Central Intelligence Agency

Washington, D.C. 20505

29 April 2019

Mr. John Greenewald, Jr.
27305 W. Live Oak Road
Suite #1203
Castaic, CA 91384

Reference: EOM-2019-00275

Dear Mr. Greenewald:

This is a final response to your correspondence of 8 January 2019, submitted on behalf of The Black Vault, requesting an Executive Order 13526 mandatory declassification review of the following document:

Iraq's Chemical Warfare Program, More Self-Reliant, More Deadly
Document Number (FOIA) / ESDN (CREST): 000072254

We have completed a thorough search of our records and determined that the document may be released in sanitized form. We have deleted material that must remain classified on the basis of Sections 3.3(b)(1) and 3.3(b)(6) of the Order. Additional information must be withheld because withholding is authorized and warranted under applicable law as provided by Section 6.2(d) of the Order. Enclosed is a copy showing our deletions and citing our exemptions.

As the CIA Information and Privacy Coordinator, I am the CIA official responsible for this determination. You have the right to appeal this response to the Agency Release Panel in my care, within 90 days from the date of this letter. Should you choose to do this, please include the basis of your appeal.

Sincerely,

Riggs Monfort
Information and Privacy Coordinator

Enclosure

[redacted]

0044

Directorate of Intelligence

~~Top Secret~~ (4)

[redacted]

CIA SW 90-10053JX

Iraq's Chemical Warfare Program: More Self-Reliant, More Deadly

A Research Paper

~~Top Secret~~

SW 90-10053JX
TCS 3090/90
August 1990
Copy 317

37

3392

Warning Notice	Intelligence Sources or Methods Involved (WNINTEL)
National Security Information	Unauthorized Disclosure Subject to Criminal Sanctions

6.2(d)

Approved for Release: 2019/04/11 C00072254

3393

Directorate of Intelligence

~~Top Secret~~
[redacted] 6.2(d)

Iraq's Chemical Warfare Program: More Self-Reliant, More Deadly [redacted] 6.2(d)

A Research Paper

This paper was prepared by [redacted] 6.2(d)
[redacted] Office of Scientific and Weapons Research, with contributions from [redacted] 6.2(d)
[redacted] OSWR, [redacted] Office of Imagery Analysis, [redacted] 6.2(d)
Office of Near Eastern and South Asian Analysis. (U)

Comments and queries are welcome and may be directed to the Chief, Science and Technology Division, OSWR [redacted] (U) 6.2(d)

[redacted]

Reverse Blank

~~Top Secret~~ 6.2(d)
SW 90-10053JX
TCS 3090/90
August 1990

3394

~~Top Secret~~
[redacted] 6.2(d)

Iraq's Chemical Warfare Program: More Self-Reliant, More Deadly [redacted] 6.2(d)

Summary

Information available as of 7 August 1990 was used in this report.

The Iraqi chemical warfare (CW) program, by far the largest in the Third World, is rapidly becoming self-sufficient. By 1993 Iraq will have completed several facilities that will supply nearly all of the precursor chemicals needed to support large-scale nerve agent production using raw materials acquired in the country. With optimum use of their CW facilities, the Iraqis may then be able to achieve combined nerve and blister agent production levels of about 4,000 tons per year—twice the 2,000 tons per year they were producing by the end of the Iran-Iraq war—without having to worry about foreign embargoes of most essential precursors. In addition, the apparent integration of pesticide production into Iraq's CW infrastructure will lend an air of legitimacy to the program. [redacted] 6.2(d)

Since the cease-fire with Iran, Iraq has stressed development of advanced CW agents and delivery systems. It is pursuing persistent nerve agents such as VX that are much more toxic than the blister agent mustard and the nerve agent sarin—the principal agents now in Iraq's arsenal. In addition, Iraq probably is developing binary chemical weapons with a longer shelf life, enabling it to maintain a sizable stockpile. Iraq also is simultaneously developing five types of short- to intermediate-range ballistic missiles that may be fitted with chemical warheads. Missile-delivered CW agents will offer Iraq greater standoff capability and deterrent value. In concert with developing a more sophisticated CW stockpile, the Iraqis are maintaining a wide range of battlefield-proven delivery options, including bombs, shells, and artillery rockets. [redacted] 6.2(d)

Apparently Iraq believes it needs chemical weapons for deterrent purposes—primarily against Israel's nuclear option—and as a key weapon supporting its professed role as military "protector" of the Arab world. In conjunction with CW, Iraq also has aggressive biological warfare and ballistic missile development programs in which self-sufficiency is a primary goal. The high priority enjoyed by the CW program probably also reflects Iraq's pleasure with the results of massive nerve agent strikes against Iranian forces in 1988 and subsequent CW use against Kurdish insurgents. However, Iraqi willingness to initiate use of chemical weapons in any future conflict undoubtedly will be tempered if its opponents possess credible CW capabilities. [redacted] 6.2(d)

The Iraqi CW program poses a serious threat to US forces and interests in the Middle East. There are strong indications that Iraq is prepared to use chemical weapons in a potential invasion of Saudi Arabia, even if the

3395

Top Secret

[redacted] 6.2(d)

United States or other countries intervene. Iraq most likely would use the nonpersistent nerve agent sarin—possibly in binary form—in artillery rockets and aerial bombs on the battlefield but might also use the persistent blister agent mustard against rear-area targets, such as airfields. [redacted] 6.2(d)

Approved for Release: 2019/04/11 C00072254

~~Top Secret~~

6.2(d)

Contents

3397

~~Top Secret~~ [redacted] 6.2(d)

Iraq's Chemical Warfare Program: More Self-Reliant, More Deadly (C NF)

For every insect there is an insecticide.

Lt. Gen. Mahir Abd al-Rashid
Commander, Iraqi VII Corps
circa 1985 (U)

Now, Iraq is in possession of the binary chemical weapon. According to our technical, scientific, and military calculations, this is sufficient deterrent to confront the Israeli nuclear weapon.

Saddam Husayn
1 July 1990 (U)

Background

After nearly two decades of work, Iraq has developed the most extensive chemical warfare (CW) program in the Third World. [redacted] Iraq first seriously considered developing an offensive CW program in the mid-1960s but did not establish an R&D effort until 1972. [redacted] construction of a CW pilot plant facility at Salman Pak (see figure 1) and a full-scale chemical weapons complex near Samarra (see figure 2) began in 1975. (See appendix A for a description of key CW facilities in Iraq.) The outbreak of war with Iran in 1980 provided the impetus for Iraq to accelerate its CW program. Large-scale production of the blister agent mustard probably began at Samarra in early 1983; by August of that year, Iraq was using this agent against Iran (see inset for a summary of Iraqi CW agents used against Iran and appendix B for details of Iraqi use of chemical weapons). [redacted]

Iraq's concerted CW effort during the war enabled the Iraqis to establish a sizable and sophisticated infrastructure for R&D, production, testing, and storage of chemical weapons. (See appendix C for a summary of Iraq's CW program organization.) By the war's end, Iraq was able to produce about 1,000 tons each per year of blister and nerve agents. Although Iraq had little difficulty obtaining the raw materials it needed to support such production, it began developing an indigenous precursor production capability after the United States and other Western nations began controlling sales of key precursor chemicals. Construction of three facilities began near Habbaniyah in 1984 as part of this precursor production effort. [redacted] 6.2(d)

Iraq also has aggressive biological warfare (BW)[1] and ballistic missile programs that, in many ways, parallel its CW effort. As with CW, the BW and missile efforts are striving for self-sufficiency. Also, all three high-priority programs play a key role in Iraqi deterrence against Israel's unconventional and superior conventional weapons capability. [redacted] 6.2(d)

The 1988 cease-fire with Iran did not diminish the importance of Iraq's CW program, but it did significantly alter the program's focus. The demands of the war necessitated that Iraq's CW program dedicate much of its resources to large-scale production of chemical weapons. Following the cease-fire, however, production of chemical weapons with a limited shelf life was no longer practical or even necessary, freeing Iraq to enhance its CW effort in preparation for future conflicts. Iraq apparently also is seeking ways to better utilize its semidormant CW facilities. [redacted] 6.2(d)

3.3(b)(1)
3.3(b)(1)

Indigenous Precursor Production—Key to Eliminating Dependence on Foreign Suppliers

Iraq is constructing several facilities that, when completed by 1993, will supply nearly all of Iraq's precursor chemical needs using indigenously acquired raw 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

[redacted]

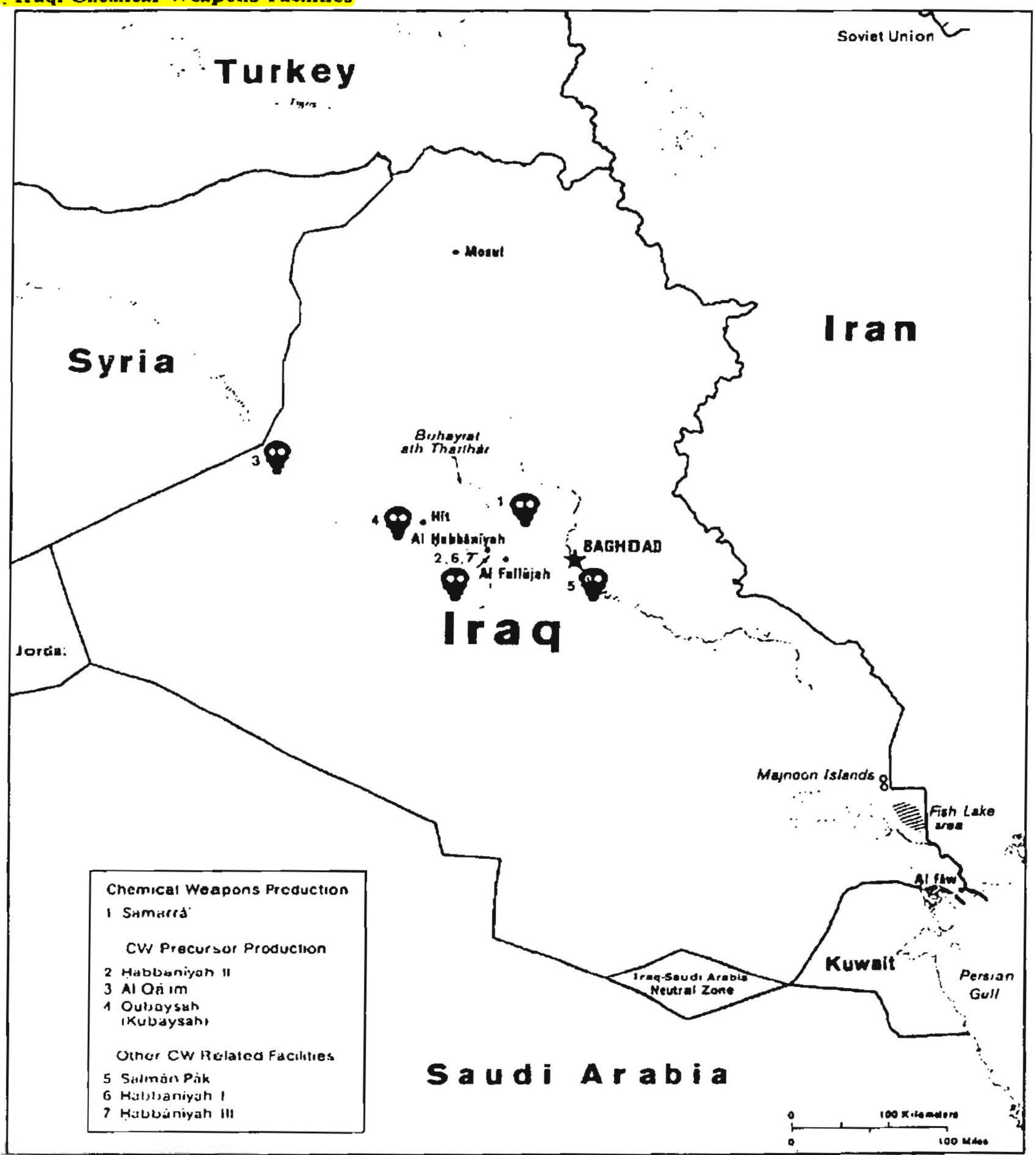
~~Top Secret~~ 6.2(d)
SW 90-10053JX
August 1990

3398

~~Top Secret~~

6.2(d)

Figure 1
Iraqi Chemical Weapons Facilities



~~Top Secret~~
TCS 3090/90

6.2(d)

3399

[redacted] 3.3(b)(1)

materials. Iraq embarked upon this effort in the mid-1980s, shortly after international export controls on key precursors were first enacted. If the project is successful, the Iraqis almost certainly will be able to produce several G-series nerve agents (particularly sarin and its derivatives)—and perhaps mustard as well—without need for imported chemicals. [redacted]

The heart of Iraq's precursor production effort is the Habbaniyah II facility, which includes a chlorine-alkaline plant and several probable CW precursor production lines. [redacted] 3.3(b)(1)

[redacted] 6.2(d)

3400

~~Top Secret~~
[redacted] 3.3(b)(1)

3.3(b)(1)
6.2(d)

[redacted]

Iraqi CW Agents Used During the Iran-Iraq War

The blister agent mustard and the nerve agent sarin (GB) were produced in large amounts at Iraq's Samarra facility and used against Iran during the Iran-Iraq war. We believe that lesser amounts of the nerve agents tabun (GA) and GF and riot control agent CS were used as well. Iraqi mustard attacks severely strained Iran's medical infrastructure and, in conjunction with the use of riot control agents, disrupted several Iranian offensives. Large-scale use of nerve agents in 1988 inflicted significant Iranian casualties and greatly supported Iraqi offensive operations. [redacted] 3.3(b)(1)

In addition to the above liquid CW agents, Iraq made limited use in early 1984 of dusty mustard agent—that is, a finely ground (generally to 1 to 5 microns) inert powder carrier, such as silica, impregnated with liquid mustard agent. Under certain conditions, dusty mustard can penetrate standard, semipermeable NATO nuclear-biological-chemical (NBC) protective suits. [redacted] *The production line probably is located at Samarra.* [redacted]

6.2(d)

3.3(b)(1)
3.3(b)(6)

[redacted]

[redacted]

3.3(b)(1)
6.2(d)

In addition to lessening dependence on foreign suppliers, construction of precursor production lines at Habbaniyah II may permit precursor lines at Samarra to be dedicated to agent production. This could nearly double Iraq's total wartime capacity, to as much as 4,000 tons of CW agents per year. In addition, similarities between buildings at Habbaniyah II and agent production buildings at Samarra [redacted] lead us to believe that CW agent production lines eventually could be built at Habbaniyah II. At present there is no evidence of such a plan, but Iraq might proceed with this possibility if it felt redundancy in its CW program was needed. [redacted]

[3] Elemental phosphorus is found in three primary forms, two of which—white and red—may be used for the production of nerve agent precursors. White phosphorus, sometimes labeled yellow phosphorus when impure, is very highly reactive. It ignites spontaneously on contact with air, and therefore often is used in incendiary munitions. Because of its reactivity and toxicity, special precautions must be taken when handling this material. As a result, the less reactive (and easier to control) red phosphorus is, in many cases, preferred when producing phosphorus-based compounds, such as phosphorus trichloride. However, use of red phosphorus necessitates higher operating temperatures [redacted]

3.3(b)(1)
6.2(d)

6.2(d)

3401

~~Top Secret~~
[redacted] 6.2(d)

3.3(b)(1)
6.2(d)

[redacted]

We believe that Iraq has used imported thionyl chloride as a chlorinating agent in sarin production but could produce this precursor or a substitute indigenously. For example, phosphorus pentachloride (PCl_5) is easily produced by combining chlorine from the chlorine-alkaline plant with PCl_3. In fact, PCl_5 is often produced inadvertently at PCl_3 plants when operating conditions are not carefully controlled. If necessary, Iraq probably could use hydrogen chloride, which—although not the optimum chlorinating agent in sarin production—is an extremely common industrial chemical. [redacted] 6.2(d)

We have not identified specific Iraqi efforts to produce the alcohols needed in the manufacture of sarin and related G-series nerve agents, but such production could already be taking place as part of Iraq's extensive petrochemical industry. Methanol, a precursor common to these agents, is a basic industrial chemical and may well be produced in an Iraqi petrochemical plant using methane from natural gas as a feedstock. The production method for the sarin precursor isopropanol is nearly as straightforward. In addition, the United States and Western Europe produce over 2 million tons of this chemical annually, and it is readily available on the open market. The alcohols required for soman and GF—pinacolyl alcohol and cyclohexanol, respectively—are somewhat less common, but Iraq should be able to produce at least the latter from indigenously available petrochemicals. [redacted] 6.2(d)

In contrast, Iraqi efforts to produce thiodiglycol and other mustard precursors seem to be less complete. [redacted] 3.3(b)(1) Hydrogen chloride, although not as good, is much simpler to produce or purchase. [redacted] 3.3(b)(1) 6.2(d)

Pesticide Production—An Air of Legitimacy

Perhaps the most surprising development in Iraq's CW program has been the apparent integration of legitimate pesticide production into the CW infrastructure. [redacted] 3.3(b)(1)

3402

 6.2(d)

[redacted] We believe that several practical considerations are responsible for this trend and that Iraq's actions do not signal a phasing out of CW agent production. [redacted]

[redacted]

There are also indications that some pesticide activity may take place at Samarra itself. [redacted]

Iraq will reap several benefits from such an arrangement. [redacted] Iraq will save hard currency in the long run by not having to import pesticides. This effort may also partly be intended to fool other nations into thinking that Iraq is abandoning its CW program; this possibility is supported by Iraq's use of SEPP—the well-publicized CW procurement agency—as the entity responsible for these apparently legitimate activities. In addition, the project will benefit Iraq's CW program directly in several ways: 3.3(b)(1)

- Iraq will be able to legitimately import or maintain production of several key CW agent precursors used to make pesticides. For example, one of the precursors for dichlorvos is trimethyl phosphite, a key sarin precursor; similarly, one of the precursors for propanil is thionyl chloride, a key blister and nerve agent precursor. 6.2(d) 3.3(b)(1)

- The pesticide and precursor production lines will allow technicians to gain expertise relevant to CW.

- Some of the pesticides sought by Iraq, particularly malathion, are structurally very similar to nerve agents, so production lines could readily be converted to CW uses. This raises the possibility that, should Iraq claim to dismantle its CW program as part of an international treaty, the ostensibly legitimate Habbaniyah facilities could give Iraq a "breakout capability" to rapidly convert to CW agent production.

- Finally, organizations such as SEPP—long involved in Iraq's CW program—could be given an air of legitimacy, perhaps simplifying future procurement of CW materiel. [redacted] 6.2(d)

In addition, the formulation facility could also be used to conceal efforts to improve the dissemination characteristics of CW agents. One technology potentially being investigated by Iraq is microencapsulation—a process in which small droplets of pesticides, CW agents, toxins, or other materials are coated with a layer of protective material such as gelatin. The resulting product can be disseminated more evenly, and the protective coating can be customized to release the contents under specific conditions of light, moisture, temperature, or other environmental factors. Because of the dual-use nature of this technology, microencapsulation equipment purchased for use in a pesticide formulation facility could be applied to CW as well. A formulation facility might also purchase equipment for production of granulated or 6.2(d) 3.3(b)(1)

[1] Pesticide formulation is a process more basic than pesticide production. Formulation entails the addition of solvents and emulsifiers to the relatively pure technical grade pesticide. The formulated product is the ready-to-mix pesticide "concentrate" available in stores, which may contain only a few percent active ingredient. (U)

3403

powdered pesticides that could be used to produce dusty CW agents. [redacted]

New CW Agents and Production Methods—Developing a More Potent Arsenal

Advanced Agents

[redacted] we believe that Iraq is engaged in a sizable effort to develop and produce additional CW agents. [redacted] Iraq has been researching vomiting agents, as well as nonstandard CW agents such as highly toxic crown ethers. (See appendix D for a summary of characteristics and field employment of different types of CW agents. [redacted]

Iraq is developing or has already produced some of the more persistent analogs of sarin, such as soman and GF. We believe that the Iraqis produced and used some GF toward the end of the war with Iran. [redacted] leading us to believe that the Iraqis also have been investigating nonstandard analogs of sarin. [redacted]

[redacted] Because VX is very persistent and toxic, it probably would be an optimum CW agent to place in a ballistic missile warhead. [redacted] Iraq also may be researching nonstandard nerve agents similar to VX. [redacted]

Iraq may be investigating entirely new classes of compounds for use as CW agents [redacted]

[redacted] 3.3(b)(1) crowns have applications in general chemistry and even in nuclear isotope separation. [redacted] 3.3(b)(1)

Improved Production Methods 6.2(d)
Since the cease-fire with Iran, the Iraqis apparently have been optimizing their CW agent production processes and searching for new routes of manufacture. The goals of this effort probably are to simplify the production of CW agents, reduce bottlenecks in the process, and rely on indigenously produced or easily acquired raw materials. [redacted] 3.3(b)(1) 3.3(b)(1) 3.3(b)(1) 6.2(d) The Iraqis probably also have been experimenting with various fluorinating agents in the production of difluor [redacted] 3.3(b)(1) 3.3(b)(1) 3.3(b)(1) 6.2(d)

Longer Shelf Life 6.2(d)
We believe that Iraq is attempting to lengthen the shelf life of its CW agents, particularly sarin, so that a sizable chemical weapons stockpile can be maintained. To accomplish this, we assess that Iraq has developed binary chemical weapons and is taking extra precautions to improve the purity of its CW agents.* [redacted] 3.3(b)(1) 3.3(b)(1)

* The United States and other nations have pursued binary chemical weapons to minimize hazards associated with handling and storage of highly lethal agents. We believe that Iraq is developing binaries primarily to lengthen the shelf life of its chemical munitions, although safety concerns may have played a small role in its decision. [redacted] 3.3(b)(1) 3.3(b)(1)

3404

6.2(d)

~~Top Secret~~ [redacted]

3.3(b)(1)
6.2(d)

[redacted]

Delivery Systems—Maintaining a Wide Range of Options

Bombs, Shells, and Rockets—Tried and True
The Iraqis have the capability to fill a variety of munitions systems with chemical agents. During the Iran-Iraq war, they delivered a large amount of agents with 250-kg aerial bombs, 90-millimeter (mm) air-to-ground rockets, and helicopter-mounted aerial spray devices, [redacted] Iraq also has chemical rounds for its 82-mm and 120-mm mortars and its 122-mm and 130-mm artillery. It also has used 122-mm artillery rockets filled with CW agents, particularly in the final year of the war. These rockets were loaded with multiple plastic canisters of CW agents. [redacted]

Historically, Iraq has purchased empty napalm or white phosphorus munitions that it filled with CW agents. [redacted]

Ballistic Missiles—The Long-Range Option
Iraq is developing a long-range CW delivery capability to augment its extensive short-range tactical capabilities. Most obvious, and probably of greatest concern, is the development of chemical warheads for ballistic missiles.[3] Iraq probably will develop and manufacture chemical warheads for each kind of missile under development.[4] [redacted] 6.2(d)

The mainstay of Iraq's ballistic missile forces has long been the Soviet-supplied Scud B, which is capable of delivering a 1,000-kg payload to a range of 300 km. Iraq modified some of its Scuds to fly extended ranges, resulting in two versions with new names—the Al Husayn and Al Abbas. [redacted] the Al Husayn can deliver an 85-kg warhead to a range of about 600 km. We believe the Al Abbas has a range of about 735 km with an 85-kg warhead, despite Iraqi claims of a 900-km-range capability. [redacted] 3.3(b)(1)

3.3(b)(1)

Iraq now has five missiles under development in the most aggressive missile program in the Arab world. These include domestic variants of the Al Husayn and Al Abbas, the 750- to 1,000-km-range Condor II with a payload of about 500 kg, the 1,200- to 1,500-km-range Al Hamza, and the 2,000-km-range Tamuz I. We believe that Iraq could begin production of its own variants of the Al Husayn and Al Abbas by 1991. [redacted]

3.3(b)(1)
6.2(d)

3.3(b)(1)

3.3(b)(1)
6.2(d)

3.3(b)(1)
6.2(d)

[3] Iraq presumably may also have planned to develop a chemical round for its planned "big gun"—the extremely long-range artillery piece that achieved notoriety in early 1990 with the seizure by British Customs of barrel segments and the assassination of Gerald Bull, the gun's developer. [redacted]

[4] A missile's range can be extended by reducing the weight of the warhead or airframe. Iraq probably will use lightweight materials in the manufacture of its Al Husayn and Al Abbas missiles to reduce the weight of the airframe. This will give the domestic variants greater range/payload capabilities than the existing modified Scuds. However, such structural changes to the airframe would require flight testing. [redacted]

6.2(d)

3.3(b)(1)
6.2(d)

3405

~~Top Secret~~ [redacted] 6.2(d)

There are cheaper ways for Iraq to deliver chemical munitions than a ballistic missile. Artillery and aircraft can do the job and with more precision, at least at present. Ballistic missiles will be the preferred delivery system, however, because they provide greater standoff capability, cannot be easily defended against, and offer more prestige and higher deterrent value. Although Iraq has had great success using ballistic missiles armed with conventional high explosives against cities, the inaccuracy of its missile systems makes the use of chemical warheads very attractive. Because chemical warheads can disperse lethal concentrations over a larger area, they are more cost effective, result in a greater number of human casualties, and provide a psychological edge. [redacted] 6.2(d)

Iraq will have to take several important factors into account when developing a chemical warhead. It probably will need to flight-test a chemical warhead—at least with a simulated agent fill—before being confident that the warhead would function properly. Iraq also will have to develop or purchase a different fuzing mechanism because these agents are optimally dispensed above ground level (no more than several meters for nonpersistent agents like sarin, somewhat higher for persistent agents like mustard and VX). Dissemination is best achieved as an aerosol—either instantaneously by a burster or more gradually through ports by an explosive-driven piston-type mechanism. The missile's flight could produce instability in the liquid fill; for this reason, bomblets are often preferred. When the warhead is bulk-filled, a void must be left to allow for heat expansion during flight. In extreme cases, heat can cause deterioration of the agent fill— sarin is more susceptible to this than are mustard or VX. [redacted] 6.2(d)

CW Protection and Training

Iraq gradually built up a protective CW capability during the Iran-Iraq war, primarily to minimize Iraqi casualties from inadvertent exposure to its own chemical attacks. However, protection against Iranian CW attacks became necessary toward the end of the war as Iran began limited use of its vastly inferior chemical arsenal. Iraq has continued to expand its protective capability following the cease-fire, probably with the realization that future use of chemical weapons in conflicts involving potential adversaries like Iran, Israel, and Syria probably would not be so strongly skewed in Iraq's favor. [redacted] 6.2(d)

As in other facets of its military industries, Iraq has chosen to produce indigenously a large portion of its CW protective requirements. [redacted] 3.3(b)(1) 6.2(d)

6.2(d)

[redacted] 3.3(b)(1) 3.3(b)(6)

~~Top Secret~~
TCS 3090/90

3406

Top Secret
[redacted]

3.3(b)(1)
3.3(b)(6)
6.2(d)

6.2(d)

[redacted]

Iraq also continues to train its troops to operate in a chemical environment. [redacted]

[redacted]

3.3(b)(1)
6.2(d)

However, Iraq's once near-total dependence on foreign expertise and materials has declined markedly since the early 1980s as Iraqis gained CW experience and embarked upon an indigenous precursor production effort. The level of precursor imports, which remained high immediately after the cease-fire, dropped markedly by 1990—probably because of minimal demand, sufficient precursor stockpiles, and pending startup of precursor lines. [redacted]

3.3(b)(1)

3.3(b)(1)
6.2(d)

3.3(b)(1)
6.2(d)

Outlook—Deterrence, Self-Sufficiency, First-Use Considerations, and Threat to the United States

In our judgment, Iraq believes it needs chemical weapons for deterrent purposes, primarily against Israel, and as a key weapon supporting its professed role as military "protector" of the Arab world. The Iraqis believe their chemical weapons are suitable deterrents against Israeli nuclear weapons and developed this theme in an early 1990 press campaign. Continued emphasis on developing new or improved strategic systems—such as longer range surface-to-surface missiles and the "big gun" long-range artillery project—probably is tied to Iraq's desire to improve the lethality and range of its chemical threat. [redacted]

6.2(d)

We believe that Saddam Husayn takes great pride in Iraq's weapons programs and uses them to tout Iraqi power and prestige. Iraq often highlights its advanced military capabilities to promote its bid for leadership of the Arab world. Completing development of modern, self-sufficient CW production and delivery systems is a key element in Iraq's quest for recognition as the "protector" of the Arab world. [redacted]

Iraq will continue to give high priority to development of its CW production facilities and delivery systems. The trend toward self-sufficiency and redundancy in these areas parallels Iraq's efforts in other top-priority programs, such as the surface-to-surface missile program. We assess that Iraq seeks self-sufficiency in these programs to ensure immunity from supply disruptions like the embargoes Iraqi procurement encountered during the Iran-Iraq war. Likewise, redundant production and delivery capabilities are a response to the lesson learned from Israel's 1981 air attack on the Osirak reactor that, by bombing the key element in Iraq's nuclear program, crippled Iraq's nuclear efforts for at least several years. [redacted]

We judge that tactical use of chemical weapons in support of conventional offensive and defensive operations has been incorporated into Iraqi military doctrine. Iraq utilized chemical weapons primarily during the last half of the Iran-Iraq war, which led to battlefield development of Iraq's CW doctrine. The decision to use chemicals during the war, however, was undoubtedly influenced by the lack of a significant Iranian countercapability. We believe Iraq will be less likely to initiate use of chemical weapons in future scenarios if its opponent is armed with a credible CW capability. [redacted]

We assess that Iraq's extensive CW capability poses a serious threat to US forces and interests in the Middle East. Iraq has the capability to deliver large amounts of CW agents on the battlefield and has shown a willingness to do so during the Iran-Iraq war. [redacted]

[redacted]

Recent activity at Iraqi chemical weapons production and storage areas strongly suggests that Iraq's expeditionary forces have ready access to a fairly sizable CW stockpile. The presence of trucks in the munitions filling and storage areas at Samarra and of canisters adjacent to a special weapons bunker at Tallil airfield in August 1990 is similar to chemical weapons shipping activity seen in 1988. At that time, such activity usually was indicative of imminent use of CW, because Iraqi nerve agents had a very limited shelf life. However, Iraq may by now have developed binary sarin weapons with a much longer shelf life. As a result, Iraqi forces probably now can maintain significant stocks of chemical weapons and use them at its convenience. [redacted]

In our judgment, the CW agents Iraq is most likely to use in an incursion into Saudi Arabia are sarin (probably in binary munitions) and mustard. Sarin would be the agent of choice for targets that Iraq wants to occupy quickly—including oilfields and other key objectives—as well as on battlefield defenses. Mustard might be used to protect Iraqi flanks and, against key transportation nodes, to hinder movement and resupply of opposing forces. The semipersistent nerve agent GF could be used in place of sarin if the target need not be captured immediately. Agents less likely to be used—but still potential threats—include the nerve agents VX and soman, nitrogen mustard, and perhaps even nonlethal tear gas and vomiting agents. [redacted]

Of the many CW delivery systems available to Iraq, we believe that artillery rockets and aircraft-delivered bombs are the most likely to be used by Iraq. It is possible that Iraq has already produced a few chemical warheads for its Scud-type missiles; if it has indeed done so, Iraq would greatly increase its capability to strike Saudi population centers, airfields, and staging areas with CW agents. [redacted]

6.2(d)
6.2(d)
6.2(d)
6.2(d)
3.3(b)(1)
6.2(d)
3.3(b)(1)
3.3(b)(1)
6.2(d)

3408

~~Top Secret~~
[redacted] 6.2(d)

Appendix A 3.3(b)(1) 6.2(d)

CW-Related Facilities

There are four primary CW-related facilities in Iraq; the oldest and largest is located near Samarra, and the other three are located near Habbaniyah. [redacted] 3.3(b)(1) 6.2(d)

Samarra
Iraq's primary chemical agent production facility is located near Samarra, approximately 70 km northwest of Baghdad. This large, integrated complex [redacted] consists of three main separately secured areas: a chemical weapons research and production area, a chemical munitions storage area, and a chemical munitions filling area. [redacted]

Construction at Samarra began in 1975. The first major phase—which included research, production, and support buildings in the chemical weapons research and production area—was externally complete by 1979. [redacted]

[redacted] 3.3(b)(1)

[redacted] one of these production buildings is capable of producing mustard or sarin, and the second one may be a universal production plant, capable of producing several different CW agents. [redacted] 3.3(b)(1) 3.3(b)(1) 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

3.3(b)(1)

3409

~~Top Secret~~
[redacted]

6.2(d)

3.3(b)(1)
6.2(d)

[redacted]

[redacted]

3.3(b)(1)
6.2(d)

Habbaniyah
The three Habbaniyah facilities [redacted] are located within 25 km of the towns Al Habbaniyah and Al Fallujah and within 70 km of Baghdad. The facilities all appeared to be identical and externally complete, but inactive by October 1986. Construction recommenced at Habbaniyah II in late 1987 and at Habbaniyah I in October 1989 and is continuing [redacted] There has been no corresponding construction activity occurring at Habbaniyah III. [redacted]

3.3(b)(1)
3.3(b)(1)
3.3(b)(1)
6.2(d)
6.2(d)

[redacted]

3410 [redacted]

3.3(b)(1)
6.2(d)

[redacted]

[redacted]

34 1 1

~~Top Secret~~

6.2(d)

3.3(b)(1)
6.2(d)

Reverse Blank

~~Top Secret~~
TCS 3090/90

34 12

~~Top Secret~~
[redacted]

6.2(d)

[redacted]

3.3(b)(1)
6.2(d)

3413

~~Top Secret~~

6.2(d)

3.3(b)(1)
6.2(d)

Approved for Release: 2019/04/11 C00072254

3414

Top Secret [redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

[redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

3416

~~Top Secret~~ [redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

3417

~~Top Secret~~ [redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

Approved for Release: 2019/04/11 C00072254

3412

~~Top Secret~~
[redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

3419

~~Top Secret~~
[redacted] 6.2(d)

[redacted] 3.3(b)(1)
6.2(d)

3420

~~Top Secret~~ [redacted] 6.2(d)

Appendix B

Iraqi Use of Chemical Weapons

Iran-Iraq War
The most visible aspect of Iraq's CW program has been the widespread use of chemical weapons against Iran. Between 1983 and 1988, Iraq used chemical weapons on a scale not seen since World War I. The effectiveness of these attacks was minimal at first but increased gradually as Iraq gained experience in CW and developed new agents, weapons, and tactics.

[redacted]

Iraqi use of chemical weapons against Iran can be divided into three distinct phases. The first phase, which continued until 1986, involved the use of CW agents in a strictly defensive role, to disrupt or halt Iranian offensives. In a transitional phase lasting from late 1986 to early 1988, Iraq used chemical weapons preemptively against staging areas prior to Iranian offensives, while continuing to rely on CW to disrupt these offensives. Finally, and most significantly, Iraq used massed nerve agent strikes as an integral part of its well-orchestrated offensives in the spring and summer of 1988. The success of these offensives prompted Iran to accept a cease-fire in August 1988. [redacted]

We assess that Iraq decided to use chemical weapons as a force multiplier, to compensate for Iran's manpower advantage. Iraq's use of CW helped to minimize Iraqi personnel and land losses by stalling Iranian human wave attacks. Iraqi CW use was enhanced by the limited Iranian CW protective capability and Iran's inability to retaliate in kind on any appreciable scale. [redacted]

During the early days of the war, Iraq's use of CW agents was often ineffective. Many of these early problems can probably be attributed to poor Iraqi CW employment techniques. In some cases the Iraqis would use agents under unsuitable weather conditions, such as when the wind was blowing toward their own troops. In the case of aerial CW bombs, Iraqi pilots would release chemical munitions from altitudes too high to permit accurate, concentrated strikes. [redacted] 3.3(b)(1)

As the war progressed, the Iraqis became much more proficient in the use of chemical weapons. We believe that one contributing reason for this was the delegation of CW release authority to Iraqi corps-level commanders in 1986. This permitted better integration of CW into battlefield planning. Before 1986, release for CW was held at the highest levels of the Iraqi Government. [redacted] 3.3(b)(1)

3.3(b)(1)
6.2(d)

In 1988 Iraq began to fully integrate CW into its successful offensives. In the battles of Al Faw, Fish Lake, and Majnoon Islands during the final months of the war, Iraq made heavy use of chemical weapons. For example, in the April 1988 battle to recapture the Al Faw Peninsula, we estimate that the Iraqis used well over 100 tons of CW agent in about 8,000 chemical artillery rockets and 1,000 chemical bombs. The suddenness and severity of this attack disrupted Iranian command and control, decimated key units, and threw the Iranian defenders into disarray. The resulting victory took only 30 hours, which surprised even the Iraqi military planners. Subsequent offensives were preceded by massed chemical attacks and met with similar success. [redacted] 3.3(b)(1)

3.3(b)(1)
6.2(d)

Kurdish Insurgency
[redacted] Iraq used both lethal and nonlethal chemical agents against Kurdish insurgents in late August 1988. Special 6.2(d) 3.3(b)(1)

3421

~~Top Secret~~
[redacted]

6.2(d)

intelligence and reporting of varying reliability indicate that at least limited quantities of nerve and blister agents were used, particularly in airstrikes. However, no cases of exposure to these agents were identified among the Kurdish refugees that fled to Turkey. Analysis of reporting from refugees claiming to have witnessed Iraqi chemical attacks led us to believe that many of these Kurds were exposed to nonlethal irritant or vomiting agents. Such harassment by the Iraqi Government is not unprecedented; [redacted]

3.3(b)(1)
6.2(d)

3422

~~Top Secret~~

6.2(d)

Appendix C

3.3(b)(1)
6.2(d)

3423

6.2(d)

Appendix D

Chemical Warfare Agents and Field Employment

In general, the amount of CW agent delivered determines the extent of contamination and the number of casualties. A rough rule of thumb is that 1 ton (or about four 55-gallon drums) of agent is enough to effectively contaminate 1 square mile of territory if properly disseminated. The number of resultant casualties depends on the number of people in the contaminated area, length of warning, degree of protection, and persistency and toxicity of the agent used. The persistency of a specific agent (length of time it remains effective) varies, depending on the type of munition used and the weather conditions. For example, the persistency of sarin under hot, windy conditions is much less than one hour; the persistency of mustard or VX may be several days to weeks under cool, calm conditions. In all cases, given sublethal doses of an agent, incapacitation will occur to varying degrees.

Blister Agents

Blister agents are primarily used to cause medical casualties. These agents may also be used to restrict use of terrain, to slow movements, and to hamper use of materiel and installations. Blister agents affect the eyes and lungs and blister the skin. Sulfur mustard, nitrogen mustard, and lewisite are examples of blister agents. Most blister agents are insidious in action; there is little or no pain at the time of exposure except with lewisite, which causes immediate pain on contact.

Mustard is preferred over lewisite because lewisite hydrolyzes very rapidly upon exposure to atmospheric moisture to form a nonvolatile solid. This conversion lowers the vapor hazard from contaminated terrain and decreases the penetration of the agent through clothing. Lewisite is less persistent than is mustard; however, the persistency of both is limited under humid conditions.

Blood Agents

Blood agents are absorbed into the body primarily by breathing. They prevent the normal utilization of oxygen by the cells and cause rapid damage to body tissues. Blood agents such as hydrogen cyanide (AC) and cyanogen chloride (CK) are highly volatile and in the gaseous state dissipate rapidly in air—generally within minutes. Because of their high volatility, these agents are most effective when surprise can be achieved against troops who do not have masks or who are poorly trained in mask discipline. In addition, blood agents are ideally suited for use on terrain that the user hopes to occupy within a short time. Blood agents rapidly degrade a mask filter's effectiveness. Therefore, these agents could also be used to defeat a mask's protective capabilities when combined with other agents.

Choking Agents

Choking agents are the oldest CW agents. This class of agents includes chlorine and phosgene, both of which were used in World War I. In sufficient concentrations, their corrosive effect on the respiratory system results in pulmonary edema, filling the lungs with fluid and choking the victim. Phosgene is more effective than chlorine because it is slowly hydrolyzed by the water in the lining of the lungs, forming hydrochloric acid, which readily destroys the tissue.

These agents are heavy gases that remain near ground level and tend to fill depressions such as foxholes and trenches. Because they are gases, they are nonpersistent and dissipate rapidly, even in a slight breeze. As a result, these are among the least effective traditional CW agents. They are useful for creating a short-term respiratory hazard on terrain that is to be quickly occupied.

Nerve Agents

Nerve agents, including tabun (GA), sarin (GB), soman (GD) and VX, are members of a class of compounds that are more toxic and quicker acting than is mustard. They are organophosphorus compounds that inhibit action of the enzyme cholinesterase. In sufficient concentration, the ultimate effect of

3424

6.2(d)

these agents is paralysis of the respiratory musculature and subsequent death.

Nerve agents act rapidly (within seconds of exposure) and may be absorbed through the skin or through the respiratory tract. Exposure to a lethal dose may cause death in less than 15 minutes. They are stored in munitions as liquids and are generally disseminated as aerosols.

Traditional nerve agents fall into two main classes: G-series and V-series. The G-series consists of GA, GB, GD, GE, GF, GH, and a number of similar experimental agents. These agents, particularly GA and GB, tend to be less persistent than their V-series counterparts and consequently present less of a skin hazard. These less persistent agents are used to cause immediate casualties and to create a short-term respiratory hazard on the battlefield. The more persistent and generally more toxic V-agents, including VE, VG, VM, VS, VX, and related experimental agents, present a greater skin hazard and are used to create long-term contamination of territory.

Psychochemicals

Psychochemicals, also considered incapacitants, include hallucinogenic compounds such as lysergic acid diethylamide (LSD), 3-quinuclidinyl benzilate (BZ), and benactyzine. These agents alter the nervous system, thereby causing visual and aural hallucinations, a sense of unreality, and changes in the thought processes and behavior. Psychochemicals are generally characterized by a slightly delayed onset of symptoms and by persistence of symptoms for a period greatly exceeding exposure time.

The advantage of psychochemicals is their ability to inactivate both civilian and military personnel for a relatively short period with essentially no fatalities. Thus, their use may prove advantageous in areas with friendly populations. One drawback, however, is that the effects of many of these agents are unpredictable, ranging from overwhelming fear and panic to extreme belligerence in which exposed personnel attack with little regard for personal safety.

Tear Gas Agents

Tear gas agents fall under the broader category of riot control agents. They are not considered by the US Government to be CW agents because they are nonlethal in all but the highest concentrations. Examples of this type of agent include orthochlorobenzylidene malononitrile (CS), chloroacetophenone (CN), chloropicrin (PS), and bromobenzyl cyanide (BBC). These agents are highly irritating, particularly to the eyes and respiratory tract, and cause extreme discomfort. Symptoms occur almost immediately upon exposure and generally disappear shortly after exposure ceases.

In military situations, tear gas agents are used to temporarily reduce the effectiveness of enemy personnel. In tactical operations, they can be used to penetrate fortified positions and flush out the enemy. Also, these agents are useful for disrupting human wave assaults by breaking up formations and destroying the momentum of the attack. Because tear gas agents are nonlethal, they can be used near friendly troops without risking casualties; thus, their use is more flexible than with conventional CW agents.

Vomiting Agents

Vomiting agents are often considered to be riot control agents because, under field conditions, they cause great discomfort but rarely serious injury or death. Characteristic agents include adamsite (DM) and diphenyl chloroarsine (DA). In addition to causing vomiting, these arsenic-based agents may also irritate the eyes and respiratory system.

The action of vomiting agents may make it impossible to put on, or continue wearing, a protective mask. Therefore, in military situations, vomiting agents may be used in conjunction with lethal CW agents to increase casualties. They may also be used by themselves in proximity to friendly troops and in other situations well-suited for tear gas agents.

This appendix is Unclassified.

3425

~~Top Secret~~ [redacted] 6.2(d)

Appendix E

[redacted] 3.3(b)(1) 6.2(d)

3426

~~Top Secret~~ [redacted] 6.2(d)

[redacted] 3.3(b)(1) 6.2(d)

3427

~~Top Secret~~ [redacted] 6.2(d)

3.3(b)(1)
6.2(d)

[redacted]

~~Top Secret~~
TCS 3090/90