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Technology in the Wrong Hands: An Iraqi Missile Case Study

An Interactive Qualifying Project Report

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by

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Abstract

This project, prepared for the Union of Concerned Scientists, is a case study of the development of the Iraqi missile program, which can serve as a case study for the acquisition of arms technology by third world countries. Working from the reports and press releases of the United Nations Security Council and other related literature, we investigate the development of the technology used to design and build ballistic missiles, paying close attention to the individual components in the design. Based upon this data, we define what level of technology Iraq has reached and what methods it has used to achieve this technology. We use this case study to suggest methods by which to prevent the acquisition of this technology by other third world countries.

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I. Introduction

In 1979, Saddam Hussein took control of Iraq and immediately set the tone for his leadership by killing 21 of his cabinet members. His next powerful move was to take over Kuwait in 1990. He now had control of 24% of the worlds oil supplies. It was clear his next target of domination was going to be Saudi Arabia. This is the point at which the United States stepped in. Iraq was given a deadline of January 15, 1991 to get all forces out of Kuwait. The deadline was ignored, triggering an all out attack on Iraq for the freedom of Kuwait. Due to the extreme power and sophistication of our military forces along with that of our allies, it was clear that we would claim victory over Desert Storm. It was at this time that we revealed the profound arsenal of weapons of mass destruction (WMD) that Iraq possessed and their intent to acquire nuclear weaponry. The Gulf War proved to be a great example about how the proliferation of arms by third world countries, such as Iraq, has a great potential to lead to mass destruction and numerous deaths.

Iraq is strategically located in the center of the Middle East sharing borders with such countries as Iran and Kuwait. Considering its previous history with Iran and its well-known hatred of Israel, allowing Iraq to acquire longer range delivery systems for their WMD's would not only be a major threat to their neighboring countries, but also the entire world. It is clear that Iraq was a threat to its neighboring countries just by the destruction and deaths that occurred during the period in which they were battling. To become such a serious threat to a country such as ours, Iraq needed to develop a missile that could achieve a much longer range. Iraq had a large ballistic missile development and production program prior to the Gulf War, so it is not unjustified to say that they could have a long-range missile in the works now.

In accordance with the cease-fire declared to end the Gulf war, the United Nations Security Council established resolution 687 (1991), which declared that Iraq unconditionally accept, under supervision, the destruction, removal or rendering harmless of its WMD's, ballistic missiles with a range over 150 kilometers, and all related production equipment and facilities. To insure that Iraq would fully cooperate with the resolution, the Security Council began an ongoing monitoring and verification system. Under this system, the United Nations Special Commission, UNSCOM was established to perform inspections in Iraq. UNSCOM would then notify the Security Council of crucial information found in Iraq through reports and press releases.

In the Interactive Qualifying Project completed by Keith Leveille, Technology in the Wrong Hands: An Iraqi Missile Case Study, reports, press releases, and resolutions resulting from UNSCOM's inspections in Iraq were read and summarized. From this information, he addressed how Iraq acquired their missile capabilities, which components were indigenously produced and which components were imported from other countries. By evaluating that data, he was able to draw conclusions on how other third world countries could be prevented from reaching such a status as Iraq did. Although Keith's IQP was very detailed and informative, there were still many gaps and questions left unanswered.

The goal of this project is to research information on Iraq's missile program outside that which was included in the UNSCOM reports. Since the completion of Keith Leveille's IQP, UNSCOM withdrew from Iraq in December of 1998 and has not returned for any further inspections. All conclusions presented in that project were based on the fact that the United Nations would still have an ongoing monitoring and verification system in Iraq. It was determined that once the monitoring was lifted, Iraq would be able to continue working on indigenously producing every aspect of advanced missile technology. Also without monitoring Iraq could easily import all components that they can't produce indigenously. The major question now is what information has been

published since UNSCOM stopped the inspections in Iraq? Former inspectors from UNSCOM are now able to come forward with data and opinions on the United Nations inspections and involvement in Iraq. Through researching, I will attempt to answer some substantial questions: How much of a global threat is Iraq to other countries? How long will it take for Iraq to acquire the capability to become a major threat to the United States? How crucial is the role of other countries in Iraq's ballistic missile program? and How successful will a new ongoing monitoring and verification program in Iraq be?

The following pages of this report will be sectioned off into four chapters respectively: Background, Methodology, Results and Analysis, and Conclusions. The Background will substantially summarize issues and knowledge needed to be able to fully understand the results and information contained in this project. It will also present gaps in the data, which may have been established in previous research on Iraq's missile program. Methodology is the chapter in which I will explain how the data used for this project was obtained, specifically where the information was found and the methods taken to acquire it. In the Results and Analysis section, I will answer a series of questions that arose during the research process for this project. These answers will then lead me to draw conclusions in the last chapter as to what can be done to prevent, not only Iraq, but also any third world country from becoming a global threat.

II. Background

Recent North Korean and Iranian missile tests demonstrated that third world countries, whose leaders are determined to advance their power, will not be deterred by nonproliferation actions. The concept of third world countries becoming a world-wide threat began developing as far back as the Cold War. Iraq's potential to impose devastation and numerous deaths by the use of weapons of mass destruction was demonstrated initially in their war with Iran. During the early years of the Iraq-Iran war, Iraq's greatest missile capability was the Soviet-made Scud-B, which was widely exported to many other countries throughout the world. Iraq's 300 kilometer-range Scud-B's were incapable of retaliating to the distance which was needed. Iraq then implemented a modified version of the Scud-B by lengthening the Scud's fuselage and lightening its warhead, it resulted in a missile with double the range, the al-Husayn. Iraq continued to modify their design, advancing to the al-Abbas missile with a range of 900 kilometers. There were also rumors of another missile in development, with a range of 3000 kilometers, giving rise to Iraq becoming a threat to countries outside the Middle Eastern area.

The United States became involved in the Iraq crisis when Saddam Hussein made the decision to invade Kuwait in 1990. Hussein's rejection of diplomatic efforts to end the crisis provoked military action. Most of the missiles used during the Gulf War were of the al-Husayn design. Modified versions of this missile were not used because of the lack of testing involved with them. The cease-fire in Iraq began on February 28, 1991, leading to the initiation of the United Nations involvement. At this point the United Nations Security Council established the U.N. Special Commission (UNSCOM) to eliminate and verify the destruction of Iraq's biological, chemical, and ballistic missile programs.

It became clear during the Gulf War that Iraq's proliferation of arms allowed them

to become a global threat. It was UNSCOM's responsibility to destroy or at least weaken Iraq's arsenal of weapons through their inspections and monitoring regime. There were many instances in which Iraq hindered the inspection process by concealing information and items, restricting the inspectors' access to facilities and providing misleading information.

Despite Iraq's obstruction of the inspections, the documents released by the United Nations Security Council still provided a substantial amount of data on Iraq's missile production capacity. The Commission was able to disclose many projects that were being worked on concurrently by Iraqi scientists. Iraq had branched out its technology into many programs of advanced missile technology. All of these covert projects were aimed at improving their level of indigenous missile production, which in turn would then make Iraq less dependent on other countries for importation of specific missile components.

The information in the UNSCOM documents about these projects is definitely not full and complete, but just knowing that they were working on them is helpful in determining their outright missile technology. In 1995, documentation on a project was discovered on a farm owned by General Hussein Kamel Hassan. These documents included information about the development of the al-Husayn and al-Abbas missile systems. The Commission also found information on a new long-range missile produced by a modification of their existing missiles. With the power of longer ranged missiles in their possession, Iraq would become an extreme threat to countries worldwide. Long range missiles also prove to be useful as a delivery system for nuclear warheads, thus, giving Iraq considerable status as an extreme nuclear power.

Every aspect of Iraq's post war research on missile production found by the Commission was focused on enhancing their indigenous missile technology. It was already determined that Iraq had the ability to indigenously produce every component of the Scud missile except for the guidance and control systems. They had also been

working on the multi-staging of missiles, creating missile systems with a greater delivery range. The success of these projects would have made Iraq less dependent on other countries for their missile production. The country(s) that Iraq was supposedly importing their components from was not disclosed in the UNSCOM documents.

The UN Security Council organized the Special Commission inspections thinking that it was an operation, which would last a couple of weeks. Without the full cooperation from Iraq, the inspections were extended over a period of seven years. Along with the extension of the monitoring operations was the extension of the sanctions on all of Iraq's imports and exports. During the inspection period, Iraq's declarations were never found to be complete. Although the information contained in the UNSCOM reports is not complete in summarizing the extent of Iraq's ballistic missile program and account of weapons of mass destruction, it is an operation that definitely slowed down their proliferation of arms.

III. Methodology

When the U.N. Security Council authorized inspections of Iraq's missile, chemical, biological, and nuclear weapons facilities after the Gulf War, Saddam Hussein set up a concealment mechanism meant to preserve his weapons capabilities. It was this concealment program that UNSCOM tried for seven years to break down. The purpose of this project is to research and summarize any new or previously overlooked information on Iraq's missile program not contained in United Nations documents. As a basis for discussion I will be using the Interactive Qualifying Project completed by Keith Leveille, Technology in the Wrong Hands: An Iraqi Missile Case Study. In this project, Iraq's missile capabilities were summarized from information that was obtained from reports and press releases by the United Nations Special Commission.

The research materials for this project were mainly found through a database search performed by using LEXIS-NEXIS Academic Universe. Through this database I was able to search for documents that specifically focused on Iraq's missile program. I chose to search for articles, which appeared in newspapers, magazines, and journals internationally.

Other materials for this project were found by searching for books or articles which were written by former UNSCOM members who participated in the inspections in Iraq. UNSCOM members were withdrawn from Iraq in December of 1998, so information published by these former members would prove to be very crucial to this project.

From information gathered from other sources I was able to obtain a list of former UNSCOM members who participated in the inspections. From this list, I researched each name for as much information as I could find on the person. Next, I contacted the people by the means of a formal email:

I am a student at Worcester Polytechnic Institute and am in the process of completing my undergraduate thesis on the Iraqi missile program. I have read the UNSCOM documents and am now focusing on material about their missile program published in the last year. Based upon my readings, I have developed a number of questions.

Considering your involvement in this topic, I was wondering if you would be willing to give up some of your time to answer some questions about Iraq's missile program. I would really appreciate any information that you may be able to contribute to this project.

I received your email address from David Wright at the Union of Concerned Scientists and MIT. The first part of my project was completed in congruence with David and Lisbeth Gronlund at UCS.

I was able to complete an interview with one former inspector involved with UNSCOM and the inspections in Iraq. Tim McCarthy is a researcher at the Center for Nuclear Studies at the Monterey Institute of International Studies. He was involved with UNSCOM for six years. The interview was conducted over the phone using Worcester Polytechnic Institute's Project Resource Center. The following questions were asked in the standardized interview:

(Set up a basis for discussion)

1. From your personal experience and involvement with the inspections, do you think UNSCOM was successful in uncovering a majority of Iraq's missile

program?

2. How much of what you learned were you able to publish in UNSCOM documents?

3. In terms of unpublished information, does it remain classified or is it something that you are allowed to share with the public?

(Iraq as a global threat)

4. At this present time, how much of a threat is Iraq to their neighboring countries, despite their supposed disarmament? To the United States?

5. Assuming that they are active in the pursuit of missile programs, how quickly do you think they are moving ahead with their research?

(Prevention by means of a new monitoring program)

6. What is the most effective measure the US or the United Nations could take to hinder Iraq's ballistic missile program?

7. What changes would you personally like to see in the new monitoring commission as compared to the techniques used in UNSCOM's inspections?

8. Do you think this new monitoring commission is going to receive full cooperation from Iraq?

(Other publications by former members)

9. Scott Ritter, a former colleague of yours, has written a book, *Endgame; Solving the Iraq Problem Once and for All*, what's your opinion of his critique of the

United States' policy towards Iraq?

10. Do you know of any former UNSCOM members who have published information in the last year?

Information obtained from this interview along with that found in other research materials will be used to draw conclusions about Iraq's present missile technology. By answering four substantial questions, it will help me to access this data properly. How much of a global threat is Iraq to other countries? How long will it take for Iraq to acquire the capability to become a major threat to the United States? How crucial is the role of other countries in Iraq's ballistic missile program? How successful will a new ongoing monitoring and verification program in Iraq be?

IV. Results

IV.-A Iraq's Present Threat

Under the control of Saddam Hussein, Iraq is a dangerous regime with a history of aggression towards its neighbors and strong ambitions to dominate the Middle East. Although not as big a threat as before Desert Storm, Iraq is still able to do substantial damage regionally, but not on a scale of mass destruction. After the Gulf War, the United Nations established UNSCOM, a commission established to eliminate and verify the destruction of Iraq's biological, chemical, and ballistic missile programs. Pursuant to Resolution 687 (1991), the Security Council required Iraq to accept and assure the destruction of all ballistic missiles with a range greater than 150 kilometers. Shortly after the adoption of UNSCOM and Resolution 687, Iraq continued missile-related activities, which were not prohibited. With a number of facilities and a significant number of qualified scientists, engineers, and technicians, Iraq's ability to develop missile systems with a range of up to 150 kilometers was off to a great start. To this day, missile-related projects are continued which have led to the production of the Ababil-50 and Ababil-100 with ranges of 50 kilometers and 150 kilometers respectively. Therefore with the power to still produce missiles with a range less than 150 kilometers, Iraq still poses a modest threat, regionally, to its neighboring countries. (10)

Iraq's regional threat capabilities are hampered by their lack of indigenous missile production technology. Having the ability to truly indigenously produce missiles is extremely rare, especially in the poorer nations. Technology is sold from country to country, as is the case with the Soviet-designed Scud-B missile, which has shown the greatest global spread. Before the Gulf War, the backbone of Iraq's ballistic missile force

was a variant of the Scud-B, the al-Husayn missile with a range of 600-650 kilometers. Iraq sought to indigenously manufacture the complete missile system of the al-Husayn, consisting of missiles, warheads, launchers, guidance and control instruments and liquid propellants. (6) At the time of the Gulf War, Iraq was able to produce most of the al-Husayn's components locally, including the warheads, airframes, and motors. Iraq was not able to successfully produce the guidance system for the missiles, which led them to import the components from other countries. It was also believed that Iraq was working on medium to intermediate range missiles, which failed to make it beyond the initial development stages. (1)

It is assumed that Iraq retains a small force of operational missiles, most likely just locally produced versions of the al-Husayn. As a means to access Iraq's missile capabilities, in late 1995, UNSCOM requested an inventory of all proscribed missiles that Iraq had destroyed unilaterally. In addition to some 85 imported missiles said to have been destroyed, there was a reference to seven nearly-indigenously produced missiles. Although Iraq declared that these seven missiles were destroyed, the Commission wasn't able to locate remnants of the missiles or engine parts at any of the destruction sites, and thus have any proof that they no longer exist. The declared destruction of these missiles has yet to be verified. Therefore, Iraq still possesses these missiles that are almost definitely still operational. (12)

As of UNSCOM's termination in 1998, Iraq's success in the indigenous production of missiles was still far from achieved. Iraq's missile production depends greatly on components, materials and equipment that it procures through foreign countries. Iraq has been subjected to United Nations sanctions on all imports and exports since 1990, which makes their missile capabilities that much more difficult. Without the ability to legally import all missile components, which they can't produce indigenously, Iraq has had to try to build a missile from the ground up. (11) With United Nations sanctions and UNSCOM inspections, their missile procurement has been significantly

hindered. (12)

Another substantial drawback is that Iraq does not have the facilities and equipment needed to produce missiles on a small scale, never mind a larger one because of the destruction that occurred. (11) At the start of UNSCOM's regime in Iraq, most of the missile production facilities had sustained significant damage during the Gulf War; leaving some of them practically destroyed. The Security Council required the destruction or rendering harmless of all remaining missile production facilities in Iraq, which was achieved in one of two ways. In most cases, UNSCOM witnessed the destruction of equipment of the facilities, but the physical infrastructure of the buildings was left intact. In the other cases, the infrastructure was damaged only because it related specifically to proscribed activities. Those facilities left undamaged were then put under the Commission's monitoring. The attacks administered during Desert Fox also led to serious destruction of the infrastructure of some of the facilities in which they were conducting prohibited research and development for their missile program. Needless to say, since UNSCOM's termination, Iraq is working to rebuild their facilities and equipment, but because of the great devastation involved, it will not occur overnight. (12)

During UNSCOM's inspection regime, it was discovered that Iraq was working on long-range missile research and development under the disguise of their short-range missile programs. Despite this fact, Iraq does not pose an immediate threat globally because they don't have the technology to produce ICBM's (Inter-continental ballistic missiles), which have a range of over 5,500 kilometers. Prior to the Gulf War, Iraq wasn't focused on developing ICBM's, but instead on becoming a superpower in the Middle East. (11)

Iraq is unique because it is the only country in which U.N. sanctions and comprehensive monitoring and inspections prohibit development of their long-range ballistic missiles. With the monitoring regime no longer active, there isn't any doubt in experts' minds that Iraq has been working on reconstituting their long-range ballistic

missile programs. It is difficult to determine a time frame for Iraq to actually produce a long-range missile because we do not know exactly how far along Iraq was able to get while monitoring was still going on. There is a substantial amount of information that is unaccounted for in the UNSCOM documents. (10)

IV.-B Iraq's Future Threat

Could a small third world country develop the capability to hit the United States with a long-range unconventional weapon during the first decades of this century? This is the main issue that is perplexing our military defense right now. It is said that we are entering a "new non-proliferation environment" in which there is a far greater availability to produce or acquire ballistic missiles and weapons of mass destruction. (9) In this new environment, it is believed that Iraq has the capacity to acquire ballistic missile powers, through a combination of indigenous development and foreign assistance, and use these components to strike the United States within a period of ten years.

Iraq is a unique case among countries posing a ballistic missile threat to the United States. It is the only country in which long-range missile production is prohibited by United Nations sanctions and monitored by subsequent inspections by a special commission, UNSCOM. Without monitoring going on Iraq could pose a serious threat in the future both regionally and globally because they can seriously focus on continuing their indigenous production of missiles. Although the Gulf War and the United Nations activities that followed destroyed most of Iraq's ballistic missile programs, it is said that Iraq could test an ICBM, capable of reaching the United States, by the year 2015. (10) Reaching this point would then increase Iraq's capability to become a substantial nuclear threat also. A nuclear-armed Iraq would be extremely dangerous. Nuclear weapons would bring Saddam Hussein to a point of ensuring his own survival and increasing his

regional and international power.

It has been very difficult to assess the future of Iraq's ballistic missile program because of the deception and denial efforts involved on their part. The likelihood that Iraq has continued its missile development and research while under monitoring is evident, as stated in the above section. UNSCOM's inspections and monitoring did not completely restrain Iraq from conducting long-range missile research covertly. Iraq has conducted computer design studies of missiles with proscribed ranges since the Gulf War, including missiles with ranges of several thousand kilometers capable of reaching the United States. They have continued to attempt to import components for missiles that they can't produce indigenously, such as gyroscopes. In December 1995, UNSCOM caught Iraq "red-handed" attempting to import banned components. As a means to avoid detection, Iraq had dumped imported gyroscopes, which could only be used for long-range missile production, in the Tigris River. (2)

Iraq has demonstrated many times that it will make great sacrifices to preserve its basic resources for its weapons program. With the extensive amount of facilities and equipment that have been destroyed over the years, Iraq's most valuable asset towards rebuilding their missile program is the brainpower that they still possess. Iraqi scientists are virtual prisoners in their own country. They have limits on what they can do or say imposed on them by the Iraqi government. They live in fear of being punished for speaking of their research. Even if they succeed in getting away, their families are held hostage as a means to keep them quiet. Needless to say, the Iraqi regime has complete control over them. Therefore, there is no doubt that these Iraqi scientists have been continuously conducting theoretical design work and small-scale research and development since the end of the Gulf War. These scientists and technicians have the ability to advise on both long-term improvements and quick fixes. It can be expected that they have created more focused and productive missile production programs ready to be launched once the opportunity rises. This is one aspect that the UNSCOM inspection

process really didn't focus on destroying. (3)

Iraq has also been known to acquire information and personnel from other western countries, such as the former Soviet Union, to use towards the advancement of their own ballistic missile technology. These other countries, some of which are tied to various other non-proliferation agreements, either have acquired long-range ballistic missile capabilities or are working hard to do so. If Iraq could acquire the cooperation needed, it could be under the guidance of such countries as North Korea, Iran, India and Pakistan, which all have access to an extensive amount of technology and information. (9) North Korea itself is one of the chief exporters of missiles and manufacturing technology to other countries. If Iraq were to obtain a three-stage Taepo Dong-2 missile from North Korea, it could have the possibility of delivering a several-hundred kilogram payload to parts of the United States within months of the purchase. It is then estimated that it would probably take them until the end of this decade to develop the capability to produce the system indigenously. (10)

It is speculated that Iraq could become a global threat within 6-10 years, from information acquired by the Special Commission and their past experience with missile related projects prior to the Gulf War. The first step in this process would be for Iraq to rebuild and replace their equipment and facilities that were destroyed, which would take 2-3 years considering the extent of the damage from Desert Storm, Desert Fox, and UNSCOM. The next essential step would be to complete their research and development on their missile related programs. The time frame for this phase of their procurement effort is anywhere from 3-6 years, depending directly on how far along they are presently in their research. Next, they would have to launch test flights as a means to determine trouble areas and focus on problems with the design. This process would only take one to two years at most. The final step of their complete indigenous missile production system would be to obtain the facilities and equipment to be able to mass-produce these missiles. Essentially without monitoring and sanctions imposed on Iraq, the time in which this

process could be accomplished would be substantially reduced. (5) "The technology is out there, the clever engineers are out there, and the nations willing to pay the price are out there--as a result, so are the missiles." (6)

IV.-C Precautions and Monitoring

"It has been said that UNSCOM destroyed more of Iraq's weapons of mass destruction than the entire aerial bombing campaign of Desert Storm."(7) United Nations established UNSCOM as a means to monitor and disarm Iraq of all weapons of mass destruction. With full cooperation from Iraq, the act of disarmament was initially expected to be a short and relatively simple process. However, Iraq opposed the entire inspection process and attempted to disrupt and delay UNSCOM's work by any means possible. There were many situations in which Iraq hindered the inspection process by concealing information and components, restricting inspectors' access to facilities, providing misleading data, and provoking unnecessary diplomatic involvement. (8)

Despite Iraq's concealment efforts and repeated non-cooperation, United Nations monitoring remains one of the most effective, diplomatic approaches to the disarmament of Iraq. UNSCOM succeeded in destroying 38,000 chemical weapons, 690 tons of live CW agents, 48 operational missiles, 60 scud launch pads, and 30 special missile warheads. (4) Although the information that the U.N. Special Commission acquired through their monitoring is said to be incomplete, UNSCOM managed to disclose approximately 90% of Iraq's ballistic missile program. The major question is why would such an effective monitoring regime be terminated?

After an extended period of non-compliance with Iraq, on December 16, 1998, the United Nations completely withdrew its entire staff from Iraq. The United States and

Great Britain then launched a "serious and sustained" military attack against Iraq for failing to allow United Nations weapons inspectors to carry out their work properly. Operation Desert Fox took place from December 16th through the 19th. Although the attack brought forth a lot of controversy, it was a step that needed to be taken in order to insure that President Saddam Hussein's capability to threaten his neighbors with nuclear, chemical, and biological weapons was diminished. (6)

Since December of 1998, there hasn't been any further inspections performed by the United Nations Special Commission. Following UNSCOM's removal from Iraq, the President of the Security Council announced on January 30, 1999 that they had decided to establish three panels to provide the Council with recommendations and information on how to re-establish an "effective disarmament/ongoing monitoring and verification regime on Iraq." These panels were Disarmament and current and future ongoing and monitoring and verification issues, Humanitarian issues, and Prisoners of war and Kuwaiti property. (4)

On December 17, 1999, the Security Council adopted resolution 1284. This resolution reiterated the importance of Iraq's compliance with all previous resolutions established after the Persian Gulf War. It also states that the decision to lift all prohibitions set in resolution 687 (1991) can not be completed until Iraq cooperates fully and it is insured that all weapons of mass destruction have been destroyed. To be able to succeed further, the Security Council established the United Nations Monitoring, Verification, and Inspection Commission (UNMOVIC). This commission will take over all responsibilities and archives that were obtained by UNSCOM. (8)

The U.N. experience in Iraq offered a number of lessons for the future of non-proliferation monitoring and verification programs. Whether or not, the new monitoring commission will succeed, once again, depends greatly on Iraq's cooperation and assistance. Iraq finds it hard to accept or implement a new U.N. Security Council plan to restart disarmament activities in the country, because of the "corruption" that was

involved with UNSCOM. Deputy Foreign Minister Nizar Hamdoon did not rule out Iraq being able to cooperate with the United Nations and UNMOVIC if "the situation changes and there are new elements."

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