Tuesday, 1 February 2011

(10.00 am)

MR KEITH: It may be my Lady that Ms Gallagher has been detained. In those circumstances, Mr Patterson has kindly agreed to go first, if that meets with my Lady's approval.

LADY JUSTICE HALLETT: Have we had any message? It's very unlike Ms Gallagher.

MR PATTERSON: I gather ten minutes.

LADY JUSTICE HALLETT: Is she happy that we carry on?

MR PATTERSON: She invited, I think, that I should go before her, my Lady.

LADY JUSTICE HALLETT: Thank you.

MR PATTERSON: I'm grateful.

COLONEL PETER FRANCIS MAHONEY (continued)

Cross-examination by MR PATTERSON

MR PATTERSON: Colonel Mahoney, may I begin by expressing gratitude from those families whom I represent for the reports that you've prepared in relation to their loved ones who died; that's the Trivedi family, the Mozakka family and the family of Philip Beer.

In fact, those three deceased in many ways cover quite a spectrum of different types of casualty, don't they? Because, at one extreme, we have Mrs Trivedi, who, as you told us yesterday, clearly died instantly,

and you referred to the non-survivable injuries.
I don't go into the detail, but you may recall how close she was to Jermaine Lindsay's bomb in that first carriage at King's Cross.
A. Yes, I can picture all her injuries.
Q. Yes. I don't ask you anything about that case. The next of the three, Behnaz Mozakka, might I just explore one matter with you in relation to that, please? It's your report at page 50, and I don't know if you have it there, Colonel, but at section D5 you dealt with injury mechanisms.
A. Yes.
Q. Again, I don't go into the details. The family have read with care your conclusions. But certainly, at D5.1, you refer to the effects of heat --
A. Yes.
Q. -- and the heat damage. At 5.2, you refer to the foreign objects, and you touched upon this yesterday. Bone fragments that must have been blasted from one lower leg area to the other lower leg area --
A. Yes.
Q. -- and you referred to the energy that would have been required to cause that.
Then, at D5.3, you refer to Mr Hepper's analysis and how he concluded that this was indicative of her being

in close proximity to the blast because of the energy required to cause those sorts of injuries to the legs in particular.

Then just looking, please, in that paragraph, I think Dr Kirkman stated that it was highly likely that anyone within two metres of the device would suffer from primary blast lung injury and, based on the external injuries, Behnaz Mozakka was at short range to the device.

A. Yes.

Q. Does it follow from that, given what we know about where the body was found -- namely, in that double doorway quite close to where the bomb exploded -- that there was a high likelihood of blast lung injury?

A. Yes, I think if we take the other injuries that Mrs Mozakka had as indicators of her proximity and take the engineering advice and modelling advice and physiology advice from my colleagues, all of that adds up to saying that she was very close to the bomb and that would be consistent with the -- with their estimates that she would have had severe blast lung injury.

Q. Then the conclusion at D6.1 is that:

"On the balance of probabilities, she was close to the bomb when it exploded. She suffered non-survivable

internal blast injury and died when the bomb exploded or soon afterwards."

A. Yes.

Q. The family, in particular, are keen to explore, if possible, whether you can help with, if she didn't die instantly, how long she might have survived before dying. Is there anything that you can cite that would help us explore that question?

A. No, I don't think there is, other than to say if you take the reasoning thus far, if we can agree the reasoning thus far, that she was that close, and if we can agree that you had that sort of overpressure and this is somebody who we do not have evidence of her being alive after the explosion, our expectation, is -- all I can say is, at the time of explosion, or very soon afterwards, my expectation -- and I don't have definite evidence for this, but my expectation, from everything that comes together, is you're talking about minutes, if at all.

But when we look at -- again, add all the injuries up and add up the train of reasoning, it is highly likely that she died at the time of the explosion, but I cannot be more precise than that.

Q. So highly likely that she died instantly, but possibly survived for a few minutes?

A. Yes, and I think you have other casualties within the carriage that demonstrate that range of experience.
Q. Then turning to the third family that I represent and in respect of whom you prepared a report, Philip Beer, and dealing first of all, please, Colonel, with the period of time that it's believed that he was still alive --
A. If you give me one moment, I'm just searching out Mr Beer's report. Other than that, if we could have the documents displayed on the screen, that would be ideal.
Q. Perhaps if we look at your time-line, which is at page 78 and your report is INQ11064 [INQ11064-78].
A. Yes.
Q. I see we have the time-line there. Certainly we know in particular from a passenger, Paul Mitchell, who survived and who gave evidence, that Mr Mitchell was with Philip Beer for quite some time and, indeed, when Mr Mitchell was finally removed by paramedics, Philip Beer cried out with pain when Mr Mitchell got up off his leg and was removed from the carriage and, as the time-line indicates, the estimate is that that was at about 9.50.
A. Yes.
Q. So a little over one hour after the explosion at 8.49, and then, as we can see from the time-line, the paramedic who dealt with Mr Beer, Peter Taylor, the

estimate given there is 9.50. In fact, it may have been slightly longer than that, because the evidence of Mr Taylor was that it was at 8.45 that he started off into the tunnel, that he triaged and dealt with some casualties both on the track and then once he was on the train, so that by the time he got up to the first carriage where Philip Beer was lying, he agreed that it was possibly something like 9.55. So certainly it's over an hour after the explosion.

I think it's clear from what you said yesterday, Colonel, that all these hundreds and thousands of hours that you and your team spent analysing these various issues, the work that you had to put in would have been a lot easier if you'd had the benefit of internal examinations. Is that right?

A. Yes, if we look at our military casualties, they have internal post-mortems and the majority of them have a post-mortem CT scan. So they have a complete, whole-body CT scan which looks for fragments, makes sure that there's no retained ordnance, but also means that you have a clear record of internal injuries.

Q. So, for example, if an expert like yourself or a family want to know about the internal injuries and whether, for instance, there was this leathering effect in the lungs that you spoke of yesterday, an internal

examination might answer that, X-rays might answer that. Is that right?
A. We rely on a combination of both.
Q. We are denied both in this case, is that the position? We don't have either?
A. Well, the only information that we have evidence of is an external examination and the fluoroscopic examination which comments on fragments but does not comment on internal injury.
Q. So for Philip Beer, we can never say with any certainty what the mechanism of death was, the precise cause of death? We know obviously that the cause of death in the broadest sense was the explosion, the bomb that exploded caused by Jermaine Lindsay, but the precise mechanism of death is something we can't ever say with certainty?
A. No. I mean, I think I wouldn't be -- I cannot add anything more to my explanation from yesterday. If we accept the reasoning of the report, blast lung is a possibility. But there are other potential causes of death. Do you want me to run through them?
Q. I'd love to go through them with you in a moment, if I may. Before we do that, can we deal with the puffed-out chest, because there was evidence, was there not, from the paramedic, Peter Taylor, that he saw what he described as a puffed-out chest --

A. Yes.
Q. -- when he triaged Philip Beer?
I think you've considered this in your report and you noticed that this wasn't something that was seen in the scene photographs.
A. Correct.
Q. So they were taken when Philip Beer's body was still on the train, I think it was on 8 July, and so, at that stage, it wasn't visible. I think the word you used was "distending" of the abdomen?
A. D6.2, I think, yes.
Q. Secondly, this was a feature that wasn't described by the pathologist who conducted the post-mortem on 12 July.
A. Yes.
Q. So five days later. Can you help us, Colonel, can you explain why a puffed-out chest might have been seen at the time by a paramedic but would have been absent a day later when photographs were taken and five days later when the post-mortem was conducted?
A. I think my difficulty is it's a very vague description and you can interpret it a number of ways. If we interpret it to mean that Mr Beer's chest looked expanded, you have a number of explanations. One explanation could be that he was breathing hard because

he had difficulty breathing due to a number of potential mechanisms, and what you were seeing was someone trying very hard, in their position -- what people tend to do when they're having difficulty breathing is prop themselves up and try to expand the chest as much as they can and use the accessory muscles of respiration in the neck and the top of the chest.

Q. Not an internal injury?

A. An internal injury is the -- is what makes you short of oxygen, and then the response of the person to that shortage of oxygen is to breathe very hard.

So one possibility is that the description is of somebody whose posture was making them breathe very hard, and their chest could looked puffed out. The other possibility is that you're looking at an internal injury, you're looking at something within the chest causing the chest to appear expanded.

Then, if you go down that line of reasoning, the conditions that could cause the chest to look expanded are an air leak, as discussed yesterday, and there are reports of blast lung having that appearance in the literature, but I have never seen that appearance myself, so I cannot verify that from my own experience.

Q. What about bleeding into the chest?

A. Bleeding into the chest -- the chest is a rigid -- when

the chest is intact, it's a relatively rigid structure. Let me rephrase that. You have a bony confine to the chest, so whereas, if you've got bleeding into the abdomen, which has got a soft front to it, you can see distension. Generally, bleeding into the chest won't cause the chest to sort of distend. You need something under pressure to cause the chest to look distended, and for that you're really talking about an air collection.

Q. So of the three possible internal injuries that you said Philip Beer could have had, the puffed-out chest as described by the paramedic could be evidence that he had a punctured lung --

A. Yes.

Q. -- rather than blast lung injury?

A. Yes, it could.

Q. The fact that it wasn't seen a day later and five days later, is there anything unusual about that?

A. Again, that's into post-mortem changes and really, for that, you'd want a forensic pathologist or a pathologist to discuss that.

Q. Can I ask you, please, Colonel, about his proximity to the bomb? Could we see on the screen, please, the schematic diagram for carriage 1? It's INQ10283. I think it's page 10 [INQ10283-10]. We can see there, Colonel, that the approximate

position of the explosion is by double doors D5.
A. Yes.
Q. Can you indicate, please, where you understand that Philip Beer was positioned, where he was standing at the time of the explosion?
A. Again, as I think it says in the report, we do not have confirmation of where he was standing. My understanding, from the reading of the evidence, is he was somewhere within that region.
Q. I think Patrick Barnes is cited in the report as the evidence for that.
A. Yes.
Q. We can look at it, if necessary. There is a diagram from Patrick Barnes that suggested that the position was -- do you see seat 90 or position 90?
A. Yes, I do.
Q. So somewhere around that. Would that be the basis for the assumption that it was two and a quarter metres from the explosion?
A. I think Mr Hepper is basing that -- his view on the distance from Mr Barnes' statement, yes. But we do not have anything saying for definite: this is where Mr Beer was placed.
Also, I think we had agreed that the density of people within this carriage is such that it's difficult

to be precise about where people were placed.
Q. There was evidence given by the survivor I've mentioned already -- Paul Mitchell -- that, when he got on to the carriage, he ended up at about position 98. Do you see that? So he would have stepped on, turned left, and moved about halfway down towards the rear of the carriage.
A. Yes.
Q. He said that Philip Beer was right behind him. So, if that's right and Philip Beer was close to position 98, clearly he was a lot further away from the explosion than --
A. Absolutely.
Q. -- you have assumed.
A. And I think, as I've stated all the way through, we based the conclusions on the evidence that was presented to us, not on subsequent transcripts, and if there is evidence that places people in a very different part of the carriage, then clearly you could interpret the injuries differently.
However, Mr Beer does have other injuries which could indicate proximity to the explosion.
Q. Absolutely. I want to ask you about those physical injuries in a moment to the legs, but just dealing with this: if that's right and that he was, as Mr Mitchell

says, perhaps about 4 or 5 metres away from the blast, looking at your table at page 84 [INQ11064-84]of your report, the blast loading, if you are less than 3 metres from the seat of explosion, is very severe, but if it's above 3 metres from the seat of the explosion, it's categorised as minor.
A. Yes.
Q. So is that right, that if Philip Beer, as Mr Mitchell suggests, was something like 4 or 5 metres from the explosion, it would be minor blast loading?
A. Well, if Mr Beer is in the position further away down the carriage, yes, quite possibly he was subjected to less blast loading. I do not argue that.
Based on the evidence that was presented to us and his injuries, we would place him close in. But if there's evidence putting him elsewhere, then you need to look at other injury mechanisms.
Q. Again, looking at your tables, on page 84, the degree of blast loading, when minor, is to be equated with lung injury categorised as minimal, if any?
A. Yes.
Q. So less likelihood of blast lung injury?
A. Agreed, which would then lead you to other potential causes of lung pathology.
Q. Absolutely. Finally, before we leave blast loading,

presumably there would be other factors that would be relevant to the amount of blast waves or blast loading that would be suffered by a particular casualty? There would be issues such as the number of passengers between the explosion and the person that you are considering?
A. Yes.
Q. Whether that screen, that draught screen that we know the bomber was next to, whether it provided any kind of shielding or barrier?
A. Yes.
Q. Whether the bomber was in some way himself shielding the blast, we know that there is a biological anthropologist to give evidence shortly, who states that the fragmentation of Lindsay's face was such that his face may have been positioned over the device?
A. Yes.
Q. So again, would that be relevant, perhaps, in reducing the amount of blast wave that might be transmitted?
A. If we look at the complex modelling, these are all factors that Dr Pope has looked to take into consideration, but there's no question, if you place something between an explosive and an individual and something can absorb the energy, then you can deliver less energy to the individual.
Clearly I'm not an expert in blast or blast physics,

but I look at casualties I've dealt with from vehicles and dismounted casualties, it's almost stating the obvious, you shelter somebody, and unless the blast has found a way round that shelter, bounced off something else and hurt them, as in the bunker-type situations I described yesterday, then, yes, you've absorbed energy.

Q. Turning then to the possible internal injuries, you've already said that the puffed-out chest would be consistent with an air leak.

A. Possibly, yes.

Q. We know that this was a casualty who was still breathing and still speaking over an hour after the explosion. Does that suggest perhaps less likely to be blast lung, more likely to be something else?

A. No. The time history and the speaking is consistent with somebody with blast lung, but equally, it could be somebody with an air leak from a punctured lung, unless you've got more detail such as how they responded to an intervention or evidence of a -- physical evidence of puncture. With the evidence I have, I can't be more precise.

Q. So that doesn't help us. What about frothing to the mouth? I think your report indicates that clear fluid and evidence of frothing around the mouth is often to be

found with blast lung injury.
A. It's certainly reported, it's reported as an indication of widespread damage within the lung structure, and it's reported as one of the symptomatic features of blast lung, but you don't always see it.
Q. So you don't always see it. But the help that we can get from that feature is this, is it not, that the paramedic, Mr Taylor, who said that he triaged him and opened his airway and carried out a few tests, he indicated that there was no frothing around the mouth. Is that a relevant factor there for militating perhaps against blast lung injury?
A. I don't think so. You can see it, you may not see it, and in a lot of the other victims who have also got good time histories for blast lung injury, it hasn't been described. It certainly is described in the literature, but it's not a consistent finding.
Q. Is it clear fluid that we see frothing sometimes, or is it blood that we see frothing, or possibly both?
A. It can be both, can be either.
Q. Caused by blast lung injury?
A. Yes. If you've got bloodstained fluid, it indicates you've got active bleeding in the lung. If you've got more clear fluid, it can indicate you don't necessarily have active bleeding but you do have disruption of lung

structure.
Q. So if there's active bleeding in the lung, that would be possibly caused by blast lung and possibly resulting in frothing blood?
A. It could, but you can have active bleeding from other causes as well.
Q. From other causes?
A. Yes.
Q. Of the various survivors who remember talking to or having dealings with Philip Beer and the various descriptions about the words that he was speaking and his behaviour and so forth, none of those witnesses describe repeated coughing, and I think repeated coughing is also described in the literature as something that you sometimes get from blast lung injury. Is that right?
A. Coughing really just indicates you've got something irritating the airway. You can see it with most chest injuries and, yes, you could have it, but equally, you might not have it.
Q. So the absence of any evidence of that doesn't help us either, does it?
A. No.
Q. Then finally, Colonel, could you assist, please, with treatment? We've already established that, if it was

blast lung, treatment that can be given that can ameliorate the difficulty is oxygen, and then, in the normal way of things, the normal treatment that somebody would receive would include, I think you said, a ventilator?

A. Oxygen will initially buy you time. You're not treating the blast lung with oxygen. What you're doing is you're trying to make up for the fact that some of the patient's or casualty's normal lung function has been damaged. So oxygen is buying you time to improve oxygen levels in the blood, to improve oxygen delivery to other parts of the body.

But the effect of that will really depend on how much of the lung has been damaged. So in a very severe injury, you really won't see an effect. With an intermediate injury you may see an effect. And then, if you can get somebody with blast lung injury into a hospital and give them intensive care treatment, including ventilation and including other ways of supporting lung function, what you're then doing is trying to give the lung time to recover and heal, if it's able to do so while you support other body functions.

Q. So it depends on the severity of the blast lung --

A. Yes, it does.

Q. -- if it is blast lung?
Going back to your tables, if the blast loading is minor, as the distance might suggest, and if the lung injury is minimal, if any, if the table is to be followed in relation to the distance and the minor likelihood of blast loading, that might also suggest, therefore, a greater chance of survivability --
A. Yes.
Q. -- if oxygen is given and appropriate treatment?
A. Yes, you could have people coming in with blast-related chest injury who can walk in and have a very uneventful time course in hospital. Equally, you can have people who deteriorate very, very quickly. But it's a reflection of the underlying damage to the lung.
Q. Then treatment, if it was one of the other internal injuries that you've postulated, bleeding into the chest, again that could be treated, presumably, by the removal of the blood, chest drains and the like?
A. A chest drain is something to think of to remove either blood or fluid to allow the underlying lung to expand and improve oxygenation.
If you've got bleeding into the chest, for a lot of chest injuries the bleeding is due to fairly minor blood vessels being injured, if you look at blunt trauma, and all you need to do is use a chest drain for that. If

you've got significant bleeding from another, a larger structure in the chest, then you're going down the route to look for surgical intervention.
Q. But chest drains are something that are used on occasions by HEMS doctors and by paramedics when the need arises?
A. More HEMS doctors. My understanding of current protocols -- again, as stated yesterday, it's been a year since I've been doing pre-hospital care, but the protocols that we were working to was that paramedics could do chest decompression but you would expect a doctor to insert a chest drain.
Q. If it was bleeding into the chest, what's the likelihood of him having survived, if he had received, to use your assumption, I think it was "normal, adequate treatment" was what you described yesterday?
A. Well, again, I can't give you any accuracy on that because, again, it's supposition, we don't know -- bleeding into the chest can be so many things. Bleeding into the chest from a minor injury is one life pathway. Bleeding into the chest from a major vascular injury is another life pathway. So really, I can't offer you a meaningful interpretation of that.
Q. So it may be that he could have survived and made a full recovery, if it was bleeding into the chest?

A. No. Go back to my previous answer. It depends on what the cause of a bleed into the chest is.
Q. Exactly.
A. If you had someone who is respiratory distressed from bleeding into the chest, but it's not a catastrophic internal injury, yes, a chest drain could release blood and, yes, that is somebody who could have their respiratory function improve.
If you are bleeding into the chest from a catastrophic injury, then putting a chest drain in may not alter survival. But, on the information I have, I can't give you any more precise answer than that.
Q. So it sounds as though you can put it no higher than: possibly would have survived?
A. Again, if you're supposing that Mr Beer had something other than blast lung, and if Mr Beer had injuries that would be treatable by a chest drain, then you're going down one route of treatment and one route, potentially, of survival. But on the information that I've got, I can't quantify or qualify that for you.
Q. Then the third possible internal injury that you posited was punctured lung.
A. Yes.
Q. Pneumothorax.
A. Yes.

Q. Again, treatment could have been given for that, if that was the problem, by a paramedic or by a HEMS doctor?
A. Yes, if you've got a leak from the lung, the treatment is either what's called decompression, which is using a needle which has been described in some of the other casualties to release pressure, or it can be a chest drain which also releases pressure in the chest and allows a continued air leak to be vented.
Q. I think in relation to one of the other casualties that you looked at, Shelley Mather, there was an example there of the insertion of a chest tube --
A. Yes, there was.
Q. -- at the scene to remove the --
A. Not a chest tube. There was an example of a decompression with a small cannula.
Q. Yes.
A. Yes.
Q. So again, obviously we don't know the precise internal injury, but if it was punctured lung, there was treatment that could have been given and he might have survived?
A. Possibly, if it was punctured lung.
LADY JUSTICE HALLETT: Can we go back to the factors you took into account in coming to your conclusions on the balance of probabilities?

A. Yes.
LADY JUSTICE HALLETT: Mr Patterson has put a large number of possible factors affecting your conclusions to you, but do I take it, from reading your report, those are all factors that you and your colleagues very much took into account in forming your conclusions?
A. Yes, I took in -- the team took into -- took the view that, if we place Mr Beer in the area we expected him to be -- close to the bomb, given his other injuries -- and if we take the explosive output and the effects to be those that Dr Kirkman, Mr Hepper and Dr Pope calculated, under that basis we would expect Mr Beer to have -- likely to have significant blast loading and have a blast lung injury.
LADY JUSTICE HALLETT: I noted, when you were expressing your conclusion yesterday, you noted his very severe injuries, including the loss of his leg, the nature of the burning to the injuries and the nature of the fractures. They were all, in your collective conclusions, likely to have meant that he was close to the seat of the bomb --
A. Yes.
LADY JUSTICE HALLETT: -- and he had also impacted against a solid object?
A. Again, I still stand by that. I'm not contradicting

a witness or contradicting the fact that some could be different, but we're reading the information in front of us and we're reading the injuries in front of us, and I think it's paragraph D5.4 I talk about the amputations, we talk about the blunt impact to his jaw, and we talk about the associated tissue loss, and just based on that and -- I beg your pardon, 5.1, we talk about the images demonstrating facial injury and what we interpreted as facial burns and, in our experience, that would place Mr Beer close to the seat of the explosion.

LADY JUSTICE HALLETT: Thank you.

MR PATTERSON: Could those leg injuries and those burn injuries have been suffered by Mr Beer if he was further down the carriage towards position 98, as the witness Mr Mitchell suggests?

A. Again, in our experience, based on our work and based on the work we did for the inquest, our experience would place those injuries -- would place someone with those injuries closer to the explosion.

Having said that, as I've said from the beginning and as is stated in the reports, the characteristics of these explosives have a number of -- a number of characteristics which are different to the type of explosives we normally deal with as stated in there, and there have to be error bars in our interpretation.

But our interpretation would place Mr Beer closer to the seat of the explosion.

Q. Is it possible that those injuries could have been suffered by him if he was further along towards position 98?

A. If you had sufficient -- again, if you had sufficient temperature and sufficient blast effect, you could injure somebody further away from the seat of the explosion, but the implication is the explosive products and the explosive force has been channelled along further down the carriageway.

Now, to answer that categorically, what we would really need to see was the injury patterns in all the surrounding people and relate the injury patterns to that individual to those other injury patterns, which has not been part of our original instruction.

Q. Finally, this please, Colonel: at the top of page 52 your conclusions that there is insufficient evidence to say for certain whether his injuries were survivable or non-survivable.

A. Yes.

Q. Does it follow from that, therefore, that it is possible that his injuries were such that, with earlier removal from the train, and with resuscitation, if necessary, and with appropriate treatment, that he might have

survived?
A. If we accept our reasoning that Mr Beer was close to the seat of the explosion, based on the injuries that we've described and our initial reasoning that we think he had a high blast lung -- a high likelihood of blast lung because of the overpressure, that would push you more towards injury being -- survival being less likely.
If you think, or there's evidence, that Mr Beer had a different chest injury, that would make survival potentially more likely. But on the evidence that we've got our -- my interpretation and the interpretation of my team would place him closer to the seat of the explosion than was indicated on the map.
But to answer it -- to answer that appropriately, we'd really need to see an injury map of all the injuries around him or where the position you believe he may have been, and only then, by mapping all the injuries and the outcomes of people, can you say, yes or no, that's how the explosive products propagated.
I can't be more precise than that.
Q. You've indicated the uncertainty and so forth, but can you rule out that he possibly might have survived?
A. I cannot rule out, as it states in -- I think where it states in our conclusion, "There is insufficient evidence" -- I'll read it verbatim -- "to say for

certain whether his injuries were survivable or non-survivable". I don't think I can say it any more precisely than that.

MR PATTERSON: Thank you very much.

A. Thank you.

LADY JUSTICE HALLETT: Ms Gallagher?

MS GALLAGHER: My Lady, if I could just apologise to yourselves and the Inquest team, and to you, for the delay in my arrival, not baby-related, despite my obvious condition. In fact, asthma-related. So I'm very grateful to Mr Patterson for going first.

LADY JUSTICE HALLETT: No apology necessary, Ms Gallagher.

Questions by MS GALLAGHER

MS GALLAGHER: Thank you.

Colonel, could I just commence by asking you about some general issues, and then I'm going to turn to some specific questions about two individual deceased, Miriam Hyman and Michael or "Stan" Brewster.

So first of all, in relation to the general issues, Colonel, in respect of the individual deceased, your task, as set out in each individual report, paragraphs 2.1 and 2.2, was to address the following questions.

First, whether or not the 18 deceased you were asked to look at did or did not, on the balance of

probabilities, receive injuries that were survivable, and then, in particular, you were given these two questions: firstly, on the balance of probabilities, what internal injuries did they have; and then, secondly, on the basis of that, those internal injuries, plus observable external injuries, what were the prospects of this particular deceased surviving at all?
A. Yes.
Q. Applying those tests to the 18 people, in summary, from the reports and from your evidence yesterday, of those 18 individuals you were asked to assess, you've concluded that 15 were non-survivable or "survival was unlikely", to use the phrase that you used in the Carrie Taylor report, but you've made clear yesterday that overall group of 15 includes both more obvious or clear-cut cases and also some more difficult, complex or even borderline cases.
A. Yes.
Q. In relation to the other three people, you simply couldn't reach a conclusion. You've said in the report for Samantha Badham and Philip Beer "insufficient evidence".
A. Yes.
Q. And Shelley Mather it's "I can't say"?
A. Yes.

Q. So in relation to the 15 on which conclusions have been reached, Colonel, albeit on the balance of probabilities and subject to many caveats, could I just summarise the different categories of material which were presented to you, so the raw data that you were given and the evidential difficulties that they presented?
Firstly, there's the post-mortems. As you've said on a number of occasions, they were external only, not internal, and also there were delays of a number of days before they were performed --
A. Yes.
Q. -- which undermines to a certain extent references made to external appearance.
A. It undermines references made to external appearance from photographs taken during the post-mortem process. Photographs taken closer to the -- on the scene or closer to the time the bombs were detonated, a number of those have much clearer appearance.
Q. Yes, I was going to come on to those. So the post-mortem photographs, as you've said, interpreting how injuries appear in photographs is obviously difficult in any event, but there's additional difficulties with the post-mortem photographs. That was the second category I was going to refer to. The third one is the scene photographs. As you've said, they were

taken closer in time to the explosions than the post-mortem photographs, but there were particular difficulties in using them as interpretative aids also, weren't there?
A. There's always difficulties just from looking at a photograph. There has to be, because you're relying on the way the photograph's taken and what is evident to you.
Q. Of course, and with those scene photographs, well, firstly, they're not taken from all angles -- understandably, because they weren't taken for the purpose that you've now used them -- but isn't it also right that they were taken, in many instances, after the bodies had been moved or rearranged?
A. Yes, as stated in the reports.
Q. Also, the bodies are generally clothed, unless their clothing has been blown off or removed by emergency services personnel. So again, that makes it difficult as an interpretative aid to possible internal injuries, external indications of internal injuries?
A. Yes, and the only way to do that is to take into account the pathologist's view in the external report, interpretation of the external post-mortem photographs, and you've a highlight of the difficulties with that, and dovetail that with the scene photographs.

Q. Certainly. The fourth category, then, you've referred yesterday, in answer to questions from my learned friend Mr Keith, to there not being full X-rays, so fluoroscopy only, the more limited form. Is this of particular relevance in relation to blast lung?
A. Yes.
Q. Because, is it right that chest radiography is considered a necessary diagnostic evaluation for blast lung and often there's a characteristic butterfly pattern? Is that right?
A. There's no question that chest radiography is enormously helpful when you're diagnosing blast lung. If you were treating someone or looking after somebody after an explosion and they were short of breath or complaining of difficulty breathing, blast lung would have to be one of the things that you consider.
But for a clear diagnosis, it is very helpful -- not essential, but very helpful -- to have either CT images or X-ray images, and that clearly has made our interpretation very complicated.
Q. The fifth category of material, then, the raw data that you were provided with was the witness statements.
A. Yes.
Q. We've heard reference to some of the difficulties, most notably the fact that the witnesses, when they gave oral

evidence, often clarified or changed their position, and we know that you had information from the Inquest team in relation to Aldgate and Edgware Road before embarking upon phase 2, so you knew about the oral evidence there. But you were, of course, even in those instances, heavily reliant on their summary of the oral evidence?
A. We were reliant on the time-line as presented in our reports.
Q. In relation to King's Cross and Tavistock Square, we know you received some updates -- reference has been made to Christian Small and Garri Hollness -- but you didn't have the full time-lines in relation to them.
A. Yes.
Q. There's a number of further difficulties with the witness statements and, indeed, with the oral evidence which haven't been referred to.
Obviously, with oral evidence, there's the passage of time. We've witnesses recalling events five years ago. Many of the witnesses we've heard from over the past four months have been distressed or confused, where they've blurred their memories of what occurred with subsequent extensive press coverage, so quite often they've come to believe that someone they were dealing with must have been a particular person they've seen in photographs and, in fact, the evidence shows that must

be wrong.
There are also conflicts in the witness evidence.
Very difficult for you to work on that when you haven't heard from the witnesses and, necessarily, that would be an imprecise science.
Also, Colonel, many witnesses only gave their original written statements in 2006, so many months after the bombings and, in fact, with some witnesses, they only gave their original statements much more recently when contact was made with them by the Inquest team.
So even the written statements aren't contemporaneous, many of them are many months after.
A. No question. It's a complex task and it is not the way you would choose to give a cause of death on an individual.
Q. Of course. Also, as well, in relation to three of the scenes, there's the conditions, because, as we've heard in evidence, there was a lack of light, poor light on the Tube trains, plainly less of an issue in relation to Tavistock Square. So in addition to confusion, passage of time and so on, there's also just the fact that many witnesses are describing things which they were seeing in the half-light in these tremendously difficult circumstances.

The sixth category of raw data which you were given essentially came from the Metropolitan Police Service, so it was the scene reports and the seating plans, but of course, they were based in large part on the written witness evidence which we've just discussed.

Just to give an example of some of those difficulties, could we have [INQ10282-8] on screen, which is a document you've seen before? It's from Edgware Road. It's referred to in your report.

I represent the family of "Stan" or Mike Brewster who's at number 14. You can see interposed between him and the bomber is number 13, a gentleman called Danny Biddle, who, in fact, survived, despite, according to this analysis, being closer.

From the witness evidence in relation to Edgware Road, Colonel, the accuracy of that graph is in doubt for a number of reasons.

Firstly, a number of witnesses didn't recall seeing the area of these doors, D3, D4, so crowded. We heard some evidence which would suggest that Laura Webb and Jonathan Downey, who were 8 and 9 on this graph, in fact were much further along towards doors D1 and D2, so they perhaps weren't thrown as far by the blast as this graph would suggest, because we know they end up at the other end of the train. Some of the evidence suggested they,

in fact, had been further along, in any event.
Also, there's a suggestion --
MR KEITH: I'm very sorry to rise to my feet. For my part, and it may be the witness's part as well, I would be greatly assisted if we knew whether or not the Colonel's conclusions in relation to Mr Brewster are being challenged, because that will then put these questions about the reliability of his evidence into some sort of context.
MS GALLAGHER: Yes, we do have a challenge, both on behalf of Miriam Hyman and Stan Brewster.
A. Then give me a scene photograph, ma'am.
LADY JUSTICE HALLETT: Sorry?
A. If you want to challenge it, I need the scene photographs and I'll take you through exactly what our conclusions are, and I mean a clinical scene photograph.
LADY JUSTICE HALLETT: You mean showing the bodies in situ?
A. If you want me to explain why we've come to the conclusions that we have, that's what I need to do.
MS GALLAGHER: My Lady, for present purposes, I'm just using this as an example in relation to some difficulties with graphs. I would need to speak to the family, who are in court, about that. I plainly have instructions to put certain matters.
Could I conclude with the general questions and the

questions in relation to Miriam Hyman before taking instructions in relation to Michael Brewster? Thank you.

LADY JUSTICE HALLETT: I also think people need to give some thought as to, if I allow the photographs to be shown in court, are they to be shown in the annexes and are they to be then, as it were, published?

MS GALLAGHER: Absolutely. My Lady, Michael Brewster's sister is in court with her husband. The remainder of the family, whom I represent, aren't in court.

I clearly would need their instructions too. But I can certainly deal with the general matters and then also deal with the Miriam Hyman issues and then take instructions.

LADY JUSTICE HALLETT: For various and important reasons, the Colonel can't return after today.

A. No.

MS GALLAGHER: Is the photograph available in court? Do you have the photograph you're referring to in court?

A. No, it's held by the Inquest team. But if you're asking me to explain why we've interpreted clinical injuries the way we have, then I can talk you through the pictures of the bodies on the scene and explain why we've interpreted the way we have.

I've already explained in great detail, as you've

just set out, the limitations of the evidence with which we've been presented. If you wish to challenge our conclusions, then I wish to defend our conclusions and, to do that, I will require clinical photographs.

MS GALLAGHER: My Lady, the witness did say yesterday, when asked about the number of variables, that if you shifted a variable -- in fact, he specifically said in relation to Michael Brewster that, if he was wrong on positioning, if the team were incorrect on positioning, that could change their conclusion. It's clearly central.

I think there is an issue regarding how it's going to be managed, particularly in the light of the fact that the witness can't have available in court this morning the material referred to.

A. There's no question, as I've said all the way through, if you move somebody and, therefore, alter the blast loading, then you have somebody who is more or less likely to have primary blast injury. But remember, the -- our interpretation is not just based on the scene photographs. It's also based on interpretation of the other injuries that we're seeing.

We have no vested interest in placing someone in one place or another.

Q. Of course, and one of the things I was going to refer

you to is the fact that in your report, in two places -- it's both pages 51 and 54, so in appendices D and E --

A. Who are we speaking about now, is this Mr Brewster or --

Q. In relation to Mr Brewster. I wasn't going to come to this yet, but I think it would be sensible to mention it.

LADY JUSTICE HALLETT: Sorry to interrupt, Ms Gallagher. I'm just thinking, do you have instructions on whether or not you are content for the Colonel to describe the injuries? Putting to one side the photographs for a moment, do you have instructions on the description -- I see Mr Smith may be able to help further. Mr Smith is exploring whether or not we have the body maps available, which might actually -- the Colonel is shaking his head.

MR KEITH: My Lady, as my Lady knows, body maps were prepared for a number of the deceased in the eventuality that we might have to refer to their injuries in more detail than that contained in the reports. I've just passed Mr Smith a note to see whether or not they are available, not in Colonel Mahoney's possession, but on the Trial Director system, so that we could refer to them.

I think the answer is that they are available, if we need to get to that stage, but as my Lady has just

pointed out, a considerable amount of detail of the clinical injuries suffered by Mr Brewster is, indeed, contained in the report at INQ11074.
There is little in that report which goes beyond, of course, the injuries which appear to be identifiable from the photographs. So if my learned friend's instructions are based on a general challenge because of the nature of the clinical injuries, could I invite her perhaps, with a certain degree of circumspection, to go through the injuries in the written report and, only if she finds herself unable to proceed further, to invite us to put on to Trial Director the body map for Mr Brewster, so as to avoid any consideration of having to look at the photographs in any kind of court proceedings.
LADY JUSTICE HALLETT: It may be that all that is subject to the final proviso that the Colonel is still going to say, "I can only explain it by use of the photographs". But, Ms Gallagher, is that a way forward, to see if we can go down that path?
MS GALLAGHER: I think certainly let's take it as far as we can go. The witness, the Colonel, can say at any time if it's simply impossible to answer the question.
I've got instructions from the family in court, my Lady. They've no objection to there being graphic

descriptions or, indeed, to even a photograph being used in court. They wouldn't be content with it being used in the annex. They plainly wouldn't be content with it being any more public and, also, they'd like the opportunity, if it is being used, for them to leave court, if they wish to, as it may be too distressing.

LADY JUSTICE HALLETT: Let's see how we go, Ms Gallagher.

MS GALLAGHER: Certainly.

MR WATSON: If at any stage anybody really feels the photograph is necessary, we'll give the family, obviously, warning.

MS GALLAGHER: Certainly.

LADY JUSTICE HALLETT: But they are now prepared for graphic description and any other family who are likely to be affected. That's in relation to the Brewster family?

MS GALLAGHER: Yes.

LADY JUSTICE HALLETT: What about Ms Hyman's family?

MS GALLAGHER: Ms Hyman, there's no need to explore. The issues which I'm exploring with Ms Hyman are not of this nature.

LADY JUSTICE HALLETT: Thank you. Right.

MS GALLAGHER: Colonel, this is a rather unfortunate example because I was just giving it as an example of the difficulties that faced your team and, in fact, the next point which I was going to make, not specifically in

relation to Mr Brewster, but just as an example, is that, although that graph shows that both Mr Biddle and Mr Brewster had a glass partition between them and the bomber, in fact in your report you refer specifically to there being very limited evidence of fragment injuries and to him being in direct line of sight of the bomber, so suggestive of there being no shielding, and that's at both pages 51 and 54 of your Michael Brewster-specific report.

A. Your scene map is showing where the bomber is sitting. That's not where the bomb is detonated, is it?

Q. Yes. That's, of course, right.

A. So I'm not sure of the argument.

Q. Yes, well, this isn't --

A. Can I have the scene map?

Q. I'm simply referring to the Edgware Road graph as an indication of some of the difficulties, because the Metropolitan Police had to put that together based on written witness evidence.

When we had oral evidence from the witnesses, it became apparent that there were inaccuracies in the graph. You've heard questions yesterday from some people relating to other such diagrams, so I was simply referring to it as one of the difficulties which faced your team, in addition to the other difficulties which

you've spoken about already.
A. Sure, no question, but if you look at -- my understanding -- and, please, other people who are in the court who can correct me -- is, although in seat 10 you've got Mr Khan sitting, who's the bomber, the indication of the seat of the explosion actually sits between figures 9, 14 and 13. That's the circle on the map. Is that correct?
Q. Yes, Colonel, it's probably best just to leave this for the moment. The simple point just is: there are difficulties with these materials which you've received. In part, here, at least, there's a bomb crater, so it gives you some more indication of where the actual bomb itself may have been.
But plainly, with these materials, the Metropolitan Police were relying on written witness evidence. You've then received it. It's a secondary analysis of written witness evidence. We've both discussed and accepted the difficulties with that witness evidence, and then, in oral evidence, certainly inaccuracies have come to light. But that's simply the point I was making.
A. As stated all the way through and as stated clearly in the report, there are large possibilities for error in a lot of the report because of the uncertainty in the

information that we've been presented with.
We have, however, based this on what I would regard as the most appropriate and experienced expert team that certainly I could put together, or the MOD could put together, and we have looked in detail at clinical injuries and have asked experts' interpretation of injuries to try to map what they can from the evidence to the state of a casualty.
Q. Well, Colonel, it sounds as if we agree, because what I was going to put to you next simply was this: that despite the incredible and very wide expertise on the part of your team, the task that you were engaged in is necessarily an imprecise science, particularly given the imprecision and uncertainties in relation to the raw data with which you were working. So you could clearly, with precision, identify certain matters, but generally, you're working with a very wide number of variables, very complex, closed environments and where, as you've said yesterday, and again today, if you shift one of those variables, you can have a very different outcome?
A. No question at all.
Q. In addition --
A. If you turn someone's orientation towards the bomb, you may have a very different outcome. But nevertheless, the injuries that people have stand.

Q. So really what we're engaged in is a very nuanced discussion around your conclusions, which are based on this material and these variables, Colonel.
In addition to the raw data received and relied upon, could I just also have on screen [INQ10552-17]? This is appendix A, so it's Mr Hepper, your colleague, Mr Hepper.
A. Yes.
Q. It's paragraph A4.3.6. This relates to the use of computational modelling to simulate the blast environment, and all I was going to say, Colonel, was that in itself carries its own caveats, which Mr Hepper refers to here. So here he refers to the work of Stuhmiller, and he says he "highlights that the possibility to validate these models is limited", and over the page, on page 18 [INQ10552-18]:
"... although the technology has progressed ... the confidence and fidelity of these models is still limited."
A. No question about it. However, you can improve the fidelity, and certainly, with this particular model, which is the HIP, the human injury predictor, you can improve the fidelity of this model -- that's the complex model -- by running it against real incidents.
While all my previous caveats stand about person

orientation, position, and interpretation of the evidence, the model, as designed and produced by Dr Pope's team at DSTL Porton Down does perform well when matched against real incidents.

Q. There's another paragraph, also by Mr Hepper, so again it's [INQ10552-19], it's paragraph A5.2.3. He refers, five lines down, to the difficulties with a complex blast environment, which, of course, you discussed in great detail yesterday, and the possibility of high peak pressures being produced in locations remote to the device, which, of course, causes all sorts of other complications, and just links to the multiple variables which you've been referring to.

Then in his final sentence, he again just indicates that you need to have some caveats in relation to the certainty of use of modelling in these circumstances.

A. No question, as stated in the report and as stated at each stage of the evidence.

Q. Colonel, one of the questions you were tasked with was, on the balance of probabilities, what internal injuries did the person have.

A. Yes.

Q. Colonel Russell -- it's in the individual reports at paragraph A6.3. I don't need it on screen, but it's page 24 of 93, if that assists, in the Mr Brewster

report. My Lady, that's INQ11074-24. Colonel, I was just hoping you could put in context this comment, given the question that was put to you about the internal injuries.

What's said here is:

"... as the victims did not have internal post-mortem examinations, injury to internal structures, (eg lungs), have not been identified and cannot be inferred."

Can you just indicate what was being said in that paragraph, given that your task was essentially to infer what internal injuries, such as injuries to lungs, had occurred?

A. The appendix A is about trauma scoring, because, normally, if you've got a casualty who's died and has had a complete post-mortem, you can get a complete inventory of their injuries. If you wanted to trauma score somebody, what you would do, you'd look at a number of the injuries, you'd take the three most severe and it gets fed into a calculation to give you a trauma score which can then be related to a likely or unlikely chance of survival. This is what we'd like to do.

We can infer from the physiology, the witness statements and the injuries, that people did have

internal chest injuries because they behave in a way consistent with dying either from a blast lung injury, an air leak in the chest, or a bleed in the chest. However, what we can't do -- which is what Colonel Russell was referring to -- is assign a score to that. So the score for a pneumothorax, an air leak, is likely to be very different to the score for an internal bleed, which in turn is different to the score for, say, an amount of bruising within a lung.

So if we accept within the error bars that proximity to an explosion is likely to cause blast lung, then we can go down an interpretation of physiology, but it would be meaningless to try to give -- interpret and give that patient a trauma score and say "This person has trauma score of X, therefore we expect their survival to be Y".

Q. Certainly. Thank you very much, Colonel.

The next issue which I wanted to ask you about was whether, in your area, your field, there's such a thing as a control group and, to a certain extent, you touched on this in answer to a question from my learned friend Mr Patterson when you talked about necessarily having to look at the surrounding injury pattern of other individuals in order to fully inform the --

A. That's not my interpretation of control group.

A control group really is one group gets therapy and one group doesn't. If we mean a comparator group to say, if you know where somebody is and you know about the other injuries around them, and you can say with a degree of certainty "This person was here, this person was here, this person is here", and interpret all the injury patterns, then you have circumstantial evidence to have a view about that person's injuries. Is that what you --

Q. Yes, it's, as a nonscientist, using the phrase. The simple point is this: you've obviously used the data that you had and you've plotted that in relation to the 18 individuals?

A. Yes.

Q. Or the 18 individuals to a certain extent you obviously for some reason -- for some reasons, you haven't in relation to particular individuals had to do the computational modelling because you had sufficient data to reach a conclusion without that. But the point is just this: we obviously have, in relation to other individuals, who aren't included within the 18, additional information.

So, for example, at Edgware Road, we've got detailed information in relation to Danny Biddle, who is estimated to be person 13 on that graph. We know he was

very close -- in very close proximity to the bomber, we know he had catastrophic injuries but survived.
One of the questions which my families wanted to put to you was: is there any mechanism for using that information to test your modelling for accuracy, so to feed in that information --
A. No question about it. If the task was to look at the entire bombing and look at all the survivors and all the deceased, map all the injuries and look at the range within which particular injuries occurred, then you create a model with much greater fidelity and then you have a better opportunity -- I use that word advisedly, this is not academic curiosity -- you have a better opportunity to say, given that these people, whom we believe to be in this location, can be demonstrated to have the following injuries, it is likely someone very close to them had the same injuries. But the same caveats are going to apply.
To interpret a survivor's injuries, you're going to have more detail, you should have hospital X-rays, you should have other investigations and hospital notes. But the proviso is that you believe everyone is where you see them to be.
Q. Of course, it doesn't just apply, obviously, to those who ultimately survived, like Danny Biddle. It could

also apply to someone like, say, Sam Ly, my Lady, who's not within the 18 but where we've got very detailed consultant information and so on.

So again, it's simply the same point. But that wasn't part of your task, Colonel, which was already quite a mammoth task, and would have been even larger had it included this much wider exercise?

A. If you want a more definitive answer on the injury patterns of closed-space bombings on a London train, then your task would be: look at all the deceased, look at all the living and look at all the injury patterns, and from that you'd have a more -- you'd have a greater fidelity of your model. But that wasn't the task.

Q. There's just three more general issues I wanted to raise with you and then I'll turn to Miriam Hyman.

Firstly, just a short point, it's from your phase 1 report, [INQ10552-14] there's no problem with this being on screen, it's paragraph A4.2.2.

This is simply, Colonel, where reference is made to the reclassification of ear injury. So is it right that ear drum rupture is now tertiary?

A. It's regarded in the literature as both primary and tertiary. There are discussions and there's uncertainty about the exact mechanism, whether it's due to the blast wave or whether it's due to people being thrown and the

subsequent impact on the ear drum.
Q. Secondly, in relation to blast lung, is it correct, Colonel, that the data on the short- and long-term outcomes with patients with blast lung is limited? That's how it's described by the Federal Agency in the US, the National Centre for Injury Prevention and Control. They describe the paucity of data in the area about the short- and long-term outcomes for patients. Would you agree with that?
A. No, I wouldn't. I think our understanding of blast lung is going on -- with the war in Afghanistan, is increasing. I think if people survive the initial blast lung injury, their outcome, their survival, all other things being equal, has been seen to be better than from other underlying lung injuries.
So -- but that can be -- that really relates to people with other -- with other survivable injuries.
Q. Of course. Of course, I think there are some studies, although they're quite old, in relation to those individuals that you've referred to who survive, where actually they tend to have quite limited pulmonary complaints when they're followed up at a later stage?
A. Not at one year, they don't. Again, it's apples and pears. The definition of blast lung in the literature doesn't necessarily reflect what we're seeing in

closed-space explosions, what we're seeing in the conflict in Afghanistan. I think our understanding of blast lung is increasing all the time, so I cannot give you a definitive answer on that point.

Q. Of course. Colonel, just one last issue. [INQ10552-8]. Paragraph 6.2.5, you were taken to this yesterday by Mr Coltart, the reference to internal bleeding.

A. Yes.

Q. Is that equally applicable to internal bleeding in blast lung?

A. No. What you're implying with that internal bleeding is internal bleeding that has a surgical cause and by that we mean there's something like a vessel that's broken and blood is leaking out or there's a hole in the liver and it's amenable to surgical repair.

As described yesterday, the injury in blast lung is very diffuse, you've got bleeding at what is a microscopic level and this is not something that is amenable to surgery.

Q. Would it be accurate to say that, in general, managing blast lung is similar to caring for pulmonary contusion, would you agree with that?

A. I think managing blast -- all pulmonary contusion means is a bruise in the chest. Pulmonary, lung; contusion, bruise. So it's a bruise within the lung, and blast

lung is a form of bleeding within the chest, albeit a generally more severe form, but, yes, if I was faced with two adjacent patients in a critical care unit, that one has blast lung, that one has been in a road accident and has bruises from another cause, my management of them would be very similar, at sort of 24, 48 hours onwards.

Q. Would it standardly require judicious use of fluids?

A. Again, that's from the literature, and judicious use of fluids, to be honest, that's -- the implication is you're restricting the amount of fluid you give so you don't flood the lung, but that's the same in any lung injury.

Q. I was instructed to ask you some questions in relation to oxygen, but in fact, Mr Coltart addressed these yesterday.

A. Sure.

Q. So just for the families' purposes, I think that's answered their questions in relation to that.

You did also make reference in passing yesterday, in answer to some questions, to haemothorax or pneumothorax. In some blast lung cases, is it right that there may be clinical evidence of a suspicion of haemothorax or pneumothorax and that it would warrant decompression?

A. If we visit what is blast lung, blast lung is a diffuse bleeding within the lung. If you look at somebody caught up in an explosive environment, with all the factors that encompasses, they may have been thrown. If they were thrown and they hit a hard object, they could have broken their ribs, their ribs could have punctured the lung, that in turn could give you other causes of bleeding and that would be haemothorax.
If you've got a fragment that's gone in and punctured the lung, that in turn could give you a pneumothorax. When you're faced with a person, a casualty, all you're faced with is somebody who is complaining that they're short of breath or looks short of breath.
Q. Colonel, could I turn -- that's been very useful, thank you. Could I turn to Miriam Hyman?
My Lady, the report is INQ11075. For obvious reasons, any references I make I'm not going to bring on screen.
Colonel, do you have a copy of her report to hand?
A. Yes, I believe I do.
Q. If we could just take as a starting point your conclusion, which is paragraph 7.4 at page 12, and in essence, Colonel, your conclusion was, on the balance of probability, the combination of three things that were

most likely non- survivable: number one, the severe limb injury and blood loss, although you say that would have been insufficient to kill her in itself; secondly, blast lung; and, thirdly, head injury.

Firstly, in relation to the limb injury, there's no challenge on the part of the family to that conclusion and they're grateful to you for it, but there is an issue arising because it appears to be at odds with the post-mortem.

Again, my Lady, I don't want to put it on screen, but it's INQ1459. It's at page 5, point 2, where in the post-mortem the conclusion was that she died as a result of multiple injuries particularly to her lower limbs.

So the family are just concerned as to whether there's a conflict between your conclusion in paragraph 7.4 and the post-mortem.

A. No, I don't regard that as a conflict. Remember, we're basing, and my colleagues are basing, these conclusions on, when you look at the limb injuries in all these patients, have we had soldiers and other people who have survived similar limb injuries?

So while you could say, yes, you could bleed to death from those limbs, equally the evidence that we had, although they are very severe, we have had survivors with that degree of limb injury who have

survived.
But when you add that to the other clinical information -- and again, my understanding -- and please shoot me down if I'm incorrect on this -- from reading the post-mortem reports, that a number of the pathologists clearly did not have access to witness statements and did not have access to physiology, all they had in front of them was an unfortunate victim of a bombing, weren't doing internal post-mortems and so were drawing conclusions as to what they saw in front of them.
From the witness statements we would also believe that Ms Hyman suffered head injury as well, which would be consistent with the involuntary movements. So I don't see a conflict with that.
Q. Of course, and, Colonel, the point you've just made about the difficulties in the post-mortem is one with which the family would also agree, because, of course, that conclusion in the post-mortem at point 2, my Lady, is followed by saying that those types of injuries to her lower limbs are associated with significant vascular injury which would have occasioned severe haemorrhage?
A. Yes.
Q. Whereas, in fact, from the witness evidence, from the surrounding area there isn't evidence of very

significant bleeding or haemorrhage from her. The bleeding seemed to be more limited. So certainly very useful, the additional information which we have from you, informed by more sources than just simply looking at the external appearance of the body as the post-mortem had to do.

In relation to the head injury, it's described as a severe head injury in your paragraph 7.3.

A. Yes.

Q. In the post-mortem, there doesn't seem to be a description of a severe head injury from external examination?

A. No, there's a description of a laceration, I believe, a parietal laceration.

Q. That's right. It's page 3. Do you have it to hand?

A. I don't have the post-mortem to hand, but I do have my notes to hand.

Q. Yes. There's a number of references to lacerations, some of which are superficial. The most serious head injury described in the post-mortem by our reading is point 1, a partial thickness laceration running obliquely across a particular part of the scalp that was 3 centimetres.

Is it right that a partial thickness laceration isn't superficial but it's not full thickness?

A. It's not full thickness, and particularly in Ms Hyman's post-mortem there is not reference to an underlying skull fracture. But if you look at the witness statements, they describe somebody who dies very quickly, is unconscious, and is making involuntary movements.
That would lead -- that is what led us to the conclusion that a severe head injury was highly likely.
Q. Colonel, this is the central difficulty which the family have in relation to the conclusion, and it's certainly no criticism. It's simply that the information that you've been provided with, there's some doubts about its accuracy. It's page 55, the final page of your report, the appendix F, the time-line of events relating to Ms Hyman.
We can see from that, Colonel, that you were provided with information about four witnesses.
A. Yes.
Q. There's a very lengthy quote from Witness Du-Feu, Michelle Du-Feu, and that describes in detail shallow bleeding, blood coming out of her nose, her eyes were open but she's unresponsive, very poor condition and then there's a description of an attempt to treat her, which is unsuccessful, and then her being dead moments later.

In fact -- and of course, my Lady, this is simply one hypothesis in relation to the evidence; you may, of course, take a different view -- Ms Du-Feu, when she gave evidence to the court, was quite confused as to who this person was and ultimately didn't consider that that person she was referring to was Miriam Hyman at all. It appeared she was referring to somebody else.
The family did have doubts from the statement alone of Ms Du-Feu as to whether she was referring to Miriam Hyman, in any event, because the location and the description was wrong in her first statement.
But if you were to disregard Ms Du-Feu, you're obviously left with the other three witnesses, Mr Featherstone, Mr Collins and Professor Dunlop, and there have also been some quite significant changes in relation to Mr Featherstone and Mr Collins in their oral evidence.
In particular, you've referred in your answer, and you refer in your report, to involuntary movements, but both Mr Featherstone and Mr Collins in their oral evidence in fact recalled something quite different, which was that the movements weren't simply involuntary but she was gripping their hand in response to them holding her hand, they felt it was a responsive movement. They did describe this happening in the first

few minutes after the blast and also they described her strength diminishing. So they described her continuing to grasp their hand, but they felt that her grip was weakening.

Also, Mr Featherstone -- my Lady will recall this from his oral evidence -- in fact said that his statement was incorrect because, having been present when an individual said that they checked her pulse and believed she was dead, he was troubled by that conclusion. Having left, he returns to her later. This all seems to be -- it's hard to say -- it all seems to be within the first ten minutes.

But certainly the reference in your concluding paragraphs, paragraph 7.3, to a seriously injured person who was unconscious, making involuntary movements, is undermined to a certain extent by that evidence, and also the reference to the blood coming from the nose. The main reference to that, of course, was from Ms Du-Feu. It is right that Mr Collins did refer in his oral evidence to there being a small trickle of blood. My Lady, the reference is Day 47, pages 166 and 167 for that.

But given those changes to the information you've got in the time-line, would that alter your view in relation to Ms Hyman?

A. Well, I still -- I don't -- from what you've just said, I don't understand what you're telling me about the time-line. Are we saying that Ms Hyman did or did not live more than ten minutes?

Q. I'm afraid we simply don't know, because the evidence is that she was weakening during that initial period and then an individual from the BMA building covered her body with a blanket and doesn't recall taking her pulse, had been told there were bodies outside, saw the torso of the bomber lying in close proximity to Miriam Hyman and covered them over, and I'm afraid, despite our best efforts and efforts on the part of counsel for the London Ambulance Service, we haven't been able to ascertain whether anyone, in fact, checked her after that point.

So the simple answer is we don't know. We've only got evidence relating to that first ten-minute period. We do know -- it's certainly ten minutes, because when the first ambulance crew arrives on scene, her body is uncovered, so we know it's some time after that, but I'm afraid we don't know. The evidence we've got, though, just relates to those early few minutes, and certainly it suggests that she was weakening during that time. There's no suggestion that she spoke at any time, but there is a suggestion that her movements weren't

involuntary, that they were responsive.
So would that information change your view in any way?
A. Not substantially, and again, you've still got a victim who's been blown up, thrown, suffered severe injuries and survives a very short period of time.
While clearly you're offering me, at no notice, different detail on which to attempt to make a conclusion, a death within that time course with the injuries, from the scene photographs that I've seen and the post-mortem report, I do not believe that substantially changes our interpretation.
Q. Thank you very much.
In relation to Mr Brewster, my Lady, there's a number of issues which don't relate to his positioning at all and I can't see any difficulty in exploring those at the outset, and we'll see how far we get with that.
LADY JUSTICE HALLETT: Certainly. And the family know -- and they're happy that they should remain?
MS GALLAGHER: Yes, they've spoken to -- they've given instructions to my solicitor.
So, Colonel, in relation to Mr Brewster, your conclusion is at page 52, it's INQ11074, so paragraph D6.2. Your conclusion is that, on the balance of probability, he suffered non-survivable blast lung

injury, but also you've -- to the extent that you can -- discounted the alternative hypothesis as to whether he may have bled to death from his injuries being untreated.

A. We've looked at the photographs of Mr Brewster's leg injuries and the leg -- the tissue looks charred. It does not look like tissue that would be bleeding. We looked at the witness statements and the witnesses who described putting a tie round Mr Brewster's leg, but one of the witnesses does comment that they're not staunching a flow of blood.

Based on that, we concluded there was no clear evidence, there was no evidence, that Mr Brewster was bleeding to death from leg injuries. But as caveated all the way through, if there are different witness statements, different positional data, or different indications of injury, then we review conclusions, but the pictures, the photographs and the reports indicate those are not limb injuries that you'd expect someone to bleed to death from.

Q. Could I just run through a number of points that you've referred to just a little more fully?

Firstly, in relation to the charring, the description in the post-mortem is of smoke blackening, but you felt that, in fact, it was more than that, it

was quite substantial charring to the limbs?
A. That was certainly our impression, excepting the caveats of interpreting the pictures.
Q. You've also referred to witnesses who have described a lack of active bleeding and also the attempted application of the tourniquet.
A. Yes.
Q. The attempted application of the tourniquet is at a very late stage.
A. Yes.
Q. You will be aware that Mr Brewster was trapped in the bomb crater?
A. Yes.
Q. In fact, the witnesses who refer to seeing the bleeding in his legs -- to not seeing bleeding in his legs, they plainly don't see that from the carriage, they see that at a later stage when they've gone underneath to look at him and the tourniquet is actually at the very end of the process --
A. Yes.
Q. -- which may have been up to 40 minutes.
So just hypothesising for a moment -- I will come to the time-line in a moment, but just hypothesising for a moment, in the most general terms, if that witness evidence about the lack of active bleeding being seen

and about the tourniquet is at the tail-end of the 40-minute period, would that affect your conclusion in paragraph D6.1?

A. We're aware that the tourniquet went on late and we're aware the witnesses were in the position that they were, but again, we have to rely on the information that we're given.

If you have a witness that says, early on in the injury, Mr Brewster was -- had severe bleeding from leg wounds, then you've got evidence that someone has bled to death. Our interpretation of the -- Mr Brewster's leg wounds were that these were wounds that had been subject to heat.

Now, there's error bars in that interpretation, but if you take -- if you take our view that these were leg wounds subject to heat from being close to an explosion, and were not actively bleeding, then it's unlikely Mr Brewster bled to death. But if you have a witness that says Mr Brewster was bleeding profusely from his legs, then you've got a different mechanism of injury.

Q. Of course, and there's no witnesses saying that, although, of course, most witnesses were seeing him from the waist up, his legs aren't seen until a later stage. Just in relation to your conclusion regarding blast lung, you obviously say it's likely, you don't say it's

certain, for all the reasons you've given earlier.
Yesterday in evidence you described how the -- you described how the alveoli become filled up with blood --
A. Yes.
Q. -- and then they're not available to perform their usual function.
A. Yes.
Q. So the person is short of oxygen.
A. Yes.
Q. Putting that in layman terms, but broadly speaking. The reference in the draft of the transcript was to page 98, my Lady. I'll get you the reference in the finalised transcript later. You did say that can be manifested by the person, if they're conscious, saying they've got difficulty breathing, and in observers watching the fact that they're struggling for their breath.
A. Yes.
Q. You then, of course, said the process can be gradual, you gave this analogy to a sprained ankle.
A. Yes.
Q. Could we just, for completeness, have [INQ10552-26] on screen, please? It's B4.2.1.1.
A. Yes, that's from, I believe, Dr -- Mr Pope -- no, that's the first one, isn't it?

Q. Yes.
A. That's from our original one, Dr Kirkman's work.
Q. It's simply the final two sentences:
"The lungs become stiffer and breathing becomes difficult resulting in hypoxia (shortage of oxygen)."
And:
"The injury may progress to a condition called acute respiratory distress syndrome."
A. Yes.
Q. If we can just go down to the next paragraph:
"Blast lung is therefore a condition that evolves ..."
This is like your sprained ankle analogy?
A. Yes.
Q. "... over a period of hours following blast exposure, ie a casualty who may not appear 'too bad' initially may become critically ill later."
Colonel, if the individual is suffering from blast lung, in addition to difficulty breathing, is chest pain an issue?
A. Not necessarily, no.
Q. You were taken to a reference yesterday -- sorry, I won't go to it again, but it referred to transient cessation of breathing and rapid shallow breathing.
A. Yes.

Q. The difficulty in relation to Mr Brewster is this: there's no evidence whatsoever that he was suffering any respiratory distress at any time, and if I could just refer both to Mr Brewster himself and to others, the family's concern is that there doesn't seem to be evidence of breathing difficulties which would link to this conclusion.

So firstly, in relation to Mr Brewster himself, quite unusually amongst the 18, he was very articulate and complaining and in full conversation at the outset after the bombing. In fact, he was going so far as to complain about pains in his legs and pains in his injured hand, so he was describing how he felt at quite an early stage, and there was no reference to problems with his breathing at all from him.

But secondly, in relation to others, Mr Brewster was in quite an unusual position because, while, at other scenes, and indeed with other deceased at Edgware Road, some witnesses remember them, some witnesses don't, as you will recall, my Lady, almost all the witnesses who were in the carriage recall Mr Brewster, and that's simply because he was the focus of attention in the carriage because of where he was placed and because of the fact that he was shouting and asking to be freed. So he was, to a certain extent, the focal point of the

witnesses. The vast majority of witnesses have described his appearance and what he was saying and none of them have referred at any time to seeing him having difficulty breathing or hearing him complaining about difficulty breathing.

So given that material, there's just a concern on the part of the family that there's no evidence of him having been in respiratory distress at any time or having had difficulty breathing and there's no evidence of him having had shallow breathing at any time, and they are simply concerned, given the absence of that evidence and, in fact, clear evidence of his condition throughout the time from multiple witnesses, they're concerned at the conclusion that blast lung must have been what killed him.

A. I think blast lung is still a high possibility. You've got somebody who, if we take the Tube map as accurate, and place him in that proximity to the explosion, and if we agree that he was subject to that sort -- to the sort of overpressure that Dr Kirkman and Dr Pope have agreed, then that is consistent with somebody getting a significant primary lung injury.

We also -- the history describes Mr Brewster as initially being very vigorous and then deteriorating. In the absence of obvious bleeding, the type of things

that could kill somebody are primary blast injury, other causes of internal bleeding, which we didn't see anything obvious in the photographs, or other lung injuries. So on the balance of probability, blast lung is a possibility, a high possibility.
But as I said all the way through and stated in each individual report, it's balance of probability.
Q. Of course, and, again, Colonel, you're highly reliant on the information that's been provided to you.
You said yesterday, and you've referred to it again just now -- you said yesterday in evidence that you understood he was initially vigorous and trying to help himself.
A. Yes.
Q. But fairly rapidly after that, his physiology deteriorated, and also, in the report at page 50, it's paragraph D5.1, you again say:
"The majority of the witnesses from the court's time-line describe him initially being very active after the explosion, shouting for help, but rapidly becoming weaker and both his breathing and pulse deteriorating."
That would fit in with the time-line that you're given, which describes these three phases. So phase 1, actively requesting help. Phase 2, there's reference to Sandip Meisuria's evidence and Anthony Pantling, when

the shouting has stopped, and phase 3, when he's quieter, when Tim Coulson arrives and so on, when the tourniquet is applied.

There's two difficulties with that in relation to phase 2. The first difficulty is this: that Anthony Pantling -- my Lady, it's Day 19, page 194 -- Anthony Pantling said:

"He certainly initially was very vigorous in trying to free himself, but he then appeared to be making himself comfortable, reconciled to not being able to get himself out."

So Anthony Pantling was describing, in phase 2, not him rapidly deteriorating and going quiet because he was rapidly deteriorating, but simply because he had become reconciled to his situation. Multiple people had attempted to pull him out and had failed. That's a different approach to phase 2, to the indication you get in the time-line.

A. It's a different interpretation, but equally, Pantling says -- I think it's down at phase 3, there was a question:

"Question: Did you deduce he was still conscious because his eyes were open, able to see you and aware of your presence?

"Answer: Yes."

But they do not describe someone who is no longer vigorous.

Q. The other difficulty is the other person who's referred to in phase 2 is Sandip Meisuria, and in fact, there was some confusion in Sandip Meisuria's evidence as to what time he was speaking of, but in fact we know -- and you have this in the time-line at page 86 -- that he thought, ultimately, the paramedics probably arrived within 25 minutes.

So his estimation of timing is affected by that, when, of course, the evidence seems to suggest, in fact, it was some time later.

So there's just some difficulties with that.

A. So what is the question?

Q. The question simply is: if the presumption that he fairly rapidly, or rapidly, as it's put in the report -- that his physiology deteriorated rapidly, and if, in fact, his physiology didn't deteriorate until some 30 minutes after the blast, would that alter your conclusion?

A. That's rapid, that's rapid. That's someone who's gone from being vigorous to someone who's dead. 30 minutes is a rapid time period. Not as rapid as 5 or 10 minutes.

Q. Of course?

A. But it's a rapid period nonetheless.
Q. Colonel, the description by witnesses of him drifting away, weakening pulse and fading and so on, is that consistent with blast injury?
A. Yes.
Q. Despite the absence of any breathing difficulties?
A. It's consistent with blast injury, it could be consistent with internal bleeding. Based on his proximity -- on what we believe is Mr Brewster's proximity to the explosion, based on the likely blast loading, primary blast injury remains a high probability. But equally possible, you could have other internal injury.
Q. Of course.
A. We have error bars.
Q. That brings me, Colonel, on to a letter which is dated 1 December 2010.
I think, my Lady, because the witness isn't going to have this available, it's going to have to be on screen. The reference is [INQ11079-2]. It's paragraph 7. If we could just centre on paragraph 7.
Colonel, this letter is after Edgware Road had concluded, because we know the evidence for Edgware Road finished on 25 November 2010, and from paragraph 7 it seems that from the work on phase 2 so far issues have

been raised in relation to four particular deceased where further information was required --

A. Yes.

Q. -- or alternative expertise on a particular issue may be required.

There's four people named there: Michael Brewster, Philip Beer, Shelley Mather and Samantha Badham. Now, Philip Beer, Shelley Mather and Samantha Badham, we know they are the three people who are referred to at the outset where you concluded you didn't have sufficient evidence or you couldn't say. So of those four people, the only person you reached a firm conclusion about is Michael Brewster.

Now, is it right that the additional information related to possible natural causes?

A. Yes, there were two things. At the stage that this letter was written, our tasking letter or instruction letter for phase 2, we didn't have the advance blast modelling. We had what we believed was a good indication of where Mr Brewster was positioned, and our expectation was that he was somebody who, being that close to the explosion, was likely to have had blast lung.

I was also concerned, given the witness descriptions, I needed to know could it be something

else. I've talked about potentially internal bleeding, but I wanted to know was this a man who had an underlying heart condition and had the stress of being blown up and the associated injuries caused him to have a heart attack.

Q. The answer from the family was there wasn't a known history of cardiac problems?

A. The answer from the family was that, yes.

Q. So, Colonel, with the other three people, obviously you decided, after those enquiries, that you couldn't reach a conclusion. With Mr Brewster, you did.

A. Can you put them back up for me?

Q. Yes, of course.

A. So Philip Beer, as brought out by your learned colleagues, we couldn't say for certain where Mr Beer was located.

LADY JUSTICE HALLETT: I don't think we need to go through those three again. I think Ms Gallagher is just concentrating on Mr Brewster.

MS GALLAGHER: I don't think so either.

A. Okay.

Q. I think the point you're making, Colonel --

A. In the absence of a clear location, while the other individuals' injuries would suggest they were close to an explosion, we could not be -- as set out, we did not

have the -- we could not give the certainty we would like to give.

If we accept Mr Brewster's position in relation to the bomb being accurate, then we have the opportunity to look at blast loading. If we dispute the position of Mr Brewster in relation to the bomb, then you call into question the blast loading. But Mr Brewster did end up in the bomb crater.

Q. Colonel, the concern of the family was, that given on 1 December you felt you didn't have sufficient information to reach a firm conclusion in relation to Mr Brewster and you were then told in answer to the query that he had no cardiac history, what's changed between then and your report? I think the answer is likely to be the --

A. Several hundred thousand pounds worth of blast loading information, a computational model and the work of two specialist teams at Porton Down, as set out in my report.

Q. But it comes back to positioning, is the point.

A. Yes, it does.

Q. It comes back to the information about positioning. My Lady, I think, without exploring positioning, it's simply not going to be possible, given that all of the answers ultimately come back to positioning.

I'm going to need to speak to my clients about how to deal with that. It may be sensible, rather than trying to deal with it in oral evidence today, particularly in circumstances where Sandra Brewster, Mr Brewster's wife, is at home and I haven't spoken to her about the specific issue --

LADY JUSTICE HALLETT: I'm afraid Ms Gallagher, I'm sorry to interrupt you again, I don't think the Colonel is going to be accessible.

MS GALLAGHER: So it simply won't be possible to explore this in writing in any way?

A. No.

LADY JUSTICE HALLETT: I'm afraid he's going somewhere where we can't submit questions.

A. You're welcome to join me.

MS GALLAGHER: Of course, but, my Lady, it plainly will be possible for us to submit further evidence ourselves relating to positioning, even if we can't test the positioning evidence further. I can just see some substantial difficulties both for me and for the witness in attempting to test the positional evidence today, particularly given the absence of a clinical photograph which you've indicated would be essential for you.

LADY JUSTICE HALLETT: Let's see, Ms Gallagher. What exactly -- before Mr Keith says something, Ms Gallagher,

what are you saying? Have you now completed the questions, as far as you can go, with the Colonel?
MS GALLAGHER: Well, I suppose there's one final matter, Colonel, which simply is this: is it right that, to a certain extent, the conclusion in relation to blast lung is a residual conclusion because of the fact that bleeding to death has been ruled out and because of the fact that natural causes have been ruled out?
A. I don't understand "residual conclusion".
MS GALLAGHER: My Lady, I'm afraid it simply all relates to positioning and I think there's some substantial difficulty in exploring --
A. I don't understand what you mean by "residual conclusion".
LADY JUSTICE HALLETT: Wait a minute. Let's -- Mr Keith -- again, Ms Gallagher, I'm a bit concerned, you mentioned further evidence, I'm not sure what you're talking about. What evidence are you talking about?
MS GALLAGHER: Rather than evidence, my Lady, I simply was referring to submissions.
LADY JUSTICE HALLETT: Right, submissions on the evidence from the witnesses?
MS GALLAGHER: Yes.
LADY JUSTICE HALLETT: Oh, I see.
MS GALLAGHER: But it may be possible we can do it in

a sensible and appropriate way in writing to the Inquest team. You are, of course, able to take into account material we put to you in writing as well as material that's put to you orally.

LADY JUSTICE HALLETT: Oh, indeed.

MS GALLAGHER: I simply can't see a way that either I or the witness are going to be -- I don't think it will be fruitful attempting to explore positioning today, orally.

LADY JUSTICE HALLETT: Does that now complete your cross-examination -- your questioning of the Colonel?

MS GALLAGHER: Yes, and in essence, where we're left is it comes down to positioning.

LADY JUSTICE HALLETT: Indeed.

MS GALLAGHER: If the positioning is accurate, the conclusion stands.

LADY JUSTICE HALLETT: I've written that down so many times I think that message has got through.

MS GALLAGHER: No, of course, but I'm afraid it hasn't been possible to avoid the issue of positioning much as I've attempted to do so.

LADY JUSTICE HALLETT: It's not in response to your questioning, but the Colonel was saying it in response to others.

Mr Keith, given what Ms Gallagher has just said, do

you have any comments at this stage?
MR KEITH: My Lady, yes, I do. The provisions of rule 40 of the Coroners Rules preclude any submissions being made on the facts. My Lady is not permitted, of course, to receive an address on the facts, so I doubt whether my learned friend in law would be permitted to address you on the interpretation of Colonel Mahoney's evidence.
LADY JUSTICE HALLETT: No, but she could remind me of those passages of the evidence that she particularly could draw to my attention. That's not making submissions, surely.
MR KEITH: My Lady, there might be a difference, we accept, between a statement of the factual position as it appears and an analysis of the conclusions to be drawn from those facts. It is, I'm afraid, a difference that we might have to explore in due course.
But for present purposes, the Colonel has, it seems to me, given clear evidence as to conclusions reached in relation to Mr Brewster and, without wishing to violate the provisions of rule 40 myself, Mr Brewster was, of course, in the crater, the bomb crater, as the Colonel said, and there is no evidence that he was any further away from the bomb than that.
Given that the bomb crater could only have been a matter of a fraction of a metre away from the bomb,

0.55 metres in the report, there is surely no material upon which it could properly be suggested that he would have suffered anything other than the full 2.0 megapascals of overpressure, 20,000 times atmospheric pressure.

So I really do question whether or not there is any proper factual basis, given that there is no evidence that Mr Brewster was anywhere else, for my learned friend to pursue the point further, even if rule 40 permitted her to address you on the facts.

LADY JUSTICE HALLETT: Right.

MS GALLAGHER: My Lady, just to finish that. Plainly, you're not able to receive an address from legal representatives on the facts directly under rule 40, but of course, you can receive submissions on the sufficiency of factual material for reaching certain legal conclusions. So we're certainly able to do that, in the way that inquest lawyers do all the time, so the factual issues are referred to in that way but not directly and so not violating rule 40.

LADY JUSTICE HALLETT: It is a typical lawyer's interpretation.

MS GALLAGHER: Yes, thank you.

LADY JUSTICE HALLETT: Thank you, Ms Gallagher. Does anybody else have any questions for the Colonel? Yes,

Ms Simcock?

Questions by MS SIMCOCK

MS SIMCOCK: Colonel, may I just start with some questions about your instructions, please? You confirmed in relation to questions from Mr Keith -- who asked you questions first of all yesterday -- that you weren't asked to address the question or comment upon the appropriateness or adequacy of any medical treatment.

A. Can I ask who you are and whom you represent?

Q. Yes, I represent the London Ambulance Service. My name is Ms Simcock. It shouldn't really matter, though, who's asking you the questions.

But can I confirm that at page 5 of each and every report you do confirm that you discussed with Mr Smith, the Solicitor for the Inquest, the parameters of that instruction and that he confirmed that, insofar as you considered that medical treatment caused or failed to prevent death, then you should say so. Is that right?

A. That's correct.

Q. So firstly, then, you did consider -- you and your team -- medical treatment to that extent in the process of preparing your reports?

A. We considered information that we had in the witness statements and we considered indications of medical treatment that we could see from the photographs, such

as evidence of thoracostomy, that is an incision being made into the chest to release air, or evidence of needle decompression of a chest.

Q. Yes, but specifically with a view to considering whether that medical treatment had caused or failed to prevent death. Is that right?

A. We could only be aware of treatment if it was mentioned in the witness statements and we could see evidence of it in the photographs, and we could only really consider that in relation to: here is somebody who's had a chest decompression, is that likely or unlikely to have made a difference to this outcome?

Q. So may I confirm that, given that there is no such factual conclusion in any of the reports, you didn't, in fact, consider that any medical treatment that was evident caused or failed to prevent death in any of the cases that you looked at?

A. On the information that we had, based on witness statements and based on the photographs -- as I say, we were not in a position to make comment on the medical treatment. The only comment that's been made is the comment that's been drawn out of me today in the additional questioning.

Where we had uncertainty, as we certainly had in one patient, we asked for additional expert opinion to

clarify that for us, in terms of one of the chest decompressions.

Q. Yes, in relation to Shelley Mather.

A. Yes.

Q. So presumably, had you considered that such a conclusion was open to you on the evidence that you had -- ie that medical treatment did cause, contribute or failed to prevent death -- you would have said so?

A. If we had evidence of something that somebody had done in a medical capacity and could say this intervention has likely hastened this individual's death, then that is something we would have commented on.
We were not in a position to comment on the application or non-application of oxygen or other interventions like that, because we did not have the evidence to judge that.

Q. Thank you. In relation to trauma scoring, just for completeness, you were asked some questions about this, and you and your team came to the view that you simply couldn't usefully carry out any trauma scoring --

A. Correct.

Q. -- on any of the deceased you looked at. Is that right?

A. Correct.

Q. So just to clarify and close this issue off, when Colonel Russell says in his appendix A in each of the

reports that full trauma scoring cannot be applied to the casualties and, later, that any results will be underestimates of the total severity of injury suffered, it's not that there are any results out there somewhere that we don't have?
A. Well, we certainly haven't done trauma scoring. One of the things we wanted to do originally before we were presented with the information, were we to do trauma scoring, which would have allowed us to make -- construct a database and give a mathematical probability of outcome.
But in deceased patients, in the absence of internal post-mortem, you do not have the anatomical intervention -- anatomical information to do that trauma scoring. Anything is a guess. We did not feel that was appropriate.
Q. Thank you. In relation to the information you did have, fluoroscopy, first of all, you described it as a limited form of X-ray, particularly looking for breaks and the presence of external fragments.
A. Yes.
Q. So it's a type of imaging that is different to plain X-rays with which some members of the public may be familiar. Is that right?
A. Yes.

Q. Am I right in saying that the image is seen in real-time on a monitor and the fluoroscopy images are generally less detailed and of a poorer image quality than plain X-rays?
A. I can't comment on image quality because that would really depend on the nature of your X-ray machine and your fluoroscopy machine, so I can't comment on that. All I can comment on is that the information that we have referred to fluoroscopic results which commented on breaks and commented on fragments. We were not presented with any hard copy of any images.
So we were not given images to say "Interpret this".
Q. Yes, of course. You'd said that it was a limited form of X-ray, so one thing it is good at, though, is looking for foreign bodies, fragments in a deceased body. Is that right?
A. That's correct.
Q. It can show breaks, fractures, in bones. That's right?
A. Yes.
Q. But of course, it may not pick up all fractures present, is that right?
A. Again, it depends on the operator, depends on the fidelity of the machine, it depends what they're looking for.
Q. But are you aware, out of your experience, that

fractures can be present, particularly, for example, if they're small, that aren't picked up by fluoroscopy and indeed may not be picked up by plain X-ray?
A. I'll comment on plain X-ray. You can take plain X-rays and you will not necessarily see a fracture on a plain X-ray. You may see that fracture, subsequently, several days later, and that can be just due to the way the -- the way the X-ray is taken, the process by which the fracture is being remodelled. So any imaging technique has limitations.
LADY JUSTICE HALLETT: It may depend on the expertise of the person assessing the X-rays?
A. Yes, my Lady, yes.
MS SIMCOCK: Indeed. What I'm getting at really, Colonel, is, simply because there may not be the presence of, for example, rib fractures in the fluoroscopy report in certain post-mortems or, indeed, small fractures of the skull in certain post-mortems here, it does not necessarily exclude their presence?
A. I can only interpret -- we can only interpret the report that people have given. If people have commented on the presence of a fracture, or the presence of a fragment, we can comment on that. I cannot comment on the absence of a report.
Q. But the absence of a report does not preclude a fracture

being present?
A. I don't know what those individuals examined. I don't know if they tried to examined the whole body. I don't know if they looked at the pelvis. I don't know if they looked at the skull.
Q. Precisely.
A. I can only draw a conclusion based on the material that is presented to us. So I cannot comment on additional aspects of investigation.
Q. But even if -- let's take the skull. Even if a skull was examined in a particular individual and fluoroscopy concluded -- the person carrying out fluoroscopy concluded "I don't see the presence of a skull fracture", that in and of itself does not preclude, does it, the presence of one, because of all the reasons you've just described?
A. Any imaging is open to interpretation, which is why you have hard copy in hospital and which is why more than one person will review it.
Q. Yes, thank you. Fluoroscopy doesn't show soft tissue injury. Is that right?
A. Correct.
Q. And it doesn't show -- so it wouldn't show, for example, pneumothoraces?
A. Well, on the reports that we've got, there's only been

comment on fractures and fragments. There have not been reports on chest examinations. There's been post-mortem reports commenting on the presence or absence of rib fractures, but no one has commented on fluoroscopy appearances.

So again, I cannot explore this any further.

Q. I'm grateful. Just lastly on this topic, then, does fluoroscopy have the ability to show blast lung or blast bowel injury?

A. If I wanted to look at blast lung or blast bowel, I would be looking for a plain X-ray or a CT image.

Q. Yes.

A. There is no comment throughout the examinations, that we've had access to, on fluoroscopy being used to look at -- trying to look at cavities.

Q. Yes, I'm very grateful.

In terms of external injury, a wound having a charred or burnt appearance, you've confirmed firstly suggests a close proximity to the explosion, to the bomb. Is that right?

A. We're interpreting it as a close proximity to a heat source and, under these circumstances, we're taking that proximity to the heat source being the explosive.

Q. The implication from that being that that individual would have been subject to a high blast loading. Is

that right?
A. That's been the interpretation that we've placed, unless we've had evidence to say otherwise.
Q. Yes, thank you.
Secondly, a charred or burnt appearance of a wound would suggest that there was unlikely to be uncontrolled or significant bleeding or haemorrhage from those wounds. Is that right?
A. If we can agree a wound looks charred, and we can agree the tissue is burned, then it is unlikely that that tissue is bleeding freely.
Q. Is that because the blood vessels have effectively been closed off?
A. Coagulated, yes.
Q. But, of course, those external injuries don't help you at all with whether or not there is the presence of a significant internal injury that would have caused significant internal bleeding. Is that right?
A. No. Again, as stated in the reports, the presence or absence of internal injuries would have to be inferred by people's proximity to the bomb and the witness statements giving clinical signs and symptoms.
Q. Yes. In the reports you've referred to post-mortem changes which occurred in some of the deceased bodies making it difficult to interpret injuries?

A. Yes.
Q. Without wishing to go into any distressing detail of the post-mortem changes you're referring to, can you explain in any more detail the sort of difficulty in relation to which particular injuries?
A. No, I can't, without giving distressing clinical detail, which I'm prepared to do, my Lady, but --
Q. No, I don't ask you to do that at all.
One last question -- and the same comment applies; if it's distressing detail, please don't say -- was there any particular issue in relation to post-mortem changes in relation to any of the deceased whom you concluded that there was insufficient evidence to be able to say non-survivable or not, one way or the other?
A. My Lady, if we want to go into -- to do that, I want photographs and I'll take you through the changes. That's what we're talking about.
Again, I'm not trying to obstruct you, but really, to give you an indication of our difficulties, I'd need to show you the photographs.
Q. I just really want a confirmation whether you experienced difficulties, without going into what those were, with those particular deceased, the ones that there was insufficient evidence?
A. We've experienced difficulty in interpreting a lot of

post-mortem photos, based -- because of post-mortem changes. If you want me to go through individual deceased to give you a clear answer, then we need to go through photographs.

Q. I'll leave it.

In the reports, you give a definition of a non-survivable injury as one from which long-term survival is not possible, albeit it might not cause instant death. You give examples in your death of full body burns or some devastating head injuries. Is that right?

A. Yes.

Q. Those, clearly, are just two examples you give. There are clearly others. Is that right?

A. Yes.

Q. When you refer to long-term survival, do you mean survival past a few hours or days?

A. Yes.

Q. I'm very grateful. Just a few questions, then, of clarification in relation to particular individuals. The first is Ms Carrie Taylor. Do you have that report?

LADY JUSTICE HALLETT: Ms Simcock, just before we embark on this, I haven't given the stenographers a break this morning.

MS SIMCOCK: Five minutes, my Lady.

A. I will locate it.
Q. I'm grateful, Colonel. May I just ask you to turn to page 76? I don't ask that it's up on screen. So we can orientate ourselves, Colonel, this is Dr Kirkman's annex and he comments on Dr Pope's conclusion that Carrie Taylor suffered a peak overpressure blast loading greater than 350 kilopascals.
I think, when you were asked questions, your conclusions were, in fact, Carrie Taylor had been closer to the blast than these two individuals your colleagues were working on, in terms of providing this figure of 350 kilopascals. Is that right?
A. The team was asked to work on the provided body -- not body maps, wrong -- on the provided carriage maps indicating people's locations, and they were asked to generate the pressures based on that.
Our interpretation of Carrie Taylor's injuries, our interpretation, which were clearly disputed by Mr Taylor yesterday, our interpretation would place Carrie Taylor closer to the seat of the explosion and, by implication, you'd expect a higher blast loading, if we've read the injuries correctly and I believe we have.
Q. Yes.
LADY JUSTICE HALLETT: Ms Simcock, I'm sorry to interrupt you, I think this is too important, this evidence, and

it's been a long morning for the stenographer, I think we ought to take a break now, I'm sorry.

MS SIMCOCK: Yes, very well.

LADY JUSTICE HALLETT: Ten minutes.

(12.00 noon)

(A short break)

(12.10 pm)

LADY JUSTICE HALLETT: Ms Simcock?

MS SIMCOCK: Thank you, my Lady. Colonel, we were dealing, just before the break, with blast loading in relation -- specifically in relation to Carrie Taylor --

A. Yes.

Q. -- and I was asking you about the figure that's in the report, which is greater than 350 kilopascals, and I think, given your other conclusions about where Carrie Taylor was at the time of the explosion, your view, your considered view, drawing on the expertise also of your team of colleagues is that, in fact, your final conclusion is that the blast loading she would have been subjected to was actually much greater than 350 kilopascals. Do I have that right?

A. If our reading of Carrie Taylor's injuries is correct, and it is a considered review of her injuries, our reading is that would place Carrie Taylor closer to the explosion than is indicated on the map. The distance

that the team calculated was based on the map, so the implication would be, if she's closer to the explosion, based on her injuries, then she's been subjected to a higher blast load.

Q. Are you able to give us any further indication of the sort of level of blast loading or not?

A. No.

Q. I'm grateful.

In relation to internal injuries, you've commented that, on the photo that you saw, the scene photo of Carrie Taylor, you didn't see the presence of abdominal distension. Is that right?

A. Correct.

Q. Abdominal distension being present, of course, as a positive sign, can indicate an internal injury and bleeding, because, as you indicated previously, the abdomen can become full of blood and that gives the appearance. Is that right?

A. That's right.

Q. Is it possible, though, to have an internal injury that does bleed significantly and still not see abdominal distension present?

A. Yes.

Q. Is that because the abdomen, being a soft structure, as you've previously described, there are other places

within the abdominal cavity for the blood to go?
A. No question.
Q. I'm very grateful.
So in relation to Carrie Taylor, given what we know about your conclusions drawn from her injuries and other data of her positioning, your conclusions about that, and given that we know she was thrown, because of your conclusions about the type of wrist fracture that she sustained, it's possible, isn't it, that she did also sustain an internal significant injury?
A. I'd say for Carrie Taylor and I'd say for a lot of the other casualties it is highly likely that, if they had been thrown, impacted with objects, or subject to high blast loading, then they're likely to have other injuries.
The requirement was to find -- was to make a view on survivability or non-survivability.
Where we've got blast loading, we can have a view on survivability from lung injury. Where we've got objective evidence of head injury, we can make comment on head injury. For most injuries other than the photographs, we don't have objective evidence either way.
Q. Yes, and just in relation to Carrie Taylor, because we know she was thrown, and we know, of course, that she

had a laceration to her scalp, which certainly would indicate an injury to her scalp might also be present of course, an underlying head injury, in fact your report concluded that that was likely. Is that right?
A. Quite possible, if someone's been thrown and impacted with an object, and they've hit their head, underlying brain injury is possible, even in the absence of an obvious skull fracture.
Q. Yes, and we know that there is witness evidence of involuntary movements and semi-consciousness of Carrie Taylor from Dr Quaghebeur, whose evidence you looked at --
A. Yes.
Q. -- because it's in the time-line. We know, of course, that there was bleeding from her nose. Those may also be indications of an underlying head injury. Is that right?
A. Yes, as discussed with Mr Taylor yesterday, bleeding from the nose could indicate bleeding coming down from a head injury, bleeding coming up from the lungs or facial injury.
Q. Yes, and involuntary movement, in particular, whilst it may be indicative of a spinal injury, is in fact a positive indication of a serious head injury, isn't it?

A. It can indicate a head injury, it could also indicate lack of oxygen to the brain.
Q. Yes.
A. But, yes, it could indicate a head injury.
Q. I'm very grateful.
Moving on, if I may, then, finally to Samantha Badham, I just had a couple of questions in clarification about her case. Do you have her report?
A. I'm sure I do.
Q. I'm grateful. Colonel, you weren't, I think, asked to look at all at the case of Lee Harris. Is that right?
A. We were not asked to look at Lee Harris at all, no.
Q. We know from the evidence that he and Samantha Badham were together prior to the explosion. We know that they were both blown out of the train carriage as a result of the explosion and were found together next to each other, indeed possibly intertwined with each other, on the track outside the train.
We also know that Lee Harris suffered significant internal chest injuries, bilateral lung contusions and injuries to the chest wall that needed the insertion of chest drains and, indeed, surgical intervention, and we also know he had significant underlying head injuries such that, eventually, his intracranial pressure raised to levels that were simply incompatible with life, and

that was despite maximum therapy in an intensive care unit.
Can we draw any inferences from those circumstances and his injuries in assessing the likelihood and seriousness of Samantha Badham's injuries?
A. If you can agree that somebody was in the same place subject to the same forces and injured by the same mechanism as you would if you're looking at a car that overturned or two people who are next to each other in an explosion, you can draw -- you can attempt to draw a conclusion about injury patterns.
If we go back to one of my previous statements, to get a full understanding of all the effects from these bombings, you'd need to know the injuries of all the deceased and all the survivors and map those accordingly.
Yes, you can draw limited conclusions, but I can't give you certain conclusions, because, when other people survived being blown out of the train, I don't know what either those individuals hit, I don't know which of their anatomy struck a solid object. So although it is likely they were subject to similar forces, without more detail I couldn't give you a meaningful conclusion.
Q. I see. In your report on Samantha Badham at page 52, you conclude that one of the likely internal injuries

she suffered was blast lung.
A. Yes.
Q. Presumably the use of the words "one of" implies that there are other likely serious injuries. Is that right?
A. There are other potential injuries and I would say the other likely injuries are: blast lung, pneumothorax, haemothorax, combinations of those. Again, exactly the same as the other discussions we've had on other people with chest injury.
Q. Yes, and of course, given what we know about her circumstances, being blown out of the train, is another potential serious and possibly fatal injury an internal head injury?
A. If someone has been blown out of a vehicle, be it a train, and impacted on other objects, then they could have a head injury, they could have a chest injury, they could have a variety of injuries. But throughout -- although she's described as being very unwell throughout a lot of this, I believe she was talking?
Q. She was certainly conscious for a period of time. May I come to that in a moment? May I just complete with possible internal injuries?
Injuries to the lungs, you've already referred to blast lung, haemothorax and pneumothorax I think. Blunt trauma to the chest and chest wall is also a potential

injury in her case, isn't it?
A. Anyone being thrown out of a vehicle can have impact injuries to any part of the body that impacts a solid object, so, yes, certainly. If somebody's chest impacts with a blunt object, quite possibly.
Q. You talked a little bit, Colonel, yesterday, about the potential even for there to be direct impact to the heart, which can affect the heart. Is that right?
A. Yes.
Q. That is a possibility in her case as well, isn't it?
A. If we accept that she was close to an explosion and subject to significant blast loading, then you would expect blast effect or blast effects to the heart are a possibility.
Equally, if she was thrown out of the vehicle and impacted on the front of her chest, then you can infer injuries behind the point of impact. But unless I'm offered more descriptions or unless there is more clinical detail, anatomical detail, all I'm doing is saying, yes, if you hit a particular part of the body you can hurt the tissues underneath it.
Q. Yes, of course, and that detail would come from an internal post-mortem?
A. Yes.
Q. Of course, we talk about all of these things in a list.

Of course, any combination of all of these together is possible also, isn't it?
A. It certainly is, and with someone who's been subject to an explosion and then ejected from a vehicle, they really typify all of those mechanisms: primary blast injury, and then flung, not unlike Tavistock Square.
Q. Of course, equally, with -- as we just discussed, with Carrie Taylor, with Samantha Badham, that mechanism, as you say, being close to an explosion and flung, an internal abdominal injury causing significant bleeding is also a possibility?
A. Exactly as I've said. Impact part of the body with a solid object and the underlying part of the body can be injured.
Q. The reason I'm going through the detail, Colonel, is that there's some evidence, in particular in relation to Samantha Badham, that she, as you say, was conscious or semi-conscious for a period of time and it appears that it was really a very rapid, over the course of minutes, final deterioration that was very significant leading to her going into respiratory and cardiac arrest once she was moved.
I wondered whether there was any significance in someone deteriorating extremely quickly once they are moved from where they were in situ after the blast and

whether one can draw any inferences about their injuries and the final cause of death from that?
A. Based on the information that I've got, I do not feel I could draw that conclusion about Samantha Badham. What you have to consider in the multiply injured patients, speaking generically, if you moved someone roughly -- I'm not saying this happened in this circumstance -- and you dislodged a blood clot, then you could cause internal bleeding, and that could cause a deterioration. But I do not have the information to make a firm statement for this lady.
Q. No, and of course, in someone who may well have serious lung injury, either blast lung or other injury or both, would -- clearly a necessary movement, she needed to be evacuated from the scene, but would a necessary movement also potentially alter the ventilation and perfusion ratios in her lungs to precipitate a respiratory arrest?
A. If you move someone with a lung injury, ie move them from one side to another, you do alter the dynamics of the blood flow within the chest. So if they're compensating and they've managed to -- say the injured side was down and the good side was up and they were able to ventilate the good side well, and then you turn them so they're in the opposite position, yes, you could alter their respiration.

But, again, I do not have enough information for this lady to say if that's what happened.

MS SIMCOCK: I see. Thank you very much, Colonel.

LADY JUSTICE HALLETT: Any other questions for Colonel Mahoney?

Those are all the questions we have for you. The fact that your research and your conclusions have been tested in questioning does not indicate any kind of criticism of you, Colonel. It couldn't possibly. And whatever conclusions I reach, there could be no criticism.

If I may say so, this is an extraordinarily impressive body of work. If I had the power to add to your list of honours and awards, I would do so. We owe you a huge debt of gratitude and your colleagues and, I understand, the Ministry of Defence.

A. Yes, my Lady.

LADY JUSTICE HALLETT: I gather that they've been significant in providing very, very large amounts of resources to enable this body of work to be done.

A. Yes, my Lady.

LADY JUSTICE HALLETT: So please express my gratitude to everybody concerned and I did note what you said about people working holidays and Bank holidays too. That was extremely dedicated of them.

When someone suggested the use of a blast expert, as it was put to me, I never expected work of this thoroughness and this quality.
So as I say, we are extremely grateful to you.
I know the families will be very grateful to you and to your team. I hope that -- have we in any way added to your body of knowledge or has it been all for the purposes of this inquest?
A. I think, without question, my Lady, going through the process and having to examine the circumstance of these unfortunate victims has meant that the teams in Porton Down have worked more closely together and the global understanding of the explosive effects within confined environments has been enhanced, and our intention, the link between Porton Down and other UK agencies, is our hope is that will be used to help further protect the public in the future.
LADY JUSTICE HALLETT: I'm sure that will be a tiny crumb of comfort to the families. So thank you again, Colonel. It is astonishing work, thank you very much indeed.
A. Thank you.
MR KEITH: My Lady, may I invite you to call DC Richard Reynolds, please.
DC RICHARD REYNOLDS (sworn)
Questions by MR KEITH

A. Detective Constable Richard Reynolds, my Lady, attached to SO15 Counter-terrorism Command, forensic management team.

MR KEITH: Officer, your statement records that, by 2010, you had over 22 years' service with the Metropolitan Police Service?

A. That's correct.

Q. You were attached, or you're currently attached, to Counter-terrorism Command SO15, but before that, before the amalgamation of various directorates, you were attached to SO13 Anti-terrorist Branch?

A. That's correct, yes.

Q. You are trained in bomb scene examination, forensic scene examination, evidence recovery, victim identification, photography and all the associated issues that go along with being an expert exhibits officer?

A. That's correct, yes.

Q. You, in essence, were in charge of the assembly, analysis, research into and further production of the exhibits --

A. That's correct, yes.

Q. -- in the overall investigation into the events of 7/7 and, in particular, the criminal investigation, of course, of those responsible for those acts?

A. That's correct, yes.
Q. Were there an unprecedented number of exhibits found by way of forensic examination of the four bombsites?
A. Yes. SO15, or SO13 as it was, has over 40 years of experience dealing with CT-related enquiries, which generated, if not thousands --
Q. Sorry, just pause there, "CT", counterterrorism?
A. Counter-terrorism enquiries in relation to this country and abroad. We are used to dealing, or being generated and dealing with a large quantity of exhibits, often running to thousands, but I understand this is the largest one to date, yes.
Q. Your statement records that over 40,000-exhibits were seized or generated?
A. Close to, 39,000.
Q. Close to 39,000, and, of those, some 7,000-exhibits were submitted for forensic analysis?
A. Or assessment, yes, sir.
Q. We know, of course, that there were a number of scenes relevant for exhibit and forensic purposes: the bombsites themselves, but also some other scenes as well.
Could you just broadly outline what the other scenes were in terms of forensic significance?
A. Yes. It basically broke down into standard house

searches, vehicle searches, large-scale-type scenes such as landfill sites, down to small scenes, including a telephone kiosk.

Q. Broadly, how many scenes were subject to some sort of forensic analysis?

A. Over 200.

Q. Those included, of course, 18 Alexandra Grove, the bomb factory, and you've come here today able to give us an overview of the exhibits found at that scene and also, of course, of the important forensic discoveries associated with the four bombsites themselves.

A. Yes.

Q. We understand that we're going to hear in due course from Mr Clifford Todd, who is a forensic expert into other areas that arise out of the exhibit discoveries with which you were concerned. But you, I think, won't be addressing those areas. Is that right?

A. No.

Q. Could we turn, then, please, firstly, to the bombsites themselves? In relation to Aldgate, can we have on the screen [INQ9550-5]?

We can recognise the familiar carriage plan in the middle of the page.

A. Yes.

Q. But have you constructed a document which contains

pictures of particularly significant forensic discoveries relating to the Aldgate bombsite by way of their display on the top of the carriage map?
A. Yes. This was prepared by a colleague, yes.
Q. Could we please, then, just look briefly at each of these exhibits and just pause to describe their significance.
At the top left-hand corner of the page, IE/119, we can see faintly there -- it doesn't, in fact, assist if it's enlarged -- but we can see there a Visa card in the name of Tanweer. Is that right?
A. That's correct, yes.
Q. To its right, 179, it appears to be a fragment of a card. What was that?
A. That is the top half of another exhibit RABH/5, which is a Northern Snooker Club card relating to Tanweer.
Q. AM/181 was a piece of paper recovered on 12 July, according to Mr Meneely, from whom we heard, with writing on it.
We can't see on this particular document that exhibit enlarged, but do you recall in broad terms what the writing was associated with?
A. Yes, it relates to thermometers and filter papers.
Q. Was that document subject to further forensic analysis in respect of the writing and did a forensic colleague

of yours -- Janet Hill -- conclude that the writing on it provided moderate support for the handwriting being that of Tanweer?
A. That's correct, yes.
LADY JUSTICE HALLETT: Sorry, as in somebody apparently writing down a list of things to acquire?
A. Yes, my Lady.
LADY JUSTICE HALLETT: I don't want to use the expression "shopping list" in this context, but --
A. Indeed, you'll probably see later there are actually thermometers in the Nissan Micra, the vehicle actually used by three of the bombers.
MR KEITH: You refer later in your statement to the document being forensically linked to Tanweer and you described it as a "walk tall document", is that because it happened to have some wording on the top left-hand corner?
A. "Walk tall", yes.
Q. To the right on the screen as we look at it, AM/186, Mr Meneely told us in his statement that that was recovered on 13 July. Was that a fragment of a photo ID card?
A. It is, yes.
Q. In whose name was that?
A. That's Tanweer as well.

Q. Then, if we can move sideways, AM/199, recovered on 13 July, what was that?
A. Again, that's part of a Visa card in the name of Tanweer.
Q. If we can go back out of the enlargement of the document, on the bottom left-hand corner, we can see there inserted some lines which describe where each of these respective exhibits was found. Is that right?
A. That's correct, yes.
Q. Just by way of example, therefore, the first document that we looked at, the Visa card, was found between the running tracks under the rear of carriage 3 in a particular zone, zone 5B, and we heard earlier from Mr Meneely how the scene was divided into zones. All the other exhibits on this page were found in the rear half of carriage 2.
A. That's correct, yes.
Q. So, in fact, in the near vicinity of the bomb?
A. Yes.
Q. Over the page, please, RABH/1 [INQ9550-6]. This was an HSBC credit card in the name of somebody else. Who was it?
A. That's Sidique Khan.
Q. Was that found within another exhibit, AM11, which was found on 7 July?
A. Yes, as are all the RABH exhibits.

Q. Were there some other exhibits also found in that wallet when it came to be examined?
A. There was, yes.
Q. Are they set out in the top of the page as well?
A. Some of them are. Other ones don't actually provide a name or any particular relevance or detail.
Q. So RABH/3 does because it's a fragmented Excelsius snooker card in the name of Tanweer?
A. That's correct.
Q. RABH/5, that's a Northern Snooker Centre card in the name of Tanweer?
A. Yes.
Q. And then is RABH/7 a Halifax card in Khan's name?
A. That's correct, yes.
Q. Significantly, in relation to the attempts and successful attempt to purchase hydrogen peroxide, what was RABH/9?
A. That's a Dr Greenthumbs hydroponics company based in Wakefield.
LADY JUSTICE HALLETT: Sorry, Dr Green?
A. Greenthumbs, it's a hydroponics company, my Lady, in Wakefield.
LADY JUSTICE HALLETT: What exactly is the exhibit?
A. RABH -- it's an actual business card.
LADY JUSTICE HALLETT: It's a business card, sorry, I've

missed that as well, sorry. Dr Greenthumbs' business card.

MR KEITH: Does the hydroponics schedule which was prepared for the purposes of my Lady's proceedings show that, on 30 March 2005, the Greenthumbs store in Wakefield was contacted by a mobile phone attributed to Tanweer?

A. That's correct, yes.

Q. The evidence is that two Asian males visited the shop, possibly, according to the witness, in March or April 2005?

A. That's correct.

Q. Returning then to the diagram, the following page, please, AM/264 [INQ9550-7], this was recovered on 15 July. What was that?

A. That's part of a Lloyds' credit card.

Q. Were those then the significant exhibits in terms of the --

LADY JUSTICE HALLETT: Sorry, in whose name, or can't we tell?

A. We can't tell, my Lady.

LADY JUSTICE HALLETT: Right, thank you.

MR KEITH: Were those the significant exhibits in terms of the links between the four suspects, now of course plainly established to have been the bombers, and the perpetrators of the attacks?

A. That's correct, yes.
Q. Turning then to Edgware Road, [INQ9550-9], we can see there, again, the plan of the second carriage and the point of the explosion where the red cross is situated. MW/85. Is that a Barclays Visa card?
A. It is, yes.
Q. Was the position this, Officer, that when Mr Brewster's body was moved, as we heard from the forensic scene examiner, found underneath was a Barclays Visa card, this card, in the name of S Khan?
A. That's correct, yes.
Q. Was that card attached to anything?
A. I'm not sure, personally.
Q. If I suggest to you -- this may jog your recollection -- that it was attached to a piece of flesh which was then subject to STR, that's to say DNA profiling, which was found to belong to Khan?
A. Sorry, yes, that's correct.
Q. MW/132, what was that?
A. That's a Halifax card in the name of Khan.
Q. And DC/6 and DC/5, were they also cards in the name of Khan, one a Leeds City Council driver pass and one a Zurich Insurance card?
A. That's right, yes, the Zurich Insurance dated for 2006 and the Leeds Council one for 2004.

Q. Thank you very much. Turning next to King's Cross/Russell Square and of course Lindsay, [INQ9550-15], JB/116 was an exhibit recovered on 17 July. What was it?
A. That's just an envelope addressed to Jermaine Lindsay.
Q. JB/117?
A. That's driving licence documents in the name of Lindsay.
Q. I think we have that in the Trial Director system. If we could just deviate to [INQ8817-2], and if we could enlarge the exhibit, we can see there very clearly the name Jermaine Lindsay and his address on the counterpart driving licence?
A. Yes.
Q. Returning to [INQ9550-15], JB/123 was a passport in his name?
A. That's correct.
Q. JB/124 was part of JB/123, was it a certificate of mobile phone insurance also in his name?
A. That's correct, yes.
Q. JB/125 also taken from JB/123, because they were together when they were found, was a letter, was it not, dated 9 May 2005, to or from the Department of Work and Pensions?
A. That's correct.
Q. I think we have that enlarged -- that's probably as far

as we need to go, although we may try just for one moment [INQ8814-2], we may have a better copy, yes, there we are.

If you could enlarge the top right-hand corner of that page, this is the document that we saw before, some months ago now, which refers to a minute, one minute per train on the top right-hand corner there.

A. That's correct.

Q. Over the page, on page 3 [INQ8814-3] , please, the familiar reference to days of the week on the left-hand side of the page and the timings of trains, in particular references to "West", possibly Westminster, and "Padd" for Paddington, and on the bottom half of that page, timings of trains through Paddington, Bond Street and possibly Westminster?

A. That's correct.

Q. Was that document subject to further analysis --

A. It was.

Q. -- in terms of the handwriting, and was the handwriting on both sides -- that's to say the first page we looked at, and the second page -- found to be that of Lindsay?

A. Yes, that's correct.

Q. That was the conclusion reached by your colleague, Janet Hill, the handwriting analyst?

A. Yes.

Q. Returning then to INQ9550-15, JB/179 -- I'm sorry, it's on the following page [INQ9550-16], in fact -- shows a travel card in the name of Tyrone Smith?
A. That's correct.
Q. Do you recall what the connection was between Tyrone Smith and Lindsay?
A. Yes, that's the alias he was using at the time. There's clearly a photograph of Lindsay.
Q. Turning then, finally, to Tavistock Square, [INQ9550-11], it's rather hard to see what the exhibit on the left-hand side exactly comprises, so could you tell us what that was?
A. Yes, that's the remains of a Caterpillar black nylon wallet, and inside there was a national insurance card in the name of Khan, a South Leeds Resource Unit minibus hire scheme card, an Orange top-up mobile phone card and a part of a credit card in the name of Khan.
Q. Are those all the subdivided exhibits that we see on the left-hand picture?
A. That's correct, yes.
Q. Why is the colour of the Leeds Resource Unit card yellow on the right-hand specific exhibit or photograph of the exhibit, whereas it's blue on the left-hand one?
A. The image on the left-hand side is after fingerprint treatment, so the actual chemicals have caused the

exhibit to go blue.
Q. The following page, please --
LADY JUSTICE HALLETT: Sorry, just before we go on, have we any idea what a South Leeds Resource Unit minibus hire scheme is? Do we know?
A. I personally don't, no, ma'am.
MR KEITH: I think the answer to my Lady is that he had in the past worked for -- unless I'm mistaken -- for Leeds City Council, so it may be some aspect of their administrative system for their employees. But I'll be corrected if I'm wrong.
LADY JUSTICE HALLETT: Thank you.
MR KEITH: Mr Patterson asks whether we can just highlight the fact that MAR/154 was found on the lower deck of the bus. That seems plain, does it not, Officer, from the reference to the lower deck plan in the bottom left-hand corner?
A. That's correct, in addition, too, there was also a Tradex Personal Premier card in the name of Khan.
Q. Over the page, then, please, this page shows exhibits [INQ9550-12] that were significant outside the bus. Is that right?
A. That's right.
Q. CMD/33 is not, I think, on this diagram, but there was a provisional driving licence photo in the name of Hussain found. Is that right?

A. That's correct, yes.
Q. Then turning to the pictures that we can see at the top of the page, CMD/34 was recovered on 10 July, was that a scholar's photo card in the name of Hussain?
A. Yes, a sports bar access card.
Q. CMD/39? Perhaps, Officer, CMD/39 was the sports bar access card and CMD/34 was the scholar card. Would that be right?
A. Yes.
Q. CMD/44, the exhibit in the middle, can we look at that in a little more detail, please? That is headed "Notice to person whose interview has been tape-recorded". We have that enlarged and separately exhibited at [INQ8891-2].
My Lady, last week I referred to this document erroneously as a notice of intention to interview. In fact it was a notice to a person whose interview has already been tape-recorded. I unwittingly set a couple of rather large hares running, because that reference was reported outside these proceedings as being some support for the notion that Hussain was under active investigation by West Yorkshire Police when he was, of course, not.
The document itself, we can see from the bottom right-hand corner, is dated 13 October 2004, and it is

signed by him. Did that relate to the criminal proceedings by way of caution taken against him in October 2004 for shoplifting?
A. That's correct, yes.
Q. So there was no suggestion that, although, curiously, he was plainly still carrying it on him, nine months later, that he was under active investigation at that time?
A. That's correct.
Q. Thank you very much. Returning then to INQ9550-11, we then turn to CMD/55 [INQ9550-12], recovered on 11 July. Was that a national insurance card in Hussain's name?
A. It is.
Q. Then DPF/24, this was found in the basement area adjacent to Tavistock Square. We can see a little blue line in the middle of the page at the bottom. What was that?
A. That was a handwritten detail relating to Hasib Hussain giving details of his address and mobile telephone number.
Q. Finally, then, over the page [INQ9550-13], the remaining exhibits linking the four bombers to the scenes of their atrocities. JWL/8. Was that an NHS card in Hussain's name?
A. Yes.
Q. GJW/43, a further card in Hussain's name?

A. Yes.
Q. GJW/45, what was that?
A. That's a Beeston taxi card.
Q. And GJW/46?
A. Likewise, a taxi card for Holbeck.
Q. All right. So there plainly was, was there not, Officer, the clearest links between the four men and those scenes by way of a multitude of identity and other documentation bearing their names?
A. That's correct, yes.
Q. Could we now turn, then, please, to Alexandra Grove, the site of the bomb factory? Alexandra Grove was searched at great length, was it not?
A. It was, yes.
Q. Could you give us some estimate of how long the detailed forensic searching lasted?
A. It was just over five weeks, my Lady.
Q. Were some 900 exhibits taken away from that address for further analysis?
A. That's correct, yes.
Q. In the course of that search, as we've heard from other witnesses in relation to the bombsites, was it necessary to divide it up into zones, to take detailed plans of the site so that the exact location of everything found could be computed and, also, was it subject to detailed

photographic recording?
A. Certainly, yes, it was, ma'am.
Q. We have an overview of the bomb factory at [INQ9556-4]. Do the photographs around the outside of that plan show the general state of the address?
A. Yes, that's the -- the majority of these images relate to the opening photography at the scene, ie this is before the search had actually commenced. So this is how police found it.
Q. Did it appear that there was any attempt to hide the detritus which is plainly visible on the photographs?
A. Nothing was found, any hides or voids or buries in the surrounding area. Everything would appear -- or was found on open display, my Lady.
Q. Was there any attempt, did it appear to you or your colleagues, by the bombers, to conceal the activities from outside observation?
A. The net curtains, if we have a look at the picture at the top right-hand corner, you'll see some tape, silver tape running down the side of the net curtains that had been attached to the inside, the wall.
Q. In general terms, were there a multitude of links between each of the bombers and this address?
A. There was, yes.
Q. Can those links be broken down into three areas: links

to exhibits by way of DNA matches, that is to say examination of the remains of DNA on exhibits or on surfaces and DNA taken from the remains of their bodies?
A. That's correct, yes.
Q. Also, were there fingerprints?
A. Yes.
Q. Were they also linked by way of handwriting analysis, their handwriting was contained on documents found at the scene?
A. They were, yes.
LADY JUSTICE HALLETT: Can we just pause there? I appreciate it would be almost impossible for to you say how many people would have been involved in establishing this multitude of links, but just because there are people who question whether these four young men were the bombers, just how many people, giving an extraordinarily rough estimate, do you calculate would have been involved in the search, the taking of the DNA samples, the taking of fingerprints, the handwriting and then we have the experts? Do we have any idea how many people would have been involved in that investigation?
A. From a forensic perspective, ma'am, search-wise, just going -- working away from this scene, at this scene you will have maybe four, five people maximum, and then occasionally you will bring on the experts as and when

they're required to enter that scene.
So scene-wise, for a full forensic search like this, for that duration, you are looking at four or five people.
Myself and my colleagues who set up a reception centre, basically, to take these items in was initially manned, for the first six weeks, up to 20 people. My role was to take possession of those items, ensure continuity, integrity is maintained at all times, assess those items and prioritise those submissions for some form of forensic exploitation.
From there, those items would be submitted either to -- purely from an investigative perspective, the three laboratories that do the majority of the work on this inquiry was the Forensic Exposives Laboratory, the Forensic Science Service, and the Metropolitan Police Counter-terrorism Fingerprint Service.
These three laboratories undertook the majority of the work on this particular enquiry.
FSS staffing, I can't really assist you with, but they were the same staff that was used throughout that.
So, for example, from the investigative side of it, the same DNA team at the Forensic Science Service dealt with all the exhibits, and it's the same with the fingerprint side of it. All the fingerprints were dealt with purely

by the Metropolitan Police Fingerprint Service and, again, from that documentary examination, obviously for continuity purposes, it's the same scientist from the Forensic Science Service dealt with that.
Actual figures-wise, staffing-wise, I know the DNA team with the FSS was about ten. Document team, you've got about two who worked on it full-time. And maybe Cliff Todd, who you'll hear from a little bit later, will give you an indication of how many staff he had at the FEL. But there was a core number of people, not exceeding 20, who have worked full-time on this.
LADY JUSTICE HALLETT: You were responsible for continuity and, do I take it that, as will be customary, when it came to the criminal proceedings, the material was obviously made available to those defending so that they could establish to their satisfaction that the continuity that you claimed was substantiated by the entire evidential chain?
A. Part of my job is to ensure that any exhibits that come under any form of questioning or scrutiny will stand up to scrutiny, and that's part of my job.
LADY JUSTICE HALLETT: So although we haven't, as it were, dwelled upon the continuity for these proceedings, do we take it that everything was gone through during the course of the criminal proceedings?

A. That's correct, ma'am.

LADY JUSTICE HALLETT: Thank you.

MR KEITH: My Lady, is that a convenient point?

LADY JUSTICE HALLETT: Yes, certainly. 2.00, please.

(1.00 pm)

(The short adjournment)