



INTERNATIONAL  
OIL POLLUTION  
COMPENSATION  
FUND

EXECUTIVE COMMITTEE  
16th session  
Agenda item 3

FUND/EXC.16/3  
4 September 1986

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INFORMATION ON AND APPROVAL OF SETTLEMENT OF CLAIMS  
(TANIO INCIDENT)

Note by the Director

1 Settlement of Claims

1.1 At the 14th session of the Executive Committee, the Director reported that claims had been agreed in the total amount of FFr348 211 098 and that an aggregate amount of FFr221 201 452 had been paid to claimants (Annex to document FUND/EXC.14/2, reproduced as Annex I to this document). No further settlements or payments have been made since the 14th session.

1.2 It should be noted that the agreements on the amounts were reached for the purpose of distributing the money available under the Fund Convention, without prejudice to each claimant's right to claim beyond the amount accepted by the IOPC Fund against the shipowner and others.

1.3 The only claim which may remain is one submitted to the Court of Brest by the Association de Marins Pêcheurs amounting to FFr500 000. However, this claim has not been pursued against the IOPC Fund.

1.4 For details of the claims mentioned above and the decisions of the Executive Committee at previous sessions, reference is made to the documents listed in paragraph 1.3 of document FUND/EXC.12/2 and to paragraphs 2 and 3 of document FUND/EXC.14/2.

2 Further Part Payments by the IOPC Fund

2.1 Part payments to claimants totalling FFr221 201 452 were made in 1983, 1984 and 1985. For details of these part payments, reference is made to document FUND/EXC.12/2, paragraphs 4.1 - 4.3 and document FUND/EXC.14/2, paragraphs 2.3, 2.4, 2.6, 2.7 and 3.11.

2.2 In September 1984 the liquidator of the owner's limitation fund, who was appointed by the Civil Court of Brest, made a first distribution of the limitation fund, amounting to FFr19 147 973.

An amount was reserved for the final distribution of the limitation fund, since not all claims had been settled by the time of the first payment. This reserve (including interest) amounted to FFr3 214 216 as at 30 June 1986, and is earning interest at market rate. The amount of compensation that will actually be paid under the Civil Liability Convention therefore increases as time passes.

2.3 The total amount of compensation to be paid by the IOPC Fund is FFr244 746 000, including the amount actually paid under the Civil Liability Convention. The amount of compensation to be paid by the IOPC Fund will, therefore, be reduced as the final distribution of the owner's limitation fund is delayed. This issue was dealt with in detail in paragraphs 4.2 and 4.3 of document FUND/EXC.14/2. For the reasons set out in that document, ie in order to prevent a situation arising whereby the aggregate amount actually paid by the IOPC Fund exceeds the total amount to be paid by it under the Fund Convention, the Director maintains his position that no further part payments should be made, at least not for the time being.

### 3 Legal Action Against the Shipowner and Other Parties

#### Basis of the Legal Action

3.1 In 1983, the IOPC Fund took legal action in the Tribunal de Grande Instance in Brest against the following persons for the purpose of recovering the amounts paid to the claimants:

- (a) La société Industrie Navale Meccaniche Assini (INMA), the shipyard that repaired the TANIO in 1979;
- (b) La société Locafrance International Leasing (Locafrance), the registered owner of the TANIO at the time of the incident;
- (c) La société Guardiola Shipping Corporation (Guardiola), charterer of the TANIO at the time of the incident;
- (d) La compagnie Malgache de Transports Pétroliers (Petromad), the company having sub-chartered the vessel and being responsible for the management of the TANIO at the time of the incident;
- (e) La Société Française des Transports Pétroliers (SFTP), responsible for the control of the repairs carried out by INMA and the technical management of the TANIO at the time of the incident;
- (f) Le Bureau Véritas, the classification society that monitored the repairs to the TANIO in 1979;
- (g) The United Kingdom Mutual Steamship Assurance Association (Bermuda) Ltd (UK Club), in its capacity of insurer of the civil liability of certain defendants.

3.2 The French Government has taken action against the same defendants for the purpose of obtaining compensation for that part of its total claim which was not compensated by the shipowner's limitation fund and the IOPC Fund.

3.3 The ownership of the TANIO and the very complex relationship between the different companies involved in the operations of the TANIO during the period which is of interest for the legal proceedings are set out in the Annex to document FUND/EXC.9/3, paragraphs 2.2 - 2.3, and in the diagram attached to the Annex.

3.4 The grounds on which the actions against the various defendants were based can be briefly summarised as follows:

Locafrance, as the registered owner, had failed to put the ship in a seaworthy and navigable state. The failure of Locafrance to organise a proper mechanism of control of the quality of the extensive repairs carried out by INMA constituted a personal fault on the part of Locafrance, which was therefore not entitled to limit its liability under the Civil Liability Convention. INMA had not carried out the repairs to the TANIO in a proper manner. SFTP had not exercised due diligence in the supervision of the repair work at INMA and in checking the results thereof. Guardiola had failed to supervise the execution of the repair work properly. In addition, Guardiola had an obligation to put the ship in a seaworthy condition. Bureau Veritas did not fulfil its obligation to check the quality of the repair work at INMA properly. Petromad failed to ensure that the Master of the TANIO was properly instructed concerning cargo distribution. The UK Club was sued as insurers of Petromad and Guardiola.

3.5 The grounds for the actions are set out in more detail in Annex II to this document.

3.6 The Court procedure has so far concentrated largely on the establishment of the technical cause of the incident and the disclosure of documents.

#### Investigations into the cause of the incident

3.7 Soon after the incident two official enquiries were initiated. A Technical Enquiry Commission, which was set up by the Ministry of Transport, submitted its report in July 1981 (the Rocquemont Report); this report is of less importance today, since additional information became available after its publication, following an underwater examination of the sunken part of the hull. An "Expertise Judiciaire" under Mr H Bensussan was ordered by the Commercial Court of Le Havre in 1980. Neither the IOPC Fund nor the French Government was given the possibility of presenting their views to the Expertise Judiciaire, which published a report in 1982 (First Bensussan Report). The conclusions of these reports as well as the results of research

carried out by the IOPC Fund's technical experts before the legal proceedings were initiated are summarised in the Annex to document FUND/EXC.9/3, paragraphs 1.1 - 1.6.

3.8 In 1984, the President of the Court in Brest reconvened the Expertise Judiciaire, under Mr Bensussan, with the task of giving its opinion on the causes of the loss of the TANIO in the light of all the information already filed or to be made available by the parties and any submissions made by them as to the cause of the fracture which made the ship break. The Expertise Judiciaire should, in particular, supervise the carrying out of an experiment devised by the IOPC Fund's technical experts, the object of which was to establish the direction of the propagation of the main crack across the bottom of the ship, and thus the likely initiation site.

3.9 For this purpose, the IOPC Fund and the French Government requested the Service Technique des Constructions et Armes Navales (STCAN) in Paris to carry out a metallurgic test on a piece taken from the sunken fore-section of the TANIO, piece 35 (cf paragraph 5.3 of document FUND/EXC.14/2). STCAN published its report on this test on 18 February 1985. The Expertise Judiciaire then met in order to study the report of that test as well as the extensive reports submitted by the parties stating their views on the cause of the incident. The Expertise Judiciaire submitted its report on 19 March 1986 (Second Bensussan Report).

3.10 In order to facilitate the understanding of this document, various technical terms relating to ship design and construction are explained in Annex III.

#### First Bensussan Report

3.11 In the First Bensussan Report it was stated:

- (a) The initial fracture in the bottom structure occurred in the vicinity of frame 131, ie at the very aft end of the sunken forward part.
- (b) The principal damage found on the aft part of the wreck (ie the tongue-shaped tears ("languettes") between frames 107 and 123 in the bottom shell plating) was a consequence of and not the initial cause of the disaster.
- (c) The ship broke into three "sections" with fractures across the bottom of frames 123 and 131.
- (d) The butt welds in the bottom longitudinals contained defects.
- (e) A complete examination of the (sunken) forward wreck was not made. Samples taken from the forward wreck, from both the starboard bilge keel and from a starboard bottom strake provided interesting information. Nevertheless, the Expertise Judiciaire was unable to exhaust its investigations.

3.12 The First Bensussan Report then classified its conclusions into three categories, viz:

- (i) those which could be discarded as the origin of the disaster;
- (ii) those which contributed to the disaster; and
- (iii) those which could neither be discarded nor adopted as the origin of the disaster.

3.13 The conclusions classified under (ii) in paragraph 3.12 as contributory causes to the incident are:

- insufficient reduction in speed before the disaster, in view of the bad weather
- defective cargo-loading of the vessel at the time of the disaster and previously
- defects in the realisation of the replacement of the bottom structure in wing tank n°6.

#### IOPC Fund's Experts

3.14 The IOPC Fund, in co-operation with the French Government, employed eminent French and English technical experts to examine all available documents in order to establish the cause of the incident. These experts (hereinafter referred to as the IOPC Fund's experts) <1> submitted three technical reports to the Expertise Judiciaire. The IOPC Fund's experts were of the opinion that several fracture processes are consistent with an initiation site in the bad welding of the bottom structure and with the observed consequences. In their view, one of these processes may be described as follows:

- (a) The initial fracture originated near frame 131 in a bad butt weld of one or more bottom longitudinals in wing tank n°6. This fracture spread down into the transverse weld between the bottom plates, then gradually opened up this transverse weld across the bottom of the ship. These bottom plates and longitudinals, on either side of frame 131, had been replaced during major repair work carried out at the INMA shipyard six months before the disaster. The initial fracture was caused by a bad welding done at that shipyard.

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<1> Mr M Pascal: Ingénieur Général and Head of STCAN 1969-77.  
Mr M Osborne: Chief Naval Architect, Shell International Marine (Consultancy and Technical Services); great experience in tanker design and construction as well as in tanker repairs; employed with Lloyd's Register of Shipping 1968-1974.

- (b) While the above-mentioned fracture was arrested at a rivetted joint between wing and centre tanks, the tensile forces at frame 131 caused the separation of the bottom plating into tongue-shaped tears between frames 107 and 123.
- (c) The fracture in the weld at frame 131 continued across the bottom of the hull, causing a clean break.
- (d) The bad distribution of the cargo, resulting in abnormally high tensile stresses in the bottom structure, might have contributed to the start of the fracture in the bottom longitudinals on 7 March 1980. However, it was not a decisive cause of the incident on that date. Similar remarks might be made with regard to the speed of the vessel at the time of the incident, and defective cargo loading on her previous voyages.

3.15 The reports by the IOPC Fund's experts give many examples of bad welding carried out at the INMA shipyard. There was a lack of penetration of the welding in some of the butt joints in the longitudinals (evidenced by photographs and detailed examination by STCAN), and many of the semi-circular cut-outs in the bottom longitudinals were poorly made. In addition, the positions of the welds between longitudinals and plates had not been staggered as shown on the approved plans, but arranged directly in line with each other, although the experts do not consider that this is bad practice.

3.16 It should be noted that the position taken by the IOPC Fund's experts is that there were two transverse fractures across the bottom of the ship, which coincides with the theory advocated in the First Bensussan Report. The identification by the IOPC Fund's experts of an initial fracture at the bad welding of the bottom longitudinals of the wing tank coincides with the findings of STCAN in its report in 1982. The bad workmanship of the welding carried out by the INMA shipyard was amply pointed out in the Rocquemont Report, in the First Bensussan Report, and in Reports by STCAN of September 1980 and July 1982.

#### Position taken by the Defendants

3.17 The defendants have advanced various theories as to the cause of the disaster and submitted a number of technical reports which were examined by the Expertise Judiciaire. INMA submitted three technical reports to the Court (in July and November 1985 and February 1986). These were supplemented by two technical reports in May and June 1985 by an expert employed by INMA. Bureau Véritas filed a report in July 1985, SFTP produced a report in July 1985, and Petromad and Locafrance also filed reports in December 1985. Thus all the defendants but one, Guardiola, have presented their theories on the cause of the incident.

3.18 INMA, in particular, presented comprehensive theories as to the cause of the incident which contrast with those proposed in the First Bensussan Report and the Reports of the IOPC Fund's

experts. INMA gave its account of the incident as follows:

- (a) The initial fracture originated in a plate within the starboard bilge area between frames 123 and 131. The particular plate identified was found, on testing after the incident by STCAN, to have significantly lower (but still adequate) impact strength compared to other plates in the hull. This plate was original material which had been in the hull since the ship was built.
- (b) In addition to the above-mentioned fracture, another fracture started in the starboard shell plating and spread up to the main deck and down to the bilge, resulting in a greater load being thrown onto the remaining intact section.
- (c) The port side bilge thus started to rupture. This fracture spread up the port side shell plating to the main deck, and down towards the bottom where it was stopped by the rivetted connection between the bottom plating and the bilge plating.
- (d) With fractures spreading up the side shell plating on both sides and across the main deck, the fore and aft parts of the TANIO were hinged only by the bottom plating, bottom longitudinals and some remaining port side structure.
- (e) The fore section, with its bows raised, applied considerable downward force on the aft section. This force caused the tearing of the bottom plating into tongue-shaped strips at frame 123, resulting in a violent separation of the fore and aft sections (the two-part theory).

3.19 INMA also maintained that, after a complete separation, the tongue-shaped plates of steel were attached to and suspended from the fore section which floated vertically. INMA explained the disappearance of these plates by adopting a theory advanced in the Rocquemont report, "the crumpling theory", ie that they bumped on the sea bed, causing a clean fracture at frame 131.

3.20 Since INMA maintained that the initial fracture started in the bilge plating which had not been replaced since the building of the TANIO, it considered that the arguments of the IOPC Fund's experts on the bad welding were irrelevant with regard to the cause of the incident. Furthermore, INMA rejected the criticisms of its welding work, maintaining that the welding in the bottom plating was carried out in accordance with the prevailing technical practice within the limits laid down by the Classification Society.

3.21 SFTP stressed in its report the great difficulty in establishing a decisive cause of the incident in view of the various hypotheses presented by the various technical experts. Nevertheless, it supported the theory proposed by INMA.

3.22 Locafrance and Petromad submitted identical reports which, like that of SFTP, emphasised the difficulty of identifying the cause of the incident. They firmly rejected that bad cargo loading had any significant influence on the disaster.

3.23 Bureau Véritas has not presented any theory of its own regarding the sequence of the events that led to the disaster. Its report was restricted to comments on all the other reports. Calculations were produced to show why the tongue-shaped tears could not have been formed by the action of the sea, as maintained by STCAN. Bureau Véritas also stated that the force necessary to distort the bottom longitudinals is greater than that which could be borne by a bad weld, and concluded that the welds did not fracture before the longitudinals distorted. Finally, Bureau Veritas rejected the allegations by the IOPC Fund's experts that it had not fulfilled its duty to check the repair work carried out at INMA. According to Bureau Véritas, a classification society did not have any obligation to carry out such checks.

#### Second Bensussan Report

3.24 The general conclusion of the Second Bensussan Report of March 1986 was that there was no reason for the Expertise Judiciaire to modify what was already stated in the First Bensussan Report (see paragraphs 3.11 - 3.13 above). The Expertise Judiciaire confirmed its theory that the TANIO broke into three parts (the three-part theory), and maintained that an initial fracture originated in the vicinity of frame 131 in wing tank n°6. As for the cause of the initial fracture, the Expertise Judiciaire reiterated the conclusion of the First Bensussan Report which highlighted, in particular, three causes which "contributed" to the disaster, viz insufficient reduction in speed to allow for the bad weather, defective cargo loading at the time of the disaster and on previous voyages, and defective realisation of replacements on the bottom plating in wing tank n°6.

3.25 The Second Bensussan Report dismissed the arguments of the defendants that it would be impossible to establish the decisive causes of the disaster, because of the many hypotheses which had been presented by various experts. The report also rejected INMA's theory that the initial fracture originated in the starboard bilge plating.

3.26 The Second Bensussan Report confirmed that bad welding carried out by INMA was one of the three "contributory" causes of the disaster, and specified the defective butt welding in the bottom longitudinals. The Expertise Judiciaire also reiterated its observation of defective butt welding in the T-shape longitudinals.

3.27 Regarding the experiment on piece n°35, the Second Bensussan Report confirmed that the direction in which the fracture spread was from the wing tank (repaired by INMA) to the centre tank (not repaired by INMA). The Report also stated that marks on the edge

of piece n°35 were caused by repeated opening and closing of the fracture during its formation. These comments support the theory advanced by the IOPC Fund's experts that the fracture originated in the wing tank, and that the fracture at frame 131 was one of the first parts of the structure to fail before the total separation of the fore and aft sections of the TANIO.

3.28 However, the Second Bensussan Report criticised the report of the IOPC Fund's experts, stating that these experts tried to minimise the effects of the state of the sea, the cargo loading of the vessel and its speed, in order to focus on the defective welding carried out by INMA as the prime cause of the disaster. The Second Bensussan Report also took a restrictive view as to the importance of the experiment on piece n°35.

3.29 However, INMA's theory on the cause of the disaster was rejected by the Second Bensussan Report. According to the INMA theory, the fracture spread from the bilge upwards along the shell plating; this is categorically rejected in the Second Bensussan Report as being in contradiction with the facts, since the First Bensussan Report had found that the fracture ran in a downward direction. The Second Bensussan Report agreed with the criticism made by the IOPC Fund's experts of the INMA theory that the horizontal bending of the hull would be insufficient to initiate a fracture in the bilge area. It also agreed with the IOPC Fund's experts as to their criticism of INMA's theories on many other points.

3.30 None of the other theories presented by the other defendants (SFTP, Locafrance, Petromad and Bureau Veritas) received favourable comments in the Second Bensussan Report.

3.31 Although the Second Bensussan Report does not make an unequivocal connection between the proven (and accepted by INMA) bad welding at frame 131, and the initiation of the fracture in the same area, the Report agrees with the theory advanced by the IOPC Fund's experts on many points, for example, as to the area where the initial fracture originated, the three-part theory and the defective butt welding.

#### Financial Position of the Defendants

3.32 Locafrance is insured against liability for oil pollution damage under the Civil Liability Convention with the UK Club up to an aggregate amount of \$200 million. The same may apply to Petromad. Guardiola is in liquidation in Panama and it is unlikely that there will be any assets against which a judgement could be enforced. It appears that Guardiola was not insured against third party liability. It is possible that SFTP was insured, but since SFTP considered its role in the operations of the TANIO as very limited, it is unlikely that such insurance would cover its liability in this case. It is believed that Bureau Veritas has some insurance against third party liability, but it is unlikely that this insurance would be sufficient to cover a liability of the kind involved in this case.

### Director's Assessment of the Situation

3.33 The Director and the representatives of the French Government, together with their lawyers, have examined the various technical reports, in particular the Second Bensussan report. They have been assisted in this examination by their above-mentioned technical experts. Advice on French law has been sought from an independent French consultant of the highest reputation. The Director and the representatives of the French Government have come to the conclusion that the results of the Expertise Judiciaire support the grounds on which the legal action is based. After consultation with the representatives of the French Government, the Director is of the opinion that the legal action should be maintained.

### Future Court Proceedings

3.34 As was reported in paragraph 5.5 of document FUND/EXC.14/2, progress in the case over the years has been held up by a number of factors including the heavy work load of the Court in Brest, the complexity of the case, the time-consuming procedure of obtaining documentary evidence from the defendants and, most recently, the technical examination carried out at the request of the IOPC Fund and the French Government, and the need to reconvene the Expertise Judiciaire and to allow the parties to make submissions to it. When the Expertise Judiciaire finally submitted its report, the IOPC Fund and the French Government requested that the Court in Brest should set down a strict timetable for further submissions and for the exchange of documents. Under the timetable established by the Court, the final oral hearing should take place in October 1987, and there will accordingly be considerable activity in the case in the next 12 months.

## 4 Action to be Taken by the Executive Committee

The Executive Committee is invited to take note of the information contained in this document and to take such decisions as it considers appropriate with regard to the recourse action in the Court of Brest.

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ANNEX ISituation of Claims as at 1 September 1986

1 AGREED CLAIMS		<u>Agreed</u>	<u>Paid</u>
		FFr	FFr
French Government		326 921 937	208 134 552
Local Authorities in France	FFr		
- Côtes-du-Nord Département	2 410 595		
- Côtes-du-Nord 20 Communes	4 985 659		
- Finistère 7 Communes	<u>1 513 899</u>		
	8 910 153	8 910 153	5 468 892
Port Autonome du Havre		116 594	71 563
Association Interprofessionale des Victimes de la Marée Noire: 50 Members		4 452 214	2 732 674
4 Private Claimants		185 783	114 029
UK P & I Club			
Own Expenses	\$	FFr	
- British Oceanics	326 769.53		
- Underwater Security	14 384.77		
- Intersub	<u>560 579.12</u>		
	901 733.42	7 298 630	
Subrogated Claims	£		
- Comité des Assureurs Maritimes		47 000	
- State of Jersey	8 093.63	98 176	
- State of Guernsey	14 439.62	175 153	
- Hotelier	450.00	<u>5 458</u>	
		7 624 417	4 679 742
		<u>348 211 098</u>	<u>221 201 452</u>
2 CLAIMS MADE IN THE COURT BUT NOT PURSUED		FFr	
Association de Marins Pêcheurs		500 000	

ANNEX IIGrounds for Legal Action Taken by the IOPC Fund and the French Government Against the Shipowner and Other PartiesLocafrance

Locafrance, as registered owner of the TANIO, has strict liability for all pollution damage under Article III.1 of the Civil Liability Convention. The only question is whether its liability shall be unlimited under Article V.2. To put a ship in a seaworthy and navigable state is the shipowner's responsibility. Locafrance had personal responsibility to ensure the seaworthiness of the TANIO when it opted to own the ship and then charter out by bare-boat charterparty. Locafrance could not escape the fundamental obligation with regard to the seaworthiness of the TANIO by delegating the task of controlling such seaworthiness to third parties. Locafrance had to ensure, by a minimum control, that a proper procedure of supervision was in place and that such supervision was in fact properly effected. By not carrying out personally the minimum control required to ensure the effectiveness of the complex control delegation it had made, Locafrance committed an act of personal fault ("faute personnelle" as defined in French law), which deprives it of the privilege to limit its liability. It is noted that the concept of "faute personnelle" in French law is considerably wider than "actual fault or privity" in English law. French case law holds that the obligation to maintain a seaworthy ship is personal to the owner and that, where there is fault in that regard, it is a "faute personnelle" of the owner.

INMA

It is apparent from the experts' reports that the weldings executed on the TANIO by INMA were badly done and did not conform with the standard and good practice as exercised by careful shipyards. INMA did not observe their contractual obligation to carry out the work in a proper manner. Moreover, INMA failed to check its work properly, and the defects in the work could have been recognised by a proper inspection at the yard. INMA's contractual negligence constitutes equally a negligence in tort involving its liability to third parties, victims of the pollution. There is no principle of limitation of liability applicable to INMA.

SFTP

SFTP was under a contractual obligation to define the extent of the repair work, to supervise the proper execution of the work and to check the results. The bad welding should have been apparent to an engineer if he had carried out diligent supervision and

inspection. Since such diligence was not exercised, SFTP is liable in negligence, notwithstanding any contractual exemption of responsibility which cannot, as a matter of law, be invoked against third parties. SFTP cannot limit its liability. SFTP was also responsible, under a contract signed with Petromad, for the technical management of the ship and, in this capacity, the same arguments regarding cargo distribution apply to them as to Petromad.

#### Guardiola

Guardiola undertook a contractual obligation to Locafrance to define the repair work to be done and check the execution of such work. It also had an obligation to put the ship into a seaworthy state apt for her intended service. Its failure to fulfil these fundamental obligations renders it liable in law to third parties, and also deprives it of any right to limit its liability under the 1957 Brussels Convention relating to the Limitation of the Liability of Owners of Sea-going Ships.

#### Bureau Véritas

The Rocquemont Report concludes that Bureau Véritas did not check the quality of the work locally, but left the inspection to the shipyard. Bureau Véritas fell short of its obligation to check the accomplishment of the repair work before giving the TANIO her class. It is therefore liable in tort. No principle of limitation of liability applies to Bureau Véritas.

#### Petromad

While the Master was undoubtedly liable for the unusual cargo distribution over a period of time, Petromad should have ensured that the Master was properly instructed concerning cargo distribution, and that he was ordered to stop the use of methods which could have led to unacceptable stress levels in the hull. Either or both were clearly not done, and so Petromad is liable in negligence, which also denies it the right to limit its liability under the 1957 Convention.

#### UK Club

The UK Club has been sued as insurers of Petromad and Guardiola, on the basis of a right of direct action against an insurer where damage has been suffered in France, although it is not clear whether the UK Club insured the latter. It was felt desirable to sue the UK Club at that stage as a protective measure. It was hoped that discussion might lead to assurances being given by the UK Club which would make it possible to withdraw the action against it; no such assurances have been given.

ANNEX IIILIST OF VARIOUS TECHNICAL TERMS RELATING TO SHIP DESIGN AND  
CONSTRUCTION WITH EXPLANATIONSGeneral

The box shaped cargo section of a tanker's hull is constructed of various elements. The external steel envelope is referred to as the 'shell plating' (specifically : bottom shell and side shell plating) plus the deck.

To maintain the rigidity of this shell plating, it is stiffened on its inside by steel bars running fore and aft along the length of the ship. These steel bars are connected by welding to the shell plating and are referred to as 'longitudinals' (specifically : bottom longitudinals, side longitudinals, bilge longitudinals and deck longitudinals).

Support for the longitudinals is provided by transverse rings, running right round the inside of the wing tanks, from deck to bottom, usually referred to as 'web frames', or simply 'frames'.

Support for the bottom longitudinals and deck longitudinals in the centre tanks is provided by girders running across the bottom shell and deck in line with the web frames in the wing tanks. These girders are usually referred to as 'bottom transverses' and 'deck transverses'.

Longitudinal bulkheads are supported in a similar way to the side shell plating, with bulkhead longitudinals welded to the bulkhead plating, usually on the wing tank side of the bulkhead, which are in turn supported by the web frames inside the wing tanks.

The plating of transverse bulkheads is supported by stiffeners (steel bars) running vertically down the bulkhead. These stiffeners are supported by two or three girders running across the bulkhead which are usually referred to as 'bulkhead stringers'.

The attached diagram illustrates these elements.

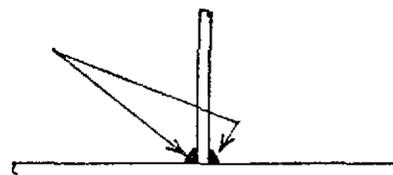
Specific terminology is explained below:

Frame : (or web frame). A transverse ring structure running right round the inside of a wing tank every few metres. Because of this regular spacing they are useful for identifying locations along the ship's hull and for this purpose are numbered sequentially starting with 0 at the aft end.

Welding : The fusion process by which two pieces of steel are joined together. Two types are commonly used in shipbuilding:

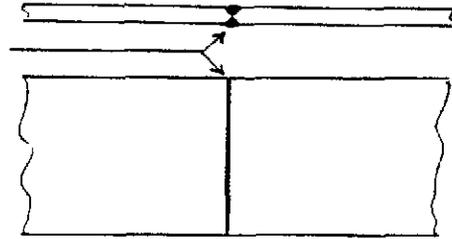
Fillet weld,

used for joining one piece at right angles to another, e.g. side longitudinals to side shell.



Butt weld,

used for joining one piece to an abutting piece in the same plane, e.g. one shell plate to another shell plate.



Longitudinal : A steel bar of various possible geometric designs:



running longitudinally to stiffen either shell plating, deck plating or longitudinal bulkhead plating.

Bilge keel : A steel bar welded at right angles to the bilge plating to reduce the rolling motion of the ship.

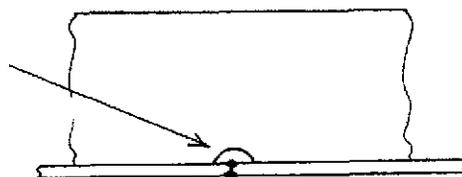
Strake : Any longitudinal line of plates running along the length of the ship, either in the shell plating or in the longitudinal bulkheads.

Rivetting : The system used, until welding was introduced, to join together two pieces of steel. The two pieces were placed together, overlapping by about 100mm. A series of holes was then drilled through the overlapped part of both pieces. A red hot rivet (round piece of steel with diameter slightly less than that of the holes) was then pushed through both holes and the ends bent over with hammers. This system is no longer used for construction or repair, and repairs to ships built using rivetted construction are done by welding.

Tensile forces : Any pulling force. In this instance it results from the loading of the cargo into the tanks, causing the hull to sag in the middle. This develops a compressive load in the deck and a tensile force in the bottom. Cargo must not be concentrated amidships since this would lead to the tensile forces exceeding predetermined limits.

Lack of penetration : When a butt weld is made it is essential for the metal of the two parts to fuse together right through the width of the weld. If this does not happen the weld is said to lack penetration.

Cut-outs : Semi circular holes cut in the bottom of longitudinals (for example) to allow a crossing weld in the attached plating to be completed.



ATTACHMENT

