

LIBYA'S PURSUIT OF WEAPONS OF MASS DESTRUCTION

by Joshua Sinai¹

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Since the late 1970s, Libyan leader Colonel Muammar Qadhafi has sought to obtain weapons of mass destruction (WMD), particularly chemical and biological weapons (CBW). By the late 1980s, Libya had developed a rudimentary capability to produce such weapons. Western experts view the pursuit of CBW as a means of bolstering Libya's military capability, since the country lacks effective conventional ground, air, or naval forces.

Libyan CBW programs may also represent a bid by Colonel Qadhafi to offset Israel's nuclear capability with weapons often called the "poor man's atomic bomb." This motivation may stem from Libya's thwarted efforts to obtain its own nuclear capability. Thus far, Libya has been unsuccessful in its attempts to acquire nuclear weapons because of international sanctions and the fact that it lacks the necessary financial and technical resources.

Qadhafi's pursuit of CBW capabilities is of concern to the international community because of his often erratic behavior and the fact that Libya is believed to possess two of the largest CW production complexes ever constructed in the developing world. Libya's official position is that it does not have a CBW program and that its chemical production facilities are intended solely for peaceful purposes.² But informed observers believe these denials demonstrate Qadhafi's penchant for "saying one thing and doing the exact opposite." According to Western and Libyan exile sources, Libya's effort to acquire CBW is coupled with an aggressive strategy to acquire

ballistic missiles that could be used to deliver them.

Because CBW are relatively cheaper to produce and easier to conceal than nuclear weapons, the possibility looms that Libya could employ chemical or biological weapons either directly or through surrogates, such as terrorist groups.³ Indeed, Libya has already resorted to chemical warfare on a small scale as an asymmetric response to conventional military inferiority. In 1987, Libya's military operation in Chad was near defeat following a series of dramatic reversals. When Chadian forces, with French support, launched a surprise attack on a military base inside Libya, Qadhafi ordered his forces to attack the Chadian troops by dropping Iranian-supplied mustard gas bombs from a transport aircraft.⁴ Although this use of chemical weapons was not extensive enough to be militarily decisive, it set an ominous precedent.

Libya's CBW program might also play a catalytic role in a future Arab-Israeli war. Nevertheless, given Israel's nuclear capability and overwhelming conventional military strength, even the deployment of Libyan chemical weapons on ballistic missiles would not significantly alter the Arab-Israeli balance of power.

This report summarizes open-source information about Libya's attempts to acquire CBW and foreign companies that have allegedly supplied technology and materials for the program.

CHEMICAL WEAPONS

Libya's chemical warfare capabilities reportedly include personal protective equipment, Soviet-type decontamination units, and a stockpile of chemical agents. Since the late 1980s, Libya has sought to develop an indigenous production capability for chemical weapons (CW) manufacture and storage at three primary facilities in isolated parts of the country (see Figure 1).

Pharma 150 (Rabta)

The first CW production facility, known as Pharma 150, is a large industrial complex at Rabta, a sparsely populated and mountainous desert area about 75 miles southwest of Tripoli. The Reagan administration first publicized the existence and purpose of the Rabta facility in the fall of 1988.

Considered to be one of the largest CW production facility in the developing world, the Rabta complex consists of a CW agent production plant, a chemical munitions storage building, and a steel mill. The complex is defended with Soviet-made surface-to-air missiles.⁵ Since the establishment of the Rabta facility, Libya has moved thousands of civilian plant workers to a nearby town.

According to published reports, the Rabta plant was built with the help of private companies from a dozen nations, including both Western and Eastern bloc countries. Firms from Germany, Belgium, France, and Italy, as well as Japan, provided Libya with the technology and materials to manufacture chemical weapons.

The German firm Imhausen-Chemie AG played a central role in construction of the Rabta facility.⁶ In 1989, Imhausen reportedly contracted with Salzgitter Industriebau, another German company, to supply plans for a large chemical plant to produce highly toxic materials at Rabta.⁷ Other German firms also cooperated with Imhausen but claim that they believed they were delivering goods for a pharmaceutical plant being built in Hong Kong. Imhausen used this cover story to move sensitive goods through its Hong Kong-based trading company, Pen Tsao Materia Medica Center, which had a branch in Hamburg and was able to circumvent German export controls.⁸ The German equipment and supplies were transshipped through Hong Kong and Singapore before reaching Libya.⁹

Ihsan Barbouti International (IBI), a company operated by Ihsan Barbouti, an Iraqi-born London engineer,

acted as middleman between the Libyan government and Imhausen and its European suppliers.¹⁰ Barbouti reportedly made the arrangement with the West German company in his capacity as Qadhafi's adviser. Imhausen contracted initially with IBI in September 1984 to provide engineering and design assistance for the Rabta plant through several companies it controlled in Switzerland and elsewhere in Europe.¹¹

IBI Engineering GmbH, Barbouti's Frankfurt office, was described by United States officials as having been set up solely to manage construction of the Rabta complex. Alfred Teves GmbH, a subsidiary of the U.S. company International Telephone and Telegraph (ITT), sold industrial cooling equipment to IBI Engineering.¹² The Frankfurt company Zink John GmbH, Combustion Technology, sold a tower for the burning of waste gas to IBI's Zurich branch.¹³ In June 1990, after his involvement in the Rabta project became known, Barbouti died suddenly under mysterious circumstances in a London hospital.

Other West German firms were involved in the Libyan CW program, although they later claimed to have been unaware that their goods and services were being used for this purpose. Gesellschaft fuer Automation, an Imhausen subsidiary, reportedly supplied automation equipment for the Rabta plant.¹⁴ The multinational telecommunications firm Siemens provided an electronic control system to Gesellschaft fuer Automation, apparently in the belief that the system was destined for a plant under construction in Hong Kong.¹⁵ The electronic control system was ultimately installed at Rabta. The chemical company Preussag AG stated that it had sold Libya a sea-water desalinization plant that was built about five kilometers away from Rabta and also supplied a water pumping station that was crucial for the plant's operation.¹⁶ Pilot Plant, a subsidiary of the chemical firm Karl Kolb, was also involved in the Rabta project.

In the late 1980s, a Japanese company, Nihon Seikojo, or Japan Steel Works, played a major role in the construction of the metal-working plant at the Rabta complex.¹⁷ The company stated that it had delivered general-purpose machine tools, which it believed would be used for a desalinization plant. However, the proximity of the metal-working plant to the CW factory indicated that the Libyans intended to fabricate munitions and delivery vehicles for poison gas. Japan Steel Works subcontracted the electrical system for the machine shop to Toshiba in 1985. Toshiba, which delivered and installed the equipment, maintained that it, too, had sup-

plied only general-purpose industrial materials and had nothing to do with the construction of the CW plant, which was off-limits to Japanese workers. According to U.S. Department of State officials, the Japanese government assured the United States that as of July 1988, Japanese firms had ceased all activities at Rabta.

As the Rabta facility was nearing completion, Libya acquired precursor chemicals from West German suppliers. The pharmaceutical firm E. Merck legally shipped 19 tons of dichlorethane (a dual-use chemical) to Libya in 1988, for undisclosed uses.¹⁸ Rhein-Mass-Seekontor, a shipping firm, admitted delivering 60 tons of phosphorus trichloride, a nerve-agent precursor, to Tripoli on an unspecified date. Other European firms involved in the Rabta project included the Belgian shipping company Cross Link, which was accused of shipping construction materials to Libya on behalf of Imhausen's Zurich subsidiary.¹⁹ A French firm, De Dietrich, provided glass-lined vessels designed to contain corrosive chemical reactions to the Rabta factory in December 1988.

In June 1990, U.S. officials claimed that China was supplying the Rabta plant with raw materials for CW agents.²⁰ This allegation followed a report in April 1990 that a Chinese manufacturer of artillery shells had been linked to Rabta, an indication that Libya was interested in the production of chemical munitions.²¹

In terms of foreign personnel, the Rabta plant reportedly employed about 1,000 Thai nationals in the late 1980s. (Between 25,000 and 75,000 Thai nationals worked in Libya at that time).²² Pakistani laborers also participated in construction of the plant. In January 1989, it was also reported that several West German experts were employed at Rabta.²³

According to U.S. intelligence sources, the Rabta factory began mass-producing CW agents in 1990, although there is some evidence that pilot production began earlier.²⁴ In the early 1990s, Rabta was reportedly capable of producing the blister agent sulfur-mustard and the deadly nerve agents sarin and tabun at a rate of 10,000 pounds a day.²⁵ In March 1990, American and German intelligence sources claimed that Libya had produced approximately 30 tons of mustard gas at Rabta. However, conflicting reports indicated that the plant was operating at about half capacity and was having difficulty producing chemical artillery shells.

On March 14, 1990, the Libyans claimed that a fire

had destroyed the Rabta plant. According to satellite photos taken by the United States and France, however, the fire caused such minimal damage that it was widely viewed as a hoax.²⁶ In the view of an Italian official, the fire was "a self-provoked accident to ward off the threat of another American attack" such as the 1986 U.S. air raid on Tripoli and Benghazi to punish Libya for sponsoring a terrorist attack against U.S. servicemen.²⁷

Western governments also rejected Libya's later claim that the plant had been cleaned up and converted to a legitimate pharmaceutical facility.²⁸ In March 1991, U.S. intelligence officials reported that in the vicinity of Rabta, Libya had built a new complex of S-shaped concrete bunkers covered with sand, which contained special equipment to assemble poison gas artillery shells and bombs.²⁹ The United States warned that this development represented a new phase in Libya's efforts to acquire a CW capability.³⁰ Indeed, some evidence suggests that CW production at Rabta restarted in September 1996.³¹

Pharma 200 (Sebha)

A second Libyan CW plant, called Pharma 200, is reportedly almost identical to the Rabta plant. It is located underground in a remote desert location, 650 miles south of Tripoli in the Sebha Oasis, a military base about 95 kilometers north of the Chadian-Libyan border. Construction of Pharma 200 began in the late 1980s and was completed in 1992. Imhausen reportedly developed and delivered plans for the plant.³² Two additional German companies, Rose of Stuttgart and Abacus in Ulm, were suspected in June 1990 of helping to design the facility.³³

It was also reported that Libya had requested Thyssen, a German firm, to supply hydraulic lift equipment for the plant.³⁴ Other equipment was supplied by the Swiss firm EDM Engineering and by the Italian firm Technoglass ICM.³⁵ The Chinese government was also involved in the project.³⁶ In July 1990, U.S. officials claimed that the Chinese government was selling an estimated 10,000 tons of chemicals that could be used to manufacture CW agents at Pharma 200.³⁷ The plant reportedly produced lewisite and sarin nerve gas. As at Rabta, most of the plant workers were Thai nationals.³⁸

Tarhunah

With the operations at the Rabta complex severely

hampered in 1991 because of its exposure as a CW plant, Qadhafi resolved to build an entirely new, underground CW production complex near the town of Tarhunah, 50 miles southeast of Tripoli. This facility was intended to supplant the Rabta plant. As with the other two plants, the Libyan government has claimed at various times that Tarhunah is a petrochemical complex or that the facility's tunnels are part of the Great Man-Made River Project to funnel water from Libya's southern aquifers to its coastal cities.³⁹ The Tarhunah facility, extending over six square miles, is a labyrinth of tunnels carved into the side of a hollowed-out mountain.⁴⁰

The plant's entrance is located in the middle of a long, narrow valley between two mountain peaks, making it difficult for spy-satellites to view the factory or for fighter aircraft to destroy it. The plant also is virtually impregnable to conventional air attack because of three 450-foot-long tunnels, protected above by 100 feet of sandstone and several feet of reinforced concrete.⁴¹ To make the plant even more difficult to attack, Libya reportedly obtained blueprints used by the former Soviet Union to build underground bomb shelters.⁴² Apparently, only a direct hit on the top of the mountain with a nuclear warhead would be capable of destroying the facility.

Former U.S. Central Intelligence Agency Director John Deutch has called Tarhunah "the world's largest underground chemical-weapons plant."⁴³ The plant was expected to become fully operational by the end of 1997 and to produce more than 2,500 tons of mustard gas⁴⁴ and other deadly agents such as the nerve agents sarin (90 metric tons) and soman (1,300 metric tons).⁴⁵ In early 1996, it was reported that the facility was already capable of storing most of Libya's stockpile of chemical weapons—about 100 tons.⁴⁶

To construct the Tarhunah plant and purchase the necessary equipment to manufacture CW, Qadhafi reportedly set up a purchasing network operating through front companies and middlemen around the world. At the top of this purchasing network is the state-owned Jowfe Corporation, which is apparently a front company.⁴⁷ Suspicions about the plant's real purpose have been confirmed by Jowfe's purchase orders. In early 1994, British authorities uncovered that Jowfe had ordered two chemical production plants from the Multinational Engineering Group, a subsidiary of the British company APV.⁴⁸ The deal was camouflaged by means of a three-way operation: Jowfe contracted with APV's Malaysian

subsidiary, APV Hills and Hills, which passed the order to its parent company in London. In addition to chemical production equipment, the order included materials for CW agent production—in particular, pinacolyl alcohol, a key ingredient in the production of soman nerve gas.⁴⁹ Jowfe also obtained technical specifications for the construction of 150-meter-long underground tunnels, commonly used in secret military installations, from the Sauer engineering company of Salzburg, Austria.⁵⁰

German and Austrian companies also provided construction personnel and equipment to help build the tunnels at Tarhunah.⁵¹ Working through a Thai middleman, Libya purchased 60-ton rotary boring machines used to tunnel into the mountain from the German company Westfalia-Becorit. Subsequently, the Kohl government ordered the company to cease supplying spare parts for the boring machines, so as to render them useless.⁵² But Libya has managed to circumvent the embargo by obtaining spare parts from other companies in China, India, and Southeast Asia.⁵³

The Belgian company Hassco, based in Ostend, supplied CW precursor chemicals to Jowfe. Among them were ethylene oxide, used for manufacturing mustard gas and incendiary bombs, and dimethylamine, a component of tabun nerve gas.⁵⁴ South Africa may have supplied additional chemicals used in manufacturing chemical weapons. On February 11, 1997, South African President Nelson Mandela promised to investigate claims that members of the South African Defense Force had sold chemical precursors or expertise to Libya after the 1994 election.⁵⁵

Further evidence for the intended military use of the Tarhunah complex has been provided by Libya's purchase of chemical reactors and piping whose inner walls are coated with teflon to make them resistant to corrosive toxic substances.⁵⁶ In addition, Libya purchased a sophisticated Swiss air-purification system, protected by special fire-resistant materials, and a computerized process control system for automated chemical production.⁵⁷ In August 1996, three German businessmen were charged with selling Libya, between 1990 and 1993, advanced computerized equipment that could be programmed to manufacture soman and sarin.⁵⁸

In late 1996, reports began to surface that construction of the Tarhunah plant had fallen behind schedule because of the success of Western governments in disrupting the global procurement network Libya had established for the project.⁵⁹ Middle East defense expert

Anthony Cordesman stated in late 1996 that work on the plant had ceased.⁶⁰ Furthermore, according to a Western diplomat in Cairo, there was little security in the vicinity of Tarhunah, suggesting that the project was dormant.⁶¹

Nevertheless, U.S. officials remained concerned about Tarhunah because of Qadhafi's history of deception. Some analysts suspected that work on the plant may have merely slowed down, and that equipment was being transported at night, when it was difficult to detect.⁶² These concerns were apparently justified. In February 1997, Israeli military intelligence sources revealed that work on the plant had halted temporarily and then resumed in late 1996, entering a new stage in which chemical production equipment was being installed.⁶³

American and Israeli sources estimate that the Tarhunah plant might be ready for CW production by the end of 1997.⁶⁴ Reportedly, Libya has enlisted some 60 to 80 foreign experts from countries such as China and Germany to help complete the plant on schedule.⁶⁵

To manufacture the precursor chemicals needed as raw materials for the Tarhunah facility, many of which are no longer available from foreign suppliers, Libya has built a production plant near the northeastern town of Benghazi.⁶⁶ This facility is an extension of an existing Liquid Petroleum Products (LPP) plant, which produces "drilling mud" for the oil industry but also has sufficient capacity to meet present and future requirements for CW precursors. The LPP plant reportedly manufactures phosphorus trichloride, a key nerve agent precursor, as well as thionyl chloride and sodium sulphide, both of which can be used to make the mustard gas precursor thiodiglycol.⁶⁷

BIOLOGICAL WEAPONS

No hard data are available from open sources about Libya's effort to develop and produce biological weapons (BW). It is believed that the Libyan BW program "is in the early research and development stage."⁶⁸ Libya's BW capabilities reportedly include an unconfirmed number of microbial and toxin agents, although Libya reportedly has not yet succeeded developing effective delivery systems.⁶⁹ Although little is known about the locations of the facilities that manufacture BW agents, Libya's Rabta facility, although primarily a CW plant, is believed to contain biological research facilities.⁷⁰ It is possible that like Rabta, the Tarhunah CW plant could

also manufacture biological agents in the near future.

In early 1995, U.S. intelligence sources claimed that Qadhafi was attempting to recruit South African scientists to Tripoli to assist Libya's development of biological weapons.⁷¹ These scientists had secretly developed biological weapons that were allegedly used to assassinate opponents of South Africa's apartheid regime.⁷² Despite such foreign assistance, however, it may be several years before Libya is capable of weaponizing BW agents. As other developing countries have discovered, developing effective BW munitions and missile warheads is technologically demanding because of the need to avoid killing the microbial agents in the process of dissemination and to disperse them at the proper altitude. Nevertheless, mere possession of BW agents represents a significant military threat because dissemination by terrorists of an agent like anthrax could inflict mass civilian casualties.

CBW DELIVERY SYSTEMS

Available documentation indicates that Libya is intent on delivering CBW agents at distant targets with ballistic missiles. While Libya has not yet succeeded in devising effective biological warheads, it has made progress in developing chemical warheads.

Two major Libyan ballistic-missile programs are reportedly under way: the al-Fateh ("Conqueror") and al-Fajer al-Jadid projects.⁷³ The al-Fateh project is a research and development effort to develop a ballistic missile with a range of 950 kilometers, although the missile is not yet operational.⁷⁴ The al-Fajer al-Jadid project seeks to upgrade Libya's Scud B surface-to-surface missiles, with a range of 190 miles, to deliver chemical weapons.⁷⁵ Another possibility would be to place chemical warheads on the Nodong-1 advanced ballistic missiles, with a range of 810 miles. Libya has reportedly received the technology for the development of such missiles from North Korea.⁷⁶

Yet another delivery option would be to equip Libya's Su-24D "Fencer" advanced fighter aircraft with chemical bombs.⁷⁷ Libya currently has only a primitive capability to refuel such aircraft in mid-air, although it could potentially strike at Israel. Even so, Libyan aircraft would have difficulty penetrating Israel's sophisticated air-defense network.⁷⁸



Figure 1: Location of Libya's CBW Facilities

RELATIONSHIP BETWEEN CBW AND NUCLEAR WEAPONS

Libya has embarked on a full-scale effort to develop a CBW capability as the most cost-effective means of bolstering its overall military posture, which lacks effective conventional military forces or nuclear weapons. Furthermore, for Qadhafi, CBW are a substitute for his thwarted efforts to obtain a nuclear bomb.

Nevertheless, Libya is still believed to be seeking nuclear weapons. This intention was officially confirmed

in mid-April 1990, when Qadhafi called for the inclusion of a nuclear component in the development of a multifaceted deterrent force.⁷⁹ Although Libya is a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and has denied seeking nuclear weapons, experts consider this commitment suspect. Although Libya signed the NPT on July 18, 1968 and ratified it on May 26, 1975, Tripoli did not enter into a formal safeguards agreement with the International Atomic Energy Agency (IAEA) until 1980.

Libya made its first attempt to acquire nuclear weapons in 1970 from China, but was rebuffed. In the intervening years, Libyan officials repeatedly have expressed interest in purchasing nuclear technology. Despite these attempts, Libya appears to have made little progress in advancing its nuclear program beyond a rudimentary level. According to the U.S. Department of Defense, Libya's nuclear program "lacks well-developed plans, technical expertise, consistent financial support, and sufficient support from foreign suppliers."⁸⁰ The report also states that to upgrade its rudimentary nuclear infrastructure, Libya reportedly "continues to send scientists abroad for training and actively recruits foreign nuclear scientists and technicians."⁸¹ It therefore appears that Libya does not pose a short- or medium-term nuclear threat.

Libya's current nuclear capabilities consist primarily of basic research and development. Libya operates a 10-megawatt research reactor at Tajura, purchased from the former Soviet Union.⁸² This reactor is subject to IAEA safeguards. It is believed that Libya no longer intends to build a 440-megawatt power reactor near the Gulf of Sidra, which it had initially sought from the Soviet Union in 1977.⁸³ Nevertheless, Libya reportedly seeks to purchase weapons-grade fissile material on the black market to restart or accelerate its nuclear weapons program.⁸⁴

STRATEGIC OR TACTICAL ROLE OF CBW

Libya's leaders have issued contradictory statements about the role of CBW as a deterrent or a usable military capability. On the one hand, regime officials have maintained that the three suspected CW plants are designed only to produce pharmaceuticals or are part of a water reservoir system. On the other hand, Libya has declined to join the Chemical Weapons Convention, which was opened for signature in January 1993 and entered into force on April 29, 1997. Libya has also refused to open its chemical installations to international inspection.

In mid-March 1990, Libya's deputy foreign minister for European affairs stated that the Libyan government was prepared to dismantle the Rabta facility in exchange for Western financing of a new facility to manufacture pharmaceuticals, to be built under Western supervision at a new site.⁸⁵ This offer was rejected, however, since Libya could still produce and stockpile chemical weapons at clandestine sites. Indeed, the Libyan regime also has used various forms of subterfuge to deceive West-

ern governments about the true nature of its CBW facilities. Moreover, Libyan officials have implicitly asserted the country's right to manufacture CW because other nations possess them.⁸⁶

CONCLUSION

In spite of the international opprobrium it has received, Libya has continued to pursue a WMD capability, particularly chemical and biological weapons. Unlike its earlier and more successful efforts in the 1970s and 1980s to acquire such weapons, changes in the international arena, particularly the collapse of sympathetic regimes in the former Soviet Union and Eastern Europe, and international pressure in the form of U.N.-imposed economic sanctions, have constrained Libya's ability to purchase the technology necessary to develop an effective CBW capability. Nevertheless, Libya's determined efforts in this sphere, backed by its oil resources, may yet prove successful.

¹ The author would like to acknowledge the help of Javad Ali, Robert Waller, Steve Bowman, and Jack McGeorge in preparing this report.

² Serge Schmemmann, "Belgian Charged in Illicit Shipment for Libyan Plant," *The New York Times*, January 13, 1989, p. A14.

³ As evidence that Qadhafi has few inhibitions about turning over highly destructive weapons to terrorist groups, in the 1980s Libya provided the Irish Republic Army (IRA) with surface-to-air SA7 missiles and tons of the plastic explosive Semtex. David Ottaway, "Middle East Weapons Proliferate," *The Washington Post*, December 19, 1988, p. A1.

⁴ *Proliferation: Threat and Response* (Washington, D.C.: Office of the Secretary of Defense, April 1996), p. 26.

⁵ Bill Gertz, "2nd Chemical Arms Plant Spied in Libya," *The Washington Times*, June 18, 1990, p. 1.

⁶ In June 1990, Jurgen Hippenstiel-Imhausen, the former head of Imhausen, pleaded guilty to violating West German export and tax laws while secretly selling a chemical production plant to Libya for \$150 million. He did not admit that the plant was designed to produce chemical weapons, although the prosecution charged that the plant's sole purpose was to produce such weapons. Ferdinand Protzman, "German Confesses on Libyan Plant," *The New York Times*, June 14, 1990. On June 27, the German court sentenced Mr. Hippenstiel to a five-year prison term.

⁷ Cologne Deutschlandfunk Network, "Salzgitter Group Accused," January 16, 1989 [Foreign Broadcast Information Service, JPRS-TAC-89-004, January 31, 1989, p. 14].

⁸ Karl Guenther Barth, Wilfried Krause, and Rudolf Mueller, "Secret Project 'Pharma 150'," *Stern*, January 12, 1989, pp. 124-28 [Foreign Broadcast Information Service, JPRS-TAC-89-001-L, January 19, 1989, p. 17].

⁹ Udo Ufkotte, "European Companies Help Libya Build Another Poison Gas Factory," *Frankfurter*, March 16, 1993, p. 7 [cited in Foreign Broadcast Information Service, JPRS-TND-93-009, March 29, 1993, p. 26].

¹⁰ At his trial, Mr. Hippenstiel admitted that he was approached by Mr. Barbouti in mid-1984 to help build a "multi-purpose" chemical plant for a project dubbed "Pharma 150." Protzman, "German Confesses on Libyan Plant."

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- ¹³ "Bes," "German Companies Confirm Deliveries of Component Parts to Libya," *Frankfurter*, January 13, 1989, p. 2 [Foreign Broadcast Information Service, JPRS-TAC-89-002, January 19, 1989, p. 45].
- ¹⁴ "Doing Business With the Misery of Others?" *Der Spiegel*, January 23, 1989, pp. 16-27 [Foreign Broadcast Information Service, JPRS-TAC-89-004, January 31, 1989.]
- ¹⁵ "K.B.," "Siemens Denies Involvement in Libya," *Frankfurter*, January 10, 1989, p. 2 [Foreign Broadcast Information Service, JPRS-TAC-89-002, January 19, 1989, p. 41].
- ¹⁶ "Doing Business With the Misery of Others?" pp. 16-27.
- ¹⁷ Stefan Wagstyl, "Japan Probes Libya Chemical Arms 'Link,'" *Financial Times*, September 17, 1988, p. 3.
- ¹⁸ Hamburg DPA, "Merck, Tewes Firms Also Implicated in Libya CW Affairs."
- ¹⁹ "Doing Business With the Misery of Others?" pp. 16-27.
- ²⁰ David Hoffman and Lena H. Sun, "U.S. Tells China of Concern Over Report of Aid to Libya," *The Washington Post*, June 7, 1990, p. 34.
- ²¹ "Doing Business With the Misery of Others?" pp. 16-27.
- ²² Serge Schmemmann, "Belgian Charged in Illicit Shipment For Libyan Plant," *The New York Times*, January 13, 1989, p. A14.
- ²³ *Ibid.*
- ²⁴ Gertz, "Satellites Spot Poison-Bomb Plant in Libya," p. 3.
- ²⁵ Bill Gertz, "Chinese Move Seen As Aiding Libya in Making Poison Gas," *The Washington Times*, July 12, 1990, p. 6.
- ²⁶ It is reported that immediately prior to the fire convoys of trucks (presumably removing chemicals) were seen headed from the plant and workers at the plant were given an unexpected holiday.
- ²⁷ Jennifer Parmelee, "Libya Said to Offer to Dismantle Plant If It Is Given New One," *The Washington Post*, May 3, 1990, p. A33.
- ²⁸ Tim Weiner, "Huge Chemical Arms Plant Near Completion in Libya, U.S. Says," *The New York Times*, February 25, 1996, p. 8.
- ²⁹ Bill Gertz, "Satellites Spot Poison-Bomb Plant in Libya," *The Washington Times*, March 5, 1991, p. 3.
- ³⁰ *Ibid.*
- ³¹ Robert Waller, "Libyan CW Raises the Issue of Pre-Emption," *Jane's Intelligence Review*, November 1996, p. 523.
- ³² In mid-1990, the President of Imhausen, Juergen Hippenstiel-Imhausen, was convicted and sentenced to five years in prison for tax evasion and export control violations in connection with work on the Rabta project. "West German Firm Said To Have Aided Libya With New Chemical Weapons Plant," *Inside the Pentagon*, August 23, 1990, p. 7.
- ³³ Marc Fisher, "Libya Deal Ends in Jail For German," *The Washington Post*, June 28, 1990, p. 33.
- ³⁴ "Another Chemical Plant Planned by Qaddafi," *Insight*, June 11, 1990, p. 40.
- ³⁵ *Ibid.*
- ³⁶ Bill Gertz, "2nd Chemical Arms Plant Spied in Libya," *The Washington Times*, June 18, 1990, p. 1.
- ³⁷ Gertz, "Chinese Move Seen As Aiding Libya In Making Poison Gas," p. 6.
- ³⁸ *Ibid.*
- ³⁹ James Bruce, "Qadhafi Tunnels Into Trouble Both Within and Without," *Jane's Defence Weekly*, September 11, 1996, p. 24.
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- ⁴¹ Waller, "Libyan CW Raises the Issue of Pre-Emption," p. 524; Mahnaimi, "US Fury As Gadaffi Steps Up Work on Mustard Gas Factory."
- ⁴² Waller, "Target Qadhafi, Again," p. 46.
- ⁴³ *Ibid.*
- ⁴⁴ Mahnaimi, "US Fury As Gadaffi Steps Up Work on Mustard Gas Factory."
- ⁴⁵ Silvia Aloisi, "Al Qadhafi's Secret Weapon," *Milan Panorama*, April 16, 1994 [Foreign Broadcast Information Service, May 11, 1994, p. 3].
- ⁴⁶ Tim Weiner, "Huge Chemical Arms Plant Near Completion in Libya, U.S. Says," *The New York Times*, February 25, 1996, p. 8.
- ⁴⁷ Aloisi, "Al Qadhafi's Secret Weapon."
- ⁴⁸ *Ibid.*
- ⁴⁹ *Ibid.*
- ⁵⁰ *Ibid.*
- ⁵¹ Weiner, "Huge Chemical Arms Plant Near Completion in Libya, U.S. Says," p. 8.
- ⁵² Waller, "Target Qadhafi, Again," p. 46.
- ⁵³ *Ibid.*
- ⁵⁴ Aloisi, "Al Qadhafi's Secret Weapon," p. 3.
- ⁵⁵ President Mandela promised to have the South African Truth and Reconciliation Committee investigate claims that his country sold chemical weapons to Libya. Mandela said: "It is a matter of grave concern, because it may just be the tip of the iceberg. There may be a lot that has not been revealed." *Middle East Economic Digest*, February 28, 1997, p. 27.
- ⁵⁶ Aloisi, "Al Qadhafi's Secret Weapon," p. 3.
- ⁵⁷ *Ibid.*
- ⁵⁸ Raymond Bonner, "Germany's Search for Libya Suspect Finds Ties to Its Own Spies," *The New York Times*, August 22, 1996, p. 13.
- ⁵⁹ Reportedly, the U.S. government has been successful at persuading the governments of Germany, Italy, Switzerland, Japan, Denmark, Austria, Britain, and Poland to pressure their companies to stop deliveries of equipment related to the Tarhunah facility, purchased by Libya, although loopholes remain. Douglas Waller, "Target Qaddafi, Again," *Time*, April 1, 1996, p. 46.
- ⁶⁰ Philip Finnegan, "Libya Ceases Work on Chem Factory," *Defense News*, December 16-22, 1996, p. 1.
- ⁶¹ *Ibid.*
- ⁶² *Ibid.*, p. 19.
- ⁶³ Mahnaimi, "US Fury As Gadaffi Steps Up Work on Mustard Gas Factory."
- ⁶⁴ *Ibid.*
- ⁶⁵ *Ibid.*
- ⁶⁶ Alan George, "Libya—Poisonous Projects," *Middle East* (May 1993), p. 37.
- ⁶⁷ *Ibid.*
- ⁶⁸ *Proliferation: Threat and Response*, p. 27.
- ⁶⁹ Philip Finnegan, "Libya Ceases Work on Chem Factory," *Defense News*, December 16-22, 1996, p. 1.
- ⁷⁰ Bill Gertz, "Satellites Spot Poison-Bomb Plant in Libya," *The Washington Times*, March 5, 1991, p. 3.
- ⁷¹ James Adams, "Libya Reportedly Seeking Biological Weapons Program; South African Angle," *The Sunday Times*, February 26, 1995, p. 1.
- ⁷² *Ibid.*
- ⁷³ Breik A. Swessi, "Libya: Unconventional Weapons and Terrorism," paper presented to the "Post-Qadhafi Conference," Center for International and Strategic Studies, Washington, DC, November 29-30, 1993, p. 3.
- ⁷⁴ Leonard S. Spector, *et al.*, *Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1995* (Washington, D.C.: Carnegie Endowment for International Peace, 1995), p. 141.
- ⁷⁵ *Ibid.*, p. 4.
- ⁷⁶ Mahnaimi, "US Fury As Gadaffi Steps Up Work on Mustard Gas Factory."
- ⁷⁷ Robert Waller, "Libyan Threat Perception," *Jane's Intelligence Review 7* (September 1995), p. 408.
- ⁷⁸ *Ibid.*
- ⁷⁹ Recalling the April 1987 U.S. air attack against Libyan targets, Qadhafi said: "If we had possessed a deterrent—missiles that could reach New York—we would have hit it at the same moment. Consequently, we should build this force so that they and other will no longer think about an attack. Whether regarding Libya or the Arab homeland, in the coming twenty years this revolution should achieve a unified Arab nation.... This should be one homeland, the whole of it, possessing missiles and even nuclear bombs. Regarding reciprocal treatment, the world has a nuclear bomb, we should have a nuclear bomb." Cited in Leonard S. Spector, *Nuclear Ambitions: The Spread of Nuclear Weapons, 1989-1990* (Boulder, Colo.: Westview Press, 1990), p. 183.
- ⁸⁰ *Proliferation: Threat and Response* (Washington, D.C.: Office of the Secretary of Defense, April 1996), p. 25.
- ⁸¹ *Ibid.*
- ⁸² Spector, *et al.*, *Tracking Nuclear Proliferation*, p. 141.

⁸³ *Ibid.*

⁸⁴ *Ibid.*

⁸⁵ Jennifer Parmelee, "Libya Said to Offer to Dismantle Plant If It is Given New One," *The Washington Post*, May 3, 1990, p. A33.

⁸⁶ Michael R. Gordon, "Libya Says It Can Make Chemical Arms If Others Do," *The New York Times*, January 10, 1989.