STANDARD COMMER. TOBACCO CO. v. THE M/V "RECIFE"

827 F. Supp. 990 (1993) | Cited 0 times | S.D. New York | July 21, 1993

OPINION

Sweet, D.J.

This admiralty action brought by Standard Commercial Tobacco Co., Inc., Universal Leaf Tobacco Company, Inc., Century Tile Co., Inc., New Hampshire Insurance Company, and The Insurance Company of North America (collectively the "Cargo Interests") against the M/V RECIFE, her engines, machinery, etc., in rem, Safbank Line Limited, Argonaut Shipping, Inc. and The Bank Line, Limited (collectively the "Defendants" or "RECIFE") arises out of an explosion and fire which occurred on the RECIFE on September 7, 1991. Upon all the proceedings previously had and upon the evidence and authorities adduced at trial, and the findings of fact and conclusions of law set forth below, judgment will be granted in favor of the RECIFE dismissing the complaint with costs.

Prior Proceedings

This action was commenced by the Cargo Interests by the filing of a complaint on April 17, 1992, in which a recovery of damages in the amount of $ 948,360.45 was sought. Issue was joined and discovery proceeded. In the course of trial by the court from March 22 to March 25, 1993, eight witnesses testified and numerous exhibits were admitted. Final submissions were completed on May 5 and final argument took place on June 8. Admiralty jurisdiction under Rule 9(h), Fed.R.Civ.P. and 28 U.S.C. § 1333 is conceded.

FINDINGS OF FACT

The Parties

The Cargo Interests were the owners and subrogated insurers of shipments of tobacco and tile shipped aboard the RECIFE, a self-sustaining containership with capacity to move containers with its own gear. The Cargo Interests are the real parties in interest.

Defendant Safbank Line, Limited is a corporation or other legal entity with a place of business c/o its general agent Gulf and Atlantic Maritime Services, Inc., 99 Wood Avenue, South Iselin, New Jersey. It is a common carrier of merchandise by water for hire, and owned, operated, managed, chartered and controlled the RECIFE as a common carrier of merchandise by water for hire.

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Defendant Argonaut Shipping, Inc. is a corporation or other legal entity formed and existing under the laws of the Republic of Panama, with a place of business at South African Marine Corp., Ltd., Room 1100, BP Centre, Thibault Square, Cape Town 8001, South Africa. It is a common carrier of merchandise by water for hire and owned, operated, managed, chartered and/or otherwise controlled the RECIFE as a common carrier of merchandise by water for hire.

Defendant The Bank Line, Limited was and now is a corporation or other legal entity with a place of business c/o its general agent Gulf and Atlantic Maritime Services, Inc., 99 Wood Avenue, South Iselin, New Jersey.

The vessel M/V RECIFE was and now is a general ship employed in the common carriage of merchandise by water for hire, and was within this district during relevant times and submitted herself to the jurisdiction of the Court for purposes of this action as did Safbank Line, Limited, Argonaut Shipping, Inc. and The Bank Line, Limited.

The Shipments

On July 20, 1991 at the port of Durban, South Africa, Stancom Tobacco Co. (MW), Ltd. delivered to the RECIFE a shipment of 3,417 cartons of "unmanufactured threshed Malawi Burley Tobacco" in good order and condition. The RECIFE accepted the shipment and issued Bills of Lading numbers SFLLI 929, SFLLI 965, SFLLI 962, SFLLI 935 and SFLLE 382, and for agreed freight charges undertook to carry the shipment to the ports of Wilmington, North Carolina, and thence to Richmond, Virginia, pursuant to the terms and conditions of the bill of lading.

On July 20, 1991, a containerized shipment of "Klorman Chlorine Replacement Cartridges" was received aboard the RECIFE at the port of Durban, South Africa, pursuant to bill of lading SFLLD 197, issued by the RECIFE in consideration of certain agreed freight, for carriage to Savannah, Georgia. The cartridges contained calcium hypochlorite, a powerful oxidant which is used for, among other things, water purification and water treatment in swimming pools. The purpose of adding calcium hypochlorite to water is to destroy organic materials.

The Klorman Chlorine Replacement Cartridges were manufactured in South Africa by "Control Chemicals d/b/a Deatrick & Associates" of Alexandria, Virginia, and consisted of round pellets approximately three inches in diameter, packed ten to a plastic tube, [1]" four Klorman Cartridges per box, four boxes per carton, and 1,005 cartons totalling over sixteen thousand individual cylinders of calcium hypochlorite packed into the container on the M/V RECIFE with a total mass of 11,000 kilograms.

The Freight container IEAU 2071028 ("the "Container") in which the chlorine cartridges were shipped was placed in a stowage location designated "11-08-84" aboard the RECIFE, on deck, at the forward edge of the forwardmost hatch, in the extreme outboard row, and on the top tier of

containers on the port side of the vessel in proximity to the cargo of the Cargo Interests.

After laboratory testing of comparable pellets there was insufficient evidence to establish that there were impurities in the calcium hypochlorite. The chemical content analysis on Klorman samples shipped in a roughly comparable period revealed traces of inorganic impurities with a corresponding negligible effect on stability. The raw materials used to make calcium hypochlorite are subjected to extreme temperatures and pressures during manufacture, a process which customarily drives out or oxidizes any trace metals.

On August 19, 1991 at the port of LaGuaira, Venezuela, Balgres, C.A. delivered to the RECIFE a shipment of 2,814 boxes of glazed ceramic tile in good order and condition, and the RECIFE accepted the shipment and issued Order Bill of Lading number BKLU 9191, and for agreed freight charges undertook to carry the shipment to the port of Baltimore, Maryland, and thence to Lombard, Illinois, pursuant to the terms and conditions of the bill of lading.

The Voyage

The RECIFE remained in port in Durban South Africa from July 20 to July 23 when she got underway for Walvis Bay where she arrived on July 28 and then departed for LaGuaira, arriving on August 11. She then departed for New Orleans arriving on August 22 and remaining in the New Orleans area until August 29 when she departed for Houston, arriving on September 1, departing Houston for Beaumont, Texas on September 4. During this voyage the outside ambient temperature rose from 17 degrees - 20 degrees to 28 degrees - 31 degrees C.

The Container

The steel roof of the Container reached temperatures of 70 degrees C (158 degrees F) due to solar heating during the voyage. During partial and full sun conditions, the temperature of the air inside the container would range between 26 and 38 degrees C above the outside air temperature. The temperature of the air in the Container periodically exceeded 120 degrees F (49 degrees C) and on some days exceeded 140 degrees F (60 degrees C). On a day of full sunlight, the inside air temperature in the Container was approximately 156 degrees F (68 degrees C). Heat did not flow out of the Container through the roof during periods of sunlight although it would at non-sunlight hours.

As a consequence of the temperature range of the ambient air adjacent to the cargo, a heat transfer process called "heat pumping" took place as described by Cargo's expert in the following terms:

Daily cycling of peak heat input can readily cause "heat pumping" depending on contents of the container and its construction, which results in the continuous increase of the temperature of the container's internal atmosphere and contents, particularly during a long voyage where daily ambient temperatures are high, as was the case in the voyage of the RECIFE.

Pl.'s Mem. of Law at 29; also Pl.'s Ex. W-1 at 5; Pl.'s Ex. AQ.

Therefore, the air inside the Container continued to heat until its temperature exceeded that of the outside air, at which point heat began to flow out through the sides of the Container. Because the inside air (heated by the sun on the metal roof) was initially much warmer than the mass of cargo, heat flowed from the inside air into the cargo. This process continued unless solar input was removed from the roof.

When the roof and outside air cooled, when the temperature of the roof and outside air dropped below that of the inside air, heat flowed out of the Container and the cargo gave up its heat. However, the rate at which the cargo lost heat was appreciably lower than the rate at which heat was introduced, resulting from the smaller temperature differentials at night.

The approximate critical temperature of a close-packed stow of Klorman Cartridges can be calculated by the use of a mathematical equation developed by D. A. Frank-Kamenetskii. [2"]

The critical temperature of calcium hypochlorite (the temperature at which runaway thermal decomposition occurs) depends inversely upon the size of the sample; as the mass increases, the critical temperature decreases. A mass of calcium hypochlorite will generate heat in direct proportion to its volume.

The critical temperature of a single pellet of calcium hypochlorite is approximately 180 degrees C. For a larger mass of calcium hypochlorite, the Frank-Kamenetskii equation enables the user to calculate the temperature required at the surface of the mass in order for the temperature of a small portion at the center to be 180 degrees C.

The temperature necessary at the outer surface of the stow of Klorman Cartridges for a small portion of calcium hypochlorite at the center of the stow to achieve runaway decomposition was 52 degrees C (126 degrees F) which was reached fifty days after the commencement of the voyage.

The Fire

On Saturday, September 7, 1991 while the RECIFE was at sea bound for Wilmington, North Carolina, at 0048 (48 minutes after midnight), the log entry states: "IMO 5.1 Container IEAU 2071028 in position 11-08-84 explodes engulfing hatch 1 in smoke and flames" (the "Fire"). The Fire was preceded by an explosion in container IEAU 2071028 which blew open the container doors of the container of calcium hypochlorite that was stowed in the forward part of the vessel, top tier, port side.

The Fire caused substantial property damage to containers and their cargoes in the vicinity of the Container. The crew successfully extinguished the Fire, and the voyage continued.

The Code And Practice Under The Code

Title 49 of the United States Code of Federal Regulations, October 1, 1990 Edition, provides that stowage requirement for calcium hypochlorite UN No. 1748 to be "keep cool and dry."

The International Maritime Dangerous Goods Code ("IMDG") provides in § 4.5 that its provisions are "applicable to all ships to which the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS), applies and which are carrying dangerous goods classified under Regulation 2 of Part A of Chapter VII of that Convention." The United States is a signatory to the SOLAS Convention, 32 UST 47, and its amendments, 32 UST 5517. The IMDG Code is formulated and reviewed from time to time by a committee of experts affiliated with the United Nations Inter-Governmental Maritime Consultative Organization, whose Sub-Committee on the Carriage of Dangerous Goods approved the amendments to the IMDG code.

Hazardous materials are separated into nine classes in the IMDG Code. Calcium hypochlorite is classified within the IMDG Code as an oxidizing substance, Class 5.1.

The specific entry relating to U.N. No. 1748, Calcium Chloride also states as follows:

Critical ambient temperature of decomposition may be as low as 60 degrees C.

May cause fire in contact with organic material or ammonium compounds.

The general introduction to this Class describes the properties of all oxidizing substances as follows:

Substances of Class 5.1 in certain circumstances directly or indirectly evolve oxygen. For this reason oxidizing substances increase the risk and intensity of fire in combustible material with which they come into contact.

(IMDG Code, P. 5101, Amdt. 25-89), emphasis added.

The first instruction in the Stowage chapter of the General Introduction states, "substances, materials and articles should be stowed as indicated in the individual schedules in the various classes . . ." (IMDG Code § 14.2). The first precaution set forth in the "Stowage" section of the Introduction to Class 5.1 says: "Oxidizing substances should be stowed as indicated in the individual schedules . . ." (IMDG Code § 3).

Under the heading "Stowage," this section of the IMDG Code requires that calcium hypochlorite be stowed "away from sources of heat."

A Class 4.1 "Flammable Solid," is defined, in part, in the introduction to this class as covering:

Substances which are self-reactive, i.e., liable to undergo at normal or elevated temperatures, a strong exothermic decomposition caused by excessively high transport temperatures or by contamination.

For 4.1 substances that are "self-reactive," the IMDG Code states in the introduction to the class as follows:

General Stowage Precautions for Self-Reaction Substances

. . .

During transport, packages containing self-reactive substances . . . should be shaded from radiant heat which includes protection from direct sunlight.

The IMDG Code defines organic peroxides (Class 5.2) as follows:

Organic peroxides are thermally unstable substances, which may undergo exothermic, self-accelerating decomposition. In addition, they may have one or more of the following properties:

Be liable to explosive decomposition;

burn rapidly . . . .

The containerized shipment of calcium hypochlorite in question is within "Stowage Category E." The IMDG Code page 5137 also provides, under the heading "Packing, Stowage & Segregation," "See also General Introduction and introduction to this class." The General Introduction pertaining to "Stowage Category E" provides in part under the heading "Stowage":

Where it is necessary to prevent pressure build-up, decomposition or polymerization of a substance, the packages should be stowed "shaded from radiant heat" which includes protection from strong sunlight.

IMDG Code section 14.12.

The IMDG Code's introduction to Class 5 cargoes, of which class calcium hypochlorite U.N. 1748 is a member, provides under the heading "Fire precautions" that, "for general advice and guidance on fire precautions, refer to section 16 of the General Introduction." IMDG Code at 5002. Section 16 of the General Introduction, entitled "Fire Precautions" provides in part as follows:

The prevention of fire in a cargo of dangerous goods is achieved by practicing good seamanship, observing in particular the following precautions:

* * *

.4 Stow packages protected from accidental damage or heating.

P 16.1.4.

Section 16.2 states:

Fire precautions applying to individual classes, and where necessary to individual substances, are recommended in the introduction to each class and on the individual schedules.

In the early 1970's, there were a number of fires involving drums of Japanese calcium hypochlorite. Cargo circular 40 distributed to the RECIFE and signed by the Director and Executive Director of the Marine Department of Safbank Line Limited, states that "this chemical [calcium hypochlorite] is liable to decompose violently if exposed to heat or direct sunlight . . . ." Cargo Circular 40 stated "over a period of a few months we have had several instances of the above-mentioned chemical [calcium hypochlorite] causing severe fires . . ." Safmarine Cargo Circular No. 40 was issued in 1973 and refers to calcium hypochlorite in drums, not containers.

In 1974 Cargo Circular No. 40-A was issued by Defendants dealing with organic contamination, not direct sunlight. Cargo Circular 40-A included the statement, "as will be seen, this cargo is inherently dangerous and the utmost care must be taken with regard to handling and stowage."

Top tier exposed stowage of calcium hypochlorite containers is common practice on the RECIFE and on many vessels on various trades, including hot climates, cold climates, long voyages and short voyages.

Prior to September 7, 1991, no fire on any ship involving a calcium hypochlorite container had been reported, including the ships of the defendant.

Until 1979, the IMDG Code's entry for calcium hypochlorite contained the plain and clear warning "may decompose violently if exposed to heat or direct sunlight." The warning as to sunlight was deleted in 1982. Prior to 1982, the individual schedule for calcium hypochlorite contained a special stowage requirement that calcium hypochlorite be protected from direct sunlight. This warning on the individual schedule was deleted because the IMO's experts concluded that exposure to sunlight was not a danger to calcium hypochlorite carried in containers, presumably given the research discussed below and the absence of shipboard fires since the 1970's. Until 1989, the Code still warned the mariner that calcium hypochlorite might decompose "violently"; however, this warning was also deleted in the 1989 version of the IMDG Code, which was in effect at the time of the RECIFE's voyage.

Burgoyne, Inc., the U.S. member of the Burgoyne Group ("Burgoyne") of engineering consultants, maintains an extensive library of marine fires which occur worldwide, but is unaware of any calcium hypochlorite fires in containers anywhere, or calcium hypochlorite fires attributable to sunlight or of any calcium hypochlorite fires since the 1970's.

A primary concern with regard to calcium hypochlorite and fire is that this oxidizing substance will "feed" and greatly accelerate an already existing fire.

The Damages

Century Tile Co., Inc. and Insurance Company of North America sustained damages in the sum of $ 15,000.

Under Safbank Line Limited Bill of Lading No. SFLLI 965, 990 cartons of Grade WB1B "unmanufactured threshed Malawi Burley Tobacco" were shipped. Standard Commercial Tobacco Co., Inc. acquired the 990 cartons from Stancom Tobacco Company (Malawi) Limited for an average cost of $ 562.02 per 100 net kilograms ($ 254.93 per 100 pounds), f.o.b. M/V RECIFE at Durban. The 900 cartons of Grade WB1B tobacco were sold by Standard to Brown & Williamson doing business as Export Leaf Tobacco Company in accordance with the terms of a contract dated June 3, 1991. The contract price for the Grade WB1B tobacco, in accordance with the terms of the contract dated June 3, 1991, was $ 6.1861 per net kilogram. Of the 990 cartons of Grade WB1B tobacco shipped pursuant to Bill of Lading No. SFLLI 965, 891 cartons were damaged. Standard's cost for the 891 cartons, f.o.b. M/V RECIFE at Durban, was $ 908,570.52 and the contract value of the 891 cartons of damaged Grade WB1B tobacco shipped pursuant to Bill of Lading NO. SFLLI 965 was $ 1,000,058.40, f.o.b. RECIFE at Durban.

Under Safbank Line Limited Bill of Lading No. SFLLI 929, there were shipped 891 cartons of Grade WB1B "unmanufactured threshed Malawi Burley Tobacco" acquired by Standard from Stancom Tobacco Company (Malawi) Limited for an average cost of $ 562.02 per 100 net kilograms, f.o.b. M/V RECIFE at Durban. The 891 cartons of Grade WB1B tobacco was sold by Standard to Brown & Williamson doing business as Export Leaf Tobacco Company in accordance with the terms of a contract dated June 3, 1991. The contract price for the Grade WB1B tobacco, in accordance with the terms of the contract dated June 3, 1991, was $ 6.1861 per net kilogram. Of the 891 cartons shipped pursuant to Bill of lading SFLLI 929, 792 were damaged. Standard's cost for the 792 cartons, f.o.b. M/V RECIFE at Durban was $ 807,618.24. The contract value of the 792 cartons of damaged Grade WB1B tobacco shipped pursuant to Bill of lading SFLLI 929 was $ 888,940.80, f.o.b. M/V RECIFE at Durban.

Under Safbank Line Limited Bill of Lading No. SFLLE 382 there were shipped 96 cartons of Grade M101HB "unmanufactured threshed Malawi Burley Tobacco" none of which were damaged.

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Under Safbank Line Limited Bill of Lading No. SFLLI 935, there were shipped 672 cartons of Grade M2A2HB "unmanufactured threshed Malawi Burley Tobacco," acquired by Standard from Stancom Tobacco Company (Malawi) Limited for an average cost of $ 497.80 per 100 net kilograms, f.o.b. M/V RECIFE at Durban. The 672 cartons of Grade M2A2HB tobacco were sold by Standard to Philip Morris U.S.A. in accordance with the terms of a contract dated May 29, 1991. The corrected contract price for the Grade M2A2HB tobacco, in accordance with the terms of the contract dated May 29, 1991, was $ 518,9806 per 100 net kilograms. Of the 672 cartons of Grade M2A2HB tobacco shipped pursuant to Bill of Lading No. SFLLI 935, 96 cartons were damaged. Standard's cost for the 967 cartons, f.o.b. M/V RECIFE at Durban was $ 92,232.38. The contract value of the 96 cartons of damaged Grade M2A2HB was $ 96,153.44, f.o.b. railcars at Lilongwe, Malawi.

Under Safbank Line Limited Bill of lading No. SFLLI 952, there were shipped 768 cartons of Grade M2A2HB "unmanufactured threshed Malawi Burley Tobacco" none of which was damaged.

Under Safbank Line Limited Bill of Lading No. SFLLD 345, there were shipped 384 cartons of Grade M2A2HA "unmanufactured threshed Malawi Burley Tobacco," sold by The Limbe Leaf Tobacco Company to Universal Leaf Tobacco Company in accordance with The Limbe Leaf Tobacco Company Invoice 6850 dated June 25, 1991. The contract price for the Grade M2A2HA tobacco, in accordance with The Limbe Leaf Tobacco Company Invoice 6850 dated June 25, 1991, was $ 918,600.00 for 185,280 net kilograms. Of the 384 cartons of Grade M2A2HA tobacco shipped pursuant to Bill of Lading No. SFLLD 345, 96 cartons were damaged. The contract value of the 96 cartons of damaged Grade M2A2HA tobacco shipped pursuant to Bill of Lading SFLLD 345 was $ 91,860.45.

On September 30, 1991, invitations to bid on the damaged Grade WB1B tobacco shipped pursuant to Bills of lading Nos. SFLLI 965 and SFLLI 929 and the damaged Grade M2A2HB tobacco shipped pursuant to Bill of Lading No. SFLLI 935 were sent to potential bidders by M.B. Ward & Son, Inc.

On or before October 11, 1991 sealed bids were received by M.B. Ward & Son, Inc. for the damaged Grade WB1B tobacco and the damaged Grade M2A2HB tobacco. The highest bid received in the bona fide salvage sale of October 11, 1991 was $ 889,500. The high bidder was Standard. The amount of Standard's bid, $ 889,500, was offset as a credit against the insurance proceeds payable to it by New Hampshire Insurance Company on account of its claim for the damage to the cargo which was the subject of the salvage sale.

On September 30, 1991, invitations to bid on the damaged Grade M2A2HA tobacco shipped pursuant to Bill of lading No. SFLLD 345 were sent to potential bidders by M.B. Ward & Son, Inc. On or before October 11, 1991, sealed bids were received by M.B. Ward & Son, Inc. for the damaged Grade M2A2HA tobacco. The highest bid received in the bona fide salvage sale of October 11, 1991 was $ 48,000.00. The high bidder was Standard. The amount of Standard's bid, $ 48,000, was paid by Standard to Universal Leaf Tobacco Company, Inc.

THE ISSUE

The facts as found above present two issues for resolution, one necessary to the disposition of this action and the other perhaps necessary for any further review or consideration, and in any case as a factor to be considered by those responsible for "those in peril on the sea." The first issue is, of course, was the RECIFE negligent in its stowage of the chlorine hypochlorite based upon the circumstances prevailing at the time of the voyage, including the relevant provisions of the IMDG. For the reasons set forth below it was not.

The inquiry could cease at that point, since without negligence, there is to be no liability, but district courts have no exclusive claim on wisdom, particularly in the non-jury context, and prudence requires the resolution of the second question, that of proximate cause: was the stowage of the container responsible for the explosion and consequent fire and damage. The uniqueness of the explosion, the absence of any evidence establishing any other competent cause and the qualities of the material combined with the heat transfers require the conclusion that stowage in the direct sunlight caused the Fire. While the conclusion may, or may not, be material to the resolution of this action, it is hoped that it will be noted by the U.N. experts for the next formulation of the IMDG Code.

The RECIFE Was Not Negligent

"Every bill of lading or similar document of title which is evidence of a contract for the carriage of goods by sea to or from ports of the United States, in foreign trade, shall have effect subject to the provisions of this chapter." 46 U.S.C. § 1300. "Neither the carrier nor the ship shall be responsible for loss or damage arising or resulting from -- * * * (b) Fire, unless caused by the actual fault or privity of the carrier." 46 U.S.C. § 1304 (2)(b). "No owner of any vessel shall be liable to answer for or make good to any person any loss or damage, which may happen to any merchandise whatsoever, which shall be shipped, taken in, or put on board any such vessel, by reason or by means of any fire happening to or on board the vessel, unless such fire is caused by the design or neglect of such owner." 46 U.S.C. § 182.

"Actual fault or privity" in § 1304 of COGSA has been interpreted identically with "design or neglect" of § 182. Asbestos Corp. v. Compagnie De Navigation Fraissinet et Cyprien Fabre (The M/V Marquette), 345 F. Supp. 814, 1972 AMC 2581 (S.D.N.Y. 1972), aff'd 480 F.2d 669, 1973 AMC 1683 (2d Cir. 1972). Neglect as used in the Fire Statute section 182 means negligence. Complaint of Ta Chi Navigation, 677 F.2d 225, 228 (2d Cir. 1982).

As set forth in 49 CFR § 176.11(a):

(a) A hazardous material may be offered and accepted for transportation by vessel when in conformance with the requirements of the IMDG Code in place of the corresponding requirements

of this subchapter pertaining to . . . stowage and segregation.

Thus, the CFR permitted the RECIFE to carry the container of calcium hypochlorite to the United States provided that stowage was in conformance with the requirements of the IMDG Code. Therefore, the ultimate issue in this case is whether the RECIFE violated the IMDG Code and whether this violation caused the Fire; 46 USC § 1304(2)(b) [COGSA fire exception]). Thyssen Steel v. Palma Armadora, 1984 AMC 1133, 1139 (S.D.N.Y. 1983). It did not.

For each hazardous container, the IMDG Code had to be consulted. There are a number of commodities listed under various classes of the IMDG Code which illustrate the advice given in PP 14.2 and 14.10.2 of the General Introduction, namely, that when a special requirement regarding stowage such as "shade from radiant heat" is recommended for a particular commodity, it is specified under the heading "Stowage" in the individual schedule for that commodity.

Stowage category E, which applies to containers of calcium hypochlorite, permits stowage on deck without further restrictions. This permission is not qualified "as long as another container is stowed above," or words to that effect.

The specific schedules relating to stowage of a particular hazardous material take precedence over statements in the General Introduction of the IMDG Code, as stated by Captain Cookson, the RECIFE's expert who testified as follows:

Q. You are saying that the specific provisions relating to, whatever that stuff is, calcium hypochlorite, take precedence over this general statement in 1412?

A. I do, because of in the same section 14, in 14.10.2, there they make the statement at all times the stowage of dangerous cargo should be so arranged and they refer you to the introduction of the various classes [and] the individual schedules where there are more details which relate directly to the commodity addressed.

Q. You are telling me that 14.10 is the section that you rely on for the proposition that the particular controls over the general?

A. Yes.

Q. And it is for that reason that you believe "shade from radiant heat" provision is inapplicable?

A. I do.

THE COURT: Thank you.

THE WITNESS: May I add?

THE COURT: Sure.

THE WITNESS: In the individual schedule, that particular requirement of shade from radiant heat is addressed for other commodities. It has been omitted by intention because it isn't applicable to that commodity of calcium hypochlorite.

(Cookson, Tr. 514-15).

The terms "away from" and "sources of heat" are defined in the Code, as is the term "shade from radiant heat."

The description of one of the properties of calcium hypochlorite in the individual schedule that "critical ambient temperature of decomposition may be as low as 60 degrees C" does not trigger § 14.12 of the General Introduction which provides:

Where it is necessary to prevent decomposition . . . the package should be stowed "shaded from radiant heat . . ."

Such an interpretation contradicts at least three other sections of the General Introduction to the Code, §§ 14.2, 14.10.2 and 16.2, and the Introduction to Class 5.1 oxidizing substances, § 3.1, all of which instruct the mariner to consult the individual schedules for special stowage precautions.

It is also inconsistent with the individual schedules for other Class 5.1 oxidizing substances which list, under the heading "Properties," the express possibility of decomposition, and also contain under the heading "Stowage" the specific precaution "shade from radiant heat" (e.g. hydrogen peroxide). When the committee of experts who drafted the IMDG Code intended to give the mariner special requirements regarding stowage of a particular commodity, such as "shade from radiant heat," it is so stated in the individual schedule for that commodity.

In the introduction to Class 4.1 (Flammable Solids), all commodities in this class that are self-reactive "should be shaded from radiant heat which includes protection from direct sunlight." Class 4.1 defines self-reactive substances as "liable to undergo at normal or elevated temperatures a strong exothermic decomposition caused by excessively high transport temperatures or by contamination." Calcium hypochlorite is not listed in Class 4.1 by the IMO, and is therefore not required to be shaded from radiant heat.

In contradistinction to calcium hypochlorite, organic peroxides, Class 5.2, are described as "liable to exothermic decomposition at normal or elevated temperatures. The decomposition can be initiated by heat . . ." Whether or not to a chemist calcium hypochlorite fits this description, the following

specific stowage recommendation for organic peroxide is given:

11.4 Organic peroxide should be stowed "away from" sparks, flame or any other source of heat. Packages containing organic peroxides not requiring temperature control should be protected from direct sunshine and stowed in a cool, well ventilated place.

The IMDG Code does not consider the concepts of "away from sources of heat," "protection from direct sunshine," and stowage in a "cool, well ventilated" (i.e., dry) place to be synonymous. Were it otherwise, it would be redundant to list all three concepts as stowage precautions together.

As noted previously, the mariner is unquestionably alerted to dangerous decomposition regarding Class 4.1 flammable solids ("liable to undergo . . . a strong exothermic decomposition) or Class 5.2 calcium peroxides ("some organic peroxides may decompose explosively"). In contrast, the reference on the individual schedule for calcium hypochlorite of the possibility of violent decomposition was deleted in 1989.

The IMDG Code also contains a definitional section for the term "shade from radiant heat," specifying that this term is used to mean, among other things, protect from direct sunlight.

Under the IMDG Code, the stowage of calcium hypochlorite in a container was Category E, meaning that stowage was permitted, without further restriction, either on deck or under deck provided that the container was stowed "away from sources of heat."

An IMDG Code analysis of the term "keep away from sources of heat," defines the term "away from" in terms of distance, i.e., 3 meters. Additionally, "sources of heat" is illustrated in the Code as man-made, local sources of heat, such as sparks, flames, steampipes, heating coils, etc., and does not include the sun.

As was observed by the Court in Louisiana ex. rel. Gusk v. M/V TESTBANK, 564 F. Supp. 729, 1984 AMC 112, 127 (E.D. La. 1983), aff'd., sub. nom., 767 F.2d 916 (5th Cir. 1985), when the Code permits carriage of a cargo on deck, there is no specific recommendation in the Code concerning where on deck the cargo should be carried.

As an elementary principle of statutory construction, when the IMDG Code at one time directly warned the mariner about stowing calcium hypochlorite in direct sunlight, but thereafter deleted the warning, the IMDG Code no longer mandated that containers of calcium hypochlorite be protected from sunlight. See, Stewart v. Ragland, 934 F.2d 1033 (9th Cir. 1991); Matter of Stein, 131 A.D.2d 68, 520 N.Y.S.2d 157 (App. Div. 2d Dept. 1987); Sutherland Stat. Const., § 22.30 (4th Ed). The deletion of this warning, coupled with the fact that the equivalent warning ("shade from radiant heat") still appears in the Code for numerous other cargoes, leads to the reasonable conclusion that the mariner does not have to shade calcium hypochlorite from direct sunlight. West Coast Truck Lines v. Arcata

Comm. Recycling, 846 F.2d 1239 (9th Cir. 1988), cert. denied, 488 U.S. 856, 102 L. Ed. 2d 119, 109 S. Ct. 147 (1988).

Reasonable care can also rest upon a comparison of the practices that were followed in this case and those customarily followed in the industry. American President Lines Ltd. v. Redfern, 345 F.2d 629 (9th Cir. 1965). The RECIFE established that calcium hypochlorite was routinely carried in containers on deck, top tier.

It has been held that custom, coupled with a long safety record, is a strong indication of due care. Gill v. Hango Ship-Owners A/B, 682 F.2d 1070, 1074 (4th Cir. 1982).

Because of the desirability to be able to move or jettison a container containing calcium hypochlorite, it is reasonable for it to be stowed on the top tier of containers. The RECIFE can move containers with her own gear. The IMDG Code also instructs the mariner to fight a fire in calcium hypochlorite by utilizing copious quantities of water which can be accomplished by stowing the container outboard on the top tier, where the top, front and at least one side can be hit directly with fire hoses which in fact occurred in fighting this particular fire.

Under the law of standard of care to be applied to the RECIFE's selection of a stowage location did not preclude the stowage of a container of calcium hypochlorite in an on deck, top tier, outboard location was not precluded, although as the succeeding section demonstrates, hopefully, it should have been.

The Stowage Proximately Caused the Fire

Three Second Circuit decisions establish the rule as to proof of causation in a maritime fire case; In Re Kellogg Steamship Co. (The S/T Doris Kellogg), 18 F. Supp. 159, 1937 AMC 254 (S.D.N.Y. 1937), aff'd, 94 F.2d 1015 (2d Cir. 1938); Verbeeck v. Black Diamond Steamship Corp. (The M/S Black Gull), 269 F.2d 68, 71 (2d Cir. 1959), reh'ing granted in part, remanded in part, 273 F.2d 61, 1960 AMC 175 (2d Cir. 1960), cert. denied, 361 U.S. 934, 80 S. Ct. 374, 4 L. Ed. 2d 355 (1959), and Petition of Isbrandtsen Co., Inc., and the S/S Edmund Fanning, 201 F.2d 281, 1953 AMC 86 (2d Cir. 1953).

In The S/T Doris Kellogg, supra, cargo plaintiffs alleged that an explosion and fire which destroyed ship and cargo were the result of a buildup of crude oil vapor in a dry cargo space followed by a spark from nearby electrical wiring. The Court defined the burden of proof as follows:

To support its contention the claimant must show that the explosion was due to the ignition of explosive gas in the No. 5 dry cargo space by a spark or other electrical manifestation from the electric wiring. But these requirements are met if conditions and circumstances be shown from which the inference could reasonably be drawn that such factors existed and produced the explosion.

18 F. Supp. at 164. The Court went on to state:

It was not necessary that the plaintiff show that a static spark was actually produced; but it was sufficient if conditions and circumstances were shown from which the inference could be reasonably drawn that a static spark was produced.

18 F. Supp. at 166. Thus the plaintiffs in The S/T Doris Kellogg were not required to prove the precise source of ignition -- it was enough for plaintiff to show circumstances on board the vessel from which the Court could draw the inference that plaintiffs' theory of causation was more likely. Accord, In re Petition of Sinclair Navigation Company (The S/T William Boyce Thompson), 27 F.2d 606, 1928 AMC 1093 (2d Cir. 1928).

In The M/S Black Gull, supra, the ship and cargo were destroyed by a fire which originated in a cargo of crude naphthalene (a hazardous cargo) stowed and carried on deck, uncovered, in burlap bags. At issue, inter alia, was the exact cause of the naphthalene fire. Cargo plaintiffs claimed that the naphthalene caught fire as a result of being negligently exposed to the sun for too long; the defendant asserted that the fire was the result of spontaneous combustion/inherent vice of the cargo, or of careless smoking on deck by the ship's crew and passengers.

The Court in The M/S Black Gull held that the stowage of naphthalene exposed to the heat of the sun amounted to the negligent creation of a dangerous condition. Addressing the question of causation, the Court then held:

Of course proximate cause in negligence will include a contributing cause and is not limited to the sole inducing reason for the damage. Here the negligent stowage, if it did not alone induce the loss, clearly set the course to make an accidental happening into a holocaust. When the facts of dangerous stowage making a fire hazard are coupled with a condition of the very kind which should have been guarded against, we think that appellants [cargo plaintiffs] had satisfied all reasonable requirements of burden of proof and that, if further explanation were to be had, it should come from appellees.

269 F.2d at 71.

In addition to the foregoing principal authorities, other Courts in this Circuit have addressed the unique question of causation in fire cases:

By the very nature of fire, its cause must often be proven through a combination of common sense, circumstantial evidence and expert testimony.

Minerals & Chemicals Philipp Corporation v. The S.S. National Trader, etc., et al., 445 F.2d 831, 1971 AMC 1612, 1613 (2d Cir. 1971); United States v. Ebinger, 386 F.2d 557, 560 (2d Cir. 1967); Michalic v. Cleveland Tankers, Inc. (The S/T Orion), 364 U.S. 325, 330, 81 S. Ct. 6, 5 L. Ed. 2d 20 (1960).

As found above, the steel roof of the container of calcium hypochlorite was heated by the sun and thereby increased the temperature of the air and the cargo inside the container. Despite daily temperature cycling from sea breeze and nightly cooling, the temperature of the mass of over 24,200 lbs. (11,000 kg) of calcium hypochlorite rose due to its large thermal inertia (that is, its resistance to changes in temperature once heated). As the calcium hypochlorite was thus heated, and the rate of decomposition was increased, the calcium hypochlorite would have generated heat from within at an increasing rate. Heat generated inside the mass dissipated least, if at all, from deep in the center of the stow, where changes in ambient conditions had no effect. Over an extended period, heat being dissipated from within the stow was met by heat driven into the stow by the heated roof and inside air of the container. Heat flow within the stow was slowed by the presence of cardboard and plastic packaging and intervening air spaces. Eventually, after fifty days in the closed steel container, some portion of the calcium hypochlorite, most likely deep in the stow, reached its critical temperature, at which point runaway thermal decomposition occurred. The portion undergoing runaway would generate such heat and energy as to involve neighboring portions, until the entire stow was involved. The explosion and fire ensued.

The difference of opinion involved here is as to what caused a portion of the calcium hypochlorite stow to undergo runaway decomposition: whether the prolonged exposure of the container, its roof and its contents to heating during the voyage, or some impurity in the chemical itself. No direct evidence of impurity was adduced, but it was advanced as the proximate cause by the RECIFE by a process of elimination -- a process which required the rejection of the theories of the heat build-up propounded by the Cargo Interests.

This effort turned largely upon consideration of the Frank-Kamenetskii model as tested by Yoichi Uehara. Evaluation of the testimony in this regard appeared to center on the element of mass and the effect upon the reaction of the mass depending upon the form in which the calcium hypochlorite was packaged.

The issue turns upon whether it is appropriate to consider the stow of Klorman Cartridges as a single mass, or as nothing more than a collection of independent cylinders of calcium hypochlorite for purposes of calculating critical temperature. The theory behind the Frank Kamenetskii equation stated the relationship between heat and mass was subjected to experimental testing on samples of calcium hypochlorite by Yoichi Uehara, who confirmed the validity of the equation with the very close correlation between his calculated and experimental results.

Each cylinder was individually packaged, but nonetheless, as heat was applied to the outside of the stow, over time, the temperature of the calcium hypochlorite pellets inside increased. Again, the crucial factors herein are heat and time. The inefficiency of the heat transfer prevented the cargo from reaching its critical temperature within hours of sailing Durban, instead requiring fifty days.

In order to eliminate radiant solar heat as the cause of the decomposition, the RECIFE's expert, Dr.

John Atherton, an engineering consultant affiliated with Burgoyne, estimated the critical temperature of a single Klorman Cartridge (his estimate was approximately 130 degrees C), yet conceded that heat would be transferred between individual cylinders and boxes of cylinders of calcium hypochlorite in the stow and that the effect of having a larger mass of calcium hypochlorite would be to lower the critical temperature of the mass.

The manufacturing process used to make calcium hypochlorite also tended to rule out the possibility that inorganic contaminants could remain after manufacture in other than trace quantity and in an already oxidized form.

In order for an inorganic impurity to cause calcium hypochlorite to decompose at an abnormal temperature, that inorganic must be present in an unreacted form. In addition, in order to have any effect, the inorganic material must be one which can and will react with calcium hypochlorite. Because the likelihood of such an inorganic impurity surviving the manufacturing process in unoxidized form is small, Cargos' expert concluded that inorganic impurities were not the cause of the runaway decomposition on the M/V RECIFE.

For inorganic materials to have caused the runaway decomposition, the inorganics must have survived the extremes of the manufacturing process of calcium hypochlorite without being driven off or oxidized by the calcium hypochlorite, the inorganics must survive unoxidized in quantities sufficient to have more than a mere trace effect on the stability of the calcium hypochlorite, and the inorganics must actually react with the calcium hypochlorite -- not all inorganics will react. There is no positive evidence to establish these conditions.

Because of the extreme reactivity of calcium hypochlorite with organic materials, if organics were present in the Klorman product, it must be concluded that the resulting violent reaction would have taken place before fifty days after the product was loaded on the M/V RECIFE, probably either during or immediately following manufacture. The passage of fifty days between loading and fire (plus an unknown period between manufacture and loading) is a strong indication that organic impurities did not cause the runaway decomposition.

An excellent example of how quickly calcium hypochlorite reacts with organic materials can be found in Ionmar Compania Naviera, S.A. v. Olin Corp., et al. (The M/V Nicolaos D.L.), 666 F.2d 897 (5th Cir. 1982), which described as shipboard fire in calcium hypochlorite hold caused by organic contamination, an explosion and fire occurred when powdered calcium hypochlorite spilled from a damaged drum came in contact with sawdust (an organic material) during loading. 666 F.2d at 902. There was no significant time lapse after the calcium hypochlorite on the Nicolaos D.L. was allowed to come in contact with the sawdust -- contact was made, and a violent reaction ensued. Also of note in the Ionmar decision is that the Court refused to accept the causative theory advanced by the carrier that an organic impurity was present in a "rogue drum" of calcium hypochlorite.

The work of Yoichi Uehara, with which Dr. Atherton, the RECIFE's expert, and his firm were familiar in the 1970's, involved extensive research into the effects of ambient temperature on different sized masses of calcium hypochlorite. Burgoyne issued at least two scientific studies which discuss the effects of temperature on the self-heating properties of calcium hypochlorite. In one of these studies, Burgoyne states that:

A feature of the [self heating] process is that there is an induction period, i.e. an appreciable time elapses between the onset of the process and the final ignition. The induction period may be long: hours, days or weeks. Consequently, the contents of a drum may spontaneously ignite after a very long time.

Pl. Ex. AD at 89, P 2 (V.J. Clancey - Burgoyne "Fire Hazards of Calcium Hypochlorite").

The experts reviewing prior cases, including V.J. Clancey of Burgoyne make no attempt to either quantify the presence of organics or even to identify what they might be. Assigning organic impurities as the cause of a calcium hypochlorite fire is simply "a convenient way to explain something which may or may not have other explanations," as the plaintiffs' expert Brandt Rising described it (Tr. Trs. 189 11 21-23) It is notable that Dr. Atherton did the same thing in this case. He determined that the fire was caused by some impurity because the fire was not, in his estimation, the result of heating.

The Cargo Interests have satisfied the burden of proof -- conditions and circumstances have been shown from which the inference could reasonably be drawn that the heat resulting from the position of the container produced the fire. In Re Kellogg Steamship Co. (The S/T Doris Kellogg), 18 F. Supp. 159, 164, 1937 AMC 254 (S.D.N.Y. 1937), aff'd, 94 F.2d 1015 (2d Cir. 1938); In re Petition of Sinclair Navigation Company (The S/T William Boyce Thompson), 27 F.2d 606, 1928 AMC 1093, 1095 (S.D.N.Y. 1928). Once the cargo plaintiff has shown that stowage resulted in a dangerous condition, and that a fire occurred, the Cargo Interests have satisfied their burden of proving that the negligent stowage caused the fire. Petition of Isbrandtsen Co., Inc. and the S/S Edmund Fanning, 201 F.2d 281, 284, 1953 AMC 86 (2d Cir. 1953). When the facts of dangerous stowage making a fire hazard are coupled with a condition of the very kind which should have been guarded against, plaintiffs have satisfied all reasonable requirements of burden of proof.

The facts and circumstances support the conclusion that prolonged exposure of the steel container to radiant heat led to runaway decomposition: the mass of the stow of calcium hypochlorite was big enough, the temperature created by the container's exposure was hot enough, and the voyage was long enough.

Similarly, these same facts and circumstances rule out the possibility that impurities caused the runaway decomposition: the severity of the manufacturing process and the very nature and design of calcium hypochlorite make impurities no more than a remote possibility; the fifty day lapse between

the loading and the fire further demonstrates the fundamental flaw of the impurities theory. It is undisputed that there is no objective evidence to support such a theory.

A fair preponderance of evidence has established that exposure of container IEAU 2071028 to radiant heat proximately caused the explosion and fire aboard the M/V RECIFE. The Black Gull, supra, 269 F.2d at 71; The Edmund Fanning, supra, 201 F.2d at 284; The Doris Kellogg, supra, 18 F. Supp. at 164.

Calculation Of Damages

There is no dispute between the parties that COGSA, 46 USC § 1300 et seq. governs the carriage of the cargo in the case at bar. COGSA provides, in pertinent part, as follows:

Neither the carrier nor the ship shall in any event be or become liable for any loss or damage to or in connection with transportation of goods in an amount exceeding $ 500 per package.

46 USC § 1304 (5).

COGSA also provides:

In no event shall the carrier be liable for more than the amount of damage actually sustained.

46 USC § 1304 (5).

Under COGSA, the ordinary rule for calculating damages is the difference between the sound market value of the goods at destination and their value as damaged. W. Tetley, Marine Cargo Claims, at 323, (3d ed. 1988), citing Empresa Central Mercantil v. Brasileiro, 147 F. Supp. 778, 780 (S.D.N.Y. 1957), aff'd, 257 F.2d 747 (2d Cir. 1958). The primary object in awarding damages is to indemnify the plaintiff for the loss sustained by reason of the carrier's fault, or in other words, the amount necessary to put the injured parties in the exact position they would have been in had there been no breach. Interstate Steel Corp. v. S.S. CRYSTAL GEM, 317 F. Supp. 112, 121 (S.D.N.Y. 1970), and Seguros Banvenez S.A. v. S/S OLIVER DRESCHER, 761 F.2d 855, 860-61 (2d Cir. 1985).

However, "the test of market value is at best but a convenient means of getting at the loss suffered. It may be discarded and other more accurate means resorted to if, for special reasons, it is not exact or otherwise not applicable." F.J. Walker, Ltd. v. M/V LEMONCORE, 561 F.2d 1138, 1978 AMC 300, 311 (5th Cir. 1977), citing, Illinois Central Railroad Co. v. Crail, 281 U.S. 57, 64-65, 74 L. Ed. 699, 50 S. Ct. 180 (1930); Internatio, Inc. v. Taimyr, 602 F.2d 49 (2d Cir. 1979) (market value measure not applicable since it results in recovery greater than the loss suffered); Knute Nelson, 1942 AMC 356, 358 (2d Cir. 1942) (when the market value rule works out to give the plaintiff more than indemnity, courts have refused to adopt it.) In such situations, the court has discretion to choose the method it considers best. See F.J. Walker, 561 F.2d 1138; Santiago v. Sea-Land Service, Inc., 366 F. Supp. 1309 (D. PR. 1973).

Finally, the amount that the underwriter paid the claimant is immaterial:

The fact that the underwriter agreed to pay the full amount claimed by the Texas Company is not material; for all we know, he may have thought it worthwhile to keep the good-will of an important customer.

Knute Nelson, 1942 AMC at 359. Cargo's claims for damages arise in three general categories under various bills of lading. BILL DAMAGED COST CONTRACT VALUE OF CARTONS F.O.B. F.O.B. LADING TOBACCO RECIFE/DURBAN RECIFE/DURBAN 1. SFLLI-965 891 $ 908,570.52 $ 1,000,058.40 SFLLI-929 792 807,618.24 888,940.80 SFLLI-935 96 92,232.38 96.153.44 TOTAL 1,779 $ 1,808,421.14 $ 1,985,152.64 SALVAGE AMOUNT: 889,500.00 BILL DAMAGED OF CARTONS CONTRACT LADING TOBACCO VALUE 2. SFLLD-345 96 $ 91,860.45 TOTAL: 96 $ 91,860.45 SALVAGE AMOUNT: 48,000.00 CLAIM $ 43,860.45