

**RESUMED**

**[9.01 AM]**

25 COMMISSIONER: We'll reconvene and I welcome, on the subject of the transportation of nuclear materials, Mr Frank Boulton. Thank you for joining us, Frank.

MR BOULTON: Thank you.

30 COMMISSIONER: Counsel.

35 MR JACOBI: Frank Boulton is based in Adelaide and provides consulting services in relation to the management of radioactive material consignments from mine sites to their points of export. He provides advice on matters including the practical operation of radioactive material transport supply chains, compliance with regulatory requirements and the establishment of effective communication channels between all relevant bodies during consignments.

40 Mr Boulton is also the Australian representative for the World Nuclear Transport Institute, WNTI. In part of his current role, Mr Boulton worked in the transportation of radioactive nuclear materials for over 30 years at Olympic Dam. The Commission calls Mr Frank Boulton.

45 COMMISSIONER: Mr Boulton, if I could start with the basics, which is generally where I'll finish, can you explain the relationship between the role of

the package and safety and then move on to the relationship between the package and material, and then we'll move on to defence in depth. So the first - - -

5 MR BOULTON: Sure. The concept of the transport regulations is that the package should adequately protect people and the environment from any damage that may be caused by material contained within. That's the same as any sort of material, really; whether it's an acid, non-radioactive material. It applies the same sort of things. The package design has to protect the goods  
10 through normal, routine and accident conditions of transport. You take a graded approach which depends on the potential hazard, the nature of the hazardous material. So low-level material there are less requirements than there are for the higher end materials.

15 These measures have been developed over a long period of time, over more than 50 years. They're constantly updated - regularly updated. The main thing is containment of the package and containment of release of radioactive materials because with Class 7 we've got this radioactivity that people can't see but we need to contain it. So once again, depending on the package, if you've  
20 got just a small sample of material, you could probably put it in a padded posted bag and send it as accepted package, whereas if you've got some spent fuel you might need to put it in a - you will put it in a stronger package because of the amount of radiation and activities coming from that material.

25 COMMISSIONER: That comes to the concept of defence in depth.

MR BOULTON: Yes, it does. Defence in depth is about the package strength and the type of package. It's also about adherence to the regulation, compliance with the regulation. The other part of defence in depth comes  
30 around having incident response; what to do in the case of an incident. It could be a normal traffic accident, routine or high-end accident. So that's the defence in depth.

There's a further part, which is basically safety in depth, but that comes from  
35 encapsulation. The best way I can describe encapsulation is to think about the Russian dolls. You know how the Russian dolls keep fitting in. The smallest doll might be a very high-level radioactive source, then a bigger doll which is a separate part of the package. As you move through, you're moving through - so you may have a source within a Type A package which is then in maybe  
40 packed in a shipping container and that shipping container is then put inside a vessel which has a double hull. You understand the situation. So that's encapsulation. If anything happens you've got - so there you've got safety in depth. If there's a spill, it's certainly contained. Also you're protecting or you're minimising the effects of ionising radiation. Appreciating alpha, beta,  
45 gamma, gamma is the strongest but it's got so many layers of metal to get

through that you're really reducing that.

MR JACOBI: Can I come back to the concept of a graded approach. As I understand it, that requires some assessment of the material that is to be transported and I'm interested, first of all, in understanding that process of what is the process of the assessment of the material involved and what's the outcome of that assessment.

MR BOULTON: It's very important to assess the material. You need to understand the material. There's a broad range of stakeholders who need to understand the material but principally the person shipping it; that's the first thing that you need to understand.

MR JACOBI: Can I just ask at this point is it a legal requirement to assess it before you transport it?

MR BOULTON: I think if you don't, you're not going to go very far, Chad. I think that's the issue, because you probably won't comply with the regulation. You really need to. But you need to understand what the material is. If you assess the material, determine whether it's actually radioactive. Does it contain uranium methyl? If it does, is it low-specific activity. You start to build up a picture. That information then goes into your shipping documentation, it goes into your discussions with people.

MR JACOBI: Can I just come back to the assessment itself. So at the point in which you've assessed the material, for example, is radioactive, what is the information that you then gather about the material in terms of being able to make relevant decisions with it?

MR BOULTON: You'll do some assessment on your materials, some chemical analysis and you're only interested in the radioactive elements. So you might be shipping some mineral sands which could have - or it could be a copper concentrate. There may be some uranium in it. You need to determine how much there is; assess the radioactive elements, their parts per million; the quantity of material. You need to make some sort of a decision about how you might be going to package this stuff. Based on that, you can then start to build a picture of this material.

MR JACOBI: Do you undergo a calculation with respect to analysing the extent to which it's radioactive; that is, the extent of its activity?

MR BOULTON: You can calculate the becquerel per gram; that's the radioactivity level. The dose rate, that's a little harder to calculate. It's a fairly complex calculation. What we recommend is it's better to take a reading of that material. Now, that can sometimes be a little difficult. It's okay if you've

got a small sample. You might have a sample bucket, you might have a 200-litre drum, a shipping container even. Maybe if you're going to put this stuff into the hull of a vessel that could be a bit difficult because you're going to have to put it there and then take a reading. But it is important to take a reading, where possible.

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MR JACOBI: The Commission understands that something is calculated called a transport index. Can you explain what the transport index and its relationship in the assessment.

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MR BOULTON: Once you've got your activity level, the transport index is a multiplier of that activity level basically. It's just a figure that is used to help understand where this material fits in the scheme of the transport. Shippers use it. They will quite often along and they will set an arbitrary number. They might say, "We'll take a total transport index of a hundred on any vessel." Then you can calculate how many shipping containers. People use it in that way at times.

MR JACOBI: Does the assessment lead to a categorisation?

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MR BOULTON: Lead to a categorisation?

MR JACOBI: I think we've got a slide up that shows what we understand to be the assessment process. I'm just wondering perhaps whether you could walk us through the left-most slide and explain to us in broad terms what that's showing us.

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MR BOULTON: What we've got here is we've got some material. We're going to put this in an ISO container with some drums, or similarly it could be Bulka bags - A, B, C Bulka bags.

MR JACOBI: An ISO container is just a shipping container.

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MR BOULTON: A shipping container, a standard 20-foot shipping container. The reason why it's a 20-foot shipping container, you don't get much value in a 40-footer. They're bigger, they're harder to handle and you don't get much more tonnage. Receivers normally can't handle 40-footers. So we've got an assessment of parts per million of thorium and uranium. We've got the dose rate in millisieverts at the surface and at one metre. We've assessed it; yes, the material does contain uranium and thorium.

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MR JACOBI: I think picking up that gamma dose rate that's measured, that's an actual measurement?

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MR BOULTON: That is the one that I'm talking about, it preferable if you

can measure it. So then the activity in the becquerels per gram, that's actually calculated from those parts per million and the quantity of material in the package. Those numbers will change if you had a sample or a drum; that would change slightly. Then we come down to the weighted average of the uranium and thorium at the head of the chain in becquerels per gram and your transport exemption factor.

MR JACOBI: Am I right in understanding that that's simply a tool to allow you to calculate the aggregate radioactivity of what it is that you're transporting?

MR BOULTON: Yes.

MR JACOBI: In terms of what those calculations then lead you to, can you explain what that leads us to in terms of what's shown on the right-hand part of that table.

MR BOULTON: At the bottom we've worked out that the material - in this case it's low-specific activity material under the conditions of paragraph 409 of the Transport Code. It's above one becquerel per gram so it's considered to be radioactive.

MR JACOBI: The effect of that, as I understand it, leads to a categorisation that it becomes a Class 7. Is that right?

MR BOULTON: Yes. Well, the fact there's radioactivity, yes, it's Class 7.

MR JACOBI: Then in terms of the tool, we then see a transport index which shows us a number of 11.2. Can you explain to us just in practical terms what that means.

MR BOULTON: I mentioned before the transport index is a figure that is used to help work out segregation and it will also tell you whether the package calls for exclusive use. Exclusive use is where a single shipper will ship his product and give instructions to people how to ship the material.

MR JACOBI: I'm just interested to understand, we're looking at a particular tool that's used for the purpose of making a decision. Is that right?

MR BOULTON: This is just a spreadsheet that I put together.

MR JACOBI: Is something similar conducted with respect to all shipments? Is that the way that the analysis is undertaken?

MR BOULTON: That's the way I do it. I think people need to do this in some

manner or form. People will ring up and say, "Can I ship this material?" and you've got to go back to them and say, "Well, please give me this information so we can make some assessments and get some understanding." Sometimes people are a little bit hesitant because they get confused about  
5 commercial-in-confidence. Transport is not about commercial-in-confidence. Commercial-in-confidence is about how much I pay you, who I deal with. This is about assessing the product so that I've got an understanding of what I'm actually shipping. Does it really tell you much about what your product is? Maybe that's what people get worried about. But this is important to assess the  
10 package.

MR JACOBI: Can I come to the next step in terms of the effect that this analysis has on transport planning. I'm just wondering about whether you can explain what's required with respect to transport planning with a good that is  
15 identified as being radioactive.

MR BOULTON: Just finishing off, this will give you the category of the package: 3 Yellow. So from this, you understand what you're packing and you also understand what the markings, the labels and the placards will be.  
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MR JACOBI: Sorry, what does 3 Yellow mean?

MR BOULTON: There's three categories. So once again in the industrial LSA you're looking at the lowest, which is a 1 White. That's where that  
25 accepted package, that small sample, can go in the post. So this is just part of the graded approach.

MR JACOBI: In terms of developing a transport plan, once you've reached a view with respect to these categorisations and these levels of activity, what  
30 effect does that have in terms of the need to develop a transport plan?

MR BOULTON: I would suggest if you're probably just shipping accepted packages you wouldn't need the sort of detailed transport plan that you would need if you're transporting extremely high-end material. So where you fit in  
35 the scale of the material - whether it's low hazard, moderate hazard or high hazard - that will have an effect on the detail of the transport plan. Transport plans are probably something a little bit unique here in Australia, particularly for uranium ore concentrates and material as you go up from that level. I guess they're a good thing. What a transport plan does, it sets out the framework on  
40 which you're going to transport this material.

MR JACOBI: What sort of information do they include?

MR BOULTON: Initially it will talk about the product that you're shipping;  
45 that's the first thing. It will have some detail about what it is you're actually

shipping and it will talk about the chemical aspects, the safety, the issues for the public - technical aspects as well. So it will tell you whether this material is explosive, whether it's composition, whether it's liquid form, solid, powder. I just gives you a basic understanding of what it is you're dealing with. Ideally it should contain a copy of your material safety datasheet, which is a technical sheet, so if something goes wrong responders can refer to it. It's important to have a copy of that. Then there will be a series of other aspects in your transport plan.

10 MR JACOBI: Who does the plan apply to?

MR BOULTON: It applies to everybody involved in the transport of that material, from packing the material through the whole transport chain. So that will be transporters, road transporters, rail transporters. It will be people at shipping terminals or in transit terminals along the way. So like the Toll NQX up in Darwin, their storage facility before it goes on the train, down at the wharf here and people on the vessel.

20 MR JACOBI: Does it define their particular obligations as to what it is that they need to do?

MR BOULTON: Yes, it will.

25 MR JACOBI: Is it something that travels with the good?

MR BOULTON: The transport plan doesn't travel with the good, no. No, it doesn't travel.

30 MR JACOBI: But there's something that - - -

MR BOULTON: It follows a process.

35 MR JACOBI: Is it something that's agreed to by each of the parties in the supply chain?

MR BOULTON: Yes, they need to understand it and they would normally be given a copy of it. Good practice would suggest that you would do that, provide them with a copy of that. The other thing is, it's overarching - I mean apart from safety, it has security aspects. It has how you monitor the products through the transport chain. It will talk about the particular transport routes that you may use. I've got a whole heap of information in that respect.

45 MR JACOBI: I will pick them up in detail in a minute when we deal with how a UOC consignment is managed.

MR BOULTON: Sure.

MR JACOBI: I just want to deal generally with two other topics. The first is the extent to which incident response is managed at an early stage and whether  
5 that's included within the transport plans.

MR BOULTON: Yes, there are details about the incident response, that'll be spelt out. It's important with incident response of course - let me step back: you've got a number of parties involved in your transport. Normally, the  
10 person producing the material isn't involved in the transport, so you're sub-contracting, you're using transporters, you're using storage people, and they will all have their own incident response plans, if they're any good. You know, you're not going to use them if they don't.

15 So you have to work within their plan, so it is a bit interesting. So if something happens, who do you respond to, what's the chain, the hierarchy? The transport plan will spell that out.

MR JACOBI: Yes.  
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MR BOULTON: You know, who goes first? It's like Abbott and Costello; who goes first, who talks first, who responds, you know? But that's at the higher level; the immediate level of course, the details in the immediate level will be for those people either on the train or on the truck, or on the ship, on  
25 what to do. There'll be some detail about that.

MR JACOBI: Also in general, in terms of the handling of radioactive goods, what's the extent of the obligation to specifically train those that are involved in the handling of those goods, with respect to their, I guess, hazards or  
30 dangers?

MR BOULTON: Well, I mean, there's two parts to that. There's obviously the company, the transporter, the producer, the shipping line, they have their internal obligations. But overarching that, the IMO have requirements to the  
35 INDG Code that state that people involved in the handling, packaging, transport and various aspects of transporting radioactive material will have a level of training as specified in the code by the IMO.

MR JACOBI: Are there particular criteria or elements that are required to be fulfilled for people to be acceptable to actually carry out that work? Are there  
40 particular modules in that training?

MR BOULTON: Yes, there are, yes. The IMO has got a very good online program that you can work through, step through, and it's got quite a number  
45 of modules and probably takes, you know, I suppose it takes somebody maybe

in their spare time, you know, work through. And you can't pass it until you get it right, it's one of those, it's not one of these easy ones, you know?

5 MR JACOBI: Is that training enforced by the Australian - - -

MR BOULTON: Yes, a week's work I'd say, at least a week's work to get through it.

10 MR JACOBI: Is that training enforced by an Australian regulator?

MR BOULTON: Yes, yes it is. ANSTO will say that you need a plan, you need training for the people involved, because the person who signs off on the multi-modal shipper's declaration is signing a legal document, saying that everything's been packed in accordance with the requirements, everything  
15 stated there is correct.

I mean, the end game in this is to make sure that when we ship the material that the paperwork describes the product and so that when we submit the paperwork, it doesn't matter if it's here down at Flinders Ports or some  
20 international port, everybody's going to understand what's there and it's going to flow freely.

MR JACOBI: I want to pick up the consignments when we come to deal with the UOC, and I think I might turn to that now. Can we come back to the point  
25 of making an assessment, for the purposes of the UOC, a uranium concentrate shipment? Perhaps you can give us a broad idea, I understand you've had significant involvement in doing this, about what the characteristics are of the material that you're there shipping?

30 MR BOULTON: Okay. Uranium Ore Concentrate is a non-explosive, solid, heavy powder, high density. It won't burn, it's non-fissile, so it can't support a chain reaction. It is a metallic concentrate. The only unique part about it: it's radioactive, low level radioactive.

35 MR JACOBI: And in terms of its radioactivity to mass, in comparison to other? Are you able to express a view - - -

MR BOULTON: Sorry?

40 MR JACOBI: I think you were expressing it in terms of it having low radioactivity; perhaps we'll deal with the extent to which you can be exposed to radiation from UOC, but in terms of the implications of what you've described in terms of its characteristics, I'm just interested to understand what's the categorisation that emerges, picking up the  
45 we've just talked about?

MR BOULTON: Well, once again it's low-specific activity, LSA-1 material, it's Category 3 yellow for ore uranium. The transport index will probably be much lower than the figure stated up on the screen there, for uranium.  
5 Normally it's about probably less than 6, much less than 6 overall.

MR JACOBI: Sorry, 6 what?

MR BOULTON: The transport index.  
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MR JACOBI: Right, yes.

MR BOULTON: It's just a number. The transport index is just a number.

15 MR JACOBI: I've read UOC described as having a low radioactivity to mass ratio, and I'm just interested whether or not - sorry, uranium ore concentrate having a low radioactivity to mass ratio. I'm just interested if you could unpack that a bit?

20 MR BOULTON: Well, the best way I can describe it, the easiest way in a practical sense is to say the dose rate emanating from a shipping container, you would get between .82 and .83 and millisieverts per hour, which is probably less than what you would get from a chest x-ray. So considering that you are actually getting from that 18 tonnes of material, which is within the drums  
25 inside, very low level.

MR JACOBI: In terms of the implications for the categorisation in terms of the package, can you explain how that's been resolved for the industry, as to what the package selection's been, bearing in mind the view as to the risks?  
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MR BOULTON: You mean in respect to uranium - - -

MR JACOBI: Uranium ore concentrate; I now exclusively want to deal with that.  
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MR BOULTON: Well, traditionally, in fact since they first started moving this stuff, they've been using 44 gallon drums, 205 litre steel drums. I suppose if you go back in time, back to when they were moving this stuff around probably in the late-30s early 40s and they were shipping stuff into America, a steel drum was probably a convenient tool, convenient package.  
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Of course, the industry know as much about this material back then, and they were probably shipping much higher grade ores. But they've used this particular package; it serves the purpose well. The actual package that we do use today is an improvement on the original 44 gallon drum, it's a heavier  
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gauge material, it's got a better lid, it's got better where the actual barrel meets the base it's got a double crimp, all beefing the package up so that its containment is better, it's got better characteristics.

5 MR JACOBI: In terms of the ability of the radiation from the uranium concentrate to penetrate the drum, I'm just wondering whether you've got an observation in terms of its ability to either absorb some of the radiation that's emitted, and the extent to which measurements are made outside drums.

10 MR BOULTON: It's gamma, so it will go through the steel, it can quite easily go through the steel, so you would get a little bit higher dose standing next to a drum than you would standing next to a shipping container, because in the shipping container, you've got the steel plate on the wall. However, in a shipping container, you do have a larger mass.

15 MR JACOBI: In terms of shipments, and I think we've come back to the question earlier in terms of making actual measurements of the radiation. Are you able to offer some information with respect to the extent to which you've made measurements around drums or shipping containers, of what the exposures to radiation are, as they've been measured?

20 MR BOULTON: It's a little tricky if you're trying to take an accurate measurement of a drum in a packaging plant, because in a packaging plant you've got a lot of radiation. You've been overseas and probably people have spoken to this: even when you put those drums inside a shipping container and you've got a yard full of shipping containers, you've got this yard full, there are still other competing if you like, competing activity.

25 The best place to take your reading is after you've put it on the truck, and you're away from, so you're well within the limits of normal background radiation, good practice to do that.

30 As I said before about the activity, that you should take the reading rather than just try to calculate the reading. Anybody setting up a uranium mine should do this. Anybody doing packages should do this. At Olympic Dam, I know that we did it for the first 20-odd years. So you develop a database which you can start to have some - if somebody says, "Do you do this?" and you say, "Yes, and here's the results." It never varies. It's like Craven A cigarettes, they never vary. The results won't change because it's physical and it can't change but you can prove it, you can demonstrate it because you've taken the readings. It's important to do that.

35 MR JACOBI: I just want to deal with how a consignment overall is managed, and I think we've got some slides that pick up the steps that have been prepared in advance and perhaps if you can take us through the steps from the point at

which you're actually at the plant I think you were just describing.

MR BOULTON: The first thing I'd say is that in the case of uranium ore concentrate is perpetually in motion. This material is being produced and being shipped on a regular basis. People don't produce this material to store it. They want to sell it. They're running a business. So you've normally got continuous bookings, so you've got a shipping line and you've got bookings. But we start out - as the material is produced, it needs to go through a fuelling plant. Here's an example of - this is the automated plant at Olympic Dam, so empty drums - the first slide is pictorial but the operator has got - and it's showing the batches and the drums. Empty drums are coming in. It goes into the booth itself where automatically the lid is taken off, the drum fuel head comes down and slowly fills the drum with a preset amount of material. As it's doing that, it's taking some samples. Once it's full, it comes out, it's washed, it's dried and it's weighed. Those numbers are then put within a computer system. The middle row you can see the washing there. The second slide in, that's where they're washing it, then drying it. The operator is checking the lid.

Now, the fact that the operator has got that white protective suit, that's just in case he needs to go into the packing booth. He normally wouldn't go into the packing booth. The only reason he'd go into the packing booth would be take the sample carousel out when he's finished or if there was an issue. So they don't normally go into the plant.

MR JACOBI: Could you explain what are the tasks that are performed for the purposes of an inspection. As I understand, an inspection is being performed at this point. You talked about checking the lid. Is there an inspection for any other purpose?

MR BOULTON: Afterwards, yes, there is.

MR JACOBI: What's it being inspected for?

MR BOULTON: He marks the drum. There's the drum. He's marked the drum. That last picture on the bottom line - the second-last picture, he's weighing the sample jar. That sample jar goes off to the laboratory for analysis and that's going to help form - there's two parts to that and there's a couple of samples. There's not just one sample jar. Samples are used to check the process, the production process, to make sure you've got no hiccups. Because if you're not making quality product it's going to hurt your price and it shows problems in your plant. So eventually he's just moving those drums onto a pallet and they will be moved within the shed, ready to go into a shipping container.

MR JACOBI: You mentioned that there was an inspection for checking the

lids and I'm just interested to - - -

MR BOULTON: He's just making sure that it's sealed.

5 MR JACOBI: Are there other inspections that are undertaken at this point?

MR BOULTON: After, yes, there are. Before - - -

MR JACOBI: Yes?

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MR BOULTON: Yes.

MR JACOBI: And what are they?

15 MR BOULTON: Check the container before - actually before this, we'd check  
the drum to make sure the drum didn't have any rust in it. Before the drum  
went into the fuel plant, we've done some pre-checks. Now it's packed, it's  
ready to go. So the operator then, he will have done an initial check on the  
shipping container first to make sure that there's no holes in the container, that  
20 the shipping container has got its ACA standards so it's accredited so it's fine to  
ship; that there's no nails on the floor, that there's no - - -

MR JACOBI: Can I just pick up the container itself because I think we picked  
up the idea here that we're dealing with a package within a package and I'm just  
25 interested to the extent to which the container itself is modified for the  
purposes of transporting drums in terms of flooring or walling that's inserted in  
the container.

MR BOULTON: No, look, they're general purpose containers, just standard  
30 20-footers. The only thing that we do like the shipping line to provide us with  
is four or five lugs at the top and the bottom of the container wall so we can  
hang droppers from which to strap the drums in and contain them. That's the  
only requirement. We don't like steel floors because you get a good coefficient  
in friction so the drums will skate around. Metal on metal is not good. So we  
35 won't use metal floors but we want good timber floors. We actually use  
30-tonne rated boxes because the floor spacing is closer. So if there is a failure  
of the floor, the drum can't slip between the rafters.

MR JACOBI: I think we're at the point of loading them into the containers.  
40 I'm just interested in whether you can explain the steps at the point in terms of  
both their loading and then in terms of their inspection.

MR BOULTON: The containers are preset. There's a plastic liner tray put in  
heavy duty Forticon plastic put in the base of the container. It comes up the  
45 wall about 18 inches. That's basically there - if there is a spill, that will help

contain the material so that it doesn't go into the flooring.

MR JACOBI: That's specific to this kind of transport?

5 MR BOULTON: Yes. It's good practice. I mean the worst thing you want is  
to have a spill where the material gets ground into the floor and then you've got  
to clean the container or get around to clean-up of the container at a later stage,  
at the end of the journey. So then the drums are then loaded into the shipping  
10 container in a set configuration, and the operator has been trained and knows  
how to do that. That configuration has been approved by the Australian  
Maritime Safety Authority.

MR JACOBI: I think we might have a slide that picks that up in terms of - if  
15 we step a couple of steps through and I'll come back to the consignments in a  
minute.

MR BOULTON: Yes, go forward a few. So you can see on the first some  
droppers. Do you see those droppers? There's rings on the top and the bottom  
20 of the container sidewall and then we're using horizontal strapping to hug the  
drums and hold them in. So there's a configuration and the operator just  
methodically goes through loading the appropriate drums into the shipping  
container.

MR JACOBI: I'm just interested to pick up the extent to which the  
25 independent inspection gets carried out at this point and the purposes.

MR BOULTON: At this stage there's no inspection. The inspection of the  
container has been completed and this guy is just going about his business. He  
will pack these containers and an independent person will come along  
30 afterwards and inspect them and they'll make sure that the drums in, that the  
strapping is tight, that the loading of the container conforms with the  
specification. But that's an independent person. It's better to have somebody  
independent.

MR JACOBI: Can I just come back to the consignments and I'm just  
35 interested to the extent to which - what's the information that's included in the  
consignment information at this point. Perhaps we'll come back to the previous  
slide.

MR BOULTON: What you've got here is, this information is the information  
40 contained within a particular shipping container. So there's 48 - here we've got  
seven. What have we got? We've got a number of drums - seven drums. How  
many batches? I can't see there. Have we got - how many rows? My eyes are  
not good.

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MR JACOBI: I think about nine or 10.

MR BOULTON: Yes. And looking at the weight, okay. This would be something like an ISL, a uranium-1 or a Heathcote; they would have about 60  
5 drums in a batch, 60 drums in a shipping container. So nine batches, seven drums. So this is the individual batch, each batch, and the weight of material within each drum, adding up to a total net weight of UOC, and then from that you've got the weight of the drums, so you add in the gross weight of the drums. You've got the percentage of UO<sub>4</sub>; being an ISL-based product, it's  
10 around the 80 per cent. Not the same as say, an Olympic Dam or a Ranger material, which is more up in the 99 per cent, because they put it in through a calcine, it's just dried.

So the transport index of the drum and the giga-bequerels activity. So that says  
15 you've got about 17586.9, or something like it. That's the total, net, kilograms of UOC, right, and the total net UO<sub>4</sub> is 14.804; this is for your - - -

MR JACOBI: Yes.

20 MR BOULTON: That's because it's 84 per cent. These fellows actually don't carry as much uranium, they don't get as much bang for their buck.

MR JACOBI: The particular point I wanted to pick up was, there's a calculation in each case, of each drum, of the transport index associated with  
25 that drum?

MR BOULTON: Yes.

MR JACOBI: Right. And that is based upon a particular calculation of the  
30 Becquerel of activity of what's contained in that drum, is that right?

MR BOULTON: That's right, yes.

MR JACOBI: I think picking up the next - - -  
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MR BOULTON: So then, this has just come through, so now we've got three containers, right? So that green information's come through from the earlier slide, there's another couple of containers. Now, we've got three containers that have been shipped as a delivery, as a consignment, and the information in  
40 green flows through to the multi-modal DG form of each container, whereas the yellow down the bottom, that's what goes to Safeguards - - -

MR JACOBI: That's what I wanted to pick up, and that is the extent to which  
45 the consignment information is used for purposes other than for what you might regard as just the ordinary transportation of goods.

MR BOULTON: That's where it's important that you've got this information, and you can get it to flow through to your multi-modal Dangerous Goods form, you can get it to your Safeguards transfer form that you send to Industry and Science, and also to ASNO.

MR JACOBI: Yes. I just wondered if you could explain what is the obligation - - -

MR BOULTON: This information also goes through to the consignee.

MR JACOBI: Yes. Can I just pick up, what is the obligation to provide information? You talk about providing a yellow for Safeguards transfer; what is the obligation in terms of when that information is required to be provided and what is the information that's required to be provided?

MR BOULTON: I mentioned for perpetuity. So you've got bookings coming, and you know that you're going to send three containers of material on a particular shipment; you might have another that's got four or five. That information you send to the Safeguards office, and initially, you say you're shipping five containers, and you give them a rounded weight, a rough weight, based on your estimations, maybe on an 84 per cent grade.

They then start to approve that, they then talk to the overseas country and say, "We have some material we'd like to transfer." They check out all the safeguards behind it, make sure everything's fine. In the meantime, you've actually packed the material, you've now got this information and then you just send the final information, say, "Okay, we are actually sending this amount, this many grams," if you like, "or kilograms of material, we are shipping to this particular location," because they're going to use that later to track through with the IAEA and the Safeguards processes.

MR JACOBI: Is that required to be provided prior to its transportation out of the mine site?

MR BOULTON: Normally it would be, yes. By the time you're trucking, yes, you would have the approval.

MR JACOBI: Now - - -

MR BOULTON: Because your approval is not a lengthy, onerous process. Over the years, we've managed to streamline that process, you know, because these shipments are happening every fortnight. There's paperwork continually happening with this.

MR JACOBI: Now, I understand you're also required to obtain an export approval. Is the same information also provided to Customs in order to get an approval to - - -

5 MR BOULTON: The first part is Industry and Science, because it's a strategic commodity.

MR JACOBI: Yes.

10 MR BOULTON: So there are parts of that information, that key information that goes to them. They're also interested in the price that you're selling it for, and now you're starting to get into the commercial side. There will be other aspects that they want to know. They really want to know what the free, on board value is, so they can send that to the ABS behind the scenes.

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But intermingled with all that, so you get the Safeguards approval, the DIS approval, and then that goes to Customs Border Protection, so when you submit your PRA, pre-receipt advice for the boxes to go into the terminal, you've actually got your export clearance. But you can't get the export

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clearance without the permit, without putting that paperwork in.  
So that tidies up all the safeguards and export control.

MR JACOBI: Can I just pick up finally, coming back to the container, in terms of the information that's provided to the shipper: are photographic records or other records maintained of what's contained within the cargo, other than the consignment note?

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MR BOULTON: No. That information you would share with the shipper when you're bringing the shipper on board, you know? When you go to a shipping line, essentially you need to go to the shipping line and you have to have a conversation with them and bring them on board with the journey. So you'll give them a presentation, give them all the background and they will understand how it's packed. They certainly would.

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MR JACOBI: Right. Now, I'm just interested, we picked up the concept of an independent inspection, that is, independent from the person that in fact packed it. I'm just wondering perhaps whether you could walk us through what that process involves, and who does it?

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MR BOULTON: Look, container inspections are an important process, and it's been exacerbated on the slide there by the Convention for Safe Containers, and the US PAT requirements, Protection Against Terrorism. It also addresses the IMDG multi-modal requirements and other obligations.

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So on the left-hand side there, that's the guy who's going to pack the container, or one of his team, and he's actually checking the container out. So he's checking to make sure it's compliant, he's looking at the compliance plate on the door, he's also going to check the container floor. He will get the container  
5 lifted up in the air so he can look at the undercarriage; he'll be making sure that there's no huge dents or that the roof hasn't got bows in it that can hold water, cracks. He'll actually go inside that shipping container and somebody will shut the door, and when you're inside a shipping container with the door shut, it's a little bit daunting, but it's pitch black. If there's any light, if there's a crack  
10 both in the rubber door seal, he'll be able to see that and he'll reject the container.

Middle slide, that is an independent lady, and she is actually checking that the drums are the drums that were destined to go in there. She's also checking on  
15 the strapping and she's also having a look around the container to make sure that there are no dents, that he hasn't missed anything, so she can do a bit of an independent inspection there.

As I've always said, particularly when we were moving copper, you know, making sure that nobody's left anything in there that shouldn't be there, you know, you don't want paper or rubbish; you want your product to look fine when they open the doors at the other end.

MR JACOBI: Now, can I just come to the point, leaving the inspection  
25 behind - - -

MR BOULTON: Just on the final one, you can see, just these yellow items here, they're container bolt seals. So she's pre-allocated those, and they will be part of the shipping documentation. Once she's finished, lock the container up,  
30 two bolt seals on the container door.

MR JACOBI: In fact, that's where I was going to come. In terms of the container at that point is sealed, is it then able to be opened again before it ultimately reaches its destination?  
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MR BOULTON: ASNO do not like their boxes being opened once you've left the mine site. There has been situations where we have, for various purposes. When we went up on the rail, we did that to make sure that the drums hadn't moved. There were some concerns at the time. But normally, no, it doesn't  
40 happen. However, we have no control over some efficient supervisor or people say in a port overseas. However, when the containers are overseas we have our overseas agent will have somebody check those boxes and if they have been opened there is a process where we can notify ASNO and put new seals on the boxes. But sometimes people say, "What's in the box?" Now, even though  
45 you've got good paperwork and that should prevent that, you'll never prevent it.

MR JACOBI: This is inspection by overseas Customs services.

MR BOULTON: Well, it could be Customs, yes.

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MR JACOBI: I just want to deal with the issue of transportation from the mine site to the point of export in terms of - I think we discussed transport planning. Am I right in understanding that there's a standard transport plan for its movement from its location at Olympic Dam to Adelaide?

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MR BOULTON: Yes, there is. The transport plan has been approved and that sets out the process. So what happens with the movements, it's perpetual, they're ongoing. So normally every month the consignor or the producer sends a notification to the government. It uses a central agency, DPC, Department of Premier and Cabinet. They've always been the one stop shop, if you like. They will say, "Okay, this coming month, on these weeks we plan to move, as per our schedule, so many boxes." That's just a heads-up, if you like, of what's going to happen, rolling over month by month. On the day that the boxes are moving, when the boxes actually physically leave the site there's a notification again goes to the DPC. That will say, "Today is three boxes. These are the container numbers. They left Olympic Dam at" - or, "they left the mine site" - whatever - "at a certain time. They're expect to get where they're going at a certain time." That information the DPC then disseminate to those people who need to know. So it's typically the police, CFS, MFS. There's a range of parties. Then the transport continues.

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MR JACOBI: I just want to come very, very quickly to at the port itself in terms of its management at that point. I think we've got a slide that picks it up. I'm just interested to understand the extent to which there are obligations with respect to where these particular ISO containers are stored on vessels.

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MR BOULTON: Maybe even if you step back. I mean when these boxes - I will just step back. During the transport from the mine site, whether it's from up north, coming down by train or from Darwin or wherever, those transports are monitored and within the transport plan it states how you will monitor it. Most of the trucking companies have got sophisticated GPS on the trucks and they can tell if the truck driver is over-accelerating, heavy braking, where he is. That's fine. But normally we just have certain points where the truck driver crawls in and you tick off where he is.

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When they get to the shipping terminal, just go in in the normal process. There's nothing special for this process. They don't get out with red carpets or blue carpets, waving flags. They just come in like a normal container would come in. The only difference is coming out Olympic Dam they actually use A-doubles all the way into the terminal but there's other operators who use

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A-doubles. It's then stored within the terminal normally for a week or less. You transport this week, it goes out on next week's ship. So it's stored in a defined area where people at the port know where it is. They need to know.

5 Then part of the ship's planning is to - and this is just typical of a ship plan. This is universal. So this is just showing - and you've got the longitudinal section of the ship and then you've got a cross-section looking along the ship. These are just basically container slots within the ship. We are fortunate here, that we put the material underdeck, up-front in nice little cuddies. So once  
10 again you've got additional encapsulation so that it protects the containment of the container. I think I had some pictures somewhere that might show that. I mean this is standard shipping. I guess you're familiar with, Chairman.

15 It will tell you what kind of - the different colours are where the boxes are going to be unloaded. They use different colours. Then within these other - it tells you what the material is, whether it might be dangerous goods or what is the class of material. They can drill down and in fact they use this material at the - I mean they guys have a permit to possess material at the wharf and the ASNO and the IAEA will come down and go through their paperwork and say,  
20 "You've received material from the mine. When did it come in? Show me when it came in, how long it was here," and they can use all of the history from this information to satisfy the requirements.

25 COMMISSIONER: Is that on an individual basis for every shipment or is that a check?

MR BOULTON: Sorry?

30 COMMISSIONER: This inspection from the IAEA or the - - -

MR BOULTON: They're quite random but they will go back and say, "Show me your history for the last six months," and they will follow it through. I was only down there last week talking at the terminal with some people, with somebody who's taking over another mine, and they just openly mentioned,  
35 "Yes, we get inspected, we get audited." I mean all of these processes are auditable and audited, and the IAEA, they come in at any time. So this information is standard. There's no secrets. It's all time stamped, every container move, every time it moves.

40 MR JACOBI: I'm just interested, once the vessel leaves the port, the extent to which the operator or the consignor that's transported the goods monitors their ongoing movement.

45 MR BOULTON: There's a vessel leaving, a tug coming in. It's monitored all the way. You can see there we leave the mine site, local transport to the point

of export on the water - maybe through a trans-shipment port, back onto the water again, overseas discharge, overseas transport, final destination. So that's a tracking form, an ASO 203 form. The consignor sends that to their overseas line carrier and they will check - you've got depart Australia, trans-shipment port, second trans-shipment port (indistinct) final discharge (indistinct) and they will check that.

On that form, as I mentioned, if somebody has changed the seal numbers, they will write on that and that form gets sent back to the safeguards. That's part of the safeguard's obligations, to be able to show the IAEA that they're tracking. There's a period of time after the ship sails - I think it's 24 hours after the ship sails - that you will let them know that the ship has sailed and there's some time obligations on this. So it's not a case of, "We'll do it when we feel like it."

MR JACOBI: Who conducts the inspections at those ports? Is that the consignor's agent?

MR BOULTON: Yes.

MR JACOBI: So the consignor's agent is then responsible for transmitting the information back to ASNO. Is that right?

MR BOULTON: Their obligation is to send it back to the consignor but in today's world, with email, normally they will email it to both.

MR JACOBI: I just want to pick up the question of incidents that might be involved with UOC transport and I'm just interested to get your view about if there is such a thing as a typical incident involving damage - and I think we've got some slides to pick it up - what your view of those sorts of incidents might be.

MR BOULTON: If we talk about safety, there's a graded approach to safety. We have normal, routine and accident conditions. Here's some examples of a bump and scrape. This was a container that had drums of uranium in it and - I forget - this happened probably in America I'd say because it's most likely in America that's where it happened. Somebody has gone along the side there of the container and you can see the scrape on the first slide. You can see the extent of a fairly strong gauge. What happened from there was, at the port, they got a radiation meter, they checked. They were able to look inside, shine a bit of light in, which was well clear of any drums. We spoke by email and I said, "Look, the easiest thing to do is just patch it, patch the hole," which they put a patch on, on the third slide. We've noted it. A note has gone to ASNO and a note has gone to the consignee saying, "This particular container, when it arrives, just check and they will" - and so they're aware - because I guess when they open it, if there is any chance of there being a spill, it's good to give them

a heads-up that there. But no spill with this. No damage.

MR JACOBI: I'm interested to get your perspective, I gather you've followed UOC shipments over the course of your career. I understand there's a concept  
5 of a reportable incident. Perhaps you can explain what that is first. Any incident that really loses control of the process - processes are in control while they're moving along. Once somebody stops anything, you lose control of the process, it can be reportable. I mean some of the incidents - this would border on being reportable but I would report that to ASNO because I think it's best  
10 that they know and it also shows them that you can manage.

Higher end might be more significant damage than that. I think we've got another slide that might show a little bit more significant damage. So this one here, that was certainly reportable. This happened in Vancouver a couple of  
15 years ago. The container has been struck by something. I'm not sure but you can make your own mind up about it. There's a drum sitting in the corner of the shipping container there. Now, this actually triggered the incident response in Canada with Transport Canada. Cameco are the responder and Cameco responded to this accident. There's the container. There's a guy just got his  
20 dust mask on and he's going to hope into the container and have a look. So there's the drum in the corner, in the middle. There's the bulge in the container wall and then you can see the damage on the drum. What it shows is that there is strength in the packaging.

25 MR JACOBI: I'm actually interested to understand was there a failure in the packaging?

MR BOULTON: No, no failure of the packaging. No contents were released. So it shows that these drums are fairly strong. If you think back to that picture,  
30 it's been hit by something pretty damn hard to bend that container wall like that. So the container wasn't fit to transport; it only had three pegs. A bent peg you couldn't lock down on a truck. So we organised a fresh container and the drums were repacked and that particular damaged drum was placed in the yellow over pack and shipped off to the consignor. But that's probably more  
35 than a normal incident, but that was certainly reported and the reporting - people in the industry know what to do. They know to report. It happens. That really is a reportable incident that one.

MR JACOBI: I'm just interested to understand the number of reportable  
40 shipments given the movements that have occurred around the world of uranium concentrate over the last several decades. How many reportable incidents there have been and what was their nature?

MR BOULTON: I don't know what the total number is world-wide but I  
45 know out of the - what I'm aware of and it's a figure less than 10. The reason I

know that is because they're so few and far between in all the years that I've been doing it and I always remember them.

5 COMMISSIONER: How many years, Frank, have you been doing this?

MR BOULTON: We started in 1988 and I finished in 2012 full-time, so 24 years.

10 COMMISSIONER: So 10 incidents in those - - -

MR BOULTON: 10 incidents, yes. A lot of those were just bumps and shunts. There was a piracy incident in the Gulf of Aden. That was a significant reportable. The carrier, bang, straight off to ASNO with a report. Steven Smith jumped in, you know. Things happen. So there's a process and that's fine. I got a bit annoyed because we couldn't ship through that way any more but I understood why: piracy is a concern. But, honestly, in percentage terms very, very low. I think it just shows that the transport of radioactive material as a daily occurrence is well managed.

20 COMMISSIONER: In your experience, has there been an escape of the product from the package?

MR BOULTON: Yes. One of the incidents in the very, very early days when we used to secure the drums within a shipping container using timber, which was the original process, one of the drums had actually moved and had worn the bottom lip away. It must have done a lot of vibrating. Going back then, those containers were on the top deck of charter vessels when started moving - - -

30 COMMISSIONER: It can get bumpy at sea.

MR BOULTON: It can get bumpy at sea, that's right, and they danced. The method we use now hugs them a lot tighter and allows it to move, whereas timber doesn't, and then the drum. So, yes, that caused a release of contents. So through that we then went back and what the industry does is it learns from its lessons. So we back to the drum manufacturer and did the double crimp, an extra crimp. In 2002, that's when I started to look at - and I got away from the timber and started to use this better method. I think it's a better method because the drums, with the Kevlar webbing, can actually move, whereas timber just doesn't. You put a wedge in the timber and the container moves and the wedge falls out.

45 COMMISSIONER: What about in the road transport from Olympic Dam down to the port? I mean that's been going on since the 80s. You must have had accidents, I would have thought.

MR BOULTON: The only one that I can tell you about that occurred was just a traffic incident where a truck basically chopped in front of an A-double - a B-double jumped in front of an A-double and there was a slight dint, just a  
5 scrape on the truck. I think the B-double probably came off worse. But once again, I was in the office about 4.30 on an afternoon, got the call. The truck was out at Linfox at Port Adelaide and I went out there, had a look and I appreciated what they did. They asked me to come out and have a look. They had it under control. They knew it but they asked me to come out. That was a  
10 reportable one. So very, very minuscule.

COMMISSIONER: In terms of transporting other radioactive material other than uranium oxide, have you been involved in something more potent?

15 MR BOULTON: Probably a little bit of radium.

COMMISSIONER: Mostly uranium oxide.

MR BOULTON: But mainly uranium oxide. But the processes, the  
20 procedures, using the graded approach, it will work. If you look at lower grade material, the accepted package IP1, the hexafluoride special package or hexafluoride missile materials, the Type A, the medium hazard, up to the B. The processes that you apply to transport, you just scale them up. You use that  
25 scalable process. I think later in the day other people will reinforce that point.

MR JACOBI: I'm just interested in perhaps one last thing in terms of if there was an incident, is it necessary to return the package back to Roxbury Downs or is that a possible option in terms of repacking, if that's a necessary step?

30 MR BOULTON: Yes, that is the process, you would take it back. You wouldn't ship it. I mean in this particular instance it was basically as close to being on the doorstep - I mean it was in Vancouver and it's heading off to Ontario, so it's a retake. But if it was here, they would take it back, yes.

35 MR JACOBI: And has that been necessary as a step if there's been difficulties in terms of things not occurring as expected, in your experience?

MR BOULTON: It may have happened once. In fact, it has happened once,  
40 yes.

MR JACOBI: What was the nature of that?

MR BOULTON: There was a bump and a scrape and the decision was made to take some material back to site, yes, for repack, but I wasn't there.  
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MR JACOBI: Did that involve a release of any of the contents?

MR BOULTON: I'm not sure. Look, I don't know. I haven't really seen any  
5 final reports but I do believe that that matter will be discussed at WNTI in  
December.

COMMISSIONER: Mr Boulton, thank you very much for your evidence,  
participating and also for the preparation that you've made to help us  
10 understand the transport of nuclear materials. It's very much appreciated.

MR BOULTON: Thank you, Kevin. Thank everybody.

COMMISSIONER: We will adjourn now until 1200.

15 **ADJOURNED**

**[10.12 am]**