

## Chapter 5

### Australia's new submarine cannot be a MOTS

#### Recommendation 4

The committee recommends that:

- the government formally and publically rule out a MOTS option for Australia's future submarines.
- The government focus its efforts on the 'new design' or 'son-of-Collins' options for Australia's future submarines and suspend all investigations for acquiring a MOTS submarine, including the current Japanese Soryu-class.

5.1 Until recently, the government had made clear that it had suspended consideration of a military-of-the-shelf (MOTS) option for Australia's future submarines.

5.2 The visit by a Japanese delegation to Adelaide, visits by Defence officials, including the CEO of DMO, to Japan to discuss submarine technology and commentary from senior government ministers has unexpectedly indicated that the possibility of buying a Japanese Soryu-class submarine off-the-shelf is being considered.

5.3 In this chapter, the committee investigates the capability of the Soryu submarine and outlines evidence given to the committee that explains why the Japanese boat is not suitable to replace Australia's submarine fleet.

5.4 This evidence confirmed to the committee that no MOTS option exists to replace Australia's submarine fleet. As such, the committee is recommending that the government formally and publically rule that option out.

#### MOTS

5.5 Because Australia's requirements are very different from those that underpin the design of other nations' submarines, modifications to such designs would be inevitable should Australia opt for such an overseas submarine. Commander Owen explained:

Nations that operate out of Europe, for example, have relatively small ranges to go to the areas in which they might patrol, and the often-shallow waters in which they operate suggest that a smaller submarine design actually fits better into their particular requirements. This is why most of the submarines that are classified are called MOTS in this world. It is really

a bit of a misnomer because you do not have a shelf full of 2,000 of these submarines; you are taking one extra off the production line. It is not really off the shelf...<sup>1</sup>

5.6 In his view, the smaller submarines do not have the range to meet Australia's requirements. Furthermore, basing Australian submarines further north or even pulling into places like Darwin to refuel would cause difficulties because once exposed any covert operation becomes visible and the clock on its activities must start again. In addition, he noted that the submarine would be 14 or 15 hours on the surface before it could dive because of the very shallow water around Darwin. In his words:

You are operating...at the risk of being under the air cover umbrella of somebody else and, as soon as you have shown your hand, you have actually pointed to where you are going.<sup>2</sup>

5.7 Commander Owen did not think there was anything at the moment that really had the range and mobility to match Australia's needs.<sup>3</sup>

5.8 Mr King agreed that Australia's particular geographical circumstances required a unique solution for Australia's operational needs:

5.9 Almost no matter what we do to come up with a submarine that will meet, as best it can, our needs as a nation, it requires some uniqueness to it.<sup>4</sup>

5.10 According to Mr King, most of the time Defence is able to purchase a product developed by one of its allies that comes very close to meeting Australian needs. This availability 'minimises the exposure to risk...we know the price and we can get it delivered on schedule'.<sup>5</sup> Having described the very demanding and unique requirements of Australian submarines, it is clear that the purchase of submarines is different. As Mr King observed, 'There are a few things [produced by Australian allies] that do not meet Australia's needs, and one of them is submarines'.<sup>6</sup>

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1 *Committee Hansard*, 30 September 2014, p. 5.

2 *Committee Hansard*, 30 September 2014, p. 5.

3 *Committee Hansard*, 30 September 2014, pp. 5–6 and 9.

4 *Committee Hansard*, 30 September 2014, p. 37.

5 *Committee Hansard*, 30 September 2014, p. 38.

6 *Committee Hansard*, 30 September 2014, p. 38.



*HMAS Rankin berths at Fleet Base West after returning from a Full Cycle Docking activity in Adelaide, South Australia.*

(Image courtesy of the Department of Defence)

5.11 Witnesses agreed that an off-the-shelf option should not be pursued. For example, Commodore Greenfield argued that a MOTS will just not work for Australia.<sup>7</sup>

5.12 Furthermore, Commodore Greenfield explained that to modify an existing submarine—any of the MOTS submarines or perhaps Soryu—by swapping the air independent section for fuel tanks, or an extra engine to make it like Collins or even heavier weapons would not be a simple exercise. He advised that such a change would in effect mean a complete redesign with all the accompanying time, costs and risks—'You cannot short-circuit this exercise'.<sup>8</sup> In his assessment:

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7 *Committee Hansard*, 30 September 2014, p. 21.

8 *Committee Hansard*, 30 September 2014, p. 22.

...a MOTS design will not suit Australia and the design will have to be heavily modified. A MOTS design even slightly modified ain't MOTS. There is no shortcut.<sup>9</sup>

5.13 Likewise, Rear Admiral Briggs stated clearly that there are no MOTS—everything involves a degree of adaptation. Even relatively minor modifications may require changes elsewhere as Rear Admiral Briggs and Commodore Roach, both experienced with the Oberon class submarines, the Collins project and developing concepts for the future submarines, explained:

Anything/everything you touch in a SM design interacts with other features of the design. A simple and partial example arising from increasing the volume, eg by adding a hull section for an AIP [air independent propulsion] capability to an existing design:

- More generating capacity is required for the long transits, either larger diesels or more of them.
- These need more fuel.
- If larger diesels are required a larger diameter pressure hull may also be required to accommodate them with the necessary quieting measures.
- Supporting systems such as cooling and switchboards may need to be enhanced, etc.

The result is a substantially new design.<sup>10</sup>

5.14 Similarly, Mr Pacey indicated plainly that there was simply no commercial off-the-shelf conventional submarine that comes close to meeting Australia's requirements.<sup>11</sup> In his view:

... If we have a look at the submarines that are produced by other countries, they are universally below 2,000 tonnes. There simply was not another submarine available with the sort of range that would allow us to continue to exploit the strategic depth that is a natural benefit of the strategic geography of the Australian continent.<sup>12</sup>

5.15 Rear Admiral Sammut, Head, Future Submarine Program, DMO, reinforced this message, indicating that: 'there would always have to be some form of adaptation for Australian conditions'.<sup>13</sup>

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9 *Committee Hansard*, 30 September 2014, p. 22.

10 *Submission 17*, paragraphs 23–24.

11 *Committee Hansard*, 30 September 2014, p. 30.

12 *Committee Hansard*, 30 September 2014, p. 30.

13 *Committee Hansard*, 30 September 2014, p. 37.

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## Shortcomings with overseas purchases

5.16 The committee considered the range of concerns raised by witnesses about the transfer of Japanese submarine technology to Australia and the paucity of available data on the Soryu's capability. For example, Rear Admiral Briggs informed the committee about the lack of detail on the propulsion system. He was not at all sure whether the Japanese design had a permanent magnet motor, which was the latest technology in Europe. He explained that the purpose of a competitive process would be to expose these sorts of issues and to get a better understanding about where they were on the technology spectrum and to compare that with one of the other three candidates.<sup>14</sup>

5.17 It should be noted that the technology around the Soryu is top secret. One report quoted a former Japanese submarine commander, Toshihide Yamauchi, who was at sea for nearly 30 years and was of the opinion that:

...it took Japan 60 years to develop and master the Soryu technology, and he believed they would not just give it all away.

Mr Yamauchi said Japan may provide just some of its knowledge to Australia.<sup>15</sup>

5.18 A country's efforts and resolve to keep advanced technology to itself applies not only to Japan. In its report on the future submarine industry skills plan, the Expert Industry Panel, chaired by Mr David Mortimer, noted:

The advanced technology used in modern submarines is the result of substantial investment in research and development, and delivers the operational advantage all nations pursue for their military equipment. For reasons of national security and industrial sensitivity, the countries that develop the technology closely guard it. This creates challenges for countries like Australia that do not produce much in the way of original submarine technology and so must purchase most of it from overseas.<sup>16</sup>

5.19 In this context, Professor Roos similarly warned of the practice of countries guarding their most sensitive secrets, particularly submarine secrets. He stated:

Any exports will be a second tier of technology which has already been surpassed by the country's science and technology programs and engineering development. Anyone who thinks they will be buying the most up-to-date stealthy submarine from another country is naive. Developed countries have three tiers of technology—one for their own use and guarded

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14 *Committee Hansard*, 30 September 2014, p. 14.

15 ABC News, 'Soryu submarine deal: Japanese insiders warn sub program will cost more, hurt Australian jobs', 15 September 2014, <http://www.abc.net.au/news/2014-09-15/japanese-concerns-over-submarine-deal/5743022> (accessed 30 October 2014).

16 Department of Defence, *Future Submarine Industry Skills Plan*, A Plan for the Naval Shipbuilding Industry, p. 36, <http://www.defence.gov.au/dmo/Multimedia/FSISPWEB-9-4506.pdf> (accessed 7 August 2014).

very closely, a second 'export' version with older, superseded technology to countries which are termed 'friends and allies' and a third version even older still—a 'vanilla' version if you like.<sup>17</sup>

5.20 According to Professor Roos, it was essential for Australia to gain access to 'a submarine design where the "older" embedded technology is not very old and is in fact the best in the world with the exception of the supplying countries own submarine system'.<sup>18</sup>

5.21 Commodore Greenfield agreed with the finding that because submarines are stealthy weapons systems and stealth is at the top of the secrecy list, their country of origin will not surrender such information or technology. He echoed the views of the submarine institute and Admiral Briggs that if a country develops something that gives its submarine a capability edge against all others, it would not let that technology out of its sight or allow it to be leaked to anybody else.<sup>19</sup> Furthermore, when it comes to finding solutions to unique requirements, such as those of the future submarines, Commodore Greenfield observed that no other country would be motivated to solve those challenges.<sup>20</sup> Mr King noted that at least on some occasions where a submarine is sold by a company resident in a country, the submarine that that country uses is not the same submarine that is exported to others.<sup>21</sup>

5.22 This reluctance of overseas countries to relinquish their most advanced technology means that Australia needs to apply competitive pressure to ensure that it is best placed to obtain the cutting edge technology it is seeking to acquire. Again this need to test and encourage designers and builders to devise the best option for the future submarine is another compelling reason for having a competitive tender.

5.23 There were many other aspects of the boat's design that should be thoroughly explored and which can only be done effectively and fairly through a competitive tender. For example, the committee referred to the standard of habitability. In this regard, Rear Admiral Briggs was of the view that it was a fundamental design feature of submarines and answers on such detail would be obtained from the PDS. This process would enable the tender evaluators to determine the space per person that was available and the provisions made for crew support. In his words, 'If you do it badly you have inefficient, ineffective crews and you will lose submarines in a hot situation'.<sup>22</sup>

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17 *Submission 25*, p. 5.

18 *Submission 25*, p. 5.

19 *Committee Hansard*, 30 September 2014, p. 25.

20 *Submission 18*, p. 2.

21 *Committee Hansard*, 30 September 2014, p. 50.

22 *Committee Hansard*, 30 September 2014, p. 15.

5.24 Rear Admiral Briggs flagged design philosophy as a major issue and one that must be assessed in getting those responses from the PDS:

You have to understand right down to a fair level of detail what the designer had in mind and what was important to him. How a Japanese crew lives and is prepared to live and operate their submarine, how long they want to keep it at sea, the transit distance, the water temperature, the shock standard, the quieting standard—all those things go into the design philosophy. You need to understand and know all of that in great detail in order to assess the risk as to whether this designer is actually the right man to come with you on the journey and is going to give you a product at the end that is going to be useful to you. It is a dry-sounding term, but it is actually pretty fundamental to getting the right answer.<sup>23</sup>

5.25 Mr Graeme Dunk, Australian Business Defence Industry, agreed fully with the view about the need for Defence to take an existing design and to modify it for Australian purposes. He noted in particular that whatever Australia does in the shipbuilding and the submarine-building space, it would use a design where the IP is owned by somebody else. He reasoned that under such circumstances, 'there should be no reason why we cannot go to an open tender to tease out all the nuances that exist and therefore arrive at the best solution'.<sup>24</sup>

5.26 In responding to suggestions about conducting an open competitive process, Mr King noted that certainly it could extend the time a lot. But Mr King noted that Defence had already done a substantial amount of work to learn about current submarine technology and performance. He stated:

We have built up this body of knowledge and we have done a lot of other work with different consulting groups in understanding the submarine design drivers that we need to take into account to get a submarine that meets Australia's strategic needs.<sup>25</sup>

## **Engagement with Japan**

5.27 Since February, Defence officials have visited Japan three times to discuss possible cooperation on submarines. The meetings—in February, May and September—were part of a series of meetings that DMO had while in Japan.<sup>26</sup> Mr King informed the committee that DMO had conducted a series of meetings with Japan exploring areas of collaboration on a range of science and technology fronts including underwater technologies, with the main focus on hydrodynamics. During the visits, discussions also took place on science and technology agreements being entered into and other strategic discussions. Mr King stated:

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23 *Committee Hansard*, 30 September 2014, p. 13.

24 *Committee Hansard*, 8 October 2014, p. 17.

25 *Committee Hansard*, 30 September 2014, p. 49.

26 *Committee Hansard*, 30 September 2014, p. 34. Mr King was unsure of the date of the hearing held around the month of May.

...we are looking at various technologies that might be shared between us or collaborated on in the future. We certainly had discussions on potential for submarines.<sup>27</sup>

5.28 In respect of the submarines, Mr King indicated that it was the biggest item on the agenda for the visits.<sup>28</sup> He stated, however, that no agreements had been signed.

5.29 According to Mr King, DMO was currently exploring the relationship with Japan in regard to the Soryu submarine:

...an option of a Soryu as a basis for an Australian submarine was not available to us last year. In making changes to the way the Japanese government deal with defence products, we are exploring the potential of some sort of cooperative program with Japan and others on submarines.<sup>29</sup>

5.30 Mr King referred to Australia's unique geographical circumstances that require a unique solution for its operational needs. He explained that Japan has a very competent conventional submarine and as a consequence, DMO:

...is looking at the early stages of whether that relationship with Japan can deepen and what is involved in that, and whether or not at the very highest level something like a Soryu would form a basis for something for the future. But it is exploratory in the sense that it is very early days and we are looking at a number of fronts.<sup>30</sup>

5.31 The initiative to hold the discussions in February with the Japanese came solely from Mr King, who informed the committee that the meeting was cleared by the Secretary of the Department of Defence but not the minister.<sup>31</sup> While the Minister was not formally advised of Mr King's intention to travel to Japan in February 2014, the visit was prompted by an informal discussion between the Minister and CEO in late 2013. This discussion related to opportunities to explore broad materiel engagement between the two countries ahead of the minister's visit to Japan in 2014.<sup>32</sup>

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27 *Committee Hansard*, 30 September 2014, p. 34.

28 *Committee Hansard*, 30 September 2014, p. 34.

29 *Committee Hansard*, 30 September 2014, p. 36.

30 *Committee Hansard*, 30 September 2014, pp. 36–37.

31 *Committee Hansard*, 30 September 2014, p. 38. In an answer to question on notice No. 2, taken on 30 September 2014, the Department of Defence informed the committee that: the approval delegate for international travel to be undertaken by the Chief Executive Officer of the Defence Materiel Organisation (CEO DMO), is the Secretary of Defence. Departmental officials do not routinely advise the Minister for Defence of an intention to travel. In this particular case, the Minister was not formally advised of Mr King's intention to travel to Japan in February 2014.

32 Department of Defence, answer to question on notice No. 2, taken on 30 September 2014.



5.32 Mr King did not think other people in the government would have known about his visit but he spoke to the submarine team about the matters he was going to look at in Japan. In his words, he was exploring a range of ways DMO might collaborate on a submarine program for Australia and that it was very much 'a matter of our own internal business'.<sup>33</sup> He was seeking logical solutions to an important problem for DMO to solve and having made that visit, he reported on what he had learnt.<sup>34</sup> Mr King repeated earlier statements that:

...we are looking at the potential to collaborate with Japan on using that class of submarine as a basis for our submarine.<sup>35</sup>

5.33 During the February visit, Mr King found more options than he originally thought were available. The May visit was a group visit and another meeting was also held in September.<sup>36</sup> According to Defence, a senior advisor (Executive Level 2) from the Department of Prime Minister and Cabinet participated in the most recent visit to Japan. This visit, which did not include representatives from the offices of the Prime Minister or the Minister for Defence, took place on 24 and 25 September 2014.<sup>37</sup>

5.34 Vice Admiral Barrett, Chief of Navy, agreed with Mr King's evidence that Defence was looking at collaborating with the Japanese on technologies that might be used in a submarine designed for Australia.<sup>38</sup> He stated:

....As you would expect us to do when we are making a decision on submarines of a certain size, where there are other nations that operate submarines of that size, we would seek to understand more of their capability, and we are doing that.<sup>39</sup>

5.35 When asked to identify the relevant option under which Australia was pursuing discussions with Japan on its submarine, Rear Admiral Sammut said:

First of all, I will go back to timing. At the time that we were talking about MOTS we were essentially talking about European MOTS because they were the designs that were accessible to us. The constraints around that were that, while we would make some changes...it was still fundamentally the boat as it exists in terms of physical size and so on. Since that decision...Japan has been moving towards freeing up its ability to deal with allies and partners in a progressive way.<sup>40</sup>

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33 *Committee Hansard*, 30 September 2014, pp. 40 and 42.

34 *Committee Hansard*, 30 September 2014, p. 41.

35 *Committee Hansard*, 30 September 2014, p. 43.

36 *Committee Hansard*, 30 September 2014, p. 63.

37 Department of Defence, answer to question on notice No. 8, taken on 30 September 2014.

38 *Committee Hansard*, 30 September 2014, p. 43.

39 *Committee Hansard*, 30 September 2014, p. 43.

40 *Committee Hansard*, 30 September 2014, p. 37.

5.36 This comment regarding Japan 'freeing up its ability' referred to recent political developments in Japan whereby restrictions have been lifted on the export of military technology.<sup>41</sup> As Mr King indicated this move opened up opportunities, previously not available, for Australia to investigate the Japanese submarine.<sup>42</sup>

5.37 To Mr King's mind, it was obvious that in searching for the best solution for Australia the potential to explore any possible cooperative arrangements with Japan was 'almost a new dimension of exploration'. Accordingly, Mr King argued that it was certainly not the MOTS exploration of small European boats:<sup>43</sup>

...there are a whole range of matters to be worked through. We are exploring with Japan whether there is potential for some form of program based around the work they have done in producing their Soryu boats. I do not think I described it as 'MOTS'... I would think about it as a new area of exploration because of the change in Japan's position... It is still ongoing. It is incremental. They are making incremental changes to their position. It is not a completed piece of work yet.<sup>44</sup>

5.38 Mr King proceeded to explain that the European boats in the water and operating currently were smaller and had a much more limited capacity and endurance. According to Mr King, he was aware that Japan had a very competent submarine, including a well-proven propulsion drivetrain. He noted that the propulsion system has been a major problem with Collins and he took it upon himself, with the approval of the secretary, to visit Japan.<sup>45</sup> He explained:

...one of my reasons for going to Japan was that I wanted to understand—because their submarine is about the size that we had in mind for our concept work—what they have done with their propulsion system. How reliable is their propulsion system? My thought for that first process was: if they have got a proven propulsion system that can move the submarine effectively through the water, then maybe—that was the original discussion—we could use that. You do not have to test it. It is at sea in multiple boats.<sup>46</sup>

5.39 The main electric motor was another area for potential investigation. Mr King explained that such a motor in a submarine was 'a very big, highly complex device, and clearly not the sort of device available off the shelf'—'it has to be scaled to your submarine'. Mr King indicated that he was interested in the Japanese electric motor

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41 For a more detailed account of the shift in Japan's policy on the export of arms, see paragraphs 5.70–5.73.

42 *Committee Hansard*, 30 September 2014, pp. 37–39.

43 *Committee Hansard*, 30 September 2014, pp. 37–38.

44 *Committee Hansard*, 30 September 2014, pp. 37 and 38.

45 *Committee Hansard*, 30 September 2014, p. 38.

46 *Committee Hansard*, 30 September 2014, p. 56.

because Defence was contemplating 'a submarine of about the same size in our concept'.<sup>47</sup>

5.40 Mr King noted that DMO had undertaken previous visits but the Japanese position on defence exports meant that any exploration of technology was not possible until recently. He took the opportunity once more to emphasise the potential advantages that the Japanese submarine offered:

Realising that Soryu was a submarine of about the size that we might be interested in, and understanding that they had a very well proven propulsion train, I thought it would be well worthwhile for me to go and visit Japan and ask them about their program—ask them, for example, whether they would be interested in supporting our program through the release of some of that technology, what restrictions might apply and whether there was any opportunity to pursue that course of action.<sup>48</sup>

5.41 Turning to other potential acquisitions, Mr King stated that he does a lot of work trying to get background knowledge and meeting with different countries, which has included Sweden several times over intellectual property (IP) issues and regular talks to ThyssenKrupp Marine Systems (TKMS).<sup>49</sup> Vice Admiral Timothy Barrett, Chief of Navy, also noted that the government was looking at options for an Australian-design submarine from a number of countries.<sup>50</sup> He explained:

In the same way that we have investigated through due process of options 1 and 2 in a previous life—we have looked at German solutions, we have looked at Swedish solutions.<sup>51</sup>

### **The Soryu submarine**

5.42 Speculation about the government opting to purchase the Japanese submarine prompted a number of witnesses to question the submarine's capability and its suitability for Australian conditions.

5.43 Range and transit are very important for Australian submarines.<sup>52</sup> At the public hearing, Rear Admiral Briggs reminded the committee that the Soryu had been designed to meet Japanese requirements. He stated that the Soryu has less mobility, that is the ability to cover the distance quickly. According to his estimates, based on publically available figures, Collins speed is nine to 10 knots and the Soryu is six to 6.5.<sup>53</sup> He explained:

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47 *Committee Hansard*, 30 September 2014, p. 39.

48 *Committee Hansard*, 30 September 2014, p. 39.

49 *Committee Hansard*, 30 September 2014, p. 40.

50 *Committee Hansard*, 30 September 2014, p. 44.

51 *Committee Hansard*, 30 September 2014, p. 44.

52 See paragraphs 6.8–6.12.

53 *Committee Hansard*, 30 September 2014, p. 12.

Their patrol area is a fraction—perhaps less than a third—of the distance we have to go, compared to Collins as a benchmark. And we are doing this with publicly available figures. We have not had any real exposure to the details of the Soryu, but looking at it with a submariner's eye we can tell quite a lot, and we have been able to talk to people who have experienced the submarine.<sup>54</sup>

Soryu and Collins are about the same size on the surface. That describes a sort of payload capacity that the two platforms have—very similar. From the publicly available figures, Soryu has two-thirds the range, 6,000 nautical miles at six and a half knots. So it is slower and it does not go as far. That is perfectly reasonable for the Japanese situation, but it would be untenable for Australia's situation. If you start from Perth, from Fremantle, and go into the centre of the South China Sea, say—a reasonable bit of geography—you have a 3,500 nautical mile transit and 3,500 nautical miles home. The Soryu might get to the Gold Coast but it cannot come back and it cannot do anything when it gets there. So Collins is expected to be able to do that and then spend up to five weeks on patrol.

...that is 3,500 there and back, 7,000 total, and another 3,000, give or take, on the patrol. You are looking for a submarine with a range of certainly 12,000 nautical miles, and it is not a good idea to come back empty. You want something—10 per cent—left.<sup>55</sup>

5.44 Commodore Greenfield supported the conclusions reached by Admiral Briggs about the differences between the Soryu and the Collins.<sup>56</sup> He gave a similar example comparing the performance of the Japanese boat to the Collins. He told the committee:

If a Soryu and a Collins left Fleet Base West near Perth together and travelled at 10 knots to Darwin, the Soryu might not actually make it or, if it did, it would be very low on fuel. This is because the power and fuel required increases exponentially with speed—at the cube of the speed.<sup>57</sup>

5.45 He indicated that the design could not simply be altered to suit Australia's needs. In his view, modifications were not straightforward exercises: that a modern submarine was 'very tightly integrated and hugely dense'...full of machinery and electronic cabinets with no empty space to allocate to a new system.<sup>58</sup>

### ***Generators, motor and batteries***

5.46 According to Rear Admiral Briggs, generator power and batteries are needed for transit. He informed the committee that the Collins has three 1,400-kilowatt diesels

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54 *Committee Hansard*, 30 September 2014, p. 11.

55 *Committee Hansard*, 30 September 2014, p. 11.

56 *Committee Hansard*, 30 September 2014, p. 25.

57 *Committee Hansard*, 30 September 2014, p. 22.

58 *Committee Hansard*, 30 September 2014, p. 22.

while the Japanese has two 1,400.<sup>59</sup> In his view, the difference was 'very significant on a transit where you require the power to quickly recharge the batteries'. He advised that it would require the submarine to run its diesels for longer to get the same capacity back in the batteries. He explained 'Every minute you run the diesels, you are exposed to counter detection'.<sup>60</sup> Noting that Soryu has two-thirds the generating capacity of Collins, he then stated further:

It is the same size—and, in fact, when it is dived, it is 1,000 tonnes heavier. It only has two-thirds the generator capacity of Collins. When it snorts, it is going to have to do so for longer. It will take longer to recharge its batteries. I do not know what its battery capacity is, but I am sure the designer has a balance in his generators and his batteries. I would be very surprised if it has anything like the battery capacity of Collins. It will be smaller. It is designed for a different job. They have very similar top speeds. Soryu has a bigger propulsion motor because, when it is dived, it is 1,000 tonnes heavier and so it needs the extra power. It does not go any faster for it.<sup>61</sup>

5.47 To his mind, there was nothing secret about looking at a submarine sitting alongside the wharf and knowing it has two 1,400 kilowatt generators to propel a 4,000-tonne submarine and concluding that it would 'be slow and rather more exposed'.<sup>62</sup>

5.48 Rear Admiral Briggs also told the committee that the Japanese submarine has a slightly larger main motor—5,900 compared to 5,400. It carries about 1,000 tonnes more weight when it dives, so it is significantly heavier than the Collins. He did not expect it would outmanoeuvre the Collins.<sup>63</sup>

5.49 In essence, according to Rear Admiral Briggs, Soryu is a submarine that physically looks the same size as the Collins but, in a capability sense, 'is significantly less than Collins' in terms of range installed power etc. In his opinion, it would be difficult to start to amend this and expand it to incorporate the sort of extra diesels and the extra fuel.<sup>64</sup> According to Rear Admiral Briggs and Commodore Roach, if Defence went with Soryu, as described in publicly available information, the boat would not match the Collins.<sup>65</sup>

5.50 Regarding Soryu's size, Commodore Greenfield wanted to clear up some misconceptions. He informed the committee that size was usually determined by

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59 *Committee Hansard*, 30 September 2014, p. 14.

60 *Committee Hansard*, 30 September 2014, p. 14.

61 *Committee Hansard*, 30 September 2014, p. 11.

62 *Committee Hansard*, 30 September 2014, p. 15.

63 *Committee Hansard*, 30 September 2014, p. 14.

64 *Committee Hansard*, 30 September 2014, p. 11.

65 *Committee Hansard*, 30 September 2014, p. 12.

surface displacement, not dive displacement—surface displacement was an indication of usable volume. He reasoned:

So we should be comparing surface displacements for Soryu at 2,950 tonnes with Collins at 3,050. To do otherwise is erroneous, except that we believe that Soryu also has 10 metres of air independent propulsion, which is only good for the slow patrol part of the mission and not good for transits... That 10 metres would be about 500 tonnes, leaving about 2,500 tonnes to compare with the Collins at 3,050. Even, if I add another 200 tonnes in there, it is still substantially less.<sup>66</sup>

5.51 To Professor Roos' mind, people should also be cognizant of issues around the design philosophies in submarines:

When you lock down at the beginning of a new class, you lock down a design philosophy that sets certain parameters. For example, a Japanese submarine has 1,300 tonnes of water when it goes...underwater—as compared to a Collins or a normal submarine from the rest of the world, which has 10 per cent, which is around 300 tonnes. That means, of course, that you have a very slow boat to accelerate and to stop; that is a lot of weight to carry around. It also means that, in those scenarios, you have very little crew space to do what you want. In such a situation, trying to make something of a requirement that we would fulfil is impossible with the same buoyancy issues.<sup>67</sup>

5.52 Indeed, Rear Admiral Biggs and Commodore Roach produced a table that compared the Soryu to the Collins (see Table 5.1). Based on the information produced in the table, they concluded that:

It is apparent therefore that SORYU would need to be heavily modified to meet the Australian requirements, particularly for long ocean transits and patrols. This would carry cost, performance and schedule risks and will amount to a new design; it will not be a Military Off The Shelf (MOTS) acquisition.<sup>68</sup>

5.53 Rear Admiral Briggs made clear that the evidence and information in the table were from the publicly available figures, which was the best data available.<sup>69</sup>

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66 *Committee Hansard*, 30 September 2014, p. 22.

67 *Committee Hansard*, 8 October 2014, p. 16.

68 *Submission 17*, p. 6.

69 *Committee Hansard*, 30 September 2014, p. 12.

**Table 5.1—A comparison of some characteristics of the Soryu and Collins class submarines<sup>70</sup>**

| <u>Characteristic</u>              | <u>Soryu</u>         | <u>Collins</u>    | <u>FSM Requirement</u>               | <u>Remarks</u>   |
|------------------------------------|----------------------|-------------------|--------------------------------------|--|
| Surface Displacement (tonnes)      | 2950*                | 3100              | Not less than Collins                | Regularly quoted displacement in media for Soryu (4200 tonnes) is submerged displacement, which means that Soryu carries 1300 tonnes of ballast water. Useable space on-board is determined by the surfaced displacement.<br>Without the AIP section, Soryu has less useable volume than Collins.<br>Note: since Soryu is a double hulled design some of the ballast tanks may be convertible to fuel tanks, improving the useable volume calculation. |
| Range (NM)                         | 6000 @ 6.5 knots     | 9000 @ 10 knots   | Not less than Collins                | Australian operations require long distance transit to reach patrol area within a reasonable timeframe. Soryu is not designed for long transits.   |
| Top Speed                          | Similar              | Similar           | Similar                              |  |
| Diesel Generators                  | 2 x 1400 kW          | 3 x 1400 kW       | Not less than Collins                | Similar diesel design on Soryu and Collins.<br>Less installed power results in longer snorting time and reduced stealth.   |
| Propulsion                         | 5900 kW              | 5400 kW           | Not less than Collins                | The higher installed power on Soryu is required due to the extra ballast water carried when submerged.   |
| Combat System                      | C2 (Japanese)        | AN/BGY-1 (US/Aus) | Updated version of AN/BGY-1 (US/Aus) | US based combat system fully integrated on Collins. Integration of US combat system into Soryu required.   |
| Torpedoes                          | Type 89 – (Japanese) | MK 48 (US/Aus)    | MK 48 (US/Aus)                       | MK 48 torpedoes fully integrated on Collins. Integration of US combat system into Soryu required.  |
| Missiles                           | Harpoon              | Harpoon           | Harpoon                              |  |
| Crew                               | 65                   | 58                |                                      |  |
| Legislation and Naval Requirements | Japanese             | Australian        | Australian                           | Modification of Soryu is required to meet Australian safety and technical regulatory standards.  |
| Operational Life                   | 16 years             | 28 years          | Not less than Collins                | Changes in design and support philosophy required for Soryu.<br>New maintenance program required.  |

### ***Combat system***

5.54 The future submarines' combat system is also an important consideration. Rear Admiral Briggs informed the committee that the Soryu's combat system is Japanese and developed in Japan. They do not use American weapons as Australia does. He then suggested that one of the challenges would be to integrate those into the new submarine.<sup>71</sup>

5.55 Rear Admiral Briggs informed the committee that Collins is 'totally comfortable carrying US weapons—Mark 48s and the Tomahawk and already carries the Harpoon missile. He noted that the Japanese submarine uses Japanese developed torpedoes; they are not Mark 48s, and 'you may find when you try and integrate the torpedoes that the 48 is heavier and so the racks that hold it have to be strengthened'.<sup>72</sup> He had no idea about how well the Japanese torpedoes work. He surmised that they may well do very well now but he did not know. He then stated:

What I do know is that we have a larger partner and ally in the Pacific that has a large number of those torpedoes and, come the need, we will be able to restock hopefully. I also know that they have a regular war shot proving program, which we participate in. So we take a war shot off the rack, and we fire it at a suitable target and watch it work and go bang. I have no idea how the Japanese do it. I do know the Americans are extremely thorough, and I am very comfortable working with those weapons.<sup>73</sup>

5.56 Commodore Roach explained further it was worth noting the relationship Australia has with the US Navy (USN). In his view, it was 'unique' in as much as:

...we both have sufficient confidence in each other's ability to operate the US combat system in Collins and the practice Mark 48 torpedoes that we fire those torpedoes at each other. The torpedoes are set to miss and they turn away, but nobody else has that relationship where both countries have sufficient confidence to be able to exchange practice torpedoes.<sup>74</sup>

5.57 Rear Admiral Briggs referred to the armament cooperation program that Australia has with the Americans. He noted that Australia was working with them to evolve the Mark 48 torpedo:

The Defence Science and Technology Organisation has been working to improve the sonar in that torpedo. So you actually have Australian smarts going into this USN weapon, and we get the latest version of it with those smarts in it. That is not something they are going to share with you if there is any chance at all of a third party getting an overview.<sup>75</sup>

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71 *Committee Hansard*, 30 September 2014, p. 11.

72 *Committee Hansard*, 30 September 2014, p. 12.

73 *Committee Hansard*, 30 September 2014, p. 12.

74 *Committee Hansard*, 30 September 2014, p. 12.

75 *Committee Hansard*, 30 September 2014, p. 12.



5.58 Professor Roos was also of the view that the Soryu could not in its current configuration carry the heavy version of the MK 28 Torpedo and hence was unsuitable for Australia's armament requirements.<sup>76</sup> Clearly, the integration of the future submarine's combat system into the future submarines introduces a number of major considerations when selecting the preferred tenderer.

### ***Different operating environment***

5.59 In addition, Mr Pacey also noted that the sea conditions under which Australian submarines operate during transit are quite demanding and may be different from those under which other conventional submarine operators move. While he accepted that Japan also has an extremely demanding environment, he noted that it was of a different nature. He explained:

If you look at the northern latitudes and seas that it operates in, they are icebound in winter and indeed for most of the summer. There are comparable latitudes in Scandinavian countries; but, of course, the pattern of ocean currents means that some of the areas that Japan operates in are considerably colder.<sup>77</sup>

5.60 Rear Admiral Briggs similarly observed that in the Northern Pacific, where the Japanese submarines operate, the waters are cooler, which probably does not present a problem. But, he argued, Australian submarines often operated in 'hot tropical waters, and 32 degrees surface water temperature compared to 16 degrees is a quantum change in how much cooling you need'. He explained that the higher temperatures affect how much cooling capacity the submarine needs for its equipment, 'right down to fundamentals like the design of the battery'. According to Rear Admiral Briggs, the battery temperature 'when you are recharging is a significant operational issue'.<sup>78</sup>

### ***Through-life-support***

5.61 The 2009 White Paper noted the operational life of the future submarines was anticipated to extend into the 2050s.<sup>79</sup> Rear Admiral Briggs drew attention to the fact that Japan has a continuous build program, which probably drives a lifetime of about 16 years for the Soryu. Thus, while it may be possible to extend the service life of the Soryu for the 20 or 25 years that Australia prefers, the changes may, according to Rear Admiral Briggs, start to impinge on the design and the design philosophy.<sup>80</sup> He noted that most countries have a much longer service life for their submarines.

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76 *Submission 25*, p. 11.

77 *Committee Hansard*, 30 September 2014, p. 29.

78 *Committee Hansard*, 30 September 2014, p. 11.

79 See Appendix 3—Background to SEA 1000 Phase 1A—acquiring Australia's future submarine capability, p. 83.

80 *Committee Hansard*, 30 September 2014, p. 11.

In his assessment, 20, 24 or 28 is the normal operational life of a submarine. He added:

I do not know but I suspect that the 16 years figure is driven by the tempo for the industry to keep the shipyards moving and they have accepted that they will take it out of service earlier than we would normally plan on. That has an effect on the support arrangements. You probably do not choose to modernise to the same degree as you would if you have the submarine running on for another 50 per cent of time to 24 years. So it could have quite a significant impact on the capability. Worse, if you decide that, although it has been designed for 16 years, you are going to run it for 24 years, you are going to find out unpleasant things in the back eight years of that.<sup>81</sup>

5.62 On the matter of the Soryu's shorter life in service, Professor Roos concluded that either Japan needs to change its design philosophy or 'Australia needs to change its operational and sustainment philosophy to ensure compatibility'.<sup>82</sup> Undoubtedly, the shorter operational life of the Soryu is another critical factor when considering it as a suitable starting point for Australia's future submarines.

### ***Crewing arrangements***

5.63 Rear Admiral Briggs and Commodore Roach suggested that the crew component for a Japanese vessel was 65 and for the Australian 58. Rear Admiral Briggs accepted the proposition that the estimated difference in the space per crew member on the Japanese vessel may be 20 per cent to 30 per cent less.<sup>83</sup>

5.64 According to Rear Admiral Briggs, there was sufficient information to calculate precisely the usable volume for crew space. He was of the view that the amount of room per crew member in the Japanese boat would be substantially less than that available to crew in the Collins. He noted that the Soryu had the AIP section added, which normally would be a 10-metre section for the Stirling engines. He estimated that, in fact, the Japanese only lengthened the submarine by two metres, so they have taken eight metres out of somewhere else in the submarine. In his view, one of the most likely candidates would be habitability: that the habitability of the submarine compared to Collins is less—it is denser; people are packed in'.<sup>84</sup> While Rear Admiral Briggs acknowledged that this shortage of space would probably not be an issue on the short patrols, it would be a completely different proposition to having a 10-week patrol.<sup>85</sup> He then detailed some of the facilities available to the crew on a Collins.

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81 *Committee Hansard*, 30 September 2014, p. 13.

82 *Submission 25*, p. 11.

83 *Committee Hansard*, 30 September 2014, p. 15.

84 *Committee Hansard*, 30 September 2014, p. 14.

85 *Committee Hansard*, 30 September 2014, p. 14.

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Collins provides a recreational space—a mess deck where people have meals—that is able to actually take the whole crew. There is nowhere in an Oberon that you can actually get all the crew into one place. If you are working the intensity that submarine crews work—two watches, 12 hours a day plus; 14- and 16-hour days are not untypical—you need somewhere where you can get away from it a little bit and relax. You need some private space. You need your own bunk. You need some locker space to take gear. Probably in the modern submarine you will need an internet inside the submarine—the equivalent of the iTunes Store and Wikipedia available for internal use; you are not going out to the world. All this takes time, space and power.<sup>86</sup>

5.65 According to Rear Admiral Briggs 'ineffective crews make for vulnerable submarines'. He added:

If your crew is not on top of the job, the difference between walking away from this engagement can be a reaction that takes place in the control room measured in seconds. In a submarine-on-submarine engagement, it is a knife fight—the best guy, the quickest guy, walks away from it. That is one impact. The other one which is more easily understood is that you will not retain submariners. People will not go to sea and stay there through a career in a submarine that is very difficult to live in.<sup>87</sup>

5.66 Commodore Greenfield agreed with Rear Admiral Briggs that crew habitability may have been heavily compromised in the Soryu.<sup>88</sup> Professor Roos, who quoted the same number of crew members for the Soryu and Collins, reached the same conclusions that crew habitability and effectiveness on the Soryu would be much worse than the Collins.<sup>89</sup>

5.67 The living and working conditions of Australia's submariners is yet another matter that requires careful consideration when selecting the design of Australia's future submarine. A competitive product definition study would provide the necessary information on facilities for the crew and space, which are fundamental design features, and allow comparison on these important matters.

### *Political dimensions*

5.68 Professor Roos told the committee that Australians could only speculate on the approaches that Australia had made to Japan. He stated, however, that it was important to realise that there was more than one party to be engaged in the dialogue. For example on the political aspects of acquiring the submission. In this regard, he referred to the excellent relationship between Prime Minister Shinzo Abe and

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86 *Committee Hansard*, 30 September 2014, p. 15.

87 *Committee Hansard*, 30 September 2014, p. 15.

88 *Committee Hansard*, 30 September 2014, p. 22.

89 *Submission 25*, p. 11.

Prime Minister Tony Abbott. He then indicated that there was the military aspect and the need to talk to the Japanese navy and their particular interests. Finally, he referred to discussions between DMO and its Japanese equivalent as well as Japanese companies who are the builders of these submarines.<sup>90</sup>

5.69 Mr Dunk concurred with Professor Roos' comments that there were numerous levels and dimensions of engagement between Australia and Japan and not simply the high level political discussions.<sup>91</sup>

### ***Technology transfer and cultural differences***

5.70 In Part I of its report, the committee touched on the problems with the AWD and some of the difficulties with technology transfer. Indeed, Dr Andrew Davies and Dr Mark Thomson, ASPI, recently suggested that the problems with the AWD program were not only to do with low productivity in the Australian shipyards but with 'the translation of the design to the build stage'. They indicated that:

Frequently, drawings had to be redone—up to four times in some cases—when they were found to be unfit for purpose. Given that Navantia had successfully constructed similar vessels in its shipyards at Ferrol, this seems to have been an unanticipated problem, despite spending more than \$200 million on pre-approval studies, including, presumably, a study of the effect of Australian design modifications.<sup>92</sup>

5.71 Dr White similarly highlighted problems with technology transfer and also cited the AWD program, where the Spanish had not previously exported their design. Such problems have proved costly and caused significant delays. The Collins experience shows that the difficulties are not only experienced during the build phase but with through-life maintenance and upgrades.

### ***Experience exporting military technology***

5.72 Commander Owen observed that the Japanese Prime Minister had opened the door only slightly on defence exports, the first one ever to relax the rules. Even so the Japanese have no experience with exporting and supporting overseas construction of their submarines.<sup>93</sup> Indeed, for many decades, Japan has had a policy that severely restricted the export of arms, including technologies that were exclusively related to the design, production and use of arms, regardless of the destination.<sup>94</sup> Recently, Japan has adopted new principles governing the export of arms, which has lifted some of

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90 *Committee Hansard*, 8 October 2014, p. 21.

91 *Committee Hansard*, 8 October 2014, p. 21.

92 ASPI, *The submarine choice; Perspectives on Australia's most complex defence project*, September 2014, p. 39.

93 *Committee Hansard*, 30 September 2014, p. 7.

94 Ministry of Foreign Affairs of Japan, 'Japan's Policies on the Control of Arms Exports', <http://www.mofa.go.jp/un/disarmament/policy/> (accessed 27 October 2014).

the export restrictions and, under certain circumstances, allowing the export of military technologies.<sup>95</sup> One commentator noted, however, that:

The Japanese people still hesitate to embrace the notion of arms sales, as shown by a Kyodo News survey published in March 2014, which found that 66 percent of respondents opposed the relaxation of the old arms export principles. Further, Japanese government agencies do not yet have a mechanism to coordinate with one another in this new field.<sup>96</sup>

5.73 Mr Hamilton-Smith noted the challenges created because Japan has not exported military technology before, especially problems related to through-life support for the future submarines.<sup>97</sup> Dr White similarly referred to Japan's lack of experience in transferring their technology.<sup>98</sup>

5.74 Rear Admiral Briggs and Commodore Roach also raised concerns about the practicalities of establishing a transparent dialogue with Japan, which 'has no established protocols with Australia for the exchange of classified, sensitive technical data'. It seemed to them, that the fact that Japan 'must develop regimes to regulate this dialogue seem to have been ignored'. Furthermore, in their view, it was 'certain that this will be a very protracted process'.<sup>99</sup>

5.75 The transfer of military technology is clearly a new and unfamiliar area of Japanese endeavour and one that should weigh heavily on the minds of Australia's decision-makers when it comes to the future submarines.

### *Cultural differences*

5.76 In addition, Dr White also noted that, in the case of Japan, the transfer of technology could be further complicated by language challenges. He observed that whereas the Europeans now regularly export work in English, the Japanese do not.<sup>100</sup> Rear Admiral Briggs and Commodore Roach also suggested that the cultural differences between European ship and submarine builders had been sufficient to cause significant problems for the Collins class submarine project and the AWD. They surmised that the prospects for difficulties arising from cultural differences with Japan were all too apparent and very real. They were of the view that:

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95 For more detail see, Taisuke Hirose, 'Japan Chair Platform: Japan's New Arms Export Principles: Strengthening U.S.–Japan Relations,' Center for Strategic & International Studies, 14 October 2014.

96 Taisuke Hirose, 'Japan Chair Platform: Japan's New Arms Export Principles: Strengthening U.S.–Japan Relations,' Center for Strategic & International Studies, 14 October 2014.

97 *Committee Hansard*, 14 October 2014, p. 2.

98 *Committee Hansard*, 13 October 2014, p. 30.

99 *Submission 17*, p. 8.

100 *Committee Hansard*, 13 October 2014, p. 30.

To expect to access all relevant technologies during the course of an overseas build of such a complex vessel as a submarine for the initial collaboration with a country, which has no experience in such matters, is extraordinarily ambitious and inherently risky.<sup>101</sup>

## Evolved Soryu

5.77 Professor Roos was of the view that although speculation centred on the existing Soryu class submarines, Australian interest was probably directed at the development of the follow-on class from the Soryu, which is presently five years into its 10-year development phase. In his opinion, it would be impossible to include the Australian requirements into that class development, without putting it five years back in time. He stated further:

It is unlikely that Japan would like to do that, because of the implications it would have for its own defence capability and build cycle. Also, there is no shipyard capability surplus in Japan to do this work, and there is no workforce to do the work if it is going to be above and beyond. In addition to that, as we have seen from the existing media comments, the decision to buy a Japanese submarine will not be made in Canberra—it will be made in Tokyo—and it is highly unlikely that it will be made to a level we are comfortable with, because the IP sits to a great extent in the Japanese companies or the builders, and they have shown no willingness to share it with us, because they believe that would immediately leak to the US, which I think is probably a reasonable assumption.<sup>102</sup>

## Comparing capabilities

5.78 Rear Admiral Sammut, DMO, did not disagree with the view that there was a need to understand that Soryu's surface displacement was indicative of its capabilities. Likewise, he was not disputing Rear Admiral Briggs' testimony or that of others. He did, however, question some of the assumptions being made when comparing the Soryu to the Collins. He indicated that there were several ways to list the displacement of a vessel depending on how it was calculated and presented. For example, he suggested that it could be in a laden state, with weapons and fuel fully embarked and so forth. According to Rear Admiral Sammut, these factors are all part of the calculation for surface displacement and have 'a large bearing on what the dive displacement needs to be as well to ensure the submarine remains in a safe state'.<sup>103</sup> He wanted to make clear that there were many factors involved, but, as a starting point, he mentioned the size considered necessary for the future submarine already existed with the Soryu class. Furthermore, the Soryu's propulsion

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101 *Submission 17*, paragraph 36.

102 *Committee Hansard*, 8 October 2014, p. 16.

103 *Committee Hansard*, 30 September 2014, p. 59. Rear Admiral Sammut is Head, Future Submarine Program, DMO.

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system was a proven main motor that could 'move that mass through the water at about the speeds we think our Future Submarine should move through the water'.<sup>104</sup>

5.79 According to Rear Admiral Sammut, there were 'broader considerations not just about the vessel's maximum speed but its speed of advance and so forth, including range and endurance:

It does get a little bit complex when talking about speed and so forth, but a speed at which a submarine will reach a certain point where it will conduct its operation and the speed at which it will be able to return goes much more to the range and endurance issues than to the size of the main motor.<sup>105</sup>

5.80 He reminded the committee about the extreme complexity of a submarine's main motor and noted that:

To have a proven main motor that would be able to propel the submarine at the speeds that we would require and of the size that we need is a definite advantage in the case of what our submarine cooperation with Japan may reveal. Similarly, the generating capacity of its diesels may be of the right sort of generator capacity that we would need to charge the batteries and so forth.<sup>106</sup>

5.81 Mr King was more forthright in expressing his views on the evidence presented to the committee on the capability of the Soryu. He stated:

Those people are not as informed as us. We are still exploring what it can and cannot do in reality and what we may or may not be able to do collaboratively. We would not be doing this if we were not exploring that very question, and we are not doing it from open source; we are doing it in close collaboration with the Japanese.<sup>107</sup>

5.82 According to Mr King the chance to consider the Soryu was 'a wonderful opportunity to explore whether Japan may be able to cooperate with us on the program, because until now nothing in a MOTS sense was even remotely like it'. He noted that another option under investigation, involved people designing significantly smaller boats, with propulsion trains optimised for those small boats, offering on paper a solution which is larger. He observed, however, that there were more questions about that approach.<sup>108</sup>

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104 *Committee Hansard*, 30 September 2014, p. 60.

105 *Committee Hansard*, 30 September 2014, p. 60.

106 *Committee Hansard*, 30 September 2014, p. 60.

107 *Committee Hansard*, 30 September 2014, p. 61.

108 *Committee Hansard*, 30 September 2014, p. 60.

## Extent of modifications

5.83 Rear Admiral Briggs contended that significant modifications would be required if Australia purchased a Japanese vessel and wanted to achieve the sort of indiscretion rates that Navy were used to. He stated that to achieve the required rates, the generating capacity in the submarine would need to be increased. To do so, means that an extra length would need to be added. He then explained:

...since the submarine is already at the length-to-beam ratio that is stretched as far as it can go, you would have to then actually make the pressure hull diameter bigger. At that point you have progressed a long way from a Soryu off the shelf.<sup>109</sup>

5.84 Overall, Rear Admiral Briggs argued that the future submarine would be as good as a new submarine—it will start from that basis, which, he suggested, was 'a perfectly sensible way of doing it'. He explained that the sort of fuel, the range capacity and the generating capacity would be significant additional requirements essentially requiring a new submarine:

....A submarine is an underwater airship. It floats underwater. If you add something, either you have to take weight out or you have to make it bigger otherwise it will not float. When you start making it bigger, you can add sections. This has already been done to this submarine [Soryu]. This submarine has already been stretched. It has had an AIP section put in it. When you come to adding new length, a very long, thin shape is very inefficient. A very fat shape is inefficient. In the middle there is a sweet spot. So you have a restriction on how long you can make it before you have to start increasing the pressure hull. This submarine is on that margin. So you are looking at a larger diameter pressure hull than the current submarine has.<sup>110</sup>

5.85 Despite the concerns raised about the Soryu's capability in respect of it meeting Australian requirements, a number of witnesses still regarded it as worthy of consideration as a candidate. This opinion was in keeping with the generally accepted view that the future submarines would require a modified design to meet Australian requirements. Dr White applauded the initiative of the government exploring the capability of the submarine from Japan. In his view:

It is one of the options; it deserves to be explored; it should be explored. It should be put into the mix with well-known other submarine designs, realising, as well, that most of those other submarine designers and builders have really long experience of how to transfer their technology. In the case of the Japanese, that is clearly not the case. So there are some apples and oranges to be compared here. Frankly, the only way you are going to do that is over an extended period of time. You cannot afford to just go down

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109 *Committee Hansard*, 30 September 2014, p. 14.

110 *Committee Hansard*, 30 September 2014, p. 13.



the path with one; you need to take two or three down the path so that at all times you have competition and you have a fall-back.<sup>111</sup>

5.86 Ultimately, as Rear Admiral Briggs pointed out—the 'starting point is that there is no point in buying something that does not do the job':

There is no point spending any money on a submarine that does not do what you need it to do. You have to modify and extend to get a new Collins-like capability. Buying an off-the-shelf submarine with a 6,000-mile range would be worse than a waste of money; it would be an illusion. You will think you have submarine capability and the day you want to use it you will find that it cannot get there or stay there and do the job.<sup>112</sup>

## Conclusion

5.87 Witnesses agreed unanimously that there was no off-the-shelf submarine currently in production that would meet Australia's requirements. Despite claims about the Japanese submarine, a number of witnesses expressed strong reservations about transferring this technology to Australia.

5.88 Their concerns ranged across a number of the submarine's features as well as the practical difficulties that may be encountered with modifications and technology transfer. The key concerns related to the uncertainty about the submarine's capability compared to the Collins: that in fact the Soryu may not even match Collins' capability let alone provide an enhanced capability as the future submarine is supposed to do.

5.89 Thus, there were concerns about the extent to which the Soryu may have to be modified in order to meet Australia's requirements for its future submarine fleet. Indeed, Professor Roos was of the view that Australian interest was probably directed at the development of the follow-on class from the Soryu, which is presently five years into its 10-year development phase.

5.90 The integration of the combat system was also a source of great concern as was Japan's inexperience in the export of military technology and less than enthusiastic support for Japan's change in policy with regard to lifting its restrictions on such exports.

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111 *Committee Hansard*, 13 October 2014, p. 30.

112 *Committee Hansard*, 30 September 2014, p. 13.

