

Preventive War and the Spread of Nuclear Programs

Matthew Fuhrmann

What are the consequences of nuclear proliferation?¹ Iran's alleged pursuit of nuclear weapons and North Korea's nuclear tests in 2006 and 2009 have heightened concerns about the further spread of the bomb. Yet, debates persist about the political effects of proliferation. Some argue that the spread of nuclear weapons constitutes a major threat to international security, in part, because it raises the risk of nuclear war and increases the odds that terrorists will acquire the bomb.² Others contend that nuclear weapons can promote international peace and stability by raising the costs of armed conflict.³ According to this perspective, the slow and deliberate spread of nuclear weapons may actually be a good thing. Still others assert that the threat posed by nuclear proliferation is overblown and that nuclear weapons have little effect on international politics. As John Mueller pithily states, "The nuclear diffusion that has transpired has proved to have had remarkably limited, perhaps even imperceptible, consequences."⁴

This chapter contributes to ongoing debates about the consequences of nuclear proliferation by analyzing the connection between nuclear programs and preventive war. Does the pursuit of nuclear weapons increase the likelihood of preventive military force? If so, under what conditions? In this chapter, I provide answers to these questions. To begin, I raise further awareness about the targeting of nuclear programs by surveying historical cases in which countries have bombed or considered bombing nuclear facilities. Although attacks of this nature are relatively rare, countries have seriously considered using military force to delay proliferation on a number of occasions. I subsequently offer an explanation for why states strike, or consider striking, based on existing scholarly research. In the end, the evidence presented here supports the view that preventive war is a potential danger associated with the spread of nuclear programs that policy makers and scholars should take seriously.

Attacking Nuclear Facilities: The Historical Record

Nuclear facilities or materials in nonnuclear weapons states have been targeted on more than a dozen occasions since 1941.⁵ The first attempted strike against a nuclear plant occurred in 1942 when British commandos targeted the Norsk-Hydro heavy water plant in German-occupied Norway. This raid was unsuccessful but the allies followed up with several other strikes against the same facility, which was believed to be the main chokepoint of Germany's nuclear weapons program.⁶ In November 1943, for example, allied aircraft dropped hundreds of bombs on the heavy water plant, setting back production by a few months. Frustrated by continued attacks against the facility, Germany attempted to transport heavy water and related equipment out of Norway in 1944 on the ferry *Hydro*; saboteurs intercepted and sank the ferry in Norway's Lake Tinnsjoe.

The Iran-Iraq War provided the setting for a series of strikes against nuclear facilities.⁷ In 1977, prior to the onset of hostilities, Israel approached Iran to discuss joint military strikes against Iraqi nuclear infrastructure.⁸ Tehran was not interested in attacking Iraq's nuclear program at that time, but it naturally warmed up to the idea after Saddam Hussein invaded Iran on September 22, 1980. Days later, Iranian F-4 Phantoms attacked Iraq's nuclear research reactor, known as

Osiraq, en route home from a bombing raid, although the strike caused only minor damage to the facility. Later in the war, on March 24, 1984, Iraq raided Iran's nuclear power plant that was under construction at Bushehr. Baghdad targeted this facility on multiple other occasions during the conflict, despite an Iranian-backed International Atomic Energy Agency (IAEA) resolution prohibiting strikes against nuclear installations. The Iraqi raids, which damaged the Bushehr facility to varying degrees, occurred as part of a broader campaign to destroy economic and industrial targets.

During the 1991 Persian Gulf War, the United States bombed numerous Iraqi nuclear facilities, including the Tuwaitha Nuclear Research Center near Baghdad.⁹ This campaign heavily damaged some Iraqi nuclear plants, but many of the bombs that were dropped missed their intended targets.¹⁰ Moreover, some facilities escaped the war unscathed, partially because the United States was unaware of their existence or their location.

Iraqi nuclear infrastructure was targeted on two other instances in the 1990s. On January 17, 1993, the U.S. Navy used Tomahawk Land Attack Missiles against the Zaafaranyah uranium enrichment plant, which was left largely intact following the Gulf War.¹¹ These strikes, which were intended to punish Baghdad for its refusal to fully comply with the United Nations - mandated nuclear inspections regime, significantly curtailed Iraq's electromagnetic isotope separation (EMIS) program.¹² Then, in December 1998, the United States and Great Britain launched Operation Desert Fox, a campaign that was intended to degrade Iraq's weapons of mass destruction (WMD) capabilities. Despite the stated objective of the operation, it appears that only one facility relevant to Baghdad's nuclear program was targeted: a plant housing machine tools relevant for centrifuge development.¹³

Israel has conducted two "bolt from the blue" raids against nuclear programs. In 1981, after Iran failed to destroy Iraq's Osiraq reactor, the Israeli Air Force bombed the facility in a mission known as Operation Opera. This strike was successful in the sense that it destroyed Osiraq, which was widely regarded as the centerpiece of Baghdad's nuclear program, although other aspects of this raid's effectiveness are still debated.¹⁴ More recently, in September 2007, Israel bombed a Syrian reactor at al Kibar that had yet to become operational. The plant, which was being built with assistance from North Korea, was heavily damaged as a result of the Israeli strike.¹⁵ After the raid, Syria bulldozed what was left of the site in an apparent effort to prevent others, particularly the IAEA, from obtaining additional information about the plant.¹⁶ Few leaders condemned the Israelis for using preventive military force, leading some to conclude that the international community secretly welcomed the destruction of the Syrian nuclear facility.¹⁷

On a number of other occasions, countries seriously considered attacking nuclear programs but ultimately did not strike.¹⁸ Egypt had plans to destroy Dimona, Israel's main nuclear facility, during the 1967 crisis, possibly with assistance from the Soviet Union.¹⁹ Indian Prime Ministers Indira Gandhi (in 1982 and 1984) and Rajiv Gandhi (in 1986-87) actively sought to destroy the Pakistani enrichment plant at Kahuta in a joint operation with Israel.²⁰ Indira Gandhi even approved plans for a preventive strike, but the raid was called off at the "last minute."²¹ Pakistani officials likewise considered attacking nuclear installations in India during the 1984 crisis.²² In a lesser-known case, the Soviet Union considered preventive strikes against South Africa in the

1970s when Moscow detected apparent preparations for a nuclear test. The Soviet Union approached the United States and asked for assistance in attacking the Y Plant, one of South Africa's key nuclear installations.²³ Washington did not respond positively to this overture.

The United States did, however, strongly consider using military force to delay nuclear proliferation on other occasions. In the early-1960s, some in Washington feared that China would soon become the world's fifth nuclear power.²⁴ President John F. Kennedy, in particular, was deeply concerned about the prospect of a Chinese bomb, and he seriously considered using military force to frustrate Beijing's nuclear program. The options that were put on the table included the use of tactical nuclear weapons against Chinese nuclear facilities as well as employing Taiwanese saboteurs to infiltrate the mainland and destroy key plants.²⁵ U.S. officials ultimately chose not to attack, and Beijing conducted its first nuclear test in 1964.

Washington likewise considered using force during the 1994 North Korean nuclear crisis.²⁶ This crisis began when the IAEA detected irregularities at North Korean nuclear plants and called for the United Nations (UN) Security Council to authorize a special inspections regime, leading Pyongyang to announce its withdrawal from the Nuclear Nonproliferation Treaty (NPT). Some U.S. officials believed that military action could reduce the threat posed by North Korea's nuclear program. For example, Secretary of Defense William Perry later indicated, "We believed that the nuclear program on which North Korea was embarked was ... dangerous, and were prepared to risk a war to stop it."²⁷ Any American operation against North Korea would likely have involved cooperation from South Korea, which had seriously considered raiding nuclear facilities at Yongbyon as early as 1991. In the end, a diplomatic bargain known as the Agreed Framework brought a (temporary) end to the crisis.²⁸

Iran's nuclear program has also raised the prospect of preventive military action. Some elites in Washington and Jerusalem have recently called for military raids against Tehran's nuclear facilities. President Obama has not publicly threatened to bomb Iranian nuclear facilities, but he has said that "all options are on the table," and that the option of last resort is the "military component."²⁹ Israeli officials, including Prime Minister Benjamin Netanyahu, have more forcefully advocated for military strikes. Speaking about the prospect of attacking Iran, Netanyahu said, "None of us can afford to wait much longer...I will never let my people live in the shadow of annihilation."³⁰ Officials outside of the United States and Israel – including Saudi King Abdullah – have similarly voiced support for preventive raids against Iran's nuclear infrastructure. It remains to be seen, however, whether Israel or the United States will take military action against Iran.

In the cases discussed above, the target state had yet to acquire nuclear weapons. Does the danger of preventive war disappear once a potential target assembles a nuclear arsenal? Kenneth Waltz, a prominent proponent of "nuclear optimism," maintains that "preventive strikes against states that have, or may have, nuclear weapons are hard to imagine."³¹ It is true that attacks against nuclear states are potentially more dangerous than strikes against states that are still nonnuclear. However, countries have occasionally considered raiding nuclear infrastructure in states that possessed nuclear arsenals. Some elites in the United States called for preventive strikes against the Soviet Union during the 1950s.³² The Soviet Union seriously contemplated striking Chinese nuclear facilities during the 1969 border crisis.³³ Libya hoped to launch a

retaliatory raid against Israel's Dimona plant following the 1981 Osiraq strike. Tripoli sought cooperation to implement such a strike from Iraq and the Soviet Union, both of whom expressed little interest in attacking Israel.³⁴ Iraq did, however, launch Scud missiles at Dimona during the 1991 Persian Gulf War, but they did not come close to hitting the target.³⁵

Why Countries Attack

The preceding discussion underscores the belief that concerns about nuclear proliferation have occasionally led to preventive strikes against nuclear facilities. Why do countries attack or consider attacking nuclear plants in other states? Prior research has shown that states are more likely to target nuclear programs when they are highly threatened by the target state's potential acquisition of nuclear weapons.³⁶ Two main factors shape this threat perception: violent interstate conflict and the proliferator's regime type.³⁷

Nuclear proliferation can be especially threatening to states that fear that they could be targeted with the bomb. The likelihood of nuclear use is generally low and nuclear weapons have not been used in war since the bombings of Hiroshima and Nagasaki in 1945. However, a history of bad relations among states can increase fears of a future nuclear attack, perhaps leading to the perception that a rival's acquisition of the bomb poses an existential threat. For example, some Israeli officials viewed the Iraqi nuclear program as a threat of the highest magnitude, in part, because Iraq fought against Israel in the 1948 War of Independence and the 1973 Yom Kippur War.³⁸ As Prime Minister Menachem Begin proclaimed shortly after the strike against Osiraq in 1981, "If we stood by idly...Saddam Hussein would have produced his three, four, five bombs...Then, this country and this people would have been lost...Another Holocaust would have happened in the history of the Jewish people."³⁹

States are substantially less threatened when their non-rivals pursue nuclear weapons. Attacks against nuclear infrastructure are therefore unlikely in the absence of hostile relations – even when states are far from friendly. Algeria, for instance, may have coveted nuclear weapons⁴⁰ and Algiers was one of the last capitals to consider normalizing relations with Israel.⁴¹ Yet, Israel did not raid Algeria's nuclear plants, in part, because the absence of major war between the two countries lessened the threat posed by an Algerian bomb.⁴² Needless to say, attacks become exceedingly unlikely when the potential attacker and target are military allies. It is unthinkable, for instance, that the United States would have attacked British nuclear facilities in the early 1950s to delay London's ability to build the bomb.

A country's regime type also affects the degree to which other states are threatened by its nuclear program. Highly authoritarian proliferators are more likely than democracies to be attacked. Indeed, all of the strikes against nonnuclear weapons states had a non-democratic target even though many democracies thought about building (or built) the bomb (e.g., Australia, Britain, France, and India). Why is this the case?

Democratic leaders are constrained by domestic institutions such as legislatures and judiciaries, which can limit capricious foreign policy decisions and promote compliance with international norms.⁴³ Authoritarian countries, on the other hand, often have less respect for norms because of

opaque institutions and relatively little domestic accountability. Autocrats might thus be more likely to threaten other states with nuclear weapons, use the bomb first during a crisis, or engage in other provocative actions. Concerns such as these can motivate states to use military force to delay proliferation. For example, U.S. National Security Advisor Brent Scowcroft believed that Saddam Hussein's "notoriously mercurial" behavior magnified the threat of an Iraqi bomb and helped justify targeting Baghdad's nuclear program during the Persian Gulf War.⁴⁴ President George W. Bush likewise believed that the world should not allow Iran to acquire nuclear weapons because Tehran has a "non-transparent" government, implying that its regime type heightens the risk of aggressive or unpredictable behavior.⁴⁵

Aside from the perceived threat posed by the target's nuclear program, two other general considerations may also affect the likelihood of preventive strikes.⁴⁶ First, potential attackers are likely to consider whether raids against nuclear facilities could be successful. The likelihood of success depends partially on the military capabilities of the attacker. Weak states will often be unable to destroy their enemies' nuclear programs in the absence of cooperation from their allies. For instance, although Zambia may have been threatened by the prospect of a South African bomb in the 1970s, it would have struggled mightily to successfully destroy the relevant facilities on its own, decreasing the odds that officials in Lusaka would even consider the military option.

The number of nuclear facilities that the target possesses also influences the likelihood that raids against nuclear programs will be successful. Iraq and Syria each possessed one main chokepoint facility at the time that they were attacked, and neither state was on the verge of building nuclear weapons. Israel therefore needed only to destroy a single facility to delay proliferation in these two cases. This situation becomes more complex, however, when potential targets have well-developed nuclear programs. Iran, to cite one example, has multiple facilities that would probably need to be destroyed to significantly curtail its nuclear program: the uranium enrichment facilities at Natanz and Qom, the heavy water production facility at Arak, the uranium conversion center at Isfahan, the Bushehr nuclear power plant, and the Tehran research reactor. This does not mean that it is impossible for Israel or the United States to successfully delay Iran's nuclear program using military force, but the probability of success is substantially lower relative to a scenario in which Iran possessed a single nuclear chokepoint.⁴⁷

Second, the costs of raiding nuclear programs could deter countries from attacking. States may be unlikely to attack if they believe that a limited preventive strike would lead to a large-scale war or produce other undesirable outcomes. For example, the United States refrained from bombing Chinese and North Korean nuclear facilities in part because officials in Washington believed that the military costs of such operations were too high. Concerns about costs have also influenced the debate about how to respond to Iran's nuclear program. U.S. officials that are considering bombing Iran's nuclear facilities today must wrestle with the possibility that Tehran could retaliate by closing the Strait of Hormuz or engage in other actions that threaten core U.S. politico-strategic interests.⁴⁸

States may also worry about the normative costs of targeting nuclear programs. There is an international norm against the preventive use of force, and Article 56 of Protocol I Additional to the Geneva Conventions (1977) specifically prohibits the targeting of nuclear plants. Thus, states might be deterred from using military force by the prospect of political or economic isolation.

One reason that India ultimately refrained from bombing Pakistan's Kahuta enrichment plant in the 1980s was because officials in New Delhi feared that "the international community would condemn us."⁴⁹ Similarly, after Israeli Prime Minister Ehud Olmert asked George W. Bush to bomb Syria's al Kibar reactor during a 2007 phone conversation, Bush concluded that the normative and political costs were too great. As he recounted in his memoir, "As a military matter, the bombing mission would be straightforward. The Air Force could destroy the target, no sweat. But bombing a sovereign country with no warning or announced justification would create severe blowback."⁵⁰

Discussion and Conclusion

Scholars have previously argued that nuclear weapons programs are dangerous, in part, because they can lead to preventive war.⁵¹ This chapter lends credence to this argument by identifying numerous historical cases in which countries attacked or considered attacking nuclear programs. I have also articulated the conditions under which nuclear weapons programs are likely to lead to military strikes. When the potential attacker and the target have a history of violent conflict – and when the target state is authoritarian – preventive strikes are considerably more likely.⁵² Other factors may also affect the use of force, but the perceived threat posed by the target's acquisition of the bomb is among the most important in triggering interest in preventive military action. This implies that nuclear weapons programs can be destabilizing, at least under certain conditions. Those interested in conflict management would therefore do well to engage in more diplomacy aimed at limiting the onset of new nuclear weapons programs.

One might dispute this conclusion, however, on the grounds that the violence caused by nuclear programs to date has been relatively minimal. Outside of ongoing interstate wars, nuclear facilities have been bombed on just a handful of occasions. During the Osiraq raid, the highest profile attack against a nuclear facility, only 10 Iraqi soldiers and one French civilian were killed.⁵³ Although it is important not to exaggerate the threat posed by nuclear weapons programs, the danger of preventive force should not be dismissed due to the modest amount of violence caused by the attacks discussed in this chapter. First, there were a number of close calls – particularly in South Asia – where attacks were strongly considered but ultimately not conducted. Had Indira Gandhi followed through on her initial decision to attack Kahuta, it is possible, and perhaps likely, that war would have resulted between India and Pakistan. Second, attacks against nuclear programs could occur more frequently – and become deadlier – in the future, particularly if there are doubts about whether states pursuing the bomb would act as "responsible" nuclear powers.⁵⁴

Compounding matters further, interest in nuclear energy is growing around the world – despite the March 2011 accident at Japan's Fukushima nuclear power plant – as part of a movement that some have labeled the "nuclear renaissance."⁵⁵ Although existing research tends to downplay the strategic effects of nuclear energy,⁵⁶ there is a growing recognition among scholars that nuclear programs could raise the risk of international conflict even when they are "peaceful" in nature.⁵⁷ This is in part because the development of a civilian nuclear program in one state might provide incentives for others to launch preventive strikes.

There is precedent for using military force against civilian facilities. Iran's Bushehr nuclear power plant – which was bombed during the Iran-Iraq War – was being built with assistance from West Germany to produce electricity. Osiraq was also technically a civilian facility. The reactor was supplied by France exclusively for peaceful purposes and it was placed under IAEA safeguards, meaning that it should have been difficult for Iraq to use Osiraq for military purposes. Many policy makers and analysts therefore condemned the Israeli strike and interpreted it as an indictment of the nonproliferation regime. For example, Sigvard Edlund, the director general of the IAEA, stated, “The Israeli attack on Iraq's nuclear research center was also an attack on the Agency's safeguards.”⁵⁸ Why would countries have incentives to bomb civilian nuclear plants?

Nuclear facilities are dual-use in nature, meaning that they can serve civilian or military purposes. Reactors can be employed to produce medical isotopes or to help meet a country's energy needs by producing electricity. These same facilities, however, also provide a potential source of plutonium for nuclear weapons. This so called dual-use dilemma means that countries can draw on civilian nuclear programs to augment their military capabilities. India, for example, used a civilian research reactor supplied by Canada in the 1950s to conduct its first nuclear test in 1974. France similarly built between 63 and 250 nuclear weapons using plutonium that was produced in civilian power plants.⁵⁹ Examples such as these are not uncommon. Recent research shows that, on average, states that receive foreign assistance in developing peaceful nuclear programs are statistically more likely than states that do not receive atomic aid (or receive lower levels of assistance) to pursue and acquire nuclear weapons – especially if they later experience an international crisis.⁶⁰

When states build nuclear facilities, it is therefore difficult for outsiders to know for certain whether the plants are meant for electricity production, the manufacture of nuclear weapons, or both. This problem is evident in the contemporary case of Iran. Many in the West suspect that Iran intends to build nuclear weapons, yet Tehran has repeatedly asserted that its program is intended only to serve peaceful ends. The oft-discussed 2007 National Intelligence Estimate (NIE) on Iran's nuclear program underscored this tension. The NIE concluded with “high confidence” that Tehran halted its nuclear weapons program in 2003 but that it continued the civilian uranium enrichment program, and this program could be applied to nuclear weapons production if Iran decided to proliferate.⁶¹ Countries aspiring to develop nuclear programs can use signals to convey that their intentions are peaceful.⁶² For instance, willingness to subject nuclear facilities to international inspections could alleviate concerns about whether a state's plants might be used to build bombs. On the other hand, states that refuse to accept measures such as the 1997 IAEA Additional Protocol (AP), which provides the Agency with greater authority to inspect nuclear sites, are likely to create ambiguity about their intentions.⁶³ One reason that some believe that Iran covets nuclear weapons is that Tehran has signed but not ratified the AP.

Yet, even if states accept the AP and allow the IAEA to inspect their nuclear plants, they may be unable to convince others – especially their rivals – that their intentions are peaceful. Interstate rivalries, which ensue from a history of conflict, erode trust and often cause states to adopt worst-case thinking when analyzing actions taken by others.⁶⁴ For example, during the height of

the Cold War, seemingly every policy adopted by Moscow was viewed suspiciously in Washington, even those that were probably innocuous. This helps explain why placing Osiraq under safeguards did not stop Israel from believing that Saddam Hussein intended to use the research reactor to produce plutonium for nuclear bombs. With that said, if Iraq's intentions were peaceful, Baghdad did not help its cause by making hostile statements towards Israel and engaging in other actions that raised questions about the true purpose of Osiraq.

The current list of nuclear energy aspirants includes states that might struggle to persuade some in the international community that they are procuring technology strictly for peaceful purposes. In the Middle East, for instance, 12 countries are considering building nuclear power plants.⁶⁵ Many assume that these states want nuclear energy programs as a hedge against a possible Iranian bomb. If countries such as Egypt, Jordan, Turkey, and Saudi Arabia expand their civilian nuclear programs, it may be difficult for them to convince others that their intentions are entirely harmless, even if they sincerely have little interest in nuclear weapons. This does not imply that these states will have their nuclear facilities bombed in the future, but the probability of preventive strikes may increase if nuclear technology diffuses around the globe to the degree that some predict.⁶⁶

My analysis in this chapter leaves an important question unanswered: are countries wise to target nuclear programs preventively? There is evidence that prior strikes against nuclear facilities delayed the targets' nuclear weapons programs.⁶⁷ However, looking into the future, policy makers should be exceedingly cautious when contemplating preventive strikes. First, the conditions that led to success in the past may not be present in the future. Importantly, many of the conditions that facilitated success in Iraq (1981) and Syria (2007) are notably absent in the case of Iran, as I discussed elsewhere in this chapter.⁶⁸ Second, worst-case assessments about the consequences of nuclear proliferation are unwarranted. Although nuclear weapons affect international politics in some respects, they are generally poor instruments for coercion and intimidation. Based on an analysis of more than 200 militarized compellent threats⁶⁹ issued from 1918 to 2001, recent research shows that nuclear-armed states are not more likely than nonnuclear states to successfully blackmail their adversaries.⁷⁰ Some countries may still believe that their rival's acquisition of the bomb constitutes an existential threat, but fears about nuclear blackmail should not be used to justify preventive strikes against nuclear facilities.

In any case, history suggests that the risk of preventive war is unlikely to disappear in the future. It is therefore important for scholars to continue to examine this issue and devote greater attention to the consequences of nuclear technology diffusion more generally. Additional research in this vein could further inform enduring policy questions, such as what officials in Washington should do in response to the development of nuclear programs in countries of concern.

¹ This chapter draws partially on two articles that were coauthored with Sarah E. Kreps. See Matthew Fuhrmann and Sarah E. Kreps, "Targeting Nuclear Programs in War in Peace: A Quantitative Empirical Analysis, 1941-2000," *Journal of Conflict Resolution*, Vol. 35, No. 6 (2010), pp. 831-859; Sarah E. Kreps and Matthew Fuhrmann, "Attacking the Atom: Does Bombing Nuclear Facilities Affect Proliferation?" *Journal of Strategic Studies*, Vol. 34, No. 2 (2011), pp. 161-187.

² See, for example, Scott Sagan, “The Perils of Proliferation: Organization Theory, Deterrence Theory, and the Spread of Nuclear Weapons,” *International Security*, Vol. 18, No. 4 (1994), pp. 66-107.

³ Kenneth N. Waltz, “The Spread of Nuclear Weapons: More May Be Better,” Adelphi Paper No. 171 (London: International Institute for Strategic Studies, 1981).

⁴ John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al Qaeda* (New York: Oxford University Press, 2009), p. 237.

⁵ See Fuhrmann and Kreps, “Targeting Nuclear Programs in War and Peace.” For other surveys of the historical record, see Dan Reiter, “Preventive Attacks against Nuclear, Biological, and Chemical Weapons Programs: The Track Record,” in William Walton Keller and Gordon R. Mitchell, eds., *Hitting First, Preventive Force in US Security Strategy* (Pittsburgh, PA: Pittsburgh University Press, 2006); Bennett Ramberg, “Preemption Paradox,” *Bulletin of the Atomic Scientists* Vol. 62, No. 4 (2006), 48-56.

⁶ See, for example, Per F. Dahl, *Heavy Water and the Wartime Race for Nuclear Energy* (London, UK: Taylor and Francis, 1999); Knut Haukelid, *Skis against the Atom: The Exciting, First-Hand Account of Heroism and Daring Sabotage During the Nazi Occupation of Norway* (North American Heritage Press, 1989); Thomas Gallagher, *Assault in Norway: Sabotaging the Nazi Nuclear Program* (Lyons Press, 2002).

⁷ Ronald Bergquist, “The Air War,” in *The Role of Airpower in the Iran-Iraq War* (Montgomery, AL: Air University Series, 1988), pp. 41-68; Mark Hibbs, “Bushehr Construction Now Remote after Three Iraqi Air Strikes,” *Nucleonics Week*, Vol. 28, No. 48 (1987), pp. 5-6; Mark Hibbs, “Iraqi Attack on Bushehr Kills West German Nuclear Official,” *Nucleonics Week*, Vol. 28, No. 47 (1987); Dilip Hiro, *The Longest War: The Iran-Iraq War* (London, UK: Grafton, 1989), pp. 129-166, 192.

⁸ Amos Perlmutter, Michael I. Handel, and Uri Bar-Joseph, *Two Minutes over Baghdad* (New York: Routledge, 2003), p. xxxi.

⁹ *Gulf War Air Power Survey*, Vol. 1, “Planning and Command and Control” (Washington, DC: Government Printing Office, 1993).

¹⁰ Most of these bombs were unguided. See *Gulf War Air Power Survey*.

¹¹ Jeremy Tamsett, “The Israeli Bombing of Osiraq Reconsidered: Successful Counterproliferation?” *The Nonproliferation Review*, Vol. 11, No. 3 (2004), pp. 70-85; “Zaafaraniyah,” Federation of American Scientists, October 9, 2000. Available at: <http://www.fas.org/nuke/guide/iraq/facility/zaafaraniyah.htm>

¹² Tamsett, “The Israeli Bombing of Osiraq Reconsidered,” p. 81.

¹³ Anthony Cordesman, “The Lessons of Desert Fox: A Preliminary Analysis,” Center for Strategic and International Studies, February 16, 1999; *Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD*, Vol. 2 (Washington, D.C.: Government Printing Office, 2004), pp. 45-46.

¹⁴ See, for example, Tamsett, “The Israeli Bombing of Osiraq Reconsidered;” Dan Reiter, “Preventive Attacks Against Nuclear Programs and the ‘Success’ at Osiraq,” *Nonproliferation Review* 12 (July 2005), 355-371; Kreps and Fuhrmann, “Attacking the Atom.”

¹⁵ Bill Gertz and Sara Carter “US: Syria Hid N. Korea-aided Nukes Plant,” *Washington Times*, April 24, 2008.

¹⁶ Joby Warrick and Robin Wright, “Search is Urged for Syrian Nuclear Sites,” *Washington Post*, May 29, 2008.

¹⁷ Leonard S. Spector and Avner Cohen, "Israel's Airstrike on Syria's Reactor: Implications for the Nonproliferation Regime," *Arms Control Today* (July/August 2008).

¹⁸ Fuhrmann and Kreps, "Targeting Nuclear Programs in War and Peace."

¹⁹ Avner Cohen, "Cairo, Dimona, and the June 1967 War," *The Middle East Journal* Vol 50, No. 2 (1996), pp. 190-210; Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998), pp. 243-276; Isabella Ginor and Gideon Remez, *Foxbats Over Dimona: The Soviets' Nuclear Gamble in the Six Day War* (New Haven, CT: Yale University Press, 2007).

²⁰ Douglas Frantz and Catherine Collins, *The Nuclear Jihadist: The True Story of the Man Who Sold The World's Most Dangerous Secrets and How We could Have Stopped Him* (New York: Twelve, 2007), pp. 88-89; Sumit Ganguly and Devin Hagerty, *Fearful Symmetry: India-Pakistan Crises in the Shadow of Nuclear Weapons* (Seattle: University of Washington Press, 2005); Bharat Karnad, *India's Nuclear Policy* (Westport, CT: Praeger, 2008).

²¹ Karnad, *India's Nuclear Policy*, p. 57.

²² Ganguly and Hagerty, *Fearful Symmetry*, p. 58.

²³ Davis Albright, "South Africa and the Affordable Bomb," *Bulletin of the Atomic Scientists*, July/August 1994; Nuclear Threat Initiative, "South Africa Profile: Nuclear Overview," May 2007: http://www.nti.org/e_research/profiles/SAfrica/Nuclear/index.html; Ramberg, "Preemption Paradox," p. 56.

²⁴ William Burr and Jeffrey Richelson, "Whether to Strangle the Baby in the Cradle: The United States and the Chinese Nuclear Program, 1960-64" *International Security* Vol. 25, No. 3 (2000/01), pp. 54-99; Gordon Chang, "JFK, China, and the Bomb," *Journal of American History*, Vol. 74, No. 4 (1988), pp. 1289-1310; Central Intelligence Agency, Office of National Estimates, "Chinese Communist Capabilities for Developing an Effective Atomic Weapons Program and Weapons Delivery Program," June 24, 1955; Policy Planning Council (PPC) Director George McGhee to Secretary of State Dean Rusk, "Anticipatory Action Pending Chinese Demonstration of a Nuclear Capability," September 13, 1961, Digital National Security Archive.

²⁵ Burr and Richelson, "Whether to Strangle the Baby in the Cradle."

²⁶ Ashton Carter and William Perry, *Preventive Defense: A New Security Strategy for America* (Washington, D.C.: Brookings, 1999), pp. 123, 131; Lyle Goldstein, *Preventive Attack and Weapons of Mass Destruction: A Comparative Historical Analysis* (Stanford, CA: Stanford University Press, 2006), pp. 133-135; David Sloss, "Forcible Arms Control: Preemptive Attacks on Nuclear Facilities," *Chicago Journal of International Law*, Vol. 4 (2003), pp. 39-58; Joel Wit, Daniel Poneman and Robert Gallucci, *Going Critical: The First North Korean Nuclear Crisis* (Washington, D.C.: Brookings, 2004), pp. 210-11, 219-220, 244.

²⁷ Ashton Carter and William Perry, "Back to the Brink," *The Washington Post*, October 20, 2002.

²⁸ Under the terms of the deal, the United States and its allies agreed to supply North Korea with light water reactors for electricity production and Pyongyang agreed to remain part of the NPT.

²⁹ Quoted in Jeffrey Goldberg, "Obama to Iran and Israel: 'As President of the United States, I Don't Bluff,'" *The Atlantic*, March 2, 2012.

³⁰ Quoted in Jeffrey Heller and Matt Spetalnick, "Netanyahu Tells Obama: No Israeli Decision on Iran Attack," *Reuters*, March 6, 2012. Note, however, that this view is not universally shared among Israeli officials. For example, Mossad head Tamir Pardo has argued that a nuclear-armed Iran would not pose an existential threat. See Barak Ravid, "Mossad Chief: Nuclear Iran Not Necessarily Existential Threat to Israel," *Haaretz*, December 29, 2011.

³¹ Waltz, "The Spread of Nuclear Weapons," p. 15. For a critique of this argument see Sagan, "The Perils of Proliferation."

³² "Acheson Rules out 'Preventive War,'" *The New York Times*, June 14, 1950; Goldstein, *Preventive Attack and Weapons of Mass Destruction*, pp. 37-42

³³ William Burr, "Sino-American Relations, 1969: The Sino-Soviet Border War and Steps Towards Rapprochement," *Cold War History*, Vol 1, No. 3 (April 2001), 73-112; Elizabeth Wishnick, *Mending Fences: The Evolution of Moscow's China Policy from Brezhnev to Yeltsin* (Seattle, WA: University of Washington Press, 2001), pp. 34-36.

³⁴ Ginor and Remez, *Foxbats Over Dimona*, p. 121; Ludmilla B. Herbst, "Preventive Strikes on Nuclear Facilities: An Analytic Framework," M.A. Thesis, University of British Columbia, 1995, p. 8; George Russell, "Attack – and Fallout," *Time*, June 22, 1981.

³⁵ Bob Hepburn, "Is Nuclear Plant Iraq's New Target in Israeli Desert?" *The Toronto Star*, February 19, 1991; "Iraq Reports 'Destructive' Attack on Israeli Reactor 'Dedicated to War Purposes,'" *BBC*, February 18, 1991; Richard Owen, "Missiles Aimed at Dimona Nuclear Reactor," *The Times*, February 18, 1991; Stewart Stogel, "Iraq Fired Scuds at Israeli Reactor; '91 Attack Sought to Crack Dome," *Washington Times*, January 1, 1998.

³⁶ Fuhrmann and Kreps, "Targeting Nuclear Programs in War and Peace."

³⁷ Another factor that influences this threat perception is the similarity of foreign policy interests between the potential attacker and the proliferator. See Fuhrmann and Kreps, "Targeting Nuclear Programs in War and Peace," p. 840.

³⁸ Iraq was not classified as a formal participant in the 1967 Six Day War because it did not commit at least 1,000 troops or suffer 100 battle-related deaths. Meredith Reid Sarkees and Frank Wayman, *Resort to War: 1816-2007* (Washington, D.C.: CQ Press, 2010).

³⁹ Quoted in Spector and Cohen, "Israel's Airstrike on Syria's Reactor."

⁴⁰ David Albright, and Corey Hinderstein, "Algeria: Big Deal in the Desert?" *Bulletin of the Atomic Scientists*, Vol. 56 (2001), pp. 45-52.

⁴¹ Jacob Abadi, "Algeria's Policy toward Israel: Pragmatism and Rhetoric," *The Middle East Journal*, Vol. 56, No. 4 (2002), pp. 616-641.

⁴² Note, however, that Algeria did provide some support to Arab forces in 1967 and 1973.

⁴³ See, for example, Matthew Fuhrmann and Jeffrey D. Berejikian, "Disaggregating Noncompliance: Predation versus Abstention in the Nuclear Nonproliferation Treaty," *Journal of Conflict Resolution*, Vol. 56, No. 3 (2012), pp. 355-381.

⁴⁴ George H.W. Bush and Brent Scowcroft. *A World Transformed* (New York: Alfred Knopf, 1998), pp. 306-307.

⁴⁵ Jim Garamone, "Bush: Iran Cannot Gain Nuclear Weapons," *American Forces Press Service*. January 30, 2006.

⁴⁶ Note, however, that many of the factors discussed here were insignificant in the statistical analysis conducted by Fuhrmann and Kreps in "Targeting Nuclear Programs in War and Peace."

⁴⁷ Matthew Fuhrmann and Sarah E. Kreps, "Why Attacking Iran Won't Stop the Nukes," *USA Today*, January 31, 2012.

⁴⁸ See, for example, Caitlin Talmadge, “Closing Time: Assessing the Iranian Threat to the Strait of Hormuz,” *International Security*, Vol. 33, No. 1 (2008), pp. 82-117.

⁴⁹ Ramberg, “Preemption Paradox,” p. 53.

⁵⁰ George W. Bush, *Decision Points* (New York: Random House, 2010), p. 421.

⁵¹ For example, Sagan, “The Perils of Proliferation.”

⁵² This is relative to a scenario in which the target is democratic and there is no history of violence between the potential attacker and the target.

⁵³ “Factfile: How Osiraq Was Bombed,” *BBC*, June 5, 2006. Available at: <http://news.bbc.co.uk/2/hi/5020778.stm>.

⁵⁴ For a similar argument, see Dan Reiter, “The Global Nuclear Renaissance and the Spread of Violent Conflict: A Comment,” in Adam N. Stulberg and Matthew Fuhrmann, eds., *The Nuclear Renaissance and International Security* (Palo Alto, CA: Stanford University Press, 2013).

⁵⁵ See, for example, Steven Miller and Scott Sagan, “Nuclear Power without Nuclear Proliferation?” *Daedalus*, Vol. 138, No. 4 (Fall 2009); Stulberg and Fuhrmann, *The Nuclear Renaissance and International Security*.

⁵⁶ Research on the strategic effects of nuclear energy conducted to date focuses mostly on the relationship between nuclear power and nuclear proliferation. See, for example, Albert Wohlstetter, Thomas Brown, Gregory Jones, David McGarvey, Henry Rowen, Vince Taylor, and Roberta Wohlstetter, *Swords from Plowshares: The Military Potential of Civilian Nuclear Energy* (Chicago: University of Chicago Press, 1979); Matthew Fuhrmann, *Atomic Assistance: How “Atoms for Peace” Programs Cause Nuclear Insecurity* (Ithaca, NY: Cornell University Press, 2012); Matthew Fuhrmann, “Spreading Temptation: Proliferation and Peaceful Nuclear Cooperation Agreements,” *International Security*, Vol. 34, No. 1 (Summer 2009), pp. 7-41.

⁵⁷ Notable examples include Kyle Beardsley and Victor Asal, “Nuclear Weapons Programs and the Security Dilemma,” in Stulberg and Fuhrmann, eds., *The Nuclear Renaissance and International Security*; Michael C. Horowitz, “Nuclear Power and Militarized Conflict: Is There a Link?” in Stulberg and Fuhrmann, eds., *The Nuclear Renaissance and International Security*; Reiter, “The Global Nuclear Renaissance and the Spread of Violent Conflict.”

⁵⁸ Quoted in Fuhrmann, *Atomic Assistance*, p. 230.

⁵⁹ Matthew Fuhrmann, “Australia’s Uranium Exports and Nuclear Arsenal Expansion: Is There A Connection?” in Michael Clarke, Stephan Frühling, Andrew O’Neil, eds., *Australia’s Uranium Trade: The Domestic and Foreign Policy Challenges of a Contentious Export* (London: Ashgate, 2011), p. 48.

⁶⁰ Fuhrmann, *Atomic Assistance*.

⁶¹ *Iran: Nuclear Intentions and Capabilities*, National Intelligence Council, November 2007. Available at: http://www.dni.gov/press_releases/20071203_release.pdf.

⁶² On the role of signaling in international relations see James Fearon, “Signaling Foreign Policy Interests: Tying Hands Versus Sinking Costs,” *Journal of Conflict Resolution* Vol. 41, No. 1 (1997), pp. 68–90.

⁶³ For a good overview of the Additional Protocol, see Theodore Hirsch, “The IAEA Additional Protocol: What It Is and Why It Matters,” *The Nonproliferation Review*, Vol. 11, No. 3 (Fall/Winter 2004), pp. 140-166.

⁶⁴ See, for example, Paul Diehl and Gary Goertz, *War and Peace in International Rivalry* (Ann Arbor, MI: University of Michigan Press, 2000).

⁶⁵ Miller and Sagan, “Nuclear Power without Nuclear Proliferation?” p. 10.

⁶⁶ Of course, this does not imply that states should oppose nuclear energy. The development of nuclear power might help states meet growing energy needs, enhance their energy security, and, possibly, help address the problem of global climate change. These potential benefits must be weighed against the costs in order to determine whether the diffusion of peaceful nuclear programs is desirable or not. Matthew Fuhrmann, “Splitting Atoms: Why Do Countries Build Nuclear Power Plants?” *International Interactions*, Vol. 38, No. 1 (2012), pp. 29-57. See also Henry Sokolski, ed., *Nuclear Power’s Global Expansion: Weighing Its Costs and Risks* (Carlisle, PA: Strategic Studies Institute, 2010).

⁶⁷ Kreps and Fuhrmann, “Attacking the Atom.” For an alternative perspective, see Reiter, “Preventive Attacks against Nuclear, Biological, and Chemical Weapons Programs.”

⁶⁸ For further details, see Kreps and Fuhrmann, “Attacking the Atom;” Fuhrmann and Kreps, “Why Attacking Iran Won’t Stop the Nukes.”

⁶⁹ A compellent threat is a demand to make some change to the existing status quo.

⁷⁰ Todd S. Sechser and Matthew Fuhrmann, “Crisis Bargaining and Nuclear Blackmail,” *International Organization*, forthcoming.