

ASC Research Vessel Replacement Program USCG Compliance Study

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References

1. Karr, M. B., Captain. (letter) [United States Coast Guard], “Vessel Cargo Authorization,” 21 October 2004.
2. 46 CFR (US Code of Federal Regulations), *Shipping*.
3. 33 CFR, *Navigation and Navigable Waters*.
4. 49 CFR §171 –§185 (Subchapter C), *Hazardous Materials Regulations*.
5. 46 USC (US Code), *Shipping*.
6. *International Convention for the Safety of Life at Sea (SOLAS)*, International Maritime Organization (IMO), as amended.
7. *International Code for Ships Operating In Polar Waters (Polar Code)*, IMO, Marine Environment Protection Committee (MEPC) 68/21/Add.1 Annex 10.
8. *International Convention for the Prevention of Pollution from Ships (MARPOL)*, IMO, as amended.
9. *Code for the Transport And Handling Of Hazardous And Noxious Liquid Substances In Bulk On Offshore Support Vessels (OSV Chemical Code)*, IMO, Resolution A.1122(30), Adopted 6 December 2017.
10. *Rules for Building and Classing Marine Vessels*, American Bureau of Shipping, 2020.

Abbreviations

ABS	American Bureau of Shipping
ARV	Antarctic Research Vessel
CFR	United States Code of Federal Regulations
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
MVR	<i>Rules for Building and Classing Marine Vessels</i> [Marine Vessel Rules]
OSV	Offshore Supply Vessel
SOLAS	International Convention for the Safety of Life at Sea
SPS	Special Purpose Ship

USC	United States Code
USCG	United States Coast Guard

Executive Summary

The Antarctic Research Vessel (ARV) is intended to support scientific missions in the Antarctic and provide logistics support to Palmer Station, Antarctica on a year-round basis. Providing logistics support requires the vessel carry personnel, containerized and general cargo, and cargo fuel.

The United States does not normally authorize research vessels to carry cargo. The current vessels (R/V *Nathaniel B Palmer* and R/V *Laurence M Gould*) supplying Palmer Station operate under a waiver from the United States Coast Guard (USCG) that allows them to carry limited scientific cargos to and from Antarctica (Reference 1). It is likely that these two existing vessels are not fully compliant with the normally applicable cargo vessel regulations.

The ARV will need to either incorporate additional design features to enable compliance with cargo vessel regulations or seek an exemption from USCG, and possibly other entities, in areas in which the vessel is not fully compliant. In addition to flag state requirements there are international requirements from the International Maritime Organization (IMO), and vessel classification society.

Compliance is expected to provide the least risk, disruption, and delay from a project standpoint. A waiver for aspects of the operation may be possible but is recommended only if compliance is not achievable.

Purpose

This report outlines the regulatory framework that governs compliance of the ARV when carrying cargo supporting logistics operations.

Assumptions

The ARV is assumed to be US-flagged, certified for international voyages, and classed by the American Bureau of Shipping (ABS). The ARV will accommodate up to 55 scientists. The vessel will be outfitted with laboratories and equipped with scientific over-the-side handling gear, a scientific sonar suite, and other scientific items. The USCG will likely designate the ARV as a Research Vessel because of the large number of science personnel, equipment, and the science-oriented mission of the vessel. The USCG outlines flag state requirements for large research vessels in 46 CFR (Reference 2), Subchapter U – *Oceanographic Vessels*.

Personnel

The USCG Research Vessel designation and 46 CFR Subchapter U allow science personnel aboard the vessel at sea. These science personnel are not considered passengers or crew members for regulatory purposes. Research Vessel safety regulations are not as stringent as those for passenger ships since the USCG considers science personnel as able-bodied individuals with some knowledge of the ship. The ARV will not be allowed to carry more than 12 personnel that would be considered passengers.

Logistics Cargo

The ARV will carry liquid fuel cargo, containerized cargo, and palletized cargo. The ARV will not carry bulk material cargo in holds (no dry materials which are powdery, granular or lumpy in

nature, and are stored in heaps) or other bulk liquid cargo beyond fuel. The general cargo will include items classified as “Dangerous Goods”. Dangerous goods are cargos classified by the International Maritime Dangerous Goods Code (IMDG Code). The dangerous goods cargos include numerous substances that are considered safety hazards or environmental pollutants.

The specific characteristics of the logistics cargo are bulleted below:

- Fuel Cargo
 - Arctic Fuel with flash point 38° to 43° C (100° to 110° F).
 - or ASTM D975 2-D with flash point 52° C (125° F).
 - Fuel Cargo has a low vapor pressure around 0.06 kPa.
 - 60,000 gallons (227 m³) total in hull cargo tanks.
- General Cargo
 - Includes carriage of dangerous goods.
 - Up to (25) 20-foot containers (25 TEU).
 - Palletized or general cargo.
 - Cargo stowage positions provided on deck and in a hold.

The existing Palmer Station fuel tank farm consists of two 125,000-gallon tanks for a total capacity of 250,000 gallons (946 m³). There are future modifications planned at Palmer Station that would change the tank farm configuration to six 25,000-gallon fuel tanks yielding a total capacity of 150,000 gallons (568 m³). Currently the vessel requirements include the capability to transport 60,000 gallons (227 m³) of Antarctic diesel. Increasing the requirement to 120,000 gallons (454 m³) would double the capacity and will result in a relative increase in vessel size, displacement, and cost. The additional 60,000 gallons of fuel represents about 182 long tons (LT) of additional vessel displacement.

The ship will carry gasoline to support small boat operations and to resupply Palmer Station. Gasoline carried for the operation of small boats supported by the vessel are vessel stores and are not cargo. Small boat gasoline would be regulated by flag state under 46 CFR Subchapter U. The small boat gasoline must be stored on deck and tanks less than 110 gallons (See 46 CFR 188.10-57, 194.05-9, and 195.11-30). Gasoline carried as cargo (not vessel stores) is subject to requirements for carriage of hazardous materials and dangerous goods by flag state, IMO, and Class rules. Carriage of gasoline as cargo is governed by flag state rules in 49 CFR Subchapter C, *Hazardous Materials Regulations*, and is allowed to be carried subject to specific requirements in 49 CFR 176.305. The IMDG Code, and Class Rules are also applicable to carriage of gasoline as cargo. The flag state, IMO, and Class rules allow gasoline cargo to be transported in portable tanks in the hold subject to specific safety requirements for Class 3 Flammable Liquids.

Flag State Requirements

The ARV will be a US-flag vessel and therefore subject to USCG requirements. Most USCG requirements are codified in 46 CFR, *Shipping*, however there are additional requirements in 33 CFR, *Navigation and Navigable Waters* (Reference 3), and 49 CFR Subchapter C (Reference 4) that will apply to the ARV. The primary flag state requirements for the ARV fall under 46 CFR Subchapter U because of the research vessel designation. Normally, research vessels are not allowed to carry cargo, see 46 CFR 2.01-7(a) Table 2.01-7(a) note 9:

Under [US Code] 46 U.S.C. 441 an oceanographic research vessel “. . . being employed exclusively in instruction in oceanography or limnology, or both, or exclusively in oceanographic research, . . . Under 46 U.S.C. 443, “an oceanographic research vessel shall not be deemed to be engaged in trade or commerce.” If or when an oceanographic

vessel engages in trade or commerce, such vessel cannot operate under its certificate of inspection as an oceanographic vessel, but shall be inspected and certified for the service in which engaged, and the scientific personnel aboard then become persons employed in the business of the vessel.

Note that regulatory numbering scheme in the USC was revised. See 46 USC 2101 (24) and 46 USC 50503 (Reference 5).

Public vessels are exempted from application of maritime safety and seaman's welfare laws of USC Title 46 Subtitle II (see 46 USC 2109) provided the vessel is not engaged in "commercial service" (see 46 USC 2101 (33)). The revision notes of 46 USC 2109 indicate that some public vessels are inspected under interagency voluntary agreements. These interagency agreements are not publicly available. Depending on the interpretation of "commercial service" this could exempt the vessel from USCG safety and inspection requirements. 46 USC 2101 (4) defines commercial service as follows: "includes any type of trade or business involving the transportation of goods or individuals, except service performed by a combatant vessel". While the 2004 USCG waiver letter for the *Palmer* and *Gould* indicated that transporting scientific cargo would not be considered "engaged in trade" it is not clear that all logistics cargo would satisfy that interpretation. We recommend seeking further information and clarification from USCG. The vessel must still comply with IMO and Class requirements.

Immediate effort could involve discussions with USCG to determine if the Arctic diesel fuel will be considered "cargo". However, this only addresses the flag state regulatory requirements. The vessel must still comply with IMO and Class requirements. Finally, if the fuel is not considered cargo that would leave open the minimum level of safety requirements for the design to transfer fuel from ship to shore.

Any discussions or clarifications with USCG need to address interpretations of the logistics fuel as cargo; but also, whether or not the vessel will be considered to be 'engaged in commercial service' while carrying logistics fuel and or any other logistics cargo.

Cargo operations invoke additional flag state requirements. Cargo vessels fall under 46 CFR Subchapter I. Requirements for transportation of dangerous goods are codified in 49 CFR. Since the ARV will carry fuel as cargo, the USCG requires that the portion of the vessel used for carrying flammable or combustible liquid cargo meet the requirements of 46 CFR Subchapter D (see 46 CFR 2.01-7(a) Table 2.01-7(a) Note 5). An overview of each regulatory section is provided below.

46 CFR Subchapter D, Tank Vessels

Diesel fuel and Arctic Fuel are considered Combustible Liquids Grade D since their flash points are between 27 °C and 65° C (80°F and 150°F; see 46 CFR 30.10-15).

Tank vessels carrying only Grade D or Grade E cargos can use portable cargo piping systems (see 46 CFR 32.50-15).

A separate pumproom and cofferdam bilge system is required, and piping must not pass through machinery spaces with a source of ignition (see 46 CFR 32.52-5).

Inert gas is not required until 20,000 deadweight tons (DWT; see 46 CFR 32.53-1).

International Convention for the Safety of Life at Sea (SOLAS) (Reference 6) Ch II-2 Reg 5,6,8,9, 11 Structural Fire Protection is considered equivalent (see 46 CFR 32.56-1).

Accommodations spaces and machinery spaces are required to be outside of the cargo block (see 46 CFR 32.56-5).

Cargo tanks carrying Grade A, B, C, or D liquids are required to be segregated from accommodations, machinery, and general cargo by cofferdams, pumprooms, empty tanks, or tanks carrying liquids with a flash point over 65°C (150°F). The cargo tanks are required to extend to the main deck (see 46 CFR 32.60-10).

Cargo pumps are required to be segregated from spaces with a source of ignition (see 46 CFR 32.60-20).

Grounded electrical distribution systems less than 1,000 volts are prohibited on tank vessels (see 46 CFR 31.35 and 46 CFR 111.05-19).

Electrical equipment in hazardous zones have special requirements. Cargo pump rooms must have intrinsically safe equipment (see 46 CFR 111.105-31).

Dry cargo compartments, pump rooms, and machinery spaces must be protected by a fixed firefighting system. Cargo tanks must be protected by a deck foam system (see 46 CFR 34.05-5).

A Vapor Control System is not required because of low vapor pressure cargo (less than 10.3 kPa at 20°C per 40 CFR 63.560 (d) (1); (also see 46 CFR 39.1001).

Other 46 CFR Subchapters

Subchapter I, *Inspected Vessels* – applicable and requirements are similar to Subchapter U.

Subchapter N, *Dangerous Cargos* – not applicable since there will be no bulk cargo in holds.

Subchapter O, *Haz Bulk Liquid* – intended for chemical cargo and not applicable for fuel.

49 CFR Subchapter C, Hazardous Materials Regulations

Carriage of hazardous materials by vessel (not in bulk) is regulated by 49 CFR 176, *Carriage by Vessel*. Icebreakers and public vessels not engaged in commerce are normally exempted from 49 CFR Subchapter C (see 49 CFR 176.5). Therefore, the following US federal requirements are not directly applicable to the ARV but are provided for reference.

Hazardous materials are required to be properly packaged and provided with a certificate (see 49 CFR 176.27).

Hazardous cargo is required to be stowed in designated locations that isolate cargo from other ship areas. Some hazardous cargo is limited to above deck, while other cargo must be in a below deck space (see 49 CFR 176.63).

Portable Tanks with flammable or combustible liquids with flash points below 60°C are permitted to be transported on deck (transport only, no transfer of liquids; see 49 CFR 176.76).

There are numerous requirements for cargo separation (see 49 CFR 176.83).

IMO Requirements

Ships operating on international voyages are subject to IMO requirements. The various aspects of requirements applicable to the ARV while carrying cargo are presented in the following sections.

Special Purpose Ships

The ARV will be designated a Special Purpose Ship (SPS) since it will be designed to carry a science party in addition to the crew. The IMO SPS Code assumes that the scientists are able bodied individuals with some knowledge of the ship. Thus, the SPS Code implements some but

not all passenger vessel requirements to encompass the increased number of non-crew personnel on board the vessel. The SPS Code distinguishes between ship's stores for use on board and cargo. Cargo including dangerous goods is subject to the IMDG Code. The SPS Code recommends a formal safety assessment of dangerous goods that are used during voyage.

SOLAS

SOLAS (Reference 6) implements numerous standards and regulations for safety applicable to vessels greater than 500 gross tons on an international voyage.

Ch I Regulation 2 "Tanker" definition: a cargo ship constructed or adapted to carry liquid bulk cargo of flammable nature.

Ch II-1 Regulation 29 requires additional redundancy in the steering system for tankers.

Ch II-1 Regulation 45 requires the electrical distribution system to be configured as a Delta system (no Wye) to comply with a tanker designation.

Ch II-2 Regulation 1 fire protection, detection, and extinction requirements for tankers apply when cargo has a flash point less than 60°C.

Ch II-2 Regulation 4 prevents using fuel with a flash point less than 60°C. This regulation also specifies allowable location and arrangements for cargo tanks, pump rooms and cofferdams. There are numerous additional requirements for other openings such as windows, doors, and ventilation. Tank inerting is not required until a deadweight capacity of 8,000 tons. Regulation 4 also contains numerous requirements for cargo tank vents, and gas detectors. The regulation specifies acceptable locations for cargo tank vents and requires minimum venting velocities during loading to aid in vapor dispersion.

Ch II-2 Part C Fire boundaries have different requirements for passenger ships, cargo ships, and tankers. The SPS Code specifies what type of ship (cargo or passenger) should be considered based on the number of special personnel carried. The tanker requirements must also be considered.

Ch II-2 Regulation 10 requires a CO₂ or inert gas system for hold spaces carrying dangerous goods. Additionally, a fixed deck foam fire extinguishing system must be provided to comply with tanker requirements. Cargo pump rooms are required to be protected by a CO₂ or inert gas system.

Ch II-2 Regulation 19 includes requirements for carriage of dangerous goods. The regulation includes requirements for firefighting, electrical equipment, ventilation, and bilge systems. A water spray system is required for below deck cargo spaces.

CH III-31 Regulation 31 requires fire-protected lifeboats for tankers carrying cargos with a flash point lower than 60°C.

Ch VII, in addition to requiring a Cargo Securing Manual, this chapter requires application of the IMDG Code for carriage of dangerous cargos, and INF¹ Code for carriage of certain radioactive material.

¹ International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on board Ships

Polar Code

The *International Code for Ships Operating in Polar Waters (Polar Code)* (Reference 7) is applicable to vessels operating in high latitude areas in the Arctic and Antarctic. The Polar Code requires that fuel cargo tanks be separated from the shell by a double bottom and wing tanks. The Polar Code does not have additional specific requirements to carriage of dangerous goods, or fuel as cargo.

MARPOL

The International Convention for the Prevention of Pollution from Ships (MARPOL, Reference 8) requirements regulate marine pollution. They are implemented for all ships and are not unique to tankers or ships carrying dangerous goods. MARPOL Annexes I through VI address control of pollution from various sources:

Annex I – Regulations for the prevention of pollution by oil – requires a double hull for cargo tanks, pumproom protection, and oil outflow calculations. High density or viscous fuels (over 900 kg/m³ or over 180 mm²/sec at 50°C) are prohibited. Cargo and fuels having a density over 900 kg/m³ or kinematic viscosity over 180 mm²/sec are prohibited in the Antarctic area.

Annex II – Control of pollution by noxious liquid substances in bulk.

Annex III – Prevention of pollution by harmful substances carried by sea in packaged form.

Annex IV – Pollution by sewage from ships.

Annex V – Pollution by garbage from ships.

Annex VI – Prevention of air pollution by ships.

IMDG Code

The IMDG Code has requirements for governing the transportation of dangerous goods by vessels. The IMDG Code includes requirements for electrical equipment, wiring, fire-fighting equipment, ventilation, smoking provisions, and requirements for special equipment. The IMDG Code breaks dangerous goods into categories and specifies requirements for acceptable packaging. There are many requirements for cargo segregation. If the ARV has only a single hold that will limit the possible combinations of cargo carried during a voyage. Explosives must be carried a minimum of 12 m from accommodations.

Offshore Supply Vessel Chemical Code

IMO Resolution A.1122(30) adopted the Offshore Supply Vessel Chemical Code (OSV Code, Reference 9) establishing regulations for Transport and Handling of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels. The OSV Code is not applicable for petroleum-based fuel cargos but does contain requirements for carriage of other chemicals to and from offshore installations. The basic philosophy of the code is to apply standards, “to the extent practicable and reasonable taking into account the unique design features and service characteristics of OSVs.” While not directly applicable to the ARV, the OSV Code illustrates a regulatory framework like that of chemical tankers but adapted for the logistics mission of OSVs. The OSV Code contains cargo segregation and other safety requirements that are similar to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) applicable to chemical tankers.

ABS Class Requirements

The ARV will be classed by ABS according to the *ABS Rules for Building and Classing Marine Vessels* [Marine Vessel Rules (MVR), Reference 10]. ABS implements many requirements directly from the IMO regulations as well as additional specific class requirements. This section describes the ABS class requirements when carrying cargo.

The general requirements for firefighting are documented in *ABS MVR 4-7 Fire Safety Systems*. The ARV will carry general cargo and is not a special carrier intended solely as a container vessel, so *ABS MVR 4-7* would be applicable to the general cargo area rather than the regulations specific to container vessels in *ABS MVR 5C-5-7*.

The ABS regulations applicable to the cargo fuel are documented in *ABS MVR 5C-1-7 Cargo Oil and Associated Systems*.

ABS Class Notations

The following ABS class notations could be optionally applied to the vessel resulting in an increased level of safety for cargo operations. Each notation would require additional engineering and vessel systems for compliance.

- CSC (Container Securing Certificate).
- FOC (Fire-fighting On-deck Container).
- FBC (Fire-fighting Below-deck Container).

General Cargo

ABS MVR 4-7-2/7 includes requirements specific to cargo spaces. A fire main is required that complies with *ABS MVR 4-7-3/1*.

Cargo vessels larger than 2,000 gross tons and vessels carrying dangerous goods must be equipped with a CO₂ or other inert gas system (*ABS MVR 4-7-2/7.1*)

There are additional requirements for dry cargo spaces intended to carry dangerous goods. (see *ABS MVR 4-7-2/7.5*).

In addition to a fire main and CO₂ system, under deck spaces carrying dangerous goods are required to have an underdeck cargo space cooling system, certified safe electrical equipment, fixed fire detection system, mechanical ventilation providing 6 air changes per hour, specialized bilge system, additional firefighting clothing, portable fire extinguishers, and A-60 fire insulated boundaries with class A machinery spaces (see *ABS MVR 4-2-7/ 7.3.1 to 7.3.8*).

Weather deck areas carrying dangerous goods are required to have a fire main, additional firefighting clothing, portable fire extinguishers, and A-60 fire insulated boundaries with class A machinery spaces. (see *ABS MVR 4-2-7/ 7.3.1 to 7.3.8*).

Cargo Fuel

The requirements for carrying cargo fuel are documented in *ABS MVR 5C-1-7 Cargo Oil and Associated Systems*. The requirements are intended to address flammable and pollution hazards. The cargo tanks are required to be separated from other spaces by cofferdams. Piping systems in the cargo space are considered hazardous and not routed through spaces with sources of ignition. There are numerous rules related to cargo tank venting, gas freeing and tank purging, ventilation, gas detection, and cargo pump rooms. The cargo piping, machinery and tank vents create hazardous zones that will influence the ship arrangement and equipment requirements in these locations.

A dedicated cargo pumping system and pump room is required. The cargo pump room requires a segregated bilge system that serves the pump room and cofferdam areas around the cargo tanks. The cargo pump room must be protected by a fixed firefighting system (CO₂, foam, or water spray).

The cargo tank vents are required to be designed to disperse flammable vapors and are not allowed to be combined with other tank vents.

Although an inerting system is not required since the vessel will be less than 8,000 DWT, the cargo tanks must have a means to purge and gas free them.

The cargo pump rooms are required to be mechanically ventilated, and the exhausts are considered hazardous areas.

The ship must be fitted with a gas detection system.

The ship is required to have a deck foam system in way of the cargo area.

Two additional firefighters' outfits are required.

The electrical distribution system must be configured as a Delta system (no Wye). There are a few exceptions allowing earthed connections to the hull for: intrinsically safe circuits; control and instrumentation circuits less than 5 amps; limited locally-earthed systems where earthed current does not flow through hazardous areas; and AC systems over 1,000 volts.

Offshore Support Vessels

The ABS MVR 5D-1 and 5D-2 are dedicated to offshore support vessels in the offshore energy sector. These vessels carry limited amounts of dangerous goods, and hazardous and noxious substances. This rule set represents the ABS Class implementation of the IMO OSV Code and IMDG Code for offshore vessels. These ABS Rules specify that any fuel cargo have flash points greater than 60°C and so are not directly applicable to the ARV. The ABS offshore vessel rules have a section related to hazardous or noxious chemicals for non-petroleum chemicals with flash points less than 60°C. These rules include requirements for cargo segregation, fire and safety, mechanical, electrical, and ventilation systems that are similar to the chemical tanker rules.

Findings

The regulations governing carriage of cargo impose requirements intended to increase the level of safety aboard vessels. Most regulations are intended to mitigate the risk of fire, pollution, or other hazards to the crew. Compliance with regulations will influence the ARV arrangement and its systems. Based on the available vessel arrangement drawings, it appears that both the RRS *Sir David Attenborough* and RSV *Nuyina* were designed to comply with cargo regulations. However, these are larger vessels compared to the ARV, and generally considered cargo/supply vessels first and research vessels second. It will be necessary to seek waivers or obtain determinations of equivalency if the ARV design deviates from the applicable regulations. Glosten has not pursued waivers or determinations of equivalency from the regulatory authorities as it is too early to discuss them in the level of detail required. In general, Glosten expects that the regulatory authorities will not grant waivers unless the design demonstrates an equivalent level of safety. Glosten recommends meeting the requirements to the greatest extent practicable and seeking waivers only as a last resort.

If the container hold space is designed to support the transportation of cargo containers it will also meet the requirements for transporting science containers. It will need to be treated as either completely cargo or science hold depending on the mission. If the container hold is loaded with

containerized science labs occupied by personnel, that will likely preclude simultaneous carriage of cargo in the same hold.

If the cargo tanks are configured to transport low flash point fuels, they will also meet the standards for normal marine fuels with flash points above 60°C. During some voyages requiring a long endurance it could be beneficial to use the cargo tanks as vessel fuel tanks instead. In this case the tanks would be loaded with fuel with a flash point over 60°C. This configuration would likely require either a removable spool piece in the vessel fuel piping system or locked closed valve so that the cargo tanks can be isolated from the vessel fuel system when loaded with cargo fuel. Either arrangement would need to be vetted and approved by the regulatory authorities.

The cargo regulations likely to drive the vessel design are summarized below.

Cargo Fuel Requirements:

- Flag State 46 CFR, Subchapters I and D.
- IMO SOLAS SPS, MARPOL, Polar Code.
- ABS Class ABS MVR 5C-1-7 *Cargo Oil and Associated Systems* and ABS MVR 4-7 *Fire Safety Systems*.
- Designated cargo fuel tanks protected by a double hull and segregated from other areas by cofferdams.
- Dedicated cargo pump room with dedicated bilge system.
- Cargo piping and pump room bilge piping cannot pass through spaces with a source of ignition.
- Only voids or ballast tanks allowed below cargo tanks, piping in these spaces treated as cargo piping.
- Electrical system configured as a Delta System (No Wye).
- Numerous requirements for arrangements, openings (doors, windows, ventilation, etc.), tank vents, gas detectors.
- Some additional firefighting requirements including a deck foam system.
- Cargo pump rooms protected by inert gas or CO₂.
- Tank inerting not required until 8,000 DWT.
- Vapor control system not required since cargo vapor pressure is less than 10.3 kPa at 20°C.
- Fire protected lifeboats required for cargo less than 60°C flash point.

Dry Cargo Requirements:

- Flag State 46 CFR Subchapter I and 49 CFR 176 *Carriage of Hazardous Materials by Vessel*.
- IMO SOLAS SPS, MARPOL, Polar Code, IMDG Code.
- ABS MVR 4-7 Fire Safety Systems.
- Most requirements apply to carriage of dangerous goods (affects arrangement, ventilation, firefighting, electrical, etc.).

- Inert gas or CO₂ system required for holds carrying dangerous goods.
- Water spray system required in holds carrying dangerous goods.
- Dangerous goods are divided into classes. There are stowage and segregation requirements for each class of goods and combination of goods. The interaction of these requirements may limit what goods can be carried in any one voyage due to a limited number of container positions.
- Any explosives must be carried at least 12 m away from accommodations.
- Cargo area needs to be separate from other areas of the ship (access, ventilation, etc.).

Specification Changes

Recommended Changes

Unless the vessel will fully comply with cargo requirements the Specification changes are pending further discussion with USCG and Class.

Required Owner Decisions

If the vessel will not fully comply with cargo requirements, then an alternate Design Basis must be developed in collaboration with USCG and Class. We recommend engaging with USCG and Class to develop a Design Basis agreement that achieves regulatory concurrence than can be incorporated into the specification. The following text outlines the necessary USCG discussion and process; Class will be similar:

The existing US vessels supporting Antarctic operations at Palmer Station are the RV *Nathaniel B. Palmer* and RV *Laurence M. Gould*. These two vessels are inspected by USCG under 46 CFR Subchapter U – *Research Vessels*. These ships carry logistics cargo to support operations at Palmer Station. Normally research vessels are not permitted to carry cargo, but USCG issued a waiver in 2004 allowing the *Palmer* and *Gould* to carry “research oriented” cargos to Antarctica.

The specifications are under development for a new US Flag vessel to replace the *Palmer* and *Gould*. The new vessel capabilities include transport of logistics cargos to and from Antarctica. The logistics cargos include fuel, containers, and general cargo. The fuel cargo consists of low flashpoint Arctic Diesel that will support electrical generating capacity and operations at Palmer Station (up to 120,000 gallons with flash point at 52°C). The general cargo will be palletized or in containers and will include carriage of dangerous goods (up to (25) 20 ft containers).

1. Will USCG consider issuing a waiver for the new vessel similar to the current waiver for the *Palmer* and *Gould* allowing the new research vessel to carry logistics cargo to support Antarctic operations?
2. The current waiver indicates that logistics cargos are “research oriented”. How does the USCG determine what logistics cargos are “research oriented”? Are there examples of logistics cargos that would not qualify for a waiver, or logistics cargos that would trigger a determination that the vessel is ‘engaged in trade or commerce’ or ‘engaged in commercial service’?
3. There are numerous IMO SOLAS Regulations applicable to cargo vessels. The SOLAS Convention appears to exempt combatants, but not other public vessels. If a USCG Flag State waiver is granted for the new vessel, will the vessel still be able to

- carry logistics cargos and obtain a SOLAS certificate as a research vessel (presumably a Special Purpose Ship)?
4. Will additional waivers or exemptions be necessary to obtain a SOLAS certificate?
 5. We anticipate that waivers or exemptions may also be necessary from Class requirements. How will USCG coordinate the regulatory process with the Class Society?
 6. We assume that the following steps are necessary to support application for a waiver is this correct?
 - a. Identify regulations normally applicable to vessels carrying cargo.
 - b. Determine a list of areas that the new vessel design is not fully compliant with the cargo regulations (Gap Analysis).
 - c. Develop an equivalent level of safety or mitigation for each gap identified (Basis of Design).
 - d. Present the Gap Analysis and Basis of Design to USCG and the Class Society and revise as necessary to achieve regulatory concurrence.
 - e. Incorporate the Design Basis into the new vessel specification after achieving regulatory concurrence.

Please see several sections of the US Code germane to this discussion:

1. 46 USC 2101, *General definitions*, (4).
2. 46 USC 2101, *General definitions*, (33).
3. 46 USC 2109, *Public vessels*.
4. 46 USC 2113, *Authority to exempt certain vessels*.
5. 46 USC 50503, *Oceanographic research vessels*.