

1 then hit those tubes. Again, we can't really make it
2 definite.

3

4 CMDR RUSH: So that we get some overall understanding to
5 put the photograph in some context, you have at figure 194
6 given us a diagram of the 21-inch torpedo. What is the
7 overall length of the torpedo?

8

9 MR BUCKLAND: It is 24 feet, so the warhead itself is only
10 a very small section. We might just indicate the head
11 there, and that's where that firing pin that you can see
12 is, around there. Where that weapon damage has occurred is
13 almost between the warhead and the air vessel itself.

14

15 CMDR RUSH: Sir, the intention now, subject to your
16 assent, would be to call Dr Neill, who was responsible for
17 the creation of both the computer model that we have seen
18 and the simulation that I showed in opening, to explain how
19 that was done, and then to bring people back together to go
20 through the interpretation of the evidence that has been
21 put before the Commission thus far, and then finally to
22 deal with the operational aspects of Sydney and fire
23 damage.

24

25 So, gentlemen, if I could ask you to retire for
26 a short period of time, and I call Dr Neill.

27

28 <ROGER ANDREW NEILL, affirmed: [12.16pm]

29

30 CMDR RUSH: Dr Neill, could you state your full name to
31 the Commissioner, please?

32

33 DR NEILL: Roger Andrew Neill.

34

35 CMDR RUSH: And your address?

36

37 DR NEILL: [REDACTED]

38

39 CMDR RUSH: And, Dr Neill, your current position?

40

41 DR NEILL: I'm head of Unmanned Maritime Systems in the
42 Maritime Platforms Division of DSTO.

43

44 CMDR RUSH: Do you have a degree of Bachelor of Science.

45

46 DR NEILL: Yes, a physics degree.

47

1 CMDR RUSH: And also a doctorate, in what area?

2

3 DR NEILL: It's medical physics.

4

5 CMDR RUSH: In your work at DSTO, you mentioned that you
6 are in charge of Unmanned Maritime Platforms, but over
7 a period of time have you also, starting off with the
8 discovery of the AE2 submarine, developed an interest in
9 maritime wrecks?

10

11 DR NEILL: Yes. Mr Buckland has mentioned many times the
12 remotely operated vehicle imagery of the Sydney. Coming
13 out of my expertise with unmanned maritime systems,
14 I obviously developed an interest in the application of
15 those systems to marine archaeology which was, to some
16 extent, out of my interest, but, nevertheless I became
17 involved with the marine archaeological assessment of the
18 submarine HMAS AE2 and, from that, I believe I developed
19 some expertise in this domain.

20

21 CMDR RUSH: And, Dr Neill, in relation to the DSTO work
22 for this report, did you undertake the task of creating
23 a computer-built image of HMAS Sydney?

24

25 DR NEILL: Yes. Again arising from the work that I did
26 with AE2, I found that by building a high-fidelity model of
27 that submarine, it very much facilitated the interpretation
28 of the wreck of that submarine in its location on site in
29 Turkey, so it seemed like an obvious and sensible thing to
30 follow a similar process with the Sydney. We have found
31 that by developing high-fidelity computer models, you are
32 able to do a degree of, I use the term forensic
33 visualisation, accurate representations of various
34 scenarios that may be relevant.

35

36 CMDR RUSH: What did you use to produce and put together
37 the computer model?

38

39 DR NEILL: I started with the original as-built drawings
40 of the Sydney. I then attempted to track the changes and
41 modifications to the ship, obviously working with my
42 colleagues, so by making use of photographs and other
43 sources of information I was able to incorporate changes
44 that we were aware of. Then finally, we cross-correlated
45 the imagery as generated by me with the imagery as seen on
46 the seabed of the wreck of the ship.

47

1 CMDR RUSH: Sir, could we bring up DST0.001.0069? You
2 might take us through it?
3

4 DR NEILL: Yes. This illustrates the process that I used
5 in building the computer model. What I have done on the
6 left-hand side image is taken the profile view of some of
7 the sections of the ship and the plan view and then
8 superimposed those in the correct orientation and position.
9 Then I have built a hull through those plans so that they
10 correspond, as best as possible.
11

12 The very first thing that you find when you do this is
13 that there are inconsistencies between the drawings, so
14 there is inevitably a little bit of interpretation that has
15 to take place.
16

17 Working from that, though, moving to the other side
18 image, I have then, if you like, roughed in, for want of
19 a better term, the major structures of the ship, so you can
20 see the A and B turrets, the breakwater; the superstructure
21 is beginning to be built; and a very early version of, for
22 instance, the director control tower.
23

24 Then as I got hold of more information, acquired more
25 information, I was able then to fill in the missing details
26 I believe with quite a high degree of integrity.
27

28 CMDR RUSH: Perhaps if we can bring up the next image,
29 which is 0415.
30

31 DR NEILL: Yes, no source of information was safe from me,
32 so in the case of the Vickers quad machine guns, obviously
33 we had that one photograph that we had access to, but
34 I discovered that the manufacturer, the company Vickers,
35 actually has a museum and it has photographs of some of the
36 things that it has built, including the quad machine guns.
37 So I was able to access photographs and I was also able to
38 access a drawing of that unit.
39

40 Wherever possible, I've done that with all of the
41 major implements on board the ship. When we started the
42 process, I wasn't sure really what fidelity we needed, so
43 I decided to just go for broke and built it as precisely as
44 we could.
45

46 CMDR RUSH: The next image?
47

1 DR NEILL: As I mentioned a little earlier, we
2 cross-checked the imagery as generated by me in the model
3 against the imagery as evident from the ROV footage, so
4 that is the vicinity of starboard side in the vicinity of
5 the blacksmith's shop, and you'll see things like the
6 grinding wheel that's still in place at the aft end of the
7 blacksmith's shop, the skylight on top of the blacksmith's
8 shop, which has been blown out, and there is the base of
9 the mast sitting just behind the skylight there.

10
11 Generally, there is a very high level of correlation
12 between what we built and what is shown on the ship. There
13 are some very slight differences. There appear to be
14 a couple of vertical supports between the upper deck and
15 the foredeck, which I haven't actually shown, because they
16 weren't shown in the plans. Until we got that footage,
17 I had no way of knowing that those struts were there. So
18 some things I haven't actually corrected, due to the
19 pressure of time.

20
21 CMDR RUSH: There are one or two more in the next image?

22
23 DR NEILL: The next image is really to illustrate the
24 level of fidelity that we generated and the fact that the
25 model is recognisably HMAS Sydney.

26
27 CMDR RUSH: That deals with the model. Yesterday, there
28 was also a simulation in relation to port side and
29 starboard side damage and the aggregation of shell hits to
30 the port side of Sydney and also the latter period of time
31 dealing with Sydney and its roll. Firstly, dealing with
32 the shells and the fire, as indicated, can you give us an
33 indication of what you relied upon in bringing that imagery
34 together?

35
36 DR NEILL: I worked with the team, so as the team
37 generated the plot of shell hits, in the first instance
38 along the port side of the ship, they very carefully
39 positioned each hit and that was mapped. That made it very
40 easy for me then to take those hits and position them on
41 the model with, I believe, quite a high level of precision.

42
43 For instance, we had sidelights in a particular
44 orientation. I was able to position the shell hits using
45 those as reference points, for instance, and relate those
46 to what the team had actually identified, so in that way we
47 were able to build up, I believe, quite a realistic

1 representation of where each of the hits were.

2

3 CMDR RUSH: Perhaps if we do it in sequence, if we could
4 go to the simulation, the first piece of simulation is an
5 aerial view or fly-around of Sydney. It is 0416. Before
6 we look at it, could you tell us what it represents and how
7 it was done?

8

9 DR NEILL: Yes. We used a software package called
10 Blender. It is actually an animation software package, but
11 it's one that is able to be used for doing quite precise
12 reconstruction. We used that to build the static
13 representations that have been shown this morning and also
14 to generate the animations that have been done.

15

16 With that package, it is an artist's package in that
17 you are able to simulate, for instance, the position of the
18 sun; you are able to simulate forces due to wind and, in
19 that way, later on we were able to generate smoke. We
20 have, we believe, a reasonably realistic representation of
21 where the smoke would have been blowing. You are able to
22 generate sea state type representations. So it is quite
23 a powerful package. However, there is a degree of
24 interpretation required to do what we have done.

25

26 CMDR RUSH: Before we show that particular section, you
27 indicated that you worked with a team at DSTO and it was
28 a team effort in relation to bringing together the
29 information that you have attempted to put into the
30 simulation?

31

32 DR NEILL: Yes, very much so. I actually attempted to
33 retain a small degree of independence from the rest of the
34 team, in the sense that we cross-checked against each
35 other, so we worked a little bit independently and, in that
36 way, we developed a high level of confidence that if we
37 came up with consistent answers, we had confidence in each
38 other's interpretations. That seemed to be a very healthy
39 way to act, if you like, as an internal referee, and
40 I think in every instance we came to the same conclusion.

41

42 CMDR RUSH: Perhaps if we have a look at this.

43

44 DR NEILL: With this sequence I was trying to get across
45 four features of the ship which have very much come across
46 in the last day. The first is the fact that, in this
47 generation of ship, the quarterdeck and the foredeck were

1 very much associated with seakeeping and ship handling,
2 with the exception of the depth charge rails, which are
3 just visible on the stern there, the quarterdeck and the
4 foredeck weren't involved with war fighting.
5

6 The evidence has shown that the German crew pretty
7 much ignored those two parts of the ship, and it kind of
8 makes sense when you think of it in that light.
9

10 The second thing which I was trying to portray was in
11 highlighting the concentration on this generation of ship
12 of the command and control in one part of the ship, so very
13 much the bridge, the director control tower, the high-angle
14 control station are all in one place. The only exception
15 to that is the aft control position, which as Mr Jeremy
16 pointed out yesterday had quite minimal equipment, in any
17 case.
18

19 That is very much shown in that imagery where you have
20 quite a large ship with a very, very centralised, and
21 therefore very vulnerable, control station.
22

23 Likewise with the boats, the disposition of all of the
24 ship's boats was really determined by the technology of the
25 day. There was only one crane on board the ship and the
26 boats were very much clustered around that crane in order
27 that it be able to get those boats into the water. Again,
28 that is a point of particular vulnerability for this design
29 of ship, in that you have many of your lifesaving
30 appliances concentrated in one place next to an aircraft
31 which carried very flammable fuel.
32

33 CMDR RUSH: This was raised by a member of the public
34 yesterday: is there any significance in the flag that is
35 depicted there?
36

37 DR NEILL: The flag caused a great degree of stress,
38 actually. That's the Admiralty Battle Ensign, as
39 I understand it, which is the ensign that was used both in
40 the First World War and the Second World War. Regarding
41 the disposition of the flag, it appears that when the ship
42 was entering and leaving harbour, it was normally deployed
43 off a jackstaff at the stern of the ship, but for
44 practicality purposes whilst she was at sea it was deployed
45 off the mainmast in the location where it is shown.
46

47 To be quite honest, my use of the flag was to give an

1 impression of motion.

2

3 CMDR RUSH: The next sequence, Dr Neill, deals with the
4 port side engagement. Firstly, in general terms, counsel
5 assisting provided DSTO with a set of assumptions which
6 appear in the report. Using that as a base, would you
7 indicate what other information you used and how it was
8 that you brought this particular piece of the simulation
9 together?

10

11 DR NEILL: Yes. I started obviously using the assumptions
12 as the basis for building the sequence. I attempted to
13 cross-check particularly the timing of the sequence against
14 what potentially was likely to take place, so based on the
15 assumption that the ships were approximately 1,000 metres
16 apart, based on the speed of Second World War German
17 torpedoes, it meant that depending on whether the torpedo
18 was flying at 30 knots or 40 knots, the time of flight
19 through the water for the torpedo was somewhere between 50
20 and 70 seconds, so that gave me a strong basis to work
21 against in terms of checking against the assumptions.

22

23 The gents determined that the likely maximum firing
24 rate of the Kormoran's guns was around about seven salvos
25 per minute, so I've worked off that and determined the
26 total time that it would take to fire the number of salvos
27 which were indicated in the assumptions, and the timing is
28 quite consistent with what you would expect to see.

29

30 Essentially, I tried to work through the assumptions
31 and do a reality check on each aspect of them. There are
32 a couple of things which I questioned a little, and you
33 will see that I have addressed them in the animation. For
34 instance, the assumptions state that the bridge and
35 director control tower were struck and then, shortly after,
36 Sydney fired a salvo from all four guns.

37

38 If the director control tower had been struck, then in
39 all probability that salvo from Sydney had to be fired
40 under independent initiation from the four guns. So I have
41 shown that in the animation.

42

43 Of course, if the order was slightly wrong, Sydney may
44 have fired that salvo shortly before the director control
45 tower was hit. I just worked with the assumptions.

46

47 The one other thing which I would say is that

1 throughout the animation, I have damaged some items on the
2 ship, for instance, the cutters come away from the ship
3 during the engagement, but I haven't damaged other things,
4 and the reason for that is that it wasn't clear from either
5 the assumptions or the evidence that we could see in the
6 wreck field at what point things were damaged. Therefore,
7 I've left them alone.

8
9 CMDR RUSH: One aspect of this particular sequence is the
10 distribution of, if you like, the shrapnel fragments from
11 each individual hit. Was that based as shown in the
12 animation on any particular advice that you had been given
13 in relation to that?

14
15 DR NEILL: The distribution, the actual spray pattern, is
16 obviously just a visualisation, but it is meant to be
17 representative of what is shown in the report. The radius
18 or diameter of the spray as shown is actually meant to be
19 a representation of the damage blast radius.

20
21 As Mr Buckland pointed out earlier, unless shrapnel
22 actually hits something, it would have kept going much
23 further than I have represented. So I have attempted to
24 represent two things with the one visualisation.

25
26 CMDR RUSH: Just before we show it, is each individual hit
27 on port side basically taken from the material that
28 Mr Buckland referred to in his evidence this morning?

29
30 DR NEILL: Yes. Sorry, the one other thing, though, is
31 that I didn't attempt to differentiate between hits that
32 penetrated the ship and hits that exploded on the surface.
33 The reason for that is that it would be very difficult to
34 represent the scope of the damage of a shell that exploded
35 inside the ship, so I felt that it was really more
36 representative to show it as if it had exploded on the
37 outside.

38
39 CMDR RUSH: Thank you.

40
41 DR NEILL: This first period, which is the first
42 10 seconds or so of this representation, corresponds to the
43 period in which the Kormoran would have been
44 decamouflaging. The assumptions state that the Kormoran
45 also fired a ranging shot during this time. I didn't
46 represent that.

47

1 The other thing which I didn't point out is that the
2 point of visual reference here is the Kormoran's bridge.

3
4 CMDR RUSH: So this is meant to represent us looking at
5 Sydney from Kormoran's bridge?

6
7 DR NEILL: From Kormoran's bridge, yes. This is about the
8 time that the torpedo would have been fired. The first hit
9 on the bridge is shown as a three-gun salvo from Kormoran.
10 Our report states that Kormoran, in all probability, didn't
11 have centralised firing, so the guns would have been fired
12 independently. I have chosen to show them as if they were
13 fired centrally, and the reason for that is that it makes
14 it easier to see the sequence of salvos, but the actual
15 contact would have been slightly staggered.

16
17 The first salvo, we believe, hit the base of the
18 barrette of the director control tower and the region of
19 the bridge, so the impact of that on the operation of
20 Sydney would have been very dramatic indeed.

21
22 Winding back just slightly, I have shown Sydney's
23 response as a slightly staggered four-gun salvo. Again,
24 that's, as I mentioned, because I believe that the gun
25 crews would have very quickly realised that they had to
26 work in local control. They possibly were still using the
27 firing solution, for want of a better term, that was
28 directed by the director shortly before the hit, but they
29 wouldn't have had the benefit of gyro initiation.
30 Therefore, that may be an explanation as to why that shot
31 apparently went high.

32
33 What you can see just starting here is
34 a representation of the secondary armament from Kormoran
35 focused on the 4 inch gun deck and the quarterdeck. At
36 that point, I have represented the roof coming off
37 B turret.

38
39 The evidence this morning was that the shell that
40 actually hit B turret between the gunsights may not have
41 fully penetrated that turret. Nevertheless, if you work
42 out the kinetic energy of that shell, just the kinetic
43 energy of the shell, regardless of its explosion, is almost
44 equivalent to a tour coach at 100 kilometres an hour
45 running into something. That's the sort of kinetic energy
46 that is involved, and that hitting the front face of the
47 turret in itself may have been sufficient to remove that

1 roof off that turret.

2

3

4 So the sequence continues. The focus was shifted to
5 the A and B turrets and then shifted back more generally
6 along the midships area. The fire started at this point.
7 I have actually represented one of the hits on the port
8 side davits for the sea cutters. You will see that I have
9 represented a hit on the forward davit and then, a little
10 later on, it represents the hit on the aft davit. The
11 order is inconsequential. Whether it was that order or the
12 other, the end result, as Mr de Yong has mentioned, is that
13 the davit would have gone overboard, and that's shown
14 a little later. So the cutter is actually hanging there on
15 the side of the ship. Then a little later, another hit
16 takes off the remaining davit.

16

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The assumptions state that Sydney was moving backwards a little bit, possibly because she saw the firing of the torpedo, and attempted to slow down. I don't know the answer to that, but the assumptions state that she slowed down and I have attempted to represent that.

This is the torpedo hit. As was mentioned this morning, the ship would have responded by trimming up by the bow initially. Then the gas bubble that was generated by the torpedo actually creates a hole under the bow and she would then drop into that hole. She would then respond by coming back up again, and then as water flooded into the ship, she would trim down by the bow, so that is represented here over about a 20-second time frame. So she goes up, she drops down, up again, and then she starts to trim down by the bow as water rushes into the bow of the ship.

During that period, we didn't show any hits from the Kormoran. That was really a limitation of the computer technology that we had available. What I have represented there are the remaining hits on the port side, and I have represented them as being fairly low down by the waterline. I have no real reason to know that that was the case, but it does make sense that the Kormoran would attempt to breach the waterline as well as that caused by the torpedo hit, and there are hits there.

CMDR RUSH: Is the next image an aggregation of all port side hits as if they occurred all at once?

1 DR NEILL: Yes. It seemed to be a very effective, I'd say
2 almost chilling, way of representing the impact of those
3 41 hits on the port side of the ship. Really, what comes
4 across very, very strongly is just how completely and
5 comprehensively that midships section of Sydney was covered
6 by the Kormoran's fire, and this is ignoring the secondary
7 fire from 3.7 and 2cm guns. (Sequence shown).

8
9 THE PRESIDENT: That last sequence also excluded the
10 torpedo, did it not?

11
12 DR NEILL: Yes. That was meant to exclusively represent
13 the 15cm shell hits.

14
15 CMDR RUSH: The next sequence, Dr Neill, is the 15cm shell
16 hits to starboard side, and for this you worked on an
17 assumption that Sydney undertook a turn to the port and
18 crossed astern of Kormoran?

19
20 DR NEILL: Yes. That was actually initiated during the
21 last sequence. During the last sequence, I showed the turn
22 up to the point where Sydney was looking directly towards
23 Kormoran. At least based on the assumptions, she continued
24 to turn to port. She then crossed Kormoran's stern and
25 then sailed off, from memory, at 150 degrees bearing and
26 basically sailed away from Kormoran.

27
28 The assumptions state that Kormoran kept firing on
29 Sydney until she was about nine and a half kilometres away
30 from Kormoran. Depending on what speed you assume Sydney
31 was doing, that may have been up to 50 minutes. Basically
32 during that period, Kormoran fired reasonably consistently,
33 we believe.

34
35 Sorry, there is one other thing that I forgot to
36 mention on the port side engagement, if I could mention
37 that. The assumptions state that Kormoran fired around
38 about 11 salvos. If we assume a maximum of four guns could
39 bear at one time, that is a maximum of 44 15cm hits on
40 Sydney. We have identified 41. So if that assumption of
41 11 salvos from Kormoran is correct, then the firing during
42 that first sequence was extremely accurate.

43
44 CMDR RUSH: The next one is sequence 4, with sound.

45
46 DR NEILL: The German account states that they saw the
47 B turret roof fall off the ship. I represented that. It

1 was during that port turn that the Germans reported that
2 they saw that turret roof fall off, so I have represented
3 that. At this stage, I have also represented the hits on
4 what became the forward face of A turret, which was
5 legitimately at starboard side, but because of its
6 disposition was pointing towards the front of the ship.
7

8 At this stage, the fire is very, very well
9 established. There is a lot of smoke. From this point, we
10 have no real knowledge of what order shell strikes would
11 have taken place on Sydney, so I have simply geographically
12 taken the chart that the team generated and I have started
13 at the front of the ship and simply moved back. So that
14 sequence follows.
15

16 Sydney is continuing to undertake the turn, and then
17 she steams off at about 150 degree bearing. Based on the
18 numbers of shells that the Kormoran's crew claim to have
19 fired and the number of hits that are evident on board
20 Sydney, they had somewhere around 10 to 15 per cent strike
21 rate as the range increased.
22

23 CMDR RUSH: The final animation, Dr Neill, relates to
24 later into the evening and the roll of Sydney. We are yet
25 to get evidence in relation to that, but did you rely on
26 the work that had been done by Terry Turner in relation to
27 the computer modelling that he had done as to the flooding
28 and the effect of the flooding and damage on Sydney?
29

30 DR NEILL: Yes. Mr Turner provided me with a time plot of
31 roll versus time. It indicated that Sydney would have been
32 rolling between about 15 degrees and up to 40 degrees, with
33 around about a 10-second time frame per roll.
34

35 Here, I attempted to reproduce a section of the time
36 line which Mr Turner provided me with, and I believe it is
37 quite precise. This is sequence 5.
38

39 The German crew reported that they could still see the
40 glow from the fires, so I have represented the fires in
41 three principal locations, which we'll also talk about
42 later on this afternoon, I believe. Sydney has listed
43 heavily to port and she's rolling across from about 15
44 degrees down to about 40 degrees, 42 degrees maximum.
45 I think this one might be 42 degrees.
46

47 The sea there is shown as having come up to about sea

1 state 4, which is about a 2.5 metre sea height, principal
2 sea height.

3

4 CMDR RUSH: I think the evidence will be that the roll of
5 Sydney developed from 15 degrees to approximately
6 45 degrees. Did you attempt to depict any particular
7 degree in that animation?

8

9 DR NEILL: Yes. That's ranging between around about
10 15 and 42 degrees. I would have to look up the notes, but
11 each roll is actually slightly different, because I tried
12 to reproduce part of Terry's sequence. I believe that this
13 particular roll is a 42-degree roll. The most upright
14 position was 15 degrees.

15

16 CMDR RUSH: Sir, before lunch, I wonder whether we will
17 take an uninterrupted view of the animation so that we get
18 a complete picture, at 0415.

19

20 THE PRESIDENT: Yes.

21

22 (Sequences 1, 2, 3, 4 and 5 shown).

23

24 CMDR RUSH: Sir, I tender the video animation.

25

26 EXHIBIT #107 VIDEO ANIMATION PROVIDED BY DR NEILL

27

28 CMDR RUSH: If that is a convenient time, sir?

29

30 THE PRESIDENT: Yes. We will adjourn to 2 o'clock.

31

32 LUNCHEON ADJOURNMENT

33

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