British Pugwash conferences on science and world affairs

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Julian Borger: Trident submarines: will its successor be obsolete by the time it arrives?

Development of underwater surveillance:

Julian Borger pointed out that this is a complex subject and he makes no claim to expertise in the technologies discussed. He aimed to provide a survey of what is out there and the implications for the Trident debate.

He gave an account of his visit to the Italian naval base of La Spezia where the NATO Centre for Maritime Research and Experimentation is developing various kinds of underwater robots, drones and gliders for anti-submarine warfare. These were originally designed for ocean survey work and have been repurposed to track submarines though they are powered by batteries that eventually die. The gliders however sweep up and down in the ocean currents and use changing pressure to generate the small amount of electric power required to run them so that they can remain at sea for months. These drones and gliders, which cost a fraction of the price of a manned submarine, could operate as a swarm if they could get the robots to communicate with each other, potentially covering great swathes of ocean.

Other major powers – including China, Russia, the USA and UK – are also doing work under secrecy of the same kind as is being done at La Spezia. All this work, a US commander at La Spezia argued, would eventually tilt the strategic balance in underwater warfare against submarines.

Implications for Trident:

The US commander also stressed that the underwater surveillance technology for now is mostly applicable for shallow water, but it would be completely applicable in deep blue water where the ballistic missile submarines operate. This applicability is a function of communications through water and the transparency of the oceans. There are huge challenges, which is why submarines remain a stealth weapon but this stealth is being chipped away from multiple directions, including by the US, Russia and China that we know of. What they all have in common is that they pick up the tiny traces produced by submarines – sonar, magnetic, anti-neutrinos produced by nuclear reactor cores, and the underwater wake left by submarines. Researchers are using big data techniques and computer capacity to interpret those traces and work away at the opacity of the oceans.

At the same time there is also the rise of cyberwarfare which poses a whole new range of threats to the effectiveness of the nuclear deterrent. There is the possibility of spoofing attacks – disrupting communications between subs and land. It has been found that the 'air gapping' of the computer systems in nuclear submarines' command and control systems does not necessarily protect against hacking. There is also the prospect of malware being introduced into the original hardware – and submarines are unable to certify that 100 per cent of the hardware on board is free of malware.

When nuclear subs surface and return to port they load up patches to their software. Each time they do this there is a moment of vulnerability when malware might be introduced into

the software. Submarine manufacturers have ceased to use common software such as Windows – it is so widely used that there is more malware that targets it.

Arguably, not all of the above are yet actual threats to the stealth of submarines – it would need a [further] leap for them to become vulnerable, and this is not a one-sided race – counter measures are now being produced.

A judgement has to be made on where these technologies will be in 2030s when the Trident successor will be deployed. This is an impossible judgement to make and creates an uncertain environment to launch a £30bn gamble on the project. How should these many wild cards affect the Trident debate?
There are two ways:
1 Whether to invest in a nuclear deterrent at all?
2 If we are going to have a nuclear deterrent, what kind should it be?

Borger can't see it having much impact – it is hard to imagine how the stealth of the submarine-based deterrent would be compromised to the point where it would be more vulnerable than land- or air-based systems.

Whatever the impact of the new technologies summarised, the changes outlined threaten to change what was a stable deterrent into an unstable one. As long as Trident is continuously operational, and there is reasonable certainty that the submarines can't be found, then there is no good time to stage an all-out attack on the UK. If successor subs become visible for brief periods of time and they are spotted by the anti-sub technology of an adversary that, in a time of crisis, could provide the incentive to strike in an available window.

Borger does not know the answer to the question in the title of this discussion meeting, 'Trident submarines: will its successor be obsolete by the time it arrives?' but the inability to answer that question changes the nature of the debate – or ought to – and changes the nature and stability of the Trident deterrent.

Julian Borger is the World Affairs correspondent for the *Guardian*.
Listen to the Q&A that followed on the video of the talk.