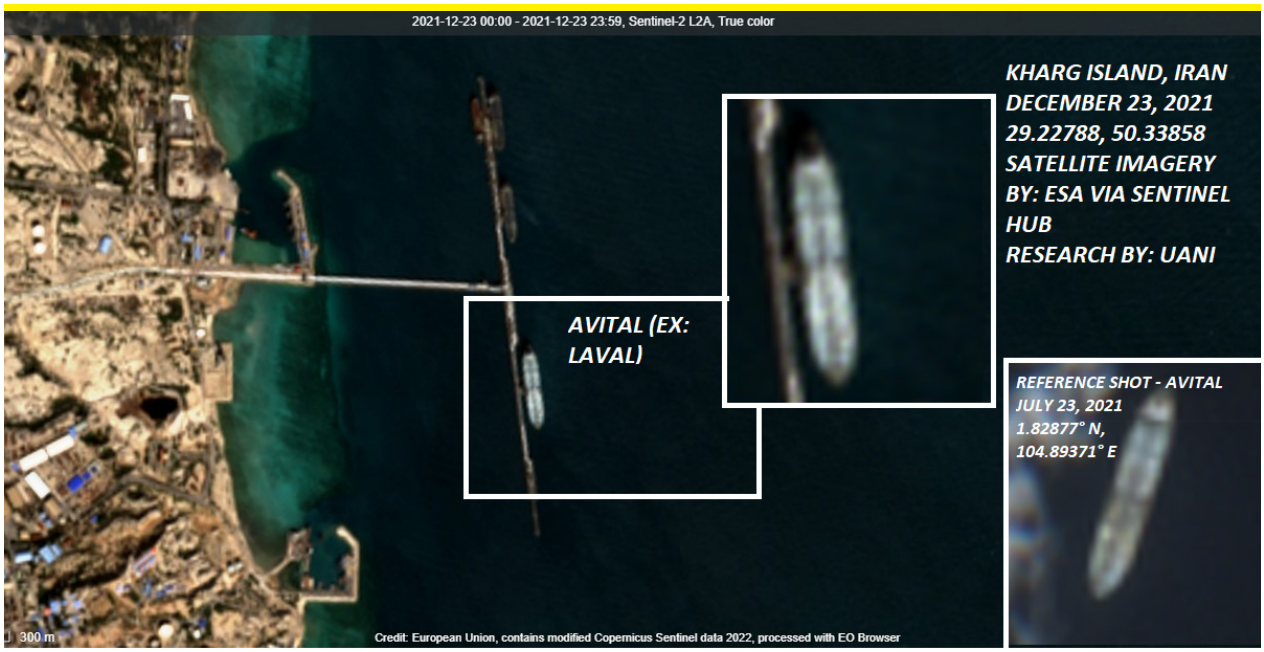
Following the same pattern, AVITAL transmitted only four AIS messages (typically, a vessel transmits AIS messages every 6 minutes) on December 23, 2021. The transmitted metadata again indicates a vessel width of 58m rather than 60m, and one message identified the vessel as LAVAL (an old name for AVITAL). By changing its size and name, AVITAL manipulated its AIS metadata and attempted to disguise its identity while loading sanctioned Iranian oil.



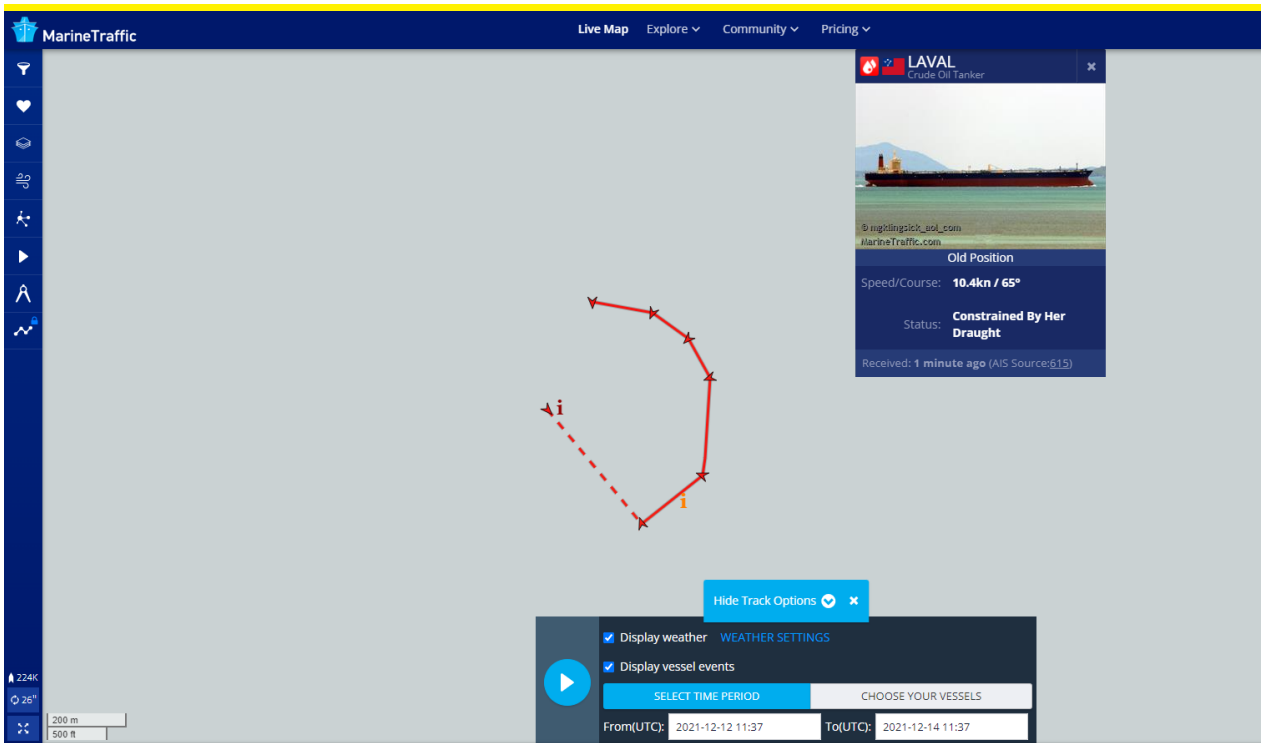
Voyage history for AVITAL between December 10 – 25, 2021. (Source: Marine Traffic)



Satellite image shows AVITAL loading Iranian crude oil from Kharg Island, Iran, on December 13, 2021. (Source: Sentinel Hub)[62]



Satellite image shows AVITAL loading Iranian crude oil from Kharg Island, Iran, on December 13, 2021. (Source: Sentinel Hub)[63]



Voyage history for AVITAL between December 12 – 14, 2021. The dotted lines show that the vessel was not transmitting an AIS signal during those two location points. (Source: Marine Traffic)

Case Study 2. UZOR (IMO: 9224805)

UZOR engaged in metadata manipulation while loading Iranian crude oil via STS transfer in the Gulf of Oman.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
UZOR	9224805	613612000	340 meters by 50 meters	October 19, 2021	STS transfer zone, Gulf Of Oman

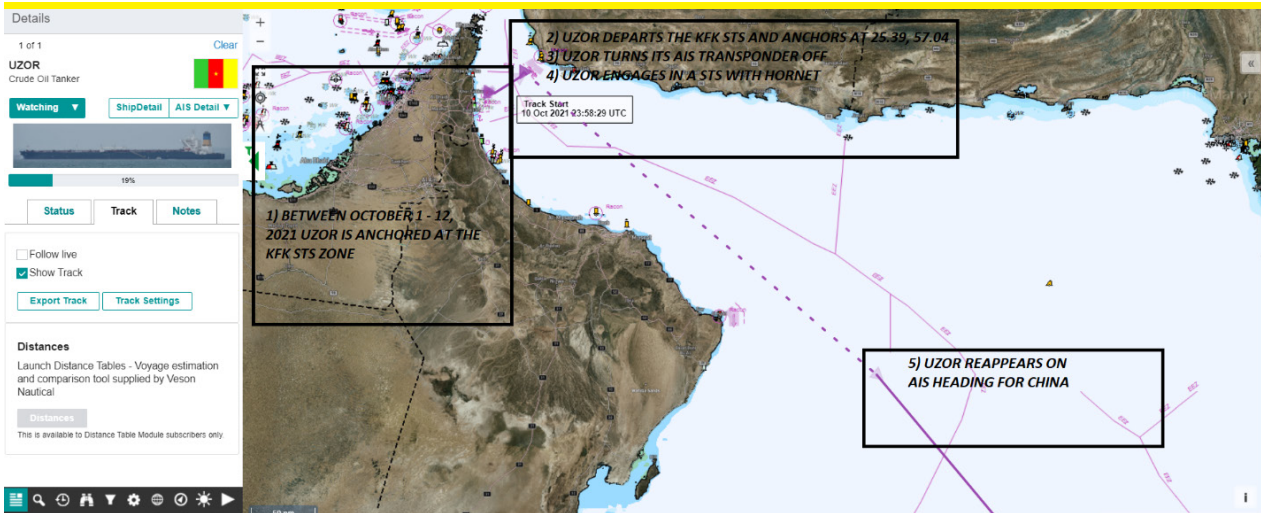
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
October 1 – 22, 2021	UZOR reported being anchored at the Khor Fakkan STS transfer zone at 25.65, 57.07.	Satellite image did not show any vessel at the location where UZOR is reportedly anchored.
October 12, 2021	According to AIS data, UZOR departed the Khor Fakkan STS transfer zone for 25.39, 57.04.	Satellite image did not show any vessel at the location where UZOR is reportedly anchored.
October 17 – 21, 2021	UZOR turned its AIS transponder off and did not transmit any AIS messages during this time.	UANI identified UZOR carrying out an STS transfer of Iranian oil with the crude oil tanker HORNET (IMO: 9197844).*
October 22, 2021	UZOR turns its AIS transponder on and reappears online as it heads for China.	Same as reported.

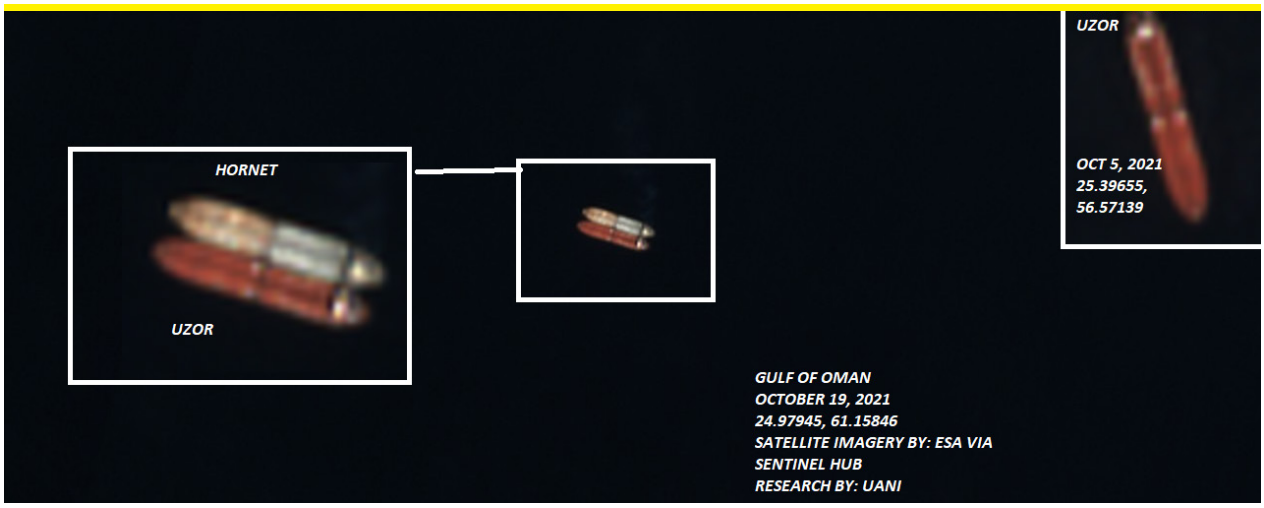
*Prior to engaging in the STS with UZOR, UANI identified HORNET loading crude oil from Kharg Island, Iran, on October 9, 2021.

Analysis

On October 12, 2021, when UZOR departed the Khor Fakkan STS transfer zone, UZOR transmitted one single AIS message that included an AIS type of 82, a type normally used by tankers carrying hazardous goods, and different from UZOR's actual type, which is 80.[64] By transmitting an AIS type different from its own and manipulating its AIS metadata, UANI concluded that UZOR was trying to disguise its identity leading up to this STS transfer.



Voyage history for UZOR between October 1 – 22, 2021.
(Source: IHS Maritime)



Satellite images show UZOR loading Iranian crude oil via STS transfer on October 19, 2021. (Source: Sentinel Hub)[65]

MMSI Numbers and Spoofing

The registries of flag states issue MMSI numbers that are supposed to be unique to each vessel. However, MMSI numbers are increasingly misused to replicate another vessel's identity. Specifically, vessels can transmit an MMSI number known to be used by other vessels, replicating another vessel's identity, and exploiting that other vessel's non-sanctioned status or activity. The vessel being spoofed via MMSI number may be an innocent vessel selected at random, or it may be complicit in the sanctions breaking activity. In the latter instance, the vessel would hand over its identity at a pre-arranged meeting at sea with the sanctions breaking vessel and then resume transmitting AIS messages.[66] The two separate vessels will appear as one in the AIS data, with a "track" that jumps back and forth between two locations.[67]

Case Study 1. AMAK (IMO: 9244635)

AMAK engaged in MMSI spoofing to assume the identity of the vessel LIAOSUIYU35376 00 while loading crude oil from Kharg Island, Iran.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
AMAK	9244635	353760000	333 meters by 60 meters	November 24, 2021	Kharg Island, Iran

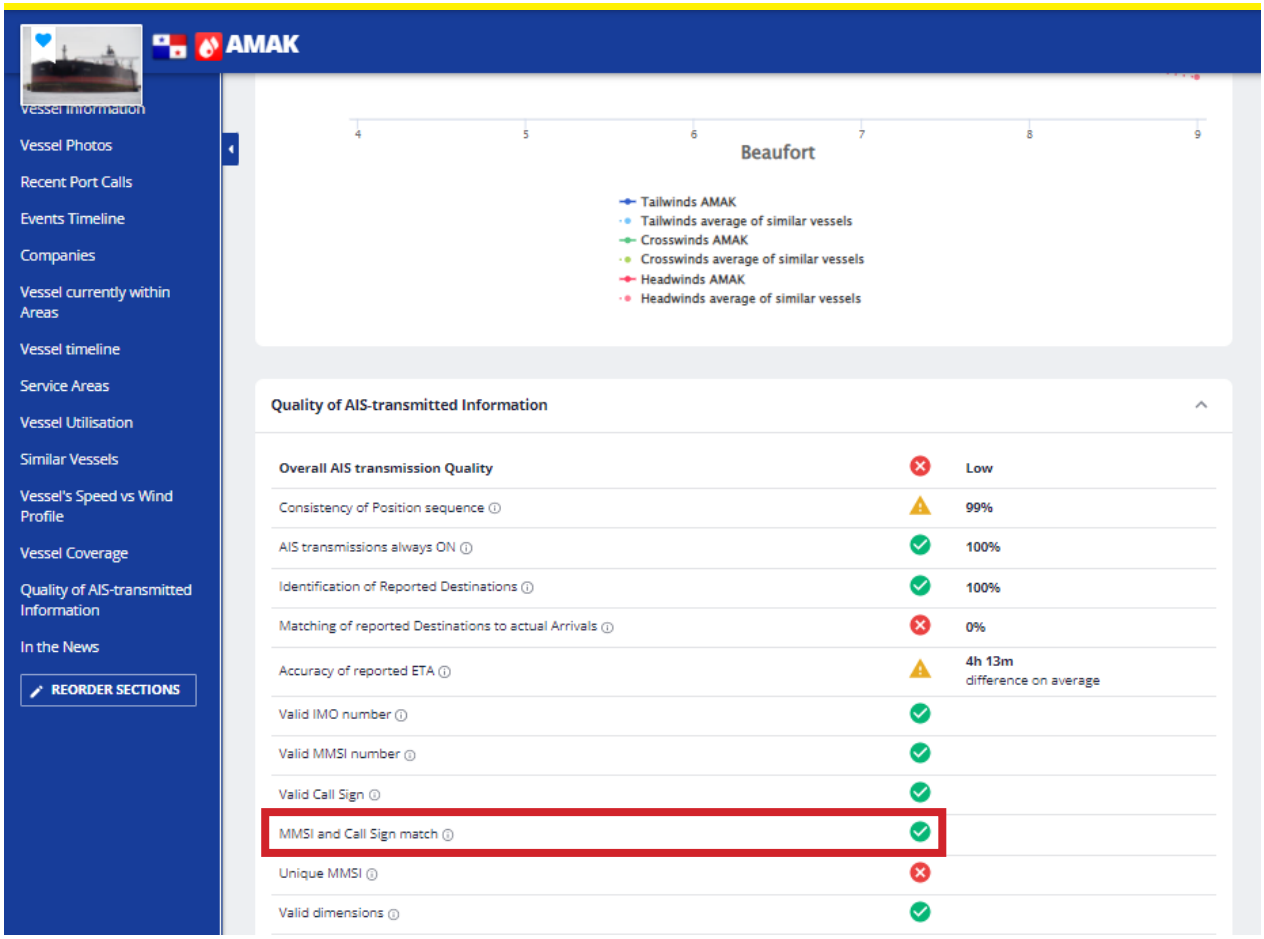
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
October 31, 2021	AMAK departed Singapore waters after it engaged in a STS transfer of Iranian crude oil. The vessel declared its destination as Khor Fakkan, UAE.	Same as reported.
November 13 – 16, 2021	According to AIS data, AMAK reached the Khor Fakkan STS transfer zone, where it anchored at 25.389, 56.567.	Satellite image confirmed AMAK is anchored at Khor Fakkan.
November 17, 2021	According to AIS data, AMAK traveled north within the Khor Fakkan STS transfer zone, where it anchored at 25.841, 56.905. AMAK then went offline for three days before abruptly heading back south within the STS transfer zone when its AIS returned online and reappeared.	N/A
November 21 – 28 2021	According to AIS data, at 3:47 AM, AMAK was in Shandong, China. Three hours later, at 6:47 AM, AMAK was within the Shidao (Shidaozhen) port at 36.851, 122.375. It is not possible for a vessel to have traveled from Shandong to Shidao in only three hours. AMAK seemingly reports AIS messages back and forth between the Gulf of Oman and Shidao for nine days.	Satellite image did not show any vessel at the location where AMAK was reportedly anchored. On November 23, 2021, UANI identified AMAK loading crude oil at Kharg Island, Iran.

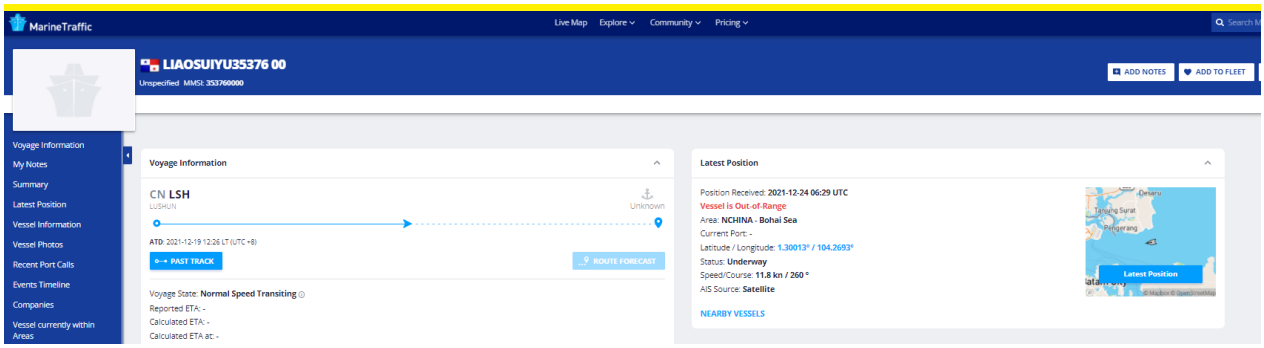
Analysis

The AIS messages indicating AMAK's location between November 21 and 28 were clearly inaccurate. A vessel cannot travel between the Gulf of Oman and China in the amount of time suggested by the AIS data for AMAK. This indicated that AMAK was engaged in spoofing during this timeframe to hide that it was at Kharg Island, Iran, loading crude oil.

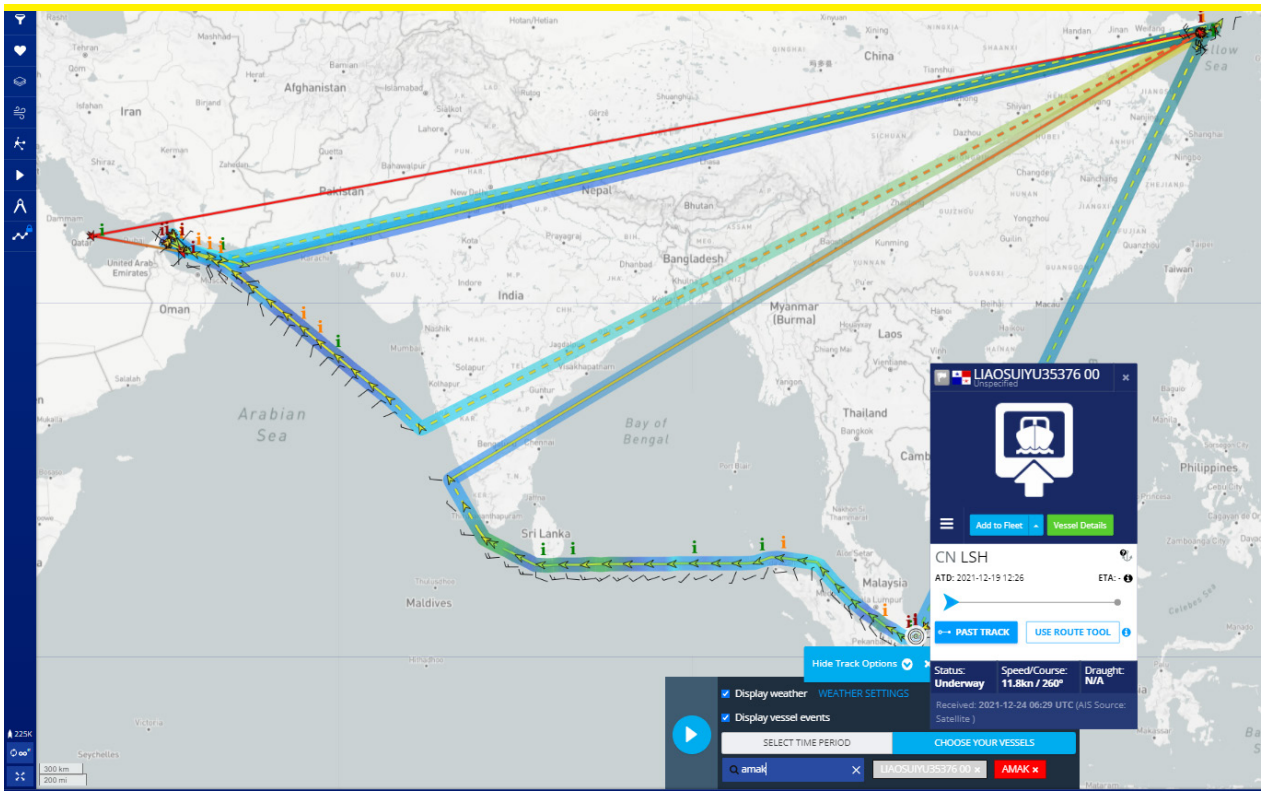
Additional analysis reveals that AMAK's MMSI number (35376000) was not unique and was shared with another vessel. In this case, the vessel is LIAOSUIYU36376 00. Furthermore, the vessels' voyage histories are identical. Rather than looking like two separate vessels in the AIS data, the two appear as one vessel with a "track" that jumps back and forth between two locations, making it harder to identify the legitimate location of either AMAK or LIAOSUIYU36376 00. Between November 21 and 28, 2021, AMAK manipulated its MMSI to pretend to be LIAOSUIYU36376 00.



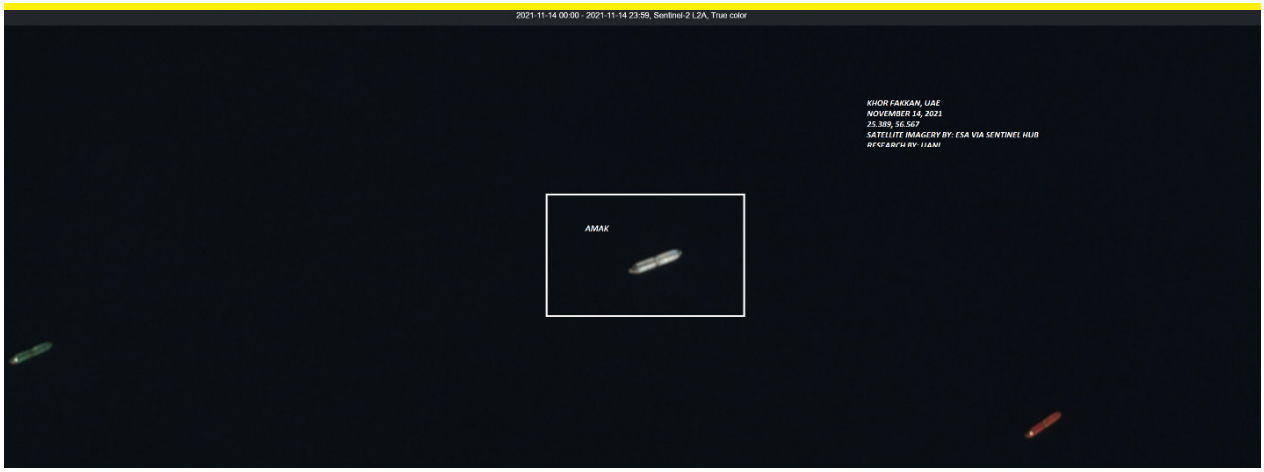
Indication that AMAK's MMSI number not being unique, meaning it shares an MMSI number with another vessel. (Source: Marine Traffic)



Vessel details for LIAOSUIYU36376 00, show that its MMSI number matches the MMSI number for AMAK. (Source: Marine Traffic)

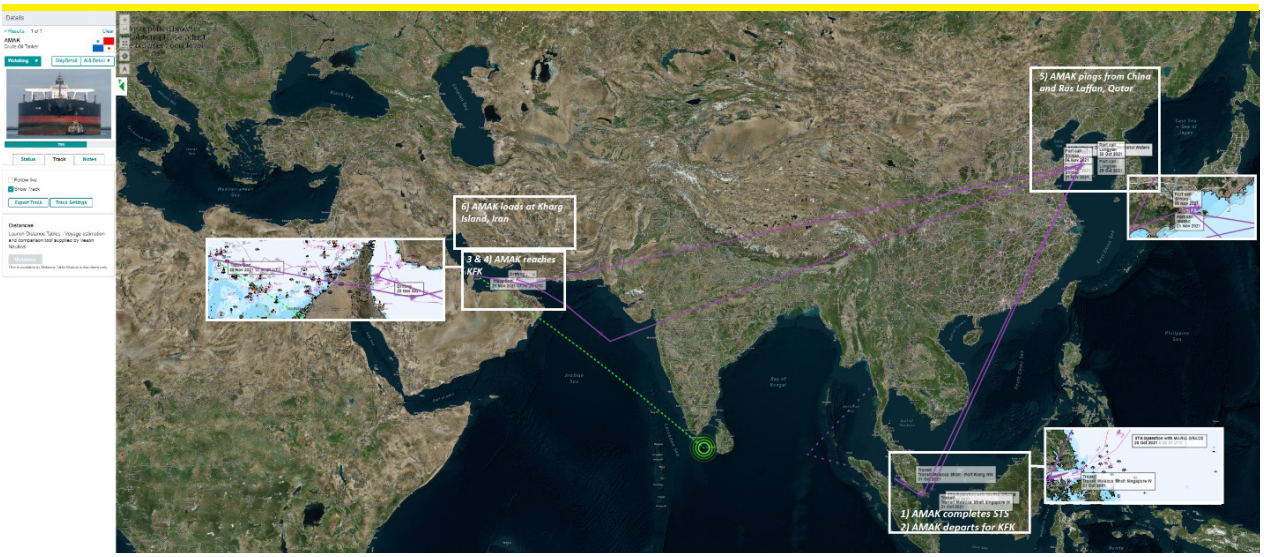


Voyage history for AMAK and LIAOSUIYU36376 00, shows that it would be physically impossible for one vessel to travel between the Gulf of Oman and China between November 21 and 28, 2021. (Source: Marine Traffic)



Satellite image shows AMAK anchored at Khor Fakkan, UAE, on November 14, 2021. (Source: Sentinel Hub)

Satellite image shows AMAK loading crude oil at Kharg Island, Iran, on November 23, 2021. (Source: Sentinel Hub)[68]



Voyage history for AMAK between October 28 – November 28, 2021,
showing AIS manipulation between the Middle East and China. (Source: IHS Maritime)

Case Study 2. CALYPSO (IMO: 9183271)

CALYPSO engaged in MMSI spoofing, assuming the identity of another vessel while it discharged Iranian crude oil to Baniyas, Syria.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
CALYPSO	9183271	613003744	272 meters by 46 meters	August 21 – 24, 2021	Sirri Island, Iran

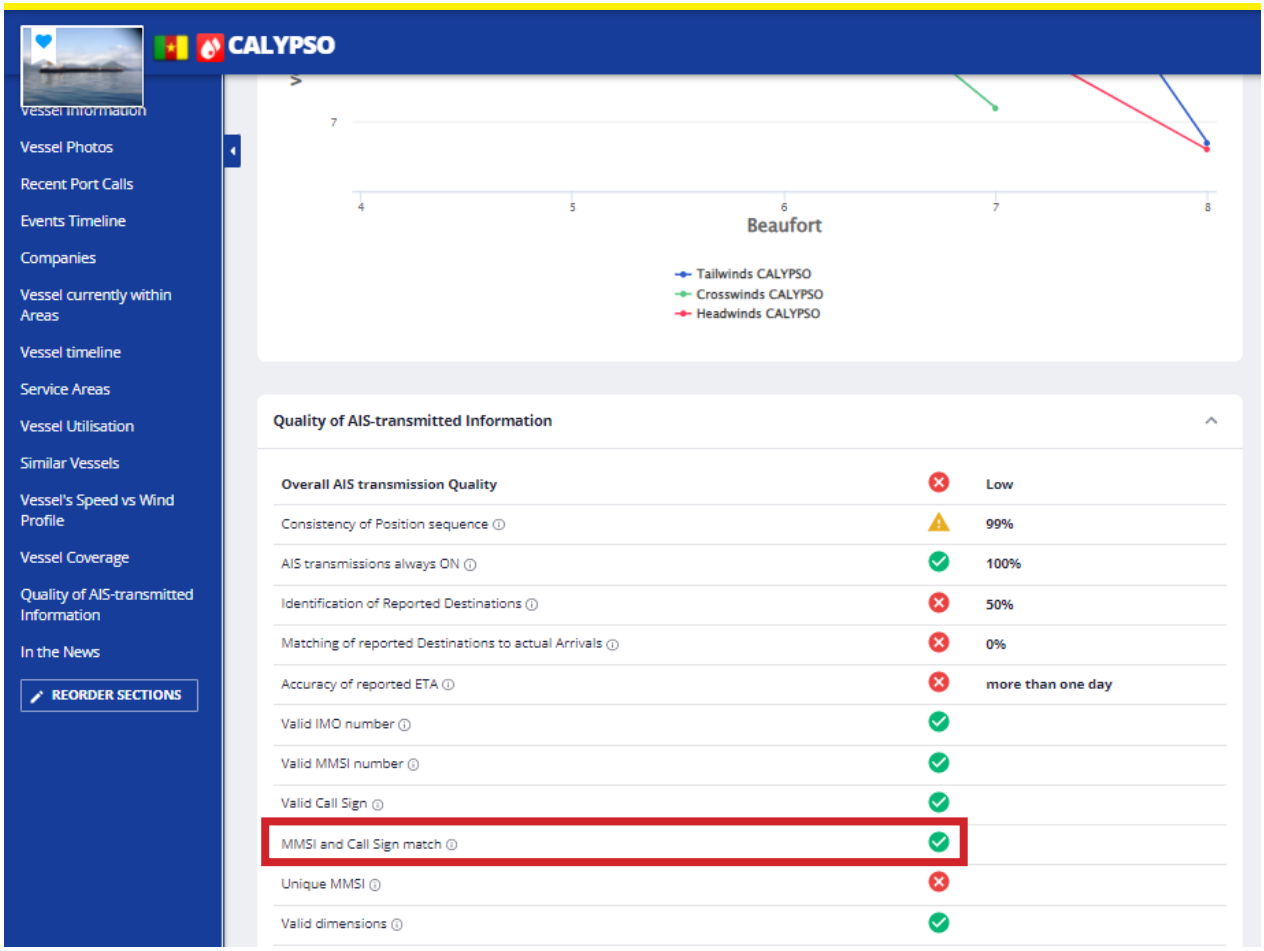
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
August 21 – 24, 2021	CALYPSO loaded crude oil from Sirri Island, Iran.	Vessel spoofed AIS transponder to appear as if it is in Qatari waters.
September 1, 2021	According to AIS data, CALYPSO entered the Suez Canal.	Same as reported.
September 5, 2021	According to AIS data, CALYPSO updated its draft to be fully laden.	Same as reported.
September 8, 2021	According to AIS data, CALYPSO exits the Suez Canal. CALYPSO traveled north out of the Suez and anchored west of the Cyprus STS transfer zone at 34.332, 31.190.	Same as reported.
September 9 – 21, 2021	According to AIS data, CALYPSO anchored west of the Cyprus STS transfer zone at 34.332, 31.190 while simultaneously reporting AIS messages from Spain at 36.179, 5.926.	Satellite image did not show any vessel at the location where CALYPSO was reportedly anchored, in Cyprus or Spain. On September 17, 2021, UANI identified CALYPSO discharging Iranian crude oil at Baniyas, Syria.
September 22, 2021	According to AIS data, CALYPSO traveled south to the Suez Canal and updated its load condition from laden to in ballast.	Same as reported.

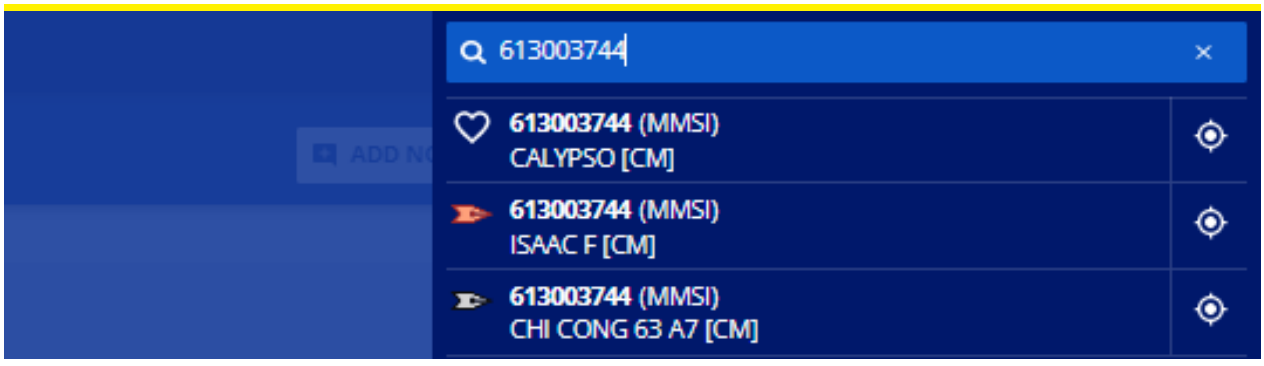
Analysis

The AIS messages indicating CALYPSO's location sent between September 9 and 21 were clearly inaccurate. A vessel cannot travel between Cyprus and Spain in the amount of time suggested by the AIS data for CALYPSO. This indicated that CALYPSO was engaged in some type of spoofing during this timeframe to hide the delivery to Baniyas, Syria, of its load of crude oil, picked up at Kharg Island, Iran.

Additional analysis reveals that CALYPSO's MMSI number (613003744) was not unique and was being shared with other vessels. In this case, there are three vessels using the same MMSI number: CALYPSO, ISAAC F (IMO: 8318441), and CHI CONG 63 A7 (IMO number not reported). This illustrates that between September 9 – 21, 2021, CALYPSO manipulated its MMSI to pretend to be a different vessel while discharging Iranian oil in Syria.

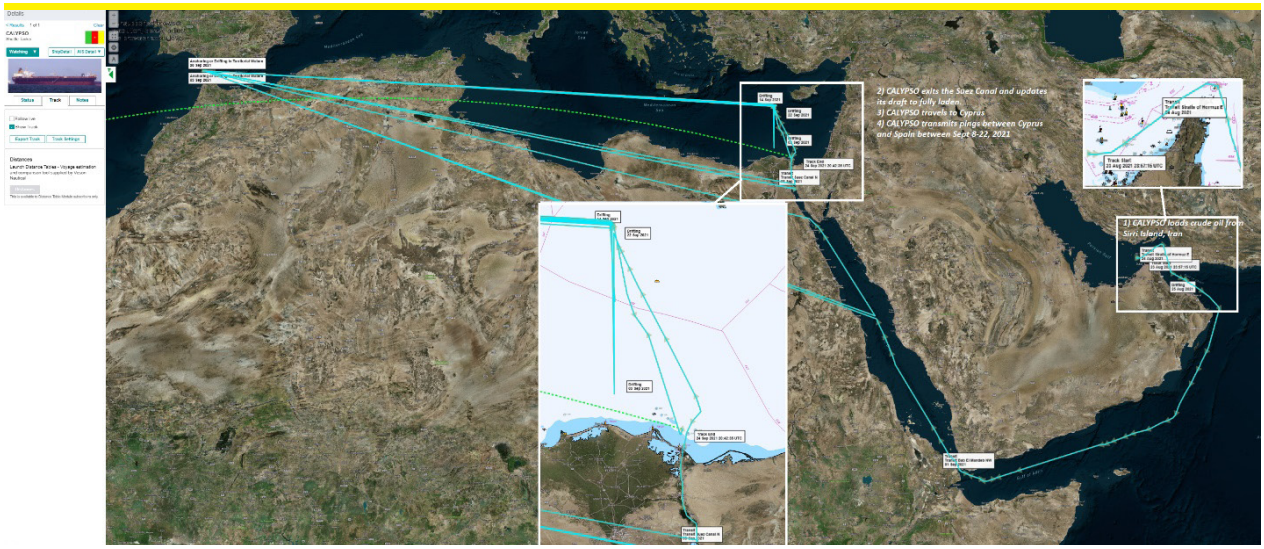


Indication of CALYPSO's MMSI number not being unique, meaning it shares an MMSI number with another vessel.
(Source: Marine Traffic)



Search for CALYPSO's MMSI number 613003744 reveals three vessels sharing the same MMSI number.
(Source: Marine Traffic)

Satellite image shows CALYPSO discharging Iranian crude oil
at Baniyas, Syria, on September 17, 2021.
(Source: Sentinel Hub)[69]



Voyage history for CALYPSO between August 22 – September 28, 2021,
shows the AIS manipulation by CALYPSO
as the vessel's location jumped between Cyprus and Spain.
The three vessels that shared MMSI numbers appear together on one past track.
(Source: IHS Maritime)

Two AIS Transponders

In multiple instances, UANI has been contacted confidentially by individuals seeking to disclose the presence of two AIS transponders on board a vessel. The two-transponder scheme works as follows. First, one AIS transponder is turned on as the vessel sails towards its intended destination. Once the vessel reaches these waters, that AIS transponder is turned off, and the second AIS transponder is turned on. The second transponder enables the vessel to lock in a GPS location and appear as anchored. In fact, the vessel can then proceed to engage in illicit activities undetected.

These second transponders are easy to obtain and available at a relatively low price. For example, the Turkish-based marine electronic manufacturer, i-Marine, sells AIS transponders. A brochure from i-Marine describes the functions of the i-ais-WTA transponder:

"In addition to standard AIS functionalities, i-ais-WTA is capable of the following: Can conceal the standard (real) identification, type, and position information, where required, and to produce, transmit from commercial channels, the information including, but not limited to the following information:

- Position offset (to create a fake position on receiving systems)
- False identity
- Fake type
- Fake echo
- Reduced signal power (reduced TX power)

"Can send real-time fake information for own ship or target ships as standard AIS messages or encrypted messages. Operator can define fake scenarios or information for up to 10 vessels using HMI laptop."[70]

As mentioned above, metadata manipulation may occur when a vessel turns off one transponder and turns on its secondary transponder. However, the two are not mutually exclusive.

Case Study 1. HELIOS (IMO: 9133587)

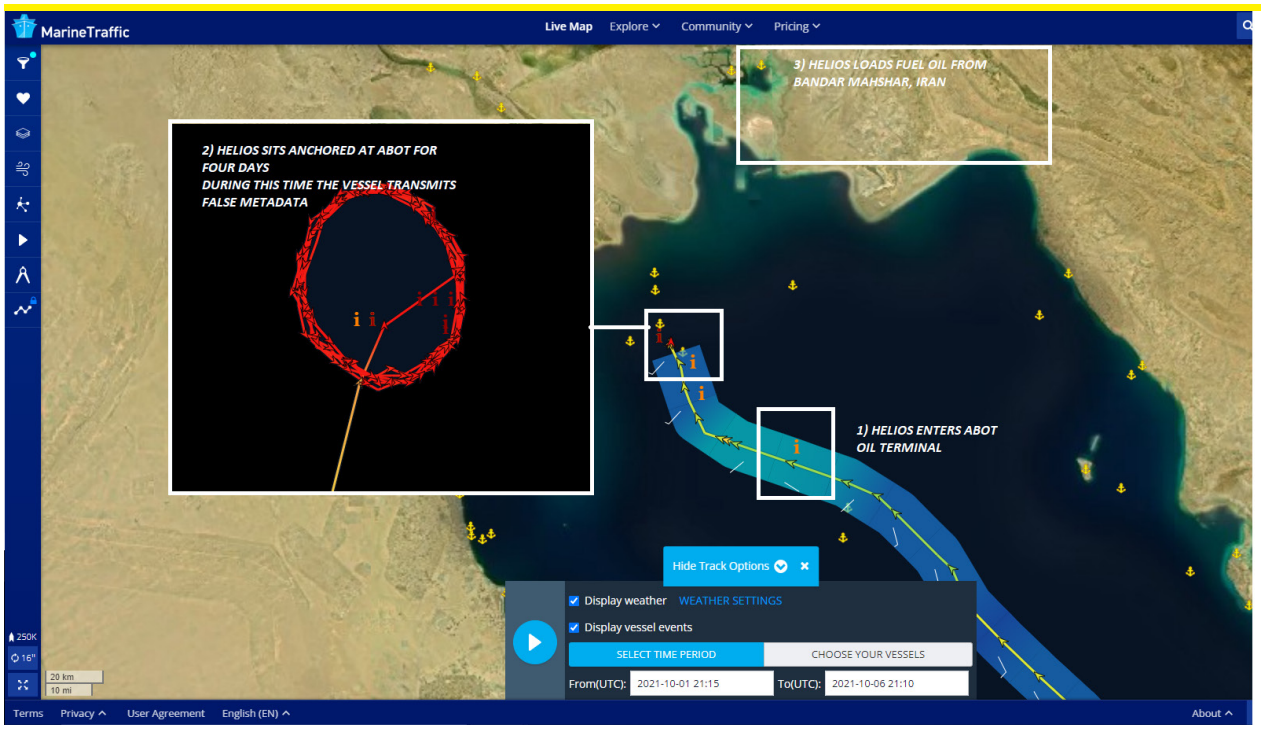
HELIOS loaded fuel oil from Iran's Bandar Mahshahr port while using two AIS transponders to make the vessel appear as if it is anchored in Iraqi waters. The duplicate AIS transponder manipulated the metadata to transmit a fake location of the vessel via AIS.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
HELIOS	9133587	518998224	232 meters by 42 meters	October 7, 2021	Bandar Mahshar, Iran

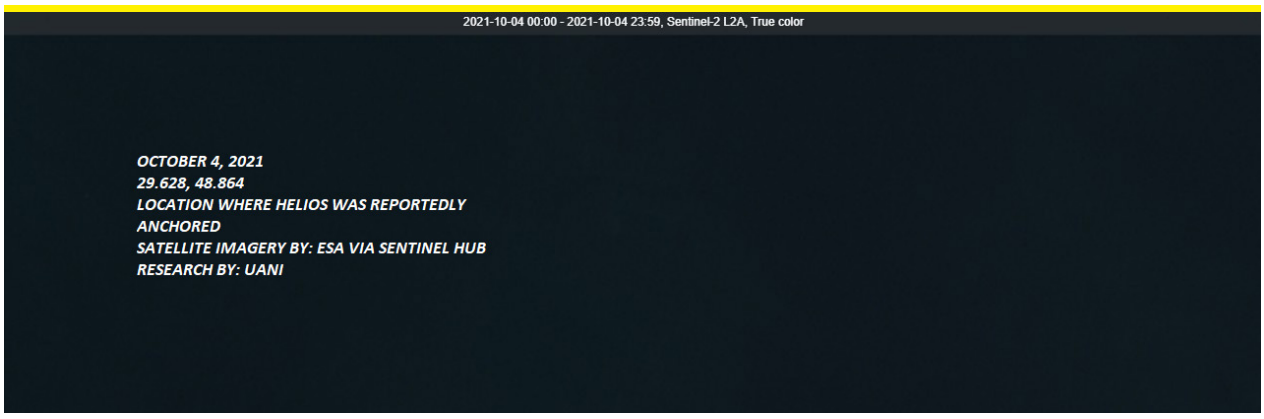
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
October 3, 2021	HELIOS entered Basrah Oil Terminal (ABOT), STS transfer zone.	Same as reported.
October 3 – 7, 2021	According to AIS data, HELIOS sat anchored at ABOT (29.628, 48.864) for four days.	Satellite image did not show any vessel at the location where HELIOS was reportedly anchored. On October 4, UANI identified HELIOS loading fuel oil at Bandar Mahshahr, Iran
October 7, 2021	HELIOS updated its load condition to laden and left the Basrah STS zone for Fujairah, UAE.	Same as reported.



Voyage history for HELIOS between October 1 – 6, 2021. (Source: Marine Traffic)

Satellite image shows HELIOS loading Iranian fuel oil from Bandar Mahshahr, Iran, on October 4, 2021. (Source: Sentinel Hub)[71]



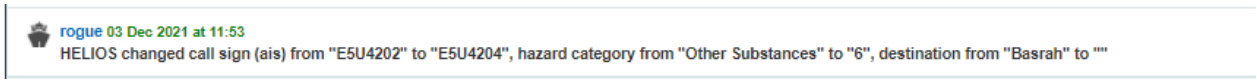
Satellite image from October 4, 2021, where HELIOS was reportedly anchored (Source: Sentinel Hub)

Analysis

Between October 3 and 7, 2021, HELIOS appeared to be anchored in Iraqi waters. However, satellite images showed no vessel at the reported location. Additional analysis revealed that on October 6, 2021, HELIOS transmitted one single AIS message when it was supposedly anchored at ABOT. For this one message, the metadata transmitted was different from the actual metadata information of HELIOS. The message with the falsified metadata omitted the length and width information, indicated another vessel name (HENOS), showed a call sign of E5U420 (actual call sign is E5U4202), and showed the MMSI number 519006416. It should also be noted that the MMSI 519006416 does not belong to any tanker or ship, according to both Marine Traffic and IHS Maritime. It is most likely that the MMSI used by the second transponder, which is not used by any actual vessel, is used solely by HELIOS to transmit messages while it goes to Iran.

This information strongly suggests that HELIOS had two separate transponders onboard. When HELIOS turned on the second transponder, it transmitted false metadata, and it was used to spoof HELIOS' GNSS in the AIS signal to make HELIOS appear as if it is anchored in Iraqi waters.

HELIOS made a similar metadata swap of its call sign on December 3, 2021.



Additional example of a metadata swap made by HELIOS.
The AIS timeline alert for HELIOS identifies the vessel as changing call signs from E5U4202 to E5U4204
(Source: IHS Maritime)

Case Study 2. BRADLEY (IMO: 9166417)

BRADLEY loaded fuel oil from Iran's Bandar Mahshar port while using two AIS transponders to make the vessel appear as if it was anchored in Iraqi waters. The duplicate AIS transponder manipulated metadata and transmitted a fake location of the vessel via its AIS.

Vessel Information

NAME	IMO	MMSI	LENGTH & WIDTH	DATES OF CARGO LOAD	LOCATION OF CARGO LOAD
BRADLEY	9166417	36535000	243 meters by 42 meters	December 1 – 7, 2021	Bandar Mahshar, Iran

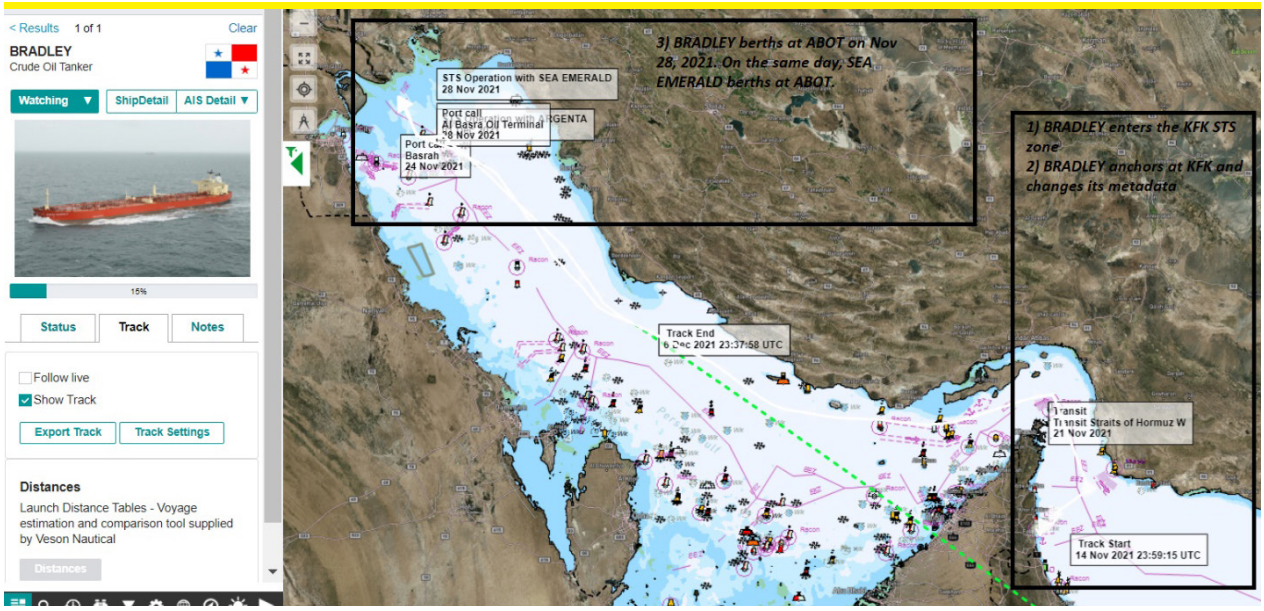
Vessel Timeline

DATE	REPORTED LOCATION VIA AIS	ACTUAL LOCATION IDENTIFIED BY UANI
November 16, 2021	BRADLEY entered the Khor Fakkan, STS transfer zone.	Same as reported.
November 17, 2021	According to AIS data, BRADLEY was anchored at Khor Fakkan at 25.359, 56.581.	Same as reported.
November 20, 2021	BRADLEY departed Khor Fakkan for Basrah, Iraq.	Same as reported.
November 28, 2021 – December 5, 2021	According to AIS data, BRADLEY was moored at the ABOT berth at 29.683, 48.807.	Satellite image did not show BRADLEY at the location where it was reportedly moored. UANI identified BRADLEY loading fuel oil from Bandar Mahshahr, Iran, between December 1 – 5, 2021.

Analysis

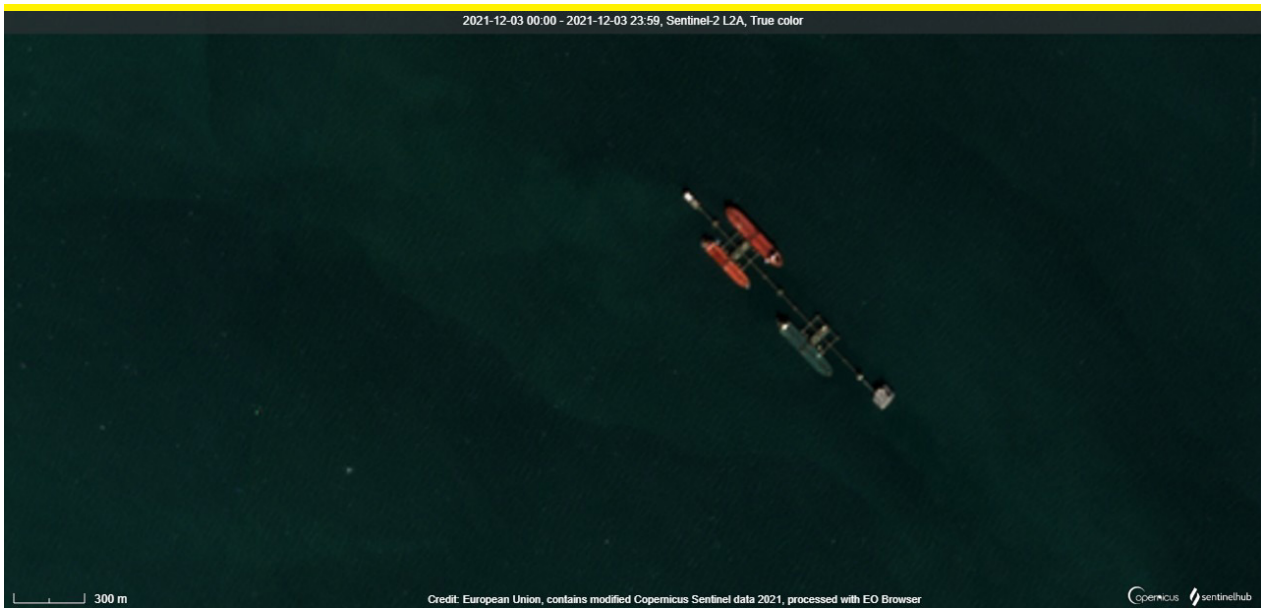
On November 17, 2021, when BRADLEY was anchored at Khor Fakkan, UAE, it transmitted one single AIS message with false metadata. It is believed that BRADLEY was activating its second transponder at this time. The message with the falsified metadata indicated different length and width measurements of 262 meters by 42 meters, a different vessel name (BRADEQ), and an MMSI number of 357583512. According to Marine Traffic and IHS Maritime, the MMSI 357583512 does not belong to any tanker or ship. It is most likely the MMSI transmitted by the second transponder and is used solely by BRADLEY to transmit signals with manipulated information when BRADLEY goes to Iran.

Between November 28 and December 5, 2021, BRADLEY appeared to be moored at ABOT at 29.683, 48.807. However, satellite images revealed only three Very Large Crude Carriers (VLCCs) at the location during this time frame. On the same date that BRADLEY is reportedly moored at ABOT, the VLCC SEA EMERALD (IMO: 9852119) was seen on AIS at the same exact location. This would mean that BRADLEY and SEA EMERALD were sharing a berth, which is not physically possible. In addition, both IHS Maritime and Marine Traffic identified SEA EMERALD and BRADLEY in an STS transfer due to the proximity of its AIS coordinates. However, an STS transfer cannot occur at the berth. Furthermore, satellite images showed no STS transfer occurring on the reported dates at this location.



Voyage history for BRADLEY between November 14 and December 6, 2021. (Source: IHS Maritime)

Satellite image shows BRADLEY loading Iranian fuel oil from Bandar Mahshahr, Iran, on December 3, 2021. (Source: Sentinel Hub)



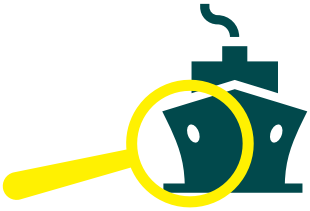
Satellite image from December 3, 2021, where BRADLEY was supposedly moored and conducting an STS transfer. However, there is no STS transfer occurring at this location. (Source: Sentinel Hub)

RECOMMENDATIONS

Cargos traded in breach of international and national trade sanctions are on the rise. Some of the techniques used to evade sanctions have been used for several years, while others are newer and have become more prevalent over the last few years. These techniques aim to minimize surveillance and detection through confusion or concealment of vessels' identities, cargo, geographical location, and navigational activities. Such concealment poses risks for all maritime industry players who may inadvertently be involved in transporting a sanctioned cargo.

The cases identified in this report highlight the numerous loopholes and vulnerabilities in the maritime industry that allow Iran to engage in deceptive shipping practices. Every case identified in this report was reported to the respective flag state, classification society, and P&I club by UANI. UANI's reporting of these cases demonstrates real challenges to the maritime industry's due diligence protocols.

In light of this report's findings, UANI suggests the following recommendations for the maritime community and its regulators to assist in developing and implementing an effective sanctions compliance program:

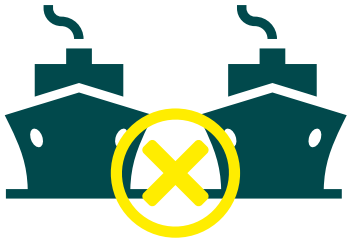


1. Physical Identity Alterations

- Flag states should implement stricter regulatory standards and due diligence checks in the registration process. Flag states should require the submission of current photographs and current details from operators at regular intervals in order for a ship to maintain its registration and deregister non-compliant vessels.

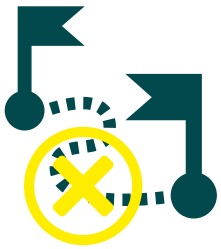
2. False Cargo and Vessel Documents

- Verifying false documentation is extremely challenging and requires checks and corroboration from several sources. The IMO should create a review and verification procedure to detect fraudulent documents, including authenticating certificates issued by flag states, classification societies, and/or ports, by getting confirmation from these authorities.
- Maritime regulators, including but not limited to flag states, classification societies, and P&I clubs, should consider adopting a system of QR codes or barding of documents in order to easily check for authenticity, validity, or cancelation of registry documents using a mobile phone app.
- Port states should require and review complete and accurate shipping documentation, including bills of lading identifying the cargo's origin.



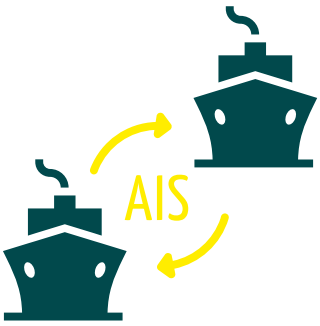
3. Ship-to-Ship Transfers

- Contractual language should be adopted by maritime regulators, including but not limited to flag states, classification societies, and P&I clubs, that prohibit STS transfers of cargo to or from vessels with other vessels that are not broadcasting AIS or have a history of AIS transponder manipulation.



4. False Flags and Flag Hopping

- Before registering a vessel, flag states should contact the previous flag state to determine if the vessel engaged in deceptive shipping practices.
- Flag states should share information with other registries, commercial databases, and the IMO the names and IMO numbers of vessels that have been denied registration or deregistered related to involvement in deceptive shipping practices.
- The IMO should publish a list of all vessels that have changed flags more than three times in one year. Any vessel on that list should be considered a red flag and investigated fully before being registered.



5. Disabling or Manipulation of the AIS on Vessels:

- Maritime regulators, including but not limited to flag states, classification societies, and P&I clubs, should adopt an "AIS manipulation clause" as part of their contracts with vessels to ensure that vessels are not engaging in this tactic and, if they are caught doing so, are immediately removed. If the relevant flag states adopted these measures, ship captains might understand that AIS manipulation could lead to vessel deregistration, insurance loss, and classification loss.
- Maritime regulators, including but not limited to flag states, classification societies, and P&I clubs, should adopt a "Two AIS Transponder Clause" as part of their contracts with vessels to ensure that vessels only have one transponder on board. If a vessel is caught using two AIS transponders, it should be immediately removed from relevant flag states, classification societies, and P&I clubs. This information should be reported to the IMO and published publicly.
- Vessels with a history of AIS disablement or manipulation should be denied port entry.
- Any maritime regulator using AIS data should cross-reference the data with known vessel particulars to determine if an AIS message broadcast by a vessel is authentic.
- The IMO should create a global registry for AIS transponders that give each transponder a unique identifier that is included in an AIS transmission. This will enable the determination of which vessels are using which transponders.
- Any flag state, classification society, or P&I club that withdraws services for a vessel due to sanctions violations, AIS manipulation, or deceptive shipping practices should inform the IMO. The IMO should establish a global database where information on vessels that have engaged in deceptive practices is publicly shared across the industry.
- Flag states and other maritime authorities should implement tools, such as satellite imagery, or partner with a ship tracking firm that uses satellite imagery to detect AIS tampering or anomalies by ships, while information on detected cases should be published and shared with other maritime regulators.
- The IMO should update the information provided in GISIS to include known vessel particulars such as the length and width of a vessel to allow for easier cross-referencing of AIS transmissions.
- The U.S. government and other jurisdictions should expand the definition of sanctionable activity to include helping sanctioned entities or entities engaging in sanctionable activities to evade authorities, such as by falsifying a vessel's identity or location. Entities that are found to be spoofing should be held accountable.

APPENDIX A:

A HISTORY OF SANCTIONS ON THE IRANIAN SHIPPING INDUSTRY

While the U.S. has continuously imposed sanctions on the Islamic Republic of Iran since its formation in 1979, shipping-specific sanctions were first imposed in 2008. Since then, there have been numerous Executive Orders authorized by three consecutive U.S. Presidents – George W. Bush, Barack Obama, and Donald Trump – as well as multiple Acts of Congress, signed into law targeting or otherwise affecting Iran's shipping sector and its capacity to import prohibited materials in service of its nuclear program or export its oil and petrochemicals.

The first sanctions specifically targeting Iranian shipping occurred under President Bush in 2008 with the asset freeze of the Islamic Republic of Iran Shipping Lines (IRISL). OFAC designated IRISL and 18 other connected and subsidiary entities for their proliferation activities and providing services to Iran's Ministry of Defense and Armed Forces Logistics (MODAFL). This important action was taken pursuant to Executive Order E.O. 13382, "Blocking Property of Weapons of Mass Destruction Proliferators and Their Supporters," which had been signed by President Bush in June 2005.[72]

During the first two years of President Obama's administration, starting in 2008, various additional IRISL entities, front companies, vessels, and officials were also sanctioned under the same E.O. 13382 authority.

In 2010, President Obama also signed into law a key piece of congressional legislation, the Comprehensive Iran Sanctions, Accountability, and Divestment Act (CISADA). Importantly, CISADA exposed foreign banks to sanctions if they were judged to have engaged in business with Iran's energy, shipping, and shipbuilding sectors. This later included two key affiliated Iranian oil/shipping entities, the National Iranian Oil Company (NIOC) and its subsidiary, the National Iranian Tanker Company (NITC). Both entities were later judged to be affiliates of the IRGC, which entailed a U.S. bank account ban on any foreign bank deemed to have engaged with NIOC.

Also, in 2010, the United Nations, with U.N. Security Council Resolution 1929,[73] and the European Union with Regulation No 668/2010, implemented sanctions against IRISL and affiliates.[74]

In 2012, President Obama signed a further executive order, E.O. 13622, "Authorizing Additional Sanctions With Respect to Iran," which included sanctioning entities for buying oil and petrochemicals from Iran.[75]

In January 2016, following the signing of the Joint Comprehensive Plan of Action nuclear deal signed between the P5+1 (refers to the U.N. Security Council's five permanent members (the P5); namely China, France, Russia, the United Kingdom, and the United States; plus Germany) and Iran, E.O. 13622 was revoked by E.O. 13716. U.N. sanctions and most E.U. sanctions were also lifted and remain so.[76]

However, with the withdrawal of the United States from the JCPOA, E.O. 13622 was reinstated through E.O. 13846 under President Trump on August 6, 2018. Additional sanctions were imposed on various shipping entities through the end of the Trump administration's term.[77]

One year into his term, President Biden has not thus far repealed any shipping-specific sanctions on Iran. Nor has he issued any related Executive Orders.

TIMELINE

September 10, 2008

The Department of the Treasury imposes a U.S.-based assets freeze on the Islamic Republic of Iran Shipping Lines (IRISL) and 18 affiliates under E.O. 13882.

June 9, 2010

The U.N. Security Council adopts Resolution 1929, reminding member states "may request inspections of vessels on the high seas with the consent of the flag State" if it is suspected a vessel is carrying prohibited material to Iran. Resolution 1929 further call on states to "prohibit the provision by their nationals or from their territory of bunkering services, such as the provision of fuel or supplies, or other servicing of vessels, to Iranian-owned or -contracted vessels, including chartered vessels" suspected of carrying prohibited items to Iran.

June 16, 2010

Five IRISL affiliates, including Hafiz Darya Shipping Co., and 27 IRISL-tied vessels are sanctioned under E.O. 13882.

June 29, 2010

U.N. Security Council Resolution 1929, the fourth round of U.N. sanctions concerning Iran's nuclear program, is adopted and calls on states to inspect cargoes by IRISL and Iran Air Cargo if they are suspected of carrying prohibited goods to Iran.

July 26, 2010

Following U.N. Security Council Resolution 1929, the European Union implements its own shipping sanctions against IRISL and affiliates under Regulation No 668/2010.

July 1, 2010

President Obama signed into law the Comprehensive Iran Sanctions, Accountability, and Divestment Act (CISADA), which had previously passed Congress on June 24.

November 30, 2010

Eight IRISL front companies based in the Isle of Man plus IRISL officials are sanctioned under E.O. 13882.

2012

The Department of the Treasury determines that NIOC and NITC are affiliates of the IRGC. NIOC was designated as a proliferation entity under Executive Order 13382.

The designations triggered, in accordance with Section 104 of CISADA, a ban on any foreign bank determined to have dealt directly with NIOC (or NIOC bank account) from opening or maintaining a U.S.-based account.

January 23, 2012

The Council of the European Union signs Decision 2012/35/CFSP implementing additional shipping sanctions on Iran, including the provision of insurance, reinsurance, and financial assistance for transporting Iranian crude oil and petrochemicals as well as an EU-based assets freeze on additional Iranian shipping companies.

July 30, 2012

E.O. 13622 bars banks using the U.S. financial system from engaging in oil and petrochemical purchases from Iran.

January 2, 2013

President Obama signs into law the Iran Freedom and Counter-proliferation Act (IFCA), the fourth major piece of legislation against Iran. IFCA is part of the National Defense Authorization Act (NDAA) 2013. IFCA expands U.S. secondary sanctions against Iranian shipping, shipbuilding, and ports.

January 2016

E.O. 13662 revoked.

August 6, 2018

E.O. 13662 reinstated under E.O. 13846, "Reimposing Certain Sanctions With Respect to Iran."

November 5, 2018

NIOC and NITC relisted. In addition, on or after November 5, 2018, persons knowingly engaged in a significant transaction for the purchase, acquisition, sale, transport, or marketing of petroleum, petroleum products (e.g., aviation gasoline, motor gasoline, distillate fuel oil), or petrochemical products from Iran, and certain persons affiliated with vessels that transport Iranian crude oil, risk being sanctioned under U.S. sanctions authorities relating to Iran, unless a waiver or an exception applies. [78]

September 4, 2019

OFAC provides an update to the global maritime petroleum shipping community, to "alert persons globally to the significant U.S. sanctions risks for parties involved in shipping petroleum or petroleum products from Iran after the expiration of any applicable significant reduction exceptions on May 2, 2019." Advisory warns non-U.S. persons, including foreign financial institutions, against financially or materially assisting NIOC, NITC, and IRISL. It also warns against providing bunkering, underwriting, insurance, and reinsurance to the same entities and Iran's energy shipping and shipbuilding sectors.

June 8, 2020

IRISL and E-Sail Shipping Company (Shanghai) are designated for transporting products related to the Iranian ballistic missile program under E.O. 13822.

October 19, 2020

Five Chinese and Hong Kong shipping lines (Reach, Delight, Gracious, Noble, Supreme) as well as Reach Holding, sanctioned under IFCA for supporting IRISL subsidiary Hafiz Darya Arya Shipping Company (HDASCO).

APPENDIX B:

WHAT IS AIS AND HOW DOES IT WORK?

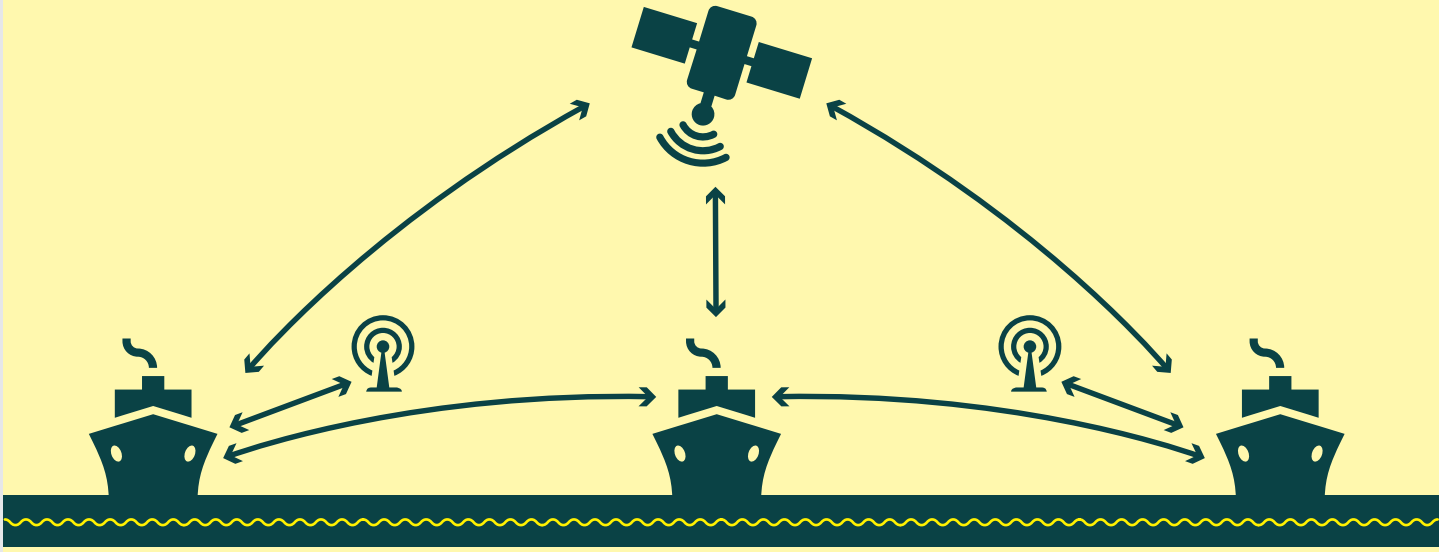
AIS is an automated tracking system that displays the location of vessels in a given vicinity. AIS uses a communication system of signals broadcast by vessels and various land stations satellites on four worldwide channels in the very high frequency (VHF) maritime mobile band to exchange navigation data. There are numerous AIS devices (i.e., transponders and receivers), known as stations, which are identified by a unique Maritime Mobile Service Identity (MMSI) and use an international open standard to communicate.[79]

Since December 2004, the IMO requires all passenger vessels, as well as all commercial vessels weighing over 299 Gross Tonnage (G.T.) that travel internationally, to carry a "Class A" AIS transponder (which transmits and receives AIS data) while smaller vessels are permitted to be equipped with a "Class B" AIS transponder, with substantially less power and geographic coverage. This requirement was a result of the 2002 SOLAS agreement.[80]

AIS transponders are designed to automatically provide position, identification, and other information about a ship to other ships and coastal authorities.[81] Thanks to AIS, static and dynamic vessel information can be electronically exchanged between AIS-receiving stations (onboard, ashore, or satellite).[82] AIS information is used to serve various purposes and facilitates the work of people in various occupations, such as port authorities and harbormasters, ship owners, managers and builders, ship agents, brokers and charters, research and data analysts, tug operators and pilots, search and rescue teams, flag administrators and classification societies, vessels' crews, as well as crew family members and other affected parties.[83]

AIS records the position and movements of vessels via the vessels' GPS or an internal sensor built into the AIS transponder. That information is then collated with programmable information from the AIS transponder (e.g., MMSI number, vessel name, destination, cargo type) and is transmitted on AIS automatically in the background at regular intervals while the transponder also receives other vessels' AIS information.[84]

A functioning AIS transponder transmits information even when a vessel is anchored. The information contained in each AIS message can be broken down into Dynamic Information (automatically transmitted information) and programable Static Information (information provided by the subject vessel's crew). The signals broadcast by vessels are also received either by land-based receivers, also known as terrestrial AIS receivers (T-AIS), or satellites.



FOOTNOTES

1 "Leadership & Staff" 2022, UANI, https://www.unitedagainstnucleariran.com/about/leadership.

2 "Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. Guidance to Address Illicit Shipping and Sanctions Evasion Practices" U.S. Treasury Department, May 4, 2020, https://home.treasury.gov/system/files/126/05142020_global_advisory_v1.pdf.

3 "Glossary of Shipping Terms"Maritime.Dot.Gov, 2018, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/education/adopt-ship-program/341/glossaryfinal.pdf.

4 "Glossary of Shipping Terms" Maritime.Dot.Gov, 2018, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/education/adopt-ship-program/341/glossaryfinal.pdf.

5 "AIS Transponders" Imo.org, 2022, https://www.imo.org/en/OurWork/Safety/Pages/AIS.aspx.

6 "Glossary of Shipping Terms"Maritime.Dot.Gov, 2018, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/education/adopt-ship-program/341/glossaryfinal.pdf.

7 "Glossary of Shipping Terms"Maritime.Dot.Gov, 2018, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/education/adopt-ship-program/341/glossaryfinal.pdf.

8 Hariesh Manaadiar, "Roles and responsibilities of Classification Societies" Shipping and Freight Resource, January 4, 2021, https://www.shippingandfreightresource.com/roles-and-responsibilities-of-classification-societies/.

9 Andrew Boling, Lucas Kuo, Luke Snyder, and Lauren Sung, "Unmasked: North Korea Vessel Identity Laundering" C4ADS, 2021, https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/613b9610b3cdba196d524b8b/1631294997128/Unmasked+-+North+Korea+Vessel+Identity+Laundering.pdf.

10 "A guide on deceptive shipping practices" Windward, August 20, 2020, https://windward.ai/blog/executive-brief-deceptive-shipping-practices/.

11 "OFAC Sanctions Due Diligence" Ferrari & Associates, https://www.ferrariassociatespc.com/practices/ofac-compliance/ofac-sanctions-due-diligence/#:~:text=Having%20this%20ability%20means%20that,counter%2Dparties%2C%20and%20intermediaries.

12 Andrew Boling, Lucas Kuo, Luke Snyder, and Lauren Sung, "Unmasked: North Korea Vessel Identity Laundering" C4ADS, 2021, https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/613b9610b3cdba196d524b8b/1631294997128/Unmasked+-+North+Korea+Vessel+Identity+Laundering.pdf.

13 "Sanctions: deceptive practices and high-risk areas – Part 2" Stephenson Harwood, May 4, 2021, https://www.shlegal.com/news/sanctions-deceptive-practices-and-high-risk-areas-part-2.

14 "Sanctions: deceptive practices and high-risk areas – Part 2" Stephenson Harwood, May 4, 2021, https://www.shlegal.com/news/sanctions-deceptive-practices-and-high-risk-areas-part-2.

15 "Flag States" The Maritime Industry Knowledge Center, https://www.maritimeinfo.org/en/Maritime-Directory/flag-states.

16 Ritbik K, "What is IMO's Global Integrated Shipping Information System (GISIS)?" Marine Insight, December 31, 2021, https://www.marineinsight.com/maritime-law/what-is-imos-global-integrated-shipping-information-system-gisis/.

17 "What is GNSS? " European Union Agency for the Space Programme, December 3, 2021, https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss.

18 "Ownership Definitions" IHS Maritime, https://maritime.ihs.com/Areas/Seaweb/authenticated/help/seaweb-help.htm#ownershipdefinitions.

19 "About Hezbollah" Hezbollah.org, https://hezbollah.org/about-hezbollah.

20 "Agreement Between the United States of America and Palau" U.S. Department of State, August 15, 2013, https://www.state.gov/wp-content/uploads/2019/02/13-815-Palau-Maritime-Interdiction.pdf.

21 Anish, "Safety of Life at Sea (SOLAS) – The Ultimate Guide" Marine Insight, February 15, 2022, https://www.marineinsight.com/maritime-law/safety-of-life-at-sea-solas-convention-for-prevention-of-marine-pollution-marpol-a-general-overview/.

22 "Introduction to IMO" International Maritime Organization, https://www.imo.org/en/About/Pages/Default.aspx.

23 "The IMO Number Explained" Pew, May 4, 2007, https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2017/05/the-imo-number-explained.

24 "Major Iranian Shipping Company Designated for Proliferation Activity" U.S. Department of the Treasury, September 10, 2008, https://www.treasury.gov/press-center/press-releases/pages/hp1130.aspx.

25 "Islamic Revolutionary Guard Corps" United Against Nuclear Iran, https://www.unitedagainstnucleariran.com/report/irgc-islamic-revolutionary-guard-corps.

26 "Glossary" Euronav, https://www.euronav.com/en/glossary/.

27 "Understanding Illicit Trade & Sanctions In Shipping" Pole Star, March 2019, https://www.polestarglobal.com/media/1ntpm0ai/united-nations-report-mar-2019-web.pdf.

28 "Treasury Sanctions Key Actors in Iran's Oil Sector for Supporting Islamic Revolutionary Guard Corps-Qods Force" U.S. Department of the Treasury, October 26, 2020, https://home.treasury.gov/news/press-releases/sm1165.

29 "Treasury Sanctions Key Actors in Iran's Oil Sector for Supporting Islamic Revolutionary Guard Corps-Qods Force" U.S. Department of the Treasury, October 26, 2020, https://home.treasury.gov/news/press-releases/sm1165.

30 "Frequently Asked Questions" U.S. Department of the Treasury, https://home.treasury.gov/policy-issues/financial-sanctions/faqs/topic/1501.

31 "Ownership Definitions" IHS Maritime, https://maritime.ihs.com/Areas/Seaweb/authenticated/help/seaweb-help.htm#ownershipdefinitions.

32 Andrew Boling, Lucas Kuo, Luke Snyder, and Lauren Sung, "Unmasked: North Korea Vessel Identity Laundering" C4ADS, 2021, https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/613b9610b3cdba196d524b8b/1631294997128/Unmasked+-+North+Korea+Vessel+Identity+Laundering.pdf.

33 Hariesh Mnaadiar, "What is a P&I clib, what they do and why we need them in our lives" Ship and Freight Resource, August 24, 2020, https://www.shippingandfreightresource.com/what-is-a-pi-club-and-what-do-they-do/.

34 "Islamic Revolutionary Guard Corps" United Against Nuclear Iran, https://www.unitedagainstnucleariran.com/report/irgc-islamic-revolutionary-guard-corps.

35 Andrew Boling, Lucas Kuo, Luke Snyder, and Lauren Sung, "Unmasked: North Korea Vessel Identity Laundering" C4ADS, 2021, https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/613b9610b3cdba196d524b8b/1631294997128/Unmasked+-+North+Korea+Vessel+Identity+Laundering.pdf.

36 "Ownership Definitions" IHS Maritime, https://maritime.ihs.com/Areas/Seaweb/authenticated/help/seaweb-help.htm#ownershipdefinitions.

37 "Ownership Definitions" IHS Maritime, https://maritime.ihs.com/Areas/Seaweb/authenticated/help/seaweb-help.htm#ownershipdefinitions.

38 "Specially Designated Nationals and Blocked Persons List (SDN)" U.S. Department of the Treasury, https://home.treasury.gov/policy-issues/financial-sanctions/specially-designated-nationals-and-blocked-persons-list-sdn-human-readable-lists.

39 "Vessel Traffic Services" U.S. Coast Guard, https://www.navcen.uscg.gov/?pageName=vtsMain.

40 "Glossary of Shipping Terms"Maritime.Dot.Gov, 2018, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/education/adopt-ship-program/341/glossaryfinal.pdf.

41 "Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. Guidance to Address Illicit Shipping and Sanctions Evasion Practices" U.S. Treasury Department, May 4, 2020, https://home.treasury.gov/system/files/126/05142020_global_advisory_v1.pdf.

42 Sam Chambers, "Nylon tarps deployed in desperate bid to dodge sanctions" Splash247.com, September 9, 2021, https://splash247.com/nylon-tarps-deployed-in-desperate-bid-to-dodge-sanctions/.

43 "Amended United States' Verified Complaint For Forfeiture In Rem" U.S. Department of Justice, August 16, 2019, https://www.justice.gov/opa/press-release/file/1196361/download.

44 Michelle Wiese Bockmann, "Maersk Tankers warns of 'more frequent and advanced' sanctions evasion" Lloyds List, January 29, 2021, https://lloydslist.maritimeintelligence.informa.com/-/media/lloyds-list/daily-pdf/2021/02-february/dailypdf010221.pdf.

45 Jonathan Saul and Marianna Parraga, "Shipping industry seeks to combat dark oil transfers at sea" Reuters, July 13, 2021, https://www.reuters.com/article/shipping-oil-transfers-idCNL1N2OP198.

46 "Sanctions – Recent Deceptive Practices" The Swedish Club, February 2, 2022, https://www.swedishclub.com/news/circulars/p-and-i-circulars/sanctions-recent-deceptive-practices.

47 Claire Jungman and Daniel Roth, "Stop the Hop II: The Ghost Armada Grows" United Against Nuclear Iran, Updated February 1, 2022, https://www.unitedagainstnucleariran.com/blog/stop-hop-ii-ghost-armada-grows.

48 "Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. Guidance to Address Illicit Shipping and Sanctions Evasion Practices" U.S. Treasury Department, May 4, 2020, https://home.treasury.gov/system/files/126/05142020_global_advisory_v1.pdf.

49 "Treasury Designates Vast Iranian Network That Supports IRGC-QF and Terror Proxies" U.S. Department of the Treasury, September 4, 2019, https://home.treasury.gov/news/press-releases/sm767.

50 "Treasury Designates Vast Iranian Network That Supports IRGC-QF and Terror Proxies" U.S. Department of the Treasury, September 4, 2019, https://home.treasury.gov/news/press-releases/sm767.

51 "U.S. Sanctions Chinese Network for Iran Shipping" The Iran Primer, October 19, 2020, https://iranprimer.usip.org/blog/2020/oct/19/us-sanctions-chinese-network-iran-shipping.

52 "U.S. Sanctions Chinese Network for Iran Shipping" The Iran Primer, October 19, 2020, https://iranprimer.usip.org/blog/2020/oct/19/us-sanctions-chinese-network-iran-shipping.

53 "Treasury Sanctions Companies for Supporting the Sale of Iranian Petrochemicals" U.S. Department of the Treasury, December 19, 2020, https://home.treasury.gov/news/press-releases/sm1214.

54 For more information on AIS and how it works, please see the appendix.

55 "The location illusion: How to manage risk in the age of GNSS manipulation" Windward, https://fs.hubspotusercontent00.net/hubfs/6091557/Windward%20PDFs/GNS%20manipulation%20whitepaper.pdf?__hstc=104508742.7238d1ed4faaf449fe25e256f438ba56.1637625144529.1637625144529.1637625144529.1&__hssc=104508742.1.1637625144530&__hsfp=2832920808.

56 Andrej Androjna, Marko Perkovic, Ivica Pavic and Jaksa Miskovic, "AIS Data Vulnerability Indicated by a Spoofing Case Study" University of Ljublijana, April 26, 2021, https://doi.org/10.3390/app11115015.

57 "Above Us Only Stars" C4ADS, 2019, https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/5c99488beb39314c45e782da/1553549492554/Above+Us+Only+Stars.pdf.

58 "Sanctions – Recent Deceptive Practices" The Swedish Club, February 2, 2022, https://www.swedishclub.com/news/circulars/p-and-i-circulars/sanctions-recent-deceptive-practices.

59 "Vulnerabilities in Global Vessel Tracking Systems" Trend Micro, October 16, 2013, https://www.trendmicro.com/en_us/research/13/j/vulnerabilities-discovered-in-global-vessel-tracking-systems.html.

60 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

61 "API Documentation" MarineTraffic, https://www.marinetraffic.com/en/ais-api-services/documentation/.

62 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

63 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

64 "AIS Ship Types" Vtexplorer, https://api.vtexplorer.com/docs/ref-aistypes.html.

65 Reference shot shows satellite imagery of the vessel when its AIS transponder was turned on. This imagery is used to compare and identify the actual vessel loading Iranian cargo.

66 "Sanctions – Recent Deceptive Practices" The Swedish Club, February 2, 2022, https://www.swedishclub.com/news/circulars/p-and-i-circulars/sanctions-recent-deceptive-practices.

67 "Spoofing: One Identity Shared by Multiple Vessels" Global Fishing Watch, July 25, 2016, https://globalfishingwatch.org/data/spoofing-one-identity-shared-by-multiple-vessels/.

68 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

69 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

70 "i-ais-WTA" I-Marine, 2017, https://www.imarine.com.tr/wp-content/uploads/2017/12/i-ais-WTA-Brochure-iMarine-Edit2.pdf.

71 Reference shot shows satellite image of the vessel when its AIS transponder was turned on. This image is used to compare and identify the actual vessel loading Iranian cargo.

72 "Executive Order 13382" A Presidential Document by the Executive Office of the President, June 28, 2005, https://www.federalregister.gov/documents/2005/07/01/05-13214/blocking-property-of-weapons-of-mass-destruction-proliferators-and-their-supporters.

73 "Resolution 1929 (2010)" United Nations Security Council, June 9, 2010, https://www.iaea.org/sites/default/files/unsc_res1929-2010.pdf.

74 "EU No 668/2010" Offical Journal of the European Union, July 28, 2010, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32010R0668&from=EN.

75 "Executive Order 13622" U.S. Department of the Treasury, July 30, 2012, https://home.treasury.gov/system/files/126/13622.pdf.

76 "Executive Order 13716" U.S. Department of the Treasury, January 16, 2016, https://home.treasury.gov/system/files/126/jcpoa_eo.pdf.

77 "Executive Order 13846" A Presidential Document by the Executive Office of the President, August 6, 2018, https://www.federalregister.gov/documents/2018/08/07/2018-17068/reimposing-certain-sanctions-with-respect-to-iran.

78 "Sanctions Advisory for the Maritime Industry, Energy and Metals Sectors, and Related Communities. Guidance to Address Illicit Shipping and Sanctions Evasion Practices" U.S. Treasury Department, May 4, 2020, https://home.treasury.gov/system/files/126/05142020_global_advisory_v1.pdf.

79 "An Overview of AIS" IALA Guideline, June 2016, https://www.navcen.uscg.gov/pdf/IALA_Guideline_1082_An_Overview_of_AIS.pdf.

80 "What is the Automatic Identification System (AIS)?" Marine Traffic, https://help.marinetraffic.com/hc/en-us/articles/204581828-What-is-the-Automatic-Identification-System-AIS-?utm_source=MTBlog&utm_campaign=Blog&utm_content=.

81 "AIS transponders" International Maritime Organization (IMO), https://www.imo.org/en/OurWork/Safety/Pages/AIS.aspx.

82 "What is the Automatic Identification System (AIS)?" Marine Traffic, https://help.marinetraffic.com/hc/en-us/articles/204581828-What-is-the-Automatic-Identification-System-AIS-?utm_source=MTBlog&utm_campaign=Blog&utm_content=.

83 "What is the Automatic Identification System (AIS)?" Marine Traffic, https://help.marinetraffic.com/hc/en-us/articles/204581828-What-is-the-Automatic-Identification-System-AIS-?utm_source=MTBlog&utm_campaign=Blog&utm_content=.

84 "What is AIS & How Does It Work?" Icom UK Ltd, https://icomuk.co.uk/What-is-AIS-and-How-Does-It-Work/3995/165/.

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