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The Iraqi Nuclear Program: Progress Despite Setbacks

An Intelligence Assessment

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June 1983

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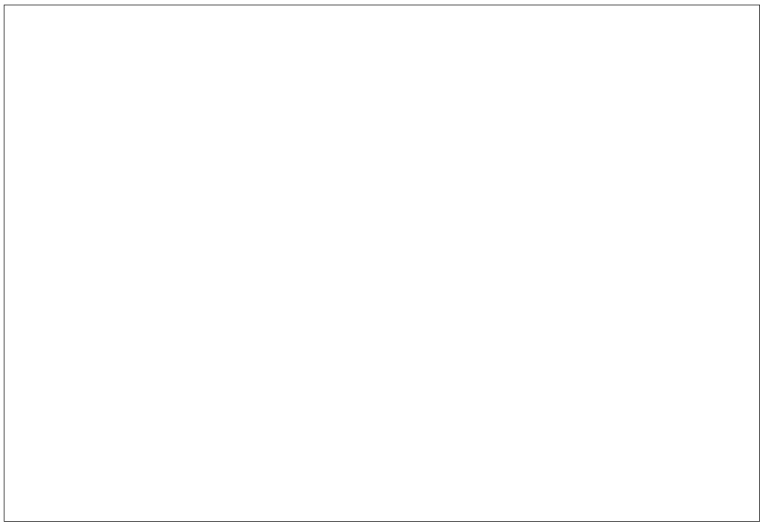
The Iraqi Nuclear Program: Progress Despite Setbacks

An Intelligence Assessment



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The Iraqi Nuclear Program: Progress Despite Setbacks

Key Judgments

Information available as of 1 May 1985 was used in this report.

The damaging Israeli airstrike on 7 June 1981 against the Osirak reactor at Iraq's Tuwaitha Nuclear Research Center dealt a significant setback to the Iraqi nuclear program but probably did not change Iraq's long-range nuclear ambitions.

Iraq's short-range options for acquiring fissile material—either by producing plutonium in the Osirak reactor or by diverting its highly enriched fuel—have been eliminated until rebuilding gets done. But Iraq's longer range program to build a significant and broad-based domestic nuclear capability—and probably an eventual nuclear weapon capability—is still moving forward steadily.

We still see no identifiable nuclear weapon program in Iraq. But Iraq has made a few moves that could take it in that direction, in addition to serving its broad purpose of eventual nuclear independence. If foreign assistance in vital areas such as the manufacturing and testing of high explosives and the design, fabrication, and testing of nuclear weapons could be obtained, Iraq possibly could have a viable design completed on paper within a few years. Unless they receive significant added foreign help, however, the Iraqis will not be able to produce the material for a nuclear weapon before the 1990s. Attaining that capability, even then, depends critically on the foreign supply of a nuclear reactor—preferably a power reactor—of substantial size fairly soon.

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The Iraqi Nuclear Program: Progress Despite Setbacks

Introduction

Iraq's nuclear R&D program was started with the establishment of the Iraqi Atomic Energy Commission (IAEC) in January 1959. In August of that year, the Soviets agreed to provide Iraq with a thermal research reactor (IRT) rated at 2 megawatts thermal (MWt), a radioisotope production laboratory, and other supporting facilities. (The reactor was upgraded in 1978 to 5 MWt, and subsequently to 10 MWt.) Subsequently, the IAEC established the Nuclear Research Institute (NRI)[1] near the village of Tuwaitha as the location for the Soviet-built facilities (figure 1). NRI came to be recognized as the most important Iraqi scientific research facility. By way of recognition, Iraq apparently decided that projects and facilities built at the institute would be designated "Tammuz."[2] The Soviet equipment and assistance came earlier than any other foreign aid to NRI and were called simply the Tammuz project.

On 18 November 1975, France agreed to provide Iraq with two nuclear research reactors, hot cells, and supporting facilities.[3] The French assistance has been referred to as the 17 Tammuz project.[4] The 40-to-70-MWt French-supplied Osirak reactor has been designated by the Iraqis as the Tammuz-1; the smaller, 800-kilowatt-thermal (kWt) French-supplied Isis reactor has been designated Tammuz-2. Each of these reactors was to be fueled with about 12 kilograms (kg) of 93-percent-enriched uranium. Such material is normally referred to as highly enriched uranium (HEU) and could be used in nuclear weapons.

On 5 April 1976, Iraq signed a contract with Italy for a radiochemistry laboratory, which was completed in April 1978. On 8 February 1978, Iraq signed a contract with the Italians for four additional facilities (now completed): a radioisotope production laboratory (RPL), a materials testing laboratory, a chemical engineering laboratory, and a fuel fabrication laboratory (FFL). The FFL has been referred to as the 30 Tammuz project. We do not know whether the other Italian-built facilities[5] are also part of this project, or are designated by their own specific project name and number.

[redacted]

[1] The NRI has been referred to successively as the Baghdad Nuclear Research Center, the Iraqi Nuclear Research Center, and now the Tuwaitha Nuclear Research Center.

[2] Tammuz: the month (July) of the Iraqi revolution in 1968. (C)

[3] Supporting facilities: radioactive-waste treatment and storage; postirradiation examination facility; "Batiments, Ateliers, Laboratoires" (buildings, workshops, laboratories); and experimental devices—IRENE, HASE, MARINA.

[4] The French established a consortium—CERBAG—as the general contractor for the 17 Tammuz project. CERBAG is controlled by the following companies: Technicatome (TA), Societe Generale pour les Techniques Nouvelles (SGN) (formerly Saint Gobain Techniques Nouvelles), Comsip Entreprise (CE), Constructions Navales et Industrielles de la Mediterranee (CNIM), and Bouygues Offshores (BY).

[5] The Italian organizations involved with constructing the laboratories at Tuwaitha are SNIA-Techint, CNEN (Comitato Nazionale per l'Energia Nucleare), AMN (Ansaldo Meccanico Nucleare), and Aerimpianti.

[redacted]

Status of the Iraqi Nuclear Program Before the Iran-Iraq War

One Israeli concern during this time was the potential for storage and accumulation of highly enriched uranium fuel in Iraq. The French, too, exhibited concern early on about the possible diversion of Osirak fuel. the French tried to convince Baghdad to accept a new, low-enriched (7-percent) fuel called "caramel" for future shipments in place of 93-percent-enriched fuel. But the Iraqis refused to accept the change. Therefore, in June 1980 the French shipped a load of highly

'We do not know how many of these Italian and French workers actually received threats, but we believe that the main targets were the Italian firm SNIA-Techint and the French firm Technicatome.

enriched uranium (comprising the first core load destined for Osirak). There have been no additional shipments. The French claim that caramel fuel is proliferation resistant, because the process for extracting plutonium from spent caramel fuel is more difficult than extraction from standard reactor fuel.

The Iraqi Atomic Energy Commission requested price quotations at this time from a Swiss firm for two 500-gram containers of 99.5-percent purity calcium metal. Calcium metal is an excellent reducing agent and would most likely be used to reduce uranium, zirconium, or plutonium halides to uranium, zirconium, or plutonium metal. Calcium metal in such a high-purity form has no other uses than as a reducing agent. Iraq has been interested in obtaining a facility to convert uranium, at least, to the metallic form. Both metallic uranium and metallic plutonium can be used as reactor fuel or in nuclear explosives. Zirconium alloys are used as a cladding for reactor fuel elements.

The IAEC has been trying to upgrade its computer capabilities since 1975. Iraq's National Computer Center has recently expressed interest in acquiring the Japanese ACOS-900 or ACOS-1000 computers for Baghdad University. We suspect that, if the computers are acquired, they will be used by the IAEC. The Japanese computers are comparable to the IBM 3081 and 3033 computers in performance and price, and they could be useful in nuclear weapon research.

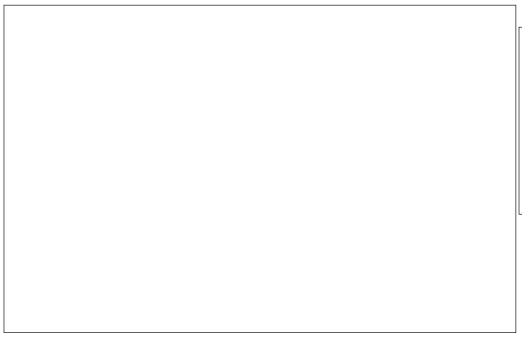
One area in which Iraq has shown a great interest, is the acquisition of lasers and associated equipment. Because of the type of equipment being sought and because of an earlier approach to the Italians for assistance in LIS, we suspect that Iraq is interested in developing an enrichment capability by this means. Even with some

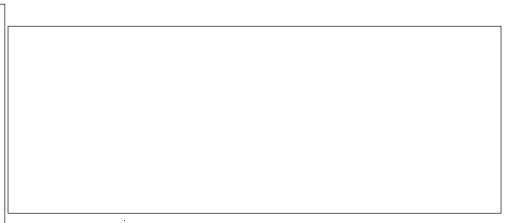
Effects of the Israeli Attack (7 June 1981)

Status of the Iraqi Nuclear Program Beforehand

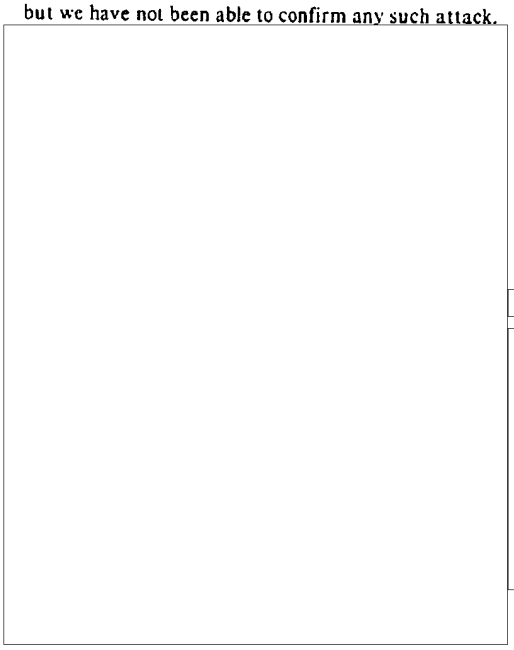
A few months before the Israeli airstrike, the Iraqi nuclear program was still at a rudimentary stage, as indicated by extensive purchases of instruments and other equipment abroad. Pakistan, by way of comparison, was much more advanced

At this time, Iraq appeared to be attempting to develop its basic nuclear physics program.





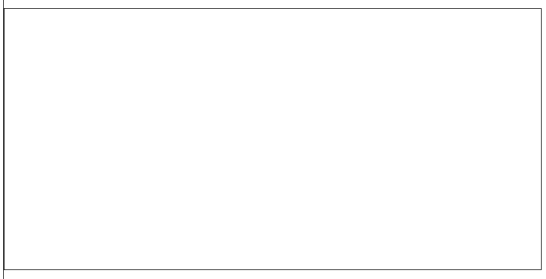
In addition to the earthen berms and camouflage netting to protect against air attack, there was an intense effort to acquire other security equipment to protect the facility from a possible ground attack. The equipment sought, included equipment to detect an illegal intrusion, blastproof and airtight doors, metal and explosive detectors, and a perimeter security system. Such activities may have been partially in response to a reported attack on the facility by Muslim extremists, but we have not been able to confirm any such attack.



Effects on the Iraqi Program

Iraqi Reaction. The Israeli attack clearly dealt a severe blow to the Iraqi nuclear program, but does not appear to have altered Iraq's long-term plans for nuclear independence. Iraq has probably gotten over the initial disarray and morale problems caused by the destruction of the Osirak reactor. It now appears resolved to get on with its nuclear program, but with more attention to covertness and physical security.

Iraq's initial response to the Israeli attack was uncharacteristically restrained. Baghdad, negotiating directly with the United States, accepted a compromise UN Security Council resolution that simply condemned Israel and called on Tel Aviv to place its nuclear facilities under international safeguards. Credit for this moderate performance, however, was dissipated soon thereafter when Iraqi President Saddam Husayn appealed for international assistance to help the Arabs acquire nuclear weapons as a deterrent to Israel. Saddam's clumsy attempt to focus world attention on Israel's nuclear capability brought unwanted publicity to Iraq and made its Western collaborators more aware of the proliferation risks of supplying Iraq with nuclear materials and technology.



Prospects for Continued Foreign Assistance

France and Italy are unlikely either to default on current commitments to Iraq or to cut off all future nuclear contacts. Neither country wants to take action that would damage good relations with Iraq, a long-term source of oil and a lucrative market for civilian and military goods. Both countries, however, will probably be more sensitive in the future to proliferation problems and insist on tougher safeguards

Iraq's oil leverage with its key nuclear suppliers has been reduced in two ways. The stalemated war with Iran has resulted in sharply reduced oil exports and has undermined Iraq's ability to use the oil weapon against France and/or Italy. A second factor is that world oil surpluses have made other supplier countries more approachable than formerly.

Shortly before the Israeli attack on Tuwaitha, SNIA-Techint and the Iraqis had met to firm up final details of a feasibility study for Italian provision to Iraq of a **power reactor rated at about 300 megawatts electric** (MWe), equivalent to about 900 MWt. The reactor involved—the Italian CIRENE, which exists only in prototype form—is designed to operate on natural-uranium fuel, although the prototype uses slightly enriched uranium.[6] Because the Iraqis are developing the capability to produce the necessary fuel (dependent upon their obtaining the three "nonsensitive" laboratories), this reactor could give them access to significant quantities of plutonium, starting in nine or 10 years. The Iraqis startled the Italians by asking for a commitment to build the reactor—something the

[6] CIRENE: CISE reattore a nebbia (CISE steam reactor). CISE is a research institute in Italy.

Finally, SNIA-Techint has submitted a bid and recently has been selected as one of two final candidates for a power reactor site feasibility study. This would be a rather innocuous and unprovocative contract. Nevertheless, it means that the company continues to pursue nuclear contracts with Iraq (if only selectively). These contracts could lead to a progressively deeper involvement.

In summary, Italy will remain the major supplier of the Iraqi nuclear program. Despite the proliferation risks, Italy probably will continue helping Iraq in numerous areas of nuclear technology, possibly even including reprocessing and plutonium chemistry. Because Italy is a major Iraqi arms supplier, it probably could impose additional safeguards without endangering relations with Iraq.

Other Countries

In addition to continuing its relationships with industrialized Western supplier countries, Iraq probably will put greater emphasis on strengthening nuclear cooperation with other industrialized countries, and with Third World countries in those situations where Western ability to influence nuclear transfers to Iraq is even more limited. Iraq might also make greater efforts to acquire nuclear materials covertly, but we would not expect such efforts to be successful. No other country, we believe, has been successful in acquiring nuclear materials covertly.

Iraq has had nuclear contacts with both Pakistan and Brazil. Iraqi-Pakistani nuclear contacts have taken place from time to time over the past few years, possibly including limited collaboration since the Israeli attack. We do not know the exact nature of the recent contacts, but they appear to have been related to purchases of uranium and nuclear equipment. Iraqi-Brazilian nuclear contacts have increased since the two countries signed a cooperation agreement in

Reactors for Plutonium Production

Iraqi options for acquiring fissile material—HEU or plutonium--for weapons are very much restricted. The only routes that appear to offer any chance of success in the late 1980s to early 1990s are: rebuilding Osirak, building another research reactor, or building a production reactor or a power reactor; all of them sources of plutonium. The clandestine acquisition of HEU or plutonium would be a very uncertain option, at best.

As to an Osirak replacement, Iraq has several options: it may abandon the Osirak project, rebuild Osirak with French assistance, or build an indigenous reactor. As noted earlier, it would probably take from one

to three years for the French to rebuild Osirak; longer if there were additional Israeli interference. Even if the reactor were rebuilt, the French probably would insist on substituting a lower enriched fuel. This step would eliminate the problem of Iraq's diverting fresh HEU fuel for bombmaking. Iraq still could produce plutonium in the reactor either by using the vacant positions in the reactor core or by building a blanket around the core. Loading natural uranium into the vacant core positions would produce only about 1 kg of plutonium per year, even with the reactor operating constantly at full power. Therefore, Iraq would have to operate the reactor for several years to acquire enough plutonium for a single device. Putting a blanket around the core, however, possibly could produce as much as 10 kg of plutonium per year.

In either case, Iraq would have to fabricate a large number of natural-uranium fuel assemblies, irradiate them, and reprocess them. We strongly believe that building a blanket around the core would be very difficult for Iraq to do without being detected by the IAEA or the French. (In addition to IAEA inspection, there would be a French presence at the reactor for many years.) Furthermore, the Iraqis would need an abnormally large amount of French fuel (probably six core loads instead of three or four) to keep the reactor operating steadily at maximum power. The French could not fail to note such abnormally large demands for fresh fuel supply.

Iraq cannot currently construct a reactor itself, but Brazil or Spain might provide assistance. Brazil could probably assist Iraq in building a research reactor, but only in the range of 2 to 5 MWt—and Iraq already has its 5-MWt Soviet-built reactor. The Spanish could help Iraq build a power reactor with a considerably higher power level (300-to-500-MWe, or 900-to-1,500-MWt, range), if that were what Iraq wanted. This reactor probably would be a pressurized water reactor (PWR). Even though it could produce a few hundred kilograms of plutonium per year, it is almost impossible to divert plutonium clandestinely from this type of reactor. An overt diversion would be possible if Iraq were to withdraw from the Non-Proliferation Treaty (NPT) and deny safeguards on the reactor. However, Iraq would still be dependent on foreign enrichment services and hence could not go into overt diversion unless it intended to sacrifice further operation of the reactor.

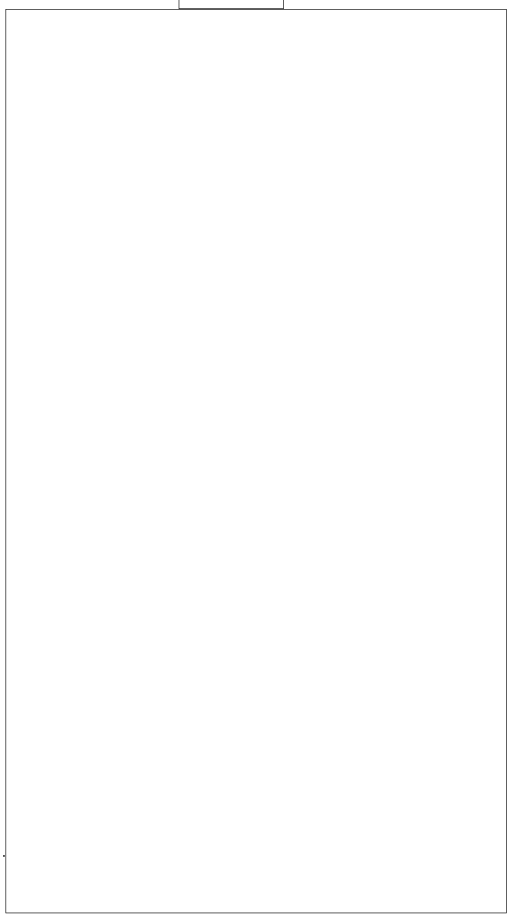
Iraq might attempt to avoid safeguards by constructing a reactor clandestinely. However, the project would be difficult to carry out clandestinely, especially since Iraq would be dependent on Brazil or Spain to conceal their own participation. With a facility of this size, and large numbers of personnel and materials, it is unlikely that it could be kept secret for long. In any case, it would be very difficult to obtain enriched uranium fuel clandestinely.

It is unlikely that Iraq could complete construction of either a natural-uranium, heavy-water power reactor type (such as the CIRENE) or a PWR before the early 1990s, although one or the other probably would afford the best chance that Iraq has of acquiring enough plutonium for a nuclear device. We do not know the current status of negotiations between Italy and Iraq on the purchase of the CIRENE. It appeared, shortly after the Israeli attack, that Iraq was preparing to purchase a PWR; since then, negotiations for this reactor appear to have stalled. After the attack, Iraq may have reasoned that there was no better time than the present to purchase a power reactor, that a power reactor could provide access to some plutonium, and that Israel would receive much stronger censure if it were to bomb a civilian power reactor.

Plutonium Fuel Cycle

Iraq has been working hard to acquire—primarily from Italy—the necessary fuel cycle (uranium supply, fuel fabrication, reprocessing, and waste treatment) to support a reactor and to extract plutonium. The IAEA confirmed a recent Iraqi request to place the Italian-provided facilities at Tuwaitha under safeguards. Already, Iraq has produced boiling water reactor (BWR) and PWR nuclear fuel pellets at the fuel fabrication laboratory. Iraq also plans to fabricate PWR and BWR fuel rods and test its ability to assemble one

PWR and one BWR fuel element. Iraq could use the uranium that it has clandestinely acquired to fabricate reactor fuel. Iraq still would have to acquire the fuel element fabrication facility that it has discussed with the Italians



Other Possible Acquisition of Fissile Material

Iraq continues to show a great interest in obtaining fissile material clandestinely—on the black market or elsewhere. For example, in 1979 high-grade uranium was offered to Iraq by swindlers. Whether it was natural, depleted, or highly enriched is not known to us; the proposed price, which is known, suggests highly enriched uranium. It is possible that Iraq has acquired some uranium, but we do not believe that any of it has been weapon-usable material. Dissatisfaction with what have probably been hoaxes so far will not be likely to deter Iraq from further attempts.

Although Iraq continues to show a great interest in what we believe to be laser isotope separation research, it is unlikely that Iraq could use this emerging technology as a source of weapon-grade material in the foreseeable future.

Nuclear Weapon Development

No active effort to develop nuclear weapons in Iraq is evident, but Iraq has shown an interest in several areas relevant to the development of nuclear weapons. As noted earlier, Iraq has shown a great interest in upgrading its computer capability and acquiring a Japanese computer that is more than adequate for nuclear weapons design. However, it is unclear whether Iraq is acquiring a computer specifically for this purpose. Iraq has also shown interest in another area that is more directly relevant to nuclear weapons—converting uranium to the metallic form. Iraq also has shown an interest in acquiring plutonium. In addition, as noted earlier, Iraq has made attempts to acquire a medium-range ballistic missile, possibly for a nuclear-warhead delivery system. The project now appears to be dormant mainly because of the inability of the prospective suppliers to provide the missile

Even if Iraq acquired enough fissile material for an explosive device, it still would need to design and fabricate a nuclear explosive. We know of no indigenous program in this area, nor of the existence of any Iraqi nuclear weapon design group. If foreign assistance in vital areas such as the manufacturing and testing of high explosives and the design, fabrication, and testing of nuclear weapons could be obtained, Iraq possibly could have a viable design completed on paper within a few years. There is no indication that a foreign supplier is willing to assist Iraq in these areas. Considering Iraq's past successes with foreign suppliers and its potential oil leverage, however, we would not totally dismiss the possibility of such foreign assistance.