

File with  
Casualty report.

ANNEX.

In drawing deductions from the loss of the S.S. Vardulia it is important to bear in mind firstly the severe weather prevailing in the particular region of the North Atlantic Ocean at the time, and secondly that the only direct evidence from the ship herself is contained in the last two tragic and somewhat meagre messages sent out in the morning of October 19.

It must remain largely a matter of conjecture as to what actually happened on that fatal morning; hence the necessity for caution in drawing conclusions and deductions from the loss of the ship. It must to a large extent necessarily remain a mystery of the sea.

The Vardulia was a well found ship, and no possible blame for the disaster can be attributed to the owners. Every provision for the wellbeing and safety of the ship had been taken that normal experience could suggest or regulations require.

Nevertheless we think some useful lessons may be gleaned from this disaster. With regard to the wireless signals sent out by the Vardulia, comment has been made that no message was sent by her captain between 16.19 hours on the 18th October, when she sent out an X X X urgency signal and 06.55 hours on October 19th when she made the first S.O.S. signal.



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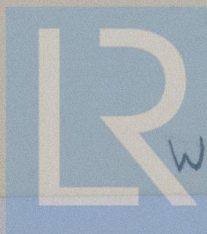


The court has carefully considered the matter. It would appear that if the Vardulia was in difficulties at 4.19 p.m. on October 18th the captain would have made some further signal during the ensuing  $14\frac{1}{2}$  hours. It may well have been that the wireless aerial was brought down by the hurricane and that owing to the weather and other difficulties being experienced it could not be replaced until the morning of the 19th.

From the records of the wireless signals of ships submitted to the court it appears that the Danish steamship Oregon reported at 17.30 on October 18th that her aerial had been brought down and that she was unable to re-rig it owing to the severity of the weather. At 09.30 on October 19th she logged "Aerial temporarily repaired".

It is also noted from the records of the wireless signals handed to the court that only two vessels S.S. Blairangus and S.S. Bisko appear to have replied to the X.X.X. urgency signal made from the Vardulia at 16.19 on October 18th. No definite conclusions can be reached from this scanty evidence.

As regards possible explanations of the disaster the first matter for investigation is the question of the stowage and trimming of the coal cargo; and it is necessary to indicate the considerations underlying the answers to questions 9 to 12 inclusive.



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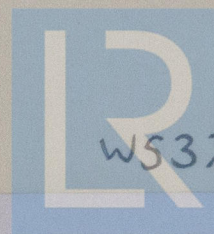
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Evidence as to the stowage rates of coal in cubic feet of space occupied per ton weight carried was given by Mr. Parkyn, a Board of Trade Surveyor at Hartlepool. Mr. Parkyn examined a number of truck loads of different coals and measured the capacities of the trucks and determined the weights of the coal. Mr. Nutton, a surveyor in the consultative branch of the Board of Trade, followed Mr. Parkyn with evidence as to the stowage rates determined from considerations of the examinations and measurements made by Mr. Parkyn. This evidence showed that for the two general classes of coal carried the average stowage rates in the trucks were 44.18 cubic feet per ton for the small coal and 45.63 cubic feet per ton for the large coal.

A material consideration underlying these figures is that they are stowage rates in trucks, and it is to be expected that coal will stow more easily in rectangular containers than in compartments in ships where curved boundaries and obstructions within the compartments are liable to result in less complete filling, or in other words to the occurrence of "voids" within the body of the coal.

A further material consideration is that the measurements of the coal within the trucks were made at the docks after the trucks had been jolted along some miles of railway lines from the colliery.



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The jolting and vibration in transit would cause the coal to settle down in the trucks. Small pieces tending to shake down into spaces between the larger pieces. Hence on these considerations it is reasonable to express the belief that the stowage rates given by Mr. Nutton in evidence are lower, representing more close packing of the pieces of coal, than can be attained in practice.

Alternative figures for stowage rates were made available for consideration of the court in evidence given by Mr. K. Jackson, manager to the colliery agents. These figures were that the stowage rate for small coal is about 48 cubic feet per ton and for large coal something more than 50 cubic feet per ton. The first point for consideration regarding the figures presented by Mr. Jackson is that they are in close agreement with some figures presented by Mr. Nutton. On the basis of the evidence of the trimmers as to the distribution of the coal in the various compartments served by the respective upper deck hatches and on the knowledge of the weights of coal loaded into these hatches, Mr. Nutton has determined for the various compartments the stowage rates for the coal as loaded into the ship. These stowage rates were :-

No. 1 hold and 'tween deck	50.23 cubic ft per ton.
Deep tank.	47.91 cubic ft per ton.
No. 4 hold and 'tween deck	46.29 cubic ft per ton.
No. 5 hold and 'tween deck	47.27 cubic ft per ton.



These spaces all being loaded with small coal.

For Nos. 2 and 3 holds and 'tween decks, in which were stowed the large coal the stowage rates as loaded were 50.72 and 51.24 cubic feet per ton respectively.

It is apparent that, setting aside for the moment the figure for No.1 hold and 'tween decks, there is close agreement between the evidence of Mr. Jackson and Mr. Nutton in this respect. It may indeed be worth observing that the figures for the after compartments are consistent in themselves. It is to be expected that the stowage rate for the aftermost hold will be higher than for the adjoining, more rectangular hold; and that the stowage rate for the deep tank, because of the special stiffening within it and around its boundaries will be higher than either; and such is actually the case.

There is, however, a material consideration underlying the later figures for stowage rates, the general figures presented by Mr. Jackson and the particular figures presented by Mr. Nutton. It is that they are based on experience with normal trimming and it does not follow that the figures would not be reduced if trimming were always carried out with extreme care.

In this connection it is now necessary to refer to the figures for the actual stowage of No.1 hold and 'tween deck.



According to the evidence of the trimmers this whole compartment, like all the others, was thoroughly trimmed. In fact, however, the coal was not so well trimmed as in the other compartments. A stowage rate of 50.23 cubic ft per ton for small coal is sufficiently in excess of all the other rates for small coal to indicate incomplete trimming. The suggestion of incomplete trimming in this instance, justified as it is by the known fact that the load into No.1 hatch was completed only a short time before the ship sailed on her fatal voyage leads to the inference that complete trimming from the point of view of the trimmer is possibly not perfect trimming from the point of view of those who have to sail with the cargo.

This inference has to a slight extent influenced the answer to question 14; although it is possible that the general principal regarding supervision of trimming embodied in that answer would have been presented even in the absence of that inference.

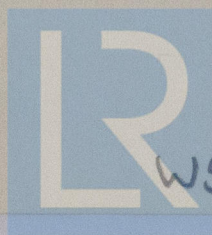
The purpose of the evidence regarding stowage rates presented by Mr. Nutton was to lead up to the conclusion that there were extensive empty spaces in the holds and 'tween decks of the Vardulia. It is apparent that in ships of the type of the Vardulia there must be empty spaces within a coal cargo, since perfect trimming is impracticable.



It is not, however, certain that the empty spaces within the holds were as extensive as was indicated by the evidence of Mr. Nutton. The calculations, the results of which were given in that evidence, are based on the assumption that the coals loaded into the Vardulia should have stowed at the low rates determined by the measurements of trucks. The objections to those low rates have already been indicated, and on the basis of these objections the court has rejected the figures presented by Mr. Nutton, indicating the extent of the empty spaces within the holds.

While rejecting these figures and stating in answer to Question 10 that there were no abnormal empty spaces within the holds the court is, however, of the opinion that a space which under general prevailing conditions may not be abnormal may still be excessive.

Consideration of the empty spaces in the 'tween decks is fortunately much more simple than the consideration of the holds. The court has no doubt that there were extensive empty spaces in the 'tween decks. The figures given in the answer to Question 10 a, apart from the figure for No.1 'tween deck, are based on the harmony between the evidence of the trimmers as to space occupied and the figures for actual stowage rates presented by Mr. Nutton.



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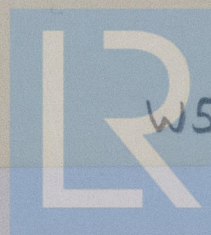


In determining the figure for No.1 'tween deck, has for the reason indicated above, rejected the evidence of the trimmers as to the space being completely filled, and in place of that evidence has assumed that the stowage rate for the small coal in No.1 hold and 'tween deck was nearly the same as for the small coal stowed in the other compartments. Hence the figure given in the answer.

In connection with the answer to Question 10 it should be observed that the Court does not lay stress on the accuracy of these figures nor on the need for absolute accuracy of the figures.

Similar considerations to those outlined above apply also to the figures given in the answer to Question 9. These figures are based on consideration of the ascertained stowage rates as actually loaded, and may not be closely accurate. Since, however, it seems that the purpose of the question is to lead up to the consideration of the empty spaces, the court is of the opinion that in view of the certainty as to there being extensive empty spaces in the 'tween decks and exact knowledge of the quantities loaded into the different compartments is not of vital importance.

The fact that there were extensive empty spaces in the 'tween decks leads up to consideration of the answers to Questions 11 and 12.



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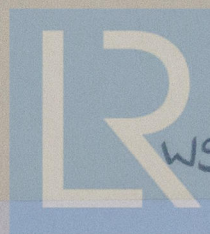
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It is clear that these empty spaces occurred in some instances at the ends of quantities of coal left to take up their natural angle of slope between the decks forming the upper and lower boundaries of the space occupied. There is also evidence for the belief that in some instances the empty spaces occurred around quantities of coal dumped approximately in the shape of pyramids extending downwards and outwards from the upper deck hatches. The court is of opinion that such stowage is not satisfactory. It, therefore, recommends that in cases where compartments cannot be completely filled the top of the coal should be trimmed down approximately level to the exclusion of slopes to sides or ends.

This recommendation is made without any implication that shifting of the coal cargo was the cause of the disaster. It is made on the ground that levelling of the top reduces the possibility of shifting and is therefore a proper thing to do.

As to the provision of shifting boards in cases where there are large empty spaces above cargoes of small coal, such small coal being liable to shift, the court is not certain that the possibilities of shifting do demand this precaution in addition to the levelling of the top. The court does, however, recommend that consideration should be given to this matter by investigation of actual states of cargo on arrival after ocean voyages.



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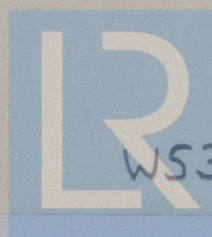


Passing on now to possible explanations of the disaster, it is proper to deal first with the theory developed in great detail by Mr. Nutton. This theory, based on a mass of careful calculations, is that the cause of the disaster was the taking of a heavy list as a result of the shifting of the cargo.

Since one of the last messages sent out by the ship refers to a dangerous list the theory has so much foundation in fact.

As a preliminary to the consideration of this particular theory it is necessary to refer to the matters of stowage rates and extents of empty spaces discussed above. And since it may be considered that some doubt as to Mr. Nutton's figures for extents of empty spaces based on the stowage rates has influenced the consideration of his theory as to the shifting of the cargo, it is proper to state that the theory has been examined entirely as a problem of stability, on the assumption that the empty spaces were of the extents determined by Mr. Nutton.

The culmination of the theory is that on certain drastic assumptions as to the shifting of the cargo the ship may have taken a list of from 31 to 42 degrees, these figures corresponding to two different assumptions as to distributions of empty spaces.



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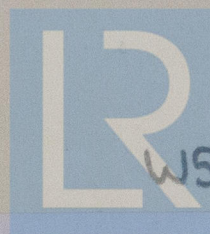
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In either case the list is dangerous. Before accepting the figures it is however necessary to note that the word drastic used to describe the assumptions was employed by Mr. Nutton who himself made the assumptions. And the assumptions as to shift certainly were drastic, too drastic for the basis of a theory as to possible occurrence. Incidentally more justifiable assumptions as to shift of cargo would appreciably reduce the possible angle of list.

It is necessary to consider an alternative theory, namely that the dangerous list was caused by the influx of water. The basis of this theory is that water entered the extensive sparsely filled space in Nos 2 and 3 'tween decks. This one compartment served by both Nos 2 and 3 hatches being more than 100 ft long. The material consideration here is that "slack water" is a potent factor in the reduction of stability. In the course of examination Mr. Nutton agreed that a moderate quantity of water entering this large empty space would at once and seriously diminish the stability.

Incidentally an influx of water in this <sup>h</sup>fashion would probably wash some of the loose coal towards the low side and so aggravate the direct effect of the water.



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In connection with this alternative possibility there is no need for drastic assumption. In any endeavour to assess the probabilities of two possibilities it is desirable to consider two pieces of evidence available to the court. The first of these is a record of voyages showing that between September 1929 and the fatal voyage in October 1935 the Vardulia had made 16 Atlantic crossings from East to West with coal or part coal cargoes and empty spaces in holds or 'tween decks, or both.

There is no record of cargo shifting on any of these voyages. The other piece of evidence is that on 14 of these voyages the hatches in the forward well were protected by a cuttle deck, The removal of which in May 1935 was at once followed by uneasiness on the part of the master as to the security of No.1 and 2 hatches; this uneasiness was indicated in correspondence and confirmed by evidence given in court.

The two voyages made subsequent to the removal of the cuttle deck and which gave rise to the uneasiness were made during summer months. In this connection it is proper to state that the uneasiness of the master as to the security of these hatches prompted a request for additional precautions at once conceded and slightly extended by the owners.

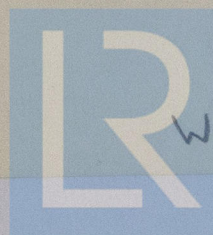


Hence, whether the casualty was caused by shifting of cargo or by influx of water through failure of a hatch or by a combination of both circumstances there is evidence to justify a doubt as to whether existing regulations are adequate as regards height of platform, or more properly in this case the height of the most vulnerable region.

In expressing this doubt due regard has been paid to the fact that published statistics of losses have shown decrease of danger; but regard has also been paid to the fact that several recent casualties can be ascribed largely to failure of hatches.

These failures have occurred in ships of the same general type as the Vardulia.

In concluding these remarks on the adequacy of existing regulations it seems desirable to call into question the propriety of the interdependence of freeboard and tonnage regulations, to the effect that extension of space exempted from tonnage should be accompanied by reduction in the height of the most vulnerable region. In effect, the reduction of tonnage in relation to deadweight carrying capacity is accompanied by a reduction in the margin of safety.



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