Trident missile failure: just how safe is the UK's nuclear deterrent?

Image of HMS Vengeance returning to HMNB Clyde, after completing Operational Sea Training. The trials were conducted in Scottish exercise areas.
HMS Vengeance is the fourth and final Vanguard-class submarine of the Royal Navy. Vengeance carries the Trident ballistic missile, the UK's nuclear deterrent.

by Robert J Downes, *King's College London*

The Sunday Times has caused a furore by reporting that a 2016 test of the UK's submarine-borne strategic nuclear deterrent ended in failure. After the submarine HMS Vengeance returned to sea following a £350M refit, it tested a Trident-II D-5 missile off the coast of Florida. Immediately after launch, the unarmed missile reportedly veered off course and flew towards the US mainland rather than following its planned trajectory towards a sea target near West Africa.

Details of the technical aspects of the failure have not been released for reasons of national security, and aren't likely to be. But the political fallout has already begun.

Confronted with the revelations on live television, the UK's prime minister, Theresa May, initially refused to confirm whether she was made aware of the incident before a crucial House of Commons vote a month later which confirmed the renewal of the submarines that carry the deterrent. However, Downing Street later confirmed that she was indeed informed

before the vote was held.

As May and her government try to take control of the story, the crucial question for the British people is whether they should continue to share Theresa May's "absolute faith" in the Trident-II missile following this event.

The UK's strategic deterrent

Under the banner of Operation Relentless, the UK has maintained a posture of "continuous at sea deterrence" (CASD) since 1969. In practice, this means that for the last 48 years, at least one British submarine carrying nuclear-tipped ballistic missiles has been on patrol in the Atlantic Ocean at all times. The posture is meant to deter "the most extreme threats to our national security and way of life" by ensuring that any nuclear attack on the UK can be met with a credible retaliatory nuclear strike.

The UK has had two classes of nuclear-powered submarine capable of carrying nuclear-tipped ballistic missiles (SSBNs): four Resolution class SSBNs, which patrolled from 1969 until 1996, and their successors, the four Vanguard class SSBNs, which have patrolled since 1993.

At any one time, one SSBN is on patrol providing the strategic deterrent, one is recovering from the previous patrol, one is preparing to depart for patrol, and one is in refit. This amounts to a minimum nuclear deterrent posture, putatively providing a credible nuclear deterrent with the smallest possible number of submarines and warheads, and therefore at the lowest practicable expense.

The Vanguard class SSBNs are equipped with 16 missile tubes that carry the Trident-II D-5 missile, built to deliver British-produced warheads with an explosive yield the equivalent of eight Hiroshima bombs. These missiles carry Multiple Independently Targetable Re-entry Vehicle (MIRV)

payloads, and each missile is believed to be capable of delivering three warheads, each with around a 100-kiloton yield. In 2010, the British government decided to limit the number of missiles to eight, with a maximum of 40 warheads carried on each SSBN.

While devastating compared with conventional weapons, the Trident-II missiles carry nuclear warheads that are significantly less powerful than those of other nuclear weapons deployed in the past. As a result, today's nuclear weapons are designed with high-precision guidance systems, unlike their forebears.

Should we be concerned?

When the test failed in June 2016, HMS Vengeance was engaged in a Demonstration and Shakedown Operation, a requirement for returning to service following an extensive 40-month refit that culminates in the launch of an unarmed Trident-II D-5 missile. These operations are tests of the submarine and its crew, but are also meant to demonstrate to the UK's allies and adversaries that its strategic deterrent is credible.

While a government spokesperson reported that Vengeance's crew were themselves tested successfully, the missile's failure is a serious problem for the demonstration of credibility aspect of the test. Because of the high cost of launch, the UK doesn't get many chances to mount these demonstrations; what's more, the last successful demonstration, conducted by HMS Vigilant in 2012, was closely observed by both allies and adversaries, particularly because it was expected to be the last such test before the UK government's "Main Gate" decision to renew the deterrent.

The success of that test and the huge parliamentary majority at the 2016 vote were meant to set a smooth path to renewing the deterrent. Now it's been established that not just the government but the Prime Minister herself were aware that the

Vengeance test had failed, the issue of renewal is suddenly live again.

This isn't just a domestic matter. While the UK does produce its own warheads, it does not manufacture its own missiles. Under contract from the US Government, defence company Lockheed Martin produces the Trident-II D-5 missiles, which are placed into a "common pool" shared by both the UK and US. A missile failure therefore has serious implications for the credibility of the US's submarine-borne deterrent as well as the UK's.

Ultimately, though, this is the first publicly recorded failure of a Trident-II D-5 missile since 1989, as opposed to the more than 160 successful launches carried out since then. So while academics and journalists have rightly drawn attention to safety and security concerns about nuclear weapons, our worries should be taken alongside all the information we have.

Missiles are highly complicated pieces of technology, and we still don't know why or how this one failed. Without more information, no one should jump to conclusions.

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