

# DOES SAUDI ARABIA HAVE OR SEEK CHEMICAL OR BIOLOGICAL WEAPONS?

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This report assesses whether Saudi Arabia has or can be expected to acquire chemical and biological weapons (CBW). No solid evidence points to Saudi Arabian acquisition of CBW. Further, Saudi Arabia has the options of conventional arms or friendship with the United States as deterrents, and often pursues conciliation or participation in the various nonproliferation regimes as strategies for dealing with potential threats. It is the purpose of this report, however, to analyze the prospects for and feasibility of CBW acquisition by Saudi Arabia. Though unavoidably speculative due to the lack of concrete information, the analysis presented here shows that there are data and indications that ought to be examined further.

The methodology of this report is primarily deductive. It examines Saudi Arabia's threat environment and strategic vulnerabilities in conjunction with Saudi resources and expertise to determine its likely motivation and capability to acquire CBW. The analysis is supplemented by a discussion of the available empirical evidence on these questions.

Situated in a region characterized by significant CBW proliferation, Saudi Arabia possesses almost unlimited financial resources and an extensive scientific-technological infrastructure. These conditions would seem to encourage Saudi Arabia to pursue a CBW capability, as do several other factors: an acute CBW threat from Iraq during the 1990-1991 Gulf conflict; a Saudi arsenal of ballistic missiles, including long-range CSS-2 missiles

originally developed by China for non-conventional warheads; and close relations between Saudi Arabia and Pakistan, which is generally believed to have both nuclear and CBW capabilities. This report examines these various factors in an effort to assess the current and anticipated status of CBW proliferation in the Saudi Arabian context. Following a brief review of CBW-relevant events in Saudi Arabia, the report will first explore the strategic vulnerability that might motivate a desire for CBW, and then discuss the technical and scientific resources that would enable Saudi Arabia to acquire a CBW capability.

## EVENTS OF CONCERN

Several events, though sporadic, indicate that Saudi Arabia may have both the motivation and the capability to acquire CBW. The major one is the 1991 Gulf War. In November 1990 the commander of the joint forces in Saudi Arabia, Emir Khaled Bin Sultan, stated that Iraqi use of CBW could not be ruled out and that Saudi forces were fully prepared to deal with this contingency.<sup>1</sup> Indeed, following the Iraqi invasion of Kuwait, Saudi Arabia engaged in extensive defensive preparations against a possible CBW attack. Throughout the Gulf War, Saudi Arabia was confronted with the CBW threat and its strategic, operational, and tactical ramifications. A likely outcome would be the increased attractiveness of acquiring CBW capabilities, both for deterrence and retaliatory purposes.

Beyond the acute CBW threat posed by Iraq, Saudi Arabia has experienced several additional CBW episodes. On January 14, 1967, two Saudi sites near the Yemen border were bombed with chemical weapons (CW). The Egyptian Air Force, having conducted many CW operations in Yemen, had apparently extended the use of CW to Saudi Arabia proper. Fragments of aerial bombs scattered near these sites had Cyrillic inscriptions on them,<sup>2</sup> indicating that Saudi Arabia's Western orientation and support given to the anticommunist Yemenite villagers were undesirable for the Soviets as well as the Egyptians.

Following these attacks, Saudi Arabia joined the Geneva Protocol of 1925, which bans the use in war of CBW, but not their possession. This step illustrated Saudi awareness of a significant vulnerability that has not yet been removed.

In 1979, while conducting a vigorous effort to suppress religious dissidents occupying the holy Ka'abba of Mecca, the Saudi regime massively and effectively employed a potent incapacitating CW riot-control agent, probably benzyl chloride, acquired from France.<sup>3</sup>

On several occasions in January 1991, during the Gulf War, Czech chemical-defense units under contract to the Saudi army detected the presence of low levels of Iraqi nerve and mustard agents in the atmosphere in northern Saudi Arabia, which may have been associated with the delivery or release of CW by the Iraqis.<sup>4</sup>

In 1993, Saudi authorities cooperated with the United States in halting and inspecting the cargo of a Chinese ship, the *Yin He*, suspected of carrying precursor chemicals for CW production from China to Iran.<sup>5</sup>

Finally, the Saudi millionaire Osama Bin Laden has allegedly directed the establishment of CW production facilities in Sudan,<sup>6</sup> as well as in Afghanistan and Bosnia,<sup>7</sup> essentially for terrorism purposes, though no interactions whatsoever have been observed with any elements situated in Saudi Arabia. These disparate incidents suggest the Saudi government should be acutely aware of CBW threats. A more systematic examination of Saudi Arabia's geostrategic situation will show additional motivations for CBW acquisition.

#### SAUDI ARABIA'S STRATEGIC ENVIRONMENT

Saudi Arabia is geographically the largest country in the Middle East. Though mostly unpopulated, its paramount significance stems from its central geostrategic

posture, its vast oil resources, and its pro-Western orientation. Prior to the 1991 Persian Gulf War, the United States Army War College described the strategic relationship between the United States and Saudi Arabia as serving key US interests in the Middle East and the Persian Gulf.<sup>8</sup> The Gulf War certainly strengthened this assessment.

Saudi Arabia is not only a strategically important country, it is located in a region that contains many potential threats to its security. Six major countries surrounding Saudi Arabia are reckoned to possess CBW, namely Egypt, Iran, Iraq, Israel, Sudan, and Syria. Moreover, many of these countries are increasing their efforts in the CBW sphere. Saudi Arabia is certainly aware of this ongoing trend. On rare occasions, including a 1989 Saudi press statement and a 1992 statement by Major General Salah El-Din Salim, Saudi authorities have even expressed approval of the possession of CBW by Arab states.<sup>9</sup> Whether or not the Saudi government would actually approve of the trend now, it cannot stop it. Regional nonproliferation efforts are formally coordinated through the Arab League Technical Committee, where a Saudi expert is usually a symbolic participant. Saudi Arabia has also led some more pragmatic but so far inconclusive steps within the Gulf Cooperation Council aimed at the total elimination of Iraq's non-conventional capabilities.

The process of non-conventional arms proliferation includes not just CBW, but also nuclear weapons, which are being pursued by Iran and Iraq. Israel, too, is likely to constitute a source of security anxiety for the Saudis. Given that Israel is widely believed to have chemical, biological, and nuclear weapons, and has at times made threats against Saudi Arabia, this is probably an additional factor in the Saudi calculus. Saudi vulnerability to attack from Iran and Iraq is quite obvious. Saudi Arabia's vast oil wealth, its non-radical orientation within the Arab world, and its strategic alliance with the United States may elevate its value as a tempting target for neighboring radical states. Under these circumstances, it would seem unlikely that Saudi Arabia has decided *not* to acquire a deterrent capability. The United States may furnish a non-conventional (i.e., nuclear) umbrella for Saudi Arabia, as was apparently the case during the 1990-1991 crisis, but the Saudis must have doubts that this would provide an adequate level of deterrence if Iran or Iraq were to attain a nuclear capability.

### Saudi Missile Capabilities

The most potent weapon known to be present in the Saudi arsenal is a force of Chinese CSS-2 long-range ballistic missiles. Saudi Arabia's overall military weakness and lack of manpower help to explain its purchase of these missiles, which are deployed as part of a new Saudi Arabian Strategic Rocket Force. In March 1988, it was revealed that Saudi Arabia had covertly bought and shipped the missiles and support at a cost of \$3-3.5 billion.<sup>10</sup> The Saudis evidently cannot fire these missiles without Chinese technical support, and Chinese technicians are deploying and operating the missiles under Saudi supervision.

There are good reasons, however, to question the value of such missiles as long as they have only conventional warheads. The CSS-2 missiles deployed in China itself are all nuclear-armed and can carry one- to three-megaton warheads. They have a maximum range of about 2,200 nautical miles (3,500 kilometers), an inertial guidance system, and a single-stage refrigerated liquid-fuel rocket motor. The version of the CSS-2 that the Chinese have sold to Saudi Arabia is heavily modified and has a special large conventional warhead weighing from 3,500 to 4,000 pounds. This added warhead weight cuts the maximum range of the missile to anywhere from 1,550 nautical miles (2,400 kilometers) to 1,950 nautical miles (3,100 kilometers). A conventional warhead of this size is more effective than a Scud missile warhead, but is scarcely a weapon of mass destruction or even an effective conventional weapon. Assuming an optimal ratio of high explosive to total weight, the warhead of the CSS-2 could destroy buildings out to a radius of 300 to 350 feet, and kill or injure people with shrapnel to a distance of up to 1,000 feet. This is substantially less destructive power than would result from a single sortie by a modern strike fighter.<sup>11</sup>

The CSS-2 has other limitations. It is an obsolete missile that was first designed in 1971. While an improved version has been deployed, most experts still estimate the circular error probable of the missile as nearly two to four kilometers, so that it lacks the accuracy to hit anything other than large area targets such as cities or industrial facilities. Even with the improved warhead, each missile would still have no greater effective lethality than a single 2,000 pound bomb. The missile also requires a large amount of technical support and ground equipment, and takes hours to prepare for firing. In sum, Saudi Arabia has acquired a very costly missile system

and deployed it in small numbers. Yet the CSS-2 has such low lethality that it provides only marginal deterrent value as long as it carries a conventional high-explosive warhead. This combination of missile forces and a lack of military effectiveness raises several serious issues:

(1) Saudi Arabia cannot defend its missiles effectively or use them to protect itself against WMD attacks. The Saudis have no antimissile defenses, and even their ambitious air-defense system is not leakproof against a few low-flying aircraft carrying chemical or biological weapons.

(2) While the offensive power of the Saudi Air Force is growing due to the increasing ordnance of the recently purchased American F-15S (S for Saudi Arabia) as well as the British Tornado 24 and 93,<sup>12</sup> no currently foreseeable combination of Saudi conventional air power and the CSS-2 missile force would constitute an effective deterrent. Iraq and Iran, the most important potential threats to Saudi Arabia, can safely ignore the CSS-2 because of the strategic might of their non-conventional capacities. This growing asymmetry is reflected in the annual surveys published by SIPRI and IISS.<sup>13</sup> UNSCOM's detailed technical findings about the Iraqi chemical and biological weapon systems have dual implications concerning Saudi attitudes—they vividly illustrate the Iraqi strategic threat, and at the same time provide potential CBW know-how. Moreover, it is now quite obvious that Iraq is determined to halt or reverse UNSCOM's reductions of its offensive capacities, meaning that Saudi planners must consider a possible increased Iraqi threat in the future.

(3) As now configured, the CSS-2 missile system may do more to provoke attack or escalation than to deter attack or provide a retaliatory capability. The 1990 Iraqi invasion of Kuwait, which raised fears of a further attack on Saudi Arabia, suggested the inadequacy of the existing Saudi deterrent. Saudi Arabia's purchase of the CSS-2 may have seemed a logical reaction to the Iran-Iraq missile war and to Israel's nuclear capabilities, while providing a means of gaining prestige and asserting Saudi independence from the United States. That exceptional Saudi move, however, may simply accelerate WMD proliferation in the region at Saudi Arabia's expense.<sup>14</sup> Iran and Iraq may view the new Saudi capability as a reason to accelerate their own WMD programs, and Saudi possession of such

missiles gives other countries in the region an added strong incentive to join the missile arms race, to acquire WMD, or to launch their own missiles preemptively in a conflict.

The CSS-2 purchase took place following the "War of the Cities" (ballistic missile duel) during the Iran-Iraq War. At the time, King Fahd noted that Saudi Arabia needed the CSS-2 to defend itself against Iran; Prince Bandar bin Sultan first explained that there had been no alternative to buying the missiles, as the Chinese had been threatening to make massive deliveries to Iran, but went on to imply that the missiles represented a necessary component of the kingdom's defense against Iran.<sup>15</sup> Saudi Arabia may well have done itself more harm than good by acquiring the missiles. The result is a destabilizing situation in which Saudi Arabia has purchased half a deterrent, and where its ultimate motives in acquiring the CSS-2 are unclear and will remain so despite any inspection agreements. Saudi Arabia is almost forced to acquire chemical or biological warheads if it wishes to make credible the deterrent threat from such missiles.

### Other Motivations for CBW Acquisition

A concrete Saudi motivation to possess non-conventional capability for purposes of deterrence and defense does appear to exist, although other possible motivations such as prestige (i.e., a desire to join the "nuclear club") or an ambition to exert regional hegemony do not seem to be relevant. Any efforts to acquire non-conventional arms appear much more likely to involve CBW than nuclear weapons. Saudi Arabia does not appear to possess nuclear research or power reactors, and it acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on March 10, 1988. Various reports of the nuclear arming of Saudi Arabia by Iraq and China remain of dubious credibility,<sup>16</sup> although Saudi financial support of the Pakistani nuclear weapons program may reflect a belief that conventional weapons are inadequate. Moreover, the fact that Saudi Arabia has not signed the Comprehensive Test Ban Treaty may further indicate a desire to keep its options open.

In 1991, it was alleged that several years earlier Saudi Arabia had developed a nuclear program of its own but that this program was abandoned after US pressure.<sup>17</sup> Other reports suggest that China may have supplied nuclear arms to Saudi Arabia,<sup>18</sup> and that the Saudis financially supported the Iraqi nuclear effort in addition to the Pakistani one.<sup>19</sup> None of these reports has been

confirmed. However, it seems clear that the Saudi government has paid attention to weapons of mass destruction. Given that Riyadh has probably not gone very far in terms of nuclear weapons, it might view CBW as a reasonable alternative. It is also likely that a change of regime in Riyadh would only increase interest in installing a much more lethal payload than high explosive in Saudi CSS-2 missile warheads.<sup>20</sup> It has been pointed out that the power of the royal family is threatened by radical elements.<sup>21</sup> A new regime would most probably be less hesitant to pursue WMD.

A few reports claim the acquisition of CBW by Saudi Arabia. The most detailed, published in April 1991 in *Defence and Foreign Affairs Weekly*, stated that China was assisting Saudi Arabia to develop a chemical warhead for the CSS-2 missile, and that Pakistan and India were probably assisting the Saudis in developing biological warheads.<sup>22</sup> The timing of this article's appearance may not have been accidental, since it took place in parallel with the effort by UNSCOM to eliminate Iraq's CBW capabilities.

The Gulf Arab states are situated in a region where the CBW specter exists and will remain a significant part of the military equation for the foreseeable future. On the basis of the data currently available, few indications suggest that additional countries in the Middle East aspire to a CBW capability. That situation might well change, however, if the monarchies in the region (such as Jordan) fall prey to internal instability and are replaced by revolutionary regimes that seek to revise the status quo. Moreover, Saudi Arabia is unlikely to take much comfort from the treaties covering CBW proliferation. Although most of the Gulf Arab states are parties to the Chemical Weapons Convention (CWC), Israel and several major Arab states (including Egypt, Iraq, Libya, and Syria) have thus far refused to join.<sup>23</sup> The Biological Weapons Convention is also a weak restraint because it lacks formal verification measures, although an on-site inspection regime to strengthen the treaty and to deter violations is currently being negotiated by an ad hoc group of states parties meeting in Geneva.

In a comprehensive review of the proliferation of chemical and biological weapons in the Persian Gulf,<sup>24</sup> Jean Pascal Zanders has argued that geopolitical orientation and balance of power in this region are shaped by three important factors: (a) population size, (b) economic strength, and (c) territorial size and location. States in the region may view advanced CBW capabilities as a

means of offsetting disadvantages in these areas. CBW may also be attractive as a relatively easy or cheap way to deny enemy military forces access through poorly accessible or sparsely populated areas in the event of an attack. Saudi Arabia is one of the most exposed states in the region, yet it has an estimated population density of only eight people per square kilometer; only Oman scores lower. Analysts often ascribe CBW value as a strategic weapon, especially if they are mated to ballistic missiles with the range to target the opponent's major population centers. Presumably, then, the existence of highly urbanized potential opponents may increase the attractiveness to Saudi Arabia of acquiring a CBW arsenal for both deterrence and compulsion purposes.

### SCIENTIFIC AND TECHNICAL INFRASTRUCTURE

The apparent Saudi motivations to acquire CBW are matched by reasonable capabilities for doing so. The Saudi chemical industry has been described as sophisticated and substantial, providing the technological potential for manufacturing chemical weapons.<sup>25</sup> Semi-industrial to full industrial scale of production evolved during the last two decades with respect to petrochemicals (including acetic acid, formaldehyde, and acrylonitrile), paints, rubber and plastics, phenolic resins, polyamide chips and fibers, germicides, anti-corrosives, anti-precipitation materials, minerals, and fertilizers.<sup>26</sup> Considerable growth in the area of biotechnology has also taken place in Saudi Arabia since the 1980s.<sup>27</sup> Fermentation technologies in particular have been upgraded, such as, for instance, the Membrane Recycle Bioreactor and the Packed-Bed Biological Reactor.<sup>28</sup>

The domestic scientific and technological level of Saudi Arabia in the fields of chemistry and biology is quite advanced, particularly in terms of the developing world. Saudi Arabia may be assessed to possess an intermediate capability for CBW development and production, comparable to that of Egypt and Iraq and superior to that of Libya, particular with respect to its "absorptive" capacity for foreign know-how and technology. Saudi Arabia's relevant technical capabilities may be gauged by the various scientific papers published by the Saudi scientific community. Saudi capabilities have also been enhanced by the frequent involvement of foreign scientists in scientific research projects. Further, the latest biochemical equipment and techniques

are as available in Saudi Arabia as they are in the best American universities. This availability applies not only to new techniques such as genetic engineering but, even more importantly, to older techniques for producing chemical and biological agents.<sup>29</sup>

Several significant Saudi activities in the area of biochemical sciences might contribute to the development of CBW agents. The Gulf War syndrome, for example, which appears to be associated with low-level CW exposures, has been studied by Saudi scientists.<sup>30</sup> In the field of aerosol sciences, studies that might be relevant to enhancing the dispersion of CBW agents began in the late 1970s, mainly in collaboration with Egyptian scientists.<sup>31</sup> All in all, the scientific activities taking place in Saudi Arabia indicate the existence of an adequate technical and scientific domestic infrastructure, a beneficial interface between that infrastructure and foreign scientists, and the accumulation of fragmentary technical and scientific knowledge that may be instrumental in developing CBW capabilities. It follows that the technical and scientific resources observed in Saudi Arabia are probably sufficient to absorb whatever complementary foreign assistance might still be needed for local development and production of CBW. Foreign assistance (Pakistani, for instance) could be given covertly.

### Biological Weapons

Saudi Arabia signed and ratified the Biological Weapons Convention when it was opened for signature in 1972. At that time, the Saudis presumably did not have any intentions of acquiring biological weapons. Since then, however, various regional developments have increased the significance of BW as a strategic armament.

While preparing for a possible Iraqi BW attack during the 1991 Gulf War, large numbers of coalition troops deployed in Saudi Arabia were vaccinated against anthrax and botulinum toxin, deadly agents in the Iraqi biological arsenal. In addition, the United States deployed in Saudi Arabia the US Naval Forward Laboratory (NFL), an advanced infectious disease laboratory that provided rapid BW diagnostic support. The NFL demonstrated the benefits of a comprehensive, on-site diagnostic laboratory when large numbers of troops are deployed to high-risk areas, and the importance of BW threat assessment.<sup>32</sup> Further, US intelligence reports on Iraqi BW capability likely had an impact on Saudi threat perceptions. Moreover, focusing on the military significance of modern BW, the US Army Command and Gen-

eral Staff College developed in 1993 several scenarios of hostile BW employment, one of which was an Iranian clandestine guerrilla operation involving an anthrax dusting while an American force buildup takes place at Riyadh Airport.<sup>33</sup> Recently, Saudi Arabia and South Korea were chosen as the first countries worldwide where the most advanced BW-agent detectors are to be deployed by the US Department of Defense. Officials describe the Portal Shield network as an intermediate step prior to the fielding in 2001 of the Joint Biological Point Detection System.<sup>34</sup>

Because of these various activities connected with Saudi Arabia, it probably has a keen understanding of biological weapons and their strategic significance. Even as early as 1988, the Saudi National Guard had acquired valuable knowledge of BW. Three specialists at King Khaled Officers School published a textbook, *The Weapons of Biological Warfare: Theory and Practice*, that includes a detailed description and drawing of an aerial bomb designed to disperse BW agents.<sup>35</sup> In addition, several foreign scientists have conducted research in Saudi Arabia on the spray drying of the simulant bacterium *Serratia marcescens*.<sup>36</sup> This work might be instrumental in producing dry powdered BW agents, the optimal form for long-term storage and dissemination.

Saudi scientists have also carried out basic research relevant to biological weapons. In 1977, a Saudi scientist acquired considerable knowledge about a potential BW agent—plague—while studying natural plague outbreaks that have occurred, notably, in Libya.<sup>37</sup> A few years later, another Saudi bacteriologist went to the United States and acquired significant additional knowledge of the plague bacterium.<sup>38</sup> He proceeded to work in Saudi Arabia with the bacterium *Yersinia pseudotuberculosis*, as well as the toxin-producing bacterium *Staphylococcus aureus*. Professor Mohammed Ismail, the Saudi participant in the Federation of American Scientists Working Group on Biological and Toxin Weapons Verification, exemplifies Saudi mastery of toxinological techniques, which have potential applications in developing toxins as BW agents.<sup>39</sup>

Another potential BW agent worth mentioning is the *Brucella* bacterium, which causes the disease brucellosis and has been widely studied by Saudi microbiologists. Although brucellosis is a severe endemic disease in Saudi Arabia, the nonindigenous species *Brucella suis* has also been studied.<sup>40</sup> Saudi research on *Brucella* has been conducted with extensive involvement of foreign

scientists, including Pakistani and Indian nationals, at the National Guard Central Hospital and other laboratories.<sup>41</sup> Saudi Arabia and Iran were also the only Moslem countries to send participants to the International Conference on Anthrax, which took place at the University of Plymouth in September 1998.<sup>42</sup> In addition to applied bacteriology and toxinology, Saudi scientists show considerable qualifications in the area of virology, conducting work on the tick-borne encephalitis complex virus, Crimean-Congo haemorrhagic fever virus, and camelpox virus.<sup>43</sup>

### Chemical Weapons

Saudi Arabia signed the Chemical Weapons Convention (CWC) on January 23, 1993, and ratified the treaty on August 9, 1996. The delay in ratification was apparently not casual and may have reflected some ambivalence toward the treaty on the part of the Arab League and/or Saudi Arabia itself. At any rate, now that Saudi Arabia has become a full member of the CWC and is potentially exposed to challenge inspections, it would have to work to conceal any effort at CW acquisition, current or future. Saudi Arabia was not active in the CWC negotiations in Geneva. In 1998, however, Saudi Arabia became a member of the Executive Council of the Organization for the Prohibition of Chemical Weapons (OPCW), the international body overseeing CWC implementation. The Saudis also participated in the fourth Asian Regional Seminar on National Implementation of the CWC that took place in Tokyo in March 1998.

In 1988, Saudi Arabia was for the first time categorized by the *Christian Science Monitor* as a country being “closely monitored for indications of CW acquisition.”<sup>44</sup> Other countries in the same category are Pakistan, India, South Korea, and Argentina, although the likelihood of CW acquisition varies with respect to each of those countries. Similarly, Elisa Harris, writing for the Aspen Strategy Group, classified Saudi Arabia as “possibly acquiring or trying to acquire CW.”<sup>45</sup> In 1989 congressional testimony, Rear Admiral Thomas A. Brooks, director of naval intelligence, indicated that the Saudis “may possess” (as compared to the more certain “probably possess”) an offensive CW capability.<sup>46</sup> Likewise, Saudi Arabia has been described as a “chemical-capable” country, possessing all the ingredients for a modern CW capability, interested in resources needed to build CW, and likely to have CW in the future.<sup>47</sup>

On several occasions, however, Saudi Arabia has officially denied any CW activity or desire to acquire CW. In response to Iranian charges that Saudi Arabia supplied CW to Iraq, highly ranked Saudi sources stressed that such weapons are not found in Saudi Arabia. On another occasion, Saudi government sources stressed that Saudi Arabia is unambiguously against any use of CW.<sup>48</sup>

In more concrete terms, unconfirmed reports suggest that chemical warheads have been developed for Saudi Arabia's CSS-2 ballistic missiles.<sup>49</sup> This development reportedly began in 1992 through the Saudi Arabian procurement of chemicals needed for that purpose from China, Kazakhstan, Azerbaijan, and Germany.<sup>50</sup> The credibility of such reports remains to be validated, and they are weakened by the failure to mention specific facilities that are supposedly involved. In terms of domestic infrastructure, the Saudi chemical industry has been described as easily capable of production of mustard gas.<sup>51</sup> Saudi chemists have done research on organophosphorous compounds (a category including both pesticides and nerve agents) with respect to toxicity since the mid-1980s<sup>52</sup> and synthesis since the late 1980s.<sup>53</sup> Cyanide has also been studied.<sup>54</sup> Aerial dissemination of hazardous substances (insecticides) was investigated earlier.<sup>55</sup>

## CONCLUSIONS

Two landmark events have shaped the defense doctrine and strategic course of Saudi Arabia, namely, the procurement of the CSS-2 missiles (1988) and the Gulf War (1991). While the former was a move that could plausibly lead to subsequent CBW acquisition, the latter provided the practical incentive for such acquisition to take place. Still, it may appear that the peak of Saudi threat perceptions in this area was the 1991 Gulf War, whereas Saudi actions since then, such as active participation in the CWC, may indicate a lessening interest in acquiring these weapons. In other words, the 1991 Gulf War may have served as a crucial test case that positively validated the security guarantees conferred upon Saudi Arabia by the United States. Consequently, the necessity for counterbalancing unconventional threats in the region ostensibly decreased.

In practice, however, the situation is just the opposite. The unconventional threats posed towards Saudi Arabia are intensifying. As long as the strategic military umbrella furnished by the United States persists, a dynamic equilibrium may be sustained. Nevertheless, Saudi

Arabia may be assessed as a "concrete threshold state" (rather than a potentially capable state) in terms of candidature for CBW acquisition. Saudi capacities for building up CB weaponry certainly exist, the related Saudi strategic interest is established, and the potential menace from its neighbors is increasing. For how long can American-British backing, plus Saudi conventional military power, remain adequate?

Further, Iraqi or Iranian possession of nuclear weapons would cast doubt upon the likelihood of American or British retaliation for chemical or biological weapons use, since there would be a disincentive for these outside powers to risk nuclear escalation. Presumably, Saudi Arabia is aware of the delicacy of the situation. The formidable unconventional threats arrayed against Saudi Arabia may necessitate offsetting (namely non-conventional) Saudi strategic efforts, despite global non-proliferation norms and Saudi obligations arising from international conventions. Although a CBW arsenal may not provide an adequate deterrent against nuclear weapons, the likelihood of nuclear attack against Saudi Arabia is considerably less than that of a CBW attack, making Saudi CBW acquisition more important (as well as more feasible) than nuclear acquisition.

Officially, Saudi Arabia denies the possession of CBW. In 1989, after a telephone conversation with President Bush, Saudi King Fahd admitted Saudi procurement of the CSS-2 missiles, but stressed that Saudi Arabia does not possess CBW and denied the existence of any CBW production facilities.<sup>56</sup> Today, however, following the incapacitation of UNSCOM, Saudi Arabia appears to be at a key decision point with respect to crossing or avoiding the threshold of CBW procurement. As long as the current American-Saudi relationship remains unchanged, the United States may discourage CBW acquisition by Saudi Arabia. Yet, even if Saudi Arabia does not already have a CBW program, future movement in that direction might be inevitable and difficult to reverse due to the ongoing non-conventional weapons proliferation taking place around it.

Chemical or biological weapons could be delivered by CSS-2 missiles as well as by the bombers Saudi Arabia possesses. Saudi Arabia would clearly require some foreign assistance in developing CBW munitions. It is not clear whether such assistance will be available, though it might be obtained from individual scientists acting independently if no foreign government is willing to provide it. Historically, states that are highly mo-

tivated and possess an adequate starting infrastructure eventually find ways to succeed, and there is no reason to expect the Saudi case would be different.

In summary, it appears that Saudi Arabia has geostrategic incentives to acquire CBW capabilities, possesses an enabling indigenous infrastructure, and has imported dual-capable equipment that cannot be produced domestically. This analysis suggests that Saudi Arabia is likely to pursue a CBW capability, if such a program is not already under way.

<sup>1</sup> Radio Monte-Carlo, November 13, 1990.

<sup>2</sup> Stockholm International Peace Research Institute (SIPRI), *The Problem of CB Warfare, Vol. 1: The Rise of CBW* (New York: Humanities Press, 1971), p. 160.

<sup>3</sup> Gordon M. Burck and Charles C. Flowerree, *International Handbook on Chemical Weapons Proliferation* (New York: Greenwood Press, 1991), p. 327.

<sup>4</sup> Jonathan B. Tucker, "Evidence Iraq Used CW During the 1991 Persian Gulf War," *The Nonproliferation Review* 4 (Spring-Summer 1997), p. 114.

<sup>5</sup> Reuters, August 25, 1993.

<sup>6</sup> USIA website, cited by *CBW Conventions Bulletin*, No. 41 (September 1998), p. 42.

<sup>7</sup> *Corriere della Sera*, July 8, 1998, cited by *CBW Conventions Bulletin*, No. 41 (September 1998), p. 35.

<sup>8</sup> Army War College, "U.S. Military/Security Assistance for Saudi Arabia: Strategic Implications for the 1990s," NTIS Field Report AD-A220 549/0/XAD U9016 (Carlisle Barracks, PA, Feb. 15, 1990).

<sup>9</sup> "Weapons of Mass Destruction, Disarmament, and Regional Security," *Akad* (Saudi Arabia), March 1992, p. 5; "The CBW Arms Race," *Akad* (Saudi Arabia), March 1989, p. 7.

<sup>10</sup> Anthony H. Cordesman, *Weapons of Mass Destruction in the Middle East* (London: Brassey's UK, 1991), p. 114.

<sup>11</sup> *Ibid.*, p. 115.

<sup>12</sup> Jaffe Center for Strategic Studies, Tel Aviv University, *The Middle East Military Balance for 1997* (New York: Columbia University Press, forthcoming).

<sup>13</sup> Jean Pascal Zanders et al., "CBW Developments and Arms Control," *SIPRI Yearbook 1997* (London: Oxford University Press, 1998), pp. 437-68; *Ibid.*, "Military Spending and Armaments," pp. 196-97, 298-99; International Institute for Strategic Studies, *Strategic Survey 1997* (London: Oxford University Press, 1998), pp. 161, 168.

<sup>14</sup> Cordesman, *Weapons of Mass Destruction in the Middle East*, p. 116.

<sup>15</sup> *Country Report - Saudi Arabia, No. 2* (London: The Economist Intelligence Unit, 1988), pp. 5-6.

<sup>16</sup> See Jack Anderson and Dale Van Atta, "Do Saudis Have Nuclear Weapons?" *Washington Post*, December 12, 1990, p. G15; Mary Colwin, "Interview with Mohammed Khellawi," *Sunday Times*, July 25, 1994, p. 4.

<sup>17</sup> Reuven Pedatzur, "The American Administration Persuaded Saudi Arabia Not to Develop Nuclear Weapons," *Ha'aretz*, March 3, 1991, p. 8A.

<sup>18</sup> Anderson and Van Atta, "Do Saudis Have Nuclear Weapons?"

<sup>19</sup> Marie Colvin, "How an Insider Lifted the Veil on Saudi Plot for an 'Islamic Bomb,'" *Sunday Times*, July 24, 1994; Steve Coll and John Mintz, "Saudi Aid to Iraqi A-Bomb Effort Alleged," *Washington Post*, July 25, 1994; Paul Lewis, "Defector Says Saudis Sought Nuclear Arms," *New York Times*, August 7, 1994.

<sup>20</sup> Angelo M. Codevilla, "Missiles, Security and Israel," *Nativ* 11 (1998), p. 52.

<sup>21</sup> P. M. Wihbey, "Succession in Saudi Arabia: The Not So Silent Struggle," *IASPS Research Papers in Strategy*, No. 4 (Institute for Advanced Strategic and Political Studies, Jerusalem, July 1997).

<sup>22</sup> "Saudi Arabia is Developing Chemical and Biological Warheads," *Defence and Foreign Affairs Weekly*, April 25, 1991, p. 3.

<sup>23</sup> Jean Pascal Zanders, "Chemical Warfare Weapons Proliferation in the Gulf Region and the Strategic Balance after Operation Desert Storm," *Pole-Papers* 2 (1995), p. 8.

<sup>24</sup> *Ibid.*

<sup>25</sup> Peter Herby, *The Chemical Weapons Convention and Arms Control in the Middle East* (Oslo: Peace Research Institute, 1992), p. 52; Burck and Flowerree, *International Handbook*, p. 327.

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