APPENDIX TO EQUITAS' CLOSING SUBMISSIONS

THE DATA AND THE ASSUMPTIONS UNDERLYING THE MODELS

Number and Type of players

1. Each of the models assumes that there were will be a certain, total number of players[1], which are then broken down between Lloyd's and non-Lloyd's; direct, non-direct, or direct and non-direct writers of inwards cover; and marine 1, 2 or 3, or aviation player type.

KAC/BA

2. In the case of KAC/BA, the model assumes that there are 409 players. Of these, 389 are assumed to provide non-direct inwards coverage and 20 are assumed to provide direct inwards coverage only. Of the 389 non-direct writers, the model assumes that 214 (i.e. 55%) are Lloyd's players and 175 (i.e. 45%) are Company players. The result is as follows.

	Non-direct and direct coverage	**Non-direct coverage only**	**Direct coverage only**
Lloyd's	144	70	11
Non-Lloyd's	94	81	9

3. Actual data was considered by Mr Bulmer and his team for the purpose of estimating the number and type of players to be used in the KAC/BA model; namely:

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1 Mr Bulmer explains, at paragraph 10 of Appendix B [**D2/47**] (KAC/BA) and D [**D2/92**] (Exxon) to his Final Report that, for the purpose of determining the number of players, Protected syndicates (i.e. closely-related syndicates within the same managing agency, which would typically share losses and reinsurance recoveries in specified proportions) were grouped together; and Non-Lloyd's players with very similar names were grouped together to the extent that they appeared to be the same entity.

(1) The "Kuwait_BA_hulls_only_fullmkt_to_2007" spreadsheet, which shows individual Lloyd's Syndicate and Company participations in the KAC and BA direct losses. The "Kuwait_BA_hulls_only_fullmkt_to_2007" spreadsheet was used to determine the numbers of Lloyd's and non-Lloyd's players which participated in either or both of the KAC and BA direct losses. These numbers were calculated, based on claim amount thresholds of US$0, US$25,000, US$50,000, US$75,000 and US$100,000.

(2) Extracts from the MAX database, which contains details of the (outwards) reinsurance contracts purchased by all Lloyd's Syndicates (including those involved in the LMX spiral in the years relevant to the KAC/BA and Exxon losses)[2]. The extracts from the MAX database were used to determine the number of Lloyd's and non-Lloyd's players which participated in more than a specified number of individual excess-of-loss contracts which are likely to be exposed to the KAC/BA loss.

(3) The "Kuwaittopdown_AHR77" spreadsheet, which is an extract from the COSS database – COSS, it will be remembered, is a substantial Lloyd's database containing details of payments by each Lloyd's Syndicate up to 1999. The "Kuwaittopdown_AHR77" spreadsheet was used to determine the numbers of Lloyd's players with current UNLs in respect of the KAC/BA loss in excess of thresholds of US$0, US$25,000, US$50,000 and US$100,000.

(4) The "Mjacques_inwards_data" spreadsheet, which was prepared by Mr Jacques at Equitas[3] and which shows (from information drawn from the MAX database) the inwards claim amounts to Lloyd's Syndicates in respect of Cat 90V which were outstanding as at August 2007[4]. According to Mr Bulmer, the "Mjacques_inwards_data" spreadsheet showed that there

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2 The migration of the records of most Syndicates took place from about 1996, but, as Mr Gregory stated in XX, all or most of their historic outwards contract data was migrated: Day 3, pp. 127-129. So, it was not the case that the migration only imported information relating to the 1996 and subsequent years. The MAX database included Gooda Walker.

3 XX of Mr Gregory, Day 3, p. 133.

4 XX of Mr Gregory, Day 3, p. 134.

are 189 Lloyd's players which currently have an outstanding claim amount in respect of the KAC/BA Losses in excess of zero (Final Report, Appendix B, paragraph 14 [**D2/49**]). However, he considered it likely that this was an underestimate of the number of Lloyd's players which were exposed to KAC Losses and/or BA Losses because (a) the "Mjacques_inwards_data" spreadsheet may have excluded players providing direct coverage only; and (b) the KAC/BA loss is now relatively mature and, accordingly, Mr Bulmer expected there to be a number of players which have paid claims but for which outstanding claim amounts are zero.

4. Mr Bulmer explained (at paragraph 15 of Appendix B to his Final Report [**D2/49**]) that he selected a figure of 225 Lloyd's players for the KAC/BA model on the basis that it was similar to the number of Lloyd's Syndicates in the "Kuwaittopdown_AHR77" spreadsheet with current UNLs in excess of US$100,000. He explained that Lloyd's Syndicates with a current UNL less than US$100,000 represent less than 0.1% of the aggregate UNL in respect of Lloyd's syndicates and that he considered it appropriate to exclude minor syndicate participants which have UNLs below US$100,000 because their inclusion would not be expected to have a significant effect on the modelled UNLs for significant players (e.g. with UNLs in excess of US$5 million). Mr Sanders accepted, in cross-examination, that this was reasonable thing to have done: Day 5, p. 85.

5. In order to arrive at the figure of non-Lloyd's players in the KAC/BA model, Mr Bulmer then grossed up the number of Lloyd's players - by reference to his analysis (at paragraphs 11 and 12 of Appendix B to his Final Report [**D2/48**]) of the "Kuwait_BA_hulls_only_fullmkt_to_2007" spreadsheet and extracts from the MAX database – to arrive at total Lloyd's / non-Lloyd's proportions of 55% / 45%. That grossing up produced a total number of 409 players (i.e. 225/0.55).

6. The players were assumed to write direct coverage, non-direct coverage or both direct and non-direct coverage, as set out in the table above (which is taken from paragraph 2 of Appendix A to Mr Bulmer's Final Report [**D2/37**]). As Mr Bulmer explained in his Final Report (at paragraph 19 of Appendix B [**D2/50**]), he arrived at the breakdown as follows.

(1) The total number of players was estimated as set out above (409 players).

(2) The split between Lloyd's and non-Lloyd's was estimated as set out above (a 55/45 split), producing 225 Lloyd's players and 184 non-Lloyd's players.

(3) The total number of players writing direct coverage (both direct only and mixed) was selected having regard to the number of players in the "Kuwait_BA_hulls_only_fullmkt_to 2007" spreadsheet. Mr Bulmer found there were 258 players writing direct coverage with an exposure to the KAC/BA direct loss. As a result there were 151 players, which were assumed to write non-direct coverage only (409 - 258 = 151 players) i.e. 37% of players write non-direct coverage only (151/409 = c. 37%).

(4) Approximately 63% of players therefore write direct coverage (i.e. direct only and mixed).

(5) Analysis of the COSS database, marking claims as direct / non-direct via their original number and date, suggested to Mr Bulmer that approximately 5% of Lloyd's players wrote direct coverage only.

(6) The summary split between non-direct only, mixed and direct only was thus selected to be 37%, 58% and 5%.

(7) The table above was then filled in proportionally across rows and columns considering the estimates made of: the total number of players (409), the split between rows (55/45) and the split between columns (58/37/5); and

(8) Mr Bulmer then made a final adjustment was to ensure that the total number of players writing direct coverage only or mixed coverage corresponded to the table set out in paragraph 11 of Appendix B (breaking down the number of Lloyd's / non-Lloyd's writers of direct losses which was derived from the "Kuwait_BA_hulls_only_fullmkt_to 2007" spreadsheet).

Exxon

7. In the case of Exxon, the model assumes that there are 300 players[5]. Of these, 285 are assumed to provide non-direct inwards coverage and 15 are assumed to provide direct inwards coverage only. Of the 285 non-direct writers, the model assumes that 142 (i.e. 50%) are Lloyd's players and 143 (i.e. 50%) are Company players. The result is as follows.

	Non-direct and direct coverage	**Non-direct coverage only**	**Direct coverage only**
Lloyd's	105	37	8
Non-Lloyd's	137	6	7

8. As with the KAC/BA model, actual data was considered by Mr Bulmer and his team for the purpose of estimating the number and type of players to be used in the Exxon model; namely:

(1) The "Exxon direct placements" spreadsheet, which shows which shows individual Lloyd's Syndicate and Company participations in the Exxon direct losses. The "Exxon direct placements" spreadsheet was used to determine the numbers of Lloyd's and non-Lloyd's players which participated in the Exxon rig or liability direct losses. These numbers were calculated, based on claim amount thresholds of US$0, US$25,000, US$50,000, US$75,000 and US$100,000.

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5 In XX, Mr Bulmer was asked why he used a significantly smaller number of players for the Exxon model than he did for the KAC/BA model: '*Q. ... What is the explanation for using significantly smaller numbers in the Exxon model? A. I think one reason is that the Kuwait model, or the Kuwait loss also had a significant exposure to the aviation markets. There would have been a significant proportion of the Kuwait loss which would have entered a separate aviation spiral market, for want of a better description, and as the losses developed through that aviation spiral, so some of those losses would then seep back into the marine spiral. In the light of this, I considered it was appropriate to make allowance for aviation players within the Kuwait model. There is no counterpart for this in the Exxon model.*' (Day 4, p. 68)

(2) Extracts from the MAX database. The extracts from the MAX database were used to determine the number of Lloyd's and non-Lloyd's players which participated in more than a specified number of individual excess-of-loss contracts which are likely to be exposed to the Exxon loss.

(3) The "Exxontopdown_AHR102" spreadsheet (which is an extract from the COSS database). The "Exxontopdown_AHR102" spreadsheet was used to determine the numbers of Lloyd's players with current UNLs in respect of the Exxon loss in excess of thresholds of US$0, US$25,000, US$50,000 and US$100,000.

(4) The "Mjacques_inwards_data" spreadsheet, which was prepared by Mr Jacques at Equitas and which shows (from information drawn from the MAX database) the inwards claim amounts to Lloyd's Syndicates in respect of Cat 89G which were outstanding as at August 2007. According to Mr Bulmer, the "Mjacques_inwards_data" spreadsheet showed that there are 148 Lloyd's players which currently have an outstanding claim amount in respect of the Exxon losses in excess of zero (Final Report, Appendix D, paragraph 14 [**D2/94**]). He considered it likely that this was a reasonable estimate of the number of Lloyd's players which were exposed to Exxon Losses because the Exxon loss is significantly less mature than the KAC/BA loss and most players and, accordingly, Mr Bulmer expected most players exposed to the Exxon loss to have an element of outstanding claim amounts.

9. Mr Bulmer explained (at paragraph 15 of Appendix D to his Final Report [**D2/94**]) that he selected a figure of 150 Lloyd's players for the Exxon model on the basis that it was similar to the number of Lloyd's Syndicates in the "Exxontopdown_AHR102" spreadsheet with current UNLs in excess of US$100,000. He explained that Lloyd's Syndicates with a current UNL less than US$100,000 represent less than 0.1% of the aggregate UNL in respect of Lloyd's syndicates and that he considered it appropriate to exclude minor syndicate participants which have UNLs below US$100,000 because their inclusion would not be expected to have a significant effect on the modelled UNLs for significant players (e.g. with UNLs in excess of US$5 million).

10. In order to arrive at the figure of non-Lloyd's players in the Exxon model, Mr Bulmer then grossed up the number of Lloyd's players - by reference to his analysis (at paragraphs 11 and 12 of Appendix D to his Final Report [**D2/93**]) of the "Exxon direct placements" spreadsheet and extracts from the MAX database – to arrive at total Lloyd's / non-Lloyd's proportions of 50% / 50%. That grossing up produced a total number of 300 players.

11. The players were assumed to write direct coverage, non-direct coverage or both direct and non-direct coverage, as set out in the table above (which is taken from paragraph 2 of Appendix C to Mr Bulmer's Final Report [**D2/82**]). As Mr Bulmer explained in his Final Report (at paragraph 19 of Appendix D [**D2/50**]), he arrived at the breakdown as follows.

    (1) The total number of players was estimated as set out above (300 players).

    (2) The split between Lloyd's and non-Lloyd's was estimated as set out above (a 50/50 split), producing 150 Lloyd's players and 150 non-Lloyd's players.

    (3) The total number of players writing direct coverage (both direct only and mixed) was selected having regard to the number of players in the "Exxon direct placements" spreadsheet. Mr Bulmer found there were 257 players writing direct coverage with an exposure to the Exxon direct loss. As a result there were 43 players, which were assumed to write non-direct coverage only (300 - 257 = 43 players) i.e. 14% of players write non-direct coverage only (43/300 = c. 14%).

    (4) Approximately 86% of players therefore write direct coverage (i.e. direct only and mixed).

    (5) Analysis of the COSS database, marking claims as direct / non-direct via their original number and date, suggested to Mr Bulmer that approximately 5% of Lloyd's players wrote direct coverage only.

    (6) The summary split between non-direct only, mixed and direct only was thus selected to be 14%, 81% and 5%.

(7) The table above was then filled in proportionally across rows and columns considering the estimates made of: the total number of players (300), the split between rows (50/50) and the split between columns (81/14/5); and

(8) Mr Bulmer then made a final adjustment was to ensure that the total number of players writing direct coverage only or mixed coverage corresponded to the table set out in paragraph 11 of Appendix D (breaking down the number of Lloyd's / non-Lloyd's writers of direct losses which was derived from the "Exxon direct placements" spreadsheet).

12. Whilst accepting that it is impossible now to know the precise number of actual participants involved in the spiral at the relevant times, Mr Berry confirmed in his report that the numbers of Lloyd's and company players assumed by the models to be reasonable[6]. By contrast, Mr Emney's 'gut feeling' was that the number of players in the models were too high: Report, paragraphs 4.4 and 4.5 **[D4/Tab 10/Pages 155-156]**; XX, Day 3, pp. 82-83. But, he had no alternative suggestion to make as to the number of players. It is submitted that Mr Bulmer's objective analysis of actual data is a more reliable guide to the approximate number of players and the Lloyd's/non-Lloyd's split than Mr Emney's 'gut feeling'.

13. In XX, Mr Bulmer was asked why he selected the numbers of players that he did, rather than reflecting the full number of participants indicated by the underlying data that he considered.

'Q. You explain at paragraph 12, you set out a table at paragraph 12 of appendix B, how extracts from the MAX database were used to determine the number of Lloyd's and non-Lloyd's players which had participated in more than a specified number of individual excess of loss contracts which are likely to be exposed to the Kuwait loss, and you show the results in the table. The first question I have is: why didn't you use the number of players indicated by this table? Why didn't you use 603 players, for example, in your model?

A. The reason for that is that a very large number of entities were exposed to each of the Kuwait and Exxon losses. I don't know the exact number but it may well be that 700, maybe 800, individual participants had a share in the Kuwait and Exxon losses. What I found, though, was that virtually the whole of the loss seemed to be concentrated in the top -- in the case of Kuwait 400, players, in the

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6 Report 1, paragraph 2.5 **[D3/Tab 5/Page 3]** By 'reasonable', he accepted in XX that he considered an assumption to be 'a fair working assumption' (Day 3, p. 25)

case of Exxon, 300 players. So I -- as a simplification, which I considered would not have a significant effect on the model results, I limited the number of players in the model to those which implicitly had a UNL in excess of what was still a fairly small threshold.' (Day 4, pp. 65-66)

Mr Sanders accepted that it was reasonable to adopt this approach: Day 5, p. 85.

14. For his part, Mr Sanders accepted, in cross-examination, the numbers of Lloyd's players for each of the models: Day 5, p. 83

'*A. I think Mr Bulmer has done his analysis on the Lloyd's syndicates and his analysis there comes up with a certain number. He has then grossed it up to allow for the non-Lloyd's players, and certainly at the Lloyd's level I have no problem with that.*'

As for the calculation of the numbers of non-Lloyd's players, the most that Mr Sanders could say was that there was a 'possibility' that the actual numbers might have been different: Day 5, p. 84.

15. Mr Sanders also accepted that the sensitivity tests for KAC/BA and Exxon which altered the Lloyd's / non-Lloyd's proportions of player numbers did not dramatically alter the proportions or ratios: Day 5, p. 88.

Marine / Aviation Player Types

16. In order to introduce an element of diversity to the model, Mr Bulmer has (amongst other things[7]) adopted different "Player Types"

17. Each of the players in the model is allocated to a "player type" which determines what sort of cover the player writes. The player type will, in short, determine the player's appetite for writing a particular form of cover.

(1) In the case of the KAC/BA model, there are 4 player types: Marine 1, Marine 2, Marine 3 and Aviation, each of which will tend to write more or

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7 Mr Bulmer explains, at paragraph 6 of Appendix B **[D2/46]** (KAC/BA) and Appendix D **[D2/91]** (Exxon) to his Final Report that he aimed to achieve diversity between different players in the model because such diversity would have been present in the actual spiral and because different participants in the spiral would have exhibited a wide variation in UNLs. Examples of the means by which diversity is achieved are: the use of different player types; the use of distributions, rather than single values, of the amount of reinsurance coverage purchased; the application of the 90% correlation coefficient between the amount of XL on XL reinsurance coverage and the amount of Whole Account reinsurance coverage purchased; and the "Matrix" of reinsurance groups and share groups.

less War, XL on XL, Whole Account or Aviation cover. The proportions of each type of cover that the model would aim for each type of player to write are set out in a table in Schedule 3 of Appendix A to Mr Bulmer's Final Report [**D2/44**]. For ease of reference, that table is as follows.

Player type	Proportion of all players	War	XL on XL	Bottom of whole	Top of whole	Aviation bottom	Aviation top
Marine type 1	28.3%	34.5%	44.0%	15.0%	5.0%	1.0%	0.5%
Marine type 2	28.3%	20.0%	39.5%	29.5%	10.0%	0.5%	0.5%
Marine type 3	28.3%	5.0%	20.0%	34.5%	39.0%	0.5%	1.0%
Aviation	15.0%	0.0%	0.0%	0.0%	0.0%	86.0%	14.0%

Thus, by way of example, Marine type 3 would tend to write higher level whole account coverage than Marine types 1 or 2.

(2) In the case of the Exxon, there are 3 player types: Marine 1, Marine 2 and Marine 3, each of which will tend to write more or less Liability or Rig cover, XL on XL or Whole Account cover. The equivalent table in Schedule 3 of Appendix C to Mr Bulmer's Final Report [**D2/89**] is as follows.

Player type	Proportion of all players	Liability or Rig	XL on XL	Bottom of whole	Top of whole
Marine type 1	33.3%	35.0%	45.0%	15.0%	5.0%
Marine type 2	33.3%	20.0%	40.0%	30.0%	10.0%
Marine type 3	33.3%	5.0%	20.0%	35.0%	40.0%

(3) It will be recalled that the Excel spreadsheet determines, in respect of each player, the player type to which it belongs by reference to the amounts of different sorts of reinsurance that it has been allocated, in order to create some correlation between the sorts of outwards protection that a player would buy and the sorts and amounts (as a proportion of its book of inwards business) of reinsurance contracts that it would then write. The types of coverage which are used for this purpose differ as between the KAC/BA model[8] and the Exxon model[9].

(4) As Mr Bulmer explained in cross-examination, the figures set out above for the player types are 'targets', so that not every player allocated to a particular player type would have the precise characteristics stated in the relevant boxes in the table: XX, Day 4, pp. 84-87. This ensures that there remains an element of diversity within the broad parameters set out above.

18. Mr Bulmer explains in his Final Report (paragraph 24 of Appendix B **[D2/51]** and Appendix D **[D2/96]**) that he ultimately chose three marine player types (and,

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8 In the case of the KAC/BA model, the spreadsheet analyses how much (in percentage terms) of each player's outwards reinsurance programme is made up of the following types of coverage: War; XL on XL; low level Whole Account (less than US$50m excess points); high level Whole Account (more than US$50m excess points); low level aviation (less than US$20m excess points); high level aviation (more than US$20m excess points). (See paragraph 9 of Appendix A to Mr Bulmer's Final Report **[D2/38]**)

9 In the case of the Exxon model, the types of coverage which are used for this analysis are as follows: Liability or Rig; XL on XL; low level Whole Account (less than US$50m excess points); high level Whole Account (more than US$50m excess points). (See paragraph 7 of Appendix C to Mr Bulmer's Final Report **[D2/83]**)

additionally, an aviation type in the case of KAC/BA) in order to reflect the fact that actual participants in the market would have different balances between direct, XL on XL, low level Whole Account, high level Whole Account (and, in the case of KAC/BA, low level and high level Aviation cover) cover. He also explains that, having considered having more than 3 marine player types, he decided against doing so on the basis that it would make the models too complicated and difficult to interpret[10].

Shares of the direct loss

19. By reference to actual data, direct losses were allocated to Lloyd's and non-Lloyd's players who provided direct coverage in the model in the same proportion as the actual direct losses paid by Lloyd's and non-Lloyd's market participants.

KAC/BA

20. Direct losses were allocated to Lloyd's and non-Lloyd's players who provided direct coverage in the model in the same proportion as the actual direct losses paid by Lloyd's and non-Lloyd's market participants, as shown in the "Kuwait_BA_hulls_only_fullmkt_to_2007" spreadsheet.

    (1) The actual breakdown of the KAC and BA losses split between Lloyd's and non-Lloyd's market participants is set out in Appendices E and F to Mr Bulmer's Final Report **[D2/Tabs E and F]**.

    (2) The detailed methodology involved in Mr Bulmer's allocation of the direct losses and the substantial worksheets (provided by Equitas and based upon actual, original data) that were used in the process are set out at Appendix J to Mr Bulmer's Supplemental Final Report **[D6/Tab J]**.

Exxon

21. Direct losses were allocated to Lloyd's and non-Lloyd's players who provided direct coverage in the model in the same proportion as the actual direct losses paid by Lloyd's and non-Lloyd's market participants, as shown in the "Exxon direct placements" spreadsheet.

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10 See also XX of Bulmer, Day 4, pp. 20-21, 43-44.

(1) The actual breakdown of the Exxon Valdez losses split between Lloyd's and non-Lloyd's market participants is set out in Appendix G to Mr Bulmer's Final Report **[D2/Tab G]**.

(2) The detailed methodology involved in Mr Bulmer's allocation of the direct losses and the substantial worksheets (provided by Equitas and based upon actual, original data) that were used in the process are set out at Appendix K to Mr Bulmer's Supplemental Final Report **[D7/Tab K]**.

22. The figures for the KAC/BA direct losses were updated in certain respects at paragraph 5.6 of Mr Bulmer's Supplemental Final Report **[D5/46]** and the figures for the Exxon direct losses were updated at paragraph 8.5 of the Supplemental Final Report **[D5/57]**.

Same assumptions for Lloyd's and non-Lloyd's

23. No differentiation is made in the model between Lloyd's and non-Lloyd's, save in respect of:

(1) the allocation of the direct losses (to reflect the allocation of the KAC/BA and Exxon losses as between various Lloyd's and non-Lloyd's participants which actually took place)

(2) the cut-off dates for payment of losses within the spiral, the non-Lloyd's participants having stopped payment a few years before the Lloyd's participants.

24. In the Joint Memorandum **(D4/276)**, Mr Berry and Mr Emney agreed that '*there is no difference in the general underwriting approach of each to the underwriting of excess of loss business*'[11]. Mr Emney confirmed his agreement to this proposition in XX: Day 3, pp. 51-55:

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[11] Mr Berry stated in his first Report: '*I do not consider it is correct to say that there are meaningful distinctions to be drawn between Lloyd's and company underwriters or the approach they took to writing business. In fact, a number of underwriters at Lloyd's at the relevant time - including me – had previously worked in the companies market and the approach I adopted at Lloyd's was no different from the one I had taken in the companies market. Similarly, I am aware that the approach I had taken at Eagle Star continued to be applied there after I left.*' (paragraph 2.4) **[D3/Tab 5/Page 3]**

'Q. You have agreed with Mr Berry in the joint memorandum of underwriters, which is at D4, tab 12, paragraph 2.1, 276, it is agreed that apart from the obvious different corporate structures of Lloyd's syndicates and companies, there is no difference in the general underwriting approach of each to the underwriting of excess of loss business, and you stand by that statement?

A. I do.

Q. So –

A. I should make it clear that here we are talking about excess of loss as a class of business. This is not limited to your definition of LMX.

Q. So it goes even broader than my narrow definition of LMX?

A. It is broader than your broad definition.

Q. As far as you are concerned, you moved from Merrett to Charter Re, Mr Berry moved in the opposite direction, Eagle Star to the Cotesworth syndicate, but in general terms you are both agreed that there is no difference in general underwriting approach to the underwriting of excess of loss business?

A. No. I mean, to paraphrase Gertrude Stein, excess of loss is excess of loss is excess of loss. There may well be -- if I may finish -- a considerable difference in the way each individual underwriter structures his portfolio and effects his reinsurance, but they are all writing the same general class of business.

Q. So as far as you are concerned, although each player, each individual player, may have personal idiosyncracies peculiar to his particular position, the generality of it is that both inwards and as regards outwards placements of reinsurance programmes, in general the approach is the same?

A. It all follows the same pattern, because if one look at the outwards, of course, the principal means of securing protection is by way of excess of loss. That is probably true of, I would imagine, 99 per cent of the players in the market. But they did rely upon other methods as well.

Q. Did you fundamentally change your philosophies when you moved from Merrett to Charter Re?

A. I had to adjust them downwards in terms of scale.

Q. In terms of scale.

A. But no –

Q. Your general approach to the writing of business inwards and the writing or obtaining of reinsurance outwards, your philosophy remained basically

unchanged?

A. Yes. If there was an Emney style of underwriting, it went from one place to another.

Q. Your appetites remained the same. I asked that because in your supplemental report, and I just wanted to make sure that you weren't, as it were, retreating from what you said there, in your supplemental report, in D7 at tab 18 at page 142, paragraph 8, the heading is on the bottom of the previous page, "Mr Bulmer's use of Lloyd's loss data", and at paragraph 8, if you just want to read paragraph 8 to yourself, Mr Emney, just to remind yourself of it.

A. Yes.

...

Q. You said to us a moment ago, and I don't challenge this, that any individual player may have his own particular idiosyncracies as regards what specifically he does or doesn't do in the market, but the distinction between a Lloyd's and a non-Lloyd's player in that context is I think, in broad terms, irrelevant, isn't it? Because in broad terms, as you agreed with Mr Berry, it doesn't matter whether you are a Lloyd's player or non-Lloyd's player, because your general underwriting approach in general terms is the same.

A. There may be some areas where it might matter, such as one's capacity to write business. One is governed by one's stamp capacity in Lloyd's. It is governed by one's corporate capital in the companies.

Q. Yes, but again the corporate structure, of course, as you say in the joint memorandum, may affect things, but the general philosophies, the writing inwards, the writing or obtaining outwards, it does not depend, I think you are both agreed, on whether you are a Lloyd's or non-Lloyd's player?

A. In general terms I would accept.'

25. Mr Berry's evidence in XX was also that there was no meaningful distinction between Lloyd's and non-Lloyd's underwriters as regards both inwards and outwards business and that the same could be said equally of the comparative position as between Lloyd's Syndicates: Day 3, pp. 3-5.

26. Mr Sanders was critical, in his Final Report, of the lack of distinction in the models between Lloyd's and non-Lloyd's players: paragraphs 4.29 [**D4/13**] and 8.19 [**D4/43**]. However, in cross-examination, he accepted that in general terms, and subject to the idiosyncracies of each of the individual players, the underwriting approach of Lloyd's and non-Lloyd's players was the same (in respect of both inwards and outwards business): Day 5, pp. 91-92.

Types of Players' Outwards Reinsurance

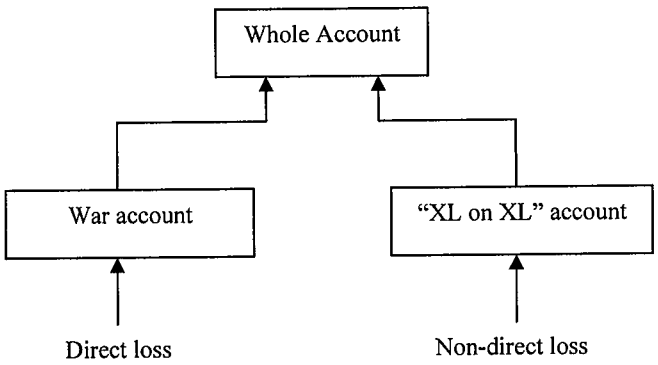
27. The models assume that players will have XL on XL, Whole Account and, where appropriate, first tier War (in the case of KAC/BA) or Liability / Rig Specifics (in the case of Exxon).

KAC/BA

28. In the case of the KAC/BA model, the basic structure of the players' outwards reinsurance depends, first of all, upon whether they are marine or aviation players.

29. A Marine reinsurance structure has a War programme, an XL on XL programme and a Whole Account programme. Direct losses first enter the War programme and then the Whole Account programme. Non-direct losses first enter the XL on XL programme and then enter the Whole Account programme. This is shown in the following diagram (taken from Appendix A to Mr Bulmer's Final Report **[D2/38]**):

Marine reinsurance structure



30. Aviation players have only a Whole Account programme and all losses enter this programme. This is intended to be a simplified representation of the typical structures which would have applied to Aviation players at the time of the KAC/BA loss, which would often have comprised both an XL on XL and a Whole Account programme.

31. The 4 broad types of coverage mentioned above (War, XL on XL, Whole Account and Aviation Whole Account) were selected by Mr Bulmer on the basis of his examination of the extracts from the MAX database which indicated that these 4 types of contracts were prevalent in the outwards reinsurance contracts in place at the relevant time: see paragraph 22 of Appendix B to Mr Bulmer's Final Report **[D2/51]**.

32. The model further breaks down the types of (marine or aviation) cover that players purchase (or write) as follows.

(1) War specifics;

(2) XL on XL coverage;

(3) Low level Whole Account coverage (coverage below US$50m excess points);

(4) High level Whole Account coverage (coverage above US$50m excess points);

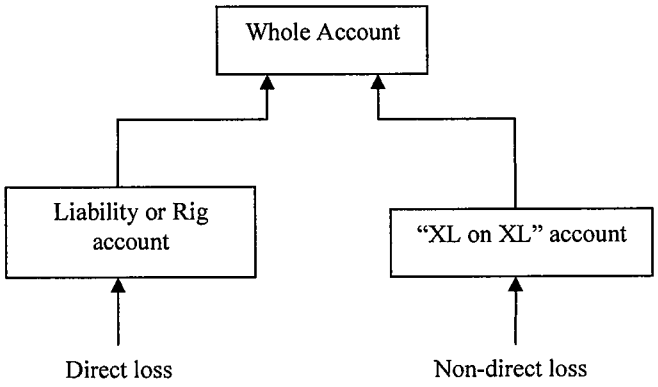
(5) Low level Aviation coverage (coverage below US$20m excess points); and

(6) High level Aviation coverage (coverage above US$20m excess points).

Exxon

33. In the case of the Exxon model, the players have a Marine reinsurance structure which is broken down into separate Liability and Rig programmes, an XL on XL programme and a Whole Account programme. Direct losses first enter either the Liability or Rig programme and then enter the Whole Account programme. Non-direct losses first enter the XL on XL programme and then enter the Whole Account programme. This is shown in the following diagram (taken from Appendix C to Mr Bulmer's Final Report **[D2/83]**):

Marine reinsurance structure



34. The model further breaks down the types of marine cover that players purchase (or write) as follows.

(1) Liability or Rig coverage;

(2) XL on XL coverage;

(3) Low level Whole Account coverage (coverage below US$50m excess points); and

(4) High level Whole Account coverage (coverage above US$50m excess points).

General

35. The models do not include every form of reinsurance that would have been purchased by participants in the market (such as, for example, Limited General programmes). They include only those which appear, from the underlying data in the extracts from the MAX database, to have been prevalent.

36. In XX, Mr Bulmer explained the position as follows.

'*Q. In creating that spiral, you have not used actual reinsurance programmes.*

A. I have used actual reinsurance programmes. I have explained in my reports that I have analysed the total amount of coverage, the number of layers, the number of participants in layers for a large number of contracts protecting Lloyd's syndicates in the MAX database.

Q. You have not directly used any of the reinsurance programmes of Lloyd's

syndicates or indeed of companies participating in the LMX market.

A. I have calibrated -- in the model there are assumptions for the amount of cover in respect of first tier, XL on XL and whole account, numbers of layers and the number of participants in layers. Those assumptions have been calibrated referring to an analysis of actual reinsurance programmes for Lloyd's players, for actual Lloyd's syndicates taken from the MAX database.

Q. For each model player you have sought to generate a simplified representation of typical reinsurance structures, is that right?

A. I'm not sure it is a simplified representation, in the sense that my understanding is that most players would have had first tier, XL of XL and whole account coverages. I accept that some syndicates would have had different structures but what I have sought to do is to encapsulate the typical structure of programmes which would have applied at the time. So I think I would prefer to use the word "typical" rather than "simplified". Having said that, there are some features of the programmes which I have not reflected in the models, for reasons which I have explained in my reports. Examples of those would include top and drop contracts, cascades, aggregate deductibles and the like. I hope that is an answer to your question.

Q. These forms of contract that haven't been modelled could influence the extent to which any actual syndicate or company was affected by the inclusion of a wrongly aggregated loss. Would you agree with that?

A. I think they could affect that, but to my mind the key question here -- I have produced the models and the reports for the specific purposes which are set out in paragraphs 1.3 to 1.6 of my final report in D2, and the purpose is to produce distributions of the proportions of total losses which are represented by the component parts, by Kuwait and BA, and also to produce a ratio of the UNL development excluding the irrecoverable losses compared with the developments including the irrecoverable losses. The focus of my work and the reports has been very much on producing distributions of proportions and ratios which are a reasonable representation of the proportions and ratios which have applied in practice in the market or which would have applied in practice had the irrecoverable losses not entered the spiral. So my reference point throughout has been the specific purposes in the final report and also the distributions of proportions and ratios. I think that is ever so important. I am keen to make that clear.' (Day 4, pp. 16-18)

37. The assumptions as to outwards reinsurance coverage have also formed the subject-matter of sensitivity testing: Bulmer XX, Day 4, pp. 19-20.

Structure of Players' Outwards Reinsurance Programmes (Total Cover, Number of Layers, Minimum Excess Points)

38. It will be recalled that, in order to generate the structure of the players' outwards programmes, the following basic parameters are fed into the Excel spreadsheet:

    (1) the distribution (i.e. the range) of the amounts of total coverage purchased by actual participants in the LMX spiral, broken down by type of cover[12];

    (2) the distribution of the numbers of layers of each of the types of outwards reinsurance purchased by actual participants;

    (3) the distribution of the minimum excess points for all of the types of outwards reinsurance purchased by actual participants.

39. Those parameters are derived from very large amounts of actual data contained in the extracts from the MAX database.

40. Mr Bulmer explains and illustrates in some detail how he has arrived at the parameters (on the basis of his analysis of the actual data concerning the LMX spiral) at paragraphs 26 to 32 of Appendix B to his Final Report (in the case of the KAC/BA model) **[D2/52 to D2/60]** and at paragraphs 25 to 31 of Appendix D to his Final Report (in the case of the Exxon model) **[D2/96 to D2/104]**. The salient details of the process are as follows.

KAC/BA

41. There were 22,937 individual contracts in the extracts from the MAX database, which were identified as being contracts which were in force at the time of the KAC/BA loss.

42. These contracts were reviewed and many were discarded on the basis that (in particular):

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12 i.e. War, XL on XL, Whole Account and Aviation (in the case of the KAC/BA model) and Rig or Liability, XL on XL and Whole Account (in the case of the Exxon model).

(1) they were not contracts which would be expected to have been exposed to the KAC/BA loss;

(2) they did not belong to a relevant category of reinsurance coverage (War, XL on XL, Whole Account or Aviation);

(3) they were not excess of loss reinsurance contracts;

(4) they were duplicate entries (in respect of a single reinsurance contracts).

43. After this review, 3,797 contracts remained. Those contracts were then combined into 446 separate reinsurance programmes, on the basis that they related to the same cedant and category (War, XL on XL, Whole Account or Aviation) and the contract descriptions, limits and excesses indicated that they in fact formed part of a single, actual reinsurance programme.

44. Having created this corpus of actual reinsurance data, Mr Bulmer then analysed it in detail in order to generate parameters for: (a) total coverage, (b) number of layers and (c) minimum excess point.

45. The extracts from the MAX database were sorted into sub-sets of data according to the type of coverage written (War, XL on XL, Whole Account or Aviation coverage) and analysed by individual reinsurance programme (i.e. the granularity level of this analysis was one entry per reinsurance programme). Each entry contains information on the maximum coverage limit (i.e. the ceiling value of the highest layer), the number of layers and the minimum excess point of the first layer.

46. The ceiling value of the highest layers of coverage, the number of layers of coverage and the minimum excess point for each reinsurance programme within each sub-set of data were plotted on graphs to produce a distribution for each variable and type of coverage.

47. A number of different probability distributions were then tested for fit against the discrete and cumulative distributions produced for each variable and type of coverage – in most cases greater weight was given to the cumulative distribution because some of the discrete distributions are relatively uneven. This testing was

performed by computer and by eye. Mr Bulmer reports that, in most cases, he found that the gamma distribution curve produced a satisfactory fit for each variable and for each type of coverage.

48. The graphs which are set out at pages 55 to 60 of Appendix B to Mr Bulmer's Final Report **[D2/55 to D2/60]** illustrate the process described above, comparing the observed distribution in the actual data (represented on the graphs in blue) and the fitted distribution which represents the parameters finally input into the model (represented on the graphs by a red line, from which the Excel spreadsheet is programmed to take random samples[13]), for each of the following matters:

(1) total coverage for each of War, XL on XL, Whole Account and Aviation coverage;

(2) number of layers for each of War, XL on XL, Whole Account and Aviation coverage. Separate graphs are shown for each of the XL on XL, Whole Account and Aviation coverage types according to whether total coverage on each reinsurance programme was more or less than US$15 million; and

(3) minimum excess point for all types of coverage combined.

Exxon

49. There were 15,657 individual contracts in the extracts from the MAX database, which were identified as being contracts which were in force at the time of the Exxon loss.

50. These contracts were reviewed and many were discarded on the basis that (in particular):

(1) they were not contracts which would be expected to have been exposed to the Exxon loss;

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13 The parameters themselves are set out in Schedule 1 of Appendix A to Mr Bulmer's Final Report **[D2/41-42]**.

(2) they did not belong to a relevant category of reinsurance coverage (Liability or Rig, XL on XL or Whole Account);

(3) they were not excess of loss reinsurance contracts;

(4) they were duplicate entries (in respect of a single reinsurance contracts).

51. After this review, 2,740 contracts remained. Those contracts were then combined into 305 separate reinsurance programmes, on the basis that they related to the same cedant and category (Liability or Rig, XL on XL or Whole Account) and the contract descriptions, limits and excesses indicated that they in fact formed part of a single, actual reinsurance programme.

52. Having created this corpus of actual reinsurance data, Mr Bulmer then analysed it in detail in order to generate parameters for: (a) total coverage, (b) number of layers and (c) minimum excess point.

53. The extracts from the MAX database were sorted into sub-sets of data according to the type of coverage written (Liability or Rig, XL on XL or Whole Account) and analysed by individual reinsurance programme (i.e. the granularity level of this analysis was one entry per reinsurance programme). Each entry contains information on the maximum coverage limit (i.e. the ceiling value of the highest layer), the number of layers and the minimum excess point of the first layer.

54. The ceiling value of the highest layers of coverage, the number of layers of coverage and the minimum excess point for each reinsurance programme within each sub-set of data were plotted on graphs to produce a distribution for each variable and type of coverage.

55. A number of different probability distributions were then tested for fit against the discrete and cumulative distributions produced for each variable and type of coverage – in most cases greater weight was given to the cumulative distribution because some of the discrete distributions are relatively uneven. This testing was performed by computer and by eye. Mr Bulmer reports that, in most cases, he found that the gamma distribution curve produced a satisfactory fit for each variable and for each type of coverage.

56. The graphs which are set out at pages 100 to 104 of Appendix D to Mr Bulmer's Final Report **[D2/100 to 104]** illustrate the process described above, comparing the observed distribution in the actual data (represented on the graphs in blue) and the fitted distribution which represents the parameters finally input into the model (represented on the graphs by a red line, from which the Excel spreadsheet is programmed to take random samples[14]), for each of the following matters:

(1) total coverage for each of Liability or Rig, XL on XL and Whole Account coverage;

(2) number of layers for each of Liability or Rig, XL on XL and Whole Account. Separate graphs are shown for each of the XL on XL and Whole Account coverage types according to whether total coverage on each reinsurance programme was more or less than US$15 million; and

(3) minimum excess point for all types of coverage combined.

57. In XX, Mr Bulmer stated his view that the red fitted distributions were reasonable, even good, fits to the blue histograms.

'*Q. The histograms are created from analysing the contracts that have been whittled down. You then seek to fit a probability distribution or curve against each histogram.*

A. That is correct.

Q. Would you agree that the fit is no more than approximate in each case?

A. That the fit is approximate in each case?

Q. But no more than approximate.

A. I think, looking through the graphs on pages 55 through to 60 of D2, my feeling when I was setting the parameters was that the fitted curves, which are the red curves, are intuitively a reasonable fit to the blue histograms. The blue histograms in some cases are a little bit lumpy, for want of a more elegant expression. For example, with the histogram at the top of page 58, the layers 25 to 26, 27 to 28, 29 to 30 and 31 to 32 are all at the same level. That is the data. The fitted curve is not going to be able to fit that lumpiness. But I think the red curves are reasonable

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14 The parameters themselves are set out in Schedule 1 of Appendix C to Mr Bulmer's Final Report [**D2/86-87**].

fits, even good fits, given the data which is available as shown in those graphs.' (Day 4, pp. 78-79)

Numbers of Players participating on layers and Size of Individual Shares

58. It will be recalled that the Excel spreadsheet has to determine the number of players required to participate on any given layer and the sizes of the lines to be written on the layer. These are determined (at random) by reference to the following parameters.

(1) The distribution (i.e. range) of the number of players participating on individual layers of actual spiral participants' outwards reinsurance.

(2) The distribution of the sizes of lines[15] written on layers of actual spiral participants' outwards reinsurance.

59. The distributions (in respect of number of players per layer and size of lines by reference to "fair share") which have been fed into the models are at Schedule 2 to Appendix A (in the case of the KAC/BA model) **[D2/43]** and Schedule 2 to Appendix C (in the case of the Exxon model) **[D2/88]** of Mr Bulmer's Final Report.

60. These parameters are, again, based on actual data contained in extracts from the MAX database; namely:

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15 More precisely, in an attempt to introduce a realistic amount of diversity (and avoid having lines divided up entirely randomly or in equal shares), the distribution relates to a comparison between the sizes of lines actually written by each actual participant and what is called his "fair share" the layer in question. i.e. it examines how many participants there were on the layer, calculates what lines would have been written by the participants if the layer had been equally divided between them and compares the result with the line which was actually written by each participant. e.g. If there were 2 participants, each with a line of 50%, each would have written his "fair share" and an index value of 100% is given to that fair share. If and to the extent that a player wrote more or less than his "fair share", the percentage given to his line would be proportionately increased or decreased. See Mr Bulmer's explanation at paragraph 33(E) of Appendix B **[D2/61]** and paragraph 32(E) of Appendix D **[D2/105]** to the Final Report.

KAC/BA

(1) "006_90V_PotentialContracts", which is a table containing full contract details, including limits and excesses, for all outwards reinsurance contracts maintained on Equitas' systems which may potentially include Cat 90V recoveries.

(2) "007_90V_SecurityDetails", which is a table containing the security details for each contract identified in "006_90V_PotentialContracts", including parent, pool participants and inter-syndicate reinsurance (Lloyd's lines). It also contains the security line percentage.

Exxon

(3) "006_89G_PotentialContracts", which is a table containing full contract details, including limits and excesses, for all outwards reinsurance contracts maintained on Equitas' systems where the selection criteria has decided that they may potentially include Cat 89G recoveries.

(4) "007_89G_SecurityDetails", which is a table containing the security details for each contract identified in "006_89G_PotentialContracts", including parent, pool participant and inter-syndicate reinsurance (Lloyd's lines). It also contains the security line percentage.

61. Mr Bulmer explains how analysed this data, at paragraphs 33 and 34 of Appendix B (in the case of KAC/BA) [**D2/61 to 63**] and paragraph 32 and 33 of Appendix D (in the case of Exxon) [**D2/105 to 107**] of his Final Report. The salient details are as follows.

62. Contracts marked as excess-of-loss contracts were selected from the extracts from the MAX database; the KAC/BA and Exxon tables entitled "Security_Details" contains security details for each contract, including the percentage shares of the contract written by individual syndicates. Mr Bulmer estimated the parameters for the number of players participating on a layer by observing the actual distribution of the number of players participating on a layer obtained from extracts from the MAX database. In some cases, a layer would be written by a sole player. As a

result a compound distribution was selected to take this feature into account. Such a distribution enabled Mr Bulmer to consider:

(1) a distribution for the situation where one player writes the whole layer; and

(2) a separate distribution for the situation where more than one player participates in an individual layer

63. The data was split according to the number of participants on each layer of each contract and, where there was more than one participant, the respective shares of each participant.

64. Mr Bulmer's analysis of the extracts from the MAX database showed that, in the case of KAC/BA, 5.7% of layers were reinsured in full by one player and, in the case of Exxon, 3.2% were reinsured by one player. However, Mr Berry's opinion was that very few layers would be written in full by a single underwriter and he estimated that approximately 0.5% of all layers (1 in 200 risks) would be written in full by a single syndicate or company: Report, paragraph 2.10 **[D3/Tab 5/Page 4]**; XX, Day 3, pp. 45-46. In the model, Mr Bulmer has adopted this alternative 0.5% assumption, but has tested the sensitivity of the model results to the assumption that 5.7% (for KAC/BA) or 3.2% (for Exxon) of layers were reinsured in full by one player.

65. A graph was plotted of the number of participants on a layer, excluding those layers on which there was only one participant. Mr Bulmer considered that the Negative Binomial distribution provided a satisfactory fit for this distribution and produced the parameters in:

(1) Schedule 2 of Appendix A to the Final Report under the heading "Stage 2" **[D2/43]** (in the case of KAC/BA);

(2) Schedule 2 of Appendix C to the Final Report under the heading "Stage 2" **[D2/88]** (in the case of Exxon).

66. A second graph was plotted of the share taken by each participant on a layer relative to its "fair share". For example, a "fair share" is represented by 100 and a participant with 50% of a layer with 2 participants would score 100 but a player

with 10% on a layer of 5 players would have a score of 50 (his fair share of the layer is 20%, but he only has 50% of that fair share). Mr Bulmer found the gamma distribution to be a satisfactory fit to this graph and produced the parameters in:

(1) Schedule 2 of Appendix A to the Final Report under the heading "size of the individual shares" [**D2/43**] (in the case of KAC/BA).

(2) Schedule 2 of Appendix C to the Final Report under the heading "size of the individual shares" [**D2/88**] (in the case of Exxon).

67. The graphs which are set out at pages 62 and 63 of Appendix B (in the case of KAC/BA) [**D2/62 & 63**] and at pages 106 and 107 of Appendix D (in the case of Exxon) [**D2/106 & 107**] to Mr Bulmer's Final Report illustrate the process described above, comparing the observed distribution in the actual data (represented on the graphs in blue) and the fitted distribution which represents the parameters finally input into the model (represented on the graphs by a red line, from which the Excel spreadsheet is programmed to take random samples), for each of the following matters:

(1) the number of players participating on a layer if there is more than one player; and

(2) the share taken by each participant on a layer relative to its "fair share"[16].

Delays between reinsurance collections

68. Reinsurance collections are not made by each player on a daily basis. They are made periodically, with the SAS programme allocating a waiting time (or "delay") to each player before he may make a collection. The calculation of the delays between recoveries is an important part of the modelling process. The delays selected by the model are arrived at by reference to average delays (and standard

16 NB: The graphs relating to participants' "fair shares" of layers (at **D2/62** and **107**) may more simply be understood if one regards the amounts on the horizontal axis as being the "fairness" (in percentage terms) of each participant's line, with (in crude terms) 100 being a participant bearing his fair share, more than a 100 being more than a fair share and less than a 100 being less than a fair share.

deviations of delays) derived from actual data regarding the collections made in the spiral; namely, information extracted from the COSS database using SAS[17].

69. In essence, the calculation of delays is important because the length of delays between collections determines how quickly the spiral turns and, therefore, the extent to which the players' UNLs accumulate during the relevant period. As explained below, the average delays which have been extrapolated from the available data have, therefore, been adjusted so that they enable the players' UNLs to develop at a similar rate to those of actual spiral participants.

70. Mr Bulmer explains the methodology involved at paragraphs 35 to 42 of Appendix B (in the case of KAC/BA) **[D2/64 to 71]** and paragraphs 34 to 40 **[D2/108 to 116]** of Appendix D (in the case of Exxon) to his Final Report, as adjusted and supplemented by Appendix B (in the case of KAC/BA) **[D5/73 to 76]** and Appendix F (in the case of Exxon) **[D5/194 to 198]** to the Supplemental Final Report. The salient details are as follows.

71. The COSS database contains details of each individual payment (in respect of both direct and spiral losses) made by each individual Lloyd's syndicate up to around 1999. Accordingly, references to UNLs derived from the COSS database refer to ultimate net losses which may be made up of both direct and spiral losses. It is possible to identify the KAC Losses and BA Losses either from the catastrophe codes or from the loss description.

72. The following process was adopted to estimate, for each year of collection, the average delay and the standard deviation of the delay from one reinsurance collection to the next.

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17 Data was also available (and was considered) from the following sources, but it was considered unreliable and given little or no weight. KAC/BA: (i) the "90V_colln_history" spreadsheet, which contains a record of all collections made (from reinsurers) by about 30 Lloyd's Syndicates; (ii) the "Kuwait billing advice v2" spreadsheet[17], which contains details of billing numbers, dates and amounts for the KAC and BA losses. Exxon: the "Exxon billing advice v2" spreadsheet, which contains details of billing numbers, dates and amounts for the Exxon loss. See paragraphs 37 and 38 of Appendix B (in the case of KAC/BA) **[D2/65]** and paragraph 36 of Appendix D (in the case of Exxon) **[D2/109]** to Mr Bulmer's Final Report.

73. Each individual reinsurance collection in respect of (a) the KAC Losses and the BA Losses or (b) the Exxon Losses was extracted from the COSS database using SAS.

74. Information was discarded in respect of:

(1) Sterling and Canadian dollar reinsurance collections;

(2) Negative reinsurance collections;

(3) Layers for which total reinsurance collections amounted to less than US$100,

for the reasons explained by Mr Bulmer at sub-paragraphs 36(B) to (D) of Appendix B (in the case of KAC/BA) [**D2/64**] and sub-paragraphs 35(B) to (D) of Appendix D (in the case of Exxon) [**D2/108**] to his Final Report.

75. For each of the remaining reinsurance collections, it was established whether or not another reinsurance collection had been made by the same syndicate on the same reinsurance layer. If there was only one reinsurance collection on an individual layer, the record was discarded because it is only possible to calculate a delay if there is more than one reinsurance collection.

76. A number of records were also discarded due to invalid date information.

77. In the case of the KAC/BA model:

(1) The foregoing process reduced the number of US dollar marked reinsurance collection records from 21,058 to 16,050.

(2) The delay between reinsurance collections was calculated for each of these 16,050 reinsurance collection records, and this information was used to estimate, for each year of collection, the average delay and the standard deviation of the delay from one reinsurance collection to the next. If there are n reinsurance collections on a layer, it is then possible to calculate (n-1) delays.

(3) Delays of 0 days were excluded. This left 11,982 delays to be analysed.

78. In the case of the Exxon model:

(1) The foregoing process reduced the number of US dollar marked reinsurance collection records from 16,161 to 14,102.

(2) The delay between reinsurance collections was calculated for each of these 14,102 reinsurance collection records, and this information was used to estimate, for each year of collection, the average delay and the standard deviation of the delay from one reinsurance collection to the next. If there are n reinsurance collections on a layer, it is then possible to calculate (n-1) delays.

(3) Delays of 0 days were excluded. This left 10,812 delays to be analysed.

79. In the case of each model, a number of different probability distributions were tested for fit against the distribution of actual delays relating to waiting times commencing in each of the years 1990 to 1996 inclusive. This testing was performed by computer and by eye. Mr Bulmer found that the lognormal distribution produced a satisfactory fit to the available data.

80. The fitted distributions for each model have then been adjusted by Mr Bulmer, as follows.

(1) The fitted distributions were adjusted to reflect the considerations which are set out in sub-paragraphs 40(B) to (D) of Appendix B (in the case of KAC/BA) **[D2/66-68]** and 38(B) to (D) of Appendix D (in the case of Exxon) **[D2/110-111]**. In particular, Mr Bulmer adjusted the final distributions so as to achieve a similar development over time of aggregate UNLs (including direct losses) of all the players in the model to the actual aggregate UNLs (including direct losses) of market participants as demonstrated by the COSS database (grossed up to allow for non-Lloyd's players). As Mr Bulmer explained (at sub-paragraph 40(D) of Appendix B and sub-paragraph 38(D) of Appendix D), his aim was to achieve development which was 'reasonably consistent' with the development of the grossed up COSS UNLs, bearing in mind (in particular):

(a) the presence of approximately US$0.4bn of erroneous entries in the COSS database for 1990-1993, in the case of KAC/BA, and approximatelyUS$0.1bn of erroneous entries for 1990-1993, in the case of Exxon;

(b) the correction of such entries (by negative entries), principally in 1995[18];

(c) the presence of "bulk entries" which will have contained some KAC/BA losses which are not identified;

(d) the disparity between the COSS UNLs and (the more reliable) Control Sheets taken from the records of some of the largest Lloyd's Syndicates; namely:

(i) "Control sheet as at 31.12.2007_90V", which comprises details of the actual UNLs (including direct losses), based on paid claims and incurred claims, in respect of the combination of the KAC Losses and the BA Losses as at 31 December 1996 and 31 December 2007, together with details of the extent of remaining outwards reinsurance protections for 52 Lloyd's Syndicates (including those which are considered by Equitas to have the largest exposures to the KAC and BA Losses).

(ii) "Control sheet as at 31.12.2007 (Exxon)", which comprises details of the actual UNLs (including direct losses), based on paid claims and incurred claims, in respect of the Exxon loss as at 31 December 1995 and 31 December 2007, together with details of the extent of remaining outwards reinsurance protections for over 39 Lloyd's Syndicates (including those which are considered by Equitas to have the largest exposures to Exxon loss).

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18 The existence and reversal of the erroneous KAC/BA entries was not disputed by Mr Sanders (who said that he had not checked them): XX, Day 5, p. 143.

(2) In light of the updating of the COSS database[19], the waiting times were re-calibrated by Mr Bulmer to ensure a similar development over time of the aggregate modelled UNLs to the (updated) aggregate COSS UNLs. This is explained by Mr Bulmer at paragraphs 6.2 and 6.3 (in relation to KAC/BA) **[D5/47]** and paragraphs 9.2 and 9.3 (in relation to Exxon) **[D5/58]** of his Supplemental Final Report.

See: XX of Mr Bulmer, Day 4, pp. 45-48:

'*Q. So far as assumed payment delays are concerned, they have varied quite considerably, would you agree, Mr Bulmer, over the lifetime of the models?*

A. Yes, I would agree with that.

Q. They have been changing because, in a nutshell, you have been trying to fit the modelled aggregate UNL over time to the real total UNL over time as represented by the grossed up COSS data.

A. That is correct, and I think that is important because in developing the distributions of the proportions and the ratios, the degree of mixing of the Kuwait and BA losses in the Kuwait model, for example, I think is crucial. What affects the level of mixing? I think it is three or four things. One thing is how many times the spiral turns. It will also reflect the number of layers into which a programme is divided, it will reflect the number of participants in a layer and it will also reflect to some extent the extent of vertical exhaustion of reinsurance protections which will dampen the spiral. I think all of those are significant inputs into the degree of mixing of the two components of the losses. It seemed to me that it was important that the model spiral should turn approximately the right number of times between the inception of the loss and 1999 when the COSS data is no longer available. Initially the model was producing model UNLs which were too high, and it was for that reason that I increased the waiting times and hence reduced the speed at which the model spiral was developing.

Q. I'm sorry, this may also be an offensive phrase to you, but isn't that "reverse engineering", Mr Bulmer? You are not actually using the payment delays information that you have derived from the COSS database as assumptions, you are working backwards from the answer you want to achieve.

A. No, I think I have been very dispassionate in the sense that the distribution -- I have always take[n] the view that the resulting distributions of proportions or distributions of ratios are whatever they are, the results are whatever they are. But it seems to me that it is important that the model UNL should develop in a way which is similar to the COSS UNLs. I have also paid significant regard to what I

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19 To correct the error made, when grossing up for non-Lloyd's players, of grossing up those parts of the Lloyd's UNL which related to the period when non-Lloyd's players were no longer paying claims.

have learned from the analysis of the actual waiting times from the COSS database. What that showed is that it's not the case that the delays are bunched around a particular value. For example, it is not the case that the delays are bunched around 90 days; there is a wide spread. If the average is 90 days, then the bunching is probably around 60 days, with a very long tail of delays which may run to several hundreds of days. That feature is reflected in my model. The distribution of the waiting times in the model is -- sort of follows that pattern.

Q. Isn't it fair to say that the assumed payment delays which you have used in your models have been chosen not to reflect the data in the COSS database as to reinsurance collections, but in order to generate a closer fit of the modelled UNL to the real UNL as represented by the COSS database?

A. I would respond to that that the real UNL from the COSS database is an important piece of data which I think I need to take into account.'

See also: XX of Mr Bulmer, Day 4, pp. 60-61:

'MR LOCKEY: What I do not understand, Mr Bulmer, is this: did you actually use any of the data to calculate the average waiting times and the distribution of waiting times used in the model?

A. In determining the average waiting times, I placed more weight on the development of the COSS UNLs. In determining the standard deviation of the waiting times, that is the level of dispersion of the waiting times, that was based on the output from the 90V collection history and in particular the output from the COSS database, and I also had regard to the average waiting times coming out of the analysis. I thought it was important in my reports to show how the selected average waiting times compare or how the distribution of waiting times compare with the results emerging from the analysis.

Q. We can certainly agree on this: the exercise involved judgment on your part?

A. Yes.

Q. But you are not able to point to a single calculation in which you've actually used this information?

A. I can only repeat what I have already said, which is that the averages were selected largely to match the development of the COSS UNLs, and the standard deviations were based largely on the level of dispersion which was evident in the data which I had analysed.'

81. The graphs which are set out at pages 68 to 71 of Appendix B (in the case of KAC/BA) **[D2/68-71]** and at pages 112 to 115 of Appendix D (in the case of Exxon) **[D2/112-115]** to Mr Bulmer's Final Report illustrate the process described above, comparing the observed distribution in the actual data (represented on the

graphs in blue) and the fitted distribution which represents the parameters finally input into the model (represented on the graphs by a red line, from which the SAS programme is programmed to take random samples). The original waiting time assumptions are set out in tabular form at paragraph 14 of Appendix A (in the case of KAC/BA) **[D2/40]** and at paragraph 12 of Appendix C (in the case of Exxon) **[D2/85]** to Mr Bulmer's Final Report.

82. The further graphs which are set out at Appendix B (in the case of KAC/BA) **[D5/74-76]** and at Appendix D (in the case of Exxon) **[D5/195-198]** to Mr Bulmer's Supplemental Final Report illustrate the process described above, comparing the observed distribution in the actual data (blue) and the fitted distribution which has been updated to reflect updated waiting time assumptions (red).

83. Mr Sanders endorsed Mr Bulmer's approach to the data (while stating that some of the curves did not fit as well as he would have expected): XX, Day 6, pp. 22-23, 26, 28-29.

84. The updated waiting time assumptions are as follows.

KAC/BA

85. Appendix B to the Supplemental Final Report **[D5/73]**:

Year	**Average delay (in days)**	**Standard deviation of delay (in days)**
1991	55	50
1992	78	72
1993	78	72
1994	117	98
1995	117	98
1996 onwards	146	127

Exxon

86. Appendix F to the Supplemental Final Report [**D5/194**]:

Year	Average delay (in days)	Standard deviation of delay (in days)
1990	106	105
1991	123	137
1992	129	156
1993	134	168
1994	185	207
1995	248	268
1996 onwards	260	268

87. Mr Berry thought it reasonable to have different average delays for KAC/BA as opposed to Exxon, as reinsureds would slow collections down where (as in 1989) there were more losses in a given year in order to maximise their recoveries: Day 3, pp. 44-45. See also: XX of Mr Bulmer, Day 4, p. 125. Mr Sanders also accepted, in cross-examination, that he wouldn't necessarily expect KAC/BA and Exxon to have the same waiting times: Day 6, p. 15.

88. Mr Emney considered the pattern of increasing this to be what one would expect; as the loss gets older, the spiral gets slower and the delays get larger (XX, Day 3, p. 89). Mr Sanders also accepted that, leaving aside the 'kick start' to Exxon in 1996, the trend of increasing delays is what he would expect: XX, Day 6, pp. 16 & 30.

89. So far as concerns the parallel runs of Scenario B, the same payment delays are used for both. Mr Bulmer explains, at paragraphs 2.125 and 2.126 of his Supplemental Final Report why it is reasonable to have done so [**D5/31**]. Mr Sanders criticised this assumption: Final Report, paragraphs 10.7 to 10.10 [**D4/63-**

65] and Second Supplemental Report, paragraphs 7 to 9 [**D7/159-161**]. In outline, Mr Bulmer's position was as follows.

(1) KAC/BA: the BA loss was relatively small compared to the KAC loss and was paid very soon after the KAC loss; as a result, the removal of the BA loss would have been unlikely to have altered the pattern of development of the KAC loss significantly. Mr Sanders accepted this in his Second Supplemental Report (paragraph 8) [**D7/160**]; see also XX, Day 6, pp. 35-36.

(2) Exxon: the acceleration of the Exxon UNL in 1996 and early 1997 was prompted not only by the introduction of the irrecoverable section I and IIIB losses (US$315m plus US$66m respectively) but also that of the larger, recoverable section IIIA losses (US$414). It is simply not possible to say, therefore, whether the rate of acceleration would have been significantly slower if only the recoverable losses had been paid at that stage. This point simply does not appear to have been considered by Mr Sanders: XX, Day 6, pp. 42-43[20]. In XX, Mr Bulmer stated as follows.

> '*Q. So far as the Exxon model is concerned, is it fair to summarise your position thus: you think that there is some merit in Mr Sanders' point that using the same payment delays for the two parallel runs on scenario B is inappropriate, but you don't know to what extent that would influence the result?*
>
> *A. I think a true statement would be that I really do not know whether the payment delays would have been different had the irrecoverable losses not entered the market. I do not know. I think Mr Sanders says in his report that he does not know. I asked the claimant about this, and I think they really weren't very sure about this point. Just to put this in context and to give a little bit of background, what happened in 1996/1997 is that quite a substantial amount of recoverable losses entered the spiral. There would have been US$414 million of Section IIIA recoverable losses and a smaller amount of BP and Arco losses, and those would have provided additional impetus to the spiral, and that can be seen in the development of the COSS UNLs. In addition, there were irrecoverable losses of something of the*

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20 What Mr Sanders *did* do was to suggest, by setting out a misguided 'illustration' which compared the total aggregate UNLs for Exxon on Sensitivity run 18 (which increased the waiting times for the whole period from 1989) against the total aggregate UNLs produced by run 1 of Scenario B, that the adoption of different (increased) waiting times on the counterfactual parallel run (for the period after 1995) in Scenario B might produce a different ratio: Final Report, paragraphs 10.8 and 10.9; XX, Day 6, pp. 37 to 41.

order of US$370 million, a figure for Section I losses which is now 303.5 million, plus 66 million of Section IIIB losses. I just do not know whether the introduction of the sum of those amounts, a total of US$800 million, would have provided an impetus to the spiral that was greater than would have been caused just by the recoverable losses. Also, I think it is true that the irrecoverable losses were the cause of disputes in the markets. So although the irrecoverable losses introduce additional amounts into the spiral, they also introduced additional disputes, and therefore friction, into the spiral. I honestly do not know whether or not the payment delays would have been different had the irrecoverable losses not entered the spiral. I do not know. I think as a hypothesis, yes, it is possible, but I do not know. I haven't found anybody that says that they would know.

Q. Can I just ask you to look at what Mr Sanders has said about this in his second supplemental report, D7, tab 21, at paragraph 7. Mr Sanders says at the foot of page 159: "I would expect for the Exxon model longer payment delays than scenario B runs of the model, which do not include the irrecoverable losses." He then refers to your two sensitivity tests that you have introduced, tests 22 and 23, and the fact that they changed the ratios, reduced the ratios, I would suggest, Mr Bulmer, by a reasonably significant amount. Would you agree that lengthening the payment delays for the second model run would have an impact on the 10th percentile of proportions and ratios?

A. Yes, that is what the sensitivity test shows. If the payment delays were longer in the parallel run, then, yes, the model indicates that that would be the case.

Q. At footnote 2 he says: "In my view, Mr Bulmer should have considered the waiting times beyond 1997 to the model end date. I am not aware of any reason why the new pattern would revert back to the old pattern in 1998 and thereafter. It seems more likely to me that it would continue at the then current rate. Based on the effect of sensitivity 22 and 23 I would expect this to decrease further the 10th percentile of ratios." Is that not right, Mr Bulmer?

A. I am not sure that I would agree with that comment. If the irrecoverable losses provide an additional impetus to the spiral, I cannot see why that additional impetus should necessarily continue for the full extent of the outstanding duration of the spiral. Furthermore, in 1998, the disputes -- essentially, the company market players were stopping paying Exxon losses at that point. The irrecoverable losses were leading to disputes in the markets which were causing the spiral to stop. So I do not think I would agree with that point.' (Day 4, pp. 132-135)

90. Finally, when producing the updated models (for his Supplemental Final Report), Mr Bulmer introduced a constraint which required waiting times to be discarded by the SAS programme if they exceeded 1,000 days, in the case of the KAC/BA model, or 1,500 days, in the case of the Exxon model: paragraph 2.122 of Mr

Bulmer's Supplemental Final Report [**D5/30**]. The purpose of this constraint was to cut down the scope for players to have excessive outstanding recovery amounts/times. Mr Bulmer states in his Supplemental Final Report that the introduction of this constraint had only a small effect on the models' results: paragraphs 6.4 [**D5/47**] (KAC/BA) and 9.4 [**D5/58**] (Exxon). Mr Bulmer explained in XX that the reason for the adoption of different maximum waiting times for KAC/BA and Exxon was that they provided satisfactory results on reasonableness test 1 (development of aggregate UNLs) and were consistent with the fact that the average waiting times were actually longer for Exxon than for KAC/BA: XX, Day 4, p. 126. Contrary to Mr Sanders' criticisms, they were not, therefore, arbitrarily introduced: Mr Sanders' Second Supplemental Report, paragraph 5: **D7/159**.

Relationship between Inwards Exposure and Total Outwards Reinsurance

The 10% Limit

91. An individual player's share of the limit on an individual reinsurance contract was limited to 10% of the total amount of outwards reinsurance protection purchased by that individual player: paragraph 43 of Appendix B (KAC/BA) [**D2/71**] and paragraph 41 of Appendix D (Exxon) [**D2/116**] to Mr Bulmer's Final Report. The purpose of this assumption was to achieve a degree of consistency between the extent of inwards exposures and outwards reinsurance protections purchased by individual players. If it had not been introduced, there would have been players for which the inwards exposure on a single contract would be a substantial proportion of total outwards protection. Mr Berry confirmed that this was a reasonable assumption: Report, paragraph 2.11(C): '*For example, if a syndicate's aggregate outwards protections were £100m, I would be surprised if its total exposure on a single contract exceeded £10m*' [**D3/Tab 5/Page 5**].

Reinsurance Coverage Groups / Share Groups ("The Matrix")

92. It will be recalled that each of the players is allocated to one of 5 "reinsurance coverage groups" depending upon the total amount of reinsurance coverage that

the player is calculated to have purchased. The purpose of the allocation is to ensure that, when the time comes for the spreadsheet to determine which players will be writing lines on particular layers of other players' reinsurance and what the size of such lines will be, the larger players will tend to write the larger shares of individual reinsurance layers. This is explained by Mr Bulmer at paragraphs 6.6 (in respect of KAC/BA) and 9.6 (in respect of Exxon) of his Supplemental Final Report **[D5/48-49; 59-60]** and was accepted by Mr Sanders to be a reasonable and realistic thing to seek to achieve (XX, Day 5, p. 115). In short:

(1) Those players who are allocated to "reinsurance coverage group 1" will be the top 20% of players who have the most outwards reinsurance[22]; those players who are allocated to "reinsurance coverage group 2" will be the 20% of players who have the next largest amount of outwards reinsurance; and so on.

(2) Each member of each "reinsurance coverage group" is, in turn, allocated to a "share group", with "share group 1" being the players designated to write the largest lines on inwards contracts, "share group 2" being the players designated to write the next largest lines on inwards contracts, and so on.

(3) In order to obtain some diversity, it is not assumed (for example) that all of the largest lines will be written by those with the largest reinsurance programmes; it is assumed that most such lines will be written by those with the largest reinsurance programmes, but a number of them will be written by those with the next largest reinsurance programmes. i.e. it is assumed that a certain percentage of the largest lines will be written by those who come from "reinsurance coverage group 1" and a certain percentage will be written by those who come from "reinsurance coverage group 2". Thus, for example, on the KAC/BA model, it is assumed that

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22 The ranking is performed according to the total amount of XL on XL cover that the players have purchased (save where the players in question do not have XL on XL cover (e.g. aviation players in the KAC/BA model), in which case they are ranked according to the total amount of Whole Account cover that they have purchased).

75% of the players with the most reinsurance will be allocated to "share group 1" (writing the largest lines on inwards contracts) 25% of the players with the most reinsurance will be allocated to "share group 2" (writing the next largest lines on inwards contracts).

93. This allocation is based upon a new assumption which was made and explained by Mr Bulmer in his Supplemental Final Report (at paragraph 6.6 in respect of KAC/BA [**D5/48-49**] and at paragraph 9.6 in respect of Exxon [**D5/59-60**]), introduced in response to criticism from Mr Sanders.

94. The original assumption was that the ratio of a player's outwards reinsurance protection to total inwards exposure was subject to a minimum percentage, ranging from 35 to 65%. The original assumption was explained at paragraph 13(B) of Appendix A [**D2/39**] and paragraph 44 of Appendix B [**D2/72**] (in the case of KAC/BA) and paragraph 11(B) of Appendix C [**D2/84**] and paragraph 42 of Appendix D [**D2/117**] (in the case of Exxon) to the Final Report. In short, the original assumption was that 25% of players would have a minimum ratio of 35%, 25% would have a minimum ratio of 45%, 25% of players would have a minimum ratio of 55% and 25% of players would have a minimum ratio of 65%. In practical terms, this meant that, for example, a player with a minimum ratio of 35% would be subject to the following constraint when writing inwards business: if it had outwards reinsurance of £35m, it would not be able to write more than £100m (in total) of inwards business. The purpose of this constraint was to prevent players from writing so much inwards business that they burnt through their reinsurance cover far more rapidly than was supported by the data relating to actual spiral participants. The assumption was, however, superseded by the "reinsurance groups" approach, which itself imposes a correlation between the writing of inwards business and outwards protection and which also prevents the overly rapid vertical exhaustion of players' outwards reinsurance: paragraphs 6.7 [**D5/49**] and 9.7 [**D5/60**] of Mr Bulmer's Supplemental Final Report; paragraph 13 of Mr Sanders' Second Supplemental Report [**D7/163**] and XX of Mr Sanders, Day 5, pp. 114-115.

95. Mr Bulmer explained the background to the adoption and subsequent removal of this assumption, in XX, as follows.