MONITORING AND VERIFICATION IN A NONCOOPERATIVE ENVIRONMENT: LESSONS FROM THE U.N. EXPERIENCE IN IRAQ

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In the aftermath of the 1991 Persian Gulf War, the U.N. Security Council sought to ensure that a defeated Iraq would never again pose a threat to regional and international security. To this end, U.N. Security Council Resolution 687, which specified the conditions for the cease-fire, mandated the dismantling of Iraq's weapons of mass destruction (WMD) and ballistic missiles with a range exceeding 150 kilometers, together with the infrastructure needed to produce them. Stripping Iraq of its WMD is a key requirement for lifting the economic sanctions imposed on Baghdad in 1990 after the Iraqi invasion of Kuwait.

To implement this program of enforced disarmament, the Security Council established the United Nations Special Commission on Iraq (UNSCOM), a multinational agency comprised of military, scientific, and technical experts. UNSCOM's task is to discover and destroy or render harmless Iraq's chemical, biological, and long-range missile capabilities and to assist the Vienna-based International Atomic Energy Agency (IAEA) in eliminating Iraq's nuclear weapons program. At the outset, it was expected that the host country would be noncooperative and perhaps even hostile. Indeed, over the past five years, Iraq has engaged in a systematic effort of misrepresentation, concealment, and deception aimed at impeding the ability of the U.N. agencies to carry out their disarmament mission.

Although the "anytime, anywhere" inspection system in Iraq was imposed on the losing side in a war and thus is far more intrusive than any negotiated verification regime could be, future international inspectors are likely to face similar challenges when verifying compliance with nonproliferation treaties. It is therefore useful to reflect on the lessons of the U.N. experience in Iraq for monitoring and verification of the nuclear Non-Proliferation Treaty, the Chemical Weapons Convention, and the Biological Weapons Convention.

PHASES OF U.N. OPERATIONS IN IRAQ

The U.N. mission in Iraq has gone through three phases. During the initial "discovery" phase, the U.N. agencies sought to obtain a full accounting of Iraq's past WMD programs and supplier networks and to compile a comprehensive inventory of dual-capable facilities that could be used either for legitimate commercial activities or for illicit weapons purposes. In the second "destruction" phase, the U.N. agencies eliminated Iraq's stockpile of

chemical weapons and those facilities that had been specifically involved in its WMD programs.

In the third and current phase, UNSCOM and the IAEA are putting in place an "ongoing monitoring and verification"(OMV) program to keep close watch on Iraq's dual-capable facilities and to track its imports and exports of sensitive technologies, with the goal of preventing Baghdad from reacquiring WMD. To support this effort, the U.N. agencies have sought to assess Iraq's indigenous scientific and technological capabilities in areas relevant to WMD (e.g., the design and manufacture of biological fermenters) and to identify chokepoints in Iraq's abilities to reconstitute its WMD activities where future monitoring efforts can most usefully be focused.

In practice, the three phases of the U.N. operation have overlapped extensively. Although the OMV program is currently under way at many of Iraq's dual-capable facilities, other UNSCOM inspection teams are still engaged in a process of intensive discovery with respect to Iraq's biological weapons and missile programs. Because the three phases of the U.N. effort have different requirements, they offer distinct lessons for future monitoring and verification efforts.

INSPECTION PROCEDURES

Security Council Resolution 687 mandated that Iraq was to "unconditionally accept the destruction, removal or rendering harmless" of its WMD capabilities but did not specify the rights of UNSCOM and the IAEA in accomplishing this mission. U.N. officials drafted a set of detailed provisions for inspections, which were communicated to Baghdad on May 6, 1991, in a proposed exchange of letters between then-U.N. Secretary-General Javier Perez de Cuellar and Iraqi Foreign Minister Ahmed Hussein. The Iraqi authorities initially rejected the proposed guidelines as an undue infringement on their sovereignty, and it was only after the Security Council exerted heavy pressure—including the implicit threat of renewed military action—that Baghdad finally executed the exchange of letters on May 14, 1991.[2]

The agreed provisions established the right of UNSCOM and the IAEA to conduct no-notice inspections of declared and undeclared facilities throughout Iraq, with full access and no right of refusal. Powers of inspection include the authority to request and retain data and documents, take photographs, conduct interviews, install remote-controlled monitoring equipment, perform aerial reconnaissance, and collect samples for laboratory analysis. All of these rights have been confirmed in subsequent Security Council resolutions, and together they constitute the most intrusive international inspection regime ever implemented.

The first months of U.N. inspections in Iraq were characterized by improvisation and a degree of experimental chaos as UNSCOM and the IAEA tried to find their way in this new type of activity. Until August 1991, when Germany contributed C-160 transport aircraft to fly inspection teams to Iraq, the United Nations leased a barely airworthy plane from Tarom Airlines, the Romanian national carrier.[3] Largely through a process of trial and error, UNSCOM and the IAEA learned how to assemble multinational inspection teams, transport them to and around Iraq, prepare and analyze the results of on-site inspections, and destroy weapons stockpiles and production facilities.

Over the past five years, hundreds of weapons experts from several supporting countries (primarily Australia, Canada, France, Germany, New Zealand, Russia, Sweden, Switzerland, the United Kingdom, and the United States) have been assigned by their national governments to serve on IAEA and UNSCOM inspection teams for a period of two weeks or more. Team size ranges from as few as three members to more than 50 in special cases. The inspectors include technical experts in a particular field of weapons development and production (often loaned from national defense laboratories), along with support personnel such as an operations officer, a photographer, a report coordinator, an Arabic-English interpreter, and one or more translators for documentary material. All members of a U.N. inspection team are granted the privileges and immunities of international civil servants for the duration of their mission, and are instructed neither to seek nor to accept instructions from any government authority outside the United Nations. In practice, however, the thinking of many inspectors is influenced—if only unconsciously—by their national interests and perspectives.

Before a given inspection begins, UNSCOM's analytical staff at the United Nations in New York plans out the mission in detail. Each inspection team is assigned a specific mandate, such as performing a complete inventory of dual-capable equipment at a given facility, or assessing Iraq's indigenous capabili-

ties in a militarily relevant field of technology.

As a staging area for inspections in Iraq, UNSCOM has established a regional field office in Manama, the capital of Bahrain, an island-nation in the Persian Gulf. Members of each inspection team assemble in Manama for acclimatization and training before travelling to Baghdad to begin their mission. The inspectors are issued a cash advance and a blue U.N. certificate to be used in Iraq in lieu of a national passport. After orientation and mission planning in Bahrain, the team flies in a military transport aircraft to Iraq's Habbaniyah Air Base, about 70 kilometers west of Baghdad, and travels into the city by bus. (Although Germany has provided military transports, helicopters, and pilots for the first five years of U.N. inspections in Iraq, flight operations will be taken over in the fall of 1996 by Argentina and Chile.)

Once in Baghdad, inspection teams work out of UNSCOM's Baghdad Monitoring and Verification Centre (BMVC), housed on the third floor of the former Canal Hotel. The BMVC comprises a conference room, a medical clinic, offices for permanent staff, working areas for visiting inspection teams, laboratories for conducting chemical and biological analyses, and an operations center that maintains radio contact with in-country inspection teams and also monitors dozens of dual-capable factories throughout Iraq with closed-circuit video cameras.

One of the first tasks for the chief of an incoming inspection team is to meet with Iraqi officials from the National Monitoring Directorate (NMD), which in recent years has coordinated internal Iraqi government activities related to the U.N. inspections and serves as Baghdad's official liaison with the United Nations. At the initial meeting with NMD officials, the chief inspector formally presents the team's credentials, explains the purpose of the planned mission, and requests the cooperation of the Iraqi hosts. Over the next two weeks, the inspection team travels to facilities in and around Baghdad by bus or Land Rover and to more distant facilities by helicopter. Iraqi government escorts or "minders" accompany the U.N. inspectors on every site visit and videotape walkthroughs, meetings, and interviews. Upon completion of the team's mission, the chief inspector holds a final meeting with NMD officials to seek answers to outstanding questions. The team then flies back to Bahrain for debriefing and report writing, after which it disbands.

TEAM COMPOSITION

UNSCOM has learned some important lessons about the composition of inspection teams. First, to minimize logistical burdens and costs, it is important to keep inspection teams as small as possible—except when the use of complex technologies such as ground-penetrating radar requires a large number of technicians. Broad geographical representation is essential for political reasons, and the team must have the appropriate mix of technical skills so that it can accomplish its assigned mission.

Second, it is important to foster a cohesive group dynamic, a task requiring strong leadership skills on the part of the operations officer and the chief inspector, who are ultimately responsible for the success or failure of the mission. The most effective chief inspectors possess a rare blend of talents, combining the discretion of a diplomat, the technical knowledge and objectivity of a trained scientist, and the skeptical intellect of a trial lawyer.

Third, evidence of weapons-related activities at a dual-capable facility typically resides in subtle details that can only be detected by individuals with a trained eye, a solid technical grasp of the production process, and a familiarity with the history of Iraq's WMD programs. For this reason, inspectors who have served on multiple inspections are particularly valuable. Because assessing the purpose of a dual-capable facility often requires the specialized knowledge and experience of several individuals, team-members must communicate well so that they can combine their technical perspectives and reach a consensus judgement on the significance of an ambiguous site, piece of information, or item of equipment. Inspection teams that suffer from interpersonal conflicts and poor communication tend to be ineffective. In most cases, however, team members from different countries and technical backgrounds quickly establish a cohesive *esprit de corps* and come to identify strongly with the goals of the United Nations mission in Iraq.[4]

UNSCOM has also learned the importance of creating a well-staffed, competent, and professional organization at its headquarters in New York and its field offices in Manama and Baghdad. This staff provides analytical, administrative, and logistical support to the inspection teams in the field, and maintains continuity and institutional memory.

INTELLIGENCE SUPPORT

An "anywhere, anytime" inspection regime is only effective if the inspectors know where to go. The UNSCOM experience in Iraq has demonstrated the key role of intelligence in guiding the work of an international inspectorate, particularly in a noncooperative environment. Under the terms of Security Council Resolution 687, Iraq was required to submit declarations stating the types, numbers, and locations of all its prohibited weapons and related facilities, which would then be verified through on-site inspections by U.N. teams. In practice, Baghdad submitted initial declarations that were both incomplete and misleading. UNSCOM distributed copies of the declarations to about 60 U.N. member states for comment, and some countries provided useful intelligence on suspect facilities that had not been declared.[5]

A few supporting countries have shared high-quality intelligence products with UNSCOM and the IAEA, including satellite photographs, line drawings derived from overhead imagery, defector reports, and information on "signatures," or indicators of illicit weapons activity. At first, national intelligence officials had reservations about sharing sensitive information with the United Nations because of concern about compromising clandestine sources and methods. Given that the U.N. presence in Iraq offers the only means to eliminate Baghdad's remaining WMD capabilities, however, several countries have decided that it is in their national interest to ensure that UNSCOM and the IAEA do their job as effectively as possible.

The use of sensitive national intelligence brings with it certain constraints. Since the resolution of satellite photographs is highly classified, they can only be used to brief the Office of the Executive Chairman and chief inspectors, and cannot be retained by UNSCOM staff for independent analysis or reference purposes. Moreover, satellite photographs of sites of particular interest may not be available on a timely basis. As a practical alternative to reliance on satellite imagery, UNSCOM accepted the loan from the United States of a U-2 high-altitude surveillance plane, which is based in Saudi Arabia and equipped with cameras for aerial photography.[6]

In September 1991, this aircraft began regular survey flights over Iraq that have continued ever since. Before each U-2 flight, UNSCOM informs the U.S. government of the particular locations it wishes to have photographed. After the flight, UNSCOM analytical staff receive the developed film to retain for their own analysis. The main uses of aerial photography are to identify undeclared sites that might be engaged in illicit activities, to plan new inspections, and to verify that no suspect or prohibited activities are under way at sites that have already been inspected.[7] To supplement the U-2 flights, UNSCOM employs three helicopters for low-level aerial reconnaissance using hand-held still and video cameras.

Human sources have also provided valuable intelligence for targeting inspections. For example, the second IAEA nuclear inspection team that entered Iraq in June 1991 received information from a human source that helped explain some mysterious images of large saucer-shaped objects that U.S. intelligence analysts had been unable to interpret. The giant saucers turned out to be powerful electromagnets known as "calutrons," which separate isotopes by their atomic weight and can be used to enrich uranium for nuclear weapons. This information helped the IAEA team to uncover Iraq's use of a nearly forgotten but still workable enrichment technology known as Electro-Magnetic Isotope Separation (EMIS).[8]

Good intelligence is particularly essential when planning no-notice or "challenge" inspections, which are designed to detect illicit weapons or activities at undeclared sites. Before a typical challenge inspection, the U.N. inspection team receives a briefing on the suspect facility and studies a detailed site map derived from overhead photography. The team then travels to the chosen site by helicopter or by road, taking a circuitous route to keep the Iraqi minders in the dark until the last possible moment about the target of the inspection. When the inspectors arrive at the site, they typically order the plant workers not to leave until the search has been completed. Hovering helicopters monitor the perimeter of the site to ensure that key items of equipment or material are not removed surreptitiously.[9] The team then conducts a visual inspection of the facility and interviews plant personnel. At some dual-capable chemical or biological facilities, inspectors collect samples from inside and outside the plant and take them back to the BMVC for analysis.

Thanks to the use of the U-2 aircraft and other independent monitoring assets, the locus of information and expertise on Iraq's WMD programs has shifted in recent years

from national intelligence agencies to the United Nations itself. An Information Assessment Unit (IAU) at UNSCOM headquarters in New York evaluates the data generated by on-site inspections and correlates them with intelligence flowing in from other sources, such as that provided by companies that sold equipment and materials to Baghdad prior to the Gulf War. At present, the IAU identifies most of the suspect sites for no-notice inspections in Iraq and analyzes the results.

IRAQI RESPONSES TO INSPECTIONS

Throughout the period of baseline inspections, Iraq engaged in a cat-and-mouse game with the United Nations in a deliberate effort to conceal the full scale and scope of its WMD programs. This interaction continues today with respect to biological weapons and missile inspections. Iraq's various means of obstruction, concealment, and deception are described below.

Incomplete and Misleading Declarations

Security Council Resolution 687 required Iraq to make "full, final, and complete declarations" in which it listed all of the facilities and activities related to its WMD programs. From the outset, however, Iraq's declarations were incomplete and contained numerous false statements and distortions. When the U.N. agencies eventually uncovered irrefutable evidence of an undeclared site or activity and demanded that Baghdad account for the missing data, the Iraqi authorities typically responded with another partial admission, indicating at each stage that they were making a full disclosure. This pattern of "cheat and retreat" continued throughout the period of baseline inspections.

The Iraqi authorities also tried to misdirect the U.N. inspectors away from sensitive sites and developed elaborate cover stories to protect their clandestine programs. For example, they claimed that the large uranium-enrichment facility at Tarmiya was a high-voltage transformer testing facility, and that the first calutrons seen by inspectors were scientific mass spectrometers.[10] When the IAEA and UNSCOM managed to penetrate such cover stories, Baghdad abandoned them in a gradual manner. In general, the Iraqi authorities tried to assess the extent of the U.N. agencies' knowledge and tailored their declarations to conceal facilities and programs that had not been detected. The end-result of this process was that Iraq's declarations came increasingly to resemble Western intelligence assessments: in effect, the Iraqis told UNSCOM and the IAEA what they already knew.

Because of Iraq's persistent misrepresentations, the U.N. agencies recognized that they could not rely on official declarations to obtain a full accounting of Baghdad's WMD programs. Nevertheless, the declarations were useful as a point of departure and provided a basis for planning and carrying out the initial set of inspections. Moreover, when examined for internal consistency and compared with independent evidence obtained from outside sources, the official declarations revealed discrepancies that offered valuable leads. For example, the Iraqi authorities declared early on that only 10 scientists had been involved in the pre-war biological warfare (BW) program, which they claimed had been limited to defensive research. UNSCOM, however, noticed a lack of middle managers between the top officials and the technical staff and deduced that Iraq was concealing the identities of many senior weapons scientists.[11] Eventually, UNSCOM was able to determine that more than 150 scientists and senior technicians had worked on the Iraqi BW program.[12]

U.N. inspectors have also identified discrepancies between legitimate production activities declared by Iraq and the technical characteristics of certain items of dual-capable equipment. For example, the Iraqis claimed that the Al Hakam Factory, a biological fermentation plant located in the desert about 80 kilometers southwest of Baghdad, was engaged in the commercial manufacture of two products: a microbial pesticide (*Bacillus thuringiensis*, or BT) and single-cell protein for use as an animal feed supplement. However, the spray drier in the BT production line was capable of generating particles whose size was inconsistent with the declared purpose of dispersing BT bacteria as a biological pesticide. The particles were too small to settle out of the air onto crops but were in the appropriate size range for efficient dispersal of a BW agent as an aerosol that would remain suspended in the atmosphere for long periods and could be inhaled deep into the lungs to cause a fatal infection.[13] This and other technical evidence raised suspicions that the Al Hakam Factory had been intended as a BW agent production facility—an assessment later borne out by documentary evidence. Accordingly, UNSCOM used high explosives to level the Al Hakam Factory in June 1996.[14]

Confrontation and Intimidation

Baghdad's response to U.N. on-site inspections has varied depending on the sensitivity of the targeted site. Iraqi minders and plant managers tend to be cordial and superficially cooperative during inspections of declared facilities, yet they can quickly become hostile and threatening when an UNSCOM or IAEA inspection team makes a surprise visit to an undeclared site that Baghdad has sought to conceal. During the first two years after the Gulf War, the Iraqi authorities resorted to verbal and physical intimidation in an effort to deter the U.N. agencies from making such intrusive inspections. According to former IAEA inspector David Kay,

> Inspectors were awakened with telephoned threats; obscene and threatening notes were slipped under hotel doors; hotel rooms were ransacked; verbal abuse on the street and at inspection sites became common; on several occasions inspectors were physically attacked by outraged Iraqi 'civilians'; UN vehicles were bombed and tires slashed; and shots were fired over the heads of inspectors as a team photographed Iraq's secret uranium enrichment equipment.[15]

The last reference is to an incident that occurred on June 28, 1991, when Iraq tried to conceal several calutrons from an IAEA inspection team. The Iraqis transported the giant electromagnets on flatbed trucks from the Nuclear Research Center at Tuwaitha to the military barracks at Abu Ghraib. Although the IAEA team caught a glimpse of the calutrons in transport, they were denied access to the barracks; by the time they were allowed in, the trucks and their secret cargo had vanished. With the aid of U.S. satellite intelligence, however, UNSCOM headquarters in New York was able to track the movement of the trucks to the Military Transport Command facility in Fallujah and conveyed this information to the inspection team through a secure communications link. The IAEA inspectors arrived in Fallujah just as the flatbed trucks were exiting the facility and followed in hot pursuit. In a desperate attempt to force the inspectors to back off, Iraqi soldiers fired warning shots over their heads.[16] This incident elicited a stern warning from the U.N. Security Council and stiffened the IAEA's resolve to uncover and eliminate Iraq's nuclear weapons programs.

There have also been a number of incidents in which Iraq has sought to prevent U.N. inspectors from entering an undeclared site, resulting in a tense standoff that at times has lasted for several days. On September 24, 1991, for example, Iraqi minders prevented the sixth IAEA inspection team from removing documents and microfilm related to the design of a nuclear weapon from the Nuclear Design Center in Baghdad. Iraqi soldiers held the inspectors captive in the building's parking lot and said they would be allowed to leave only if they left the documents behind. After a four-day standoff, the Iraqi authorities finally relented and let the team depart with the documents.[17]

Similarly, on July 5, 1992, UNSCOM requested a no-notice inspection of the Agriculture Ministry building in Baghdad, based on an intelligence tip that documents on the Iraqi ballistic-missile program were stored there. The Iraqi authorities refused to allow the inspection to proceed, resulting in a standoff that lasted for 17 days. Only when the U.N. Security Council threatened Baghdad with military action did the Iraqis finally back down and allow a full inspection.[18]

There were no further major standoffs between Iraq and the United Nations until March 1996, when an UNSCOM inspection team was detained five times over a 10-day period. The 43-member team was searching for components and documents related to Iraq's past ballistic missile program. On March 8, Iraq prevented the team from entering and searching for documents in a building in central Baghdad belonging to the Ministry of Irrigation. After the inspectors were denied entry, they camped outside the building and photographed anyone entering or leaving. The standoff ended after 18 hours, when Iraqi Deputy Prime Minister Tariq 'Aziz and UNSCOM Executive Chairman Rolf Ekeus worked out a compromise in which a subgroup of the team was allowed to search the building. UNSCOM deputy chairman Charles Duelfer admitted, however, that the delay of 18 hours meant that any incriminating documents—if they existed—had probably been destroyed.[19] The Iraqis, for their part, remained inscrutable. When questioned about a burning incinerator found inside the ministry building, Iraq's U.N. ambassador Nizar Hamdoon replied, "Every building has some kind of smoke coming out. It is bad for the environment but that is life."[20]

Another standoff occurred two days later, on March 11, when the same UNSCOM missile inspection team sought to enter an underground barracks and training center for Saddam Hussein's elite Republican

Guards in Sarabadi, about 50 kilometers southeast of Baghdad. A U.S. official said that the facility was suspected of harboring banned launchers for Scud medium-range missiles. After an 11-hour standoff, the Iraqis finally relented and allowed the team to enter the compound.[21]

During the week of June 10, Iraq upped the ante in its confrontation with the United Nations by declaring that five Revolutionary Guard bases in and around Baghdad, which UNSCOM sought to search for equipment, documents, and materials related to banned weapons programs, were strictly off-limits to U.N. inspectors because the searches would threaten Iraq's national security. Iraqi troops trained antiaircraft missiles on UNSCOM helicopters overflying the suspect sites, and Iraq defied a unanimous resolution by the U.N. Security Council demanding that Iraq permit "unrestricted access" to UNSCOM inspection teams. This blanket refusal introduced a new dimension in Iraqi noncompliance: in the past, Baghdad had delayed inspections but never rejected them outright. On June 22, however, after a meeting between Rolf Ekeus and Tariq 'Aziz, Iraq agreed to grant UNSCOM inspectors access to all five suspect sites.[22]

Direct confrontations with the United Nations have been relatively rare in recent years as Iraq has sought to improve its international image in the hope of achieving an end to the trade embargo. At the same time, the Iraqis have continued to obstruct the U.N. mission in more subtle ways, as described below.

Counterintelligence and Infiltration

The initial U.N. no-notice inspections of undeclared sites were highly productive, yielding extensive information about Iraq's clandestine nuclear and missile programs. After 1992, however, UNSCOM and IAEA inspectors repeatedly came up empty-handed after raiding facilities suspected by cooperating national intelligence agencies of hiding Scud missiles, chemical or biological weapons, or nuclear materials. One reason for these diminishing returns was Iraq's increasingly effective use of counterintelligence techniques. To ferret out which undeclared sites would be targeted for surprise visits, the Iraqi intelligence services engaged in intensive surveillance of U.N. inspectors. Iraqi agents bugged hotel rooms, conference rooms, and office spaces used by the inspectors, monitored U.N. radio frequencies, and tapped telephones.

The Iraqi government also infiltrated a number of spies into UNSCOM's Baghdad field organization. One such agent was dramatically exposed after the defection to Jordan in August 1995 of Lt. Gen. Hussein Kamel al-Majid, the Iraqi armaments director and a son-in-law of President Saddam Hussein. When sitting down for a meeting in Amman with UNSCOM Executive Chairman Rolf Ekeus, Hussein Kamel was shocked to recognize the U.N. envoy's interpreter—as a spy, whom he himself had infiltrated into UNSCOM. According to an account in the German news magazine *Der Spiegel*, the Iraqi defector snapped angrily, "Piss off, damn you. You worked for me, and I refuse to make statements in the presence of my own agents."[23]

As a result of Iraq's intensive surveillance and infiltration efforts, the targets of several no-notice inspections were compromised in advance. U.N. inspectors arrived unannounced at a suspect facility, expecting to find incriminating material, only to discover that the site had been painstakingly swept clean as if they had been expected. Despite obvious signs that something was amiss, it took a long time for the U.N. agencies to come to grips with the problem. Part of the reason was a cultural disconnect. Although many of the people who work for UNSCOM have military or intelligence backgrounds and are thus familiar with the need for operational security, such measures are entirely foreign to the organizational culture of the United Nations, which fosters the free and open exchange of information.

Eventually, however, the U.N. agencies took some modest steps to enhance security. UNSCOM created "secure areas" at the BMVC and at U.N. headquarters in New York. Inspectors were given radio call-signs to use instead of names, so that Iraqis monitoring the airwaves would not know who was talking to whom. Internal documents such as inspection reports were classified "UNSCOM-Sensitive" and given restricted circulation, and only the chief inspector of each team was authorized to communicate with members of the news media.

Destruction of Evidence

Before the first U.N. inspection teams entered Iraq, and later as they began to close in on major elements of the secret nuclear and biological weapons programs, the Iraqis sys-

tematically destroyed, removed, or dispersed evidence so that the true purpose and sophistication of key facilities could not be determined. For example, the large calutron test facility at the Nuclear Research Center in Tuwaitha was razed to the ground and the site covered with dirt before the first IAEA team arrived. At other nuclear sites, incriminating equipment was removed and either buried or shuttled around the country on trucks, concrete was poured over characteristic features, and floors were painted in an effort to foil attempts at sampling and analysis.

The systematic destruction of evidence also took place at sites involved in the Iraqi BW program. Two weeks before the first UNSCOM biological inspection team visited the research laboratory at Salman Pak in August 1991, the Iraqis tore down several structures at the site that had survived the Coalition bombing campaign unscathed, including buildings housing fermenters, an aerosol inhalation test chamber, and a small incinerator. The steel aerosol chamber was crushed and deposited at a dump several kilometers away. The Iraqis then bulldozed the site and covered it with fresh dirt to erase any remaining evidence. They also burned reams of documents, leaving melted looseleaf binders and piles of ashes scattered around the site. According to a member of the UNSCOM team that visited Salman Pak:

> Although the Iraqis were able to produce some original research papers and hand-drawn sketches of the layout of the buildings now reduced to rubble, they were unable to produce any documentary evidence to support their assertions, claiming that everything was destroyed by the bombing. Although none of us wanted to admit it, one thing became painfully clear: the only thing we were going to get from the Iraqis was what they wanted to give us.[24]

Impeding Inspections

During no-notice inspections of sensitive sites, the Iraqi minders have found excuses ranging from transportation bottlenecks to bad weather to delay the U.N. team's arrival and buy time to remove incriminating evidence. Since inspections of undeclared sites far from Baghdad require the use of a helicopter to transport the inspection team, the Iraqi authorities insist on 15 hours' notice to "stand down" their air defenses so that the U.N. helicopters can fly safely. Although inspection teams try to avoid revealing the location of the target site by declaring a large block of airspace for the helicopter to fly through, the Iraqis still derive useful clues from the advance notice, particularly if they are concerned about a particular clandestine facility within the declared zone.[25] On a few occasions, the Iraqis have also threatened to open fire on UNSCOM helicopters if they approach secure areas such as presidential palaces.

Once the inspectors arrive onsite, plant managers sometimes refuse to provide requested documents or give answers that are inappropriate to the questions asked. Another common delaying tactic is for Iraqi officials to feign incomprehension and request the services of an interpreter even though they are capable of speaking fluent English in other situations.

U.N. inspection teams are generally not allowed to interview more than a few senior engineers and technicians employed at an inspected facility, regardless of the type of site visited. During plant walk-throughs, minders from the National Monitoring Directorate may prevent plant workers from responding to inspector questions or pressure the few individuals who speak some English to work through an interpreter. In addition, the fact that the minders videotape all interviews has a chilling effect on the willingness of plant workers to speak freely.

At times, Iraqi stalling tactics have verged on intimidation. During a biological weapons inspection at Salman Pak, for example, Iraqi soldiers deliberately placed live munitions and a radioactive source inside bunkers that were to be inspected. In addition to frightening the UNSCOM inspectors, this tactic delayed the inspection until the ordnance had been removed and a nuclear expert had been called to check the radioactive source.[26]

On another occasion, the Iraqi authorities tried to prevent the excavation of a field near Salman Pak suspected of containing buried biological munitions. The Iraqi officials brought in Moslem clergymen who spent two hours pleading with the UNSCOM team that the field was a grave site and that digging would be sacrilegious. Although the chief inspector finally ordered the excavation to proceed, only one trench had been completed before the backhoe broke down and work had to cease because of the intense midday heat. On subsequent days the clergymen did not return and the excavation proceeded, but no incriminating evidence was found.[27]

Deception and Denial Techniques

Iraq has paid close attention to the monitoring methods employed by the U.N. agencies and Western intelligence agencies and attempted to counter them by various means. In particular, Baghdad has been highly skilled in suppressing the telltale signatures of WMD production facilities through the application of deception and denial techniques. *Deception* involves the use of active or passive measures to convey a false or inaccurate picture of a clandestine activity, such as disguising a biological weapons production facility as a vaccine plant. In contrast, *denial* entails the use of active measures (camouflage, electronic emission control, and various forms of physical, personnel, and communications security) to conceal the very existence of a clandestine activity.

Because of the earlier U.S. decision to share satellite imagery with Baghdad during the 1980 to 1988 Iran-Iraq War, Iraqi counterintelligence officials possess a familiarity with the resolution and coverage of U.S. reconnaissance satellites. The Iraqis also have an understanding of the technical limitations of these systems and of how the data they generate are analyzed and interpreted. With this knowledge in hand, Baghdad has undertaken costly steps to conceal or disguise many of the key installations involved in its WMD programs from the eyes of Western intelligence agencies.

For example, Iraqi nuclear engineers studied uranium enrichment facilities in other countries and deliberately designed their plants not to contain characteristic design features that might give away their real function. Knowing that Western photo-interpreters would look for facilities structurally similar to those in the United States and the Soviet Union, Iraq turned to EMIS, a 1940s-era enrichment technology with which nearly all U.S. photo-interpreters were unfamiliar.

In addition, Iraqi engineers devised several deception techniques to disguise the main EMIS facility at Tarmiya. The plant had no security fence or visible supply of electricity, suggesting to Western photo-interpreters that it was of little strategic significance. Only after the war did UNSCOM inspectors discover that the Tarmiya facility was powered by a 30 kilovolt underground cable from a 150 megawatt substation several kilometers away. The EMIS plant was also situated within a large military security zone, so that it did not require any additional perimeter security or military defenses.[28] Other deception techniques employed by Iraq include the construction of WMD facilities inside existing buildings or underground; the minimization of off-site emissions; and the movement of critical pieces of equipment at night.[29]

Iraq has also used deception and denial strategies to prevent foreign intelligence services and the U.N. agencies from grasping the full scale and scope of its WMD programs. First, the Iraqi authorities duplicated and dispersed their weapons development and production activities at a large number of sites. There is no shortage of potential hiding places in Iraq, a large country containing many thousands of buildings, warehouses, factories, bunkers, and underground installations, most of which have never been inspected.[30] Only a regime of "saturation" monitoring, far exceeding the U.N.'s human and material resources, could compel Iraq to move its hidden weapons and equipment, increasing the probability of detection.

Second, Iraq sought to confuse outside observers by using multiple and shifting codenames for the same program or site. Moreover, in the venerable tradition of the U.S. "Manhattan Engineer District" and the British "Tube Alloys" project, Iraq selected innocuous cover names for its clandestine WMD activities, such as "Petrochemical Project 3" for the nuclear weapons program and "State Establishment for Pesticide Production" for the chemical weapons production facility at Muthanna.

Third, Iraq employed a byzantine procurement network involving multiple shell companies and transshipment points to conceal its acquisition of sensitive technologies from abroad. Components for key factories and weapon systems were imported from several suppliers or in unfinished form so that the intended military end-use would not be apparent. For example, to avoid arousing suspicion, Iraq imported the giant 4.5-meter-diameter electromagnets used in calutrons from a European foundry in the form of crude castings. A factory in Iraq then finished the magnets to the necessary technical specifications.[31]

Fourth, Iraqi counterintelligence officials have sought to exploit deep-seated misconceptions and prejudices on the part of Western intelligence analysts. They are aware that Western analysts tend to engage in "mirror-imaging"—the false assumption that other countries use the same production technologies and safety and environmental standards as those employed in the West. For example, the lack of

biocontainment measures at the Al Hakam Factory led many UNSCOM inspectors to conclude that BW agents could not have been produced there because of the high risk of contaminating plant workers and the surrounding environment. Yet, the Iraqis later confessed to having produced thousands of liters of anthrax spores and botulinum toxin at the site, indicating that Baghdad was prepared to cut corners on worker safety and environmental protection to an extent unthinkable in the West. The same cavalier attitude was characteristic of Iraq's treatment of chemical munitions, which were routinely handled by soldiers without protective masks or suits.

In yet another form of deception, the Iraqis have sought to reinforce Western stereotypes about the technical incompetence of Arabs. Although many of Iraq's key WMD facilities were sophisticated and well-maintained by Western standards, Iraqi engineers often pretend to be poorly trained and equipped so as to lower the U.N. inspectors' expectations of the level of military technology they are capable of developing.

U.N. ACCOMPLISHMENTS

Iraq's sophisticated strategies of deception and denial prevented both national intelligence services and the U.N. agencies from assessing the full scale and scope of its WMD programs for more than four years. Faced with pervasive noncooperation and obstruction, UNSCOM and the IAEA found it extremely difficult to penetrate Iraq's clandestine activities, particularly with respect to its pre-war programs and its dual-capable facilities. Still, thanks to resourceful detective work and dogged persistence, the U.N. agencies have managed to discern the broad outlines—if not the full details—of Iraq's chemical, biological, nuclear, and missile programs.

Ironically, Iraq's initial efforts at intimidation only stiffened the resolve of the U.N. agencies and caused them to adopt more aggressive tactics. This change of approach was possible because UNSCOM and the IAEA were backed by the authority of a united U.N. Security Council and the tacit threat of military force. For example, faced with Iraqi declarations containing obvious omissions and misrepresentations, the U.N. agencies stopped revealing everything they knew to make it harder for Baghdad to tailor its responses. They also placed greater reliance on technical means of monitoring and verification (such as U-2 aerial surveillance), confiscation of documentary evidence, and no-notice inspections of undeclared sites.[32]

Over the past five years, U.N. analysts have learned to piece together bits of information from a wide range of sources, including aerial and satellite imagery, confidential trade data from Western companies that supplied materials and equipment for Baghdad's WMD programs before the Gulf War, the ongoing monitoring of Iraq's imports of sensitive technology, and reports by Iraqi defectors. These various sources of information have helped to guide and amplify the results of the on-site inspections. Important insights into Iraq's WMD programs have also been gleaned from lengthy interviews with senior Iraqi officials in which UNSCOM interrogators have hammered away at inconsistencies in previous declarations and statements. Although Iraqi officials are carefully coached, they sometimes inadvertently let slip some significant piece of information.

Indeed, Baghdad's initial success at deceiving the United Nations made the Iraqi authorities overconfident and careless, so that they failed to prepare convincing cover stories. For example, UNSCOM learned from Western suppliers that during 1988 alone, Iraq had imported nearly 39 tons of "complex growth media" suitable for growing large quantities of bacteria as well as culturing patient specimens for hospital use. Yet, UNSCOM could account for only 22 tons of the media, leaving 17 tons unexplained.[33] When confronted with this evidence, the Iraqi authorities stated that the missing media had been imported for medical diagnostic purposes and distributed to four regional health clinics, all of which had burned down during riots after the Gulf War.

Three aspects of this story did not add up, however. First, Iraq's total hospital consumption of diagnostic media over the period 1987 to 1994 was less than 200 kilograms per year. Second, UNSCOM analysts determined from the suppliers that the culture media that Iraq had imported in large quantities did not include the types used most often by hospitals for diagnostic purposes, although they were suitable for cultivating BW agents such as anthrax. Third, since culture medium spoils rapidly once the package has been opened, media intended for hospital diagnostic purposes are normally sold in small packages of 0.1 to 1 kilogram, yet Iraq had imported media in 25 to 100 kilogram drums.[34] These discrepancies made

it clear that the official explanation was false, and provided strong circumstantial evidence that Iraq had produced large quantities of BW agents.

UNSCOM's successful detective work persuaded the U.N. Security Council of the need to maintain economic sanctions against Iraq despite strong political pressures from France and Russia to lift them. The new revelations also put senior Iraqi officials in the increasingly untenable position of being caught telling outright lies, generating tensions within the regime that may have contributed to the defection in August 1995 of Lt. Gen. Hussein Kamel al-Majid, the mastermind behind Baghdad's WMD programs. Shortly after the defection, the Iraqi government—in an apparent effort to undercut the value of Kamel's likely revelations—released to UNSCOM some 40 tons of documents, videotapes, photographs, computer diskettes, technical drawings, and prohibited hardware components, which were stored in crates inside a chicken house at a farm outside Baghdad purportedly owned by Hussein Kamel.[35] Together with Kamel's own testimony, this trove of documentary evidence proved to be an intelligence windfall about Iraq's pre-war weapons programs that confirmed many of UNSCOM's suspicions.

The U.N. inspection regime has also been successful at physically eliminating major elements of Iraq's WMD programs, setting them back several years. Tens of thousands of Iraqi chemical munitions have been destroyed, as well as key facilities involved in the nuclear, chemical, biological, and missile production complexes. Furthermore, the IAEA and UNSCOM have established an ongoing monitoring and verification (OMV) program at suspect dual-capable facilities, including the installation of closed-circuit video cameras and other remote sensors at high-risk sites.[36] The purpose of this regime is to increase the difficulty, expense, and political cost to Iraq of attempting to reacquire WMD, thereby serving to deter future violations. The U.N. agencies have also put in place a system to monitor Iraqi imports and exports of sensitive dual-use technologies. According to a senior IAEA official, while blueprints and computer codes may be hidden and experts and technicians remain, "Iraq's coherent, industrial-scale support infrastructure has been devastated and cannot be re-established as long as effective monitoring of the country is in place."[37]

Nevertheless, monitoring is particularly difficult in the ballistic missile area, since Iraq is allowed under U.N. Security Council Resolution 687 to manufacture missiles with a range up to 150 kilometers. These legal missile factories could potentially be diverted to the illicit production of longer-range missiles, while providing a cover for the import of dual-capable parts and materials. Preventing Iraq from reacquiring chemical and biological weapons will also be difficult. Weapons stockpiles could be concealed underground, and short production campaigns of chemical or biological warfare agents might be carried out at dual-capable facilities. According to Rolf Ekeus:

> We know that it is not that difficult to hide chemical weapons production, or even to make limited batches—you can have a production line where, for one or two months or even less, you make chemical warfare agents, and then go back to some permitted activity. That means you have to monitor the chemical industry very carefully. In the biological field it is the same. We need to keep a special eye on the laboratories...with high protection for dangerous organisms or materials.[38]

Given Iraqi President Saddam Hussein's apparent determination to reacquire WMD, Ekeus has said that the United Nations may have to keep Iraq under surveillance for the next 20 years with aerial overflights, closed-circuit television cameras, and teams of specialist inspectors.[39] Nevertheless, once economic sanctions against Baghdad are lifted, it is questionable whether the international community can sustain the political will needed to fund and operate the OMV and import-export monitoring programs indefinitely.

IS IRAQ A UNIQUE CASE?

Iraq's vast oil wealth relative to its small population, and its large pool of Western-educated scientists and engineers, have made that country a particularly tough case of WMD proliferation. In particular, Baghdad's deep pockets have enabled it to:

- pursue every conceivable path for the development of nuclear, chemical, and biological weapons and missile delivery systems;
- establish global procurement networks for WMD-related equipment and materials;
- pay a substantial premium for the procurement of sensitive goods shipped in violation of national export-control laws;
- duplicate and diversify its WMD production facilities at multiple sites; and
- make extensive use of costly

deception and denial strategies to conceal its vast WMD programs from Western intelligence services and later from the United Nations.

Few other proliferators in the developing world have the financial and technical resources required to pose such a formidable challenge to an international monitoring and verification regime. Nevertheless, future weapons inspectors are likely to face similar types of noncooperative behavior, albeit on a lesser scale, in other proliferant states such as North Korea and Iran.

LESSONS FOR FUTURE REGIMES

The U.N. experience in Iraq offers a number of lessons for future nonproliferation monitoring and verification regimes.

1. Intrusive on-site access is a necessary but not sufficient condition for obtaining evidence of noncompliance. On-site inspections will rarely turn up conclusive, "smoking gun" evidence of a violation, particularly when the inspected facility is dual-capable. Nevertheless, inspections can indicate unresolved suspicions and concerns that can then be followed up with other verification measures. The existence of a short-notice inspection regime also has a valuable deterrent effect by increasing the financial costs and political risks of noncompliance.

2. A multilateral inspection regime can be effective only to the extent that it is coupled with accurate and timely intelligence. To enhance the effectiveness of international monitoring and verification regimes (such as those conducted by the IAEA and the new Organization for the Prohibition of Chemical Weapons in The Hague), the United States and other like-minded countries should share sensitive intelligence information, while investing in new collection methods to replace those that have been compromised. At the same time, a multinational monitoring agency must have its own intelligence-gathering assets (e.g., UNSCOM's U-2 aircraft) and internal analytical capabilities (e.g., UNSCOM's Information Assessment Unit) to ensure its political independence from both the inspected state and the supporting states, thereby enhancing the credibility of its findings in the international arena.

3. Short-notice inspections can increase the likelihood that a violator will make mistakes and leave behind telltale indicators of illicit activity. A short time interval between notification of an inspection and the arrival of an inspection team at the site will force a violator to rush cleanup operations, increasing the odds of finding telltale evidence of a violation. In the context of a negotiated monitoring and verification regime, however, the desirability of short inspection timelines to increase confidence in compliance judgements must be balanced against the host country's legitimate need to safeguard national security and proprietary business information unrelated to the purpose of the inspections.

4. The combined use of various monitoring tools (e.g., overhead surveillance, monitoring trade flows, visual inspection, and sampling and analysis) can yield valuable synergies. For example, overhead reconnaissance can be used to "cue" on-site inspections. In July 1991, the United States informed UNSCOM that satellite imagery had indicated the presence of undeclared Scud missiles at an Iraqi military base, and an inspection team was sent to Iraq within 48 hours to investigate. The missiles proved to be decoys, which were destroyed to facilitate overhead accounting.[40]

5. An effective way to investigate clandestine WMD programs is to identify and interrogate key managerial and technical personnel. Important breakthroughs in UNSCOM's investigation resulted from multiple interviews with Iraqi weapons scientists and technicians over a period of years, in which UNSCOM interrogators hammered away at inconsistencies revealed by evidence from outside sources and their own internal analysis.

6. Only one agency should be assigned responsibility for coordinating all aspects of an international inspection regime. Security Council Resolution 687 was flawed in that it gave the lead for nuclear inspections to the IAEA and for all other inspections to UNSCOM. The resolution also mandated an awkward division of labor between the two agencies: the IAEA headed the nuclear inspection teams, provided experts in fissile material accounting, and evaluated the results, while UNSCOM helped to designate the inspection sites and recruited national inspectors with expertise in nuclear weapons design and production. Unfortunately, these overlapping areas of responsibility led to bureaucratic turf battles between the two agencies that made their collaboration tense and, at times, openly hostile. (The institutional conflict was not reflected in personal relationships between UNSCOM and IAEA inspectors,

which were generally cordial.) The inspection regime would have worked more smoothly had UNSCOM been given the lead for all categories of banned weaponry, with the IAEA serving in an advisory role.

7. Effective verification cannot be based on periodic on-site inspections alone, but requires the integration of data from a wide variety of sources to monitor patterns of host-country activity over an extended period of time. This task entails considerable analytical and inferential work on the part of a staff of proliferation specialists who possess the appropriate technical expertise. For this reason, the international community must recognize from the outset that monitoring WMD programs is a long-term activity that requires a major commitment of expert knowledge, resources, and money.

8. In the future, the task of verifying nonproliferation treaties and drawing compliance judgments will grow more difficult as technologies capable of supporting deception and denial efforts become more widely available. By employing pollution-control systems, computer data encryption, and electronic emission control, determined proliferators will be able to conceal WMD programs within their civilian industrial infrastructure.[41] For example, Iraq's EMIS facility at Tarmiya contained a sophisticated, multimillion-dollar "chemical wash" system for recovering enriched uranium from refurbished calutron components. Effluents were triple-filtered so as not to release traces of radioactive material into the atmosphere that might have led to the detection of this plant after it became operational.[42]

The continued diffusion of such "deceptogenic" technologies will make identifying and tracking foreign nuclear, chemical, biological, and missile programs more difficult. Future WMD proliferation analysts will therefore need to extract faint patterns of suspicious activity from large amounts of extraneous noise, perhaps with the aid of artificial-intelligence software.

[1] The author is grateful to Tim McCarthy of the Center for Nonproliferation Studies for reviewing the manuscript and providing useful comments.

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