OFFSHORE HELICOPTER SAFETY INQUIRY
June 29, 2010
Tara Place, Suite 213, 31 Peet Street
St. John's, NL

June 29, 2010

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COMMISSIONER:

Q. Good morning, ladies and gentlemen. Good morning, Dr. Coleshaw.

DR. COLESHAW:

A. Good morning.

COMMISSIONER:

Q. Ready, Mr. Roil?

DR. SUSAN COLESHAW, EXAMINATION BY JOHN ROIL, Q.C. (CONT'D)

ROIL, Q.C.:

Q. Thank you, Commissioner. We are indeed ready. We've just about finished issue number one from yesterday's evidence, but there was a couple of -- or there are a couple of housekeeping items. Apparently we have spouses who watch these things and Dr. Coleshaw's spouse reported that she may have misspoke yesterday, so I don't know if she wants to clarify something about observing water and/or bubbles coming out of suits when underwater.

DR. COLESHAW:

A. That's right. Apparently when I was talking about the buoyancy inside the helicopter

Page 2

escape trainer, I talked about water coming out of the suit and in fact, I should have said air bubbles coming out of the suit, so I hope there's no misunderstanding.

ROIL, Q.C.:

Q. I think this was in the context of you saying you've watched film footage of the actual HUET procedure?

DR. COLESHAW:

A. Yeah, and as the individual goes under the water, you can actually see air escaping from around the sides of the hood.

ROIL, Q.C.:

Q. Right, which would allow air out and possibly allow water in?

DR. COLESHAW:

A. It means that the worst problem with buoyancy is in the first few seconds and that it will improve slightly the longer that you're underwater because some of the air has escaped.

ROIL, Q.C.:

Q. Okay. Well, hopefully the television stations or the red is on in England today and he will pick up that correction.

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COMMISSIONER:

Q. I wonder if he's watching this morning.

DR. COLESHAW:

A. He could well be.

ROIL, Q.C.:

Q. The third question that was in issue number one for you says -- the question was put should the C-NLOPB require guidelines to ensure such equipment is properly fitted, and I guess the question that was more properly to you is, is it appropriate that a regulator, I think whether or not the C-NLOPB does it is perhaps a question that the Commissioner will have to grapple with, but to put it more generically, the fitting, the appropriate fitting, the way that these things all work together, is that the kind of thing that a regulator should be engaged in in seeing or ensuring happens?

DR. COLESHAW:

A. I think so, yes.

ROIL, Q.C.:

Q. Okay. The second issue then that we had on our list was should the C-NLOPB or in this case to you perhaps, a regulator, more

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directly involve itself in studies and research into the prevention of inversion of ditched helicopters and the enhancement of passengers' ability to escape, and I think this is issue number two and on your slide presentation, it is at page 11. Okay. Whenever you're ready, you can proceed with what you want to tell us about this issue.

DR. COLESHAW:

A. Okay. What I'll be focusing on is research that's been undertaken or instigated primarily by the UK Civil Aviation Authority looking at helicopter stability, floatation and the prevention of capsize or prevention of inversion.

ROIL, Q.C.:

Q. Inversion is the 180 rotation, so that the propellers are on the bottom?

DR. COLESHAW:

A. What you'd expect at present, that if a helicopter does turn, it's going to turn completely over to a 180 degree angle.

ROIL, Q.C.:

Q. Okay. So to look at the pictures that are in front of us, the bottom photograph would show

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a fully inverted helicopter?
DR. COLESHAW:
A. That's a fully inverted helicopter.
ROIL, Q.C.:
Q. And this is something that is trying to be avoided?
DR. COLESHAW:
A. Yes, certainly, and the ethos of that is that if you can prevent complete inversion and keep an air gap within the cabin of the helicopter, then that's going to enhance occupant escape and going to make it much more simple for occupants to escape and not have to spend as much time with their heads underwater. That is obviously dependent on the capabilities of helicopters, the fact that they've got a very limited range of stability and particularly breaking waves are a major hazard. It's breaking waves that are most likely to turn a helicopter over.
ROIL, Q.C.:
Q. And breaking waves are associated with sea state generally?
DR. COLESHAW:
A. Sea states. Helicopters are required to have

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ditching capability, so have to have measures as to the sea states in which they are capable of remaining stable in an upright position without inversion, and the upper practical limit is thought to be around probably sea state five, though ideally they should have capability up to sea state six, if you consider the weather conditions flying out to installations certainly some in the North Sea, some rigs in the North Sea, I suspect here in Canada, and I think again if you look at the pictures on the slide 11, the top picture is of a controlled ditching in fairly calm seas. The second one was a ditching that occurred in seas that were up to about sea state six. So these are wave heights of about six metres. This helicopter stayed afloat for several hours after the occupants had escaped, then capsized.
ROIL, Q.C.:
Q. Just so that we look at things like brands and whether they make a difference, what kind of helicopter is the top photograph?
DR. COLESHAW:
A. The top is a Bell 214. The middle one is a

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Super Puma, I think the L2, and the inverted one, which you don't see much of, is an EC225.
ROIL, Q.C.:
Q. Which is also a Super Puma or of the same generation?
DR. COLESHAW:
A. Yes, it's the latest generation of Super Puma.
ROIL, Q.C.:
Q. So all brands are capable of capsizing, given various circumstances, including most especially sea state?
DR. COLESHAW:
A. Yes, I mean, all helicopters are inherently unstable due to the fact that the weight is very high up and they've got a very high centre of gravity.
ROIL, Q.C.:
Q. Okay. So is anything being done to try to assist in this pursuit of keeping it afloat or upright or at least not fully inverted?
DR. COLESHAW:
A. Well, there's been a research program that's been ongoing since the mid 1980s. If you go to the next slide, there's a little bit of a background to that. I think I've covered the

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first point here that the research focuses primarily on the ditching of helicopters and by this we're defining ditching as a controlled landing on water, though we'll see capability for that means that there is some improvement in capabilities in terms of crashes, but there's been less work done on the high impact crash scenarios.

The background to the work started with the HARP Report, which is the Helicopter Airworthiness Review Panel, who reported on these issues back in 1984 and some of the recommendations they made, they identified the need to improve both crash worthiness and the stability of helicopters. So that was the report that really started off the research program. That was followed in 1995 by the RHOSS Report, which is a review of helicopter offshore safety and survival, and that was following the helicopter accident close to the Cormorant Alpha installation in the North Sea back in 1992, and again, they looked at these issues of floatation and emphasized the importance of a helicopter floatation systems, the need for a helicopter to stay afloat for

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long enough for passengers to get out and I think they were one of the first to talk about having additional floatation that would provide redundancy if one of the standard floatation bags was damaged by the high impact, that you'd have additional floatation that could then provide the support required.

One of the other things that occurred in 2000, one of the later ones, was a workshop on emergency breathing systems and that was where there was a big debate and then recognition of this mishmash we talked about yesterday, in terms of the time needed to escape and the time that individuals are able to breath hold in cold water. So that's again the human factors aspect of the research program.

ROIL, Q.C.:

Q. Yes, so there's a need to keep the helicopter afloat or not totally submerged as long as possible because of the inability to breathe for very long underwater?

DR. COLESHAW:

A. But if it doesn't stay afloat or if you're in the position where -- pictures on the last slide where it has capsized, but it's still on

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the surface and then obviously emergency breathing systems are again going to enhance the possibility of subjects escaping.

ROIL, Q.C.:

Q. Right, okay. So what did that lead to?

DR. COLESHAW:

A. On the next slide, I just show that some of the areas that have been looked at in terms of stability -- have to say this is probably not my personal area of expertise, I'm not an engineer, but I just wanted to mention some of these as they're quite important, in terms of the overall research program that's been ongoing.

ROIL, Q.C.:

Q. So you don't design these features on the helicopter that would allow it to float high, low, on its side or whatever. You are concerned about what the consequences of that are for escaping?

DR. COLESHAW:

A. For the occupants, yes, yeah.

ROIL, Q.C.:

Q. Understood.

DR. COLESHAW:

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A. Some of the things that have been looked at, first one I've got is sea anchors and I think it was BMT that felt that they were something worth looking at. They'd observed that helicopters that are nose into the waves or into the wind and are more stable and less likely to capsize and so they looked at the option of would a sea anchor position the helicopter in that position and therefore reduce capsize incident, but it was felt that they were rather difficult to deploy and take quite a long time to deploy so perhaps it would be too long for them to be effective, so that wasn't taken any further.

The second one was what are referred to here as a wet floor approach and this is work done by the British Hovercraft Company in fact, similar to, I think, to helicopters, and this was looking at positioning the floatation slightly higher up on the helicopter so that the floor of the helicopter would be underwater and thereby improving the stability and the helicopter then sits lower in the water.

ROIL, Q.C.:

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Q. Yes.

DR. COLESHAW:

A. But they found very variable results, in terms of the effectiveness, dependent on the design of the helicopter and the weight of the helicopter. It also meant that there was a much greater risk of blade strike. So the rotor blades would be close to the water and again, that's something that can flip the helicopter over. So again, that was rejected as a sensible way forward.

The final one which the parties feel has certainly got benefits to offer are float scoops. These are similar to scoops you get on a liferaft to improve stability, so effectively bags of water underneath the floatation and they reduce both roll damping in the water that a helicopter is less likely to roll in the water. If one set of floats lifts out of the water, it increases the -- I forgot my term -- basically, they're less likely -- it's going to bring it back down. I note it was considered that it would actually improve the ditching capability of a helicopter by one sea state, so that a

helicopter that had been certified to have ditching capability in sea state four, it would improve its stability so that it was therefore capable of ditching capability in sea state five. So that's quite a significant change and was thought to be a relatively low cost and with very little extra weight on the helicopter.

ROIL, Q.C.:

Q. Is that research still ongoing? Are you aware of any current activity on it?

DR. COLESHAW:

A. I'm not aware of any current activity. I think it's something that our authority would like to see that being brought in, but one of the problems is that there are very few regulations in this area and it's not something that's regulated.

ROIL, Q.C.:

Q. Would this kind of equipment or facility, would that be, in your view, and again recognizing you're not an expert, is that an airworthiness thing that would have to be -- the helicopter would have to be recertified if something like this was added to it, or do you

know?

DR. COLESHAW:

A. I'm assuming it would come with certification if there's something that's -- I couldn't really answer that.

ROIL, Q.C.:

Q. Okay, fair ball. Okay, but there's another idea that's out there floating around, we understand. Pardon the pun in floating around.

DR. COLESHAW:

A. That's right, and this is looking at -- work that's been done looking at the prevention of complete inversion. This is work by -- or conducted by BMT fluid mechanics on behalf of the Civil Aviation Authority back in 1997 and they were looking at novel floatation systems, but this is looking at additional floatation over and above the existing emergency floatation that's on helicopters at present, and they looked at various configurations of this additional floatation. So one option was to put inherent buoyancy around the engine cowling, so high up on the helicopter. Another was to put long floatation bags along

the side of the helicopter and you can see that in the second photograph on my slide. So the engine cowling, you can see is the orange area on the top model. The third one was actually to have some tethered buoyancy bags just floating at the side of the helicopter, but that was rejected as not working at all. So they basically conducted model tests in a wave tank with these different configurations to see whether they could prevent complete inversion.

ROIL, Q.C.:

Q. So rather than keep it upright, it allows it to fall to the side, but the object is to stop it from doing a complete 180 inversion?

DR. COLESHAW:

A. Yes, and effectively end up on its side with one set of exits above the water surface -

ROIL, Q.C.:

Q. Yes.

DR. COLESHAW:

A. - and an air gap within the cabin and be stable in that position. One of the issues, in some of the configurations, they were getting a double capsize. So the helicopter

would turn part way and then if another large wave hit the helicopter, it would turn again and do a double roll, which was seen as something they didn't want. So the preferred configuration that they came up with was to have a combination of the inherent engine cowling and one long floatation bag down one side of the helicopter and that asymmetry meant that it turned once and then was stable in that position.

ROIL, Q.C.:

Q. The look of these photographs here, it would appear that these are actually models, not actual helicopters.

DR. COLESHAW:

A. Yes, they're all scale models.

ROIL, Q.C.:

Q. Right, okay. Has the research gone to test this on actual models or is it still in the scale model -- real helicopter -

DR. COLESHAW:

A. So far it's all been scale, scale model.

ROIL, Q.C.:

Q. Scale model work, okay. But from your perspective, this is considered to be a

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desirable objective, to have one set of exits above the water and to have some sort of an air space within the helicopter cabin?

DR. COLESHAW:

A. Certainly, and it also -- this is this additional floatation, so it added some crash worthiness as well in that you've got this redundancy of buoyancy. If you're adding extra floatation high up on the cabin, it's less likely to be damaged in a crash.

ROIL, Q.C.:

Q. So as a result of this, was there any work actually done to see what the human factors issues were?

DR. COLESHAW:

A. Well, this is moving on to slide 15. This is where I became involved in the research program. I was working at RGIT at that time and we were commissioned to look at the human factors of escape from a side floating helicopter. So this was looking at a helicopter that had turned to an angle of150 degrees and that was to the side-floating attitude. So instead of turning the full 180 degrees, turned part way to 150. And we were

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comparing that with the full 180 degree inversion. It was a comparative study.

We started off just looking at configuration and seeing at what level we felt -- and this was done with a helicopter simulator of the type that's used for training.

ROIL, Q.C.:

Q. The so-called HUET.

DR. COLESHAW:

A. A so-called HUET, and my picture on the right shows the HUET used at RGIT. You can see we've added some floatation bags just to mock up the long floatation bag on the upper cabin wall. Just some initial trials using experienced training officers as our test subjects to start with. We felt that the ideal position was the helicopter floating at a level where the top of the exits in fact are close to the water. We didn't want people having to climb up to exits to have to get out. So that's what you can see there in the picture with somebody escaping from the air gap out through one of these windows. On the left, you see the air gap within the cabin.

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Now some issues there in terms of the position of occupants within the cabin. It's possible that some will still have their heads underwater when it's in this side-floating attitude, but on releasing the harness, they can just come up into the air gap and at least then, they have the time to locate the exit and decide which way they're going before having to actually make the escape from the helicopter cabin.

ROIL, Q.C.:

Q. So this study was done comparing the results with a fully inverted HUET training device and one that is sitting at 150 degrees over with a partial amount of air within the -

DR. COLESHAW:

A. Once we looked at the feasibility of it and had a look at what were the issues of having it in his attitude, we then went on to do trials with naive subjects and those trials, they all did comparative trials, so yes, with the 180-degree full inversion, having to do underwater -- a standard underwater escape, and that was compared with trials where they did the 150-degree capsize, coming into the

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air gap and then making the above water escape from the helicopter cabin.

ROIL, Q.C.:

Q. Okay, and what were the findings as a result of that research?

DR. COLESHAW:

A. I think probably the most significant one for me was we measured the submersion times, and this is really looking at the time that occupants would have to breath hold if they're escaping from a helicopter at this floatation attitude, and we did various escape exercises. So I think the most interesting one were the cross cabin, where the person is sitting on one side of the helicopter and having to escape through an exit on the opposite side. With the side-floating scenario, the average time that the head was underwater was 9.5 seconds. With the full inversion and having to do the underwater escape, that time was, on average, 20 seconds. So a significant reduction in the time that the heads were underwater effectively, so significant reduction in breath hold time.

ROIL, Q.C.:

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Q. It cut the breath hold time literally in half?
DR. COLESHAW:
A. Yeah.
ROIL, Q.C.:
Q. Okay. What other findings did you have?
DR. COLESHAW:
A. Well, we asked the subjects to fill in a whole range of questionnaires. So there was a lot of data created, but basically some of the simple questions that were asked were things such as the difficulty of making the escape from the helicopter cabin and 89 percent found the underwater escape to be moderately or very difficult, whereas only 29 percent of subjects found escape from the side-floating cabin to be moderate or very difficult. So not all still saying it's simple, but there's a big reduction in those that are finding it very difficult and tying in with that when we asked them overall what their preference was escaping, you know, doing a standard underwater escape or escaping from the side-floating cabin, then 90 percent of subjects preferred the side-floating attitude.
ROIL, Q.C.:

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Q. This was not surprising to you or was it surprising to you?
DR. COLESHAW:
A. I think not surprising. There was much less disorientation felt and asked them questions about "how easy was it to locate the exit?" It wasn't really an issue in the side floating because by that time, they were in the air gap and you then got time to find the exit. So basically a very positive result in terms of the human factor side. There were some issues remaining that haven't been resolved as yet. One was potential loading on the harness. Some of the people will actually be almost suspended a little above the water and so there's concerns as to whether the harness would release correctly, and that's an area that still needs a bit more work. But I think that's something that can be improved upon to resolve that.
ROIL, Q.C.:
Q. Sure. So has anything else happened in the area of research with respect to floatation on helicopter airframes?
DR. COLESHAW:

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A. We have to jump forward now to the last few years.
ROIL, Q.C.:
Q. Sorry, this study that you did was in 2001?
DR. COLESHAW:
A. Published in 2001, is it? I think. Yes, 2001.
ROIL, Q.C.:
Q. Yes.
DR. COLESHAW:
A. So there's been a little bit of a gap in terms of moving the research forward and during that period, responsibility for the research program was transferred from the UK Civil Aviation Authority to the newly established European Aviation Safety Agency. So of course, that has, for obvious reasons, slowed some of this down. But they finally, I think in 2008, put a contract out to tender to look at a type specific design study. So this is another model study, but looking at specific designs of helicopter. So the early work by BMT was just on a generic helicopter.
ROIL, Q.C.:
Q. So this is taking the actual weight and

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characteristics of a particular model and saying now -
DR. COLESHAW:
A. Yeah.
ROIL, Q.C.:
Q. - or a particular helicopter, bringing it to a model and saying "now what happens?"
DR. COLESHAW:
A. Yes, so modelling the weight of that helicopter, the design of it and where you could actually put floatation on that particular design of helicopter, they were all sort of factors involved. The process that they looked at was both a light helicopter, the AS355, and a heavy helicopter, the EC225. So that's the one we saw earlier that is used for offshore passenger transport.
ROIL, Q.C.:
Q. Yes.
DR. COLESHAW:
A. And again, they did model studies in waves with the EC225. They quite reassuringly came up with similar results in terms of being able to create a stable floatation position at an angle of between 150 and 160 degrees. So the

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earlier work had come up with a figure that was pretty close to the modelled floatation attitude. Their preferred option was again using a buoyant engine cowling, but they preferred having long floatation bags on both sides of the upper cabin of the helicopter. So rather than the asymmetric design, they were able to get stable floatation without this double capsize scenario we talked about with additional floatation on both sides of the cabin. It's partly to do with the amount of floatation. With small floatation bags, they couldn't achieve that stability. But with sufficient buoyancy within those upper floatation bags, they were able to achieve stability in waves and that was a configuration which again gave them the largest air gap within the cabin for the passengers allowing them to potentially escape from the cabin.

ROIL, Q.C.:

Q. Now we, in this jurisdiction, happen to, at this point in time, use a piece of equipment called the Sikorsky S92A, I believe.

DR. COLESHAW:

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A. Um-hm.

ROIL, Q.C.:

Q. Are you aware of any particular research that relates to that particular model?

DR. COLESHAW:

A. Not that I'm aware of, no.

ROIL, Q.C.:

Q. So there may be, but you're simply not aware of it?

DR. COLESHAW:

A. Yeah, and I mean, this is relatively recent work, so I suspect I would have heard about it if there had been some work on this particular topic done within that area.

ROIL, Q.C.:

Q. Okay. Is there any other research going on that we should be aware of, in terms of helicopter airframes, crash worthiness and so on?

DR. COLESHAW:

A. Well, most of this is focused on the controlled ditching scenario and some work has been done on the crash worthiness. There's a report that I know you will be familiar with by Clifford back in 1996, which was in two

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parts. Part of it was looking at different types of water impact and I referred to some of that data yesterday where I was splitting it down or he split it down into controlled ditchings, vertical descent so limited control, fly ins and uncontrolled impacts, and he was looking at fatality rates and the findings were that drowning was the highest cause of fatality in many of those accidents.

They also looked at the airworthiness of the airframe and felt that additional floatation was something that would improve crash worthiness.

ROIL, Q.C.:

Q. So even in a very heavy impact, additional floatation is considered as a desirable feature?

DR. COLESHAW:

A. Or particularly if it's high up on the helicopter, so it's this thing of where you put the floatation. The current floatation is low down on the aircraft so in the event of a crash into water, it's at the point where it's most likely to be damaged whereas if it's higher up, there's less risk of damage. The

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floatation low down takes a lot of the force and a lot of the problems are the forces on actually hitting the water and it would be quite difficult to improve the crash worthiness of the floatation bags sufficiently to prevent damage in certain scenarios.

There were two further studies, one by W.S. Atkins, which again looked at air worthiness both of the airframe and of the floatation systems, and they recommended design modifications to improve crash worthiness of the floatation system. So seems to be a bit of a pattern here. They also recommended automatic arming and deployment of the floatation system. So that's the existing floating systems. One of the problems is if there's little warning of an impact, if the pilot has to arm and deploy the floatation systems, that might not happen. They might not have time to do it. So that's something that certainly in the UK, our offshore industry have voluntarily gone for automatic arming and deployment, though it's not within any airworthiness requirement at present.

ROIL, Q.C.:

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Q. This research, is it generally under the auspices of the air regulator, like the EASA or the FAA in the United States or Transport Canada within Canada, or is it within the auspices of the industry and the regulator of the oil industry?

DR. COLESHAW:

A. Well, I think this demonstrates it's the two. That the regulation is coming from the authorities such as EASA and the FAA, but where there isn't regulation, a lot of the air worthiness regulations relate either to impacts on land, and that's where most of the crash worthiness requirements come from, or they relate to the controlled ditching scenario. But we don't have anything for crash worthiness, in terms of high impact with water.

ROIL, Q.C.:

Q. With water.

DR. COLESHAW:

A. So it's then the responsibility of -- it's then maybe industry look for certain performance that isn't regulated.

ROIL, Q.C.:

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Q. And there's one other bit of research, I gather, that is ongoing now that you mentioned earlier in your evidence yesterday.

DR. COLESHAW:

A. This is the final bit in terms of the human factors side. I mentioned a workshop back in 2000 where this was basically added into the program of research. I should say the report I mentioned, the RHOSS Report back in 1994, it actually recommended the EBS not be pursued at that time and that emphasis should be placed on the floatation, but because of this recognition and the time taken for the floatation research to progress, the CAA felt that perhaps in the meantime they should relook at emergency breathing systems because this recognition of the time needed to escape being greater than the breath hold time.

So back in 2001, I was commissioned to look at the extent of knowledge in terms of EBS performance. So I looked at the development of various designs, particularly those that were being used in the UK, both in the military and civilian side. They were particularly interested in the balance between

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the benefits to the equipment and any potential safety, or if it is, safety disbenefits, disadvantages. Carried out a risk assessment looking at the issues of deployment in the helicopter and then the final step of that was to provide the basis for a technical standard for the approval of such equipment. I think I covered here some of the requirements that are being covered. But at that time, that was just published within the CAA report as an example draft standard. It wasn't completed because there were certain areas of performance where we didn't have sufficient data to be able to set pass fail criteria.

Again, that wasn't taken forward at that time, partly due to some people that again felt there were certain disbenefits and there wasn't value but some years on, 2008, I was then asked to actually complete the technical standard. So that is work that's currently ongoing. We've been doing performance trials in both relatively warm water, so using a training pool, similar to that used for the offshore survival training. But we've also

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done some cold water performance trials with the help of the University of Portsmouth and Professor Tipton's team.

We've looked at issues of the time taken to deploy the EBS in inversion helicopter escape, so looking at a whole raft of performance criteria. So I'm currently in the process of writing up that report. The technical standard will be completed. That will be published by the CAA, but the intention is then to submit that, still be seen as a draft standard to EASA for possible development as a ETSA, which is the European Technical Standard. So that will hopefully be happening later this year.

ROIL, Q.C.:

Q. All of this research in relation to floatation, crash worthiness, again human issues, EBS, things that all impact one another, the longer you keep it afloat, the less you need the EBS, the earlier it sinks, the quicker you need it, all of that research is going on, from your perspective, in the United Kingdom. The question that the Commissioner has posed is should our local

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regulator be engaged in that. What is the extent of international cooperation on these kinds of studies? Is there a formal process whereby people get invited or do you have to express an interest? How can you help him grapple with the issue of whether or not the C-NLOPB here, as the regulator of the industry, safety within the industry, should or should not or can or cannot get involved in monitoring or even participating in that kind of research?

DR. COLESHAW:

A. Well, I certainly know from speaking to the UK CAA that they would be very pleased to have support of others for these scheme. The more interest the better because they're wanting to push it forwards. Certainly in terms of international involvement, there are various committees where this work has been discussed and that's not been just the UK, that has been bringing in over -- certainly over European bodies. There are certainly meetings held with CAA and FAA. I went to a meeting following the -- actually, I think following the side-floating work, so that was probably

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the early 2000, which involved the FAA. So again, the FAA is certainly aware of the work and I think, yeah, the more involvement of others, the more -- the greater the likelihood that we'll actually get some progress, because I think the biggest problem is converting research to implementation and there's got to be a will to implement some of these proposals.

ROIL, Q.C.:

Q. And we have seen in earlier evidence that the lag time or the development time can be as much as ten years for -

DR. COLESHAW:

A. Yeah.

ROIL, Q.C.:

Q. - in our case, for the EBS to be introduced. We call it the HUEBA, but it's a part of the EBS world. Is it typical that this research does tend to take a lot of time or does it depend on the issue? Some of it is fast or some of it's not faster?

DR. COLESHAW:

A. I think it's fairly typical. This particular program, I think there was very much a slowing

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down five years back and that was partly because of this transfer of authority from the UK to Europe and that has slowed this particular project. But yes, there's always -- it's always disappointingly slow to move things forward, I think.

ROIL, Q.C.:

Q. Okay. I think you had sort of a residual side which sort of gives an overview on all this research that you've now spoken about on issue number two.

DR. COLESHAW:

A. That's right, yes. Just to go through this fairly quickly then, I think the overall conclusion is that the side-floating scheme is considered as the optimum solution to the current problems with inversion and passenger escape. In terms of feasibility, I did ask for a comment from the UK CAA and they have specifically stated that they are not aware of any unsurmountable problems that would render the side-floating scheme impractical or ineffective, at least for new build design helicopters. It's accepted that there could be greater problems in trying to retrofit

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existing helicopters and I think that doesn't really need explaining. It would be much easier to start afresh than to retrofit what's there. But yeah, they feel that those problems are not unsurmountable.

Because of the time taken, in the meantime, EBS provides a potential short term solution for post-capsize survival and that's pending availability of this floatation scheme. WE don't know how long it's going to be before that does take effect.

ROIL, Q.C.:

Q. So short term may be many years?

DR. COLESHAW:

A. Yes. So short term, for now, but it could be an intermediate or long term solution if we don't get progress in the other area. It doesn't necessarily mean that if we manage to achieve a situation where we have additional floatation that we'd stop using EBS. It may be that we decide to still carry it in case. There's still going to be situation where people find themselves underwater. But the importance of it as present is it's the only means of extending the time underwater to

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enhance escape possibility.

Then the final point I've put down is just a note that we understand that EASA proposed to hold a workshop in 2011 to review all of the helicopter ditching and water impact requirements, look at the research material, but also look at advisory material. So that's something that we're hoping will actually take place and be the next step forward.

ROIL, Q.C.:

Q. Perhaps if you could undertake to let us know as that develops, that it does develop. If anybody in the room is interested in participating, obviously they would have to get in touch with the appropriate authority.

DR. COLESHAW:

A. Certainly (unintelligible) that would be through my links within the CAA, but I'm sure that would be possible.

ROIL, Q.C.:

Q. Thank you. Okay, issue number three which was posed to you, and I think that's all we need to say about issue number two. Issue number three is "what are the appropriate standards

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of helicopter safety training to ensure that the risk to passengers is as low as reasonably practicable, both during training and helicopter transport?" and I take it that you have some considerable exposure to the whole issue of helicopter training?

DR. COLESHAW:

A. Well, through having worked for a training organization, though not myself being involved in the training for some years and a lot of work I've done, trials work, is all done at the training centres. So it's given me some familiarity with the issues, in terms of training, and so really, I started by just looking at the value and a lot of people have tried to look at evidence for the benefits of HUET training and certainly the evidence we have suggests that it does significantly improve the chance of survival and so I think that's sort of our starting point before looking at what should be included within training.

ROIL, Q.C.:

Q. I think Mr. Taber, who follows you, will have some specific information on that very

Page 39

subject.

DR. COLESHAW:

A. Yes, certainly so, and he's closer to it than I am, I should say. But from my own point of view and my own experience, in terms of the research I've undertaken, I think we're looking at training that provides not only information about what people should expect in a helicopter underwater scenario, to provide them with practical training of the procedures that they have to undertake, but also help them to build coping strategies so that they can actually deal with this, what would be a very scary situation to be in and help them to reduce panic in the event of being exposed to a real emergency.

I say this because of evidence that relates to how people behave in real emergencies and there is a whole set of behaviours that have been observed, most of them, you know, quite negative. The obvious ones are the fear and anxiety. A little bit of anxiety can be a good thing, it helps you to perform better, you know, a little bit of adrenaline. Too much and that can have a very

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negative effect, in terms of people's ability to perform and take correct actions. Panic is a term that's used a lot and has been described to me as people making very rapid reactions, but possibly inappropriate reactions. I think it's quite a good definition of what we mean by panic, and obviously that can be very negative. Disorientation, we've talked about. If you're turned upside down in water, perhaps in the dark, disorientation is a big problem and people need to -- you know, just if you've experienced it once, you're much more able to cope with it on re-exposure. Inaction or freezing in the event of emergency and certainly there's evidence from aircraft accidents and rail accidents that a proportion, it's thought to be between 10 and 20 percent of people, will just sit in their seats and do nothing and not try and get out. So this is just a scenario of freezing. So all these things, if training can actually allow people to experience and then cope with those behaviours, then they're going to be better able to cope with a real emergency

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situation.

Moving on there, we've got a slide looking at some of the other issues which have been discussed at length over the years in terms of training. The first one being the fidelity or the realism of training, and that's something that's open to debate is about how far you take the realism. The obvious benefits of having realistic training, I think the most important thing actually is the tasks that people undertake reflect tasks that they should undertake in a real scenario. So what I'm most interested in is that in terms of sort of work through an impact scenario. First thing certainly the Canadians are actually going to have to think about is putting the hood on and zipping up, locating the exit, locating your harness, being able to carry out all of those actions, releasing the harness, operating any exit mechanisms. So we're looking for training to provide an experience of carrying out all of those actions and in the correct order. So then that becomes, you know, not automatic, but you're going towards this people just carrying

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out actions in the correct sequence, then they're going to have a better chance of escaping in a real scenario.

ROIL, Q.C.:

Q. Just let me ask you by using some examples where you are in terms of the fidelity issue, and I would take it that fidelity could be everything from the inside of the HUET being the same colour as the inside of the helicopter that you're flying on.

DR. COLESHAW:

A. Uh-hm.

ROIL, Q.C.:

Q. Would that be something that you would consider to be important in terms of fidelity?

DR. COLESHAW:

A. Less important. I think the look is the least important. There has been research to show that that is less important than the procedures and tasks. I think certainly in terms of exits, we would like to see high fidelity means of operation so that they're carrying out correct action. You know, if it's a lever action, there's a lever that's close to reality. With harnesses, there's one

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type of seat harness; well, let's have a realistic seat harness and have that realistically represented within training. That one is very easy to achieve, I think. So, yes, I think exits should be realistic size, but, no, I don't think they should necessarily have to look exactly. It's less important that they look exactly the same.

ROIL, Q.C.:

Q. So by a realistic size, you don't mean the exactly the same dimensions by centimetres, but something of the same general size and configuration?

DR. COLESHAW:

A. Well, if you look at different helicopters, there's quite a range of different specific sizes if you get down to the centimetre level. Emergency exits, there are minimum sizes that are regulated. In fact, there aren't for the escape windows that are used for the underwater escape scenario, so it's only two or three of the emergency exits that are again regulated in terms of size, but you can look at helicopters and they fall within the range. So certainly the size of exits within the

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training simulator should be close to that range of exit sizes. Now in the UK there's a lot of different helicopters. People on training will be flying in different helicopters in the following week after training. I think here they got much more limited number of helicopters that are used, so it's probably easier to get high fidelity simulators because you can be much more specific about this is the type of exit you have to use in a real helicopter, let's mock this up in the simulator.

ROIL, Q.C.:

Q. One of the things that I think we've heard from the workforce is that they don't get trained to be the in-board person as opposed to the out-board person in the HUET training.

DR. COLESHAW:

A. Uh-hm.

ROIL, Q.C.:

Q. They sit in the actual helicopter. If there's two seats, there's one by the window, there's one by the aisle. Do you have any views on the extent to which training can deal with those kinds of variables?

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DR. COLESHAW:
A. I think there's a number of issues there. When I first went to RGIT and did the training, in those days we had people sitting side by side. There was a large number of trainees within a helicopter simulator at one time, but they had problems with people being injured, that if you had somebody in the seat next to the window that was having problems, the person on the inside tried to get out first and they were getting a lot of injuries. So early 90s, early mid 90s, they switched to only having people in seats next to exits to improve the safety of the training, but that doesn't mean that people then don't experience this thing of being in a seat that won't necessarily be next to an exit. My view is that the standard training maybe will have to keep with the safest option, but I'd certainly like to see the option that people have a chance to do the cross cabin, not necessarily with somebody sitting on the inside, but certainly have the option of doing an escape from a different seat or doing cross cabin escapes.

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I think it's something that would make the recurrent further training more interesting because another problem we've got here is training frequency.

ROIL, Q.C.:
Q. Yes.

DR. COLESHAW:
A. One of the difficulties of bringing that down to improve training is that we have people who've been in the industry for 30 plus years that have retrained every three years, and they're fed up with doing the same training over and over again. So I think a little bit of flexibility and a few different training exercises could actually have quite a positive benefit if it could be incorporated within the organization of training.

ROIL, Q.C.:
Q. So the issue of safety in training is an ameliorating or a conditioning factor for the fidelity of the training? Is that what I should take from your evidence?

DR. COLESHAW:
A. I think there's a need to balance that, yes, and that ties in with the last factor I've got

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in my slide here in terms of stress and anxiety caused by training. The first research I undertook at RGIT was to look at the stress experience by people undergoing offshore emergency response training, and this was in response to the senior medical officer from one of the offshore companies who was very concerned about the stress experienced by some of his employees. So again there's a balancing act there between making training so stressful that people experience too much stress and they're not going to learn properly during the training. I think measures need to be taken to - I think there are specific measures that can be taken to reduce stress in that small group of people. It's possibly only 10 percent of the workforce who experience levels of stress that mean the don't get the most out of training, but I think there's got to be some awareness that the more realistic you make training, the more stress that can be caused, and you've at least got to manage that issues as part of training.

ROIL, Q.C.:
Q. One of the fidelity items that we didn't

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discuss but is perhaps now relevant in the context of stress and anxiety is the whole issue of the temperature of the water, and throughout this Inquiry we've heard some workers say we should really be trained in colder water so that we know what to expect, we should wear our suit in cold water, we should do some exercises on cold water. What does that do to the learning experience, in your opinion?

DR. COLESHAW:
A. I think if all training was done in cold water, it would have a pretty negative effect. My early research work was looking at the effects of cold on mental reasoning, ability to learn, and memory, and if you got somebody in very cold water, they find it very distracting. I think if you're doing training in that sort of scenario, they'd be thinking far more about how cold they were than about the actual procedures they were undertaking.

Having said that, I think there is some value in people experiencing cold water and the real environment because I think a lot of our workforce don't really realize just how

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cold the water temperature is, and what it's like to be in the North Sea. We talked yesterday and today about clothing worn and the suits, and I think they realize the benefits of wearing warm clothing under their suit when they've experienced the reality of being immersed in sea temperatures. So I think an exercise that familiarizes people with that environment is good, but I would certainly prefer to see training in life raft boarding and things. I think they're going to learn more if that's in a controlled environment.

ROIL, Q.C.:

Q. In a more comfortable environment you will learn better. If you need to experience the effects of cold, that should be a separate exercise?

DR. COLESHAW:

A. Yes. I think some of the pools are actually too warm, but again it's getting a balance.

ROIL, Q.C.:

Q. I think we can move to the next slide.

DR. COLESHAW:

A. Okay, this is moving on to - just looked

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briefly at training standards. Again I'm sure Michael Taber is going to have a lot more to say about this, but my experience is primarily from the UK sector. In terms of what should be in standards, I think they certainly need to cover the various scenarios we've talked about, say, a controlled and dry evacuation into life raft, needs to look at submersion of a helicopter and obviously the event of capsizing and full immersion. Also these training standards are laid down by various organizations, such as OPITO, OLF.

ROIL, Q.C.:

Q. Sorry, OLF is an acronym we haven't used much. Who are OLF?

DR. COLESHAW:

A. That's a training organization responsible for training in Norway.

ROIL, Q.C.:

Q. So OPITO is in the UK?

DR. COLESHAW:

A. OPITO is UK based. There are courses worldwide. OLF in Norway. There's an organization called NOGEPA in Netherlands. So there are various training standards

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organizations who monitor what training is carried out.

ROIL, Q.C.:

Q. Including CAPP in Canada.

DR. COLESHAW:

A. That's right, and there's differences within those courses.

ROIL, Q.C.:

Q. So in your experience, the standards are not the same, or are the standards the same, but the interpretation is different?

DR. COLESHAW:

A. I think similar, but the interpretation, the number of exercises and various OPITO training differs to the training out here because we include EBS training, they do shallow water, do exits - underwater escape with the EBS in the helicopter simulator.

ROIL, Q.C.:

Q. With the EBS?

DR. COLESHAW:

A. That's one obvious difference.

ROIL, Q.C.:

Q. I'm sorry, but the EBS is not a compressed air device?

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DR. COLESHAW:

A. That's right, yes. There's a good reason for why the training is different. With OPITO, it's only recently that the removal of exits has been included within the training. So that's been another difference in the past, and that's now starting to be harmonized, but again maybe the exercises they're undertaking are quite the same as in other jurisdictions.

ROIL, Q.C.:

Q. Right.

DR. COLESHAW:

A. I just cover here the exercises that are covered by the current OPITO course. So basic training, they do a dry evacuation, they then do three exercises involving submersion of the helicopter, and three exercises with a capsize, and those three exercises are a breath hold escape through openings without an exit to remove. They then repeat that using the EBS, still with no exits, and then a third exercise is using EBS, but removing an exit.

ROIL, Q.C.:

Q. So there's a series of steps that increase the number of skills that you are exercising?

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DR. COLESHAW:
A. That's right, and that's been something that has been recommended in terms of a means of learning is that you do part task learning and you build up the difficulty with the exercises. So they're doing those exercises on submersion and then doing the same exercises with a capsize. I think the last point in terms of differences we've talked about already.
ROIL, Q.C.:
Q. Yes. Okay, that takes us through the third of the issues and we have one final one, and this is expressed in the issues for consideration as "Should helicopter passengers have a level of accountability for their own safety in helicopter transport", and that question has been worded rather broadly to allow various people to interpret it whichever way they choose.
DR. COLESHAW:
A. Yeah.
ROIL, Q.C.:
Q. How do you choose to interpret that?
DR. COLESHAW:

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A. Well, again this is something that - safety culture isn't my particular specialty, but obviously in the course of the type of work I do there's a lot of issues that come up that can be put under this heading of personal accountability.

The first one is confidence in water and people's swimming ability, and certainly the stress project demonstrated a problem of highest levels of anxiety are quite often in non-swimmers for obvious reasons. They're quite scared of the whole thought of doing underwater escapes, which is quite understandable, so I think this is somewhere where individuals perhaps have some responsibility to think about, will I get a lot more from this training if I had some swimming ability, the benefits of building up confidence.

Certainly RGIT at one time offered short courses a couple of days before doing HUET training, they could come in and just get used to that water environment, get used to having their head underwater because if you're a non-swimmer, you've perhaps never put your head

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underwater. So it's no wonder that training them becomes very stressful, and if you apply that to the real emergency, how well are those people going to be able to cope with being plunged underwater and in that case in very cold water. I think that's something that individuals can take on board in terms of would they be better off if they had some experience in the water environment.

The second one I've got is clothing worn under the helicopter immersion suits. This is an issue in terms of who is responsible for the overall level of insulation of the suit system. Part of it is controlled by the suit that's being worn, but part of it is within the control of the individual as to what they wear. I think in the past, if it was a very hot day, they'd have worn very little clothing under the suit because they didn't want to get hot in the helicopter. I went to a very interesting short project for one oil company when we were first introducing thermal liners underneath their helicopter suits. Before that, they'd just been coveralls that kept you dry. We went to a local harbour and had a

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group of subjects, so split into one group; one wearing just the coverall - helicopter suit over their normal clothing, and one with these thermal liners, and the idea was we're going to go into the water, experience the cold water and environment, and then we're going to swap them over and they could experience the other option. The ones who had been in the uninsulated system basically refused to go in a second time. Those that had been in the higher insulation suit system said no way we're going to go back with less insulation. So that group went back to their colleagues with a very strong message that having additional insulation under the suits is important, and I think that applies to the clothing.

In the UK now, most of the oil companies operate a clothing policy where the workforce are recommended to wear either two or three layers under the suit and they have that policy posted at the heliports. Some of that varies. They might have two layers in the summer and three during the winter months, but most of them now have policies to try and

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encourage the individual to take responsibility for the level of clothing that they're wearing.

ROIL, Q.C.:

Q. Uh-hm.

DR. COLESHAW:

A. And that probably leads into the correct sizing and fit of helicopter immersion suits. We've talked about regulators having a role in the sizing of suits, but I think again the individual has some responsibility for checking that they be given the correct size of suit.

I'm sure there are individuals who ask for a larger size suit because particularly the seals are more comfortable if they're in a larger suit. We've had problems in the past of seals on wrists that are being cut down, and if you have a cut down wrist seal, it might be more comfortable, but it will certainly leak if you entered the water. So that's another area where I think there's a bit of personal account.

ROIL, Q.C.:

Q. I take it that if an individual was

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responsible to make a decision about sizing, that that individual should have enough information about sizing to be able to make that -

DR. COLESHAW:

A. Yes, I think -

ROIL, Q.C.:

Q. If somebody gives me a large suit and it -

DR. COLESHAW:

A. Yes, they should be educated as to what is the correct size that they should be wearing, and they should be double checking that they've actually been issued with that size of suit.

ROIL, Q.C.:

Q. So you should understand what fit means, and then understand what the correct size is for you?

DR. COLESHAW:

A. Yeah.

ROIL, Q.C.:

Q. Okay.

DR. COLESHAW:

A. The next one on the list is attitude to training. I think this is just an issue of those who are positive about training again

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get more out of it than the individuals I mentioned earlier who are perhaps very fed up with training, don't want to be there, and I think they're going to get much less benefit from training courses than those that see the value of the training. I think part of that is the responsibility of employers and the training organizations to educate them in terms of why they're doing the training, what the benefits are. A positive personal attitude is going to be a good thing.

I think similarly in terms of helicopter transport, I've put in here having a personal survival strategy. This is a personal plan. I think my example here is getting on a fixed wing aircraft to fly across from the UK to Canada. One thing I always do is check where the exits are, the exit mechanism on my safety card, and I do religiously take that out of the pocket and I religiously count how many seat rows to the nearest exits. I'm sure my family possibly think I take that too far. That's having a personal plan in the event of things going wrong, and it could happen to me, it's not always going to happen to somebody

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else, that you've actually thought through what's going to happen and where your nearest exists are going to be. I think that can only enhance that experience of helicopter transport.

The very final point I've got is in terms of responsibility for speaking out. This is more of a more general safety issue, I think, but again in the UK sector at the moment there have been some initiatives for people, and again it's just taking personal responsibility for safety, that if they see an unsafe act that somebody else is doing, they speak out about it. One of the companies has put in a policy for walking downstairs that everybody must always have one hand on the handrail. If you see somebody else going down the stairs not using that hand on the handrail, they should speak out and point out to the person that they're not doing it. If they don't take any action, they themselves could be disciplined for not pointing it out. This has been to try and stop preventable accidents, little accidents that could have been prevented by somebody who had seen something

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and not said anything. It's to encourage a situation where if you see something that's wrong, you take some action and do something about it. It's getting away from the fear culture of the past. People are able to do that speaking out.

ROIL, Q.C.:

Q. Just an overall comment or question from you, a comment from you, a question to you, in your experience working in the place that we say that is like us, the North Sea, what have you seen in terms of trends over the past number of years in terms of accountability and responsibility and culture; is it static, is it improving, is it getting worse, what's happening over on your side of the world?

DR. COLESHAW:

A. I would say definitely improving with time. There have been big moves - change in safety that's been going on for the last ten years, and that is all about continuous improvement, it's about improving the safety culture, involving the workforce in decision making, allowing people to have a say so that everybody feels involved in safety issues,

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that it's not somebody else that's making all the decision. I think that has made big improvements.

ROIL, Q.C.:

Q. I have no further questions for you. Thank you very much, Dr. Coleshaw, for the information you've provided to us and for taking the time to come over here and speak to us. I'm sure some of my colleagues and some others in the room may have some questions as well.

COMMISSIONER:

Q. Thank you, Mr. Roil. Now Transport Canada is not present. CAPP?

MR. SCHULTZ:

Q. No questions. Thank you.

COMMISSIONER:

Q. Thank you. The oil operators, beginning with HMDC, Ms. Strickland.

MS. STRICKLAND:

Q. I have no questions on direct. Again we reserve our right to raise any questions that might arise.

COMMISSIONER:

Q. Yes. On that matter, you know, if anyone, no

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matter what they're turn is wants to ask a question, I would permit it, because the more information that we can get obviously the better for all concerned. So nobody should worry about being caught out of turn or something like that, you know. All right, counsel for Cougar? Well, wait, I'm sorry, the other oil operators, of course, Suncor and Husky, have you any questions at this time?

MS. HICKMAN:

Q. No, Mr. Commissioner.

MR. PRITCHETT:

Q. No questions.

COMMISSIONER:

Q. Counsel for Cougar, Mr. Stamp?

STAMP, Q.C.:

Q. No questions. I might after Ms. O'Brien, if I may. If I have any questions, then I can bring them up at that time.

COMMISSIONER:

Q Okay then. Helly Hansen is not here.

MR. SPENCER:

Q. Helly Hansen is here.

COMMISSIONER:

Q. Oh, sorry.

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MR. SPENCER:

Q. Wouldn't miss it for the world. We don't have any questions at this time.

COMMISSIONER:

Q. After saying that, you have to ask a question.

MR. SPENCER:

Q. (Inaudible). We have nothing at this time.

COMMISSIONER:

Q. All right then, thank you. Counsel for MUN?

HURLEY, Q.C.:

Q. No questions, Mr. Commissioner.

COMMISSIONER:

Q. Thank you. Government of Newfoundland and Labrador?

MR. PRITCHARD:

Q. Nothing arising, Commissioner.

COMMISSIONER:

Q. Okay, thank you. Mr. Harris.

DR. SUSAN COLESHAW - EXAMINATION BY JACK HARRIS, Q.C.:

HARRIS, Q.C.:

Q. Thank you, Mr. Commissioner. I just have one question arising. Dr. Coleshaw, my name is Jack Harris, I'm a Member of Parliament for this particular riding.

DR. COLESHAW:

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A. Good morning.
HARRIS, Q.C.:
Q. You mentioned under the EBS, emergency breathing systems, that there's been some experience with it in civil aviation, but you also indicated that the military had been using it for a much longer period of time.
DR. COLESHAW:
A. Uh-hm.
HARRIS, Q.C.:
Q. Can you tell us what type of breathing apparatuses the military, and I'm assuming you're talking about the British, the UK military, but can you tell us any more about what type of breathing apparatus they use, whether they use the rebreathing or the compressed air, and what their experiences have been and has there been any research done on their work as well?
DR. COLESHAW:
A. Yes, I think predominantly the military are using compressed air systems. That's not just in the UK, that's worldwide.
HARRIS, Q.C.:
Q. And what experiences have they - has there

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been any reports or research? Obviously, the training side is much more of a - in the military, there would be heavier emphasis on training throughout, but what experience have they had, are there any reports on that or any studies been done on that that would help inform what choices might be made in terms of the use of helicopter suits?
DR. COLESHAW:
A. Yeah, there certainly is material that's been undertaken, there's been research undertaken. Some of it is a little bit more difficult to obtain, it's not necessarily out there in the public domain, but, yes, there is research that's been done and there's certainly quite a lot of anecdotal experience or reports of incidents where compressed air systems have been used and have aided escape when they've been used by military personnel.
HARRIS, Q.C.:
Q. So the reports have been positive with that system?
DR. COLESHAW:
A. I would say so, yes.
HARRIS, Q.C.:

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Q. Do you have an idea why they would choose that particular compressed air system versus the rebreathing?
DR. COLESHAW:
A. I think if you got personnel that you can train, the medical aspects, I think, are much less of a problem because military personnel would have gone through very vigorous medicals, anyway, so I think that's been much less of an issue in terms of adding on. Assessing respiratory performance has not been a big issue for the military. So some of the things that have constrained implementation of compressed air systems for the civilian workforce haven't been there for the military.
HARRIS, Q.C.:
Q. Thank you.
COMMISSIONER:
Q. Thank you, Mr. Harris. Counsel for CEP, Mr. Earle.
DR. SUSAN COLESHAW - EXAMINATION BY RANDELL EARLE, Q.C.:
EARLE, Q.C.:
Q. Good morning, Dr. Coleshaw.
DR. COLESHAW:

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A. Good morning.
EARLE, Q.C.:
Q. My name is Randell Earle, and I represent the Communications Energy and Paperworkers Union, which is the bargaining agent for the employees at the Hibernia Platform and the Terra Nova FPSO. There are a number of areas that I'd like to explore with you, the first of which - and I think the reference is at Publication 8 in your CV. I believe you've referred to that in your evidence this morning, "preliminary study of the implementation and use of emergency breathing systems, Civil Aviation Authority Paper 2003-13", and did I understand you to indicate that you were actually engaged to do the work leading to that paper in 2001?
DR. COLESHAW:
A. I was the author of that paper.
EARLE, Q.C.:
Q. Yes, but in terms of time frame, your work was initially commenced in 2001?
DR. COLESHAW:
A. Probably 2001 or 2002. I can't remember exactly, but that's the time period. It was

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following the EBS workshop, and it was probably about a year after that. I can remember it actually started in about 2001.

EARLE, Q.C.:

Q. And would it be correct that the genesis, if you will, of this EBS work was the recognition which you've mentioned earlier in your evidence in 2000, that the breath hold time of the average person in a submerged helicopter which was for a large percentage insufficient to allow escape, is that correct?

DR. COLESHAW:

A. Yes, in cold water that would be the case.

EARLE, Q.C.:

Q. Yes. So I was wondering could you tell us by the time that you published this paper in 2003, what was the state of affairs in terms of the prevalence of use of the EBS in its various iterations in your part of the world?

DR. COLESHAW:

A. At that time, we probably got to the point where the majority of offshore operators were then using either Air Pocket, which was the pure rebreather, the original design, or Air Pocket Plus, which is the hybrid device, and I

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think by 2003 the majority were probably using Air Pocket Plus. There was at least one company that took a long time to adopt, and I think it was only really when training in EBS was introduced that it was across the board because then it became part of the OPITO training to actually use EBS.

EARLE, Q.C.:

Q. So by 2003, it was -

DR. COLESHAW:

A. Most had devices of some type.

EARLE, Q.C.:

Q. Really the norm for passengers in the North Sea -

DR. COLESHAW:

A. In the UK sector. I think Norway was somewhat later before they started using their rebreather systems.

EARLE, Q.C.:

Q. And how much later would that have been?

DR. COLESHAW:

A. As far as I remember, several years. I think they've been using them for several years now, say, maybe three years that they've been using. I couldn't tell you the actual date

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that theirs were introduced.

EARLE, Q.C.:

Q. You did another paper which was delivered January 30th, 2006.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. To a CAPP workshop.

DR. COLESHAW:

A. That's right.

EARLE, Q.C.:

Q. In Canada. What was the prevalence in the North Sea at that time in terms of the use of rebreathers and the hybrids?

DR. COLESHAW:

A. I think by then everybody would have been using hybrid devices.

EARLE, Q.C.:

Q. Now we - as I understand it from you, have yet to have a technical standard for these things.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. So I take it from this, that the technical standard - the absence of a technical standard

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has not stood in the way of implementing this device?

DR. COLESHAW:

A. I think that's partly because of the devices that have been used there's either published information or there has been a large body of work in terms of the development of the devices. In terms of what we use in the UK, it was Shell that instigated the original development of the Air Pocket Rebreather, and so they, as the end user, had control over the work that was done and it was a very extensive program or research that was undertaken up to the point when the final device was developed and implemented.

EARLE, Q.C.:

Q. It's my understanding that Shell brought the rebreather in in the late 90s?

DR. COLESHAW:

A. Yes.

EARLE, Q.C.:

Q. So it was, if you will, an industry driven -

DR. COLESHAW:

A. It was an industry led initiative, yes.

EARLE, Q.C.:

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Q. We associate Shell, of course, with the Netherlands. Would they have been using it in that part of their operations?

DR. COLESHAW:

A. I'll have to say I'm not sure of the answer to that question. It's something I could find out. They do certainly use different equipment in the Netherlands than the UK.

EARLE, Q.C.:

Q. I'd like to turn for a moment to the area of HUET training.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. And just see if I understand what you're saying correctly. In the area of fidelity, the training would necessarily incorporate all the activities that would be needed to be undertaken by a person to escape from an inverted or submerged helicopter, is that correct?

DR. COLESHAW:

A. I mean, I think that is the ideal, that's what you're aiming to achieve is that they cover as many of the procedures that are possible

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within the training environment. I'm sure there are some small areas that potentially are not covered, but I think that is the overall objective.

EARLE, Q.C.:

Q. One of the things that has come to the fore in this Inquiry is that the newer helicopters are now being equipped with a stroking seat, which to the layman seems like the old Volvo advertisements where they showed the front end of the car collapsing in the collision, and that we have a seat that goes into a controlled collapse to avoid the impact effect. Would you feel that the activities should be undertaken in a circumstance where that seat is operative?

DR. COLESHAW:

A. It's certainly a very good question because I think it would change some of the tasks that are being undertaken by the individual if they're going to end up in a different position. That's going to influence their relationship to the exits and it could influence the ease of releasing the harness. So I'm not sure whether you'd be able to

Page 75

simulate the actual change in height of the seat, but I think certainly they should possibly look at carrying out the actions in a normal seat and maybe have compressed seat, so can they release the harness from that position.

EARLE, Q.C.:

Q. Yes, and so design a seat such that when sitting in it, you're in that position with your knees raised considerably -

DR. COLESHAW:

A. Again it's the familiarity with the scenario that you might be presented with.

EARLE, Q.C.:

Q. And I take it from what you said, you would consider it important that if the industry standard is moving towards a four point harness, that people should be doing HUET training with a four point harness?

DR. COLESHAW:

A. I think that would certainly be what I would be looking for.

EARLE, Q.C.:

Q. And again an absolute requirement is that the individual go through the process of opening

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an emergency exit or pushing out a window in the course of training?

DR. COLESHAW:

A. And that is some work I did again for OPITO a few years ago was to look at some of those issues. They forwarded a proposal for adding in exits, and one of the recommendations was, yes, that that should be done. The concern then was that it was going to make training more stressful, and my view at that time was manage the stress, but include exits within the training.

EARLE, Q.C.:

Q. And so that you would see these things as being sort of the elemental building blocks of the training?

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. The window on the other hand probably be somewhere within the range of window sizes, and we should not get terribly hung up about the fact that the window may not be exactly the same size as the window in the dominant aircraft here because, after all, our people

Page 77

might be in another aircraft off the coast of Africa?

DR. COLESHAW:

A. That is true. I mean, I think if you got a workforce where they're predominantly using one type, then the ideal would be to have that type. If you got a workforce where they could be in different helicopters, then it becomes less of an issue because they don't know - then it's got to be representative. I think they've got to have some feel that they might have to get through a pretty small escape window, that they have that experience. Now I don't think they're going to know whether it's exactly the same to the inch.

EARLE, Q.C.:

Q. And in terms of the frequency with which someone goes through the escape process, I hear you suggesting that three/four escapes underwater may be the sort of thing that we should be looking at?

DR. COLESHAW:

A. Well, I'll just say what's in the current OPITO which are - they actually do six underwater escapes, three of which are

Page 78

inversions. Again that's something that's changed over time and the number of escapes has increased within the OPITO training, and I think any further changes, I think they would be saying, well, I'm not sure that we want to put in yet more exercises, maybe we'll switch them around, and part of that is just the time that the training takes.

EARLE, Q.C.:

Q. But I do get the sense from you, and correct me if I'm wrong, that, for instance, a training process where one does one inverted escape might be a bit thin?

DR. COLESHAW:

A. One is better than nothing; two would be better than one. I think it's - I mean, there's no doubt that the more practice you have, the more competent you're likely to be. So, yes, more than one escape would be an advantage.

EARLE, Q.C.:

Q. I think we wanted to stop precisely at 11.

COMMISSIONER:

Q. Oh, yes, I think we ought to try and keep our schedule. If you have another question

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probably before -

EARLE, Q.C.:

Q. I've got another brief question.

COMMISSIONER:

Q. Yes.

EARLE, Q.C.:

Q. And I should know the difference because I occasionally get on the water, but you referred to sea state 5 or 6 as being the limit of the kind of seas that we can maintain stability for a helicopter, and I wonder could you translate that into metres for us because our earlier evidence on flight limits for helicopters has been in terms of metres of sea?

DR. COLESHAW:

A. I understand that sea state 5 are seas with four to six metre waves. So that's the range - obviously, they're not all uniform, so I think that range covers - four to six metres.

EARLE, Q.C.:

Q. A shorthand method, if we change metres for sea state, we'll -

DR. COLESHAW:

A. Yes, I can't remember all the - I mean, I did

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look at it because I knew I was going to be asked this question at some point, and it's not a case that sea state 6 is up six metres, and sea state 5 is up to five, it's not quite parallel to that. They are defined. They can be found on the internet. I did look at sea state 6, which is the four to six metres.

EARLE, Q.C.:

Q. At the risk of people looking at their watches, I'll just ask you are you aware in your jurisdiction if there is any limitation on helicopter transport which is based in the safe sea state for ditching of a helicopter, i.e. we will not fly helicopters if the sea state is greater than?

DR. COLESHAW:

A. Again it's a little difficult for me to answer this one, and I'm not sure I'm the person that should be. I mean, I know there has been some debate in terms of the certification of helicopters and question marks about the routes that are being followed that perhaps the sea states are higher than the current ditching capability of those aircraft. I know that has been a question that's raised. I

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think ultimately it's down to the helicopter pilots to say whether they're willing to fly or not, so I think one time when they wouldn't fly, and the ultimate responsibility would be with the pilots, and beyond that, I don't think I'm qualified to answer that.

EARLE, Q.C.:

Q. I have some more questions, but we are into the -

COMMISSIONER:

Q. Yes, well, I think we'll take our break now then.

(RECESS)

EARLE, Q.C.:

Q. Dr. Coleshaw, you discussed the idea of personal accountability and the need to speak up on the fit of your suit, or for that matter to identify somebody who is not holding onto a handrail. Would you agree with me that the precondition to that kind of personal accountability is a sense on the part of the worker that they can raise these issues without fear of recrimination?

DR. COLESHAW:

A. Absolutely.

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EARLE, Q.C.:

Q. I was just wondering -

DR. COLESHAW:

A. That has to do with the safety culture, I think.

EARLE, Q.C.:

Q. Yeah, I was wondering if you could offer anything to us from the UK experience in that area. The UK offshore has been described as a mature industry, and I wouldn't want to get everybody upset by saying that we're immature, but we certainly haven't been at it as long as you have in the UK, and there's no doubt that attitudes change from time to time. Has it always been the case in the UK that workers have felt, you know, if it doesn't work for me, I can bring it up, or has that been a result of a change in attitudes towards safety over the period of time?

DR. COLESHAW:

A. I should first say this isn't a particular area of expertise I have, other than it's an obvious interest in the type of work I do, but I certainly can say that I think probably it has changed over the last 10, 15, 20 years

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that I've been in the industry. Post Pipe Alpha there was a lot of work done, both on safety culture and on management styles, and I've got colleagues within the University of Aberdeen who've done a lot of work in that area. So I think that has been instrumental in bringing about a change in culture within the companies.

EARLE, Q.C.:

Q. Now in the area of suits, the issue of the comfort of the suit is one that hangs around the edge. Would you agree with me that compliance in terms of the proper wearing of the suit, not having it open so much that it can't be zipped up properly, or, you know, in a state of non-readiness because you're too warm if you are, but comfort in the suit and compliance with proper use are definitely related factors?

DR. COLESHAW:

A. They're certainly related, and I think it's a difficult question about how much discomfort should you expect people to cope with, and I think that's - because it's a very subjective thing that's quite a difficult one to handle.

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EARLE, Q.C.:

Q. How long is the typical flight for an offshore worker in the UK?

DR. COLESHAW:

A. In the UK, I think between one and two hours.

EARLE, Q.C.:

Q. Between one and two?

DR. COLESHAW:

A. Yes, some are one hour flights, some are two hour. I think there are some getting slightly longer now, they're going further out.

EARLE, Q.C.:

Q. There's mention in the area of comfort, dampness from sweating. If a suit causes the wearer to sweat in the weather conditions that are operative during the flight time, what is the effect of that sweat and dampness on the thermal value of the suit if the person has to use it? I mean, is it neutral, or will the fact of their clothing being damp and any lining perhaps being damp, will that affect the thermal value?

DR. COLESHAW:

A. I mean, there's certainly been work that's shown that a significant amount of sweat will

Page 85

somewhat reduce insulation, and I think that's to some extent again dependent on the type of clothing. If you got clothing that will wick some of that moisture away, it's going to have much less of effect, and suits used in the UK are breathable materials, another difference we haven't touched on before, so part of that is trying to reduce if you have any problems due to this sort of thing.

EARLE, Q.C.:

Q. Breathable materials, though, don't have the same thermal value, do they?

DR. COLESHAW:

A. Well, actually that's the outer fabric, so the insulation is provided by the lining materials, but there's also been some work done, I think, to do with people getting very hot, and I think in terms of its influence on body cooling if you end up in the water, if you start off very hot when you go in, that's a situation where you're sweating, actually your body temperature has got further to fall. So I think there is one study that's shown that overall it doesn't have a significant effect on the overall end point, so basically

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you can tolerate a certain amount of sweating within a suit and not have an effect on body cooling.

EARLE, Q.C.:

Q. Now you've written fairly extensively in your paper in issues of buoyancy.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. And I think it would be helpful at the outset to understand how the buoyancy of a suit is calculated.

DR. COLESHAW:

A. It's measured by using human subjects for the measuring and you weigh their weight underwater when they're in standard clothing or in swimming trunks. So you fully immerse them in the water above the head and measure their underwater weight. They then don the suit and any associated clothing that might be worn and you repeat that measurement, and the difference of the two underwater measures buoyancy.

EARLE, Q.C.:

Q. One point that you made, and it's one that I

Page 87

must say gives me pause for thought, is that the amount of material in a suit will affect its buoyancy?

DR. COLESHAW:

A. Yes.

EARLE, Q.C.:

Q. Just the amount of material, so that if you are in a suit with great folds of material hanging away, even though the suit seals properly and everything, that you probably have a suit that gives a greater buoyancy than if you have a suit that fits like it was tailored for you?

DR. COLESHAW:

A. That's right, yes, certainly.

EARLE, Q.C.:

Q. So -

DR. COLESHAW:

A. Because you're not just measuring the buoyancy of the suit, you're actually measuring the buoyancy due to the suit and any other trapped air, and that is the measurement that's made.

EARLE, Q.C.:

Q. Yeah, that's right, and - but just if we could break it up, just the material alone adds to

Page 88

the buoyancy, and, you know, I don't know exactly how these things translate in terms of sizing, but I know, for instance, some of the materials I've read have indicated that the thermal testing is done using a mannequin, and it strikes me that if you got a mannequin, it's very easy to get a suit that's a good fit because you say we want a size 12 mannequin for a size 12 suit.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. I can tell you from personal experience that the human body doesn't always come in an easy size to fit, and so I'm just wondering what is the standard, how do we determine what the buoyancy of a typical suit on a typical helicopter passenger is?

DR. COLESHAW:

A. I mean, that is only covered by the fact that all suit testing is done on a range of subject sizes, cut up in six subjects. I'm not sure if the Canadian - if it's not - I think it's actually more than that. I think it might be 10 or 11 subjects, but you're hoping that

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within that range, and within that range you're trying to go from the small thin person to the large bulky person and cover a range of different body shapes. By picking that up, you then take an average reading, or, in fact, most of the standards, all of those test subjects have to meet the buoyancy requirement. So that is - you're just taking a sample of the population. You're not going to represent the whole population in that, so it's down to whether you've got a good range of body sizes within your subject group.

EARLE, Q.C.:

Q. We know, for instance, with the 452 suit that we had real problems here with people having suits that had a huge amount of excess fabric, as well as problems with the seals on the thing, and you made the point that if you have an over large suit, you can as well have trapping of air within the suit, that the air will not fully evacuate when the hydrostatic pressure of being submerged is engaged?

DR. COLESHAW:

A. Well, I think the more air that's been trapped, the longer it's going to take to

Page 90

escape from the suit. So, yes, the more over size the suit is, the bigger the problem the individual is going to have.

EARLE, Q.C.:

Q. Now in your paper you've used this figure of buoyancy as being "N".

DR. COLESHAW:

A. Yeah.

EARLE, Q.C.:

Q. And that is about as clear to me as "Clo's" were before we heard from you on that yesterday. What's an "N"?

DR. COLESHAW:

A. "N" stands for neuton, which is a measure of force. 150 neutons is equivalent to - I'll try to explain it, 15 kilograms force. So that is - multiply to change that to neutons, you'll multiply the 15 kilograms force by the gravity factor, which is 9.98. So it's to do with the output force that's being exerted. So if you try and submerge - if you put the suit in a cage underwater, that would be a force.

EARLE, Q.C.:

Q. So see if I've got it right. You say 150 N's

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is the equivalent of 15 -

DR. COLESHAW:

A. 15 kilograms of force.

EARLE, Q.C.:

Q. Kilograms. So that if we had a vessel in water that contains sufficient air to generate 150 N's of buoyancy, and we put a 15 kilogram weight on top of it, it -

DR. COLESHAW:

A. It should then be neutral.

EARLE, Q.C.:

Q. It should be suspended?

DR. COLESHAW:

A. Yeah.

EARLE, Q.C.:

Q. So that tells me that, in fact, it doesn't take a lot of trapped air to create a neuton. Am I correct in that?

DR. COLESHAW:

A. Not a huge amount, I suppose. I haven't thought about it in terms of volumes.

EARLE, Q.C.:

Q. Well, the amount of air that would be contained within this vessel, that would be considerably more than would be required to

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create a neuton, wouldn't it?

DR. COLESHAW:

A. Uh-hm. See I don't know, but that seems reasonable.

EARLE, Q.C.:

Q. And I apologize, Mr. Commissioner, for not having these earlier. Suncor was good enough to supply us with some photographs of the actual suits that we're using now, and I have got enough copies for everybody. Mr. Commissioner, if we could perhaps mark these as exhibits. As is evident from the pictures, these are pictures of individual - of an individual front and back in the HTS-1 suit.

COMMISSIONER:

Q. Okay. We could give them a number then.

REGISTRAR:

Q. Yes, Public Exhibit 00222, the front of the suit, and the photo of the back of the suit, Public exhibit 00223.

COMMISSIONER:

Q. I might say, Mr. Earle, so that you'd know, there are three suits, the older suit and two of the new suits within eight or ten feet of you beyond that wall which we took the

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precaution of getting here should someone want to demonstrate something.

EARLE, Q.C.:

Q. But I'm not about to put one on. So, Dr. Coleshaw, in looking at this suit, and this is the suit as we've heard from the evidence that has been modified to - basically, it has a pair of suspenders inside to allow the legs to be pulled up, and we can see the accordion effect at the knee area of the individual. These fold areas, would you agree with me that they're potential air traps?

DR. COLESHAW:

A. They're going to trap a certain amount of air, certainly.

EARLE, Q.C.:

Q. If we could have these -

REGISTRAR:

Q. Yes, the second photograph of the front of the person wearing a suit will be Public Exhibit 00224, and the second photograph of the rear of a person wearing the suit will be Public Exhibit 00225.

COMMISSIONER:

Q. Okay, thank you.

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EARLE, Q.C.:

Q. Dr. Coleshaw, these two pictures are of the - as indicated, the E452 suit, and as we can see, it has the capacity for a wearer of somewhat larger dimensions particularly in the middle than the individual wearing it, and also of somewhat longer legs because - we really have quite a bit of excess material here, and again potential for air traps with the folds, would you agree?

DR. COLESHAW:

A. Certainly, looking at these pictures.

EARLE, Q.C.:

Q. And the reason I brought these real life pictures into play because as I understand your paper, you're telling us that the buoyancy limit on the Canadian General Standards Board approved suit at 175N is 25N higher than what others are recommending as the maximum standard, is that correct?

DR. COLESHAW:

A. That's correct.

EARLE, Q.C.:

Q. And this recommendation is based in studies of the ability of people to get out of submerged

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helicopters, which basically say that - I think they use the word "naive" subjects, and what I take that to mean is people without professional training.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. In the - under water, had difficulty in getting out of helicopters wearing suits with buoyancy from 138N to 173N.

DR. COLESHAW:

A. Uh-hm.

EARLE, Q.C.:

Q. Again is that correct?

DR. COLESHAW:

A. I think that's correct figures from the work of Chris Brooks.

EARLE, Q.C.:

Q. Yes, and, in fact, professional trained divers used to working underwater had difficulty at the 175 level?

DR. COLESHAW:

A. I think that's correct in some cases. I mean, there are others who managed to escape. I think the upper limit was 260/270. That's the

Page 96

level. So there was a range in the difficulty of escape.

EARLE, Q.C.:

Q. Now I understand the reasoning behind the 175N for suits for the Canadian offshore is the thermal factor, that it's a tug of war, if you will, between buoyancy and thermal protection because as the state of things now exist, in order to get more thermal protection, you end up increasing the buoyancy?

DR. COLESHAW:

A. You can do, yes.

EARLE, Q.C.:

Q. Dr. Coleshaw, it appears to me from what you've told us, that the lesson for this Inquiry is that we should be paying extremely close attention to good fit of suits in this jurisdiction?

DR. COLESHAW:

A. I think that'll create a big difference.

EARLE, Q.C.:

Q. That when we're dealing with a suit like the 452, a fit like the 452 that we have here, we're actually playing with the limits of safe buoyancy?

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DR. COLESHAW:
A. I would say it's of the upper limit, yes, certainly for certain individuals. I think probably smaller less fit individuals are going to have much more problems with buoyancy than the heavier individuals because, of course, individuals have also got different underwater weights. So heavier individuals will have less of a problem, but buoyant individuals are going to have much bigger problems with this type of suit.
EARLE, Q.C.:
Q. So if you've been watching your calories, but for some reason or another you needed a tall person's suit, you've got a problem?
DR. COLESHAW:
A. Yeah.
EARLE, Q.C.:
Q. And just so we understand, the problem with all -- with buoyancy, if you have too much of it, you're going to find yourself pushed against whatever is -- whether it is the bottom of the helicopter or the top of the helicopter, whatever is in the direction of the surface?

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DR. COLESHAW:
A. Particularly if you've lost contact with surfaces. I think if you can keep contact with your handholds, it's going to be less of a problem than if you've lost that contact. There's also been some people suggesting that more handholds close to exits would help, because at least then you can pull yourself towards the exit, but if you lose contact, then yes, there is this danger you're going to float up or down, at least until some of this excess air is evacuated from the suit.
EARLE, Q.C.:
Q. So would you subscribe to the view that I know has been put forward by one of our people that if you're going to put an inboard fuel tank, a fuel tank in the cabin, that it should be designed with a handhold?
DR. COLESHAW:
A. I think that would certainly help the situation, that if people had to go over that tank to get to an exit, they've got something to help them move in that direction.
EARLE, Q.C.:
Q. Basically, the method of evacuation is

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essentially get hold of the exit and pull yourself towards it, right?
DR. COLESHAW:
A. Yeah. That is certainly what is trained is locate your exit, have a hand on it and don't lose contact with it. Now that might not always be possible, so handholds would help.
EARLE, Q.C.:
Q. And if you lose hold of something and your suit is too buoyant, you're going to find yourself trying to push yourself off a surface in the direction of -
DR. COLESHAW:
A. And have to then either pull down or pull up to get yourself to the exit.
EARLE, Q.C.:
Q. Thank you very much, Dr. Coleshaw.
DR. COLESHAW:
A. Thank you.
COMMISSIONER:
Q. Okay, thanks, Mr. Earle.
EARLE, Q.C.:
Q. I must say it's been very nice to see you. We know in one of the earlier exhibits, your name was redacted out of respect for your privacy,

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so nice to have you here.
DR. COLESHAW:
A. Thank you.
COMMISSIONER:
Q. Now then, counsel for the families, Mr. Martin.
DR. SUSAN COLESHAW, EXAMINATION BY MR. JAMIE MARTIN
MR. MARTIN:
Q. Good afternoon, or I guess it's still good morning. Good morning, Dr. Coleshaw.
DR. COLESHAW:
A. Good morning.
MR. MARTIN:
Q. Mr. Commissioner. I'm Jamie Martin. I represent the several families of the deceased passengers and my line of questioning is actually directed to the fidelity issues that you dealt with in the latter part of your brief and if we could turn up Tab 22 or page 22 of your PowerPoint presentation? And I read with interest your paper and what I'm inquiring about is just trying to get some more clarification, some more specifics, if I could. The first issue, you talk about the stress and the anxiety caused by training.

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DR. COLESHAW:
A. Um-hm.
MR. MARTIN:
Q. I think it's widely acknowledged in the Province of Newfoundland and Labrador that jobs in the offshore are very rewarding professionally and in particular, financially, and there's a tremendous demand, I would think, for people trying to get jobs in that industry and companies, I'm sure, trying to retain them. We heard from one of the widows in their presentation here in February that -- and I think it's reflected in the survey that was done for the Commissioner, that one of the concerns that workers have is the anxiety associated with the training, and I guess that's one of the reasons why you dealt with that and I'm sure it's not a problem unique to the offshore Newfoundland and Labrador, but -- and in that particular, the widow, her late husband had a very rewarding job as a nurse in the offshore industry. He had tremendous amount of experience, felt he made a tremendous contribution to the offshore and in his previous employment as well.

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But what I'm trying to establish, you know, in terms of -- and just as part of the preamble, we heard from the Marine Institute and we heard from some of the operators, and particularly the Marine Institute, and they were talking about some of the problems that workers experience with the training, some of the stresses and the anxieties that were produced, and I guess at one point in time, you know, maybe it was thought that maybe they should choose a different career, maybe they're not cut out for the offshore. But that's a pretty difficult to choose because you want to be in that industry. You have professional designations that allow you to contribute to that industry and it's not an easy choice to make, and it is probably one of the better jobs that you're ever going to get in your lifetime.

But what I don't see in your paper and I'm just wondering if you can offer a perspective -- and I know you don't provide the training. I know you're commenting on the training in an academic context, but what can a company or what can a training provider,

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such as the Marine Institute, do to make the situation a little bit more acceptable? Because, you know, there's a lot of anxious people out there who are very -- feel very compromised by what's going on. They need the training, on the one hand. The companies have to deliver the training, on the other hand. So how do you strike an appropriate balance? Any thoughts as to what companies and training providers can specifically do? Because I know you've dealt with it in generality.
DR. COLESHAW:
A. Well, and I have actually written a report on exactly that issue for OPITO, which is one of my references on the reference list.
MR. MARTIN:
Q. Okay.
DR. COLESHAW:
A. In 2006, and various measures were suggested in that report, because a lot of the anxiety is due to anticipation of training, and quite often that's, you know, particularly the first time round. Stress tends to be particularly bad the first time people come and do their training. So that's considered to be due to

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possibly lack of knowledge about -- either lack of knowledge about what's about to happen or in the past, in the UK, there are all sorts of stories about difficulty of training and people getting hurt and, you know, there's this ramping up stress levels, I think, before people actually arrived at the training school. So one recommendation was more information given to people about what to expect before they arrive.

Another key issue I felt was very important was to -- one, that staff could recognize signs of stress within their trainees and be able to pick up on it, and I think giving them much more one-to-one attention during training so that you're recognizing they're having problems and giving them that extra help. I certainly saw that if you have big groups, there's potential for peer pressure, and if you've got a group of 16 students all standing on the side of the pool, is one individual who's feeling very bad about it going to admit that? Or if they're asked the question in front of 15 others, "are you happy with use of this piece of equipment?"

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are they going to say no and then go through additional training? So I think particularly in the early stages of training when you do the shallow water training, smaller groups where there's less peer pressure is probably going to be something that can help the situation and just make that -- you know, allow those individuals just to be helped through the training.

MR. MARTIN:

Q. Now would it be fair to say that you did not undertake a specific review of the Marine Institute program, in terms of whether their instructors have the professional training to deal with those types of issues?

DR. COLESHAW:

A. No, I mean, I was looking at issues in the UK, and that was in response to the proposal to include exits, push-out exits within training, and again, there were people in the industry expressing just the fears you were, that if they made training more difficult by giving them an extra task to do while they're underwater, that was going to increase levels of stress. So my report was in response to is

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this too much or other ways that we can handle this.

MR. MARTIN:

Q. From your understanding of the UK experience, because I know you don't -- you haven't specifically looked at the Newfoundland and Labrador experience, are instructors, are the training personnel equipped to deal with those types of issues? You know, is it a regular part of their curriculum to deal with those apprehensive workers who really want to work in the -

DR. COLESHAW:

A. I did actually ask several of the training officers in one of the training institutes where I was looking at this problem and there tends to be a range of responses to just how much training they had had in how to deal with stress. From one had very specific training because part of his own personal development had included that. I think they'd all had some, but it did vary. I think it would be an advantage if they all had some stress management training as part of their own personal development plan.

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MR. MARTIN:

Q. The instructors you're talking about?

DR. COLESHAW:

A. Yes, the instructors.

MR. MARTIN:

Q. So they can anticipate stress, deal with it accordingly?

DR. COLESHAW:

A. Yeah.

MR. MARTIN:

Q. Okay.

DR. COLESHAW:

A. And I think all of them certainly said that if they were aware, they'd be giving them additional help and certainly were quite willing to provide one-to-one instruction to get people through, and there are a lot of situations where -- in the old days, we had to jump off a fairly high platform and then that again was a big fear for some people, and at the end of the training course, that individual would be kept behind and coached through because they had to do at least one jump into the water from this, especially from the height. At one stage, they allowed them

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just to do it from the lower level and then build up, but certainly they were quite willing to do that one-to-one coaching. But I think you need the trainer to be able to recognize it, because some will just shut off. They won't admit that they're having problems and quite a few I interviewed would sort of say "well, I wasn't really confident, but I didn't want to do any more training." They didn't want to extend the agony of the training for them. They just wanted to get through it very quickly. Whereas I suspect those people really would have, at the end of the day, coped much better if they'd had slightly more training, rather than rushing through it.

MR. MARTIN:

Q. The second area of questioning, and again it's one of the fidelity issues that you identified in your paper, is the training frequency. I know you alluded to it earlier this morning that it would be desirable that -- and I'll deal with the time frame, because you had dealt with that in your paper, but especially for the recurrent training, your position was

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that it should be made more interesting. It should be more innovative because there are people who probably are not as apprehensive, do the training the first time and refresh themselves two or three years later, but they don't absorb as much because they've done it before. I know in your paper, you talk about it would be desirable to do it on a more frequent basis, and again, I ask the question have you looked at the experience here in Newfoundland and Labrador, in terms of the frequency of training that's offered here? Have you specifically looked at that?

DR. COLESHAW:

A. I mean, I haven't specifically looked at that. I mean, that wasn't within my remit in terms of the report. So I think it's another of these situations where idealistically more frequent training is the better the retention of skills, but I think from the practicalities, you've got to come up with something that's workable for the industry and I think the industry is struggling with what is the optimum retraining period.

MR. MARTIN:

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Q. And do you have an opinion on that, as to what would be the optimum period? Obviously the companies want to make sure they have a well trained work force, but they also are sensitive to the costs and I don't hold any ill feeling because that has to be factored into the equation as well. But do you have an opinion as to, you know, based on your experience in the UK, as to how frequently it should occur? I know it'll vary and there'll be different circumstances facing our industry, as opposed to the UK or Norway, but any opinion as to how frequently it should occur? And your answer may depend on what type of training you're offering, I would think.

DR. COLESHAW:

A. I mean, I certainly don't think it should be any longer than the sort of three to four years maximum and I think OPITO is officially four, though I think most are called up for their training after three years and it just gives a little bit of leeway that if they can't do it immediately. So I certainly wouldn't want to see it any longer than that.

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I'm not sure that we've got sufficient knowledge as to set what the optimum time period is before that. There's one study done in Australia where they felt it should be less than two years, but we don't really know the implications of bringing it down, whether that would, in the long term, really improve retention of skills. I think more work is needed in that area.

MR. MARTIN:

Q. Those are my questions, and like previous questioners, I thank you for your contribution to the Commission and wish you all the best. Thank you.

COMMISSIONER:

Q. Okay, thank you, Mr. Martin. The estates of the pilots, Ms. O'Brien?

DR. SUSAN COLESHAW, EXAMINATION BY MS. KATE O'BRIEN

MS. O'BRIEN:

Q. Yes, thank you. Good afternoon, Dr. Coleshaw.

DR. COLESHAW:

A. Good afternoon.

MS. O'BRIEN:

Q. My name is Kate O'Brien. I'm here today representing the families of the deceased

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flight crew, so my issues will largely centre on those having to do with pilots/copilots.

DR. COLESHAW:

A. Um-hm.

MS. O'BRIEN:

Q. I want to start with a comment you made in the course of your presentation on the colour of suits worn by flight crew.

DR. COLESHAW:

A. Um-hm.

MS. O'BRIEN:

Q. And if I understood you correctly, what you said was that you seemed to have some concern that flight crew tend to wear a -- in our jurisdiction, I think, a navy coloured suit. I think it's similar perhaps in the UK, is it?

DR. COLESHAW:

A. I think navy is quite a common colour, yes.

MS. O'BRIEN:

Q. Okay. Can you just maybe expand on that a little bit and you know, tell us what -- really what the issue is and why aren't pilots all in, you know, bright yellow jumpsuits?

DR. COLESHAW:

A. The issue is obviously location of the

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individuals in the water following an accident and I raised it because it was a point made in a recent accident report from the UK issued by the Accident Investigation Branch in the UK, and that was a crash in the Irish Sea, and they commented that it was much easier to spot the passengers in the yellow suits than the pilots in their dark suits. So yeah, that is a major issue.

In terms of why that's the case, I'm not really certain why those supplying suits for pilots haven't seen it as an issue. I think one of the differences is that the pilots are wearing their suits every day and they want something that they feel comfortable in. In the past, I've heard comments that they want to look smart and that a navy uniform, I suspect it's almost coming from the days before they wore suits. They want to stand apart. I suspect that the question has just never really been looked at as to should they be wearing a suit that makes them more visible in the event of an accident.

MS. O'BRIEN:

Q. So you don't know that anyone has studied this

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issue?

DR. COLESHAW:

A. I suspect not. I don't know that it's been investigated.

MS. O'BRIEN:

Q. Okay. In the course of your presentation, you reviewed some of the standards and I think they're actually listed on page 9 of 47 of your report, the immersion suit standards. You had them listed there, and from that list, I take it that in Canada there is no standard for flight crew suits. Is that correct?

DR. COLESHAW:

A. I'm not aware of a separate standard for flight crew suits.

MS. O'BRIEN:

Q. Okay. You have listed here, under the Canadian standard, maybe I'll give time for the Registrar to bring up that page, 9 of 47. There it is. I see there that the first standard listed, the CAA standard, that is a UK standard, correct?

DR. COLESHAW:

A. Yeah.

MS. O'BRIEN:

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Q. Okay.

DR. COLESHAW:

A. Which has now been superseded.

MS. O'BRIEN:

Q. Yes, I understood your -- yes. Then the next one is the CGSB. That's the Canadian standard, right?

DR. COLESHAW:

A. Yeah.

MS. O'BRIEN:

Q. Okay, and so that says, you know, helicopter passenger transportation suit systems, and there's none others that you've identified there as being Canadian standards. So is it your understanding that in terms of Canadian standards, that's what we have, it's a passenger suit standard as opposed to a flight crew suit standard?

DR. COLESHAW:

A. It's a good point. I didn't go looking to see if there was a crew standard, but I've not been aware of a separate standard certainly, so I'm not familiar with there being one.

MS. O'BRIEN:

Q. Okay, and I don't -- my understanding is there

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isn't one either, from previous witnesses. So in terms of what's going on in Europe now, the CAA spec No. 19, you say that has been preceded now by these two EASA standards?

DR. COLESHAW:

A. Yeah.

MS. O'BRIEN:

Q. Is that right?

DR. COLESHAW:

A. That's right.

MS. O'BRIEN:

Q. Okay, and I notice these standards, these EASA standards, as well as the old CAA spec No. 19, these are standards that deal with crew and passengers. Is that right?

DR. COLESHAW:

A. Yes. Yes, the new EASA, in fact the old spec 19 was purely for crew, because they were the only ones who were required by regulation to wear suits, and it's only since the transfer to EASA that -- or I think in the previous aviation requirements in Europe, referred to as JAR-OPS, which are very similar to the FAA operational procedures, that was the first time that it brought in requirements for suits

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to be worn by passengers. So crew immersion suits were the priority in the early 90s.

MS. O'BRIEN:

Q. Did any of these -- do any of these standards, these European standards include specifications with respect to colour?

DR. COLESHAW:

A. I don't remember colour specifically being mentioned, and in the aviation standards, I'm trying to think if it actually says that they should be conspicuous. I'll have to check back on that one.

MS. O'BRIEN:

Q. Sure, yeah, okay. All right.

DR. COLESHAW:

A. I think conspic -- it's a hell of a word, conspicuity certainly is a word that comes up in the European and international standards for immersion suits in general, the ISO standards, but I can't remember it being in the aviation suit standards.

MS. O'BRIEN:

Q. I mean, navy blue might be slimming, but it's not conspicuous, right. Okay. All right. It seems to be -- it seems odd to me that that

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hasn't been looked at a little bit more, because it -- okay. When I mentioned this issue earlier to counsel for Cougar, he indicated that there may be some issue with reflection on brighter suits in the cockpits. Are you aware of that or not?

DR. COLESHAW:

A. I mean, that's a comment that's been made before.

MS. O'BRIEN:

Q. Okay.

DR. COLESHAW:

A. So yeah, there could be some very specific reasons for not having the very light, bright suits.

MS. O'BRIEN:

Q. I suppose until someone studies it, no one's really going to know.

DR. COLESHAW:

A. That's right, yes, and I think, yeah, the cockpit, they're much more exposed to the effects of sunlight than passengers in the cabin behind.

MS. O'BRIEN:

Q. After the accident, the Irish Sea accident,

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are you aware whether anyone is looking at undertaking this kind of research?

DR. COLESHAW:

A. I'm not aware of anything, no.

MS. O'BRIEN:

Q. I just want to also talk to you a bit about spray hoods. You talked earlier today that spray hoods can be a very important piece of safety equipment. So could you maybe just recap your evidence on spray hoods for me?

DR. COLESHAW:

A. All right. Well, in terms of protection from drowning, there are two sort of issues. Yeah, one is obviously if the head is underwater, you're highly -- at high risk from drowning. So that's where you're looking for buoyancy to support the head, but once you're floating on your back with the head well supported, then you're still at high risk, particularly from breaking waves. So any water splashing over the face puts your airways at risk of ingesting water. Now if you're conscious, you can look for wave, particularly if you're facing the waves, you can see a wave coming towards you and in that case, you'd make sure

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your mouth was closed and take a breath as that's washed over. Of course, that becomes a problem if you're losing consciousness and you're no longer able to protect yourself in that way. So spray hoods then become a very important part of protecting yourself from this water splash over the face.

MS. O'BRIEN:

Q. Would spray hoods be more important in higher sea states?

DR. COLESHAW:

A. Yes.

MS. O'BRIEN:

Q. Okay, and do you know whether the pilots, the flight crew in the UK, do they have spray hoods as part of their immersion suits or protective equipment?

DR. COLESHAW:

A. I'm fairly sure there's a spray hood on the lifejacket. In the UK, we're having separate lifejackets, so where there is a spray hood, it's always on the lifejacket, and 99 percent sure there is a spray hood on the pilot's lifejacket.

MS. O'BRIEN:

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Q. Are you aware that our flight crew here don't have spray hoods with their protective equipment?
DR. COLESHAW:
A. I wasn't aware of that.
MS. O'BRIEN:
Q. Does that surprise you?
DR. COLESHAW:
A. Yes.
MS. O'BRIEN:
Q. Yes.
DR. COLESHAW:
A. Well, as I said, there had been a lot of resistance in the past to spray hoods and I think design of spray hoods has improved immensely over the last -- the new designs were coming in about ten years ago, so there has been a bit of improvement in the last ten years.
MS. O'BRIEN:
Q. Are you aware whether spray hoods are addressed by the EASA standard?
DR. COLESHAW:
A. Yes, there is a requirement in there, sure, for spray hoods.

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MS. O'BRIEN:
Q. And that would be for flight crew as well.
DR. COLESHAW:
A. Yes, that would apply to both. I'll just qualify that, that is probably in the life jacket standard which I've not listed here and potentially is not one in the suit--I'll have to check in the integrated suit standard--actually it won't be in the integrated suit standard, it won't be in the one that's entitled "Helicopter Crew and Passenger Immersion Suits".
MS. O'BRIEN:
Q. Just to be clear, my purpose here today is not to try and trip you up or to trick you to either say something, so if there's ever after your testimony that you realize that you mis-stated or you went back and checked something, I know that the Commission counsel and the Commissioner, every one would be more than pleased to hear from you.
DR. COLESHAW:
A. Sure. I'm fairly certain that it is in the EASA Life Jacket Standard, the one I would have to check again would be in the integrated

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suit where it's assumed that the buoyancy is part of the suit. I'd be surprised if there isn't a spray hood in that standard, so I would need to check that.
MS. O'BRIEN:
Q. Okay, it's of interest to me because knowing that you're either telling us that the pilots on the other side have spray hoods as part of their equipment, but hearing that it's an important piece of safety equipment or hearing it's particularly important in higher sea states which we know in this jurisdiction we get high sea states and we also know that our pilots don't have those spray hoods, so it seems to me an issue that might be begging for a little further research.
DR. COLESHAW:
A. Uh-hm.
MS. O'BRIEN:
Q. To find out if we do have the best practice here.
DR. COLESHAW:
A. Yes, I mean, I'll certainly recommend that spray hoods would be of great benefit.
MS. O'BRIEN:

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Q. Okay. I take from your testimony generally that what you had done is sort of given a fairly--I won't say a high level, but a sort of academic look at, in particular with issue one, with the safety equipment, but that you haven't gone and looked at what is happening on the ground in the Newfoundland and Labrador offshore?
DR. COLESHAW:
A. I had a fairly limited time period to prepare the report and due to other work that was ongoing at the time, so I have to do it on the basis of my existing knowledge, rather than being able to do some new research and really spend time looking a the Canadian situation. So my report was more written from my current position, rather than doing any new work.
MS. O'BRIEN:
Q. Okay, the reason I ask, we--Cougar who operate the helicopters here in this jurisdiction, they testified earlier at this Inquiry and I asked them to provide the Inquiry with the specifications for the suits that their pilots are wearing and they have gone with a, what they call a three-layer approach, so that the

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first layer is an undergarment which is like a Stanfield's long underwear type garment and then they have an air crew flight suit which is a second layer of protection and I think this has a fire retardant capability.

DR. COLESHAW:

A. Yes.

MS. O'BRIEN:

Q. And then the third is their immersion suit, the pilot immersion suit which is a suit supplied by Viking, the Viking model PS4177. Are you at all familiar with that suit?

DR. COLESHAW:

A. I haven't worked with that particular one.

MS. O'BRIEN:

Q. Okay. I notice in the literature that Cougar provided and in the literature that they provided on the suit itself, it doesn't talk about, it doesn't address that it is compliant with any specific standards, so the literature from the company as provided, it doesn't say this suit is compliant with the EASA standard or the Spec. 19 standard. Does that surprise you?

DR. COLESHAW:

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A. Yes, slightly. I would have thought there was always a benefit for all manufacturers to be able to say that any piece of PPE that they're supplying is approved to a certain standard.

MS. O'BRIEN:

Q. Okay, here is--this is what Cougar provide and I'm going to ask you to give your comments on this, with respect to the pilot immersion suits, they talk about "there is no standard used for reference to pilot survival suits by either the FAA or Transport Canada. They are a product which has been developed out of necessity over decades of work with airforce and private aircraft operators based on the unique requirements of each. Designs follow common industry practices, but there is not a standard performance criteria for them at this time. The EASA is working on a new ETSO-2C502 and ETSO-2C503 for helicopter crew and passenger immersion suit systems, but that is not expected to come into force until sometime in late 2010. That may even be optimistic. There are some flag states which seem reluctant to make the adoption." So, I'm putting this to you because you, you know,

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having talked about those standards in your report and listed those as standards. So what I just read out to you there, do you agree with those statements that are coming from Cougar?

DR. COLESHAW:

A. I'm surprised with the comment about 2010 and the standards were published in 2006.

MS. O'BRIEN:

Q. Okay, have they come into force?

DR. COLESHAW:

A. Yes.

MS. O'BRIEN:

Q. Yes.

DR. COLESHAW:

A. Well within the European jurisdiction.

MS. O'BRIEN:

Q. Okay. Has there been flag states which have been reluctant to adopt them?

DR. COLESHAW:

A. I don't know that, I mean with this type of standard, it isn't--unless it's within things like airworthiness requirements, then there wouldn't be any other legal requirement to meet a standard, so within Europe personal

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protective equipment has to be, it has to have what's called a C mark, which means that the manufacturers put together a technical case for approval of that piece of equipment. Now the usual way to demonstrate compliance, normally that would be with what's called a personal protective equipment directive, which is a European directive. The normal way of showing compliance with that directive is to use an appropriate standard, so that's what would apply for something like the ISO suit standard as somebody who is producing a general suit standard. The aviation industry is slightly different, so within the UK, it would be the CAA that required an ETSO standard suit or it would come under the EASA requirements. So I think it would be further jurisdictions to say from this date we require you to have a suit meeting this particular standard.

MS. O'BRIEN:

Q. Okay.

DR. COLESHAW:

A. So I'm possibly mixing up the difference between the publication of the standard and

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when it would be required by, airworthiness requirements within a particular jurisdiction.

MS. O'BRIEN:

Q. Okay. But in the UK now, is it required--if you were putting out a new suit, is it required to meet that standard now.

DR. COLESHAW:

A. Actually no because it's one of those things of grandfathering rights in terms of the old Spec. 19.

MS. O'BRIEN:

Q. That would be for pre-existing suits, how about a new suit being -

DR. COLESHAW:

A. If there was a new suit produced by a manufacturer, to get that suit approved for use they would now have to use the ETSO, rather than the old Spec. 19.

MS. O'BRIEN:

Q. Okay, so that is in effect in the UK now for new suits, you have got to follow that standard. The reason--the point of these questions is certainly when we've been discussing suits generally at this Inquiry, there seems to be generally be evidence as,

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well more focused on passenger suits and the impression that I've been given from a number of witnesses is that, you know, passenger suits are very different than flight crew suits, flight crew suits have very different requirements, whoever has been talking at a various time has sort of felt that they didn't have the expertise to talk about what was needed for flight crew. Do you see that big distinction between passenger suits and flight crew suits?

DR. COLESHAW:

A. I think certainly in the UK it would possibly be a difference because of an industry that have been driven by the offshore industry, rather then being driven by the aviation regulator and maybe that's a lack of joined up thinking between the offshore industry and the pilot, you have groups responsible for the pilots that they're not following the trends that the industry are pushing for their workforce.

MS. O'BRIEN:

Q. Okay, so there's no--what I'm hearing in that answer is that it's two different groups, the

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air regulators really in some ways may be not keeping up with what's going on for the oil regulators are doing and putting funding into their workforce suits, their passenger suits, but that it has to do more--it doesn't have something to do necessarily with the vastly different requirement of these two -

DR. COLESHAW:

A. No, because I think the requirements, certainly the risk in terms of immersion in cold water are exactly the same for the two.

MS. O'BRIEN:

Q. Okay. With respect to your issue No. 1 which is our issue No. 13, the issue was what personal protective equipment and clothing is necessary for helicopter passengers and pilots? And I'm just going to stop there for a moment. One of the pieces of protective equipment that was not addressed in your report was helmets and I know that that would really be a flight crew issue.

DR. COLESHAW:

A. Uh-hm.

MS. O'BRIEN:

Q. Can you just comment, you know, is it not in

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your report because you don't think it's necessary or is it it just wasn't in the scope of what you were looking at or whatever?

DR. COLESHAW:

A. I'm assume it was not one I thought of as being--probably because most of my work has been concerned more with passengers than pilots, so it's not something I've got any experience of and so that's probably oversight on my part in terms of what would be required by the crew.

MS. O'BRIEN:

Q. Okay. The other thing just reading on issue No. 13, the next part is what are the standards which you've addressed in that section of your report and some others, and should the C-NLOPB require guidelines to ensure such equipment and clothing is properly fitted. That part of the issue, although that full issue appears in your report, that second part, what the C-NLOPB should do, wasn't really addressed in your report. Can you just give us some comment on that?

DR. COLESHAW:

A. Well in terms of whether they should be well

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fitted.
MS. O'BRIEN:
Q. Well the issue as it reads, it says what are the standards and should the C-NLOPB require guidelines to ensure that such equipment and clothing is properly fitted. In that whole last section there, it hasn't been addressed by you either in your report or your testimony.
DR. COLESHAW:
A. I just don't know how to answer that. I mean, I certainly think that there should be guidelines there to ensure the best protection of the individuals, whether they be crew or passengers. But I think guidelines would be beneficial.
MS. O'BRIEN:
Q. Okay. And I'm almost done here and I thank you for your time. One of the other things that struck me when I was looking at the specs for the flight crew suits, these Viking suits, nowhere on the specs that I was provided for any of the layers does it give any numbers with respect to a thermal protection, so there's--I have no clothes here, I don't have

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any numbers here with respect to buoyancy, I have no neutons. Does that surprise you that the specs that we've been provided don't have those, from your presentation it seems to me, critical numbers.
DR. COLESHAW:
A. Uh-hm. I think if you're going to do a risk assessment of what you're going to provide then I think you'd need to know what the water temperatures were and what level of protection was needed to protect the individuals. In terms of the actual suit itself, it would probably depend on the design of the suit. If it's just a coverall design of the suit, as I am not familiar with the suit number you're talking about, but if it's just a coverall, then there's very little inherent insulation in a suit of that type and then it is dependent on what's worn underneath as to how much insulation you've got, which wouldn't be specified by the manufacturer in that case.
MS. O'BRIEN:
Q. Someone would have to put these elements together, test them and find out, right?
DR. COLESHAW:

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A. Yes, so you're looking at the whole system.
MS. O'BRIEN:
Q. And would you recommend that when someone is putting together a full system that they do testing on that full system to find out exactly what they're getting in terms of thermal protection, what they're getting in terms of buoyancy?
DR. COLESHAW:
A. I'd think so and I think the added element is I think you'd, as well as looking at the cold water performance, you'd certainly have to look at thermal stress in the cockpit as being an issue.
MS. O'BRIEN:
Q. Yes.
DR. COLESHAW:
A. There has been some work done in measuring temperatures in cockpits and looking at that, but in terms of these, yeah, these balancing acts I think was, again, an issue and it's perhaps why pilots have got less protection in terms of thermal insulation in the suits, you know, on a day-to-day basis they're exposed to those warm cockpit temperatures and, you know,

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maybe the balance there is much more towards what they're wearing, they're wearing it for work "x" hours a day and not just for a couple of hours every couple of weeks, so yeah, I think there are different issues that would have to be addressed.
MS. O'BRIEN:
Q. Have to be addressed, sure.
MS. O'BRIEN:
Q. Would you agree with me until somebody actually studies and puts some numbers around this and does some actual testing, you know, trying to make that assessment based on anecdotal evidence is not all that effective?
DR. COLESHAW:
A. It's difficult.
MS. O'BRIEN:
Q. All right, thank you very much. Those are my questions.
COMMISSIONER:
Q. Thank you Ms. O'Brien. Counsel for C-NLOPB?
DR. SUSAN COLESHAW, EXAMINATION BY AMY CROSBIE
MS. CROSBIE:
Q. Good afternoon, my name is Amy Crosbie and I am counsel for Canada Newfoundland and

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Labrador Offshore Petroleum Board, the regulator in this jurisdiction. I only actually have a couple of things I wanted to confirm with you. In talking about the research studies that are ongoing with respect to the EBS technical standard, crash worthiness, floatation and then also some of the human factors that you were involved in, I just wanted to confirm that those studies are actually commissioned by the Civil Aviation Authority?

DR. COLESHAW:

A. Yes, up until--the last of the studies was EASA.

MS. CROSBIE:

Q. And that's the European Aviation Safety Authority?

DR. COLESHAW:

A. European Aviation Safety Agency.

MS. CROSBIE:

Q. Agency, and so are they the equivalent of the Civil Aviation Authority?

DR. COLESHAW:

A. Well they're now the European regulators, so they've taken on a lot of the responsibility

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that originally was delegated to the member states. A lot more of that responsibility has now been pushed up to the European agency.

MS. CROSBIE:

Q. And you also indicated that you were aware that the Civil Aviation Authority had had some meetings several years ago with the US counterpart.

DR. COLESHAW:

A. Uh-hm.

MS. CROSBIE:

Q. Are you aware if Transport Canada has been involved in any of these studies?

DR. COLESHAW:

A. I don't know.

MS. CROSBIE:

Q. Just one other point, with respect to what is worn by the flight crew in your jurisdiction, am I correct in that it is the Aviation Authority who would call up a particular standard for the crew?

DR. COLESHAW:

A. Yes, that now has also shifted to -

MS. CROSBIE:

Q. The European -

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DR. COLESHAW:

A. - the European regulator, yeah.

MS. CROSBIE:

Q. Those are all my questions.

COMMISSIONER:

Q. Okay, thank you Ms. Crosbie. Are there any other questions? I see you rising.

MR. SPENCER:

Q. Yes, Commissioner, if I may just have a couple of questions arising?

COMMISSIONER:

Q. Yes, absolutely.

DR. SUSAN COLESHAW, EXAMINATION BY MR. GEOFFREY SPENCER

MR. SPENCER:

Q. Hello Ms. Coleshaw, my name is Geoffrey Spencer, I'm the solicitor for Helly Hansen. I just have a couple of questions that arise from some questions that were asked of you by Mr. Earle.

DR. COLESHAW:

A. Uh-hm.

MR. SPENCER:

Q. Now he had asked you some questions about the fitting of the suit and he had stated that it was important to pay close attention to the

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fitting of the suits. And he had asked you, he had made a statement that the E452 suits, there were some problems with bulkiness of the suit. I understood from your paper, I guess, in your principle of personal accountability that there would be some responsibility on the individual to ensure they have a proper fitting suit.

DR. COLESHAW:

A. Well I think to ensure they have the correct size. I think if they had been told your size is a medium, that our responsibility to making sure they were issued with a medium. I don't think they could have responsibility for whether that was a good fit or not.

MR. SPENCER:

Q. If you had an individual who had a medium size suit and found that it was bulky, there would be some obligation--there's some responsibility on the individual to go back and ask for a smaller suit?

DR. COLESHAW:

A. I think it would be sensible for the individual to say is there a smaller suit that will fit me?

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MR. SPENCER:
Q. Sure.
DR. COLESHAW:
A. But I think that would be the start of the process, I mean, I think that's when you establish what is the correct size of suit for that individual, I think that would depend on how that was managed.
MR. SPENCER:
Q. Okay, and are you aware that in the last year Helly Hansen has been contracted by the operators to do individual suit fittings of every offshore worker before clearing that worker to fly?
DR. COLESHAW:
A. I wasn't aware of that.
MR. SPENCER:
Q. You weren't aware of that.
DR. COLESHAW:
A. No.
MR. SPENCER:
Q. That type of individual suit fitting of every worker, to your knowledge has that been done anywhere else in the world?
DR. COLESHAW:

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A. I don't know specifically, I'm just trying to think, I'm not sure how it's actually managed in the UK, I suspect it's down to the individual to give their dimensions, rather than being specifically measured.
MR. SPENCER:
Q. Sure, normally I guess the suit manufacturer would provide a range of sizes and then it would be up to the individual to choose the suit, I guess, that they would want to wear, would you agree with that?
DR. COLESHAW:
A. I think that would be the more normal practice.
DR. COLESHAW:
A. Sure. So this--these individual suit fittings that are now occurring here in Newfoundland, that's something that's certainly well beyond what you would normally see in the industry, would you agree?
DR. COLESHAW:
A. I would have thought so.
MR. SPENCER:
Q. Okay. You were referred to some photos that showed some folds, I guess, in the suits

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around the knee area in particular, I think.
DR. COLESHAW:
A. Uh-hm.
MR. SPENCER:
Q. Would you agree that you need a certain amount of flexibility in the suit for mobility purposes?
DR. COLESHAW:
A. That is certainly true, yes.
MR. SPENCER:
Q. And I guess, because if you had, you could have a perfectly skin tight suit, but the individual wouldn't be able to sit down, wouldn't be able to move very well.
DR. COLESHAW:
A. I mean, certainly if it was skin tight and there was no elastication of any form and no shaping, yes, that would certainly be true.
MR. SPENCER:
Q. Sure.
DR. COLESHAW:
A. And I think a lot of tailoring makes suits much more expensive, so I can see why there isn't an excessive amount of tailoring in terms of shaping.

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MR. SPENCER:
Q. You were referred as well to some buoyancy issues. Would you agree that these individual suit fittings that are now being done before workers are cleared to fly, does that help address some of the buoyancy issues, in terms of trapped air?
DR. COLESHAW:
A. It should help to address some of the problems, again I think another question for me is the range of sizes, I think the more options you've got, the better fit that you can achieve. So I think there's still going to be some individuals who are going find it quite hard sometimes to fit to a particular suit size, particularly in terms of girth, you're going to have to go to the maximum rather than the minimum.
MR. SPENCER:
Q. Yes, okay. And I take it it would not be standard, I guess, to custom make a suit for every individual, would it?
DR. COLESHAW:
A. It's certainly not normal practice, I think again there are some situations where custom-

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made suits might be made for certain individuals where they were particularly frequent flyers and they have particular needs, so I know made to measure suits are made for them, but it's a very small proportion only in the UK.

MR. SPENCER:

Q. Sure. Okay, those are my questions, thank you.

COMMISSIONER:

Q. Okay, thank you Mr. Spencer. Mr. Stamp, you reserved a right to ask a few questions or to say something, would you like to do so?

STAMP, Q.C.:

Q. No, I think actually the issues that we had a concern about were addressed adequately.

COMMISSIONER:

Q. Okay then, thank you. Well Dr. Coleshaw, thank you very, very much for coming and giving us the benefit of your knowledge and research, it's been very helpful.

DR. COLESHAW:

A. Thank you.

COMMISSIONER:

Q. Thank you. Now, Mr. Roil.

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ROIL, Q.C.:

Q. Yes, Commissioner, the next witness is Michael Taber, had we ended a few minutes earlier, I would have asked for a break and then started him and then broken at 1:00, but I'm wondering in view of the proximity to 1:00, whether we might break now and come back a few minutes earlier to get as much time -

COMMISSIONER:

Q. I think it's a good idea. It's a good thing we're only here for a limited number of days so we don't bring the lunch hour forward.

ROIL, Q.C.:

Q. I wouldn't do a run because I have twenty to one, but -

COMMISSIONER:

Q. Well let's come back then at--what time is it now--at quarter to two, that would give you time and Mr. Taber to be present.

ROIL, Q.C.:

Q. Yes, absolutely.

(RECESS)

COMMISSIONER:

Q. Yes, Mr. Roil.

ROIL, Q.C.:

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Q. Thank you, Commissioner. Having started with the consultant from Australia via Washington, D.C. and then moved to the United Kingdom, we decided it was also prudent to have somebody from Canada and so I would like to introduce Mr. Michael Taber who comes from us Ontario and he will be the next consultant and the next witness. There will be three exhibits that we will be referring to from Mr. Taber, one would be his curriculum vitae, the second will be his report and the third will be the PowerPoint presentation which is what I will lead him through today. I have to say to you and to those present that there is a small change in the report, not in the PowerPoint presentation but in the report itself, and we will deal with that when we come to it and I will ask the security gentleman here to provide copies to all the parties, the Commissioner as well, one for him. Mr. Taber already has one and one for the clerk. While that is being given out, Mr. Taber, you are Michael John Taber?

MR. TABER:

A. Yes, I am.

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ROIL, Q.C.:

Q. I understand that you are going to be a witness here today and that you are prepared to take an affirmation with respect to your evidence and I would ask the Registrar if she would read to you the affirmation please?

MR. MICHAEL TABER (AFFIRMED), EXAMINATION BY JOHN ROIL, Q.C.

ROIL, Q.C.:

Q. Okay, the three exhibits are Exhibit No. 215 which is the Michael Taber C.V., 216 which is the report that he prepared and 217 which is the PowerPoint presentation. Commissioner, I would ask you to admit them into evidence with the qualification that there will become a small change to the report and we have--the revised pages are dealt with and can be brought up by the Registrar. Okay, Mr. Taber, welcome and let's take a few moments to talk about you and who you are and why you're before us today. You live in St. Catherine's, Ontario?

MR. TABER:

A. Yes, I do.

ROIL, Q.C.:

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Q. And what is your background and experience with respect to matters that might give rise to you being able give opinion evidence to this Inquiry?

MR. TABER:

A. Good afternoon, thank you. I think the start of my background is from military, X Airforce Airplane technician and during the period in military I became a safety diver, I did search and rescue safety diving for helicopter operations over the water which led me to taking a course at Survival Systems Training, at which time I sort of moved from the military to working for Survival for just shy of 14 years. During that time I went back to university, finished an undergrad, Masters and I almost completed a Ph.D, and working at Brock University.

ROIL, Q.C.:

Q. And so you are not yet a Ph.D., a doctor of philosophy?

MR. TABER:

A. No, I'm not.

ROIL, Q.C.:

Q. Okay, so I have to call you "Mister".

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MR. TABER:

A. Yes.

ROIL, Q.C.:

Q. And that's fine. What was the subject of your doctoral thesis, which I gather has been done but is not yet through the final process.

MR. TABER:

A. The doctoral thesis is looking at emergency response and performance for offshore oil and gas, Canadian control management.

ROIL, Q.C.:

Q. And I understand you are currently a post doctoral fellow at Brock University?

MR. TABER:

A. Yes, I start next month.

ROIL, Q.C.:

Q. Okay, and that--you are working on a project, what is the title of that project?

MR. TABER:

A. The title of that project is changing daily, but we are looking at performance, cognitive and physiological performance in long-term cold exposure, so commercial aircraft for passenger vessels in the Arctic.

ROIL, Q.C.:

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Q. Okay. As with Dr. Coleshaw we had to define an area of expertise and in conversations with Mr. Taber, we have come up with the following definition of his area of expertise, that is human factors and functional task analysis in underwater escape and evacuation. And so now with that definition of where your area of expertise is, what can you tell us about your background work, writings, experience, training, education, any of it that would lead you to be qualified to give us opinions on those things?

MR. TABER:

A. I guess I can start with the training background in my capacity at Survival Systems Training while I was there, I trained in excess of 10,000 individuals in underwater escape training, trained all over the world, did train the trainer programs for the military and civilian organizations. I have done extensive human factors research related to the skillset that's required for underwater escape, so that would include exactly what position an arm should be during a rollover, an eversion, how far they need to reach to

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grab an exit, if they're sitting in an isle seat, how many difficulties might they find if they have to go across an isle. So I've done extensive research on both civilian and military aircraft over the last ten years.

ROIL, Q.C.:

Q. And I note that some of your academic work has also followed the same sort of subjects? I draw your attention particularly perhaps to your academic awards and distinctions, which is on page 1 of your CV and in 2007, you seem to indicate that there's a best graduate oral presentation on the effect of emergency breathing systems during helicopter underwater escape training for a land force element of the standing contingency force.

MR. TABER:

A. Correct.

ROIL, Q.C.:

Q. And to those of us who are not engaged in the military, does that somehow or other relate to the military?

MR. TABER:

A. Absolutely, the standing contingency force is a group that was set up during the Second Gulf

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War and a number of military personnel, land force base personnel were required to be transported by helicopter from land base to ship, so that they could do ship boardings at sea in the Gulf of Oman, so prior to doing that, I guess standing them up and getting them ready, we tried to look at can they actually even egress as a unit, so 12 individuals in the back of a modified Sea King helicopter with all of their equipment, weapons, everything else and say okay, we've modified the aircraft, let's stick them all in there and see if they can make their way out.

ROIL, Q.C.:

Q. Now back in 2006 you had a similar distinction awarded to you with respect to a presentation called "Simulated Underwater Helicopter Escapes, Anxiety Sensitivity and Human Performance." Was that in relation to military or was that in relation to civilian?

MR. TABER:

A. It's actually a combination of both and it's related to my Master's work in which I was looking at whether or not instructors could predict based on a small questionnaire anxiety

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levels, so that they were able to--and this was already mentioned earlier in the presentation today, are the instructors capable of being able to identify who is nervous and who is not or who is a little bit anxious about that and that work was really trying to identify if there is an actual measure that's out there that we can do that with because a lot of the psychological measures might be 30, 40, 70, 120 questions and we really didn't want to ask all of the offshore workers when they showed up on the first day this 120 questionnaire about anxiety. So we didn't want to prime them and say are you going to be anxious to do--well, maybe, so from that we realized that at this stage there isn't a measure that only has a few questions that would be able to help the instructors identify. So as it was mentioned earlier, it's really sort of a feeling that the instructors get from the participants that are going through the training.

ROIL, Q.C.:

Q. Right. Under your scholarly publications on page 3, you indicate peer review journals and

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the first one is Tabor, Simoes Re, and Power, J. and I gather that those are two individuals we may hear from tomorrow, that's something that you're actually working on jointly with them at the National Research Council?

MR. TABER:

A. It's actually completed, it's just waiting, it's been through review process and it's just waiting for a publication date at this point.

ROIL, Q.C.:

Q. That particular study, however, does not have to do with helicopter underwater escape or anything like that?

MR. TABER:

A. No, but it relates to human factors and performances skillset within a particular environment.

ROIL, Q.C.:

Q. With a different environment than -

MR. TABER:

A. Yes, it's a life boat in ice.

ROIL, Q.C.:

Q. That, Commissioner, is--Mr. Taber's C.V. is much more extensive than that, but many references to journals and to manuscripts

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either incomplete or completed already. I would not have any further questions for him at this time, unless somebody else from the group here would wish to ask him questions, I won't ask for a designation until we determine that there are no other questions.

COMMISSIONER:

Q. All right then, well ladies and gentlemen, you had an opportunity to read Mr. Tabor's C.V., have any of you any questions? Okay, then Mr. Roil.

ROIL, Q.C.:

Q. Thank you. In that case, I would like Mr. Taber to be able to give opinion evidence to us on human factors and functional task analysis in underwater escape and evacuation. Now, Mr. Tabor, I am going to take you particularly to the PowerPoint presentation that you've prepared and I will not be taking you specifically to the report, except with respect to the area that you're requesting that a small change be allowed and when we get there, we'll deal with that, if that's okay?

MR. TABER:

A. Okay, yes.

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ROIL, Q.C.:
Q. Okay, so tell us what happened after you were retained? What did you do to undertake this assignment?
MR. TABER:
A. I was asked to look at five key factors and to do that, I thought it was important to try and contextualize those five key issues by looking at some of the helicopter ditchings around the world for the last ten years. So that took a bit of work, obviously, to try and gather the reports from various sources and as we get into the presentation, I don't know if I can bring that up or -
ROIL, Q.C.:
Q. Okay, I'll ask the Registrar to bring the presentation up. I will bring you back a page, though, to the outline and just take a moment--are you going to be able to control it perhaps from over there?
MR. TABER:
A. Yes, I will be able to control it from there.
ROIL, Q.C.:
Q. Okay, it's up there now.
MR. TABER:

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A. So basically when I was looking at the outline, I wanted to be able to contextualize exactly what was going on, so that when we're thinking about the five factors or the five issues, we think about it in a holistic manner, as opposed to looking at it in one main component verses another. And those five issues obviously, because we've seen from the report, we look at the additional operator requirements, the helicopter underwater escape training standards and I've shortened these a little bit to make them fit onto the slide.
ROIL, Q.C.:
Q. Yeah, I was just going to say, to make them fit on the slide. The additional operator requirements is our issue for consideration, No. 10, I believe.
MR. TABER:
A. Okay, and personal protective equipment related to the suits and the fittings and collaboration of the--or a collaborative approach really to helicopter safety initiatives and then look at personal accountability, and then obviously as we go through those five particular issues, then

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just to draw some conclusions from that based on my past experience.
ROIL, Q.C.:
Q. Okay, well perhaps now you can move into your introduction in the area and I think you told us that you looked at some statistics.
MR. TABER:
A. I did, I gathered--actually I do this on a regular basis, some people might think it's kind of bizarre that I do this, but I regularly watch a number of the alerts there, therefore helicopter crashes and ditchings and I wanted to look at specifically the offshore ditching statistics for the last ten years to try and see if there was any trends that were going on, and at this point I really haven't been able to analyse in a lot of detail those numbers. But what I thought was important to do as opposed to just stick a list of all of the information like I have in the report, I thought it was important just to identify where those numbers come from.
ROIL, Q.C.:
Q. Okay, now these are offshore helicopters that are ditching all over the world or just -

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MR. TABER:
A. All over the world.
ROIL, Q.C.:
Q. All over the world, okay. And have you broken down the ditching in terms of hard ditching, gentle, lying down, crashing, that sort of thing?
MR. TABER:
A. Haven't got to that stage yet.
ROIL, Q.C.:
Q. Okay.
MR. TABER:
A. That will come in a little while and we'll also be looking at position of aircraft, time of day, type of equipment and maybe training that they have as well, so that's later statistics that I will be working on. This is the -
ROIL, Q.C.:
Q. This is the statistics you will work on following your appearing here, it has nothing to do with what you're going to do today.
MR. TABER:
A. Following, that's right, yes, absolutely.
ROIL, Q.C.:

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Q. So you just have here about raw data.
MR. TABER:
A. That's right. So the blue bars we can see are the total number of personnel that were on board those events and then the red bars are indicating the fatalities that occurred in those events. So we're looking at 60 events that occurred over the ten years for the offshore oil and gas and we know that there's roughly 900,000 flights there transporting personnel offshore on an annual basis, so 60, if we look at the numbers there, not necessarily a lot, but it's maybe a little bit more than what people would have expected 60 ditchings seems like a lot in ten years.
ROIL, Q.C.:
Q. Yes, but that's in the context of 900, 000 flights.
MR. TABER:
A. Right, so we're really not looking at a huge anomaly from any of the other years previous and I've looked at the way up to 2005 and in that analysis that I had done previously with a colleague from Dalhousie, so we're not really seeing a huge difference that's

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happening here, but what I thought I'd also do is in the report I indicated that there was an overall survival rate of 48 percent, so I thought it was important to break that down a little bit and just identify the years in which less than 50 percent survival rate occurred and then more than 50 percent survival rate. And this is based on an understanding that Shanahan and colleagues have done for the US Military as well as some of the FAA reports to look at what is considered survival. And if we look purely at the human factors as far as capabilities of humans within an impact situation, he suggests that about 85 percent of all crashes, whether they're fixed wing or rotary wings to a helicopter, that 85 percent of those crashes is within human tolerances, that doesn't take into account the environment in which they're in, so it might be toxic environment, there might be fire, there might be a number of other things that are going on, but just if we look at human tolerances within those crashes, about 85 percent is what we would expect to see.

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ROIL, Q.C.:
Q. So 85 percent of humans should survive the impact if there were no other considerations?
MR. TABER:
A. Should, should, okay. So when I'm identifying those different number of years that are below 50 percent or above 50 percent, I just wanted to show that those numbers for below50 percent actually represent a survival rate of just over 32 percent. Okay, so those four years that are there. The six years in which we had greater than 50 percent, we can see that the survival rate for that is around 64 percent, just slightly over that, which leads me to the 48 percent overall survival rate.
ROIL, Q.C.:
Q. So the overall survivability rate is less than 30 percent?
MR. TABER:
A. Right, and if we take into consideration the fact that I haven't looked at whether this was a crash that might not be considered survivable, verses a ditching which could possibly be survivable, then those numbers might change.

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ROIL, Q.C.:
Q. Yes.
MR. TABER:
A. I just wanted to give a general scope of how many events have actually occurred over that ten year period.
ROIL, Q.C.:
Q. Okay, good, thank you.
MR. TABER:
A. So that leads us to something that's not necessarily identified directly in the report, but I think that is implied as we go through and I think that this is what I would like, throughout the rest of the report, is that we consider the fact that there are influences that are associated with different aspects of the overall survival. So training in particular is, we know that it has influences based on research that's been done in the past for the US Military and we can see that there is a significant difference between trained verses untrained individuals and we see that those numbers for the trained individuals--and this is military, this is the US Military keep in mind, that those numbers actually get much

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closer to that 85 percent survival rate that Shanahan would suggest is what we should expect to see. The untrained individuals, and again, these are military personnel, so these would be people that might be VIPs or technicians that might not have that type of training, it's now required both in the Canadian Military and the US Military that if they're going to fly over water, they have to have at least a basic understanding of what they're supposed to be doing, so they'll take a training course now. So this research was done in early to mid '90s and we just recently published, myself--pardon me, Chris Brooks and an individual from Transport Canada and one from Dalhousie looking at well are there a lot of reports for civilian helicopter ditchings that indicate whether or not they're trained, and in fact, we look around the world and we see that there really isn't any indication as to whether the individuals have training in underwater escape. So it's really hard to draw a conclusion based on training for that particular influence, but we know from the military there's no question training made a

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difference for sure. So if we look at it just in isolation, then we do see a difference. If we look at floatation, we know that Dr. Coleshaw spoke about that this morning and from the research that I have conducted with my colleagues at Dalhousie, all the 511 ditchings that I looked at in one dataset really didn't show that much of a difference. We didn't see the floatation really identified a strong relationship to its overall survival rate. The problem with that is that some helicopters will float on the surface, inverted even without floatation, so it might not sink, so there is some difficulty at being able to identify whether or not it's going to be able to make that much of a difference. If it stays on the surface, even if it's inverted, we know that survival rates are much higher, but just looking at base rates of whether it's installed or not installed, we don't see those differences at this point, so it's important to keep that in mind.

This next point is related to the use of emergency breathing systems and I know there was a couple of questions earlier this morning

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about the use of emergency breathing systems and this is the particular report that you asked me about for the standing contingency force and looking at individuals using emergency breathing systems verses not using emergency breathing systems, so we trained 12 individuals inside a simulator that was mocked up exactly the same as it would be for the helicopter and said, okay, you've completed the full day of training, you're all qualified, we'll stamp the card and you go out--or pardon me, Survival Systems would stamp the card and say you're all certified, you're all good to go. But one last thing before you go, we want to ask you to go back in, all 12 of you, no air, and you can imagine that they raised a couple of eyebrows and said I don't know if I want to do that, but they did, they went in and we looked at how many people needed assistance or actually didn't egress and required the simulator to be pulled out of the water. And without the air, 52 percent of them were able to make it out, out of those 12. As soon as we said go back in and use all the air, we got them to do it

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twice just to make sure, a hundred percent survival rate. And at that point the general or the standing contingency force was watching the training and said, there's no question left in my mind we'll use emergency breathing systems. So there is some researchers out there showing, whether it's anecdotal or imperial evidence, we are seeing that EBS does have an influence on that. And when we get to day verses night, there is no question. There's been a number of reports that have been done to look at day verses night survivability rate and we know that day is definitely a higher level and we can see that it's much closer to the 85 percent than nighttime. There's a number of factors that are related to that, it could be that the pilots don't have visual acuity related to the surface of the water, so being able to identify how far away they are and being able to identify when we need to flare the aircraft, slow things down. There's also search and rescue aspects post crash, so individuals make it to the surface, they're harder to locate just simply because of the

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environmental conditions. And I think it's important--I know I sort of delineated each one of these in separation, but I think it's important to sort of look at their influence, their overall influence, if we're sitting somewhere around 48 percent, we need to move that closer to the 85 percent and we know for a fact that a trained individual using EBS during the day has a higher survival rate based on all the imperial evidence than someone who is untrained, no EBS and in the nighttime ditching. So we understand that, but it's the influence or the relationship between those three key factors that makes the difference when we're trying to identify where do we make changes, how do improve the system, how do we move forward from here? So I've just identified those three key areas and I think that as we shift those closer together, we need to look at the overlap between the training and the equipment and I'll talk about this a little bit more, but in the report I mentioned specifically things like crashworthy seats and I'll talk about that in the next slide, actually, as I get there, but it's

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important to identify that if we think about the equipment and the environment and the influence of those key components, it might be that we stick in a new piece of equipment or we have a different type of environment or different type of training and it may not necessarily be beneficial to the overall survival rate and until we consider all of the aspects that are related to that, then it's difficult for us to be able to predict what that performance might be like in a real world situation.

ROIL, Q.C.:

Q. And you will bring some actual examples of that as we go through?

MR. TABER:

A. Absolutely, absolutely. So the first issue and if I'm going too fast, please let me know and I will slow down as we go along.

ROIL, Q.C.:

Q. Doing fine so far.

MR. TABER:

A. So I was asked to look at is there a need for additional operator requirements and one of the main factors that I thought was important

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was to look at the installation of a crash where the component, such as a seat, so it's already been mentioned stroking seats and the fidelity of the training environment. And if we consider a stroking seat was designed specifically to look at land-base crashes, it was designed to attenuate the G forces during an impact, so if we have a seat that will collapse under controlled conditions, so in excess of 20 Gs, the seat will collapse as much as eight inches and in a land environment when I'm breathing and I can see what's going on and I can understand what's happening around me, then it does seem very beneficial and there's been a number of reports that identify that it does save lives, there's no question. However, if we look at that environment and this is where we get into this three different components, if we look at an environment where we're upside down underwater possibly holding our breath and we've now moved possibly eight inches from our original position, does that impact my ability to perform the skillset that I was trained at that original height? Furthermore, if that

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seat strokes and I've moved that distance, the possibility of me moving my feet in underneath a seat, either in front of me or my own seat becomes a real issue and most of the crashworthy seats that are out there, I've only seen pilot seats that don't have it, so what I'm talking about is passenger seats, the majority of those would have a guard or a net that would be at the bottom of those seats to prevent the individuals from jamming their heels or their toes underneath the seat in front of them or their own seat. That's not to say that they couldn't push hard enough in a real situation to try and drive their feet back into that spot, so it's something to be considered, I'm not suggesting that that's an issue right now, but it's something to be considered when we're thinking about installation of a crashworthy component such as a seat.

ROIL, Q.C.:

Q. So you're saying that in making a change in anything you need to consider the impact that that might have on the so called holistic approach, what is it doing to the training,

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what is it doing to other issues, it may solve a problem, but it may create a problem.

MR. TABER:

A. Absolutely, absolutely, with every component that we're looking at or every training issue that we look at, that also leads to things like functional reach or strike envelope. So what we're looking at here is a picture of the forward portside--pardon me, forward portside seat in an S92, it's the only rear facing passenger seat that's in there and by CAA and FAA regulations we know that there's only a requirement for an emergency exit, one on either side of the aircraft. So this is the one on the portside of the aircraft for passengers in the back and that handle is designed to be pulled down to the lower position so you can see that down in the lower section on that image, and the individual wearing a four point harness--and we know for a fact that four point harnesses and five point harnesses based on the research, that that's much better for them during an impact because it restrains them in a position, they don't flare around too much and that's the

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strike envelope which I'll get to in a second. But as they reach for that, if that harness has been locked now by inertia, it's much like an inertia you have in your car and every once in awhile I'm sure that you both experience this where it will lock up and you have to wheel it all the way back in before it will release and then it will come back out. So it's the same sort of thing that we look at for an aviation environment as well, so if that's locked during impact, it's designed to do that to prevent you from flaring in that seat and what happens is your ability to now reach the emergency exit that's located next to you is limited. With a lapbelt, that limitation is removed, you can then stretch forward but during an impact, we know that it's not as safe as it is with a four point harness, so that's where I'm talking about disintegration and the strike envelop that we're looking at here to the left, the drawn image is a strike envelop and that is basically -

ROIL, Q.C.:

Q. And that's an expression that we have not

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heard before, so you might want to explain that?

MR. TABER:

A. Yes, a strike envelope is basically the distance that you can reach during an impact. So from wherever you're restrained, your upper limbs, torso, lower limbs, will move during the impact forces. So anything that's within that strike envelope, another person, a seat, a window, whatever it happens to be, you may possible impact that with your arm or your face or whatever happens to be moving around at that point in time. So that's the image for a strike envelope done by Shanahan and colleagues for the US Military, looking at how large of a strike envelope we actually have. If I'm just restrained at the lap, then my entire upper torso can be moved quite a distance. If we superimpose the four point harness over top of that, four or five point harness in this case, we can see that the strike envelope is greatly reduced. So if we keep them in a more confined space, there's less likely a case where they will strike another object or individual, and based on

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brace positions that they have, whether it's crossed arms or however they have it set up for a training environment, then that will again adjust strike envelopes.

So particularly when we look at a pilot's position in a cockpit, this is extremely important when we think about how far that individual will move within that environment. So we have flight controls, one in particular right in front of our face, so we want to try to reduce the amount of movement that occurs, that flailing movement that occurs, and there's been a number of research reports for the US Military that have identified that this is a real problem if they don't have proper restraint devices that are there, and the Canadian Coast Guard has put out a couple of reports particularly looking at whether or not the pilots were wearing shoulder harnesses during their long line work offshore. So there is an understanding that the strike envelopes are reduced by the type of harnesses that we have.

So I thought it was just important to identify that for the operators if we are

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going to make this change, if we say we think five point harness or four point harness or lapbelts are better than another style, we have to take into consideration what are we asking the individual to do in an emergency situation. When it's day to day operations and we're moving around, it's really not that much of an issue, but when we look at emergency situations, then we want to identify that.

So this is still a continuation of issue one, looking at the integration of those elements, and I mentioned previously that the aircraft is only required to have one emergency exit on either side of the aircraft. That's not to say that the operators and the aviation industry hasn't identified the fact that it would be kind of nice to have exits at every single row of seats. That just makes it a lot easier for the individuals if they need to move to a different position, but if we consider the size of the individuals, particularly ones that we might have offshore in Atlantic Canada, we may find that their body size might be different than other parts

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of the world, and if we do identify that, then the consideration of the size of the exit is extremely important, the interior configuration.

So this right upper image is of the back seat on a Super Puma and that window measures 21 by 12 inches. So it's slightly larger than a legal size sheet of paper, and we think about some of the offshore workforce that might be requested to use that exit in an emergency situation, and the indication of size of individuals related to the exit - and I know it's not considered an emergency exit, but if I'm sitting next to it in an emergency, it automatically becomes an emergency exit for me. So falling under the same criteria, it's not necessarily what we see in the regulation. In some cases it might, but in this particular case it doesn't. So on a Super Puma it's important to look at that. The lower right hand corner of the interior configuration is the starboard seat on the forward auxiliary fuel cell for offshore operations, and the individual that's sitting in that seat cannot use the right hand side or starboard side

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window because it's blocked by the auxiliary fuel cell hoses, so venting hoses. So they are then required to egress across the cabin. So they need to make their way from their position to reach over to that exit. They can't reach while they're wearing four point harness, so they would be required to disconnect the harness before they make their way to emergency exit, and we've identified already talking with Dr. Coleshaw that buoyancy becomes a bit of an issue when we're dealing with that, and depending on the position of the aircraft on the surface of the water, if it's partially inverted or fully inverted, then it becomes a bit of an issue of location, where the emergency exits might be located - pardon me, the exit might be located.

The lower left position, or image, pardon me, is a S-92 with the auxiliary fuel cell in the outboard position to a seat, and just identifying the fact that if that seat, that particular seat, drops eight inches and the individual is just about at their limit of their functional reach right now, so if we

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drop that seat eight inches, the ability for them to reach over top of that now to locate that exit becomes an issue. Not to say that it couldn't be done, and not to say that it couldn't be ameliorated with training, but I'm just saying that it's something that needs to be kept in mind when we're thinking about these interior configurations. If I move a seat six inches because of operational requirements, I put in auxiliary fuel cell or take equipment out to the offshore, whatever it happens to be, I need to be very sure that that six inch move isn't going to affect the capability of the individual to egress under those conditions, under those emergency conditions.

ROIL, Q.C.:

Q. And that study of the interaction between human and machinery, is that a scientific discipline?

MR. TABER:

A. Absolutely, and that's my next point. Human systems integration is we've moved a little bit away from looking at pure human factors and looking more at the integration of the

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individual, the environment in which that takes place, and whether that happens to be the physical environment that we're in or the organizational environment, so there's been a bit of discussion about safety climate, safety culture, so we consider those aspects as well within environment, and technology or equipment and how we integrate those particular aspects. So I think it's important - if the offshore operators are asked to do anything as far as additional requirements, I think it's important that they have some input from - it doesn't necessarily need to be a human systems integration expert, but I think somebody who is well versed in the training aspect of underwater escape, how that would impact the performance if we move the configuration around, if we implement a new suit or a new piece of equipment that's attached to that suit, and then the consideration related to how many people are inside that aircraft.

A really good example of that is an S-76 helicopter, so a Sikorsky S-76. If we think about the configuration for that, we have four

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people sitting on a bench style seat at the very back of the aircraft who would be required to egress over top of a seat in front of them and out through an exit. So if we don't take into consideration those requirements, then it's hard to develop a standard for what we need to train those individuals to, so I think it's important that the consideration is taken into fact that we've got some integration that's going on here and we need to be aware of it. I don't know if there's any further questions about that.

ROIL, Q.C.:

Q. No, I think that's fine. I understand you. I hope that others in the room do. We'll find out.

MR. TABER:

A. Okay. So that leads us to Issue 2. I was asked to look at the helicopter underwater escape training standard, so HUET standards internationally, I think, as well here in Canada, and what it is, I posed three fundamental questions that I think need to be addressed as we go forward, is how much

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practice is needed to prepare an individual for a real world training, and I'll touch on these as we go along, but these are just the questions being posed.

ROIL, Q.C.:

Q. I think you misspoke. You said for real world training.

MR. TABER:

A. I'm sorry, for real world ditching.

ROIL, Q.C.:

Q. Right.

MR. TABER:

A. And the second question was how often, so recurrence levels, and we've already discussed that a little bit this morning, so how often does individuals need to refresh their HUET skillset, and the last one is what level of training fidelity is needed to ensure transfer of tasks to a real world situation.

ROIL, Q.C.:

Q. So these are the three issues that are subsets of this question for you?

MR. TABER:

A. Yes, I think that it was important for me to - this is how I would think about training

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standards, and we know fundamentally we look at performance levels when we're considering training, so how well would someone perform in a real world situation versus training because there is an argument that we could train somebody perfectly to get out of a simulator, there's no resemblance to the actual environment, and they would do it 100 percent perfect every single time. Then we put them in a situation where we've moved the seat, we've moved the position, the windows are a different style, and now we're asking them to extrapolate that information they gained on their training to this emergency situation. We tend to revert back to the way we do things naturally in an emergency. Anything that's automatic for us, we tend to do those sorts of things in an emergency situation, and I think a really good example for everyone would be, I think you've all been in your vehicle enough times that you could close your eyes and you could identify how far away the release handle is for your car, or your radio, or your blinker, or the steering wheel, you could do that just visually and I could measure, in

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fact, how far you reach in a simulation versus a real situation and compare those, and those would be pretty close because you've done it so many times, it becomes automatic.

Now if I place you in someone else's vehicle or a taxi, and I ask you to do that same thing, you may have opened the exit yourself, you might not have. So if it's at nighttime and the dome light doesn't come on, and we're then trying to identify where is this handle and searching for this thing, obviously upside down under water possibly holding your breath is not a situation that we necessarily want to put ourselves in. So when I'm talking about training fidelity, I'll get into that a little bit more detail and contextualize that within a real world setting, but the transfer of knowledge from one position to another is the most important aspect when we look at how good is the training, how far can we transfer this information.

So the first point here was looking at representative exits, seats, and harnesses. So regulations for CAA, FAA, and Transport

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Canada all indicate that training should have representative exit seats and harnesses, but there is no stipulation as to what representative means. So it's open to interpretation. If we say, and earlier this morning there were questions about how close should it be, should it be the same colour, should it represent the actual window size, and I would argue that, yes, it should be the exact same size if we can accommodate that, and I understand that if we fly in parts of the world where there's 10, 15, 20 different styles of aircraft that I might be flying in a week, it becomes very difficult for us to deal with that. The Gulf of Mexico is a perfect example. We have thousands of platforms that are in operation, there's numerous different types of helicopters that fly individuals back and forth all over the place out there, and for us to train an individual to one standard, which is exactly what I'm saying, so if I train them to one particular environment, their ability to extrapolate to another environment might not be beneficial for them. So being able to do that in a training

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environment is somewhat difficult. We run into an issue where, well, how many times do we need them to escape under water, how many times do they need to do a mechanical window, how many times do they have to do a push out window, how many times does a window have to be 12 by 21. So it's important to look at, well, what is representativeness and how do we identify that, and right now there is no way to do that at this stage.

I would argue that we get it as close as we possibly can, and when I say that, I mean if it's a push out window - okay, if it fits, as Dr. Coleshaw said, if it fits within a range of a different type of exit, then that's reasonable, but I think that it needs to be the exact same distance from that particular point in space because if it's not, and I'm expecting it to be there, and a really good anecdotal evidence of that is the last Sea King ditching - they've had a number of them in the past, but in Denmark in 2005 a number of my colleagues were involved in a ditching, and the two pilots had quite a bit of difficulty locating their emergency exit.

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These pilots are in this aircraft all the time, they fly every day, they know exactly where that emergency exit handle is, but during their annual - actually, they do semi-annual practice session in dry air conditions, and they actually - only the first pilot will open that emergency exit, the rest of them just reach for it, and the handle is actually located in a horizontal position and they move it to a vertical position. So all the pilots subsequent to the first one actually just touch the handle and they egress out the open window, so they don't have to replace it every single time. Well, both pilots in that scenario reached up and grabbed what they thought was the emergency exit handle, and, in fact, it was just the window slide release to open the front portion of the window that they use to ventilate the cockpit. So they both slid the window open and one of the pilots on the starboard side believed that that exit was open, and actually tried to make his way through that and egressed with the window wrapped around his waist when he came to the surface. He actually had to force the window

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out of the frame and it came with him to the surface. So this was just a small little thing that they do in their semi-annual training. Just the distance between one position to another made all the difference in the world in a real world environment.

So they've since gone to an annual underwater egress requirement. They used to go once every five years, and now they go to once a year for the Sea King - well, Sea King, now the new Cyclone environment. So representativeness, I think it's important to address that issue and identify where it is, and to do that we need to sort of think about, well, where do we put the emphasis. Do we put the emphasis on declarative knowledge, can you tell me how to egress, and I think those pilots would have been able to tell you 100 percent what they needed to do, they'd say I can do this, what skills to perform and when to do those, I can tell you word for word every single things that's there, but there's a difference between declarative knowledge and procedural knowledge. When we think about procedural knowledge, it's how to actually

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perform that skill. If I asked you how to open a car door, you would tell me, well, I'd just locate the handle, pull on it, open the door, and get out, but your ability to do that depending on the environment you're in is dependent on what type of training you've had and how much experience you've had. The more times you practice it, the more automatic it becomes, the better chance we have of doing that. So if we place the emphasis on declarative knowledge, representative exits, seatbelts, and seats, isn't necessarily as important as it is if we put the emphasis on procedural knowledge, and that was the point I was trying to make in the report.

So that leads us to the fidelity of the training environment, and while this is building, this next slide, I think there's been some questions raised about, well, how much fidelity is really required and how safe can we make the environment for the individuals.

ROIL, Q.C.:

Q. How safe in training?

MR. TABER:

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A. Yes, how safe in training because there is clearly a difference between safety in a real world situation and safety in training. What's reasonably practical, what can we do to train someone to the point that we think that they - we predict that they would be able to do their training - pardon me, do their skillset in a real world setting. So depending on the type of aircraft that we fly in, some of them have low back seats, some of them have lapbelts only - the S-76 is a perfect example of an aircraft that's like that. So that level of fidelity is perfectly fine for that. If we look at different types of aircraft, say, the S-92, we can see in some of these images that the seat position, and it's difficult to see in the upper right hand corner, but that's the interior of the S-92, and the one just left of that is the interior of a simulated environment for underwater escape. We can see just to the left of that moving across the top, we can see that there are stroking style seats that are at their lowest position there. So there was some question as to whether or not that could be

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done in training, could we have individuals at a full height, and then could we also have them at a lower position. In fact, the engineering is out there and those do exist, that capability of fidelity is at a level where we can see those.

We can see on the far left side there's a cockpit simulation that's there with full flight controls, instrumental panel, there's even to the point where we can see throttle controls above their head for the S-92 in some of the different - pardon me, the Cormorant, so different types of aircraft. If we're just moving around that circle counterclockwise, we can see the interior of a Super Puma, and that's the cargo door exit.

ROIL, Q.C.:

Q. Which one are you at now? I've lost which one we're at.

MR. TABER:

A. I don't know if you can see my arrow when I move it around on the screen.

ROIL, Q.C.:

Q. Okay, yes, you take our arrow to it.

MR. TABER:

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A. Okay, so this image right here.
ROIL, Q.C.:
Q. Yes.
MR. TABER:
A. This is the interior of a cargo door exit for a Super Puma. So unless we take into consideration the fact that that window is actually recessed in or around where the cargo door slides back, if we don't think about that in a training environment, then we run into the issue that we actually can't reach that exit in the same manner that we thought we could, we can't generate enough force across the front of our body, we can't reach it with your elbow, and it's recessed far enough back that we can't push it with our hands. So we need to think about the functional task analysis and this is really the - the area of my expertise is to look at, well, what can we do to mitigate and deal with that type of risk. We can see that if the individuals utilize the handle that's already in place for a reference point before they disconnect the harness, they can then generate enough force to be able to open that exit, and it is

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possible to simulate that in an environment for underwater escape.

We can see the next two exits - or the next two pictures are also from the Super Puma cargo door exit. If we move further to the right which I've identified, here is high back seats with four point harnesses, and then we look at a stroking style seat for the cockpit as well. The reason I brought that up is I just wanted to identify that there is the capability to do that and it's been done in training in different parts of the world, as well as here in Canada, and we can keep the level of safety at the point where it's reasonably practicable. We can do that.

Now as far as the anxiety level goes, that's not necessarily to say that if I'm going to tell you you're now going to be in a realistic environment and we're going to put lightning, wind, and rain, and everything else that we can throw at you, that we need to get to that level of simulation, but - and that it's not going to affect your anxiety level; I'm pretty sure that it will affect your anxiety level, but when we think about the

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fundamental differences between training that's done for military, say, offshore, that's a consideration that needs to be taken into our thought process and say, well, if they're going to be in the same type of environment, it's an upside down underwater environment most times, should the offshore personnel be trained to the same level as the military. I'm not suggesting today that that necessarily is the case, but I think that we should definitely look at, well, over learning a task is what the military has identified for a long period of time and said if they can do it 10, 15, 20 times without being prompted, we can be reasonably sure that they're going to be able to do that in an emergency situation. If they do it one time and it's not sort of a realistic environment, how are we able to make the prediction then that that individual is going to be able to do that in a real situation. That's the point that I'm trying to make with the fidelity.
ROIL, Q.C.:
Q. So the example Dr. Coleshaw gave of one is good, two is better, three is better again,

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you would subscribe to the same sort of principle?
MR. TABER:
A. Absolutely. So continuing on with Issue 2, when we look at the questions that I posed earlier, these are sort of answers, or at least the beginning of an answer to how we address those. I think the fundamental portion of this identifying what skills are actually required to egress from the existing helicopter interior configurations that are out there in operation right now. So an S-92, how far do they have to move, what sort of skillset do they require to be able to get them to a position where they'd be able to egress. For a Super Puma, I've already done research related to this, to look at what skillset is required and published papers on that, looking at, well, maybe it's not just your basic here's your brace position, this is how you open a window, undo your harness, make your way out. Maybe it's not just that. Maybe if I'm sitting in that forward seat on the starboard side on that auxiliary fuel cell, then I'm required to do a whole lot

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more, like locate the bottom of my seat and disconnect my harness, relocate the bottom of my seat, reach across and find the other seat, make sure there's nobody sitting there, locate the emergency exit and then make my way over there. So the difference between those two is pretty vast. So we need to at a fundamental level identify what skills are required to do that in every type of aircraft that we have out there, and there's not a lot of research that's been done to look at those particular aspects and identify what it is that we need to do.

We need to ensure that the representative exits are positioned in representative locations and I've already alluded to that, that I believe that they should be the exact same distance. So the distance from the floor up, from the shoulder out, and we have to consider that if we take into account 99 percentile of the average population, whatever the average population happens to be depending on the part of the world that we're looking at, is that within the functional reach of that individual, and if it's not, then can we

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move the seats or can we modify what's being done in training as well as in the operational setting. This needs to be done for all the offshore helicopters that are being used out there right now. That should be represented within the training and the simulation.

I think to ensure representative seats are similar is important. High back seats, stroking seats, four point harnesses, five point harnesses, whatever happens to be in the aircraft, I think that it's important to identify that and add that into that position. I mean, if it sounds like I'm sort of going around in circles here, I am, because I think fidelity is a fundamental aspect, and identify the level of initial training proficiency that's required, so it won't degrade to the point that it becomes problematic within a recurrency training schedule.

There's been a number of research projects that have been done to look at, well, how do we best integrate that information at the initial onset. As Dr. Coleshaw pointed out earlier today, anxiety levels are highest when we first show up to a training

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environment because we don't really know what to expect, it's something that's probably quite foreign to a lot of people the first time they go in there, and in particular for non-swimmers. So how do we best get them to the point where we can say I'm reasonably certain that you'll be able to perform that skillset, and the research is suggesting that we add contextual interference and we make it hard for them. I know that sounds counter-intuitive that we say you're stressed out, you're anxious, but there's a lot of research that's now sort of leaning toward that side, that we make it hard for people to be able to perform the skillset at the beginning because then they allocate a lot of attention to it. They say I need to focus on this because if I don't focus on it, I actually can't perform that skill.

What that level is, I don't know. I can't tell you even based on the research that I've done exactly what that level should be at this point in time, but I think that it's important that we start to identify where we are at this stage and where we move forward in

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the future of testing.

ROIL, Q.C.:

Q. Okay, before you move on to the next issue, this might be a good time to deal with the small changes to the report. I wonder if I could ask the Registrar to bring up the report. She now has the amended one, and I have to provide to the parties here a copy of a one page, printed on both sides. What can you tell us about - I think we're talking about pages 28 and 29. Would you just describe to us what changes you are asking us to allow you to make to your report?

MR. TABER:

A. Okay. When I was asked to look at the training standards, I wanted to look at the training standards that were provide not only internationally, but also here in Canada, and the only two CAPP certified HUET providers were those individuals at Survival Systems Training Limited in Nova Scotia, and Marine Institute here at MUN, and look at not necessarily the overall differences per se, but just to identify that there were differences. So when I was doing that, I was

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trying to identify the number of rolls that were inverted, the number of rolls that were straight in, whether they jettison an exit or not, and I think I got into slightly more detail than what was required to identify what was important in that aspect, and what I thought was important to do was just sort of clean that up a little bit so that there's no question as to what is actually being done. So a step-wise process at Memorial Institute, looking at it, breaking it down building block scenario, going through step by step there versus Survival Systems Training Limited, and there wasn't really, I don't know, an intention to tally all those differences, just to identify the fact that there were differences that were there. So that was the first change within that table, so Table 3, to remove some of the ambiguity that was involved in that overlapping.

ROIL, Q.C.:

Q. Yes, I had tried to add up the ones on top, and the old on top to see if they would fit the bottom and it didn't, so I think what we have is here - so the numbers that are here

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are not changed, but simply there's less information provided?

MR. TABER:

A. Right.

ROIL, Q.C.:

Q. Okay.

MR. TABER:

A. And the second change was the equivalency for training from one institution to the next, and I put one inversion egress as opposed to two for Memorial Institute.

ROIL, Q.C.:

Q. Okay, so if you go down six lines down from the graph - sorry, the chart, it says, "Marine Institute carries out similar HUET programs and requires", it now says "two inversion egresses". Your initial draft had said one?

MR. TABER:

A. That's right, it said one.

ROIL, Q.C.:

Q. And you're satisfied that two is the correct number?

MR. TABER:

A. Absolutely, and what that did is that changed the - on the next page that changed from nine

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years to six years, the equivalency between the two.

ROIL, Q.C.:

Q. So an attendee would need to attend one basic and three recurrent, equivalent to - now it says six years offshore as opposed to nine?

MR. TABER:

A. Absolutely, and I think it's important to point out here that the intention was to consider the integration of all those aspects and any differences that might be there, do we jettison an exit underwater, do we involve inversion, how many inversions, and really there isn't a clear understanding of how that affects your performance on the other end. We know that the more you do something, the better you get at it. That's been well established throughout the literature, but it's to identify, well, how much, how many times, and how often do we actually need to do that.

ROIL, Q.C.:

Q. And in what sequence?

MR. TABER:

A. And in what sequence as well. So I thought it

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was important just to, in conversation with yourself, that it was important to draw attention to that as well.

ROIL, Q.C.:

Q. Okay, perhaps we can get then back to Issue #3, which brings you to Slide #12, I believe. Can I bring you to -

MR. TABER:

A. Do you want me to do that?

REGISTRAR:

Q. Up to you.

MR. TABER:

A. Okay, it's probably easier if we just close that and just move down to #12. Actually, I can type it in from here, it's okay. So this moves us to Issue #3 now, personal protective equipment and what standards are there, and I know that we talked about quite a bit of those this morning. So as I go through, I think I may refer to the suit that's displayed at the front, just to talk about certain aspects of where things are located.

ROIL, Q.C.:

Q. In case those in the public are not able to see it, we've invited Charlie, a rather light

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weighted individual, to come in with - it's in fact, an HTS-1 survival suit, which is the current suit that has been developed for the Newfoundland and Labrador offshore, and so you may refer to that. I don't know if any of the cameras will be able to scan to it, but they may be able to if you do make reference to it. So just indicate before you go that, "I am referring to the suit" and that might allow the technician the opportunity to do that scan.

MR. TABER:

A. Okay. So with the passenger - I've separated the two. It's been pointed out earlier this morning as well that there is this separation between passenger suits and aircrew suits, and I'll talk about my interpretation of those standards and how I think that they're incorporated into the offshore setting, and we'll start off with the passenger suits, and the HTS-1 now meets the CGSB standards to look at, and I've just really identified some of the key areas, so buoyancy, the escape buoyancy which has already been discussed at length this morning.

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ROIL, Q.C.:

Q. Yes.

MR. TABER:

A. Self-righting capabilities. So if we're unconscious, is there a requirement to have the suit right us or whether it's an additional floatation device. If it's a full integrated suit, then we would expect that that would be able to right us. Thermal protection. So at a certain level - .75 Clo, pardon me, values that are there for the suits, and there is a basic standard and that's what I was asked to address, is there a standard out there and how does that sort of affect what's going on.

So related to that, it was really for me, and I think that that's sort of become apparent so far, is that I always think about the integrative aspect of all these components. So if we then add a personal locator beacon, is that a requirement, and if it is, where should it be located and does it have any influence on my capability to egress from a helicopter, depending on the size, the shape, anything hanging off of it, is it going

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to snag on a particular component inside the helicopter. If we start adding strobe light, where should that be located, how large should it be, should it be a quick release mechanism if for some reason it does get caught up. So when I look at these systems and I look at this integrative component here, so I am now referring to the HTS-1, my first sort of thought is well, how does this suit integrate into the environment in which it's going to be required to be used.

We also install a floatation device in some cases. This particular suit has an integrated life vest as opposed to previous suits. In different parts of the world, they might wear a vest that isn't integrated into that particular suit system.

ROIL, Q.C.:

Q. So having the floatation device integrated right from the state of manufacture is perhaps a good thing?

MR. TABER:

A. Absolutely.

ROIL, Q.C.:

Q. Okay.

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MR. TABER:

A. Because if we add a suit that was never designed to be integrated into that system, fitting always becomes a bit of an issue. So if I'm an extra large person and I have a suit that I'm sort of stretching the limits of those straps, I could also be wearing the same size or similar size vest and have now tightened down those straps and there's a lot of extra material that might be hanging around off to the side. So how does that affect my egress, does it get caught up on anything, does it get caught up in my seatbelt, those particular aspects, and then the integration of emergency breathing systems. So if we add that in, is it a separate system or is it fully integrated into the system itself. So with the HTS-1 from Helly Hansen that I'm referring to now, it's not an integrated from the onset, although the modifications or adjustments to this do sort of try to adjust for that fact that it wasn't originally designed to do that, but a reasonable attempt at trying to make sure that we're not looking at any issues as far as integration goes.

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ROIL, Q.C.:
Q. So it's simply not bolted on to the outside -
MR. TABER:
A. And just hanging out there -
ROIL, Q.C.:
Q. It seems to be covered, and almost as if it was always a part of the suit?
MR. TABER:
A. Absolutely, and I think that if we consider the unit as one piece, then it's important to identify if there is - in fact, within the standards, is there a discussion about where these things should be located, what size they should be, where they're going to be placed, and we only see that in European standards and we don't see that in the CGSB standards right now to identify an integrative component to, say, EBS is important to think about when we're designing or when we're implementing this piece of equipment.
Fitting is our last point that's on here. I don't want to leave that because obviously there's been a number of discussions on the fitting of the suit, and this suit has been modified to try to mitigate some of the excess

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material that's located. So internal straps for suspenders to try to be able to deal with that. The zipper for the face shield has been shortened, so the zipper is not pushed up further, and I believe it's around four inches that that's been reduced in distance. Looking at the fit of the overall hood itself and then the wrist cuffs as well, so to look at different types of materials to try to get a better fit when we're out there, and this will lead into personal accountability, I think, a little bit more as I get further on into that, and that's already been discussed quite a bit today about should I be responsible as an offshore worker to ensure that that suit that I've been given is going to fit me properly, and I think that that's part of the fitting that starts off at the very onset. There is no standardization or, I guess, guideline at this point within the Canadian Standards that I know of that identify a regime that's used to fit an individual, each individual to that suit. So there isn't currently, as far as I'm aware, a standard that's going to do that.
So if we take the steps to do that, it

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will be great to document that at this early stage and say, we now custom fit every single suit that's out there to the person, how do we do that, and what steps do we take to ensure that that's the case.
ROIL, Q.C.:
Q. You've heard in earlier evidence, and the questioning from Mr. Spencer earlier today, he alluded to the fact that there has been a process whereby Helly Hansen has individually measured every offshore worker to see what suits fits him or her best.
MR. TABER:
A. Right.
ROIL, Q.C.:
Q. You're saying that's a good thing, but we should capture that information?
MR. TABER:
A. Absolutely. I think at this early stage, the 11 or 12 different sizes that we have sort of meet the anthropomorphic data that we know to exist, but there's going to be some differences in each one of those body shapes and custom fitting those suits is something that we don't really see. It's not the norm

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and as Dr. Coleshaw indicated this morning, that's not something we would normally see. So capturing that data now, it goes a long way to being able to help in the future and I think that's a great thing that we do at that stage.
So if there's nothing else on the passenger, I'll move to the -
ROIL, Q.C.:
Q. I'd just -- I'll go back for a moment.
MR. TABER:
A. Okay.
ROIL, Q.C.:
Q. I'll just ask for your view. I think we heard this morning Mr. Earle referred to it as the natural tugging that goes on between thermal capacity and buoyancy. Do you -- are you aware of any efforts to resolve that tugging or is it a major concern from the perspective of, you call it, human systems integration?
MR. TABER:
A. I think it is a major issue if we start looking at the amount of buoyancy that's required to be in the suit to meet the standard of .75 clo. So if we install more

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insulation to meet that standard, then we need to identify how that's going to affect our egress capabilities and if we go to a suit that has less insulation and we require the individuals to wear their own insulation, that needs to be taken into consideration. So if we meet the .75 clo, based on the clothing that you arrive at the heliport with, then does the suit need to include that in that position. So that integration between all of that becomes important, absolutely. At any stage, we want to look at what are the requirements. Why am I wearing that suit and what skill set am I needing to perform in that environment?

ROIL, Q.C.:

Q. So I guess the question is am I saying to you -- are you saying to the offshore workers, if you're fitted for this suit now, should you or should you not run out and buy three sets of thermal underwear and put underneath it?

MR. TABER:

A. And I can get to that, the personal accountability, but I'll answer it now is I think that there should be layers of clothing

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next to your skin that will wick the water away from the surface of your skin, and I personally when I have flown offshore, I make sure that I wear thermal insulation next to skin. Even though I know that that suit meets a certain standard and meets certain requirements and I try to be diligent at getting the right size for myself, I still ensure that I take that personal accountability to the stage where I identify how much clothing I want to wear based on the environmental condition. So if I know it's the middle of the summer, I'll wear maybe less, one layer less, than if it's in the middle of the winter when the water temperature and air temperature might be minus 45. So I'll definitely look at doing that. Now whether we require the offshore worker to go buy their own equipment or whether that becomes part of the issuing of the equipment, I'm not sure where we are with that, and you know, I can't really speak to that, but I think that it does take into consideration how accountable I actually am.

And when Dr. Coleshaw was talking about

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when she flies, I actually take it one step further. When I sit in an aircraft, I not only look at the emergency exit and the rows of seats, I also look at the overhead bins that are ahead because I know that people are going to be in the aisles and maybe climbing over seats. So if I have to climb over somebody, I want to know how many overhead bins there are. So maybe I'm sort of being over reactive, but I think it's based on my experience and my knowledge related to crash scenarios, and we know that survival typically occurs, for fixed wing environment, for people who have climbed over seats, because we jam the aisles and people climb over seats. So anyway, that relates a little bit more to the personal accountability.

So are there any other points?

ROIL, Q.C.:

Q. No, that's all. I think we can move on now.

MR. TABER:

A. Okay. So this sort of leads us into the differences for the air crew suits, and I identified in the report that there are differences as far as the type of requirements

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that are there, and the first one that really sort of jumped out at me was the thermal loading and the heat stress for the air crew. It relates to a term that's called greenhouse effect and basically, you can imagine the same as when you're in your car when the sun's beating through the windscreen and it becomes very warm in that environment. So as far as the difference between a passenger environment and an air crew environment, there is a difference, and as Dr. Coleshaw mentioned, those air crew individuals are wearing those suits, not only to the rig, but they'd be flying back and possibly doing another flight during the day. So they wear those suits for an entire day. So if we think about the greenhouse effect and the thermal loading that's on them, we need to consider the fact that cognitively, their ability to perform at a level that we would like them to be able to perform is a very important thing.

So the thermal aspects related to an air crew suit has really driven industry based and military based applications for the type of liners that they wear, the type of suits that

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they wear and there was some discussion about the coloration of the suit, and there has been, in the CAA report and a number of other industry reports, looking at the colour of the suit and why a pilot wouldn't wear a bright orange suit, and as we move closer and closer or further and further into glass cockpits, so it's all instrumentation, the reflective properties of an orange suit versus a dark blue suit or a green suit, for the military, let's say, does have an impact in my performance level because being able to visually identify what's on that screen is impacted by the reflective surface of that material and that's extremely important, particularly when the sun is beating in on that material. So that's a key issue that's there and there's been a number of reports that have been done looking at cognitive performance related to thermal load and we know that once we get to a -

ROIL, Q.C.:

Q. I'm sorry, cognitive performance is perhaps an expression -

MR. TABER:

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A. Oh sorry. How you process the information related to the environment that you're in. So are you able to make decisions quickly? Are you able to make those decisions in an emergency? Can you identify that there is a problem in this environment? Your vigilance, so how well do you recognize that there might be a small little flashing red light somewhere? We know that as we thermally load, as we increase your internal body core temperature, your ability to perform at an acceptable level starts to decrease. So we want to try to ensure that we're not setting up a situation where we thermally load our pilots before they go out there. So we stick them in a suit that might have the same clo value, we put them in insulated underwear, and we ask them to fly out there and perform at a level that we think is reasonable.

So that's sort of driven, in the past, both military and civilian applications, of air crew suits versus passenger suits. We know that the passengers might have to perform a skill if an emergency occurs, but typically they wouldn't need to perform that. Whereas a

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pilot or the air crew would need to perform that skill on a regular basis, whatever -- whether they're flying the aircraft or they're second pilot, the copilot, and being able to support the primary pilot, flying pilot. So that was one of the aspects.

And fitting as well is the same sort of concerns and issues that we run into for passengers. It's typically a one size -- probably not one size, but one particular size for a range of individuals. So we might have five or six different suit sizes for pilots that are out there, and do I think that they should be fitted for individuals? I think at an air crew level, and this becomes their daily work clothing, I think it is important. I think that fitting to the individual is an important aspect so that we don't run into a situation where we do have a larger suit than maybe what we need to have in that aspect.

We know that for the military, it's -- they've run through for Canadian military, in particular, and my experience has taken me through quite a bit of that training program and also the testing of those suits, and I do

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see that there are always issues, particularly for smaller female pilots or air crew, and when we start putting them in the smallest suit that's capable for them to wear, they realize very quickly it's just too much material. So they have those custom fitted to those individuals, but not for all of the other air crew that are out there. They custom fit neck seals and custom fit wrist seals, but as far as the overall torso size, they don't custom fit at that point. So that's just a little bit different than the passenger suits at this point.

I don't believe that the air crew suits for the offshore do that. It's just a standardized suit that we purchase that's a size small, medium, large, extra large, whatever it happens to be, and then we sort of try to fit it as much as we possibly can at that point.

So colour, I've already mentioned, and the last aspect that I think I'll refer to the suit as well here, so the HST1 that's displayed up here, is something called Christmas tree effect, and this has been

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identified by the US military over the last number of years, addressing the fact that how much equipment is too much on the outside of a suit? Do we continually add? And the Christmas tree effect or the idea of the Christmas tree effect is basically what it sounds like. We get a new ornament. It's nice and shiny and we hang it on the tree until at some point, ten years down the road, we look at our Christmas tree and go, there's just too much going on here. It's way too busy. There's far too many ornaments that are on here. So that really sort of stems from the US military and they identified in a study that when they did the testing for the ground troops or the land force element troops, some of them were carrying in excess of 150 pounds of equipment and asked to march through the desert and perform at a level that you would expect a person maybe wearing shorts and t-shirt to be able to perform at.

So I think that what we need to do is when we're thinking about not only air crew suits, but also passenger suits, that we start to consider that maybe we don't want to have

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too much going on here. We want to try to integrate right at the very beginning how this suit looks and we don't start adding all this weight and going we've got a new EBS or we've got a new strobe or we've got a new splash hood or whatever it happens to be, and we say "oh, that'll look great. That'll fit into the standard" and because the standard doesn't get into that too much detail, then it's difficult for us to identify whether or not it should be in place and it's really the testing that occurs, not only within just the performance standards for wave action, but I think in the actual environment where they'll be used, so underwater escape and in a dry environment.

I've done testing in the past where we do dry snag hazard testing and just to identify that, that would be anything on the suit that would get caught up on the equipment that's installed in the aircraft. So the edge of a window or handle for a window, possibly the harness that's there. And if we do dry snag testing, we don't always see the same issues we see when we do the underwater escape because of floatation, and it's important to

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consider that. When we're looking at the application for that suit, we know that it's -- if it's going to be used, it's possibly going to be used in an upside down underwater environment where they might have to open an emergency exit, undo a harness and make their way out. So it's important to take all those components and say "what is it going to do in a real situation?" Not just test one suit, but test every size of suit and so we look at exactly what's going to happen there.

ROIL, Q.C.:

Q. So I take it then there are considerations that are common to the passenger and the air crew, but there are also considerations that are different and so you would not expect to see the same suit worn by the air crew as you would expect to see worn by the passenger?

MR. TABER:

A. Absolutely not. I think a really easy way to look at that, for this particular suit itself, is the boots, the insulated properties of the boots and the sole on those. I wouldn't expect a pilot to be able to control the rudder pedals in an aircraft with those types

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of boots, but that's fine for the application that we look at for a passenger who wouldn't be performing that skill set. If we look at a pilot, different skill set, so different standards that are there.

ROIL, Q.C.:

Q. I think Dr. Coleshaw and counsel for the pilots got engaged in a discussion about whether there's a standard for pilots. Do you have anything you can add to that discussion about whether for air crew there is currently a standard?

MR. TABER:

A. Well, aside from -

ROIL, Q.C.:

Q. As in the CGSB standard, a standard in Canada.

MR. TABER:

A. I don't believe there is. I don't believe that there's one right now, other than the ones that have been identified for the European Union. I don't think that there is a particular standard at this point. It's been more industry base driven and individuals that come from a military background who wore a thermally protective suit while they were

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doing their exercises there come to a civilian operation and say "I think we need to have a suit" and there has been some reports for the US military identifying that when we think about thermal loading, the commanding officer of a unit will say this is what the limits are. We know a combination of air temperature and water temperature. If it is below 30 degrees, then we need to wear an immersion suit. If it's in excess of that, then possibly we don't, but we still have to take into consideration if the air temperature is 30 degrees and the water temperature is minus one or plus two. If I'm going to find myself in that situation, yeah, it's hot, it's absolutely hot, and we do have to be concerned about the amount of cognitive processing or the thought process that goes on, but they'd be limited possibly to the operational requirements if they do. So we'd say instead of being able to fly four hours normally, you only can fly two hours before you get a chance to cool down, take the suit off, rehydrate, get something to eat, take a break and then we get you to fly again.

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So when I flew with the military in the - - off the back of ships, that was often the case. If we were flying in the Gulf of Mexico or somewhere warm that the pilots would be limited to the amount of time that they could spend in the aircraft, controlling that aircraft, and sometimes they'd fly with a third pilot, so they'd switch out the pilots so that they would be able to do full operations.

ROIL, Q.C.:

Q. Okay. I think we are now ready to move to issue number four.

MR. TABER:

A. Okay. So this is the collaborative process of the collaboration of helicopter safety initiatives.

ROIL, Q.C.:

Q. Yes.

MR. TABER:

A. And looking at operators, helicopter operators as well, the offshore and passengers and the collaboration between those individuals as far as how much dialogue goes on and is there a capability for us to voice an opinion. So the

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first point there is Cougar and Canadian are required by Transport Canada to have a safety management system in place in which there is some sort of process where if an individual identifies an issue, they're able to bring that forward and it's dealt with in a manner where there's some transparency that occurs so they can identify whether steps are being taken to ameliorate that risk and I think that right now, both Canadian and Cougar have probably the highest standards that we can see for an SMS system. I don't see any other systems really that are out there right now or templates that are out there that are much better than what they have at this current stage.

ROIL, Q.C.:

Q. CHC doesn't fly in Newfoundland. They fly in Nova Scotia.

MR. TABER:

A. Right, absolutely, but I'm just -

ROIL, Q.C.:

Q. Clarity for the people who are listening who are wondering why are we taking about CHC.

MR. TABER:

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A. Pardon me, yes, absolutely. So they're at a level right now where they need to be by regulation, but I think that they're even above that a little bit. So I don't see a major issue there, other than possibly a little bit more dialogue that could occur, and I'll talk about that a little bit as we go along, but I think that they're really at the standard that they need to be at this point in time, and these safety management systems really stem from work that was done for NASA in the late 80s, early 90s, looking at the aviation community, saying well, we have to reduce the accident rate, and how do we do that?

They identified that if pilots have an anonymous process where they can identify near misses and problems that they run into, they had a mechanism by which they could say "look, I just about did this" and there was no repercussions that would come from that anonymous process, and so other pilots would come and say "well, yeah, I've had that same issue." So then human factor specialists started to look at "well, why is it that all

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these pilots are having the same issue with this particular system?" And started to say "well, we need to change the system." It's not necessarily the pilots, it's the system itself that needs to be adjusted and it could be something as simple as the landing gear handle. Do we change that to actually represent for them a tactile wheel? So actually when they originally decided to change the way they had landing gear, because they had aircraft that were landing with landing gear still up -- so they said well, they pulled a different handle. So the flap handle and their landing gear handle were in the same position and they felt exactly the same, so they said it's as simple as just putting a little wheel on top of it. Oh, okay. So then that sort of moved its way through and now we're at a safety management system that's required by all aviation operators that carry personnel or passengers. So I just wanted to mention that as we're going through.

The reporting process, I think again, like I said, it's very high standard right

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now. I think additional transparency might be good to be able to identify it. Perhaps it might be that there is a board, a safety initiative board that's at the heliport that says "these are the reports that have come in in the last 60 days, and from these 60 days, these are the reports that we're addressing right now. This is where we are, and this is where we project the next stage to be." So I couldn't find any of that that's on their websites to look at the safety management system, and I think maybe that's a step that could be taken forward as far as the reporting procedures that are there. How we do that, I'm not necessarily sure exactly where we go from there, but I think that maybe that's a possible approach.

Safety climate, and I think I'm going to bring up the next point here as well, the safety culture, and I believe that there's been some reports that have been addressed on that and some presentations as well. So I don't think I'm going to spend too much time on that, but just to say that I think within the offshore, the safety culture drives the

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safety climate and if the organizational commitment to safety is very high and we say we value your opinion, and we can see that in the Gulf of Mexico, this has become a major issue for an offshore oil operator, based on the current situation, that safety culture may not necessarily have been at the stage where the safety climate could be such that people felt it was okay to say we can voice our opinions. And unfortunately, research has shown that safety climate is fairly short lived.

Post event, people will voice all their opinions and all their concerns and say "well, we knew there was a problem. We knew that was an issue. We knew" -- but they hadn't really sort of voiced that officially. They might have talked to one another and said "I don't really like the way this is set up" but it's very short lived. Within 6 to 12 months post event, unless this is brought to the forefront all the time, then people tend to forget, because we tend to try to -- humans try to accommodate systems into our everyday life and if we don't have to allocate a lot of

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attention to it, then we don't bother, because we try to find the easiest way to deal with our day-to-day lives. We're quite busy so if it's not apparent to me all the time, then I don't really spend a lot of time thinking about it.

So I think in the offshore in Newfoundland, I think that the safety culture is quite good, as far as the organizational commitment to safety. I don't think that I could find anything really that was out there that suggested otherwise. I know I heard anecdotally a couple of times that there might have been issues as far as aircraft configurations, but as far as someone voicing their opinions, I don't really know at what stage they do that and I don't think I can speak to that at this point.

So that sort of leads us to certification versus competency and there's been a bit of discussion about that as well. Identifying the standards for safety initiative. If we say that you're certified to do a particular task or the aircraft configuration is certified to do a certain task, does that

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necessarily mean that it can perform that? Is it to the standard that is open to interpretation and we say representative exits or representative seats? So this sort of leads back to this understanding of the implementation of those safety initiatives, and I think it's important for us to identify that certification level doesn't necessarily mean that it will perform at that level, and sometimes -- and I use the term loosely, but the lowest common denominator, if we say that we have to accommodate all of the aspects that are there and we don't necessarily understand all those aspects, it's much easier for us to say generic standards. This is what we think you generally should do. So I think that what we need to do is identify what is actually required and how we deal with that. So that might be part of the dialogue that occurs in the future, as far as the safety initiatives go.

So we continue on with issue number four and I notice this aspect is sort of throughout the entire report is that we need to think about -- and there's been a number of reports

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that have been done in the past, both academic and industry based -- that we have to think of safety as an emergent property. So if we look at an organization that has really good safety culture, then safety becomes just part of that. We sort of think that if the upper management and operators say that safety is the number one factor that we need to address, no matter what, then -- and we prove that through our actions, that the workforce will instill that in their day-to-day operations and there's a number of cases within industry where we see this happen and organizations that say safety is important to us, and we're going to prove it by doing X, Y or Z, then the employees tend to follow along and say it is important. So I can bring up the point and say "hey, listen, I don't think that's safe." So we just have to think about it as an emergent property and it stems really from the top down process.

I'd already mentioned the client operator communication, more open dialogue possibly. If I sit in the helicopter and I identify that there is an issue with where the seat is

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placed or maybe something's been moved, maybe equipment's in a particular position, I think it's important that I should be able to say to the pilot or copilot, "listen, I don't feel that this is reasonable for me if there is a safety concern" or as far as an emergency situation. I think that it should be that there should be quite a bit of open communication and I know that when I flew, I never felt like I couldn't talk to the pilots. I always felt that there was the capability for me to be able to go up and say, hey, listen, I think that this person maybe should be moved. This extra large person sitting next to this extra small window maybe shouldn't be sitting there and I'll take that seat because I know I can fit through it. So I never felt that there was any resistance to that whatsoever and I think that that's important and I think that we need to continue that.

Proactive versus reactive approach to safety is important and I'll talk about that in the next slide when we get to it, but being reactive to a situation is fairly easy.

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Something happens, we say, oh, we need to deal with this issue. As opposed to saying, well, can we identify problems before they occur? And this is sort of a bit of an art for risk identification is being able to say, well, if I stick a piece of equipment on a suit in a particular spot, is it then going to become a problem? And I think that we were -- in our discussions before, we were talking a little bit about identifying whether or not a volcano is going to erupt somewhere in the world and it's going to effect what's happening for our flight operations. That's sort of a little bit beyond being proactive because I think it's sort of gets beyond what anybody would ever imagine, but I think it's important that we take the time to say, well, are there any issues that are currently out there, and I can identify a few, if we need to, that need to be addressed before anything ever occurs. And if we do that ahead of time, then possibly that's going to help, that's going to benefit later on, and all too often, we wait until after something's happened and say, well, you know, maybe we should have changed those operations

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beforehand. So I think that it's important just to have that proactive approach.

So this -- actually, this drives us right into personal accountability. I'm wondering if I'm mixing up my slides a little bit, but I'll continue on and we'll go from there. Are there any questions before I get to issue five?

ROIL, Q.C.:

Q. No, keep on going.

MR. TABER:

A. Okay. So okay, I am here. I thought maybe I missed a slide here. I know this is a bizarre image and it looks sort of like a -

ROIL, Q.C.:

Q. We had that conversation.

MR. TABER:

A. Yes.

ROIL, Q.C.:

Q. Yeah.

MR. TABER:

A. This is work done by Kim Vincente out of University of Toronto and he sort of looked at the invisible boundaries of safety and he took work done by Rasmussen in the early 80s, late

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90s and said what we need to be able to do is consider the boundaries that are set by safe work operations, and I'll bring up my own interpretation of this here in a second, to be able to identify that. But that there's this pole between economic requirements, operational requirements and then my own personal understanding of what's going on, and if I feel some obligation to perform at a certain level, if it's within a certain safety culture where my boss says "you finish that job right now. I don't care what it takes" it depends on how I interpret that, depending on my experience in that environment. If I know that whatever it takes means still within a safe work boundaries, then that's the environment that I'm going to work in.

But one of the things that we tend to do is if we take a system, and I'm going to use driving your car as an example. So our system and our driving on a highway is a system. We work within the safe boundaries when we first start out. We say, okay, the speed limit is 100 kilometres an hour and I'm going to try to stay at 100 kilometres an hour. Then the

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first time you push that system beyond its safe boundary and nothing happens, so you drive at 105 or 110 kilometres an hour, you immediately move that safe work boundary to that next level. We automatically say, well, the system can tolerate a little bit of leeway. It's going to allow us to move beyond those safe work practices. And then we say, well, if I can drive at 105 or 110, I'm a little late today, can I drive at 120? Nothing happens, so we say, okay, I think the system is going to be able to tolerate 120. And then we drive at 130. For whatever reason, we drive at 130, but what we haven't taken into consideration is the fact that maybe the conditions under which we drove at 120 or 110 are not the same environmental conditions they were -- or they are at this point in time when I'm driving 130. It might be raining out. There might be ice on the road. There might be snow.

And we see this in research that was done for anti-lock brakes and when anti-lock brakes were first initially brought into the market, they were tested with New York City cab

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drivers, which seems like a reasonable place to try to test that, and they originally thought, the hypothesis was that we give them anti-lock brakes and we're going to drop the accident rate. Well, in fact what happened was the accident rate increased because they believed that the safety factor was going to accommodate their faster driving, sharper corner turning and they found that in fact that safety benefit was absorbed into the individual's understanding of what was going on and they just pushed the limit to the point where they thought, oh, it's safe enough. So their accident rate actually increased.

So that's one we were thinking about and this is sort of Vincente's work and I'm just trying to make it a little bit easier to understand with my own interpretation of that system.

ROIL, Q.C.:

Q. I think I like your graphic better.

MR. TABER:

A. Doesn't necessarily look like an eyeball, but I think that that's an important consideration and Vincente uses another analogy that I think

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is really good, is that he thinks about a campfire, and I think most of us have sort of experienced this invisible boundary around a campfire. We get a little bit too close and we recognize very quickly, "oh, it's too hot. I've started to melt my fleece jacket" or whatever it happens to be and I recognize the fact very quickly there is an invisible boundary and what's important is that we start to consider, and this is the safety management system process, is that we start to consider those invisible boundaries and we start to identify those and we say, look, 120 is not reasonable, or 130 is not reasonable because we understand what the issues are. So we look at our past issues that have bene brought up and we say, it might -- you might not be able to see it, but we know that you can't work beyond this boundary, and I don't know that we know all the boundaries yet.

I don't think that the research has sort of taken us to that level yet, but we certainly have identified some of the boundaries, and there's an example with the HTS1, a perfect example of recognizing a

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boundary as far as thermal protection goes. We need to meet .75 Clo to be able to establish a level of time that someone is going to be able to survive, given these environmental conditions. If the environmental conditions are warmer than that, it's hot and it's uncomfortable, but we know that this safety boundary is here. So the safe -- the quality management system is really designed to try to do that, try to identify what it is that we need to do to address the concerns and these invisible boundaries.

So I don't know if there's any questions related to that?

ROIL, Q.C.:

Q. No.

MR. TABER:

A. No questions, okay.

ROIL, Q.C.:

Q. I'm fine with it, thank you. As I say, others may have questions along the way.

MR. TABER:

A. Okay. So when we think about the personal accountability and identifying those invisible

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boundaries, I think it's important that we think about what we ask the offshore personnel to do and the pre-flight preparation, I think it's important that during the training and their indoctrination into that safety culture and that safety climate, identifies these invisible boundaries for them because if I don't have any experience and I'm not really sure what the system limitations are, then I'm going to incorporate whatever I see and whatever I experience into my understanding of that environment.

So if at a safety training level we say you need to wear thermal protective clothing or you need to drink water or you need to eat food to get yourself organized beforehand because this will affect your hypothermia level and your performance level, then it's easier for the individual to say, okay, well, obviously I need to do that. I need to incorporate that, and if I show up after I've been trained, I show up to the heliport and say I haven't had a lot to drink, I've had no breakfast, I've been drinking coffee all day, I stopped at Tim Hortons possibly or whatever

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on my way to the heliport, didn't get a lot of sleep last night, and now I'm in a suit. The first thing that may happen as soon as we get in that helicopter is we fall asleep. So it's a nice warm environment. I'm all strapped in, vibrating a little bit and I'm now at a point where I fall asleep. Now our understanding of what's going on around us while we're asleep is a little different than it is when we're awake, and we know that alertness is affected by hydration level and we know that hypothermia is affected by hydration and dietary intake.

So I think it's important that we identify that at the first stages when they go through their safety training program, but it's also important that when they arrive at the heliport that this is reenforced and we say it's important for you to do this because if you don't think about those invisible safety boundaries, then there's no way for me to identify. If I show up at the heliport and I look at people who have 20, 30, 40 years -- maybe not 40 years offshore experience, but maybe 20 or 30 years of offshore experience

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and they've arrived in the middle of the summer with a t-shirt, pair of shorts, socks in hand and flip flops on, I immediately incorporate that into my understanding of the differences between a training environment and a real world environment.

ROIL, Q.C.:

Q. Okay. Now this might be a good place. If we go back, this is an example in the offshore -- your little emergency event thing where you get a level of comfort where you shouldn't get a level of comfort.

MR. TABER:

A. Absolutely, and I'm just simply trying to make the system easier for me. My understanding of it is that nobody else is wearing thermal underwear and I can guarantee you that if I'm trying to conform to the safety requirements within that safety climate and culture, the next time I show up at the heliport, I'm going to look like everybody else. I'm going to make sure that I conform to that, so that I'm not sort of singled out as being different, you know, oh, that guy's a new guy. He just took his training course. I want to integrate

Page 246

myself very quickly, and as humans, we like to do that. We like to fit in as much as we possibly can. So this relates to the clothing. If I arrive at the heliport and everybody is wearing thermal underwear or I'm issued thermal underwear, there's really no issue there.

I mentioned in the report that the clothing next to skin is important because it creates a thermal climate or a microclimate next to my skin. If I wear cotton, and I would venture a guess to say that everybody in the room is wearing cotton next to skin, at least a certain level, cotton is very bad in a thermal environment because it doesn't wick the water away from you. It's great in a fire environment. It works very well that way. But in a thermal environment, particularly when we're trying to try to control our thermal regulation, it's not very good. So what we want to try to do is create a microclimate next to our skin that wicks the water away from the surface of our skin.

So next to skin clothing is important. Now can I issue that at the heliport?

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Probably not. If you tell me that you've drycleaned someone else's underwear and give it to me, I'm probably not going to want to take it. But if I'm issued that at the very onset and I say well, this is my underwear for whenever I fly and I need to show up at the heliport with this stuff because I'm going to be required and I'm going to actually be checked when I get there, are you wearing thermal clothing next to skin, no cotton next to skin, then yes, I think that's a reasonable application. But who pays for that or how that's designed, I don't think I need to speak to that part of it, but I think it's an important aspect of it.

ROIL, Q.C.:

Q. Before you go any further, we are at 3:30. I don't know, Commissioner, whether you'd rather we went through and did the conclusion. It might take five or ten minutes, and take our break a little later, or whether you would prefer -

COMMISSIONER:

Q. I think that would probably be a good idea, and then we can see where we're going after

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that.

ROIL, Q.C.:

Q. Yeah. So we'll continue.

MR. TABER:

A. Okay, because I'm on my last -

ROIL, Q.C.:

Q. Yeah, you're on your second last slide now anyway.

MR. TABER:

A. Yeah. So the physical preparation, I think, is also important. I think that physically getting yourself organized when you're in the helicopter or when you're watching a pre-flight video and going through this process is to actually perform the skill set that you think you might have to do and Sue Coleshaw, Dr. Coleshaw identified the fact that it's important to think about it ahead of time, and we do that when we fly. I sit down and I go, okay, what would I do, and I actually reach down and figure out where that lifejacket is. I figure out where are my first reference points going to be, and I know when I sit down people start to look at me a little bit strange and when I tighten my seatbelt, I

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actually take the time to use -- put away the loose end of the strap, so that if for some reason something happens, that tiny bit of material that might come over the release mechanism is never in the way. I never wear a tie when I fly either because that small bit of material around my neck may, in some case, become an issue, and we've seen this in cases before for flyers, an aircraft crashes, where small little things make a big difference.

So this physical preparation of going through a brace position, actually sitting down, and I was thinking about it as I was preparing the presentation and also the report, but more so for the presentation is that it may be that we get to the point where we say, at the heliport, there is a physical representation of the inside of the aircraft. So there's maybe two seats and exits that represent the aircraft and before I fly, I sit down in that, strap in, make sure everything fits good, go through a brace position and then figure out how do I open this exit, physically open the exit, grab the reference point, undo the harness and make my way, not

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all the way through the exit, but at least to the stage where we get to that. Maybe that's where we need to go, but there is no research that's identifying that right now at this stage, but I think it's important when you sit in the aircraft to physically prepare yourself and say, okay, these are the steps that I need to do and this is where we build muscle memory and the more times we do it, the more practice we get, and this is how we offset maybe the gap between when we do our recurrency training. So every time I fly I go through the same steps and now I've got the capability of being able to do that physically.

As far as the psychological preparation, this is really, as Dr. Coleshaw had mentioned, being ready, just in case. Saying it might happen today. If I show up at the heliport, I haven't eaten properly, I haven't slept properly and I sit down and I go, oh, it's not going to happen today, there's nothing ever going to happen, then I'm not psychologically prepared if the event does occur and I think that's just as important. If we're thinking about a survival equation, we would think of

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the physical component as well as psychological component have equal weighting in that equation. So it's very important that we prepare ourselves psychologically just in the event that something does occur.

I don't know if there's anything else on that.

ROIL, Q.C.:

Q. No, that's fine. I think that you're very clear on those points.

MR. TABER:

A. Okay. As far as the conclusions go, I think based on all of the slides that I've identified and the report as well, I think there needs to be a greater understanding of that interrelated influence of the multiple factors. So we talk about the equipment, the human, the environment and try to think about how those integrate and how we get ourselves to a better stage of understanding what's going on.

An examination of the HUET course requirements. At this stage, although there's been research that's been done, Mills and Muir looked at, well, how much do we retain that

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information and they looked at six months after. They looked at one year, 18 months, two years, three years, four years and then identified that after even just six months individuals weren't able to -- or a third of the individuals weren't able to perform the basic skill set of opening an exit underwater inverted. Dr. Kozey and colleagues at Dalhousie have also identified six months later that they're not able to perform those skill sets at the level that we might think. Is it six months later? That might be based on what we've done in the initial onset. So how we've trained the individuals and what sort of information they take with them when they go offshore.

So I think that more realistic testing and training in the environment is needed to ensure that the equipment and personnel can perform at expected predicted level. That's that 85 percent that I was talking about earlier, the Shanahan studies that have been done for the US military. I think that it's reasonable for us to expect, in 2010, that if we have an event that occurs, there should be

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some sense that we're going to meet the human limitations that are there. If we account for the equipment, the environment, the tasks that are required from the individual and if it's within human tolerances, then we should sort of see a trend that moves us toward that 85 percent and we know that the US military has achieved in excess of 85 percent with trained individuals. Canadian military as well. They had a 100 percent survival rate until the Cormorant ditching in Canso and that was related more to equipment issues as opposed to physical performance of the individuals or the training that was related to that. So up until that event, they had a 100 percent survival rate after they started doing the training. So we do see that that's -- that's something that I think we should start looking at.

More focused research on the human system integration is required, absolutely. I don't think that there's any question there because we don't really understand all of the aspects that are out there.

And that concludes my presentation. I

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think I'll pass it back to -

ROIL, Q.C.:

Q. Okay. Well, Mr. Taber, thank you very much for the animated presentation that you have given and we will now take a break for about 15 minutes and come back and others will have an opportunity to ask some questions.

MR. TABER:

A. Okay, thank you.

COMMISSIONER:

Q. Okay.

(BREAK)

COMMISSIONER:

Q. Now ladies and gentlemen, I've found my list. Transport Canada is not here. CAPP?

MR. SCHULTZ:

Q. No, thank you, sir.

COMMISSIONER:

Q. No questions, thank you. Oil operators?

MS. STRICKLAND:

Q. No questions at this time.

MR. PRITCHETT:

Q. No questions, Commissioner, thank you.

COMMISSIONER:

Q. No questions. Okay, thank you. Counsel for

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Cougar, Mr. Stamp, did you have any questions of Mr. Gerber (sic)?

STAMP, Q.C.:

Q. No.

COMMISSIONER:

Q. Okay, thank you. Helly Hansen?

MR. SPENCER:

Q. (unintelligible),

COMMISSIONER:

Q. I'll come back to him then. Counsel for MUN?

HURLEY, Q.C.:

Q. Not at this time, Mr. Commissioner.

COMMISSIONER:

Q. Thank you. Government of Newfoundland and Labrador?

MS. LAENGLE:

Q. None at this time, thank you.

COMMISSIONER:

Q. Thank you. Mr. Harris?

MR. MICHAEL TABER, EXAMINATION BY JACK HARRIS, Q.C.

HARRIS, Q.C.:

Q. Thank you, Mr. Commissioner, and good afternoon, Mr. Taber. My name is Jack Harris. I'm a Member of Parliament, and I just have one area I wanted to explore with you. When

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you showed up the chart and the graph of all of the ditchings throughout the world in the last ten years, I thought we might -- I thought you might have elaborated on it a little bit, but one question occurred to me. You talked about accidents being survivable and I want to ask you what in fact that means, because we have heard, and I've in fact heard it in Parliament by a representative of the Government, to suggest that the accident that occurred -- the Cougar accident that caused this Inquiry was in fact not a survivable accident. Yet of course, we do know that two individuals escaped from the helicopter, one survived. I found that statement being made officially as being rather incredible. Is there some technical term that I'm missing here, and can you -- are you able to explain that in the context of analysis of ditchings or crashes?

MR. TABER:

A. I'll try. It's not an easy question to answer though because the term survivable crash or ditching relates to human tolerances, the environmental conditions within the immediate

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space around the individual and a number of other small factors that I'm not completely sure when we look at the survivable accident distinction between CAA and FAA. There are some discrepancies that are there, and that's why I tried to identify that the Shanahan reports are saying within human tolerances, and we look at G forces or the research is looking at G forces that are impacting, the amount of time from the point of initial impact to the end of that impact. So we would reasonably expect an individual, an average individual to survive 20 G forces during an impact, and if we can identify -- and I don't know what the end G force level was. The report's not out to identify what that was for the event. So I couldn't say whether that was survivable or not survivable. So if we say that it was, let's say, 40 G's and we know that the seats worked to 20 G plus.

We also look at research that was done for the race car drivers. Right now they've done in excess of 100 G's and survived that without any injuries whatsoever. We would have to identify then what is the immediate

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environment around that individual and then sort of make a decision at that point, well, was it survivable or wasn't it? And what I find as well strange is that if individuals survive, how can we then say it was non-survivable? And I've always struggled with that, even in the academic circles and people have difficulty trying to explain that distinction between survivable and non-survivable if someone does actually survive the event.

HARRIS, Q.C.:

Q. I think certainly the family members found it disturbing to hear that, especially when it was used as an excuse as to why the response time for search and rescue was not an issue because the crash was unsurvivable. It doesn't seem to me to be very useful distinction to make in a situation like this. What -- in terms of the limits of survivability though, if the G factor is a force, clearly a seat that's able to withstand a higher -- or do the collapsible -- be collapsible in a way that absorbs some of the force will obviously increase the

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survivability of a crash.

MR. TABER:

A. Absolutely.

HARRIS, Q.C.:

Q. Would you say that -- I think you said in your testimony we got to be careful of doing that unless you're -- you have reasonable assurance that that's not going to cause problems in other areas.

MR. TABER:

A. Right, but for the pure human tolerances, a 20 G seat stroking device alleviates or reduces the amount of impact forces that are transferred to the individual. So that's really -- if we have a 20 G crash and the seat strokes, it's supposed to attenuate the impact forces that are associated with that to a certain degree, and it also depends on the direction of the force as well. So if it's rear facing seat, 4-point harness and we have a vertical impact force that drives us back in the seat, that's much more survivable than if we're in a lapbelt facing forward and we impact in a forward position. So it really depends on a number of different factors that

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are related to whether we consider it survivable or not and even within one environmental space, let's say it's cockpit versus cabin, is it survivable for the pilots and not the passengers or the other way around? That's difficult to say, but if the pilots impact a surface with their head or break both their arms, both their legs, collarbone, you know, there's a number of impact injuries that occur, then perhaps that's non-survivable in that case, in that small environment. Whereas in the cabin, it might be survivable. So it's -- there's a number of factors that are taken into place to identify what is a survivable accident, and I think that's the best explanation that I can give you at this point.

HARRIS, Q.C.:

Q. What about the seats that are in the current configuration of the Cougar crash? Do they have any particular properties that would be designed to absorb G forces and to what level, do you know?

MR. TABER:

A. Yes, both pilot and -- or air crew and

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passenger seats have stroking capability and they're 20 G. So if we're within that range, then we know if the average person would survive a 20 G impact without a seat, we would say a 20 G crash with a seat should then be within human tolerances. That's not to say they'll survive, but it should be.

HARRIS, Q.C.:

Q. And is that the limits of the stroking seats? Are there seats that can absorb more G forces or what -- is there a range in which these products are developed?

MR. TABER:

A. There are a few different seats that are manufactured, but typically industry standards are around the 20 G force range and that comes from research that was done by Colonel John Stapes, US military. He was the original human guinea pig and he put himself on a rocket sled and did 50-60 Gs to himself for years and said, "yeah, I can survive this, so so should every else." But if can put a seat in place, then we think the 20 G range is probably a reasonable position to start off with, but there are seats that would attenuate

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a higher level of that. So I think that the most I"ve seen is somewhere around 30 G, but I'm not sure exactly. I couldn't swear to that.

HARRIS, Q.C.:

Q. Thank you. The other question I had, and I'm looking at our friend over here on the coat rack. You talked about the Christmas tree effect. That particular outfit there doesn't look to be really loaded up. I see three or four items there. Would you be able to identify what they are for us and tell us whether you think that that particular configuration is problematic or is that within the useable range?

MR. TABER:

A. Absolutely. Do you want me to stand up to point -

HARRIS, Q.C.:

Q. Yes.

MR. TABER:

A. Okay.

HARRIS, Q.C.:

Q. Maybe someone can -- maybe the camera can get you, I don't know.

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COMMISSIONER:

Q. You might press the button on that mic. There we are.

MR. TABER:

A. I think it's on there now.

COMMISSIONER:

Q. Okay.

MR. TABER:

A. I'll go from one side of the suit to the other. So look at the far left side, we can see emergency breathing system that's been integrated into the vest itself.

HARRIS, Q.C.:

Q. Is that the rebreathing type?

MR. TABER:

A. This is the HUEBA. It's not rebreathing type, no, this is compressed air system.

HARRIS, Q.C.:

Q. It has compressed air, yeah.

MR. TABER:

A. Yes, that's right. So it's been fully integrated and everything is attached, closed in, so as far as I'm concerned, my opinion would be that no, this doesn't represent an issue as far as snagging is concerned when

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dealing with that.

Strobe light is in the centre of the chest here and again, low profile, not really an issue as far as snagging goes when we're dealing with that.

HARRIS, Q.C.:

Q. Does that operate automatically or have to turn it on?

MR. TABER:

A. There's two different styles. I couldn't answer whether it's an automatic or a manual. I believe this one has both, but it might be a manual. In fact, it might be -- I don't know if it needs -- it probably needs water to activate it so I'll just leave that now.

Then a personal locating beacon that's in position with an antenna that's here and I would say that this is definitely a good position to be in. If I had any sort of comments about snagging hazards, I would like to see this sort of looked at, the antenna. Not necessarily that it's going to be an issue, but -- and it seems to be quite close to the surface of the suit, so it's really not hanging out there too much, so I wouldn't say

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that it's a major issue, but I couldn't say without actually testing to try to identify it. Based on my experience though, I would say that it would be one of the things that I would sort of identify as hanging out there a little bit, a small amount.

HARRIS, Q.C.:

Q. Could that be integrated into the suit by some sort of sewing in or whatever?

MR. TABER:

A. I'm sure. In fact I think that if we just did that, it might be -- if we just move the antenna slightly, but the problem with doing that is that there may be, during the course of wearing the suit that things start to move around a little bit. So that would be the only sort of thing that would sort of stick out in my mind. As far as the rest of the suit goes, there's really no other components. The pull tab for the floatation device, the external floatation device that's there, that's sort of tucked away. You have a harness on. That's not really -

HARRIS, Q.C.:

Q. And that pull tab operates same way that the

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ones that they show you on an airplane every time you're on board.

MR. TABER:

A. Exactly.

HARRIS, Q.C.:

Q. You pull on it and it -

MR. TABER:

A. The only spot that I would say it might get caught up is maybe on a window frame when you're making your way out. So if you lean against it, but you want your floatation device to be activated anyway, so as you make your way toward the surface, you're going to be doing that anyway or as soon as you get to the surface as well. So if there were any issues, the only one that I would say out of all, that's based on my experience, would be maybe the small bit of material that's here. But otherwise, I think that they've done a good job of trying to identify how close things need to be to the surface and in fact, even one of the modifications to this suit, the low profile exhaust valves that are in the back of the suit, as well as at the shoulder. So to try to limit the amount of surface area

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that sticks out away from the individual is extremely important and I think it's sort of where we need to be.

HARRIS, Q.C.:

Q. So the thing that you got here is something to help you breathe to get out.

MR. TABER:

A. Yes.

HARRIS, Q.C.:

Q. Something to see you when you're out, and someone to locate you if they can't see you?

MR. TABER:

A. Absolutely.

HARRIS, Q.C.:

Q. So that's not overloaded. You could probably handle something else if you needed it.

MR. TABER:

A. Well, I don't know if I'd start adding too much more. I think we sort of got what we need here, as far as the equipment base. So I don't think that there's really a need for a GPS and a little motor or anything else to try to get us somewhere else, but I think that we're sort of at the stage where if more was added, then it would be something that we'd

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have to consider.

HARRIS, Q.C.:

Q. All right, thank you. Thank you very much, Mr. Taber. Those are all my questions, Mr. Commissioner.

COMMISSIONER:

Q. Thank you. Mr. Earle?

MR. MICHAEL TABER, EXAMINATION BY V. RANDELL J. EARLE, Q.C.

EARLE, Q.C.:

Q. Good afternoon, Mr. Taber. I'm Randell Earle. I represent CEP Local 2121, bargaining agent for the employees at the Hibernia platform and the Terra Nova FPSO. I have a few questions for you, firstly, in the area of HUET training. Am I hearing it right and you're saying, particularly in the area of procedural, our training is a bit light and people aren't getting the repetition of the tasks necessary to retain these tasks for the period of time in between initial training and refresher?

MR. TABER:

A. I think that research has shown that quite convincingly that, yes, in fact, we're not

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retaining that information as long as what we might have thought. So this comes from the UK as well as research that's been done here in Canada as well. So yeah, I would say that.

EARLE, Q.C.:

Q. Now your table at page 28 of your report, the revised one -

ROIL, Q.C.:

Q. We're not able to bring that exhibit up. Seems to be a technological issue here.

EARLE, Q.C.:

Q. Yes. If we could -- perhaps it's just as well to wait.

REGISTRAR:

Q. What page, Mr. Earle?

EARLE, Q.C.:

Q. 28. I guess we've got a different numbering.

MR. TABER:

A. It's 28 on the report itself, but it starts at number one once it gets beyond the Table of Contents. So -

ROIL, Q.C.:

Q. Add one number, so it would be 29.

EARLE, Q.C.:

Q. 29.

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REGISTRAR:

Q. 29?

ROIL, Q.C.:

Q. Yeah.

MR. TABER:

A. Well, in fact, it's probably further along than that. If you just scroll down and see what page we're on here. So there's 19, so we still have quite a distance, because there's Table of Contents, list of figures, list of tables and then the report starts at number one.

EARLE, Q.C.:

Q. You're not the first one we've had this problem with.

REGISTRAR:

Q. 28.

MR. TABER:

A. There we go.

EARLE, Q.C.:

Q. I'm curious about the following items, and that is in your tasks, the third task is controlled ditching to surface, including exit jettison procedures and subsequent immersion, (no inversion), and then second from the last,

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number of times exit is jettisoned underwater.

MR. TABER:

A. Yes.

EARLE, Q.C.:

Q. Would you tell us what the difference we're dealing with here is, what's going on?

MR. TABER:

A. Okay. The difference is that if there is jettisoning the exit at the surface of the water, then when I was looking at, and I believe you're asking about jettisoning underwater, is that correct?

EARLE, Q.C.:

Q. Yes.

MR. TABER:

A. That it's been shown, research both here as well as in the UK, that jettisoning the exit underwater in an inverted position is desirable, that we think it's important for people to be able to practice the skillset that they're going to use in a real situation. So the chances of opening the exit at the surface of the water are limited. There may be cases, but we know from research that not only I've conducted, but other researchers

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have conducted, that the roll over rate, the inversion rate of helicopters is quite high. In around the area of 70 percent of all helicopters that touch down on the surface of the water will invert rapidly. So the chances of jettisoning an exit at the surface is probably not one of the skillsets that you're going to be required to do.

EARLE, Q.C.:

Q. Now when we talking about jettisoning an exit, I take we're including both the door and the window?

MR. TABER:

A. It can be a mechanical exit or a push out, any style of exit that you need to operate.

EARLE, Q.C.:

Q. I want to go to the area of your purchasing of thermal underwear. First of all, in respect of that, you have a background in the actual training area of this escape training. You've done a lot of things in the interim, but that's where you started out is my understanding.

MR. TABER:

A. Absolutely.

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EARLE, Q.C.:
Q. As I understand it from the evidence we've had from Dr. Coleshaw, the recommended buoyancy in some reports is 150 neutons, no more, that the Canadian General Standards Board standard for the Canadian suit is no less than 156 and no more than 175.
MR. TABER:
A. Yes.
EARLE, Q.C.:
Q. You agree with me on that, and that we have studies which indicate that the ability of a naive subject to exit a submerged helicopter is - without hand hold, is restricted, and a significant proportion fail at buoyancies of 98 to 137 neutons. Are you familiar with -
MR. TABER:
A. Right, that's the work by Dr. Chris Brooks.
EARLE, Q.C.:
Q. Yes.
MR. TABER:
A. Yes.
EARLE, Q.C.:
Q. And I believe you've actually worked with Dr. Brooks?

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MR. TABER:
A. I have a number of times, yes.
EARLE, Q.C.:
Q. So it seems to me that we can conclude from that, that for the ordinary passenger the exiting in this suit, without hand hold, is going to be challenged by buoyancy issues. Is that correct?
MR. TABER:
A. I would say that from my experience, and keep in mind that I've trained over 10,000 people in these types of suits for the offshore oil and gas, and I would say that we see those differences for smaller individuals.
EARLE, Q.C.:
Q. Pardon?
MR. TABER:
A. We see those differences for smaller individuals. So below - so size small or extra small, that's where we see the greatest difference, but for the average individual, say, 150 pounds and above, it's not as - I personally have not seen as much of an issue related to buoyancy of that suit.
EARLE, Q.C.:

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Q. Okay. Are we not, by adding thermal underwear, adding buoyancy?
MR. TABER:
A. If we're trapping air, then potentially, but if the clothing itself is mutually buoyant, then we're not, in fact, adding any additional buoyancy. In fact, what we would do is if we think about thermal insulation that's related to that, the .75 Clo, it could be that in the future that's not .75 Clo, that we offset that with the clothing that we issue or they buy in that position. If you take clothing - if you take your clothing right now and you put it in the water, if there's no trapped air in it, then it's not adding additional buoyancy in that position.
EARLE, Q.C.:
Q. No, but presumably inside a suit we're trying to keep dry -
MR. TABER:
A. Right, and there may be a larger air gap, but if it's not that much - I mean, when I'm talking about insulating underwear or clothing, I'm not talking about in excess of 1 or 2 neutons or anything like that. I'm

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talking about clothing that's tight fitting next to your skin that doesn't have a lot of air difference, and, in fact, would fit in that suit the same as your shirt or your pants, or whatever else that you're wearing.
EARLE, Q.C.:
Q. I heard you say that in the wintertime you actually go with three layers?
MR. TABER:
A. Four layers in the winter, and three in the summer, two to three in the summer.
EARLE, Q.C.:
Q. So aren't you adding buoyancy by doing that? I mean, this is important. I hear you telling people to, look, you should be wearing thermal underwear, multiple layers wearing these suits, and I will tell you I've read other repots which seem to suggest that adds buoyancy and with the Canadian suit, that is not advisable because we're at the upper limits of buoyancy?
MR. TABER:
A. And I'm suggesting that the type of clothing that I'm wearing isn't adding excessive buoyancy, and if it is, it's negligible, it's

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not - and the only way that it will increase the buoyancy is if it traps more air inside that suit.

EARLE, Q.C.:

Q. But isn't the whole principle of thermal underwear that it does trap air?

MR. TABER:

A. It does trap a small amount of air, but the important part actually for me is that it wicks the water away from my skin.

EARLE, Q.C.:

Q. And the importance of that is?

MR. TABER:

A. If I have water next to my skin, hypothermia is more likely to be an issue for me than if I don't have water held next to my skin. So cotton versus thermal protective underwear would wick that or polypropylene type synthetic fibres will wick that water away from -

EARLE, Q.C.:

Q. So you would say that the value of wicking away moisture exceeds the detriment of buoyancy?

MR. TABER:

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A. Right, if we assume that it's adding a considerable amount of buoyancy, but if we suggest that it's not adding a considerable amount of buoyancy, then the benefit is far greater.

EARLE, Q.C.:

Q. Well, do you know how many neutons?

MR. TABER:

A. No, I don't. I can't answer how many neutons a pair of underwear is going to add to that overall suit, and I don't think that it's - I don't know of any studies that have been done particularly to look at the increase in buoyancy based on thermal insulation underwear, and I'm talking - I'm not talking about, you know, pile that's this thick, I'm talking about next to skin thin layered suits, and that's why I wear four next to the skin and it's really no thicker than maybe not even a sweat shirt in thickness, but it wicks the water away from my skin.

EARLE, Q.C.:

Q. Very good. Now we have that clarified. Now the other thing I wanted to ask you about is the importance of fit. Mr. Roil may have

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given the impression that the E452 is history in the Newfoundland offshore, but I understand that workers going to the Stenna Carron are still wearing the E452.

MR. TABER:

A. Okay.

EARLE, Q.C.:

Q. And I don't know if the picture of the 452 was left there on the desk.

MR. TABER:

A. I have enough experience, I think I know - it's not up here, but I'm okay with it.

EARLE, Q.C.:

Q. Well, you've seen the picture and it's quite a bulky fit, and as I understand it from Dr. Coleshaw, the material and the extra air space that's there and the potential for trapping of air adds to buoyancy?

MR. TABER:

A. Absolutely, no question.

EARLE, Q.C.:

Q. So my question for you is looking at the E452, would you consider a better fit than that to be desirable?

MR. TABER:

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A. I think that - is this in comparison to the HTS-1? Is that what you're asking?

EARLE, Q.C.:

Q. No, I'm just asking you if -

MR. TABER:

A. If this should be a better fit?

EARLE, Q.C.:

Q. Yes, if we should be looking for a better fit than that?

MR. TABER:

A. I would say that I've seen more excessive material than that before, and I would suggest that that's not necessarily a huge - I think a better fit would be great, but I would say within the sizing that was used for the 452, and I understand now that they're being used elsewhere, this individual, taking into consideration there's no context of size, we don't know how tall this individual is, we don't know how much they weigh, we don't have any anthropomorphic data, so I'm suggesting that if they were issued a medium, I would get them to wear a small to see if they could actually fit into a small because it may be that they can't fit into a small, so it might

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mean they need to be custom fit to a suit. I don't know if I can answer your question directly. I think more suit material adds buoyancy.

EARLE, Q.C.:

Q. You seem to be answering the question, accepting a limited range of sizing.

MR. TABER:

A. Yes.

EARLE, Q.C.:

Q. And it seems to me that one of the things that we learned with the 452 was that we needed a greater range of sizing.

MR. TABER:

A. Absolutely, and I'm not arguing that. I would say that that's absolutely true. I think a greater range of suits would be perfect because - particularly for myself, I can fit into a small size suit, but the boots - in the 452, the boots are too small for me, so I had to go to a medium suit, which means that I had extra material. It is undesirable in a ditching situation. There's no question that the air trapped in a suit would add to the buoyancy and then make it more difficult for

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an individual to egress.

EARLE, Q.C.:

Q. Thank you very much.

COMMISSIONER:

Q. Thank you, Mr. Earle. Now, Ms. O'Brien, it's twenty past. Would you prefer - I'll explain what's coming up to people. Would you prefer to delay your cross-examination until tomorrow when we're all going to be back here again, in any event, or would you rather go now and try to finish in five minutes because - I should explain to the group, in the evidence this morning there were references in Ms. O'Brien's questioning to pilots and the pilot suits, and we all heard that, and the matter was not really clarified. I think that this evidence, expert evidence has clarified it, but also Cougar is here and the chief pilot of Cougar is here. He cannot be here tomorrow, but he would be prepared to explain, and Mr. Stamp would ask him questions, the whole pilot suit thing, and so I would like to not proceed with the rest of the cross-examination or examination now, and deal with the matter of the pilot's suits so that we're all fully

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informed because we're getting to the end of the process, it's not as if we were trying to fit something in in two or three weeks ahead of us, so I'd like to do that now, and we are going to be back here in the morning, anyway, and conclude Mr. Taber's cross-examination because you are the only one left now, and Ms. O'Brien tomorrow morning, and Mr. Martin -

MR. MARTIN:

Q. I have no questions of Mr. Taber, in any event.

COMMISSIONER:

Q. So all right then, if you'll stand down, Mr. Taber, until tomorrow morning at 9:30, and we'd call you up, Mr. Stamp, and Mr. Gerber, and clarify this issue of the pilot suits, why they are as they are.

MR. JAKOBUS JOHANNES GERBER (AFFIRMED) EXAMINATION BY KEVIN STAMP, Q.C.:

REGISTRAR:

Q. State your name, please.

MR. GERBER:

A. My full name is Jakobus Johannes Gerber. Everybody prefers to call me JJ.

STAMP, Q.C.:

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Q. As I will, Captain Gerber. Mr. Commissioner, I would just like to say thank you for the opportunity to have Captain Gerber to speak to these few points briefly this afternoon. As you say, the last witness, Mr. Taber, did I think clarify some of the issues that had perhaps arisen, but I would like to have Captain Gerber speak to these a little bit as well. Captain Gerber, first of all, can you tell us your actual position now with Cougar Helicopters?

MR. GERBER:

A. My position is Director of Flight Operations, and I manage the Flight Department. So really anything that doesn't have to do with maintenance or administrative roles, I'm the Manager of that part of the business.

STAMP, Q.C.:

Q. And what are your responsibilities in that role?

MR. GERBER:

A. My responsibilities are three. Number one, to ensure that Cougar has a safe operation. Number two, to make sure that it's a legal operation with two parts to that; legal in

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regards to regulation by Transport Canada, and secondly, to meet the requirements that we are contracted for by our customers. The last responsibility is to make sure that those people that work for me have the resources to do the first two items.

STAMP, Q.C.:

Q. And this position of Director of Flight Operations, is this a term known in aviation operations or is it a recognized term?

MR. GERBER:

A. Yes, it's probably more commonly known as Operations Manager in other jurisdictions, but in Canada the title, DFO, Director of Flight Operations is fairly familiar, and it's a Transport Canada mandated position, a company must have that position, and they approve of the individual holding that position.

STAMP, Q.C.:

Q. Okay.

COMMISSIONER:

Q. I am sorry then to have called you a chief pilot, although that's a fine designation.

MR. GERBER:

A. It is a fine designation, sir.

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COMMISSIONER:

Q. You were chief pilot at one stage.

MR. GERBER:

A. Yes, sir.

COMMISSIONER:

Q. Is that correct?

MR. GERBER:

A. Yes, that's correct.

STAMP, Q.C.:

Q. And Captain Gerber, do you also or can you also fly passengers to offshore facilities in Newfoundland and Labrador?

MR. GERBER:

A. Yes, I am a qualified captain of the S-92 helicopter.

STAMP, Q.C.:

Q. Now you've heard the discussion, of course, and you know what particularly we're interested in which is the issues associated with the suit colour, the flight crew suit colour and its thermal protection. Now on the issue of the colour, you've heard Dr. Coleshaw comment that passengers wear bright yellow suits and I recognize that that's orange, but bright suits, and flight crews tend to wear

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blue suits, and her concern was with the issue of visibility if you're in the water.

MR. GERBER:

A. Yes.

STAMP, Q.C.:

Q. And on that point, first of all, can you confirm that Cougar flight crew wear a blue suit?

MR. GERBER:

A. That is correct, dark blue.

STAMP, Q.C.:

Q. And not to be flippant, but is it for appearance?

MR. GERBER:

A. I think most pilots, Commissioner, will remind you they look good in anything, so it's not about looks. I hear, I hear, I don't know.

STAMP, Q.C.:

Q. So what is it about, Captain?

MR. GERBER:

A. Very simply, it's a reflection, and we brushed over the issue earlier this morning, and this afternoon I heard Mr. Taber talk about the same thing.

STAMP, Q.C.:

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Q. Yes.

MR. GERBER:

A. But I think I want to put a little bit of perspective to that. There's a very good reason why a helicopter has such large windows. If you look at a fixed wing aircraft, the windows are very small, they're going that way and only that way. A helicopter can go pretty much 360 degrees. There's even helicopters where the slightest little piece of metal to build up the frame is in the way, and so there's a reason, you want good visibility out, so there's a lot of glass, and glass has reflection. So it's reflection from all angles, and a helicopter pilot uses his peripheral vision quite literally every time he takes off and lands, and any kind of movement in the corner of your eye can mean something, and helicopter flying by the very nature, even though we fly in cloud a lot here in St. John's, it's a visual means of flying. I have to see and be seen. I have to observe outside to hover. So reflection is a very important aspect. Also it was mentioned earlier that cockpits have a

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lot of glass in it that's not related to the window. Every instrument has a glass face or a flat piece of glass. Now there's a lot of effort being made to try and make them not reflective, but that impedes visibility, so back to our compromise issue that a lot of things in a helicopter is a compromise, you know, what is the best way of doing it. When you add all these pieces of glass together, there's a lot of reflection in the cockpit. As well, cockpit is painted mat black inside. Don't even take a chance with gloss black, you want mat black because you don't want reflection. If I have to single out the single biggest reason why you don't want anything bright in the cockpit, such as that suit, that would be it. It will be a distraction and probably detrimental to safety at some important aspect of the flight.

STAMP, Q.C.:

Q. Okay, and so as you heard Dr. Coleshaw speak about this, and, of course, as you say, the darker suit, the blue suit is in your mind certainly preferable for cockpit operations, but does it give you a concern then on the

Page 290

other side of things for issues of visibility in the water?

MR. GERBER:

A. Yes, it does, it doesn't help that cause.

STAMP, Q.C.:

Q. And is it addressed in some way? Are you satisfied?

MR. GERBER:

A. I'm satisfied it's addressed, and there's four things that we do. The first one might take a little bit understanding. From the very moment we decide to buy a 529 compliant S-92 helicopter, there's my first reason. All the programs we've put in place, whether it be HUMS, two control system, simulated training, all of that tries to guarantee that I never go in the water. That's the first step, we don't want to go in the water, but if I do go into the water, then there's three things more. First of all, the life vest. If we're going to pull the life vest and blow it up, it has reflective properties and we use reflective tape on the suit, and I also carry a personal locator beacon. So to me, the way we address the part of the flight that we deal with most,

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which is in the cockpit looking at the instruments, and by the small chance, although very real, but small that we end up in the water, those are the things we use to address that issue with. So I feel confident that it is addressed.

STAMP, Q.C.:

Q. So in your mind, it's a trade-off then to do that?

MR. GERBER:

A. Yes, I think so, yeah.

STAMP, Q.C.:

Q. The second point that was raised by Dr. Coleshaw was this issue of the suit's thermal protection, and as she put it, I believe, the very same issue was in play for passengers and crew, that is the issue of cold water immersion. Now on that point, is it your understanding that flight crew suits, in particular the suit that you and others at Cougar wear, has a lower thermal protection than, say, the passenger suit?

MR. GERBER:

A. Yes, I'm aware of that.

STAMP, Q.C.:

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Q. And is there any sort of measure, first of all, do you know, sort of what properties it has in terms of thermal protection?

MR. GERBER:

A. Yes, our suit was selected, and just for reference, we first became aware of this suit, the Viking suit that we wear, in Norway, and we saw our colleagues in Bergin, Norway, wear the suit and that's how we, as part of the selection process, ended up with the suit, but I understand it's got a - I suppose, what they say, a six hour hypothermic rating to it, six hours.

STAMP, Q.C.:

Q. And so the issue of having a lower thermal value or lower thermal properties perhaps than does the passenger suit. Are there reasons that, in my mind, justify that as well?

MR. GERBER:

A. Yes, there are two reasons. First of all, it's mobility, and the second is also what we heard today is alertness. The mobility issue, again like many things in the helicopter which is a compromise, they put switches and levers everywhere. I literally have to twist around,

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reach up switches, I have to turn my head, be able to reach. The first thing is they almost insist not to put a proper door on a helicopter, to work out way into the cockpit is difficult, and when we get there, there are switches from my side, overhead, slightly to my back. So I have to be able to manoeuvre. Can I do it in that suit? Some of the things that may seem trivial as well, for instance, if you take a look at that suit, just the simple fact of the HUEBA system they use, that doesn't work in a cockpit, we don't want the hose and the antenna, we don't want that loose in the cockpit because they can trip a switch when we don't look and they can hook up on things. So we need to be careful about mobility, and that is the place where we work and we need to be free to manoeuvre in there.

STAMP, Q.C.:

Q. And you mentioned the second issue was the one of alertness. How does that come into play?

MR. GERBER:

A. Alertness is directly related to the thermal issue, how warm I get in the cockpit. Well, the ground has been covered. If the

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temperature goes up and it stays up, our alertness seems to go down, and that's what we're trying to avoid. So back to the compromise of the big glass windows; well, it's a greenhouse, and I think that even though it's sometimes very overcast in St. John's, we tend to get above the cloud sometimes, not every day, but we're certainly exposed to it. In fact, back to our dark suit issue, even now - and that's a bit of a negative because it holds a little bit more temperature, but again that's a compromise as well, I need to be able to see the instruments. We try and strike that balance. So if our suit is that warm, I don't think we'll be able to function when we have to.

STAMP, Q.C.:

Q. Now, Captain, one of the issues that came up earlier, maybe it was yesterday, I guess, was some indication of the number of - the frequency of flights that passengers might take. For the most people on average, I thought it was something like six to nine flights annually.

MR. GERBER:

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A. Yeah.

STAMP, Q.C.:

Q. And that was the greatest proportion of people who travel offshore as passengers. How does that compare for flight crew?

MR. GERBER:

A. Pilots can fly two flights a day, sometimes one, sometimes they're on call so they don't fly at all, but on average, I'm going to say a pilot probably flies between eight and ten flights a week, and if you do the math quickly, it's certainly in the region of 200 flights a year. To me, that's a significant amount of time more than a passenger. So what works for the passenger, we shouldn't compare that to what a pilot needs to go through.

STAMP, Q.C.:

Q. And are you indicating that there are occasions when a flight crew leaves St. John's, fly to the installations, fly back to St. John's, fly back to the installations and fly back to St. John's again?

MR. GERBER:

A. Four legs easily.

STAMP, Q.C.:

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Q. And you have the suit on the whole of that time, of course.

MR. GERBER:

A. Correct, yes.

STAMP, Q.C.:

Q. So the heat build up is a feature for you to be -

MR. GERBER:

A. That is correct and as the day wears on, it just gets worse and worse and even between flights, the way we do the schedule, there is no time to take the suit off and take a breather, I mean, you certainly allow yourself a break and a bathroom break and replan the next flight, but the suit is difficulty getting in and out to and I know a lot of people prefer just to unzip the zipper, get a bit of fresh air and then carry on in the next flight. So it's a completely different scenario than a passenger.

STAMP, Q.C.:

Q. So the issue then of the visibility in the water is really, there's a similar issue with respect to the, sort of from the protection in the water, it's better to have the warmer suit

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and the brighter suit, but you spend a lot of time in the cockpit and it's better the other way in those circumstances?

MR. GERBER:

A. Yes, that's correct, I mean our primary task is to fly the aircraft and for that we need to be alert and not heat fatigued and work to stay out of the water and stay in the cockpit, that's, you know -

STAMP, Q.C.:

Q. And is it your view then that the compromise that would occur with the heat build up in a heavier suit would be a feature that it would be a concern to you as a pilot?

MR. GERBER:

A. Yes, it would.

STAMP, Q.C.:

Q. Just one last question and it's not really on this point but something I think Mr. Taber did mention was the issue of the suit selection, suit sizing for flight crew. I think he mentioned that it's sort of an off the rack thing for most flight crews, series of I think maybe five sizes he mentioned and the flight crew would fit into those five sizes.

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MR. GERBER:

A. Yes.

STAMP, Q.C.:

Q. Is that the case with Cougar?

MR. GERBER:

A. My understanding of the Viking suit there is eleven sizes available and I know that the first thing when we hire a new pilot, he gets a sheet and email to go and get measured because every suit is custom, adjusted for each flight crew member.

STAMP, Q.C.:

Q. Mr. Commissioner, that's all I have along these issues, if other people might want to have -

COMMISSIONER:

Q. Thank you, Mr. Stamp. Now, Ms. O'Brien, anything that you'd like to ask Mr. Gerber?

MS. O'BRIEN:

Q. I do have a couple of questions.

COMMISSIONER:

Q. Yes, all right, thank you.

MR. JAKOBUS JOHANNES GERBER, EXAMINATION BY MS. KATE O'BRIEN

MS. O'BRIEN:

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Q. Thank you Captain Gerber, some of that information you did give me off line, shall we say -

MR. GERBER:

A. Yes.

MS. O'BRIEN:

Q. But I think it was very helpful and you gave me more just then, particularly with respect to the colour of the suits. With respect to the thermal protection, I know that Mr. Taber in his report has actual ranges of Clo or thermal ratings that are recommended for flight crew suits.

MR. GERBER:

A. Yes.

MS. O'BRIEN:

Q. And I'll get a chance to question her a bit on that tomorrow, do you have any idea what the suit that you're wearing at Cougar and with the various triple layer protection, what the Clo rating is?

MR. GERBER:

A. No, I don't.

MS. O'BRIEN:

Q. Do you know if Cougar has that information?

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MR. GERBER:

A. No, I don't know that we have that information.

MS. O'BRIEN:

Q. Okay, you said just then--I had asked when Cougar was giving evidence here before this Commission if they could provide us with the specifications on their suits and they did provide some information. It didn't have a Clo rating which is consistent with what you're saying, but you just then said your suit was rated for a six-hour rating.

MR. GERBER:

A. Yeah.

MS. O'BRIEN:

Q. Do you know what that--I mean, that wasn't provided in the information I got from Cougar, so do you know what--can you give us a little more on what six-hour rating means?

MR. GERBER:

A. I'm not a hundred percent sure. It's a question I just asked a person who researched the suit before and that's the response I got. To me, I would like to answer the question a little bit differently though. We talked

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about the three layers, we all know about the waterproof and the flame proof layer and so on, the thermal, it's very difficult when you're going to work in that environment to tell somebody you will wear that layer or you don't work here. Our ability to work in a certain thermal load on us differs from person to person, just as somebody, even though they train all their life, they can't run a marathon even if they wanted to and another person can. I think our ability to work by ignoring the temperature that we feel differs from person to person and therefore, it's something that we try and stay away from and say, you know, you need to wear a thermal layer that is appropriate for you. And that's quite a wide scope to leave to somebody, but I run the risk of when I tell somebody that is the thermal protection you are going to wear and he suffers a heat issue, we will be back in this room discussing that. And so even though it seems like I leave a lot up to the individual or the company does, to us, it's an appropriate response and we feel that regardless of the Clo rating or what the

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thermal protection is, we still believe we're going to spend the bulk of our time in a cockpit working, so understand the risk, go do your immersion training, expose yourself to that, know what the risk is, understand what can happen. Now get dressed for work, what are you going to do? So personal accountability does come into it and we will provide all the guidance we can, but ultimately I feel that a pilot needs to know in what kind of heat load he can function and that's why for us it's, yeah, it's an interesting subject but I don't know if there's one specific solution to it.

MS. O'BRIEN:

Q. Wouldn't you think in the studying that's been done to come up with a standard for flight crews that gives a range of appropriate Clo levels, don't you think that the research would have taken into account the different personal tolerances people have.

MR. GERBER:

A. Yes, I think it will, yeah.

MS. O'BRIEN:

Q. So wouldn't you think that when you have a

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range when a standard, you know, albeit a European standard because we don't have a Canadian one -

MR. GERBER:

A. No, we don't.

MS. O'BRIEN:

Q. - is giving an appropriate range, wouldn't you, as a pilot, take some comfort in knowing that you're wearing a suit within the recommended range?

MR. GERBER:

A. Yes, I would.

MS. O'BRIEN:

Q. Wouldn't you want to know what that range was?

MR. GERBER:

A. Yeah, I would, yeah.

MS. O'BRIEN:

Q. To make that decision. And to make that decision wouldn't you have to know what the Clo rating of the equipment that you've been provided is?

MR. GERBER:

A. And to make the comparison, yes, but we don't have that information now.

MS. O'BRIEN:

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Q. But isn't that information that someone could get, it's not that difficult -

MR. GERBER:

A. Oh, I'm sure that we can get it, I still come back to the issue that it doesn't really matter what the Clo rating is, I'll dress as warm as I can so that I can still function my two flights back and forth to the rig, that would be the guiding -

MS. O'BRIEN:

Q. I think you're asking your pilots to take into personal accountability and take responsibility for their own decisions, but for them to do that, what I'm saying is they need to have some basic information -

MR. GERBER:

A. That is correct, yeah.

MS. O'BRIEN:

Q. - to be able to do that and I'm suggesting that one of the pieces, critical pieces of basic information that they need is some testing done on the suits that they're wearing so they know what Clo value it is.

MR. GERBER:

A. Yes, yeah.

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MS. O'BRIEN:
Q. Okay, all right, so that, you know, if Cougar has any further information on their suits to provide, I certainly--I really would be happy to see it and certainly if any further research is done on your suit and you come up with a Clo rating, I'd be happy to know that too.
MR. GERBER:
A. Okay, very good.
MS. O'BRIEN:
Q. Thank you.
COMMISSIONER:
Q. And Mr. Gerber, if you do come up with any information like that regarding the Clo rating, would you be good enough to provide it to the Commission -
MR. GERBER:
A. Yes, I will
COMMISSIONER:
Q. And we can provide it then to everybody.
MR. GERBER:
A. Yes.
ROIL, Q.C.:
Q. Commissioner, if I could prevail upon us for

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one moment, we have fifteen minutes left. I think as I understand from what I've heard that it's only Ms. O'Brien that has questions and that the C-NLOPB have none, I would hate to bring Michael Tabor back tomorrow morning for fifteen minutes, but if Ms. O'Brien is going to be longer than that, then clearly we have to, so I'm putting her a little bit on the spot.
COMMISSIONER:
Q. I suppose we could go over a little while.
ROIL, Q.C.:
Q. Yeah, I'm just thinking in terms of (unintelligible) Ontario.
COMMISSIONER:
Q. What do you think, Ms. O'Brien?
MS. O'BRIEN:
Q. I don't think I'll be that long with Mr. Gerber.
COMMISSIONER:
Q. All right then.
ROIL, Q.C.:
Q. Thank you very much for that, I think Mr. Gerber appreciates it because he does have prior commitments tomorrow that he would like

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to get to, if he could, but he understands that his first responsibility is to be here.
MR. MICHAEL TABER, EXAMINATION BY MS. KATE O'BRIEN
MS. O'BRIEN:
Q. Thank you, Mr. Taber, if you could just give me a moment here because I'm switching gears. Mr. Taber, I might start with some follow up questions to the questions I just asked the Captain from Cougar, I'm looking at your report at page 41 of your report if it's helpful for you to go there. So at that section you're referencing some work by Mr. Chris--or Dr. Chris Brooks whose name we've heard a few times today and it says "in a review of cold water survival needs, Brooks indicates that while offshore passengers should wear a certain thermal range of suit, air crew should be thermally protected from a suit ranging from .25 to .75 Clo and refer to it as group one. This recognition of integrated hazards, the hot environment in a cockpit and the cold water, is important to ensure that the effective heat stress does not compromise flight safety." So, you know, I just made an assumption then when I was

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questioning Captain Gerber that that sort of research would have taken into account personal tolerances for heat in coming up with a range from .25 to .75 Clo, and I'm wondering am I correct in that assumption? Can you give us a little more insight into--when Dr. Brooks was coming up with that range what was going, what other inputs were going into that result?
MR. TABER:
A. Okay, I wasn't privy to the study that was conducted, but I know just from the other research that's conducted in this area that it's typically not taken into consideration, personal differences. Typically it would be volunteers that would be recruited from--and in particular he was looking at air crew in the military and extrapolating that to an offshore setting or any air crew really he was looking at. So that's not normally taken into consideration, it's just the volunteers that are willing to step forward and say I'm willing to take part in the study. So there wouldn't be an assessment of flight plan, there's no thermal loading testing done ahead of time for that. Now we assume that if we

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get a large enough sample size that that will accommodate for all different levels and when we average out those differences, there will be accommodating for all ends of that spectrum.

MS. O'BRIEN:

Q. Wouldn't you want to have a sample group--in order for the research to be robust enough and the results to stand up, wouldn't you want to have a sample group that was large enough to take into account those variations?

MR. TABER:

A. That's what I just said, yes.

MS. O'BRIEN:

Q. So that would kind of be inherent in the results, even though it's not something specifically studied, it would be inherent in your results.

MR. TABER:

A. That's right, yes.

MS. O'BRIEN:

Q. In coming up with the range, are you aware of what other factors are being considered to come up instead of just one number, like they had done for the passengers, the range of

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numbers that they have come up with for the flight crew.

MR. TABER:

A. Right, and Dr. Brooks would have addressed this pneumatical value based on research that was done with performance, air crew performance, so there's been a number of studies that have been done through the Department of National Defence, as well as the US Military looking at decision making and performance in hot environments and those would have ranged in the thermal levels, and from that, he said, okay, well we know that if we dress them in .25, this is what their cognitive performance is; if we dress them in .75, over a period of time we ask them to perform a particular skillset that's related directly to their flight operations, then we start to notice decrements that are occurring at that higher end. So we would say reasonably it's--we would argue that .25 to .75 Clo would be within a range of acceptable performance.

MS. O'BRIEN:

Q. Okay. The point that I was just making that

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in order for pilots to make an informed decision about, you know, what they're wearing in their cockpit, that it would be important for them both to know what the research is showing an acceptable range is as well as knowing what the thermal value of the outfit that they're currently wearing is. Would you agree with that?

MR. TABER:

A. I think so and during their training that's discussed. In their program they talk about the thermal protective properties of insulated underwear, constant wet suits, benefits of those, some of the events that have occurred in the past where pilots are not wearing thermal protective equipment, although it's included in the aircraft, and their ability to survive lengthy periods of time. So I'm referring to the Canadian Coast Guard ditching that occurred in 2006 or 2007, I'm not sure, in Newfoundland where the pilot and passenger both had cause to wear immersion suits, they weren't wearing them, they were wearing life jackets, but they perished after the ditching waiting for a rescue.

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MS. O'BRIEN:

Q. Okay.

MR. TABER:

A. So part of their training is a discussion about the properties and the benefits of wearing thermal protective equipment.

MS. O'BRIEN:

Q. In that kind of a case, is it common that pilots are really given the information, given the equipment and then left to make their own decisions on what to wear, is that common to have it that way?

MR. TABER:

A. I think that that's more common, yes.

MS. O'BRIEN:

Q. Okay. At page 43 of your report, you say and I'm looking at the very top of page 43, "As there is no standard requirement outlined by Transport Canada, CAA or FAA regarding clothing to be worn under the constant wear of suits for air crew, a guideline of thermal comfort zone with respect to protection in both hot and cold conditions should be developed." What do you mean, this is a recommendation you're making here, can you

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tell us a bit more about that recommendation, what you mean?

MR. TABER:

A. Thermal comfort zone is related to basically what Captain Gerber was talking about is that there is a range in which we can operate and if we think about thermal regulation for humans, there is this sort of spot where we're quite comfortable at, if we sort of get above that, then we don't perform as well, if we get below that, we don't perform very well. So this range of thermal comfort is a zone in which, based on the requirements that we need to perform, if there are studies that are done to identify well what Clo value is actually best for those particular tasks that you are asked to do, then that guideline would be most beneficial to any air crew that's out there working right now, and currently it doesn't exist, there's been work done by Michel Ducharme of DRDC and I'm trying to remember what the acronym stands for, but the Defence Civil Research Centre, I believe that's correct, but he's done work looking at thermal comfort zones for air crew, as have

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researchers that are in the UK looking at this range that's important for performance. And I think that it's important that we have that as well in a Canadian context to try and look at, not just military crew, but civilian air crew and try to identify--because Dr. Ducharme's work was related to back-end crew members, so they're part of the air crew, but they don't work in a cockpit, they're more working in the back at a hoist position or they'd be a search and rescue technician working with patients, things of that nature.

MS. O'BRIEN:

Q. How is that different from the work that was done by Dr. Brooks that you were talking about where he actually came up with a range of Clo-- a Clo range for air crew suits.

MR. TABER:

A. It's similar but Dr. Brooks actually was looking at a review of literature that's been published previous and said, well this is what I think is reasonable range that's here, there wasn't actually a test that was done, a study that was done specifically to look at the .25, .75, he was looking at overall--this was a

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report done for Transport Canada to try and give them a sense of what, what is a reasonable solution and what sort of cold value should be afforded for each position that's in the air craft, say passenger or air crew. So he basically looked at a review of the literature, as opposed to conducting a research study which Dr. Ducharme did as an extension of some of the work that has been done before.

MS. O'BRIEN:

Q. Okay, so more work needed there -

MR. TABER:

A. Yes, absolutely.

MS. O'BRIEN:

Q. This is one thing perhaps maybe, I don't think it's necessarily a conflict in your report, but it was something that I was, perhaps need a little help in getting the two pieces of information to sit together. When I look at page 41 of your report, which is where you're discussing the issues of thermal loading and heat stress on air crew and you say Ducharme indicates that at ambient temperatures above 18 degrees celsius, air crew dressed in

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thermal protective clothing would likely be affected by heat stress during flight operations. And then when I looked a little later on in your report at page 52, where you are talking generally, in a more general sense about clothing, it says that, you're citing another report here and it says "Furthermore in an ongoing study of heat stress related to the performance of HUET skillset", the authors noted that even after 90 minutes of exposure to 34 degrees celsius there were no decrements in task performance, so I know that it's not a clear black and white contradiction, but the two pieces of information are kind of tugging us in different directions, can you sort of shed more light on it?

MR. TABER:

A. Okay, the Ducharme study is air crew related and the study that I conducted with colleagues at Brock is looking at 452 and E452 immersion suit for passengers and there was some discussion before the study was done to look at, well if I fall asleep in the back of the aircraft based on the thermal loading properties of that suit, will I be able to

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perform the skills required to egress that helicopter should an event occur? So what I did is I took individuals and put them in, both a thermally neutral environment which was 21 degrees and then put them also in a 34 degrees relative temperature in the suit for 90 minutes and said can they still perform the skill? I know they can do it at the lower level, at the 21 degrees, can they still do that same at 34, and I had people fall asleep and literally some of them were drooling, they were still fast asleep and snoring away and as soon as the alarm was sounded--so I did that through the same sort of procedure that they would expect, so the words "ditching, ditching, ditching, prepare to ditch", instantly they didn't even skip a beat, they literally performed all their tasks in the right sequence with no problems whatsoever in both conditions and we were just trying to see if there was this limitation based on a thermal loading. We noticed that there was an increase, a significant increase in body core temperature and significant increase in skin temperature, but when I say "significant" it

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was statistically significant but not necessarily practically significant, so the difference between that is that in a real environment would .03 of a degree actually make that much of a difference for you and in fact it didn't. And there's a number of research studies that are supporting that saying yeah, the intensity of the thermal loading is important, how fast it happens, how intense it is and what tasks were actually asked to perform, so we wasn't necessarily surprised by the results, but we just wanted to address whether or not there was an issue with the suits based on my personal experience of being hot in a suit, I just wanted to have a look at that research aspect.

MS. O'BRIEN:

Q. Okay, I understand, all right, those are all my questions, thank you very much.

COMMISSIONER:

Q. Thank you, Ms. O'Brien. Now, Ms. Crosbie, do you have any questions.

MS. CROSBIE:

Q. No, we have no questions, thank you.

COMMISSIONER:

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Q. Okay, thank you. Well Mr. Taber, thank you very much for coming here and giving your evidence today and so that between Dr. Coleshaw, the unexpected evidence of Mr. Gerber and your evidence from my point of view, this has been a very valuable day.

MR. TABER:

A. Thank you.

COMMISSIONER:

Q. Thank you. Okay, 9:30 tomorrow morning.

Upon conclusion at 5:00 p.m.

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CERTIFICATE

We, the undersigned, do hereby certify that the foregoing is a true and correct transcript of a hearing heard on the 29th day of June, 2010 at Tara Place, 31 Peet Street, Suite 213, St. John's Newfoundland and Labrador and was transcribed by us to the best of our ability by means of a sound apparatus.

Dated at St. John's, NL this
29th day of June, 2010
Cindy Sooley
Discoveries Unlimited Inc.
Judy Moss
Discoveries Unlimited Inc.

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