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Malcolm Chalmers and Cristina Varriale



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# Executive Summary

This paper assesses how nuclear threats to the UK might develop over the next 30 years.

Nuclear threats to the UK could emerge, during this time period, in the context of an armed conflict between the UK and a state that has the ability to threaten the UK with nuclear attack. Both of the most plausible scenarios for such a conflict relate to the UK's projection of conventional military power. First, there are potential threats to the UK homeland and deployed forces that could emerge as a result of the fulfilment of the UK's collective security obligations in defence of treaty allies. Second, nuclear threats could emerge as a result of military involvement in regional conflicts in defence of other UK and allied interests, for example in the Middle East or Northeast Asia.

In both cases, an opponent might seek to manipulate the possibility that it might launch a nuclear attack on the UK in order to deter or coerce it into changing its behaviour, for example by desisting from any conventional military action. Nuclear threats could include the possibility of attacks on UK deployed forces, seeking to weaken their operational effectiveness. However, the central strategic threat would be the possibility of an attack on the UK homeland itself. An opponent could also launch demonstration nuclear strikes in order to convince British leaders of the seriousness of its intent.

**Russia** is the primary source of potential nuclear risk to the UK, and will continue to be for the foreseeable future. Its nuclear forces have the range and capabilities for conducting a large-scale attack on NATO, including the UK. Short of a radical improvement in political relations between Russia and NATO, both sides will continue to structure their military preparations around the possibility that they might find themselves in conflict in the future. As recent events have made clear, Russia and the Western states continue to have fundamentally different concepts of European order, which in turn increases the potential for misunderstanding and conflict. As a result of the UK's longstanding NATO treaty obligations, as well as its growing commitment of capabilities to the defence of exposed states in Eastern Europe, the UK is likely to be involved militarily should Russia miscalculate and attack a NATO member state. The possibility for conflict with Russia could also arise as a result of disputed strategic interests outside Europe, for example in Syria. Any such conflict, even if initially limited to the conventional level, could substantially increase the risks of nuclear threats being made against the UK and its allies.

After Russia, **China** is the only other potentially hostile power which possesses a reliable capability to attack the UK with nuclear weapons. Its capability to do so is limited at present, amounting to some 44 strategic missiles capable of reaching the continental US, some of which could also, in principle, be used to threaten the UK. The risk of such a threat might grow if the extent of UK security commitments in the Asia-Pacific region increases, alongside a further deterioration in relations between the US and China. There could also be increased potential for

conflict with China after 2030 if China develops to become a major military competitor in other parts of the world where the UK has interests, for example in the Mediterranean or the Middle East. It is possible that China might then use its nuclear force to coerce other powers, such as the UK, to stay out of its bilateral quarrels with the US. This is more plausible in a 30-year time frame and less so in the near to medium term (to 2030).

**North Korea** currently has no proven capability for striking the UK with nuclear weapons. On current trajectories, however, it appears to be on course to develop a nuclear-armed intercontinental ballistic missile (ICBM) that could reach the continental US, as well as Europe, by the mid-2020s. While this initial capability is likely to be unreliable, inaccurate and limited in scale at first, it could grow quite rapidly in the subsequent decade. While it is difficult to foresee a situation in which North Korea would have an interest in striking the UK – given the country’s penchant for bombastic nuclear threats against the US – it is possible that at some stage after it acquires an ICBM capability, Pyongyang could use the same sort of rhetoric with reference to the UK. North Korea could, for example, seek to use its force to help deter the UK from taking part in military operations against its interests.

The nuclear deal with **Iran**, signed in July 2015, has substantially reduced the probability of a nuclear threat to the UK emerging over the next decade from Iran. The Joint Comprehensive Plan of Action has sharply reduced the size of Iran’s stock of fissile material, and improved monitoring across the whole Iranian nuclear cycle. The longer Iran abstains from active weapon design work, moreover, the harder it will be to reconstitute. Yet the extremely high level of instability in Iran’s region could, during the next decades, lead to a recalculation of Iran’s current policy, and potentially reopen the question of a nuclear capability. Preventing Iran from taking such a path is likely to continue to depend on the perception that the costs of breakout would be too great to bear. Iran’s active pursuit of longer-range ballistic missile capabilities suggests it continues to hedge. If Iran were to acquire a fully operational nuclear missile capability, breaking out of the Nuclear Non-Proliferation Treaty (NPT), it could add a significant new nuclear risk to the UK and its NATO allies.

The relationship between **India and Pakistan** has frequently been considered as presenting the greatest risk of nuclear war, with far-reaching implications for global security and development if it were to take place. Yet this is unlikely to involve a direct threat against the UK itself.

By 2030, **India** may well have the capability to hold targets at risk in the UK and the rest of Western Europe. It is unlikely that this would be a source of significant strategic concern for the UK.

There is little indication that **Pakistan** is seeking the capability for attacking targets outside the subcontinent. The development of a nuclear threat to the UK, moreover, would require a fundamental shift in Pakistan’s strategic orientation, in a direction which would greatly increase the country’s vulnerability to external economic and military pressure. Given the improbability of this combination of events, the possibility that Pakistan will pose a nuclear threat to the UK is likely to remain very low over the next 30 years.

The 1970 NPT has played a key role in stemming the growth in the number of states with nuclear weapons. Since its inception, only an additional four states have acquired nuclear arsenals, two of which (India and Israel) already had advanced nuclear weapons programmes. In the aftermath of the 2015 Iran nuclear deal, **no states that do not already have nuclear weapons are currently believed to be pursuing such a capability. This is the first time that this has been the case since the 1940s.**

Yet the prospects of **further nuclear arms reductions for existing nuclear-armed states**, at either a bilateral or multilateral level, now depend primarily on some lessening of current tensions between Russia and the US. In its absence, it is hard to see much progress being made on reductions in the size of strategic arsenals on either side, or in reaching any mutual agreement on limitations of other strategic systems (for example missile defences).



# Future Nuclear Threats to the UK

**T**HERE HAS BEEN an ongoing debate on whether the UK should continue to maintain a nuclear weapons capability and what form this capability should take. The main decision to replace the existing Trident-armed *Vanguard*-class submarines was taken in Parliament in March 2007, with the Labour government winning the vote by 409 to 161, with 77 not voting. The House of Commons reaffirmed this decision on 18 July 2016, with the Conservative government gaining approval to proceed with the programme by a margin of 472 to 117, with 61 not voting.

Supporters of this decision, including the current government, argue that the existence of potential nuclear threats from other states necessitates the entry into service of a new generation of four ballistic missile submarines (SSBNs), starting in the early 2030s. Critics variously argue that threats to the UK are overstated, that nuclear modernisation plans are not compatible with the UK's commitments under the Nuclear Non-Proliferation Treaty (NPT), and that the government should spend resources on other purposes (including conventional defence) instead.

What is clear is that conducting a threat assessment that is relevant to the renewal decision cannot only focus on short-term concerns. On current plans, the first of the new generation of SSBNs is not due to enter into service until the early 2030s, with the fourth submarine not due until around 2040. The mid-point of their service lifetime, therefore, could be in the mid-2050s, four decades from now.<sup>1</sup> This paper focuses on possible developments between now and the mid-2040s, the timeframe also used by the Ministry of Defence's (MoD) Development, Concepts and Doctrine Centre (DCDC) in its publication *Global Strategic Trends*.<sup>2</sup>

## What 'Most Extreme' Threats Could the UK Face?

The government bases its case for a UK nuclear arsenal on the need 'to deter the most extreme threats to our national security and way of life, helping to guarantee our security, and that of our allies'.<sup>3</sup> At the heart of this role is the requirement to deter possible future threats of nuclear attack on the UK homeland.

The most plausible circumstances in which such a threat could develop would be in a scenario in which the UK is involved in a military confrontation with a hostile nuclear-armed state in another

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1. Assuming an average service lifetime of 40 years (the projected lifespan of the *Vanguard* class) and a median in-service date of 2037.
  2. MoD DCDC, 'Global Strategic Trends – Out to 2045', 5<sup>th</sup> edition, June 2014.
  3. HM Government, *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*, Cm 9161 (London: The Stationery Office, November 2015), p. 34.

part of the world, and this opponent then threatens nuclear escalation, including against the UK homeland, in order to achieve its objectives. As the 2015 *National Security Strategy and Strategic Defence and Security Review* (SDSR) argues: 'Although it is unlikely that there will be a direct military threat to the UK itself, there is a greater possibility of international military crises drawing in the UK, including through our treaty obligations'.<sup>4</sup>

An 'extreme threat' could also take on a non-nuclear form, for example through catastrophic biological, cyber or other novel strategic technologies that could create an effect similar in severity to a nuclear attack. Space, together with the complexity of the issues involved, forbids further detailed consideration of these options in this paper.

The paper will also discuss the possible impact of future disarmament agreements and norms in shaping the nature of future nuclear threats to the UK. Over the past 45 years, the NPT has played an important role in slowing the growth in the number of nuclear-armed states, and it is likely that the norms that the treaty has helped to perpetuate will continue to play an important role.<sup>5</sup>

## UK Interests

The historical reasoning for the creation of the UK's nuclear force lies in the context of the summer of 1940, with the threat of a conventionally superior – and possibly nuclear-armed – enemy power in full control of the adjacent European landmass. Even after the defeat of Nazi Germany, there remained a real prospect that such a threat might emerge given the presence of large, nuclear-armed Soviet forces in Central Europe.

The threat of continental hegemony no longer exists. Democracy and liberal values are deeply embedded in all major powers of Western Europe. Even if a right-wing populist party were to be elected in any of these countries, there is no significant political constituency for territorial revisionism.

Yet nuclear threats to the UK could still emerge in the context of an armed conflict between the UK and a state with the ability to threaten the UK with nuclear attack. Both of the most plausible scenarios for such conflict relate to the UK's projection of conventional military power. First, potential threats to the UK homeland and deployed forces could emerge as a result of the fulfilment of collective security obligations in defence of treaty allies. Second, nuclear threats could emerge following military involvement in regional conflicts in defence of other UK and allied interests, for example in the Middle East or Northeast Asia.

In both cases, an opponent might seek to manipulate the possibility that it could launch a nuclear attack on the UK in order to deter or compel certain behaviour by the UK, for example by persuading it to desist from any conventional military action. Nuclear threats could include the possibility of attacks on UK deployed forces, seeking to weaken their operational effectiveness. But the central strategic threat would be the possibility of an attack on the UK homeland itself. An

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4. *Ibid.*, p. 85.

5. William Walker, *Perpetual Menace: Nuclear Weapons and International Order* (Abingdon and New York, NY: Routledge, 2012).

opponent could also launch demonstration nuclear strikes – for example, using a small number of weapons against UK overseas bases, while avoiding the targeting of population centres – in order to convince British leaders of the seriousness of its intent.

Threats to the UK in such scenarios would not be a result of the UK being itself a nuclear-armed state. Nor would they cease to exist if the UK no longer possessed nuclear weapons. Rather, such threats would be in response to UK involvement in the projection of military power in ways that threatened the interests of another nuclear-armed state.

Any assessment of the nuclear threats the UK might face over the next three decades therefore necessarily depends on some broad assumptions as to the UK's future strategic posture.

In the wake of its decision to leave the EU, uncertainty over the UK's longer-term strategic orientation has grown. The most likely scenario remains a continuing commitment to be a major power, with global reach and influence. Accordingly, it is also likely that the UK will continue to contribute to the provision of security guarantees to regional partners, for example in the Middle East and Northeast Asia. If this does turn out to be the UK's approach, the risks relating to a conflict with a nuclear-armed state – arising from London's international commitments – will need to be taken into account in shaping the country's deterrence policy.

The possession of nuclear weapons by potential opponents will affect how the UK and its allies behave in a crisis involving those states. The Western powers would, almost certainly, not have launched an invasion of Iraq in 2003 if Saddam Hussein had been in possession of an operational nuclear arsenal. Nor would they have attacked Libya in 2011 if Qadhafi had succeeded in acquiring his own nuclear weapons. The probable existence of a North Korean nuclear capability may have helped to deter offensive action by the US in recent years.

While this does not mean conflict with such states is impossible, it does mean that the UK and its allies would each have to be convinced that their stakes in such a conflict were sufficiently important to justify any escalatory risks it might involve. The extent of such risks might be reduced by the possession of nuclear weapons by the UK and its allies. But nuclear weapons in the hands of opposing states do not simply cancel each other out. Instead, they add further complexity to a crisis, especially when some nuclear-armed states are determined to demonstrate they are more prepared to take risks than their opponents.

## **Mapping the Threat**

An assessment of the most extreme threats that the UK could face needs to be grounded in an assessment of both the technological and the strategic dimensions of possible future threats. The main actors who could potentially pose such a threat are states.

## A Note on Non-State Actors

It is possible that a state could seek to threaten the UK by supplying an allied non-state actor with nuclear weapons, perhaps in order to benefit from its comparative advantage in covert delivery. In such cases, however, the UK would assume that this was simply another form of state-authorized delivery and respond accordingly.

This paper does not consider cases in which non-state actors obtain, and threaten to use, a nuclear weapon against the UK without state support. There are no recorded cases of this happening and the technical challenges involved remain considerable, especially in relation to accessing fissile material. Significant international efforts have been made to further reduce the risks of terrorist acquisition – and more are needed. The continuing strength and growing sophistication of non-state actors (Daesh, also known as the Islamic State of Iraq and Syria, or ISIS, being the latest example) could in principle create conditions in the future where such groups might acquire a useable capability for radiological terrorism and perhaps even for nuclear detonations.<sup>6</sup> However, where the non-state actor lacks any relationship to a territorially defined state, such a threat is not relevant to the debate on the possible future roles of the UK nuclear force.

## Potential Threats to the UK

In addition to the UK itself, there are eight other states with the ability to use nuclear weapons: the US; Russia; France; China; Israel; India; Pakistan; and North Korea. Four of these states are known to possess the ability to attack the UK: the US; France; Russia; and China.

The US and France can be ruled out as posing possible nuclear threats to the UK. There will continue to be some conflicts in which the interests of the three leading Western military powers diverge; an adversary might believe that the mutual security guarantees between the three might not be fulfilled if such a situation emerges. It is also possible that, over a 30-year timeframe, the domestic politics of any of the three could diminish the credibility of their alliance. Even in such a situation, however, neither the US nor France would pose a direct military threat to the UK.

Although it neither confirms nor denies it has a nuclear arsenal, it is generally believed that **Israel** has possessed an independent nuclear force since the late 1960s.<sup>7</sup> It refuses to sign the NPT as a non-nuclear weapon state, one of only three countries – along with India and Pakistan – to continue to do so. A recent study estimates that Israel now has a stockpile of around 80 warheads, with delivery means including some 25 mobile land-based Jericho missiles, a couple

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6. Matthew Bunn et al., 'Preventing Nuclear Terrorism: Continuous Improvement or Dangerous Decline', Belfer Center for Science and International Affairs, March 2016. For a critique of pessimistic views of the probability of nuclear terrorism, see John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al-Qaeda* (New York, NY: Oxford University Press, 2010), pp. 181–98.

7. For a comprehensive history, see Avner Cohen, *The Worst Kept Secret: Israel's Bargain with the Bomb* (New York, NY: Columbia University Press, 2010).

of squadrons of aircraft and perhaps a small number of submarine-launched cruise missiles.<sup>8</sup> There is little evidence to suggest that it is seeking to produce additional fissile material or to substantially increase the size of its arsenal. It has, however, conducted several tests of an intermediate-range ballistic missile, the Jericho III, with an estimated range of perhaps 4,000–5,000 km.<sup>9</sup> It may therefore already possess a capability to target most of western Russia and Europe.<sup>10</sup>

The probability of further significant conflicts between Israel and its neighbours during the next three decades is high and Israel is likely to retain a nuclear arsenal as an ultimate deterrent against invasion or nuclear blackmail. The UK and Israel, moreover, do not always agree on the best approach to issues of regional security. Yet it remains very hard to imagine strategic circumstances in which the UK and Israel would find themselves in direct armed conflict with each other. The possession of a nuclear force by Israel, therefore, is unlikely to pose an extreme threat to the UK during the next 30 years.

**This leaves two states – Russia and, to a much more limited extent, China – that currently possess the capability to threaten the UK with a nuclear strike, and three states with nuclear programmes that could possess the capability in the future – India, Pakistan and North Korea.**

In order to be added to this list, other states would need to acquire the fissile material and technologies necessary for the manufacture of nuclear devices, as well as delivery systems that would be able to achieve the long ranges that would be required to attack the UK. At present, ballistic missiles are the primary delivery vehicle used for long-range nuclear strike systems. This is the case for the three Western nuclear powers, as well as for Russia and China. The US and Russia also have long-range strategic bombers, but no other state appears to be seeking this capability.

Over the three decades to 2045, there are likely to be significant developments in capabilities for defence against long-range ballistic missiles, with a growing number of countries – including the US, Russia, China and India – investing substantial amounts in this area. These investments could, over time, undermine the credibility of small nuclear arsenals based on ballistic missiles, overpowering the technical and/or economic ability of weak nuclear states (such as North Korea) to invest rapidly enough in countermeasures. The nuclear arsenals of weak states will, however, continue to provide significant deterrent potential even when their operational effectiveness is far from assured.

In contrast, at least over the next decade (to 2025), both China and Russia are likely to devote substantial resources to retaining the capability to overwhelm deployed US missile defences

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8. Hans M Kristensen and Robert S Norris, 'Israeli Nuclear Weapons, 2014', *Bulletin of the Atomic Scientists* (Vol. 70, No. 6, 2014), pp. 97–115. Kristensen and Norris argue that other estimates, which range up to a total arsenal of more than 400, are less credible.

9. *Ibid.*, p. 107. Estimates of the range for Jericho III continue to vary widely.

10. Alon Ben-David, 'Israel Tests Enhanced Ballistic Missile', *Aviation Week and Space Technology*, 29 July 2013.

through a wide range of new investments. Beyond this timeframe, the deployment of conventional strategic capabilities – including missile defences and conventional strike systems, but possibly also strategic anti-submarine warfare capabilities – is likely to play an increasingly important role in shaping the deterrent credibility of most of the world's nuclear forces.

## Potential Future Nuclear Threats to the UK: Countries that Pose Zero or Very Low Risk

As a result of the Iran nuclear deal, no states that do not already have nuclear weapons are currently believed to be pursuing such a capability. This is the first time that this has been the case since the 1940s.

**Several key US allies in East Asia, notably Japan, South Korea and Taiwan, have the technological capability to build nuclear weapons within a decade or less, should they make the political decision to do so.<sup>11</sup>** Strong US alliance relationships, underpinned by the presence of US troops, have reduced the incentive to acquire a national nuclear weapons capability. All three states also recognise the considerable reputational risks that would be involved in leaving the international nuclear non-proliferation regime, including the probability of a severe rift in relations with the US.

Yet these circumstances could change. The changing balance of power between the US and China could, over the next three decades, weaken the credibility of extended deterrence guarantees from the US to its allies in East Asia. This process could be accelerated if future US administrations were to become more sympathetic to nuclear acquisition by these key allies (as Donald Trump, the Republican candidate for the 2016 presidential election, has indicated).<sup>12</sup> Even in the absence of a change in US policy, Japan's growing assertiveness in the face of growing Chinese power might, perhaps in response to a new crisis, tip it into a decision to go nuclear. Such a step might lead South Korea to follow suit, if it had not already done so.

Even if Japan and South Korea were to acquire nuclear weapons during the next 30 years, such a development would be highly unlikely to pose a direct threat to the UK. The primary strategic concern of both countries would continue to be regional, probably focused on China's growing power and the unpredictable behaviour of nuclear-armed North Korea. It is unlikely either would have a requirement to build the long-range nuclear delivery systems needed to reach Europe or the US. Taken together with the continuing strength of relationships between these two states and the UK, and the absence of plausible sources of strategic friction, **neither state is assessed to be a possible nuclear threat to the UK over the next three decades.**

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11. For an assessment of these two cases, see Etel Solinger, 'The Perils of Prediction: Japan's Once and Future Status' and Scott Snyder, 'South Korean Nuclear Decision-Making', in William Potter with Gaukhar Mukhatzhanova (eds), *Forecasting Nuclear Proliferation in the 21st Century. Vol. 2* (Redwood City, CA: Stanford University Press, 2010). For the Taiwan case, see Monte Bullard and Jing-dong Yuan, 'Taiwan and Nuclear Weaponisation: Incentives versus Disincentives', in Potter with Mukhatzhanova, *Forecasting Nuclear Proliferation in the 21st Century*, pp. 182–204.

12. Demetri Sevastopulo, 'Donald Trump Open to Japan and South Korea Having Nuclear Weapons', *Financial Times*, 27 March 2016.

The possibility of a nuclear threat to the UK emerging from **Latin America, Southeast Asia or sub-Saharan Africa** before 2045 appears to be low. All three regions have their own separate nuclear weapon-free zones and there is no evidence that any of the states in these regions – all of which are non-nuclear NPT signatories – are actively pursuing nuclear weapons.

The most plausible candidate is **Brazil**, now the world's ninth largest economy and the biggest country (in GDP terms) without nuclear weapons or membership of a nuclear alliance.<sup>13</sup> Under the old military regime, it continued to seek a nuclear weapons capability until the 1980s. The country did not join the NPT until 1998, well after the end of military rule.<sup>14</sup> It still maintains a significant capability for uranium enrichment (the only state in these three regions) and (along with Iran, Germany, the Netherlands and Japan) is one of only four non-nuclear NPT signatories with such a capability. Brazil could produce significant quantities of weapons-grade uranium within a short period of time if it chose to do so. However, it is difficult to imagine how it could be in the country's strategic interests to take such a step. Its primary external security concerns are regional, with a particular focus on sub-state threats (especially from organised crime). Levels of proxy conflict between the major global powers in the region are lower than in the past and show few signs of being revived. In order to provide a credible deterrent against other nuclear powers, moreover, Brazil would have to develop a delivery programme from scratch (it has no indigenous ballistic missile or space programme with a capable launch vehicle).<sup>15</sup> Moreover, even in the unlikely event that Brazil was to take this road, it is hard to imagine circumstances in which its strategic interests clashed fundamentally with those of the UK or its main allies.

**The possibility of conflict between the UK and Argentina** is higher, as a result of their continuing sovereignty dispute over the Falkland Islands. Conversely, Argentina's capability to develop nuclear weapons remains limited, and it has only demonstrated a very limited enrichment capability in the past. There is little evidence of any active interest in a nuclear weapons programme, the defence budget remains limited and the political costs incurred by initiating such a programme would be considerable.<sup>16</sup> The probability of Argentina posing a nuclear threat to the UK over the next 30 years is therefore extremely low.

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13. World Bank, 'World Development Indicators 2015', <[databank.worldbank.org/data/download/GDP.pdf](http://databank.worldbank.org/data/download/GDP.pdf)>, accessed 14 July 2016. Japan, Germany and Italy have larger economies, but all have nuclear alliances with the US.

14. GlobalSecurity.org, 'Nuclear Weapons Programs', <<http://www.globalsecurity.org/wmd/world/brazil/nuke.htm>>, accessed 13 July 2016.

15. James Clay Moltz, 'Brazil's Space Program: Dreaming With Its Feet on the Ground', *Space Policy* (Vol. 33, August 2015), p. 16.

16. For a comprehensive overview on both the Argentine and Brazilian programmes, see TV Paul, *Power Versus Prudence: Why Nations Forgo Nuclear Weapons* (Montreal: McGill-Queens University Press, 2000).

## Potential Future Nuclear Threats to the UK: Countries that Deserve more Detailed Consideration

There are **four further states that could, in principle, decide to build a capability for long-range nuclear strike against the UK by 2045: North Korea; Iran; India; and Pakistan**. After looking at Russia and China, the potential threat that these countries could pose to the UK is considered below in turn.

In each case, the analysis starts with a qualitative assessment of the circumstances in which the UK might find itself in conflict with the country in question. It then discusses how the nuclear weapons capabilities of these states might develop over the next decades. In order to acquire a capability that could threaten the UK, a country must develop both the nuclear weapons themselves and long-range delivery options. While the production of fissile material is a mature technology, as is the design of nuclear warheads, key international regimes – notably the NPT, the norm against testing established by the Comprehensive Nuclear-Test-Ban Treaty (CTBT), and strong export controls – do make it more difficult, and costly, for states to make the technical advances required.<sup>17</sup>

The delivery vehicle of choice for nuclear weapons remains ballistic missiles. Although seven of the nine nuclear-armed states also have an air-based nuclear capability (the UK and China are the two exceptions), their primary capability for long-range nuclear attack is now the ballistic missile. At extended ranges, aircraft and cruise missiles become increasingly vulnerable to enemy defences, the suppression of which would require a substantial investment in capabilities for overcoming those defences. The ability of ballistic missiles to overcome possible defences, by contrast, increases with range. In the absence of a step change in the UK's ability to defend itself against long-range ballistic missile attack, an opponent in possession of such a capability is likely to be able to hold the UK at risk through most of this period.

It is also possible, in principle, that an opponent could explore covert delivery methods. During the Cold War, the Soviet Union is believed to have maintained a capability for delivering man-portable devices against adversary states, with a total stockpile of some 250 devices.<sup>18</sup> Russia may still maintain some of these devices, perhaps for delivery by special force detachments. Yet the limitations of relying on such a capability for deterrent purposes would be considerable. Both the likelihood and risks of detection, and the organisational effort required to maintain them in place, would be so significant that it is highly unlikely any country would deploy them within the territory of an opponent in peacetime. The incentives to do so during intense crisis would grow, but so would the obstacles to doing so. In order to reach the UK, a nuclear device

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17. While the CTBT has not come into force because some nuclear-armed states (including the US and China) have refused to ratify it, it has greatly increased the reputational costs that would be involved in testing. Partly as a result, only one state – North Korea – has conducted a nuclear test since 1998.

18. Carey Sublette, 'Alexander Lebed and Suitcase Nukes', Nuclear Weapons Archive, 18 May 2002, <<http://nuclearweaponarchive.org/News/Lebedbomb.html>>, accessed 6 July 2016.

would have to be transported a long distance by sea or air, during which the risks of detection, interception or malfunction would be high.<sup>19</sup>

The possession of a ballistic missile capability able to reach UK territory is therefore likely to remain a key element in determining whether any potential opponent is capable of mounting a credible nuclear challenge to the UK in a future armed conflict.<sup>20</sup>

The use of nuclear weapons against UK armed forces deployed on, or near, the territory of a nuclear-armed opponent, in contrast, need not involve longer-range delivery systems. A much wider range of options, including shorter-range aircraft and missiles, artillery and atomic demolition munitions, could also be employed for this purpose. Non-strategic nuclear weapons could also be used against surface ships or submarines, and Russia is believed to possess around 300 operationally assigned non-strategic weapons designed for this purpose.<sup>21</sup>

While any significant use of nuclear weapons against the UK homeland would constitute an example of the type of 'extreme threat' which the UK's own nuclear force is designed to counter, the use of nuclear weapons against UK deployed forces would not necessarily constitute such a threat. Much would depend on the UK's opponent also possessing a credible capability for threatening the UK homeland itself.

In the absence of such a 'strategic' capability, the value of the 'tactical' use of nuclear weapons against UK conventional forces would depend on a wider assessment of the balance of forces on the regional battlefield. It is possible, however, that the risk of substantial UK military casualties as a result of the tactical use of nuclear weapons (for example against a UK divisional-scale invasion force of the sort used against Iraq in 1991 and 2003) could be of deterrent value to a future adversary, even in the absence of a long-range means of delivery.

## Russia

**Russia is the primary source of potential nuclear risk to the UK, and will continue to be for the foreseeable future. Its nuclear forces have the range and capabilities for conducting a large-scale attack on NATO, including the UK. Short of a radical improvement in political relations between Russia and NATO, both sides will continue to structure their military preparations based on the possibility that they might find themselves in conflict in the future. As recent events have made clear, Russia and the Western states continue to have fundamentally different concepts of European order, which in turn increases the potential for misunderstanding and conflict. As a result of the UK's longstanding NATO treaty obligations, as well as its growing commitment of capabilities to the defence of exposed states in Eastern**

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19. Some observers have suggested that aside from the development of a reliable ICBM, Pyongyang retains the option of covert delivery via a container ship. See John Schilling and Henry Kan, 'The Future of North Korean Nuclear Delivery Systems', US-Korea Institute at SAIS, 2015, p. 20.

20. Schilling and Khan, 'The Future of North Korean Nuclear Delivery Systems', p. 20.

21. Igor Sutyagin, 'Atomic Accounting: A New Estimate of Russia's Non-Strategic Nuclear Forces', RUSI Occasional Paper, November 2012, p. 39–52.

**Europe, the UK is likely to be involved militarily should Russia miscalculate and attack a NATO member state. The possibility for conflict with Russia could also arise as a result of disputed strategic interests outside Europe, for example in Syria. Any such conflict, even if initially limited to the conventional level, could substantially increase the risks of nuclear threats being made against the UK and its allies.**

Russia remains one of the world's two most capable nuclear powers, with a total nuclear stockpile of around 7,000 warheads, of which some 1,800 are deployed on missiles or operational bases.<sup>22</sup> Comparable in scale to that of the US, Russia's arsenal is some 20 times larger than those of France or China, and 30 times larger than that of the UK. It is very likely it will continue to have the capability to launch a large-scale nuclear attack on the UK for the foreseeable future.

The capabilities of Russia's strategic nuclear force are unlikely to decline significantly in the near future. After almost two decades of decline following the end of the Cold War, Russia is now devoting substantial resources to modernising its nuclear arsenal. The replacement of Soviet-era intercontinental ballistic missiles (ICBMs), by the new single-warhead SS-27 (RS-12M1 Topol-M) and the multiple-warhead SS-27 (RS-24 Yars), is now well under way, and is due for completion by the early 2020s. In addition, a new road-mobile missile, the multiple-warhead RS-26 Rubezh, together with a new 'heavy' ICBM, the multiple-warhead silo-based RS-28 Sarmat, are both due to enter full production soon, equipped with new capabilities for overcoming future US missile defences. The Russian Navy has launched three new *Borey*-class ballistic missile submarines and a further five are in various stages of construction, all due to come into service by the mid-2020s, armed with sixteen multiple-warhead Bulava submarine-launched ballistic missiles (SLBMs). Russia also operates around 60 nuclear-capable heavy bombers which can operate at intercontinental range. A new long-range cruise missile (the Kh-102) is being introduced for these bombers and existing Tu-95 Bear H and Tu-160 Blackjack aircraft are being modernised. In addition to these strategic capabilities, all subject to the numerical limits on deployed warheads agreed in the New START (Strategic Arms Reduction Treaty) with the US, Russia also has additional intermediate-range systems that could be used to attack targets in Europe, including intermediate-range Tu-22M3 Backfire bombers and nuclear versions of the Kalibr sea-launched cruise missile. The US has also accused Russia of developing a new intermediate-range ground-launched cruise missile, in violation of the 1987 Intermediate-Range Nuclear Forces (INF) Treaty.<sup>23</sup>

All of this has been made possible by the sharp increase in levels of Russian defence spending since 2008. As a result of its wider economic difficulties, the Russian government has cut back on previous plans for further growth in its defence budget. As a result, some of the more ambitious plans for nuclear modernisation could be delayed or cancelled. Even so, by the mid-2020s Russia should have a large and relatively modern nuclear arsenal that can last well into the 2030s, and

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22. Stockholm International Peace Research Institute, 'Global Nuclear Weapons: Downsizing but Modernizing', 13 June 2016.

23. Igor Sutyagin and Qingzhen Chen, 'Russian Rearmament: Putin's Key Priorities', *RUSI Newsbrief* (Vol. 35, No. 3, May 2015), pp. 17–19; Hans M Kristensen and Robert S Norris, 'Russian Nuclear Forces, 2016', *Bulletin of the Atomic Scientists* (Vol. 72, No 3, April 2016), pp. 125–34.

in large measure the 2040s, without further large-scale capital expenditure. Over this longer time frame, Russian military leaders worry that the credibility of their strategic forces could be challenged by growing US capabilities for conventional strike and missile defence.<sup>24</sup> A prudent assessment must assume, however, that Russia will continue to maintain a capability for massive nuclear strike against the US and Europe throughout the next three decades.

Concerns over the possibility of an armed conflict between Russia and NATO are currently focused on its revisionist aspirations, seeking to reverse some of the strategic losses suffered in Eastern Europe since 1990. NATO's efforts to reinforce its forward presence in the Baltic republics and Poland, together with enhanced reinforcement capabilities for NATO's eastern flank as a whole, are designed to help reduce the chances of Russian miscalculation in this regard. Russia's appetite for military adventurism could be further dampened by its deepening economic problems, which have already led to its defence budget being frozen in real terms at a level equivalent to only one-tenth that of the US.<sup>25</sup>

Yet the risks of conflict with Russia over the next three decades are as likely to be a consequence of its wider weaknesses (outside the nuclear sphere) as of its strength. Its growing belligerence, dating back to when Vladimir Putin first became president in 2000, is rooted in a belief that the US and NATO exploited Russia's post-Cold War weakness to drive through their own revisionist agenda; enlarging NATO to Russia's western borders (and encircling Kaliningrad in the process); overthrowing Russian allies in Serbia, Iraq and Libya; and seeking to do the same to the regime of Bashar Al-Assad in Syria. From this perspective, the 2014 crisis in Ukraine was precipitated by the Western-supported uprising against President Viktor Yanukovich in Kiev after he refused to support an association agreement with the EU and instead backed closer economic ties with Russia. President Putin responded by ordering the annexation of Crimea, followed by military intervention in eastern Ukraine, in turn precipitating outrage and concern across NATO at these breaches of fundamental European norms. Russia is now suffering the economic consequences of this action, but shows little sign of regret.

New crises in the European neighbourhood could also arise in other states not covered by its security guarantee, especially where Russia still believes it has a stake in determining the outcome. Current concerns focus on Syria and the eastern Mediterranean, as well as the Western Balkans, Moldova and Belarus. In the longer term, future sources of tension could include the territory of the Russian Federation itself, for example if Moscow's hold on the North Caucasus again begins to weaken.

While none of these potential crises, taken individually, is likely to lead to nuclear escalation, any military crisis involving both Russia and NATO inevitably has a nuclear dimension. This was

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24. For further discussion, see Elbridge Colby, 'The Role of Nuclear Weapons in the U.S.-Russian Relationship', Carnegie Endowment for International Peace, 26 February 2016, <[carnegieendowment.org/2016/02/26/role-of-nuclear-weapons-in-u.s.-russian-relationship-pub-62901](http://carnegieendowment.org/2016/02/26/role-of-nuclear-weapons-in-u.s.-russian-relationship-pub-62901)>, accessed 20 July 2016.

25. International Institute for Strategic Studies (IISS), *The Military Balance 2016* (London: IISS, 2016), pp. 484–85.

clearly illustrated during the Ukraine crisis, when President Putin made it clear he was ready to put Russian nuclear forces on alert in order to deter any NATO intervention. Since then, Russia has greatly increased exercises of nuclear capable aircraft and submarines near to the territory of NATO member states, including the UK.<sup>26</sup> This is an example of what the UK's SDSR assessed as the risk that a regional crisis (in this case in relation to Ukraine) could escalate into a direct threat to the UK's own territory.

The probability of deliberate nuclear use in a crisis remains very low. But it is not zero. In a future crisis, decision-makers will need to make decisions rapidly and on the basis of incomplete information. The risks of escalation could be further increased where one or more parties fail to understand the constraints and core objectives which limit the options of their adversaries. Once a conventional war starts, the time for decision-making could be further compressed by concerns over pre-emptive attack on command and control networks.<sup>27</sup> Such risks could be intensified by new technologies, including offensive cyber-operations, which provide new capabilities for blinding and deceiving adversaries before, or during, a conflict.

A further deterioration in NATO–Russia relations is not inevitable. The prospect of a prolonged slowdown in Russia's economy could convince its government of the need to improve relations with its European neighbours. EU states, for their part, are likely to welcome a Russian initiative to dial back from the high levels of confrontation, political and military, of the last two years.

While short-term stabilisation of Russia's relations with the US and NATO is possible, however, a more fundamental benign transformation appears unlikely for some time to come. For the foreseeable future, therefore, NATO member states (including the UK) must prepare for the possibility of further Ukraine-style crises in Russia's neighbourhood. The risk that such a crisis might escalate to a nuclear level remains small, even over a 30-year time period. But it remains the most likely source of possible nuclear threat to the UK.

## China

**After Russia, China is the only other potentially hostile power possessing the capability to attack the UK with nuclear weapons. Its capability to do so is limited at present, amounting to some 44 strategic missiles capable of reaching the continental US, some of which could also, in principle, be used to threaten the UK. The size of China's arsenal is growing, and could grow further over the next three decades. During the next decade or so, the risk of a potential threat to the UK is likely to depend in large part on the extent of UK security commitments in the Asia-Pacific region, as well as on the risks of US–Chinese conflict. After 2030, there could also be increased potential for conflict if China develops to become a major military competitor in other parts of the world where the UK has interests, for example in the Mediterranean or the**

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26. For a thorough account of Russian nuclear signalling in the first year of the Ukraine crisis, see Jacek Durkalec, *Nuclear-Backed 'Little Green Men: Nuclear Messaging in the Ukraine Crisis* (Warsaw: Polish Institute for International Affairs, 2015).

27. See, for example, Anthony M Barrett, 'False Alarms, True Dangers? Current and Future Risks of Inadvertent US-Russian Nuclear War', RAND Perspective, 2016.

**Middle East. In both cases, it is possible that China could use its nuclear force to coerce other powers, such as the UK, to stay out of its bilateral quarrels with the US.**

China has the second-largest economy in the world, measured by GDP at market prices: more than twice that of Japan and some eight times the size of Russia's economy.<sup>28</sup> It continues to give a relatively low priority to military spending (measured as a percentage of GDP) compared to the US and Russia. As a result of its remarkable levels of economic growth over the last four decades, however, its defence budget has grown rapidly, leaving China with the world's second-largest budget in 2015.<sup>29</sup> This has allowed China to invest in a broad range of increasingly capable military forces, with a particular focus on air and maritime capabilities. This growing military strength is leading to increased unease among its Asian neighbours, with whom it still has serious boundary disputes, notably in the East China Sea (with Japan) and in the South China Sea (primarily with Vietnam and the Philippines).

While the short-term (one- to five-year) outlook for the Chinese economy remains unclear and the near-term risk of a financial crisis is substantial, further significant growth is probable over the next three decades, narrowing the gap with the US and consolidating its position as one of the world's two leading economic powers. China's economic weight is already being used to expand its influence in many parts of the world, where it is becoming one of the main sources of investment, markets and concessionary economic assistance. It is shaping up to pose a more formidable challenge to the US's position as the world's superpower than the Soviet Union ever provided, in part because (unlike the Soviet Union, or Russia today) its challenge is not a predominantly military one. On one recent projection, China's military budget could be as large as the US's by 2045 and more than four times as large as Russia's.<sup>30</sup>

China's deep entanglement in global economic networks means it will continue to have strong interests in maintaining peaceful relations with other major powers, including with the UK, the US and Japan. While relations with the US have become more competitive recently, primarily in response to its boundary disputes in neighbouring waters, the two powers continue to co-operate on a wide range of other global and regional issues. If this relationship were to deteriorate further, however, and if the chances of a large-scale military conflict were to increase, it would have profoundly negative consequences for international politics. For the UK, it would pose the risk, as a leading ally of the US, of the country being drawn into a conflict between the world's two most capable powers.

In stark contrast to Russia, China's recent military modernisation has given a relatively low priority to its nuclear arsenal. Given the size of its economy, China's nuclear arsenal remains remarkably small, and it has grown much less rapidly over the last two decades than Pentagon analysts had anticipated.<sup>31</sup> This reflects the relatively limited role Beijing ascribes to its nuclear

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28. World Bank, 'World Development Indicators 2015', accessed 14 July 2016.

29. International Institute for Strategic Studies, *The Military Balance 2016*.

30. MoD DCDC, *Global Strategic Trends*, p. 94.

31. Hans M Kristensen and Robert S Norris, 'Chinese Nuclear Forces, 2015', *Bulletin of the Atomic Scientists* (Vol. 71, No. 4, 2015), p. 77.

force. In contrast to the US and Russia, China does not appear to be interested in building dedicated counterforce capabilities or battlefield weapons. It has consistently maintained a declaratory commitment to a no first use policy, alongside a force structure based on minimum deterrence. Since the inception of the force in 1964, its primary focus has been deterring a US nuclear attack on China.

Recent estimates suggest China now has 44 ICBMs capable of launching a total of around 64 warheads at targets in the continental US (or Western Europe).<sup>32</sup> This total includes around ten single-warhead silo-based DF-5a missiles, around 25 single-warhead DF-31a road-mobile missiles, and (most recently) around ten DF-5b missiles, which reportedly carry three multiple independently targetable re-entry vehicles (MIRV) warheads.<sup>33</sup> China's total strategic capability is therefore broadly comparable in size with the 80 warheads which the UK is able to deploy on two Trident-armed submarines. In addition, China is also believed to deploy around 100 nuclear weapons on medium-range missiles, capable of use against eastern Russia and other regional targets, but not against the US or Europe. Russia and China came close to a nuclear conflict in 1969.<sup>34</sup> If China were to revive its historic claims to territories in eastern Russia, nuclear weapons might again come to play a role in both countries' deterrence strategies.

While China's arsenal has only grown slowly in the past, it may develop more rapidly in the future, especially if it believes this is necessary in order to maintain a credible second-strike capability in the face of increased US investments in long-range conventional strike and missile defence systems.<sup>35</sup> Current developments already include new generations of missiles and submarines, as well as new systems such as hypersonic glide vehicles (HGVs). Such a capability appears to be a high priority in China, evidenced by the frequency of the flight tests.<sup>36</sup> It is also believed the HGVs are designed in reaction to US missile defence programmes.<sup>37</sup> The dual aspect of such capabilities may increase serious, and possibly unintended, escalation, as China moves down the path of integrated nuclear and conventional capabilities.<sup>38</sup> Both conventional and nuclear land-based missiles fall under the responsibility of the People's Liberation Army (PLA) Rocket Force, increasing the risk of miscommunication or unintended escalation through an adversary misreading signals.<sup>39</sup>

China is working to replace all liquid-fuelled missiles with solid fuel and developing mobile delivery systems in order to improve the survivability of its strategic forces.<sup>40</sup> It is developing

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32. *Ibid.*

33. Michael S Chase and Arthur Chan, 'China's Evolving Strategic Deterrence Concepts and Capabilities', *Washington Quarterly* (Vol. 39, No. 1, Spring 2016), p. 124.

34. Andrew Osborn and Peter Foster, 'USSR Planned Nuclear Attack on China in 1969', *Daily Telegraph*, 13 May 2010.

35. Kristensen and Norris, 'Chinese Nuclear Forces, 2015', p. 77.

36. *Ibid.*

37. Chase and Chan, 'China's Evolving Strategic Deterrence Concepts and Capabilities', p. 124–25.

38. *Ibid.*, p. 131.

39. *Ibid.*, p. 132.

40. Office of the Secretary of Defense, 'Annual Report to Congress, Military and Security Developments Involving the People's Republic of China, 2015', p. 81; M Taylor Fravel and Evan S

the DF-41, a road mobile ICBM with a possible MIRV capability.<sup>41</sup> Like the DF-31a and DF-5, this new missile will probably be capable of reaching the UK. Recent US intelligence estimates suggest China's total strategic capacity could reach over 100 warheads by the mid-2020s.<sup>42</sup>

The PLA Navy appears to be placing a high priority on the modernisation of its submarine forces, as it continues to produce the *Jin* SSBN with the JL-2 SLBM, which has an estimated range of 7,400 km.<sup>43</sup> The Pentagon believes China is set to develop and operate its next generation of SSBNs, the Type 096, over the next ten years.<sup>44</sup> However, in order for the JL-2 to pose a threat to the UK, a deployed *Jin* SSBN would have to sail well into the Pacific Ocean, which would require it to pass through a range of choke points, exposing it to potential hostile anti-submarine tracking and attack.<sup>45</sup> It remains to be seen whether China will be able to successfully introduce the new capabilities – including SSBN quieting and protective escort screens – that would be necessary for it to operate a fully strategic submarine-based capability.<sup>46</sup>

The primary focus of China's strategy of nuclear deterrence is the requirement to deter a US nuclear attack, and there is no indication that it considers the UK as a concern in this regard. Nor, after the UK's withdrawal from Hong Kong, are there bilateral conflicts that could potentially lead to an armed clash between the two countries. If strategic relations between China and the US were to worsen over the next decades, however, the UK might be drawn into a conflict as a result of its position as a global US ally. By the 2030s, a US–China conflict could take on a more global character, for example involving proxy (or even direct) clashes in the Middle East, Africa, Eastern Europe or South America. In these circumstances, China might be tempted to use its nuclear force to reinforce a demand that other countries, such as the UK, should stay out of its bilateral quarrels with the US. While this may be a plausible scenario in a 30-year timeframe, however, it seems less credible in the near to medium term (to 2030).

## North Korea

**North Korea currently has no proven capability for striking the UK with nuclear weapons. On current trajectories, however, it appears to be on course to develop a nuclear-armed ICBM by the mid-2020s, able to attack targets in the continental US, as well as in Europe. While this initial capability is likely to be unreliable, inaccurate and limited in scale at first, it could grow quite rapidly in the subsequent decade. While it is difficult to foresee a situation in which North Korea would have an interest in striking the UK – given the country's penchant for**

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Medeiros, 'China's Search for Assured Retaliation, The Evolution of Chinese Nuclear Strategy and Force Structure', *International Security* (Vol. 35, No. 2, 2010), p. 82.

41. Office of the Secretary of Defense, 'Annual Report to Congress, Military and Security Developments Involving the People's Republic of China, 2015', p. 8.

42. Kristensen and Norris, 'Chinese Nuclear Forces, 2015', p. 77.

43. Office of the Secretary of Defense, 'Annual Report to Congress, Military and Security Developments Involving the People's Republic of China, 2015', p. 9.

44. *Ibid.*

45. Kristensen and Norris, 'Chinese Nuclear Forces, 2015', p. 82.

46. Michael S Chase and Arthur Chan, *China's Evolving Approach to 'Integrated Strategic Deterrence'*, (Santa Monica, CA: RAND Corporation, 2016), p. 21.

**bombastic nuclear threats against the US – it is possible that at some stage after it acquires an ICBM capability, Pyongyang could use the same sort of rhetoric with reference to the UK. North Korea could, for example, seek to use its force to help deter the UK from taking part in military operations against its interests.**

North Korea is the only state to have resigned its commitments to the NPT to pursue the development of its own nuclear-weapon force. It has made clear that its objective is to acquire an intercontinental-range nuclear capability, capable of attacking the continental US.<sup>47</sup> The country is investing substantial efforts in all the main components necessary to achieve this objective. On its current trajectory, and in the absence of regime change, there is a strong likelihood it will achieve this objective by the mid-2020s, if not earlier. This would also provide North Korea with a capability for attacking the UK and Western Europe. It is unclear how North Korea intends to use these capabilities, but it may be unwise to assume they would be used for purely defensive purposes.<sup>48</sup>

The primary focus of North Korea's nuclear deterrent posture is the US and, to a lesser extent, South Korea. It deploys the threat of nuclear use in order to deter US military action against it and potentially also to pursue its ambitions to create a unified Korea on the North's terms. The possibility of a limited North Korean threat to the continental US is already the main rationale for the US deployment of 30 ground-based missile interceptors in Alaska.<sup>49</sup> The primary means through which the UK might be threatened by such a development would be through its 1950 commitment to the UN force charged with defending South Korea against aggression. This commitment, under UN Security Council (UNSC) Resolution 83 (1950), calls for members to assist South Korea as necessary to repel an armed attack from North Korea and restore peace on the Korean Peninsula. More widely, as a permanent member of the UNSC with aspirations to a global military role, the UK could become involved in future Korean conflicts, for example through the provision of carrier-based strike capabilities.

Although in the medium term it is difficult to foresee a situation in which Pyongyang would have a direct intent to target the UK, long-term assessments are more clouded. The UK is a regular participant in Exercise *Key Resolve*, as part of continuing support to South Korea and partners in UN Command. The UK's 2016 contribution saw its largest-ever participation in this exercise, with 56 servicemen from the British Army, Royal Navy and Royal Air Force taking part.<sup>50</sup> If the UK were to 'pivot' further towards Northeast Asia in the years ahead, North Korea's concerns in

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47. Max Fisher, 'Maybe North Korea's Nuclear Goals Are More Serious Than Once Thought', *New York Times*, 13 July 2016.

48. Aside from frequent declarations of its willingness to use nuclear weapons against South Korea or the US, Pyongyang is deemed to maintain threshold that could see the use of a nuclear weapon in an event that is perceived to threaten the security and survival of the regime. See Brad Roberts, *The Case for U.S. Nuclear Weapons in the 21st Century* (Stanford, CA: Stanford University Press, 2015), pp. 74–80.

49. Missile Defense Agency, 'Elements', <<http://www.mda.mil/system/gmd.html>>, accessed 5 July 2016.

50. British Embassy Seoul, 'UK Deputy Chief of Defence Staff, Lt Gen Gordon Messenger, visits South Korea', 15 March 2016.

relation to the intentions of the UK in the region could increase. Such a scenario could see the UK become a target of interest for Pyongyang.

At the beginning of 2016, North Korea carried out its fourth nuclear test. It has also claimed to have satisfactorily simulated the test of a re-entry vehicle and has successfully launched a satellite. All of these represent a continued commitment to its nuclear developments. Pyongyang likely still faces challenges to warhead re-entry, but it is believed that it does already have the capability to mount a nuclear warhead onto an intermediate-range missile capable of reaching regional adversaries.<sup>51</sup> In March 2016, North Korea released images of what appeared to be a miniaturised nuclear warhead, or at least a mock-up of such.<sup>52</sup> Furthermore, since it does not adhere to the wider testing moratorium, Pyongyang is less constrained in its ability to test new designs and devices.

North Korea already has around 1,000 ballistic missiles with a maximum range of 1,500 km (capable of reaching most regional targets),<sup>53</sup> and is actively pursuing more capable and longer-range missiles. Although the Musudan missile, with an estimated range of up to 3,500 km, has not shown its full potential throughout the series of tests conducted this year, the KN-08 and KN-14 road-mobile ICBMs in development use the same engine as the Musudan.<sup>54</sup> The latest test suggests these engines can work in flight, and although many technological hurdles remain, their credibility is increasing.<sup>55</sup>

Some analysts still believe the challenges faced in developing delivery systems could result in slower than anticipated progress and even see the cancellation of some systems under development.<sup>56</sup> Others have cited the operational deployment of the KN-08 as being likely in the next few years.<sup>57</sup> A reliable operational ICBM capability is unlikely to be available by 2020, although it is possible the KN-08 could achieve an 'emergency operational status' by that time.<sup>58</sup> Beyond then, the probability of success increases. At present, a reasonable assumption is that North Korea is on course to deploy a nuclear capable ICBM by the early to mid-2020s.<sup>59</sup> It is likely that North Korea will continue to state that such a capability is operationally deployable, irrespective of its reliability status. Even if the probability of technical failure remains much higher than would be acceptable in other nuclear-armed states, and its accuracy is likely to remain limited, such a capability could still have a significant immediate effect in deterrence

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51. Denny Roy, 'Preparing for a North Korean Nuclear Missile', *Survival* (Vol. 58, No. 3, 2016), p. 132.

52. JH Ahn, 'N. Korea Publishes Pictures of "Miniaturized" Nuclear Device', NK News, 9 March 2016, <<https://www.nknews.org/2016/03/n-korea-publishes-pictures-of-miniaturized-nuclear-weapon/>>, accessed 1 July 2016.

53. Schilling and Khan, 'The Future of North Korean Nuclear Delivery Systems', p. 21.

54. John Schilling, 'A Partial Success for the Musudan', 38 North, 23 June 2016, <<http://38north.org/2016/06/jschilling062316/>>, accessed 1 July 2016.

55. *Ibid.*

56. Schilling and Khan, 'The Future of North Korean Nuclear Delivery Systems', p. 8.

57. Yong-Soo Kwon et al., *Uncertain Trajectory: Implications of a Long-Range North Korean Nuclear Capability*, (South Korea: RINSA and RUSI, 2014), p. 16.

58. Schilling and Khan, 'The Future of North Korean Nuclear Delivery Systems', p. 15.

59. Roy, 'Preparing for a North Korean Nuclear Missile', p. 142.

terms. Over time, as North Korea continues to invest in testing and development, the reliability and size of its ICBM capability will likely grow.

The size of the current North Korean stockpile of weapons-grade fissile material has been estimated at the equivalent of between 13 and 21 warheads, as of June 2016.<sup>60</sup> Others have estimated that Pyongyang could have anything between 20 to 125 warheads by 2020.<sup>61</sup> The amounts available will likely be impacted by the fissile material used in nuclear tests. At present it is known that North Korea has used its plutonium production abilities to produce nuclear explosives. However, highly enriched uranium production is largely unknown. While covert facilities are suspected, open source information does not provide sufficient information to understand the quantitative current and future stockpiles of North Korea's nuclear arsenal.

Alongside its land-based capabilities, North Korea is working to develop an SLBM. Two test launches, in April and July 2016, demonstrate a commitment to the programme, and these are likely to continue as increased survivability and deterrence remain a priority for the country.<sup>62</sup> However, at present the KN-11 SLBM's range is unknown.<sup>63</sup> Furthermore, the SSBN designed for the SLBM, the *Sinpo*-class, is still under construction and questions remain around its survivability and stealth. Although the direct threat to the UK remains relatively low, deployment of such a capability would be undoubtedly significant within the region. Deployment of an SSBN would complicate ballistic missile defence efforts, in the region and beyond, and hinder the ability to secure any nuclear weapons in the event of domestic regime change.

A major driving factor in the vigorous nuclear and missile developments is the role of President Kim Jong-un and his personal commitment to technological development.<sup>64</sup> Although the current pace of his nuclear and missile programmes suggests a steady rate of capability development, uncertainty over the future stability of the regime remains. The process of transition to a new order, probably associated with some form of reunification with the south, would likely be chaotic and violent. The moment of transition, therefore, could be a time of enhanced nuclear risk, with the possibility of the nuclear and missile arsenals being used as a means of ensuring the survival of the regime or some of its factions. If it already possesses an ICBM when a regime crisis occurs, the possibility of threats to use this capability cannot be excluded.

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60. David Albright and Serena Kelleher-Vergantini, 'Plutonium, Tritium and Highly Enriched Uranium Production at the Yongbyon Nuclear Site: North Korea's Nuclear Arsenal May be Growing Significantly', Institute for Science and International Security, 14 June 2016, <[www.isis-online-org/uploads/isis-reports/documents/Pu\\_HEU\\_and\\_tritium\\_production\\_at\\_Yongbyon\\_June\\_14\\_2016\\_FINAL\\_pdf](http://www.isis-online-org/uploads/isis-reports/documents/Pu_HEU_and_tritium_production_at_Yongbyon_June_14_2016_FINAL_pdf)>, accessed 20 July 2016.

61. Scott A Snyder, 'Addressing North Korea's Nuclear Problem', Policy Innovation Memorandum No. 54, Council on Foreign Relations, 19 November 2015, p. 1.

62. John Shilling, 'A New Submarine-Launched Ballistic Missile for North Korea', 38 North, 25 April 2016, <<http://38north.org/2016/04/jschilling042516/>>, accessed 6 July 2016.

63. *Ibid.*

64. For a deeper insight into the role of leadership, see Roy, 'Preparing for a North Korean Nuclear Missile'.

## The Middle East

The prospect of further nuclear proliferation within the Middle East was a prominent concern of US and UK security policy during the 1980s and 1990s. After Israel first acquired its own nuclear capability in the late 1960s, Iraq, Syria, Egypt, Libya, Iran and Saudi Arabia were all considered as potential proliferation candidates.

None of these aspirations has been realised. The nuclear programmes of Iraq, Syria and Libya no longer exist, dismantled or destroyed as a result of strong US-led (and UK-supported) coercive diplomacy stretching over decades. The economic and political turmoil that has followed the Arab uprising in 2010 has further undermined the ability of these states, and others, to organise the focused effort that would be required to build a nuclear capability.

Of all the Arab states, **Egypt** probably has the greatest scientific potential relevant to building a nuclear weapon capability. One recent study suggested that ‘despite possessing a relatively advanced capability in nuclear technology, Egypt is many years away from the ability to produce nuclear weapons if it chose to do so.’<sup>65</sup> Yet there is no evidence that it is considering such an option, which it gave up several decades ago.<sup>66</sup>

**Saudi Arabia** remains a possible candidate for nuclear proliferation over the next three decades. Its leaders have frequently argued that the Kingdom would be forced to take this route if Iran successfully acquired its own nuclear arsenal. Riyadh has ambitious plans for the construction of a civilian nuclear industry, which could over time help the country build the scientific expertise necessary for an advanced hedging posture of weapons development.<sup>67</sup> It has also acquired nuclear-capable DF-21 ballistic missiles from China in the past, although it is highly unlikely that China would also be willing to provide warheads.<sup>68</sup>

At present Saudi Arabia’s capabilities do not represent a significant nuclear concern. Although it has been highlighted that Riyadh might turn to Pakistan for assistance, capitalising on its previous economic support for Islamabad, it is not certain how this would materialise.<sup>69</sup> Assistance could take the form of technical support, equipment transfers or, in the most extreme scenario, the deployment of Pakistani nuclear weapons in Saudi territory.

Of these options, technical and scientific assistance from Pakistan remains the most plausible, but is still unlikely. Yet development of an indigenous weapon is likely to take decades and could

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65. Shaul Shay, ‘The Egypt-Russia Nuclear Deal’, Lauder School of Government Diplomacy and Strategy, Institute for Policy and Strategy, IDC Herzliya, November 2015, <[www.herzliyaconference.org/end/\\_Uploads/dbsAttachedFiles/Egypt\\_nuclear\\_plant2015B.pdf](http://www.herzliyaconference.org/end/_Uploads/dbsAttachedFiles/Egypt_nuclear_plant2015B.pdf)>, accessed 20 July 2016.

66. Egypt relinquished its nuclear weapons programme in the 1970s. For more information see Maria Rost Rublee, ‘Egypt’s Nuclear Weapons Program: Lessons Learned’, *Nonproliferation Review* (Vol. 13, No. 3, 2006) pp. 555–67.

67. Yoel Guzansky, ‘The Saudi Nuclear Genie is Out’, *Washington Quarterly* (Vol. 38, No. 1, 2015).

68. Jeffrey Lewis, ‘Why Did Saudi Arabia Buy Chinese Missiles?’, *Foreign Policy*, 30 January 2014.

69. Yoel Guzansky, ‘Questioning Riyadh’s Nuclear Rationale: Saudi Arabia’s Atomic Ambitions’, *Middle East Quarterly* (Vol. 20, No. 2, Spring 2013), p. 62.

not be concealed from the international community. There is also no evidence that Pakistan would be interested in providing such assistance, given the severe risks that it would pose to relations with both the US and Iran. In order for Saudi Arabia to risk the costs this could involve, therefore, there would probably have to be either a further radical loss of trust in US security guarantees or a breakout by Iran from its nuclear deal. Provided it is assessed that Iran is not moving towards acquisition of a nuclear weapons capability, it is unlikely that Saudi Arabia will seek to do so. Even if Iran were to go nuclear at some stage over the next 30 years, Riyadh would be highly dependent on external assistance in order to match this step rapidly. It is far from clear that such assistance would be forthcoming.

## Iran

**The Joint Comprehensive Plan of Action (JCPOA), designed to increase confidence in Iran's adherence to its NPT commitments, has substantially reduced the probability of a nuclear threat to the UK from Iran emerging over the next decade. It has sharply reduced the size of Iran's stock of fissile material and improved monitoring across the whole Iranian nuclear cycle. The longer Iran abstains from active weapon design work, moreover, the harder it will be to reconstitute.**

**Yet the extremely high level of instability in Iran's region could, during the next decades, lead to a recalculation of Tehran's current policy and potentially reopen the question of a nuclear capability. Preventing Iran from taking such a path is likely to continue to depend on the perception that the costs of breakout would be too great to bear. Iran's active pursuit of longer-range ballistic missile capabilities suggests it continues to hedge. If Iran were to acquire a fully operational nuclear missile capability, breaking out of the NPT, it could add a significant new risk to the UK and its NATO allies.**

It is possible that a return to a more hardline administration following the era of President Hassan Rouhani could result in Iran's withdrawal from the JCPOA agreement, leading to greatly increased tensions in the region and with the US and Europe. Given the volatility of Iran's geostrategic situation, there are plausible scenarios that could lead to nuclear acquisition, for example in the event of a major (conventional) military defeat or a perception of US withdrawal from the region. Yet the economic and military factors that helped Iran's decision to agree the nuclear deal remain in place. A significant breakout would probably be detected and would likely trigger a reimposition of many of the financial sanctions that proved so damaging in the past. Iran might also risk the possibility of a preventive military strike on its relevant nuclear facilities.

Following the conclusion of the nuclear deal, the time required for Iran to produce enough fissile material for weapons production has been extended significantly. Thus far Iran has acted within the agreement. In its most recent compliance report the International Atomic Energy Agency (IAEA) concluded that Iran has co-operated in providing the relevant information and had allowed the agency to monitor sensitive material quantities restricted under the agreement.

The plutonium production route has been closed off and heavy water stockpiles reduced.<sup>70</sup> In compliance with the agreement, Iran no longer enriches uranium above the 3.67 per cent limit and has only conducted such activity at the permitted facilities.<sup>71</sup>

Despite the proliferation resistance embedded into the agreement, Iran has considerable indigenous capabilities in centrifuge production and operation, and the agreement allows Tehran to retain and develop its experience in centrifuge operation, possibly granting it the ability – in the absence of any follow-on agreement – to rebuild its stockpile of low-enriched uranium relatively quickly in the future.

According to the 2007 US National Intelligence Estimate, Iran halted all activity relating to the possible military dimensions of its nuclear programme in 2003.<sup>72</sup> If this assessment is correct, its preservation of tacit scientific and technical weapons-related human capacity is likely to be diminishing. Some experts have suggested Iran could retain its previous weapons development knowledge, leading to an assessment that it would be technically capable of developing a nuclear explosive device in a timeframe of months by 2025–30.<sup>73</sup> However, unless Iran is able to conduct weaponisation research without detection in the intervening period, it is likely to face significant difficulties in reassembling the required capability in such a short timeframe.

In contrast to the significant restrictions imposed by the JCPOA, Iran has continued to devote considerable energy to the development and improvement of its ballistic missile capabilities.<sup>74</sup> Because it is the only country to develop medium-range missiles without having first developed nuclear weapons,<sup>75</sup> Iran's missile development is frequently considered to be linked to its continuing nuclear aspirations. Furthermore, Iran's medium-range ballistic missiles, such as the Sejil-2, are thought to be capable of carrying nuclear warheads.<sup>76</sup> As seen with the modification of the Ghadr-1 missile, also known as 'Emad', Iran has been working on modifications that increase its ability to steer a warhead as it re-enters through the atmosphere.<sup>77</sup> Iran also appears to be working on improving the accuracy of its short- and medium-range missiles, while not seeking to develop missiles with ICBM ranges.<sup>78</sup>

Iran does not yet possess the capability of reaching Western Europe with a ballistic missile strike. If its programme continues on the current trajectory, however, it is likely to obtain the capability to

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70. IAEA, 'Verification and Monitoring in the Islamic Republic of Iran In Light of United Nations Security Council Resolution 2231 (2015)', GOV/2016/23, 2016, 27 May 2016, para C.1.7.

71. *Ibid.*, section C.2.

72. Office of the Director of National Intelligence, 'Iran: Nuclear Intentions and Capabilities', November 2007, <[https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/20071203\\_release.pdf](https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/20071203_release.pdf)>, accessed July 2016.

73. Bruno Tertrais, 'Iran: An Experiment in Strategic Risk-taking', *Survival* (Vol. 57, No. 5, 2015), p. 70.

74. Steven A Hildreth, 'Iran's Ballistic Missile and Space Launch Programs', Congressional Research Service, 6 December 2012, p. 6.

75. Michael Elleman, 'Statement of Mr Michael Elleman, Iran's Ballistic Missile Programme Before the US Senate Committee on Banking, Housing and Urban Affairs', International Institute for Strategic Studies, 24 May 2016.

76. Hildreth, 'Iran's Ballistic Missile and Space Launch Programs', pp. 21, 25.

77. *Ibid.*

78. Elleman, 'Statement of Mr Michael Elleman'.

launch ballistic missile targets throughout Europe, including on the UK, during the 2020s. Such a programme could draw on the experience being developed through its national space programme.<sup>79</sup> Beyond this, it is possible that Iran could acquire an ICBM capability at some date after 2025.

## South Asia

**Both India and Pakistan possess significant and expanding nuclear arsenals. Neither country poses a nuclear threat to the UK at present. There is also no evidence that either country is seeking a capability to threaten the UK or its Western allies. Yet the difficult relationship between the two countries, neither of whom is a signatory of the NPT, is one that continues to present the most likely threat of nuclear war, with far-reaching implications for global security and development if it were to take place.**

In considering developments over the next three decades, moreover, the possible trajectories for India and Pakistan could be very different, both in terms of their strategic aims and alliances, and in relation to the development of their nuclear and missile capabilities.

## India

India's nuclear arsenal currently consists of some 110–120 warheads, around 50 of which are deployed on shorter-range aircraft, about 60 on land-based ballistic missiles, and perhaps 14 available for sea-based ballistic missiles.<sup>80</sup> While the main initial focus of Indian policy has been to deter use of nuclear weapons by Pakistan, its nuclear force is also becoming increasingly oriented towards China. The country's current arsenal of 110–120 warheads is due to grow significantly over the next decade, with new longer-range missiles due to be deployed on land and at sea. India will soon be deploying the Agni IV rail-mobile intermediate range ballistic missile, with a planned range of 4,000 km, capable of striking Beijing from bases in northern India. The planned Agni V rail-mobile intercontinental range ballistic missile, with a planned range of more than 5,000 km, will increase India's options, as will plans for the 4,000 km-range K-4 SLBM for its *Arihant*-class nuclear-powered SSBNs.<sup>81</sup> Although these new capabilities will bolster deterrence against Pakistan, their primary role is in regard to China and other potentially more distant targets.<sup>82</sup>

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79. Brian Mckeon, 'Statement of Brian P Mckeon, Principal Deputy Under Secretary of Defense for Policy, Before the House Armed Services Subcommittee on Strategic Forces', House Armed Services Committee, 14 April 2016.

80. Hans M Kristensen and Robert S Norris, 'Indian Nuclear Forces, 2015', *Bulletin of the Atomic Scientists* (Vol. 71, No. 5, 2015), p. 77.

81. Feroz H Khan and Mansoor Ahmed, 'Pakistan, MIRVs and Counterforce Targeting', in Michael Krepon, Travis Wheeler and Shane Mason (eds), 'The Lure and Pitfalls of MIRVs: From the First to the Second Nuclear Age' (Washington, DC: Stimson Center, 2016), p. 152.

82. Tahir Mahmood Azad, 'Pakistan: Misperceptions about Nuclear Stockpiles', Issue Brief, Institute of Strategic Studies, 11 December 2015, p. 4, <[issi.org.pk/wp-content/uploads/2015/12/Final-Issue\\_brief\\_Tahir\\_Azad\\_dated-11-12-2015.pdf](http://issi.org.pk/wp-content/uploads/2015/12/Final-Issue_brief_Tahir_Azad_dated-11-12-2015.pdf)>, accessed 20 July 2016.

There has been growing speculation that India is developing a longer-range ICBM, the Agni VI, with a range of 10,000 km. Some reports suggest that flight tests could start as early as 2016, suggesting a possible entry into service sometime over the next decade.<sup>83</sup> If such deployments were to take place, it would extend the range of India's nuclear force well beyond the territory of its current strategic competitors (Pakistan and India), and bring all of Europe (but not the continental US) within range.

Such a deployment, likely to be achievable within the next fifteen years, would be consistent with India's aspirations to acquire an international status commensurate with its growing role in the international economy. It is on course to have the world's largest population by the early 2020s, the world's third-largest economy (up from eighth in 2015) by 2030,<sup>84</sup> and probably the third-largest defence budget in the world. It is investing substantial resources into capabilities for conventional power projection into its wider neighbourhood.<sup>85</sup> However, there appears to be a disconnect between the development of its longer-range delivery systems and any plausible military requirements for such systems. An ICBM capability may, therefore, come to be seen as a natural corollary of major power status, not least because all the five established nuclear weapon states (the US, Russia, the UK, France and China) already possess such a capability.

**By 2030, therefore, India may well have the capability to hold targets at risk in the UK and the rest of Western Europe. It is unlikely, however, that this would be a source of strategic concern for the UK.** India enjoys increasingly good relations – political, economic and military – with the Western powers, with shared interests across a wide range of issue areas. Shared concerns over the rise of China and violent extremism are helping to cement new bonds in intelligence sharing and co-operation. And even if India's relationship with Europe and the US were to go through more difficult periods in the future, it is hard to imagine circumstances in which a clash of interests could become serious enough to lead to armed conflict.

### Pakistan

Pakistan is currently estimated to have a nuclear arsenal of around 130 warheads, around 36 of which are deployed on shorter-range aircraft, 86 on land-based ballistic missiles, and eight on short-range ground-based cruise missiles.<sup>86</sup> It is engaged in an ambitious programme to expand both the number and type of its nuclear delivery vehicles,<sup>87</sup> and the rate at which it can produce fissile material for a growing arsenal.<sup>88</sup> On current trends, Pakistan could have

83. Ankit Panda, 'India is Capable of Developing a 10,000-Kilometer range ICBM', *The Diplomat*, 6 April 2015.

84. Jeanna Smialek, 'These Will be the World's Twenty Largest Economies by 2030', *Bloomberg News*, 10 April 2015.

85. Shashank Joshi, *Indian Power Projection: Arms, Ambitions and Influence*, RUSI Whitehall Paper 85 (London: Taylor and Francis, 2015).

86. Hans M Kristensen and Robert S Norris, 'Pakistani Nuclear Forces, 2015', *Bulletin of the Atomic Scientists* (Vol. 71, No. 6, November/December 2015), p. 61.

87. David J Karl, 'Pakistan's Evolving Nuclear Weapon Posture', *Nonproliferation Review*, (Vol. 21, No. 3, 2014), p. 319.

88. Kristensen and Norris, 'Pakistani Nuclear Forces, 2015', p. 59.

220–250 warheads by 2025, overtaking the UK to possess the world's fifth-largest nuclear weapon stockpile.<sup>89</sup>

A primary focus of Pakistani development has been short-range, low-yield nuclear weapons, designed to be used in response to even a limited Indian conventional incursion into its territory. Yet Pakistan is also investing in longer-range systems, designed to hold India's major population centres at risk if the latter threatens massive nuclear escalation in a crisis.<sup>90</sup> The introduction of the Shaheen-3 ballistic missile, capable of delivering nuclear or conventional warheads up to 2,750 km, will give Islamabad a capability to reach targets across India for the first time.<sup>91</sup> Pakistan also appears to be pursuing a submarine-launched missile capability, with the aim of enhancing the survivability and reach of its nuclear forces.<sup>92</sup>

In order to maintain a capability for overcoming planned Indian ballistic missile defences, Pakistan also appears to be considering the introduction of a multiple-warhead capability for its Shaheen-2 and Shaheen-3 ballistic missiles.<sup>93</sup> In order to go down this route, Islamabad will need to engage in warhead redesign, significant improvements of terminal guidance systems, and strengthening re-entry vehicles.<sup>94</sup> Even if these technical hurdles are overcome, deployment will likely occur in limited numbers at first, due to financial restraints and fissile material limitations.<sup>95</sup>

**In contrast to India, there is little indication that Pakistan is seeking the capability for attacking targets outside the sub-continent.** India remains the primary focus of its defence effort, albeit with some increased effort now being devoted to internal counter-insurgency tasks. In the face of the growing resourcing gap with India (whose defence budget is six times larger than that of Pakistan), multiple insurgencies within its borders, and a fragile economy, Islamabad has neither the inclination nor the capability to expand its strategic horizons. It has refused to meet Saudi Arabia's requests for large-scale military assistance in its war against Houthi rebels in Yemen. Its high level of dependence on external economic support – including from both the US and China – further constrains its ability to take steps (such as investing in capabilities for longer-range power projection), which those partners would find worrisome.

Despite the best efforts of the Pakistani government to stabilise the domestic situation, it is not possible to rule out entirely the possibility that a more radical and anti-Western regime could emerge in Islamabad at some point over the next three decades. Such a regime might also, like North Korea, use Pakistan's nuclear arsenal to rally internal support and to deter external intervention. In this scenario, the risks that nuclear material could be diverted to radical non-

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89. *Ibid.*, p. 60.

90. Jonathan McLaughlin, 'Pakistan Missile Update – February 2016', Wisconsin Project on Nuclear Arms Control, 2016, <<http://www.wisconsinproject.org/countries/pakistan/PakistanMissileUpdate-2016.html>>, accessed 1 July 2016.

91. Kristensen and Norris, 'Pakistani Nuclear Forces, 2015', p. 64.

92. *Ibid.*, p. 64.

93. Khan and Ahmed, 'Pakistan, MIRVs and Counterforce Targeting', p. 157.

94. *Ibid.*, p. 159.

95. *Ibid.*, p. 170.

state actors might grow, as well as the risk of a war with India. There might also be an increased risk that a more radical Pakistani regime would import advanced ballistic missile technology from abroad, for example from North Korea, in order to accelerate the path to a long-range capability. In this unlikely combination of circumstances, Pakistan would then be able to use its nuclear arsenal to deter external intervention, both from India and from more distant powers, such as the UK.

The development of a Pakistani nuclear threat to the UK cannot, therefore, be entirely ruled out. Yet it would require a fundamental shift in Pakistan's strategic orientation, in a direction which would greatly increase the country's vulnerability to external economic and military pressure. Given the improbability of this combination of events, the likelihood that Pakistan will pose a nuclear threat to the UK is likely to remain very low over the next 30 years.

## Arms Control and International Norms

The 1970 NPT has played a key role in stemming the growth in the number of states with nuclear weapons. Since its inception, only an additional four states have acquired nuclear arsenals, two of whom (India and Israel) already had advanced nuclear weapons programmes. Many other states with the technical potential to develop nuclear arsenals have not done so. In the aftermath of the 2015 Iran nuclear deal, the probability of further proliferation has diminished, at least in the short term.

Multilateral export control regimes are also making it significantly more difficult to acquire the technologies and materials needed for nuclear weapons development. The Nuclear Suppliers Group (NSG), established in 1975, is designed to limit the spread of sensitive technologies to potential proliferators through implementing guidelines for states party to the NSG and involved in nuclear-related exports.<sup>96</sup> Although the number of states able to supply listed items appears to be growing faster than group membership,<sup>97</sup> the NSG is expanding, with India pushing to become a member. In addition, the Missile Technology Control Regime, formed by the G7 in 1987, seeks to limit the transfer of items that could be used in the development of missiles capable of delivering all types of weapons of mass destruction, including nuclear weapons. It now has 35 members, including Argentina, Brazil, India and Russia.<sup>98</sup> On current trajectories, the idea and implementation of technology and material controls – including through these regimes – are likely to continue to strengthen, increasing the cost and complexity of nuclear acquisition for potential future proliferators.

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96. For more detailed information on the Nuclear Suppliers Group (NSG), see IAEA, 'The Nuclear Suppliers Group: Its Origins, Role and Activities', INFCIRC/539/Rev. 6, 22 January 2015, <<https://www.iaea.org/sites/default/files/infirc539r6.pdf>>, accessed 20 July 2016.

97. Mark Hibbs, 'Toward a Nuclear Suppliers Group Policy for States Not Party to the NPT', Carnegie Endowment for International Peace, 12 February 2016, <[carnegieendowment.org/2016/02/12/toward-nuclear-suppliers-group-policy-for-states-not-party-to-npt-pub-62758](http://carnegieendowment.org/2016/02/12/toward-nuclear-suppliers-group-policy-for-states-not-party-to-npt-pub-62758)>, accessed 20 July 2016.

98. Missile Technology Control Regime, 'Accession of India to the MTCR', <<http://www.mtcr.info/english/index.html>>, accessed 13 July 2016.

While the existence of the NPT, and the broader non-proliferation regime, has significantly raised the costs of acquiring an independent nuclear capability, it does not make it impossible where a state believes that it has a pressing national security need. Any assessment of possible long-term nuclear threats to the UK, therefore, must examine whether there are plausible breakout scenarios that might lead to such a threat.

Consideration must also be given to the possibility that the NPT could weaken or collapse. Various factors could come together to bring this about: for instance a weakening of the credibility of US security guarantees to key allies such as Japan and South Korea; or an Iranian breakout from the NPT followed by one or more Arab states, perhaps combined with wider impatience with the lack of progress towards nuclear disarmament by the major nuclear powers. Whatever the immediate triggers, there remains a possibility that the NPT will not exist in its current form by 2045.

Yet the prospects for radical nuclear disarmament continue to be dependent on a prior improvement in the strategic relations between the major nuclear states. There is little indication, at present, that such an improvement is on the horizon.

The prospect of further nuclear arms control, at either a bilateral or multilateral level, now depends on the lessening of current tensions between Russia and the US. Unless this occurs, it is hard to see much progress being made in further reductions in the size of their strategic arsenals or in reaching any mutual agreement on limitations of other strategic systems (for example missile defences). If strategic relations between nuclear-armed states improve, this could – as in the conclusion of the 1987 Intermediate-Range Nuclear Forces (INF) Treaty – provide an opportunity for new nuclear arms control agreements. Bilateral treaties between the US and the Soviet Union (now Russia) have set ceilings on levels of strategic forces and banned intermediate-range weapons entirely from their two arsenals. The CTBT, although not yet fully in force legally, has established a strong norm against testing that has materially limited the ability of new nuclear states from building more sophisticated arsenals. Only one country – North Korea – has tested a nuclear weapon since 1998. Even if current international regimes weaken, it does not follow that nuclear dangers will increase.

Some progress could also be made towards new transparency and confidence-building measures between the five NPT recognised nuclear weapon states, using the ‘P5 process’.<sup>99</sup> Yet such measures, welcome though they would be, are likely to fall short of the more comprehensive multilateral disarmament that most of the world’s non-nuclear weapons states believe is the NPT-mandated collective responsibility of the five.

Nuclear deterrence relies on the credibility of the threat that nuclear weapons might be used. In order for a deterrent effect to exist, this probability of retaliation cannot be zero. Yet nuclear weapons have not been used in war since 1945 and the frequency of nuclear crises (where use seems a distinct possibility) does not appear to be increasing. Despite multiple conflicts in

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99. Andrea Berger and Malcolm Chalmers, ‘Great Expectations: The P5 Process and the Non-Proliferation Treaty’, *RUSI Whitehall Report* (No. 3–13, 2013).

which at least one nuclear-armed state has been a party, a tradition of non-use has developed, especially in the three Western nuclear powers. Some analysts ascribe this absence to the growing 'tradition' of non-use, or even a 'taboo' against use, which is so strong that no leader would ever contemplate such a step. China's longstanding commitment to no first use of nuclear weapons also appears to sit firmly in this tradition.

This normative development (more evident in Western states than elsewhere) may have been paralleled by a declining tolerance for the human costs that even a limited nuclear attack could inflict, compared with the much higher political tolerance for suffering that, arguably, existed at the end of the Second World War. The net effect of these two normative trends on how seriously to take possible nuclear threats to the UK is not clear. Even if the probability and potential scale of such an attack are much lower than in the past, the tolerance for taking such a risk may also be lower. A potential aggressor may only need to pose a small probability of success in a nuclear attack to have a strategic effect on its opponent's behaviour.

These normative and prudential constraints on nuclear use are less well established in other nuclear-armed states. North Korea, Pakistan and Russia all want others to believe they would be prepared to use nuclear weapons first in order to intimidate or block conventionally superior adversaries. The strength of these declarations, even when underpinned by aggressive programmes of exercises, does not necessarily provide an accurate indication of behaviour in a crisis. Yet the norm of non-use could be dramatically weakened if nuclear weapons were to be used (or even credibly threatened) in a crisis elsewhere, especially if they were seen to have achieved a positive (even if defensive) effect. This could increase the chances of nuclear threats against the UK in a subsequent crisis.

Normative developments – often summarised as the trend towards 'delegitimisation' of nuclear weapons – are therefore unlikely in themselves to lead to the agreed dismantling of existing nuclear arsenals. While the pace of proliferation has slowed, all nine of the existing nuclear-armed states continue to devote substantial resources to renewing, and in some cases expanding, their nuclear capabilities. The best hope for further significant progress in nuclear disarmament lies in political developments, both within states (for example, regime change in North Korea) or between states (for example, a reconciliation between India and Pakistan, or between the US and Russia). It is not possible to estimate how likely such developments are over the coming decades.

## Conclusion

This paper has sought to discuss possible trends in future nuclear risks, with specific reference to the UK. In relation to the risks of future proliferation, the picture looks better than a decade ago. Today, for the first time since 1945, no state that does not already have nuclear weapons is currently believed to be pursuing such a capability.

Yet serious concerns remain in relation to other long-established nuclear powers. The projection of UK military power, whether in Europe as part of its commitment to NATO collective defence, or in other regions where potential opponents have nuclear capability, must take account of the

possibility that others may use the threat of nuclear escalation against the UK homeland in order to deter British intervention.

Over the next decade, Russia is likely to be the main concern in this regard, given the continuing risk of conflict with NATO and its formidable nuclear capabilities. The nuclear risks from both China and North Korea could also grow in subsequent decades, although this is only likely if the UK increases its military commitment to East Asia. The probability that the UK will be involved in nuclear conflict over the next three decades remains low. Given the catastrophic consequences that would be involved, however, efforts to minimise nuclear risks will continue to be a central consideration in the development of the UK's national security policy.

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