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III. INTELLIGENCE COMMUNITY ANALYSIS OF IRAQ'S NUCLEAR PROGRAM

A. Background

(U) Prior to the October 2002 National Intelligence Estimate (NIE) on *Iraq's Continuing Programs for Weapons of Mass Destruction*, the Intelligence Community (IC) prepared several Community papers on Iraq's weapons of mass destruction (WMD) programs, and, more specifically, Iraq's nuclear weapons program. In October 1998, the IC published a National Intelligence Council (NIC) Memorandum, *Current Iraqi WMD Capabilities*. In December 2000, the IC published an Intelligence Community Assessment (ICA), *Iraq: Steadily Pursuing WMD Capabilities* (ICA 2000-007HCX). The assessment was prepared at the request of the National Security Council (NSC) for a broad update on Iraqi efforts to rebuild WMD and delivery system programs in the absence of weapons inspectors, as well as a review of what remains of the WMD arsenal and outstanding disarmament issues that were the focus of the United Nations Special Commission (UNSCOM).

(U) On Iraq's nuclear program, the IC also produced a Joint Atomic Energy Intelligence Committee (JAEIC) report in October 1997, *Reconstitution of Iraq's Nuclear Weapons Program: An Update* (JAEIC 97-004) and a JAEIC report in June 1999, *Reconstitution of Iraq's Nuclear Weapons Program: Post Desert Fox* (JAEIC 99-003.)

(U) All of the assessments in these Community papers on Iraq's nuclear program were consistent in assessing that:

- The International Atomic Energy Agency (IAEA) and UNSCOM had destroyed portions of, and neutralized the remainder of Iraq's nuclear infrastructure but that Iraq retained the foundation for future nuclear reconstitution.
- Iraq continued low-level clandestine theoretical research and training of personnel, and was attempting to procure dual-use technologies and materials that could be used to reconstitute its nuclear program.
- If Iraq acquired a significant quantity of fissile material through foreign assistance, it could have a crude nuclear weapon within a year.

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- It would take five to seven years for Iraq – with foreign assistance – to produce enough weapons-grade fissile material for a nuclear weapon.
- Iraq did not appear to have reconstituted its nuclear weapons program.

(U) In December 2001, the IC produced an National Intelligence Estimate (NIE) on *Foreign Missile Developments and the Ballistic Missile Threat Through 2015*. In the Iraq section of the NIE, the IC noted, “Recent Iraqi procurements, however, suggest possible preparation for a renewed uranium enrichment program.” Possible preparations for a renewed uranium enrichment program represented a slight shift in the IC’s assessment, but the assessment remained consistent with previous IC position that “Iraq did not appear to have reconstituted its nuclear weapons program.” This judgment did not change until the 2002 NIE on *Iraq’s Continuing Programs for Weapons of Mass Destruction*, when, for the first time, the IC assessed that “Baghdad began reconstituting its nuclear program shortly after the departure of UNSCOM inspectors in December 1998.” Viewing this as a possibly significant shift, Senate Select Committee on Intelligence staff focused their work on the analysis of Iraq’s nuclear program in the 2002 NIE and the analysis from individual agencies leading up to that judgment in the period following the 2000 ICA.

B. Nuclear Reconstitution

(U) The assessment that Iraq began reconstituting its nuclear program shortly after inspectors left in 1998 was based on the longstanding IC view that, in the 1990s, because of sanctions and United Nations (UN) inspections, Saddam Hussein had reorganized his nuclear program to recommence work once sanctions were lifted. After inspectors left Iraq, intelligence analysts became concerned that Iraq might use the opportunity to restart its nuclear program. In the 2002 NIE, the IC judged that Saddam Hussein had most likely shifted his strategy from waiting for sanctions to end to waiting for inspections to end. IC analysts told Committee staff the assessment was an analytical judgment based on Hussein’s clearly established desire to acquire nuclear weapons and the fact that Hussein probably realized that sanctions were not going to be lifted soon. The IC did not have direct intelligence reporting to show that Saddam Hussein had decided to shift his strategy from waiting for sanctions to end to waiting for inspections to end.

(U) At the time of the 2002 NIE, the IC continued to hold its longstanding view that once reconstitution had begun, it would take five to seven years, with foreign assistance, for Iraq to produce enough weapons-grade fissile material for a nuclear weapon. Although the NIE said that

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reconstitution had begun shortly after inspectors departed Iraq in 1998, the NIE concluded that Iraq probably would not be able to make a weapon until 2007 to 2009, nine to eleven years after the IC assessed that reconstitution had begun. The National Intelligence Officer (NIO) for Strategic and Nuclear Programs told Committee staff that although most IC analysts believed that Iraq had started reconstitution “efforts” in 1999 by starting to put the nuclear program back together, they did not assess that full reconstitution, in which the “five to seven year clock” would start running, had occurred at that point. He said the IC assessed that, “The five to seven year clock started in 2002 – in other words, the time of the Estimate.”

(U) The reasons the IC believed that Iraq was reconstituting its nuclear program were described in the key judgments, and in more detail in the body of the NIE. The key judgments said:

- Most agencies believe that Saddam’s personal interest in and Iraq’s aggressive attempts to obtain high-strength aluminum tubes for centrifuge rotors – as well as Iraq’s attempts to acquire magnets, high-speed balancing machines, and machine tools – provide compelling evidence that Saddam is reconstituting a uranium enrichment effort for Baghdad’s nuclear weapons program. (The Department of Energy [DOE] agrees that reconstitution of the nuclear program is underway but assesses that the tubes probably are not part of the program.)
- Iraq’s efforts to re-establish and enhance its cadre of weapons personnel as well as activities at several suspect nuclear sites further indicate that reconstitution is underway.

(U) Although the DOE’s Office of Intelligence and the Department of State’s Bureau of Intelligence and Research (INR) both assessed that the aluminum tubes Iraq was seeking were probably not intended for a nuclear program, only INR disagreed with the assessment that Iraq had begun reconstituting its nuclear program. In addition to a text box explaining INR’s alternative view in the body of the NIE, INR also published a text box in the key judgments explaining its analysis on reconstitution:

The Assistant Secretary of State for Intelligence and Research (INR) believes that Saddam continues to want nuclear weapons and that available evidence indicates that Baghdad is pursuing at least a limited effort to maintain and acquire nuclear weapons-related capabilities. The activities we have detected do not, however, add up to a compelling case that Iraq is currently pursuing what INR would consider to be an integrated and comprehensive approach to acquire nuclear

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weapons. Iraq may be doing so, but INR considers the available evidence inadequate to support such a judgment. Lacking persuasive evidence that Baghdad had launched a coherent effort to reconstitute its nuclear program, INR is unwilling to speculate that such an effort began soon after the departure of UN inspectors or to project a timeline for the completion of activities it does not now see happening. As a result, INR is unable to predict when Iraq could acquire a nuclear device or weapon.

(U) Committee staff interviewed analysts from every all-source intelligence agency involved in the nuclear section of the NIE including the Central Intelligence Agency (CIA), the Defense Intelligence Agency (DIA), the National Ground Intelligence Center (NGIC), the DOE, and INR to hear each agency's argument on nuclear reconstitution and the aluminum tubes. Committee staff also interviewed experts at the International Atomic Energy Agency (IAEA) to learn about their work to investigate Iraq's nuclear program.

(U) The following sections recount the Committee's examination of the intelligence supporting the six reasons the IC assessed Iraq was reconstituting its nuclear program as outlined in the NIE: Iraq's procurement of 1) aluminum tubes, 2) magnets, 3) high-speed balancing machines, and 4) machine tools, and Iraq's 5) efforts to re-establish and enhance its cadre of weapons personnel, and 6) activity at several suspect nuclear sites. The report focuses first on the intense debate in the IC about the intended use of aluminum tubes Iraq was attempting to procure in late 2000 to 2002 and then addresses the other reasons outlined in the NIE that contributed to the assessment that Iraq was reconstituting its nuclear program. The Committee's examination of the intelligence did not stop with the NIE, however. Information that became available to the IC through IAEA inspections prior to Operation Iraqi Freedom is included because analysts could have updated or altered their assessments based on that information if they believed the information warranted a change.

1. Aluminum Tubes

Most agencies assess that Iraq's aggressive pursuit of high-strength aluminum tubes provides compelling evidence that Saddam is attempting to reconstitute a uranium enrichment effort for Baghdad's nuclear weapons program. (DOE agrees that reconstitution of the nuclear program is underway but assesses that the tubes probably are not part of the program.) (October 2002 NIE)

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(U) In 2001, the IC became aware that Iraq was attempting to procure 60,000 high-strength aluminum tubes manufactured from 7075-T6 aluminum, with an outer diameter of 81 mm, and inner diameter of 74.4 mm, a wall thickness of 3.3 mm and a length of 900 mm. The tubes were to be anodized using chromic acid and were to be shipped, wrapped in wax paper and separated from each other. Seven-thousand series aluminum alloy is extremely hard and strong and when formed into a tube of more than 75 mm in diameter, is a controlled item under the Nuclear Suppliers Group and Annex III of UNSCR 687 and 707 which Iraq is prohibited from importing because it could have nuclear applications.

([REDACTED]) Soon after receiving the initial intelligence report, the CIA assessed that the tubes were probably intended for an Iraqi uranium enrichment centrifuge program.¹⁰ Although coordinated with other WINPAC analysts, the CIA's initial analysis was based largely on the work of a centrifuge analyst in the Director of Central Intelligence's (DCI) Center for Weapons Intelligence, Nonproliferation and Arms Control (WINPAC). This analyst had [REDACTED]

[REDACTED]. The CIA published its first assessment on the aluminum tubes on April 10, 2001¹¹, noting that they "have little use other than for a uranium enrichment program." (Senior Executive Intelligence Brief [SEIB] 01-083CHX) The assessment did not provide any details outlining why the CIA assessed that the tubes were probably intended for a centrifuge program, but noted, "using aluminum tubes in a centrifuge effort would be inefficient and a step backward from the specialty steel machines Iraq was poised to mass-produce at the onset of the Gulf War. Iraq successfully used outdated enrichment technologies, such as its electromagnetic isotope separation effort, before the war."

(U) One day after the CIA published its assessment, the DOE published their own analysis of the aluminum tube procurement. The DOE paper provided a more detailed analysis of the aluminum tubes and their applicability to a uranium centrifuge enrichment program. The assessment said:

¹⁰ Centrifuge rotors are typically thin walled tubes which spin at very high speeds and cause uranium gas to enrich into the isotope – U235 (enriched uranium). The high rate of spin required for a centrifuge requires that the tube be composed of a high-strength material, such as 7075-T6 aluminum.

¹¹ The CIA has told Committee staff that the first assessment they published was actually a PDB published on [REDACTED]. The Committee cannot verify the date or describe the content of this document because the CIA has not provided it to the Committee.

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Based on the reported specifications, the tubes could be used to manufacture gas centrifuge rotor cylinders for uranium enrichment. However, our analysis indicates that the specified tube diameter, which is half that of the centrifuge machine Iraq successfully tested in 1990, is only marginally large enough for practical centrifuge applications, and other specifications are not consistent with a gas centrifuge end use. Moreover, the quantity being sought suggests preparations for large-scale production of centrifuge machines, for which we have not seen related procurement efforts – and the tubes’ specifications suggest a centrifuge design quite different from any Iraq is known to have. Thus, we assess that this procurement activity more likely supports a different application. Regardless of end use, the delivery of aluminum tubes with the reported specifications to Iraq would be prohibited under Annex III of UNSCR 687 and 707.

(U) DOE’s assessment concluded that:

While the gas centrifuge application cannot be ruled out, we assess that the procurement activity more likely supports a different application, such as conventional ordnance production. For example, the tube specifications and quantity appear to be generally consistent with their use as launch tubes for man-held anti-armor rockets or as tactical rocket casings. Also, the manner in which the procurement is being handled (multiple procurement agents, quotes obtained from multiple suppliers in diverse locations, and price haggling) seems to better match our expectations for a conventional Iraqi military buy than a major purchase for a clandestine weapons-of-mass destruction program. However, we have not identified an Iraq-specific, military, or other noncentrifuge application that precisely matches the tube specifications. (Daily Intelligence Highlight, *Iraq: High-Strength Aluminum Tube Procurement*)

([REDACTED]) By the next month, the DOE had done further research on the tubes and had identified a noncentrifuge end use that did match the tube specifications. On May 9, 2001, DOE published another Daily Intelligence Highlight, [REDACTED] /*Iraq: Aluminum Alloy Tube Purchase*, which said, “The Intelligence Community’s original analysis of these tubes focused on their possible use in developing gas centrifuges for the enrichment of uranium. Further investigation reveals, however, Iraq has purchased similar aluminum tubes previously to manufacture chambers (tubes) for a multiple rocket launcher.” The assessment noted that the IAEA had learned that tubes found at the Nasser metal fabrication facility in Baghdad that were 800 mm in length, 81 mm in diameter and had a wall thickness of 3.3 mm, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The DOE assessment noted that Nasser officials said the tubes were used for manufacturing the chambers of 81-mm rockets and that the high-strength tubes had previously been purchased in large quantities. Iraq had 160,000 tubes on hand in 1989 and 66,737 in 1996.

([REDACTED]) On June 14, 2001, the CIA produced a Senior Publish When Ready (SPWR) which said that China [REDACTED]. The assessment noted that the tubes are, “controlled items under the Nuclear Suppliers Group and Chinese export laws, are suitable for uranium enrichment gas centrifuge rotors and, while less likely, could be used as rocket bodies for multiple rocket launchers.” This CIA assessment also did not provide any further details outlining why the CIA assessed the tubes were more likely to be used for centrifuge rotors.

([REDACTED]) Although China [REDACTED], a shipment of about 2,000 tubes had already been sent [REDACTED]. In [REDACTED] June, 2001, the tubes arrived [REDACTED] authorities, [REDACTED], seized the tubes. [REDACTED] several sample tubes [REDACTED]. A [REDACTED] intelligence assessment disseminated on July 2, 2001 said [REDACTED] personnel had inspected the tubes [REDACTED] and said, “The tubes are constructed from high-strength aluminum (7075-T6) and are manufactured to the tight tolerances necessary for gas centrifuges. The dimensions of the tubes match those of a publicly available gas centrifuge design from the 1950s, known as the Zippe centrifuge.”¹² The assessment concluded that “the specifications for the tubes far exceed any known conventional weapons application, including rocket motor casings for 81-mm multiple rocket launchers.”

([REDACTED]) From July 2001 to July 2002, the CIA produced at least nine additional intelligence [REDACTED] discussing Iraq’s aluminum tube procurement efforts. None of these assessments provided any additional information to support the CIA’s analysis that the tubes were probably intended for Iraq’s nuclear program, other than what was stated in the July 2001 assessment; the tubes matched the 1950s Zippe centrifuge design and the tubes’ specifications far exceeded those for any known conventional weapons application. Most of the assessments were

¹² The dimensions of the tubes seized [REDACTED] do not “match” the dimensions of any of Zippe’s centrifuge designs. The inner diameter of the tubes was close to the dimension of the diameter in a Zippe design, but the wall thickness of the tubes is more than three times the wall thickness of any of Zippe’s designs. The tubes seized [REDACTED] were also more than twice as long as the tubes used in Zippe’s centrifuge designs. (See page 109).

[REDACTED]

disseminated in limited channels, only to high-level policymakers and were not available to intelligence analysts from other agencies. In a written response to a question from the Committee, the CIA said these products were limited in their distribution because they were intended for the President, drafted in response to specific policymaker questions, or were very narrow in scope.

([REDACTED]) On August 2, 2001, the DIA produced an internal background paper outlining the brewing debate within the IC about the intended and likely end use for the aluminum tubes. The paper briefly discussed the assessments from both the CIA and the DOE on the intended purpose of the tubes and noted that “DIA analysts found the CIA WINPAC presentation to be very compelling.” The paper pointed to WINPAC research which indicated that “The tubes have specifications very similar to the gas centrifuge rotor described in the German scientist, Gernot Zippe’s publications: the material was 7075-T6 aluminum with an outer diameter of 74.2-81.9-mm, an inner diameter of 68.6-76.3-mm, a wall thickness of 2.8-mm,¹³ a length of 279.4-381-mm and a tolerance of 0.1-mm.”

([REDACTED]) On August 17, 2001, DOE published a Technical Intelligence Note (TIN), *Iraq’s Gas Centrifuge Program: Is Reconstitution Underway?* (TIN000064) which contained an extensive eight page analysis of whether the aluminum tubes were intended for a rocket or a centrifuge program. The assessment [REDACTED] noted that the Iraqis had declared to the IAEA that the Nasser State Establishment obtained and used large numbers of high-strength aluminum tubes to manufacture 81-mm rockets dating back to at least 1989. The tubes were declared to be made of 7075-T6 aluminum with an 81 mm outer diameter, 74.4 mm inner diameter, and 900 mm length – the same specifications of the tubes Iraq was trying to acquire in 2001. The assessment also noted that the IAEA [REDACTED] found large numbers of the tubes stored in various locations around the site. As mentioned in an earlier DOE assessment, the IAEA [REDACTED]

[REDACTED] Iraq did, in fact, have an 81 mm-rocket in its arsenal that was produced at the Nasser State Establishment.

(U) Regarding the tubes’ utility in a gas centrifuge program, the DOE assessed that the tubes could have been used to manufacture centrifuge rotors, but were not well suited for that

¹³ The wall thickness of all of Zippe’s centrifuge designs were less than 1 mm, not 2.8 mm as suggested by the CIA’s presentation and restated in DIA’s intelligence assessment. (See page 109).

[REDACTED]

[REDACTED]

purpose. The DOE assessed that 7075-T6 aluminum “provides performance roughly half that of the materials Iraq previously pursued.” Prior to the Gulf War, Iraq had pursued rotors made from maraging steel and carbon fiber composites, which both offer better uranium separative capacity. If Iraq were to pursue a rotor of 7075-T6 aluminum instead, it would need twice as many rotors, as well as twice as many other centrifuge components, such as end caps, bearings, and outer casings.

([REDACTED]) According to the DOE assessment, the tube diameter was smaller than that of any known deployed centrifuge machine and was about half the diameter of Iraq’s pre-Gulf War prototype machine. DOE noted that a small diameter would have presented “various design and operational problems that veteran engineers of Iraq’s prior program should readily understand.” In addition, “the tubes are too thick for favorable use as rotor tubes, exceeding the nominal 1-mm thickness of known aluminum rotor tubes by more than a factor of three Additionally, various tolerances specified in contract documents . . . are looser than the expected precision call-outs for an aluminum rotor tube by factors of two to five.” The DOE also noted that the anodized surface, requested by Iraq in its tube procurements, “. . . is not consistent with a gas centrifuge application. [REDACTED]

[REDACTED]

[REDACTED]

(U) According to the DOE’s assessment, “A centrifuge machine using 81-mm aluminum rotors is different from any known centrifuge machine deployed in a production environment. . . . In our judgment, Iraq would need to undertake its development program all over again and address each aspect of centrifuge engineering anew at the reduced diameter and using the different rotor material.” DOE concluded that “. . . a gas centrifuge application is credible but unlikely and a rocket production application is the more likely end-use for these tubes.”

([REDACTED]) In November 2001, the DIA published a Military Intelligence Digest (MID) supplement [REDACTED], *Iraq: Procuring Possible Nuclear-Related Gas Centrifuge Equipment*. The MID was prepared by a DIA Iraq nuclear analyst and an analyst from the NGIC, the IC agency responsible for conventional ground weapons systems assessments. The MID assessed that “Although alternative uses for the tubes are possible, such as rocket motor cases or rocket launch tubes, the specifications are consistent with earlier Iraqi gas centrifuge rotor designs.” In a box titled “Conventional Military Uses Unlikely for Aluminum Tubes” the paper said, “Although 7075-T6 aluminum could be an acceptable metal for small rocket motor bodies, the 3.3-mm wall thickness and overall weight would make these particular tubes poor choices for

[REDACTED]

rocket motor bodies. The thickness is roughly twice that of known small rocket motor bodies,¹⁴ and . . . the 0.1-mm metal thickness tolerance along the 900-mm length is excessive for both rocket motor bodies and rocket launch tubes.”

(U) On August 1, 2002, the CIA published its first detailed paper explaining its assessment that the aluminum tubes were destined for Iraq’s nuclear program. An intelligence assessment, *Iraq: Expanding WMD Capabilities Pose Growing Threat*, provided a one page outline of the CIA’s assessment that the tubes’ materials, exceedingly stringent tolerances, high cost, and the secrecy surrounding procurement attempts, indicated that the tubes were destined for Iraq’s gas centrifuge program.

(U) In September 2002, DIA published an assessment of *Iraq’s Reemerging Nuclear Weapons Program*, which included an assessment of the tubes potential use in an Iraqi gas centrifuge enrichment program. The assessment noted that “Alternative uses for the tubes, such as rocket motor cases or launch tubes, are possible. However, this is less likely because the specifications are consistent with late-1980s Iraqi gas centrifuge rotor designs.”

(U) In September 2002, the CIA published an even more extensive analysis of the tubes in a second intelligence assessment, *Iraq’s Hunt for Aluminum Tubes: Evidence of a Renewed Uranium Enrichment Program*. This assessment also discussed Iraqi efforts to hide the tube procurement attempts, the materials, high cost, tight tolerances, dimensions and the anodized coating of the tubes, and CIA’s assessment that the tubes “matched” known centrifuge rotor dimensions. The assessment also included a box outlining NGIC’s analysis that the tubes were unlikely to be intended for a conventional rocket program. The CIA’s analysis in these papers will be discussed in more detail below because, according to NIC and CIA officials, this assessment was used as the basis for the draft text of the majority position of the aluminum tube section of the October 2002 NIE on *Iraq’s Continuing Programs for Weapons of Mass Destruction*.

([REDACTED]) Contributing to the CIA’s analysis for the extensive September intelligence assessment was an analysis performed by an individual from [REDACTED] who were working under contract with the CIA at the time to provide broad-based technical advice [REDACTED]

¹⁴ The thickness is consistent with tubes declared by Iraq for use in a rocket program in 1996 and is consistent with an Italian rocket design the Iraqis were attempting to re-engineer. Both are manufactured from 7075-T6 aluminum.

[REDACTED]

[REDACTED]

[REDACTED]. The CIA WINPAC analyst, [REDACTED], requested in September 2002 that they perform an analysis of the tubes. [REDACTED]

[REDACTED]

([REDACTED]) The contractors told Committee staff that the CIA provided them with a stack of intelligence data and analysis on the Iraqi aluminum tube procurements on September 16, 2002. All of the information was provided by the CIA and the contractors told Committee staff that they did not discuss the data with any agencies other than the CIA. They were provided with NGIC's analysis of the tubes, but said they were not briefed by nor did they ask to speak to NGIC or DOE analysts. One contractor said, "This was internal to the agency." One of the contractors said before joining [REDACTED] he had been given a tutorial on 81-mm rockets by a DOE analyst, but said that the conversation was "pretty meaningless to me because the rest of the issue had not bubbled up at that point." A DOE analyst told Committee staff that he also discussed the issue with the contractor in May of 2001. The contractor produced a paper on September 17, 2002, one day after receiving the information, that said the team concluded, "that the tubes are consistent with design requirements of gas centrifuge rotors, but due to the high-strength material and excessively tight tolerances, the tubes seem inconsistent with design requirements of rocket motor casings." The report referenced NGIC's analysis that the material and quantity of the tubes were inconsistent with rocket motor applications. The report said that while the dimensions "possibly" were suitable for rockets, the tolerances were too stringent and the pressure test requirements were too high.

([REDACTED]) A September 13, 2002 *New York Times* article which discussed the IC debate about the aluminum tubes, noted that an administration official said, ". . . the best technical experts and nuclear scientists at laboratories like Oak Ridge supported the CIA assessments." The [REDACTED] contractors told Committee staff, however, that before September 16, 2002, they had not seen any of the intelligence data on the Iraqi tubes. DOE officials, including the Director of the Oak Ridge Field Intelligence Element, told Committee staff that the vast majority of scientists and nuclear experts at the DOE and the National Labs did not agree with the CIA's analysis.

(U) Although the IC had been debating this issue for almost a year and a half, the DCI testified at a Committee hearing that he was unaware of the debate until mid-September of 2002.

[REDACTED]

[REDACTED]

a. *The National Intelligence Estimate*

(U) In September 2002, Members of the Senate Select Committee on Intelligence (SSCI) requested that the IC produce an NIE on Iraq's WMD programs. Because of the time constraints required to finish the estimate, the NIO for Strategic and Nuclear Programs used existing Community papers to build the text for the various sections. The National Intelligence Council staff drew the portion of the nuclear section on nuclear reconstitution largely from an August 2002 CIA assessment and a September 2002 DIA assessment, *Iraq's Reemerging Nuclear Weapons Programs*. The majority analysis of the aluminum tubes in the NIE was drawn from the CIA's September intelligence assessment, *Iraq's Hunt for Aluminum Tubes: Evidence of a Renewed Uranium Enrichment Program*.

(U) In late September 2002, when the NIE drafts had been completed and circulated to analysts to review, the NIO for Strategic and Nuclear Programs brought IC analysts together for a coordination meeting on the NIE draft so that the analysts could raise and discuss pertinent issues about the draft text and refine and complete the draft. At the meeting on September 25, 2002, both the CIA and the DIA supported the NIE assessment that the aluminum tubes were intended for Iraq's nuclear program and were evidence that Iraq was starting to reconstitute its nuclear weapons program. The DOE's Office of Intelligence and State Department's INR believed that the tubes were intended for a conventional rocket program and probably not a nuclear use. The DOE did agree, however, that for other reasons addressed later in this report, that Iraq was reconstituting its nuclear program. Both the DOE and INR included extensive text boxes in the NIE outlining their analysis of the tubes. The NGIC, the IC agency responsible for conventional ground weapons systems, did not attend the NIE coordination meeting, although the agency's analysis was cited in the NIE in support of the assessment that the tubes were highly unlikely to be intended for a rocket program. NGIC was represented at the coordination meeting by DIA.

([REDACTED]) The IC assessment that the tubes were intended for Iraq's nuclear weapons program centered on several factors outlined in the NIE and outlined previously in the CIA's analysis of the tubes:

- (1) Saddam Hussein had a personal interest in the procurement of the aluminum tubes, suggesting that the acquisition efforts had a high national priority.
- (2) The composition, dimensions, and extremely tight manufacturing tolerances of the tubes far exceed the requirements for non nuclear applications but make them suitable for use as rotors in gas centrifuges.

[REDACTED]

- (3) Iraqi agents agreed to pay up to [REDACTED] for each 7075-T6 aluminum tube. Their willingness to pay such costs suggests the tubes are intended for a special project of national interest.
- (4) Iraq has insisted that the tubes be shipped through such intermediary countries as [REDACTED] in an attempt to conceal the ultimate end user; such activity is consistent with Iraq's prewar nuclear procurement strategy but are more robust than post-war denial and deception (D&D) efforts.
- (5) Procurement agents have shown unusual persistence in seeking numerous foreign sources for the tubes, often breaking with Iraq's traditionally cautious approach to potential vendors.
- (6) An aluminum tube built to the Iraqi specifications for the tubes seized [REDACTED] was successfully spun in a laboratory setting to 60,000 rpm (1000Hz). This test was performed without balancing the tube; a critical step required for full speed operation, but still provided a rough indication that the tube is suitable as a centrifuge rotor.¹⁵
- (7) The dimensions of the tubes [REDACTED] are similar to those used in the Zippe and Beams-type gas centrifuges. The inner diameter of the seized tubes - 74.4 mm - nearly matches the tube size used by Zippe and is described in detail in his unclassified report on centrifuge development. The length and wall thickness of the seized tubes are similar to Iraq's prewar Beams design.
- (8) Iraq performed internal pressure tests to induce a hoop-stress level similar to that obtained by an operating rotor.
- (9) [REDACTED]

(U) The NIE included discussion of some of these assessments in the main text and contained an annex with a more extensive discussion of the assessments and extensive dissenting opinions from both the DOE and INR. The following section outlines the intelligence and assessments provided by the intelligence agencies on the aluminum tubes.

¹⁵ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(1) Saddam Hussein Had a Personal Interest in the Procurement of the Aluminum Tubes, Suggesting That the Acquisition Efforts Had a High National Priority

([REDACTED]) The intelligence provided to the Committee in support of the conclusion that Saddam Hussein had a personal interest in the tubes was limited to one CIA human intelligence (HUMINT) report. The source of the report was a “[foreign] government service, from a [REDACTED]” The report provided very little detail, saying only that “As of late August 2002, Iraqi President Saddam Husayn was closely following the purchase and analysis of 114,000 7075-T6 aluminum tubes by the Iraqi Organization for Military Industrialization (OMI).” The IC told the Committee that they had no other reporting to show Saddam Hussein had a personal interest in the tubes, but had information that the Iraqi deputy prime minister was also involved in the tube acquisition effort.

([REDACTED]) The information on the deputy prime minister [REDACTED] [REDACTED] indicated the deputy prime minister’s interest in urgently needed shipments of unspecified items. The shipments appear related to the aluminum tubes. [REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) It is not clear from either of these reports that the high-level interest from Saddam Hussein and his deputy prime minister suggests the tubes were intended for Iraq’s nuclear program. The report on Saddam Hussein’s interest in the tubes provides few details which would help corroborate the information or indicate why he was interested in the procurement. The report on the deputy prime minister also does not indicate why he is interested in the shipment. The deputy prime minister is also the minister of the Organization of Military Industrialization, suggesting that his interest in the tubes may be consistent with his ministerial responsibilities. Furthermore, because both reported instances of high-level interest in the tubes occurred after a previous shipment of the tubes had been seized [REDACTED] in 2001 and the IAEA had become involved in the matter, it is possible that both Saddam Hussein and the deputy prime minister were interested in the shipments because of concerns that they too might be confiscated. In any case, it is not clear why these shipments were a high priority for Iraqi officials.

(2) The Composition, Dimensions, and Extremely Tight Manufacturing Tolerances of the Tubes Far Exceed the Requirements for non Nuclear Applications but Make Them Suitable for Use as Rotors in Gas Centrifuges

[REDACTED]

(U) All intelligence agencies agreed that the composition, dimensions, and tight manufacturing tolerances of the aluminum tubes made them capable of being used in a centrifuge program if the tubes were modified. The DOE assessed, however, that technical aspects of the tubes and their handling appeared inconsistent with a gas centrifuge application, and INR agreed with the DOE's analysis.

([REDACTED]) The CIA and DIA were the all-source analysis agencies which supported the NIE assessment that the composition of the tubes, dimensions, and tight manufacturing tolerances far exceeded the requirements for conventional rocket applications. The NIE noted that Iraq consistently requested tubes composed of 7075-T6 aluminum, although the material ". . . is considerably more expensive than other more readily available materials." The NIE also noted that "Materials or tubes meeting conventional rocket requirements could be acquired at much lower prices or be produced indigenously." A separate box in the NIE contained NGIC analysis that the tubes were "highly unlikely to be intended for rocket motor cases," and that the "wall thickness and overall weight would make these particular tubes poor choices for rocket motor bodies." The NGIC analysis compared the Iraqi tubes to a U.S. rocket system that uses the same type of aluminum, 7075-T6, and found that the tubes Iraq was seeking were much more precisely manufactured than the U.S. system or any other U.S. or Russian system of which the NGIC was aware. The tone box said "most agencies agree with NGIC, the Department of Defense (DOD) experts on conventional military systems, that tubes with the specifications – materials and tolerances – like those seized [REDACTED] are highly unlikely to be used for rocket motor cases."

(U) The NIE's assessment that the composition and dimension of the tubes exceeded the requirements for conventional rocket applications is contrary to information obtained by the Committee indicating that the composition and dimensions of the Iraqi tubes were consistent with rockets manufactured in several countries, and, in fact, match exactly the tubes Iraq had imported years earlier for use in its rocket program which it had declared to the UN.

(U) Committee staff interviewed DOD design engineers who work on U.S. rocket systems, specifically the Mark-66 rocket, who said that the assessments in the NIE that 7075-T6 aluminum "is considerably more expensive than other more readily available materials" and that "materials or tubes meeting conventional rocket requirements could be acquired at much lower prices" are "not correct at all." They said that high-strength aluminum is "around the world the material of choice for low cost rocket systems, because it's widely available and can be easily manufactured," and has a high strength to weight ratio. They added that aluminum is "one of the cheapest materials [from which] to make rocket motor cases. Everything else is higher cost to manufacture, like steels."

[REDACTED]

[REDACTED]

[REDACTED]

(U) In addition, [REDACTED] UNSCOM inspections indicated that Iraq had declared using 7075-T6 aluminum in their own rocket program as early as 1996. Information noting that tubes of “apparently similar dimensions were discovered during IAEA inspections” was included in a text box in the NIE explaining NGIC’s analysis of the tubes. The text box said that the “Iraqis claimed to UN inspectors that the tubes were 7075-T6 aluminum and were used by Iraq for the Nasser 81 MRL.”

(U) The IAEA told Committee staff that in 1996 they discovered over 66,000 tubes at Iraq’s Nasser State Establishment, a military industrial complex which was involved in various rocket manufacturing programs. Iraq declared the Nasser tubes to the IAEA as 7075-T6 aluminum with an 81 mm outer diameter, 3.3 mm wall thickness, and 900 mm length, the same composition and dimensions of the tubes the Iraqis were trying to procure in 2001 and 2002.¹⁶ The Iraqis indicated at the time that the tubes were intended for use in their Nasser 81 mm rocket program.

([REDACTED]) The CIA WINPAC centrifuge analyst told Committee staff that the IAEA [REDACTED] tested the tubes to determine their material properties, but the tests showed that none of the tubes tested were high-strength aluminum. The DOE and the IAEA told Committee staff, however, that the testing was not intended to show whether [REDACTED] the 81-mm tubes Iraq had declared were made of 7075-T6 aluminum. The [REDACTED] tests the IAEA had conducted were on other tubes found at Nasser to determine whether those tubes were made of proscribed materials. The IAEA never tested the 7075-T6 aluminum tubes in 1996, because they assessed that the Iraqis would not declare the tubes to be 7075-T6 aluminum and voluntarily submit them to IAEA control if they were not made from the restricted material. Since the controversy regarding the tubes erupted in the fall of 2002, the IAEA told Committee staff they did test the older Iraqi tubes and found that they were in fact, 7075-T6 aluminum as declared by the Iraqis. According to DOE, the U.S. Government learned of this fact in February 2003.

(U) The IAEA told Committee staff that the tubes that Iraq declared in 1996 were the same material and were the exact same dimensions as the tubes Iraq had been trying to procure in recent years. According to the IAEA, the Iraqis were working to reverse engineer an Italian air to

¹⁶ [REDACTED]

[REDACTED]

[REDACTED] The IAEA told Committee staff that the tubes were 900 mm in length and they believe the reference to 800 mm was a typographical error.

[REDACTED]

[REDACTED]

ground rocket, the Medusa. The tubes used by the foreign government service in the Medusa rocket bodies are also of the same material, 7075-T6 aluminum, and dimensions as the tubes Iraq had been recently trying to procure.

([REDACTED]) Finally, although the NGIC assessment cited in the NIE said “tubes with specifications – materials and tolerances – like those seized [REDACTED] are highly unlikely to be intended for rocket motor cases,” the NGIC told the Committee in a written response that “lightweight rockets, such as those originally developed for air-to-ground systems, typically use 7075-T6 aluminum for the motor casing because of its strength and weight.” In addition, the response noted that [REDACTED] review of the tubes and stated that “it is not unusual to use the aluminum alloy specified by Iraq for casings of unguided rockets.” The Swiss produce their own version of the Italian Medusa rocket using 7075-T6 aluminum. Furthermore, U.S. and Russian rocket systems also use 7075-T6 aluminum and, according to the DOD rocket design engineers, thirteen other countries that manufacture the U.S. Mark-66 also use 7075-T6 aluminum in their rockets.

([REDACTED]) The [REDACTED] NGIC [REDACTED] analyst on Iraq told Committee staff he was unaware at the time of his assessment of the materials or specifications of the Medusa rocket. He had not spoken with any DOE analysts about their analysis and had not read any DOE products. He learned of DOE’s position on the tubes from discussions with the CIA and DIA, agencies that vigorously disagreed with DOE’s assessment.

([REDACTED]) In addition to the composition and dimensions, the NIE assessed that the tolerances Iraq was seeking for the aluminum tubes “. . . far exceed the requirements for non-nuclear applications.” This assessment was based on the CIA’s analysis dating back to a July 2, 2001 CIA intelligence assessment and was supported by NGIC’s analysis in both the November 2001MID Supplement [REDACTED], *Iraq: Procuring Possible Nuclear-Related Gas Centrifuge Equipment*, and the September 2002 CIA intelligence assessment, *Iraq’s Hunt for Aluminum Tubes: Evidence of a Renewed Uranium Enrichment Program*, which assessed that the tolerances of the tubes Iraq was trying to procure were far tighter than any rockets of which NGIC was aware.

(U) When questioned about the assessment that Iraq’s requested tolerances would have been unusually tight for rockets, the WINPAC centrifuge analyst told Committee staff that intelligence reporting showed that “almost every country [the Iraqis] approached has told them we cannot make tubes to these specifications,” suggesting that the tolerances were so tight that manufacturers would not even try to make them. Because this statement contradicted

[REDACTED]

information previously provided to the Committee which showed that Iraq was working with several companies to try to procure these tubes, the Committee requested intelligence to support the analyst's contention.

([REDACTED]) The analyst provided six intelligence reports to the Committee, but only one of the six showed that any company from any country told the Iraqis that they could not make the tubes to the specifications requested. The report does not say which specifications the manufacturer could not meet so it is unclear whether this was due to the tolerances. [REDACTED]

[REDACTED]

[REDACTED] These reports did indicate that the manufacturers did not always meet the requested tolerances, but in several cases Iraq accepted the tubes nonetheless. The reports did not show that "Almost every country [the Iraqis] approached told them we cannot make the tubes to these specifications."

([REDACTED]) Contractors from [REDACTED], brought in by CIA to perform a [REDACTED] analysis of the tubes, told Committee staff that Iraq was seeking tolerances far tighter than standard industrial tolerances for extruded¹⁷ products. In addition, an NGIC assessment in November 2002 (NGIC-1143-78184-03) contained a chart with a side by side comparison between the tolerances of the tubes Iraq was seeking and two U.S. rocket systems, the Mark-40 and Mark-66 MRLs. The chart was intended to show that the tolerances "far exceed the tolerances of the Iraqi tubes." The chart below shows NGIC's comparison of tolerances (in parenthesis) of the tubes Iraq was trying to procure and the two U.S. multiple rocket launcher (MRL) systems.

¹⁷Extruded tubes are those that have been formed by forcing heated metal through dies, rather than cast.

[REDACTED]



	Iraqi tubes	U.S. Mk 40 rocket	U.S. Mk 66 rocket
Outside diameter	81 mm [REDACTED]	67.95 mm (+1.27 mm)	70 mm*
Inside diameter	74.4 mm [REDACTED]	62.23 mm (+0.38 mm)	66.4 mm (+0.1 mm/-0.08 mm)
Wall thickness	3.3 mm [REDACTED]	1.83 mm (+/-0.178 mm)	1.8 mm (+0.1 mm/-0.05 mm)
Roundness	[REDACTED]	Not provided	Not provided
Yield strength	[REDACTED]	Not available	483 N/mm

* Outside diameter tolerance is inferred from inner diameter and wall thickness.

(U) The DOE told Committee staff that the tolerances of the Iraqi tubes and the Mark-66 are very similar and that the NGIC chart is misleading because the U.S. Mark-66 specifications included 25 pages of detailed tolerances which are not shown on the chart and which were not requested by the Iraqis for their tubes. These 25 pages of tolerances show that the Mark-66 tubes are more precisely manufactured than the Iraqi tubes. In addition, DOE noted that many standard industrial items, such as bicycle seat posts or aluminum cans are of the same or better tolerances than the tubes sought by Iraq. DOE noted that even if the tolerances were tighter than those for most world wide rocket systems, the fact that Iraq may have requested tolerances that were tighter than necessary, does not indicate that the tubes were intended for a nuclear program. The DOE told Committee staff that over-specifying tolerances is quite common when poor or average engineers try to reverse engineer equipment as the Iraqis were attempting to do.

(U) The DOD rocket design engineers told Committee staff that based on their assessment of the tolerances Iraq requested, the tubes were “perfectly usable as rocket motor tubes, but were excessively tightly toleranced for the application.” They added, “You could easily build rocket motors out of them. They would certainly be nice, straight-flying rockets. But it’s unnecessary.” When asked if they could think of a reason why a country might request tubes with such tight tolerances for a rocket program, one of the engineers said, “Sure. If a person is a relatively inexperienced engineer and they don’t have 40 years of rocket manufacture like we have . . . you would tend to err on the conservative side.” Another engineer said, “If you were starting from scratch, you would tend to go for a straighter, more tightly-toleranced product.”



[REDACTED]

(See page 118 for a description of the IAEA's findings regarding Iraq's rocket production efforts.)

(U) The DOD rocket engineers told Committee staff they had been approached by CIA analysts in January 2003 and were asked for their opinion on how the tubes Iraq was attempting to procure compared with tubes in the U.S. military. The engineers noted that the CIA provided them with the specifications for the wall thickness, straightness, and surface finish of the tubes to help make their assessment. The engineers told Committee staff they informed the CIA that tubes were more accurately made than those for the U.S. systems, but said that they were perfectly usable for rockets. One engineer said he told the CIA analysts, "There was nothing that would have prevented them from being used as rockets, that they were excessively tightly toleranced for the application, but that didn't preclude them from being used. They were just an expensive tube that could be incorporated into a rocket motor." One of the engineers also told Committee staff that he recommended that the CIA contact the foreign government service to get information on their rockets, because the tube diameter appeared similar to that of an Italian rocket system. The engineer said the CIA analysts told him that was not an option. A second engineer told Committee staff he had initially expected that the CIA was coming to them for an objective opinion but believed the CIA analyst "had an agenda" and was trying "to bias us, to encourage us to come up with [the] answer," that the tubes were not intended to be used for a rocket program.

(U) The WINPAC centrifuge analyst told Committee staff that he did not provide the DOD engineers with the wall thickness specification because it was classified at a level higher than that for which the engineers were cleared. He also said the engineers did not suggest he speak with the foreign government service. He told Committee staff that he had in fact already tried to contact the foreign government service twice through [REDACTED] but was not given any information on the Medusa rocket.

(U) IAEA inspections in early 2003, prior to the war with Iraq, supported the assessments of both the DOE and DOD engineers that Iraq may have over specified the tubes because of inexperience. The IAEA interviewed an engineer who worked on the Nasser rocket program and explained that the tight tolerances were the result of an Iraqi Ministry-level requirement to improve the rockets, without making significant changes to the rocket's original design. Because Iraq already had all of the other needed rocket parts, the tolerances were the one area in which the engineer said he could make improvements. All changes to the rockets had to be approved all the way up to the Minister in charge of the rocket's production, and the IAEA was able to follow the paper trail to document the approval process for the changes made to the tolerances. The

[REDACTED]

[REDACTED]

IAEA said they were able to match the paper trail of requested changes to Iraq's procurement requests showing that each time a request to change tolerances went to the Ministry, a corresponding procurement request was sent to potential suppliers.

[REDACTED]

[REDACTED]. The State Department disseminated an unclassified report on March 7, 2003 which provided text of IAEA Director General Mohammed El-Baradei's report to the UN Security Council. El-Baradei said "Extensive field investigation and document analysis have failed to uncover any evidence that Iraq intended to use these 81 mm tubes for any project other than the reverse engineering of rockets." The cable added that the IAEA had developed "a coherent picture of attempted purchases and intended usage of the 81 mm aluminum tubes, as well as the rationale behind the changes in the tolerances."

[REDACTED] In addition, the DOE and the IAEA told Committee staff that the tolerances of the Iraqi tubes were not as tight as those Iraq [REDACTED] as typically desired for high-speed rotating equipment. The IAEA told Committee staff that the specifications of diameter of Iraq's pre-Gulf War centrifuge drawings were [REDACTED] while the tubes Iraq had tried to procure had tolerances of only [REDACTED]. The IAEA said the difference between [REDACTED] is a substantial difference for a centrifuge. The DOE noted that even Iraq's requirement for [REDACTED] tolerance for eccentricity is lower than expected for high-speed rotating equipment such as a centrifuge. The DOE said they would expect to see tolerances in the 0.01 mm range if tubes are to be used as delivered. Even a [REDACTED] would lead to significant balancing problems – especially with a thick walled rotor like the Iraqi tubes. [REDACTED]

[REDACTED]

[REDACTED] Finally, the NIE cited Iraq's request that the tubes' inner surface be free of all defects as a superfluous specification and inconsistent with use in rocket applications. The NGIC said

[REDACTED]

[REDACTED]

[REDACTED]

that in manufacturing rockets either a layer of insulating material is painted to the interior wall and the case is then filled with solid propellant, or a precast grain of solid propellant is loaded inside the tube cavity using thin metal spacers to separate the grain from the tube wall. In either case, minor surface imperfections would have no effect on the performance of the rocket. According to the IAEA, the finish of the Iraqi tubes that were intercepted [REDACTED] was worse than the finish on the older tubes Iraq declared in 1996. In addition, any machining Iraq had to perform to change the wall thickness of the tubes would also change the interior surface of the tubes, making a request for a smooth finish unnecessary if the tubes were intended to be used in a thin walled centrifuge.

(U) (3) Iraqi Agents Agreed to Pay up to U.S. \$17.50 Each for the 7075-T6 Aluminum Tube. Their Willingness to Pay Such Costs Suggests the Tubes Are Intended for a Special Project of National Interest

(U) A [REDACTED] intelligence report does indicate, as the NIE notes, that Iraq may have agreed to a price of about U.S. \$17.50 per tube in an attempt to procure aluminum tubes. Most reports showed, however, that Iraq had negotiated lower prices for the tubes, typically U.S. \$15 to U.S. \$16 per tube, and as low as U.S. \$10 per tube [REDACTED]. The DOE told Committee staff that according to the IAEA [REDACTED] Iraq paid between [REDACTED] [REDACTED] for each aluminum tube acquired in the 1980s. If inflation is taken into account, Iraq would be paying less today than in the 1980s for the same tubes. A DOE analyst also contacted a U.S. aluminum tube manufacturer to request a price quote for 7075-T6 aluminum tubes with similar dimensions to the Iraqi tubes. The analyst did not request specific tolerances which could have raised the price of the tubes. The U.S. manufacturer quoted a price of \$19.27 per tube, higher than the price Iraq was able to negotiate.

(U) Furthermore, the NIE assessment about the cost of the tubes referenced the fact that Iraq was using 7075-T6 aluminum, which the NIE noted "is considerably more expensive than other, more readily available material." As noted previously, DOD rocket engineers told Committee staff that 7075-T6 aluminum is not more expensive than other suitable materials, suggesting that the use of 7075-T6 aluminum did not increase the cost of the tubes.

[REDACTED]

[REDACTED]

(4) Iraq Has Insisted That the Tubes Be Shipped Through Such Intermediary Countries [REDACTED] in an Attempt to Conceal the Ultimate End User; Such Activity Is Consistent with Iraq's Prewar Nuclear Procurement Strategy but Are More Robust than Post-war D&D Efforts

(U) Several intelligence reports show clearly that Iraq did try to conceal itself as the ultimate end user of the aluminum tubes. Intelligence reporting on Iraqi procurement efforts shows, however, that Iraq has tried for years to conceal its identity as the end user for a range of materials that monitoring countries may suspect are for WMD programs. The DOE noted in the NIE that "Iraq's use of procurement agents and front companies to acquire the tubes is consistent with high-priority conventional military applications that would be subject to interdiction efforts." Certainly for items such as the high-strength aluminum tubes – materials that Iraq is prohibited from importing under Annex III of United Nations Security Council Resolution (UNSCR) 687 and 707 – Iraq would have to conceal itself as the end user if it hoped to ever obtain a shipment of the tubes. CIA analysts who followed Iraq's compliance with the Oil For Food Program told Committee staff that Iraq used intermediaries or front companies for the procurement of many every day items that it was legally entitled to procure through legitimate channels, suggesting that Iraq's use of front companies provides little, if any, indication of the potential end use for the product being procured.

(5) Procurement Agents Have Shown Unusual Persistence in Seeking Numerous Foreign Sources for Tubes, Often Breaking with Iraq's Traditionally Cautious Approach to Potential Vendors

(U) The Committee was not provided with intelligence to show that Iraq's persistence in seeking aluminum tubes from numerous foreign sources was unusual. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] This approach is consistent with how Iraq attempted to procure the aluminum tubes. The approach, however, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(I) [REDACTED], no intelligence reporting showed that Iraq was trying to acquire the thousands of other components needed for a centrifuge. For example, if Iraq were attempting to use 64,000 tubes to make 32,000 centrifuge rotors, Iraq would also need 64,000 end caps (two for each rotor), 32,000 lower bearings, 32,000 upper bearings, and thousands of other parts. No reporting was provided to the Committee which showed attempts to procure these items.

(I) (6) An Aluminum Tube Built to the Iraqi Specifications for the Tubes Seized [REDACTED] [REDACTED] Was Successfully Spun in a Laboratory Setting to 60,000 revolutions per minute (Rpm) (1000hz). This Test Was Performed Without Balancing the Tube – a Critical Step Required for Full Speed Operation – but Still Provided a Rough Indication That the Tube Is Suitable as a Centrifuge Rotor

([REDACTED]) Subsequent to publication of the statement in the NIE that a tube was successfully spun to 60,000 rpm, a CIA [REDACTED] continued testing of the aluminum tubes. The CIA reported [REDACTED] in January that their testing had found that, after balancing, the Iraqi tubes were “successfully spun to 90,000 rpm.”

([REDACTED]) The original report, published January 28, 2003, describing the CIA [REDACTED] spin tests of the Iraqi tubes described only five tests. Of the five tests described, four of the tests failed or were stopped due to unexplained “imbalance conditions” or problems with the test equipment. One test was said to have successfully spun a tube section at 90,000 rpm for two hours.

(U) Partly based on questions and comments from DOE analysts, the CIA issued a corrected version of the spin test report on May 5, 2003. In addition to correcting some information from the first report, the second report provided additional data, including the fact that 31 spin tests were performed on the Iraqi tubes. The corrected report showed that of the 31 tests only one tube sample was spun to 90,000 rpm with no apparent deformation, and the report was changed to show that the tube was spun for only 65 minutes, not two hours as originally indicated. Three more of the tests were run to speeds between 95,000 and 100,100 rpm, but excessive vibration caused deformities in the tube samples. The report said the spin tests confirmed that the tubes “have sufficient strength to be used to speeds of 90,000 revolutions per minute (RPM).” 90,000 rpm is consistent with the operating speed of the Zippe centrifuge for tubes with a 74.2 mm inner diameter.

[REDACTED]

(U) All intelligence agencies and the IAEA agreed, based on basic engineering calculations, that properly manufactured tubes of 7075-T6 aluminum could be used as a centrifuge rotor at speeds adequate for uranium separation. Consequently, DOE analysts initially believed that spin testing the tubes was unnecessary. DOE analysts told Committee staff, however, that the results of the CIA spin tests showed that the Iraqi tubes deformed at stresses considerably lower than expected. The DOE told Committee staff that ordinarily, spin tests are performed until the tube fails, not to the target speed of the tube. According to the DOE, in the case of CIA's spin tests, only a few of the tubes were appropriately run to failure and the failure speeds ranged from 96,000 rpm to 100,100 rpm. The DOE noted that the failure speed was just above the speed the tubes were expected to be run in an operating centrifuge – 90,000 rpm – which provides an indication that the tubes were not strong enough to run consistently at that speed. The DOE told Committee staff that to ensure that the tubes would have sufficient strength to run in a centrifuge at 90,000 rpm, they would have to reach a speed of about 20 percent above 90,000 rpm before they failed. This is because the tubes in a centrifuge cascade would have to run at 90,000 rpm constantly, all day, every day for years to produce enough highly enriched uranium for a weapon, not a few hours. As an example, a DOE analyst told Committee staff that “Running your car up to 6,500 rpm briefly does not prove that you can run your car at 6,500 rpm cross country. It just doesn't. Your car's not going to make it.”

([REDACTED]) The DOE wrote in an analysis of the CIA spin tests in May 2003 (TIN000127) that the CIA tests showed that “These specific tubes had structural imperfections that would have precluded their use in a centrifuge.” The DOE said that “A centrifuge fabricated from this material, allowing the accepted standard 60 percent margin of safety, would have a top operating speed of only [REDACTED], which is too slow to make a centrifuge capable of use in a centrifuge facility.”

([REDACTED]) The DOE has not had direct access to [REDACTED] who conducted the spin tests and has had to rely on the CIA's released data for their analysis. The CIA did not ask for assistance or input from any other IC agency in conducting these spin tests and only asked the DOE [REDACTED] for their assessment and assistance in the spring of 2003. The DOE analysts did not know the extent of CIA's spin test work until the CIA disseminated cables on the test results. When asked by Committee staff why the CIA did not consult with the DOE, the IC's nuclear experts, the WINPAC centrifuge analyst said, “Because we funded it. It was our testing. We were trying to prove some things that we wanted to prove with the testing. It wasn't a joint effort.”

[REDACTED]

(b) (7) The Dimensions of the Tubes Seized [REDACTED] Are Similar to Those Used in the Zippe and Beams-type Gas Centrifuge. The Inner Diameter of the Seized Tubes [REDACTED] Nearly Matches the Tube Size Used by Zippe and Is Described in Detail in His Unclassified Report on Centrifuge Development. The Length and Wall Thickness of the Seized Tubes Are Similar to Iraq's Prewar Beams Design

[REDACTED] Although the information in the NIE suggested that the Iraqi tubes have similar measurements to some dimensions of both the Zippe and Beams centrifuge designs, the measurements of the tubes Iraq was seeking do not precisely match either design. The chart below is similar to one initially prepared by the WINPAC centrifuge analyst for use in CIA presentations and the CIA's September 2002 intelligence assessment on the aluminum tubes. This version was published in the October 2002 NIE.

	Iraq's Oil Centrifuge Rotor	[REDACTED]	[REDACTED]	Beams Centrifuge Rotor	Zippe Centrifuge Rotor
Length	651 mm	[REDACTED]	[REDACTED]	about 900 mm	279.4 - 381 mm
Inside Diameter	84 mm	[REDACTED]	[REDACTED]	69.85 mm	68.6 - 76.3 mm
Outside Diameter	96 mm	[REDACTED]	[REDACTED]	76.2 mm	74.2 - 81.9 mm
Wall Thickness	6 mm	[REDACTED]	[REDACTED]	3.175 mm	2.8 mm*

* The Zippe unclassified report discusses several centrifuge rotor designs but does not explicitly state the wall thickness of any of the rotors. Based on the limited documentation, we can infer that Zippe used rotors with wall thicknesses that range from 1 mm to approximately 2.8 mm. We know that more advanced Zippe designs used rotors with 1 mm thick walls. We do not know to what exact wall thickness was used in the early Zippe designs. The rotor wall thickness for the Beams centrifuge has also been specified as 6.35 mm.

[REDACTED]

([REDACTED]) This chart is misleading in several respects. First, the chart does not show the dimensions of Iraq's version of the Zippe design, which had very different dimensions than the Zippe dimensions shown in the CIA chart. Iraq had worked on this design prior to the Gulf War, obtained substantial foreign assistance on this design, and had a full set of designs and drawings for this centrifuge. Second, according to DOE analysts and the IAEA, Zippe's centrifuge designs had wall thicknesses of 1 mm, not 2.8 mm as indicated in the chart. A DOE analyst told Committee staff that this was explained to the [REDACTED], in July 2001 [REDACTED] and was pointed out several more times by DOE analysts throughout the next year. In addition, DOE analysts contacted Gernot Zippe, the designer of the Zippe centrifuge, directly and he confirmed that the wall thickness of his centrifuge designs were not more than 1 mm. Finally, the CIA chart did not include the dimensions of the tubes Iraq had declared in 1996 as part of its Nasser 81 mm rocket program and did not include materials of the rotors for any of the tubes listed. The following chart would have provided a more accurate representation of known information at the time of the NIE.

	[REDACTED]	Tubes Iraq Declared in 1996 for Use in Rockets	Iraq's Oil Centrifuge Rotor	Iraq's Zippe Centrifuge Rotor	Beams Centrifuge Rotor	Zippe Centrifuge Rotor (Design that most closely matches Iraqi tubes)
Length	[REDACTED]	900 mm	651 mm	<600 mm	about 900 mm	332 mm
Inside Diameter	[REDACTED]	74.4 mm	84 mm	NA	69.85	74.2 mm
Outside Diameter	[REDACTED]	81 mm	96 mm	[REDACTED]	76.2 mm	76.2 mm
Wall Thickness	[REDACTED]	3.3 mm	6 mm	[REDACTED]	3.175 mm	1 mm
Material	[REDACTED]	7075-T6 aluminum	Duraluminum	Maraging steel and carbon fiber	Duraluminum	2000 series aluminum with T6 hardening

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) As can be seen from the chart above, none of the specifications of the tubes seized [REDACTED] match or are consistent with previous Iraqi centrifuge designs. The specifications appear similar to the Beams centrifuge rotors and the diameter specifications are similar to those of the Zippe design. Neither the CIA analysts nor the [REDACTED] contractors could tell Committee staff, however, which design they believed Iraq would pursue, only that the tubes' specifications had similarities to both designs. One of [REDACTED] contractors told Committee staff they did not have enough information to judge which design they might have intended the tubes to be used for, only that the specifications, tolerances and the packaging requirements indicated that they were suitable for both designs.

(U) The DOE analysts told Committee staff that they asked CIA analysts to explain which design they believed Iraq would pursue at the NIE coordination meeting, but the CIA WINPAC analyst suggested that the Iraqis are "tricky" and that they could not speculate on which design they might use.

(U) The DOE's analysis of which design the Iraqis were likely to pursue was based on analysis of Iraq's pre-Gulf War centrifuge work. According to the DOE, Iraq began its uranium centrifuge enrichment program in the late 1980s when they began to work, by themselves, on an oil type centrifuge, a derivative of a machine that was developed by Jesse Beams in the U.S. during the Manhattan Project. This centrifuge design is supported by oil bearings, rather than magnets. The Iraqis were able to make a rotor, but it had severe problems with vibrations and leaking seals, consumed excessive amounts of power and never operated close to its target operating speed. According to the DOE, neither the Iraqis nor anyone else, including the U.S., who has ever attempted to build a Beams centrifuge, has ever put these into a centrifuge cascade for uranium enrichment.

(U) The Iraqis abandoned the Beams design and in 1989 obtained assistance from German engineers who helped the Iraqis obtain Zippe type magnetic suspension centrifuge components and designs. The Iraqis attempted two versions of this centrifuge design, a maraging steel rotor and a carbon fiber rotor. Iraq was able to produce about 60 maraging steel rotors indigenously, only four of which passed dimensional inspection, but they never ran a centrifuge machine using these rotors. Because they were having problems making the maraging steel rotors, the German "consultants" recommended that the Iraqis try a carbon fiber rotor. Iraq covertly imported 30 pre-made carbon fiber rotors. Iraq built two machines with the carbon fiber rotors. One machine failed during the run-up, but the other machine operated. Iraq was continuing to work with the Germans to optimize that machine until the program was halted because of the Gulf War.

[REDACTED]

(U) The DOE analysts assessed that if Iraq were going to rebuild a centrifuge program, they would be most likely to pursue the carbon fiber rotor design because the Iraqis had the full set of diagrams outlining how to build the components and the machine, they had experience with this design, and it was industrially-proven. When Iraq began attempting to procure the aluminum tubes made of a material and with specifications that did not match the dimensions of Iraq's known design, however, DOE analysts examined the specifications of the tubes to determine how Iraq might be able to use them in another design.

([REDACTED]) The DOE noted that no successful centrifuge cascade has ever been built using rotor tubes of the size and material Iraq was attempting to procure and that Iraq would encounter several problems attempting to design a centrifuge, from scratch, using these tubes because the walls were too thick and the diameter was too small. The DOE assessed that Iraq could modify the tubes for use in an uranium enrichment gas centrifuge, but doing so would require significant additional research and development. One analyst told Committee staff you could also "turn your new Yugo into a Cadillac, given enough time and energy and effort as well." In TIN000084 in December 2001, *Iraq: Seeking Additional Aluminum Tubes*, the DOE explained some of the problems Iraq would encounter using the tubes for a centrifuge cascade:

The wall thickness is three times greater than that for metal rotor designs used in high-speed centrifuges. This would increase the weight and the energy of the spinning rotor by a factor of three. A significant R&D effort would be required to compensate for the suspension problems introduced by the heavier rotor.

The design which the Iraqi tubes most resemble – that for a tube used by centrifuge pioneer Gernot Zippe for laboratory experiments in 1960 – has never been tested at production levels. Because the centrifuge described by Zippe operated as only a single unit for a very short period of time, its use in a cascade with thousands of centrifuges would require a significant development effort. And again, the specifications of the Iraqi and Zippe tubes differ in some important ways: while the inner diameter [REDACTED] of the Iraqi tubes is similar to the inner diameter (74.1) of Zippe's, the tube used by Zippe had only a 1 mm wall thickness and was only 332 mm long. Zippe noted that the low efficiency of his laboratory machine would prevent its practical use. If Iraq attempts to use these tubes in a Zippe centrifuge, the efficiency could be further reduced due to complications with the damping and suspensions systems as a result of thicker walled tubes.

[REDACTED]

(U) The DOE also noted that the inefficiency of centrifuge machines using these tubes is such that Iraq would need more than 12,000-16,000 centrifuges to produce 25 kg of highly enriched uranium (HEU) annually, enough for one weapon per year. The DOE said,

As a result, we judge it would take much longer than five to seven years¹⁸ to fabricate even a small functional cascade capable of producing gram quantities of HEU. Beyond fabrication challenges, operating a series of cascades with this many centrifuges would require significant operational experience. To date, the only entities known to operate more than 10,000 centrifuges are Russia and the European enrichment consortium, Urenco. Maintaining such a plant with first generation machines would be extremely difficult. Additionally, this centrifuge and the Zippe centrifuge have extremely low stage separation efficiencies that would lead to a very large number of centrifuge stages with a corresponding increase in cascade piping and complexity. In short, we judge it unlikely that anyone could deploy an enrichment facility capable of producing weapons significant quantities of HEU based on these tubes.

([REDACTED]) The DOE was so pessimistic about Iraq's ability to successfully use these tubes in a centrifuge, one analyst told Committee staff, that his initial assessment was that if Iraq was really trying to make centrifuges out of these tubes that "we should just give them the tubes." [REDACTED]

[REDACTED]

(8) Iraq Performed Internal Pressure Tests to Induce a Hoop-stress Level Similar to That Obtained by an Operating Rotor

([REDACTED]) The NIE stated that the pressure tests Iraq conducted on the tubes performed to a stress level similar to that obtained by an operating rotor. Other than in the DOE's alternative view text box, the NIE did not indicate that pressure testing is not a known method for testing centrifuge rotors. The CIA's [REDACTED] contractors suggested in their report that although pressure tests are not a typical test for centrifuge components, they can substitute for other tests. The contractors believed the tests were too high for rocket motors.

¹⁸ Five to seven years was the estimate of the time it would take Iraq to make a nuclear weapon if it produced the highly enriched uranium itself.

[REDACTED]

assessment added that “Iraq’s prewar centrifuge effort used anodized molecular pumps indicating the Iraqis understand [REDACTED]” CIA and DIA analysts told Committee staff that while anodization is not necessary for an aluminum centrifuge, intelligence reporting suggested that Iraqi officials thought it was necessary [REDACTED]. The CIA provided the Committee with a HUMINT report distributed in November 2002, after the publication of the NIE, which indicated that Iraq may have believed they needed to anodize aluminum rotor tubes.

([REDACTED]) The DOE alternative view text box in the NIE said that anodization is not necessary and can be problematic for centrifuges. “It is well established in open sources that bare aluminum is resistant to UF6 and anodization is unnecessary for corrosion resistance, either for the aluminum rotors or for the thousands of feet of aluminum piping in a centrifuge facility. Instead, anodization would likely introduce uncertainties into the design that would need to be resolved before a centrifuge could be operated.” Some of these uncertainties are described in a [REDACTED]

([REDACTED]) [REDACTED]. DOE analysts told Committee staff that the CIA’s claims about U.S. and European centrifuge programs using anodized surface coatings is misleading [REDACTED]

[REDACTED] The DOE analysts said that they asked Gernot Zippe personally if his rotor was anodized and he said, “no.”

([REDACTED]) The DOE also provided Committee staff with an assessment of the November 2002 CIA HUMINT report. The DOE assessment, and comments from DOE analysts, noted that the HUMINT report that Iraq anodized aluminum rotor tubes used in its early Beams-type centrifuge design is inconsistent with Iraqi disclosures to the IAEA and post-Gulf

[REDACTED]

[REDACTED]

war reporting from this source which said Iraq used anodization in a gaseous diffusion nuclear program, not its centrifuge program.

([REDACTED]) When Committee staff interviewed the [REDACTED] contracted by the CIA, [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] In a second interview with the DOE, analysts told Committee staff that the model was anodized in order to protect it from corrosion, but the actual rotors used in Zippe's centrifuge design were not anodized.

([REDACTED]) [REDACTED], the DOE noted in the NIE that anodization is a standard practice in missile construction for environmental protection. In a written response to questions from Committee staff, the NGIC agreed that anodizing "provides components of military weapon systems with maximum corrosion resistance. The coating also provides a surface having better paint adhesion than uncoated aluminum." The IAEA told Committee staff that Iraq was anodizing the tubes because they were being stored outdoors and, therefore, required the coating as environmental protection. According to the IAEA, Iraq lost thousands of the tubes it procured in the early and mid-1990s due to the corrosive effects of being stored outdoors. The Iraqis believed an anodized coating would better protect the new tubes they were attempting to procure.

(2) Quantity of Tubes

([REDACTED]) The DOE assessed that the quantity of tubes Iraq was trying to procure is inconsistent with the needs of a centrifuge program. Iraq was consistently seeking 60,000 tubes and in some cases over 100,000 tubes. The DOE assessed that ten to twenty thousand tubes would be sufficient to build enough centrifuge machines to produce sufficient highly enriched uranium for two nuclear weapons annually. The fabrication of 60,000 centrifuges would take Iraq well over a decade even if it were able to produce 20 acceptable centrifuges per day, a large number considering Iraq's industrial capabilities.

([REDACTED]) The CIA assessed that over-purchasing is typical of Iraqi buying habits and likely reflects Iraq's attempts at quality control, to ensure that at least 10,000 to 20,000 tubes were of sufficient quality for use in a centrifuge program. The CIA's [REDACTED] contractors and CIA analysts also relied on the NGIC's assessment that 60,000 tubes were too few for Iraq's Nasser

[REDACTED]

[REDACTED]

81 MRL system. The NGIC assessed if Iraq were to use the Nasser 81 MRL in a conflict, they could expend 60,000 rockets in less than a week, meaning that Iraq would need many more tubes for an effective weapon system.

([REDACTED]) The NGIC analyst told Committee staff, however, that he was unaware of other intelligence reports which showed that Iraq had attempted to procure over 100,000 tubes in some cases. The NGIC analyst was also unaware that Iraq had procured 160,000 tubes for the Nasser 81 program in 1989, and still had 66,000 tubes available in 1996, suggesting that it would take Iraq a long time to use even 60,000 tubes. The NGIC analyst also could not provide Committee staff with an assessment or estimate of Iraq's Nasser 81 rocket production rate. [REDACTED], Iraq's rocket production rate was about 50 rockets per day, or about 10,000 a year. This would mean that it would take Iraq six years to produce rockets from all 60,000 tubes.

(3) IAEA Investigation of Tubes

(U) After publication of the NIE but before the war had begun in Iraq, the IAEA was able to investigate Iraq's claims that the aluminum tubes were intended for its Nasser 81 rocket program. The IAEA told Committee staff that, primarily because of U.S. concerns about the tubes, investigating the tubes became one of the key lines of work during inspections in Iraq.

(U) The IAEA was able to verify that Iraq was engaged in rocket production at the Nasser 81 facility, making propellant and warheads and painting the rockets. A random spot check showed that the Iraqis had 13,000 completed rockets in their inventory. These rockets were being produced from the older 7075-T6 aluminum tubes at Nasser. Many of the older tubes had corroded because they had been stored outside and the Iraqis told the IAEA that they were trying to procure more tubes because they were going to run out of unspoiled tubes in about twelve to eighteen months. The older Nasser tubes had not been anodized, and the Iraqis told the IAEA the new anodization requirement was intended to protect the new tubes from spoiling in the elements.

(U) The bottom line assessment of the IAEA was that the tubes Iraq was trying to procure were capable of being adapted for use in a uranium centrifuge, but that it would require significant research and development and technical skills which would require years of work, even for people who knew what they were doing. The IAEA officials said they could not totally disregard the scenario that the tubes could be used in a centrifuge, but there were many

[REDACTED]

[REDACTED]

inconsistencies with that scenario, while the theory that the tubes were being used for rockets was completely consistent with the evidence in Iraq.

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]. The CIA [REDACTED]
produced intelligence assessments which rejected the IAEA's conclusions, [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]. Most of these assessments were distributed in limited channels, only to senior policymakers.

2. Procurement Attempts for Magnets, High-Speed Balancing Machines and Machine Tools

(U) Intelligence information provided to the Committee shows that Iraq was trying to procure magnets, balancing machines, and machine tools, all materials that have potential applications in a nuclear program. These materials, however, are all dual use and none of the intelligence provided said that the materials were intended for a nuclear end user.

([REDACTED]) According to the NIE, the manager of one of the Iraqi companies negotiating the magnet procurement, along with a large number of personnel for the new production facility, worked in Iraq's pre-Gulf War centrifuge program. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] information indicated the magnets to be produced at the facility were intended for the al Rashid directorate, which was coordinating the Ababil-100 missile project and was directly responsible for the missile's solid propellant engine.

([REDACTED]) The Committee was not provided with any information to show that a large number of personnel for the new magnet production facility worked in Iraq's pre-Gulf War centrifuge program as stated in the NIE. According to the intelligence provided to the Committee, [REDACTED] 40-50 percent of the PhDs and senior engineers there worked in Iraq's pre-Gulf War nuclear program, but in the electromagnetic isotope separation (EMIS) program, not the centrifuge program. The Committee

[REDACTED]

found it reasonable to assess that these individuals worked in al-Tahadi because of their experience with magnets.

(U) In an interview, the NIO for Strategic and Nuclear Programs and CIA analysts told Committee staff the reference to the centrifuge officials working at al-Tahadi was a mistake and it was, in fact, former EMIS officials. The NIO and the CIA analysts agreed that the officials were probably working at al-Tahadi because of their magnet expertise and agreed that there was no direct connection to an Iraqi centrifuge program, although they noted that Iraq potentially could use the magnets in support of a renewed centrifuge effort.

([REDACTED]) The NIE also assessed that a front company, trying to procure high-speed balancing machines that can be used in centrifuge balancing work, was involved in trying to procure 7075-T6 aluminum tubes. [REDACTED]

[REDACTED] When questioned by Committee staff, CIA analysts noted that procurement companies are often involved in a variety of unrelated procurement efforts and the procurement efforts [REDACTED] to obtain balancing machines and [REDACTED] to obtain aluminum tubes, may be totally unrelated.

(U) The Committee was not provided with any other information to show that equipment procurements were related to a nuclear program.

3. Iraq's Efforts to Re-Establish and Enhance Its Cadre of Weapons Personnel as well as Activities at Several Suspect Nuclear Sites

(U) The following points were offered in the NIE in support of the key judgment that Iraq's efforts to re-establish and enhance its cadre of weapons personnel and activity at several suspect nuclear sites further indicated that nuclear reconstitution was underway.

- a. The IAEC is expanding the infrastructure: research laboratories, production facilities, and procurement networks, to produce nuclear weapons.
- b. Many of Iraq's nuclear scientists recently have been reassigned to the IAEC.

[REDACTED]

[REDACTED]

- c. Renewed regular contact between Saddam and the IAEC, as well as enhanced security, suggests the IAEC is again the focal point of Saddam's nuclear program.
- d. Activity at several suspect nuclear sites.

a. The Iraqi Atomic Energy Commission is Expanding the Infrastructure – Research Laboratories, Production Facilities, and Procurement Networks – to Produce Nuclear Weapons

([REDACTED]) A [REDACTED] HUMINT report provided to the Committee showed that in April 2002 Iraq completed construction of a new building for the IAEC. The report said the building was an alternative to the existing IAEC offices and was built for the "operation room" of the IAEC. The report noted also that the IAEC planned to open a new high-level polytechnic school that would offer PhDs in all branches of nuclear energy at another location. The Committee was not provided with any other intelligence to show that research laboratories, production facilities, and procurement networks were expanded.

(U) In an interview with the NIO and CIA analysts, Committee staff asked if there was any additional information to support such an assessment. The CIA analyst said there was nothing additional to show that Iraq was expanding research laboratories, production facilities, or procurement networks.

b. Many of Iraq's Nuclear Scientists Recently Have Been Reassigned to the IAEC

([REDACTED]) The information provided to the Committee shows that nuclear scientists worked for the IAEC, but does not show that these scientists were recently reassigned to the IAEC as stated in the NIE. According to the intelligence provided, [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] several personnel changes in the IAEC indicated the changes were the result of a decision from the President's office to replace government managers who had been in their positions for five years. This suggests that many of these individuals had been located within the IAEC since at least 1996, five years before the reported personnel changes and, also suggests that transfers within the IAEC were not related to specific interest in that program, but were due to a government wide directive to change management. The Committee requested additional

[REDACTED]

[REDACTED]

[REDACTED]

intelligence to support the assessment that many scientists had recently been reassigned to the IAEC, but the additional documents provided did not show recent reassignments.

([REDACTED]) Some of the reports provided by the IC that were intended to show that scientists had been reassigned to the IAEC, actually suggested that no work was being done on the nuclear program. In one report from September 2001, an IAEC employee complained that the Iraqi nuclear program had been stalled since the Gulf War. [REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) Reporting from a foreign government service indicated that “As of late 1999, several groups from Iraq’s nuclear establishment remained intact, although the majority of key nuclear scientists, but not engineers or technicians, either had retired, died, or left Iraq.” The report also noted that “As of late 1999, it was unlikely that any nuclear weapons work was taking place.” Other reporting indicated that employees of Iraq’s pre-Gulf War program maintained a loose professional alliance through their work in engineering and design centers within Iraq’s Military Industrialization Commission, [REDACTED]

[REDACTED]

(U) In an interview with the NIO and CIA analysts, Committee staff asked if there was any additional information to support the assessment that “Many of Iraq’s nuclear scientists recently have been reassigned to the IAEC.” The CIA analyst told Committee staff that he could not find any additional information to support the assessment that scientists had recently been reassigned to the IAEC.

c. Renewed Regular Contact Between Saddam and the IAEC, as Well as Enhanced Security, Suggests the IAEC is Again the Focal Point of Saddam’s Nuclear Program

([REDACTED]) Several open source and other intelligence reports show that Saddam Hussein did meet with IAEC officials and praised their work. Saddam met and praised the work of other military, industry and private sector personnel at some of these meetings as well, however. It is also unclear whether the IAEC officials who Saddam praised were actually engaged in nuclear work.

([REDACTED]) One report shows that, in a televised speech, the Iraqi leader praised engineers from the Atomic Energy Agency, Ministry of Industry and Minerals, Oil Ministry and the private sector who were engaged in pharmaceutical research. Saddam Hussein praised the work of the

[REDACTED]

creative mujahidin in the pharmaceutical industry and their work on producing medicines. It is this report which the NIE references in saying that "Saddam told the IAEC its responsibilities have been doubled because they "owe" it to their past relationship with him." This report does not, however, reference nuclear work and does not say that Saddam told the IAEC its responsibilities have been doubled. The translation of Saddam's speech said,

The Atomic Energy Agency should come up with two things or two items at a time when others come up with one thing. This is because its personnel are basically Iraqis and because they owe this to me, at least between me and them. Although you are all Iraqis and we cannot discriminate between you, but because of the old relationship between me and them, your responsibility is doubled.

([REDACTED]) Because of the difficulty in determining what Saddam Hussein meant in this speech, the Committee asked for a re-translation. The CIA was unable to provide a new translation [REDACTED].

([REDACTED]) A second report provided to the Committee dated September 2001 on this subject shows that Saddam Hussein did promise to present new plans to facilitate the IAEC's work, as described in the NIE. [REDACTED]

([REDACTED]) Several intelligence reports also point to increased security efforts at the IAEC. [REDACTED] The report mentioned that Iraqi intelligence officials would travel with any IAEC official who traveled abroad. The report also indicated that the IAEC had launched an operation to evacuate files, computers, and other materials because of a "crisis" with the UN. The information in this report dated from February to May 1998, when UN inspections were ongoing in Iraq.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED] suggesting that at the time of the report in April 2001, Iraq's atomic energy personnel had not begun reconstituting the nuclear program.

d. Activity at Several Suspect Nuclear Sites

(U) Several intelligence reports support the conclusion in the NIE that scientists had been consolidated into establishments previously associated with the nuclear program and that these facilities retained equipment that could be used in reconstituting a nuclear program at some point. The reports show, however, that the consolidation took place before 1998. This appears to be continuing activity indicative of plans to reconstitute Iraq's nuclear program at some point, but not new activity that would indicate recent or impending nuclear reconstitution.

(U) In addition to the scientific activity, intelligence reports support the conclusion that there was construction activity at al-Tahadi, a research and engineering facility engaged in a variety of high-voltage and magnetics work, but it is unclear that al-Tahadi was linked to nuclear work. Intelligence reports showed that several former scientists from Iraq's pre-Gulf War EMIS uranium enrichment program were working at al-Tahadi. There is no information to suggest they were currently engaged in nuclear work, however.

([REDACTED]) The IC provided the Committee with two intelligence reports indicating that Iraq was trying to procure a permanent magnet production line during the mid-1999 to March 2001 time frame. [REDACTED] that construction of a high-bay building was completed at al-Tahadi by November 2000 which could have been intended to house permanent magnet production facility. Reporting, however, indicated that the magnet procurements were likely affiliated with Iraq's missile program and one report specifically mentioned that the magnets were intended for the al Rashid directorate, which is involved in solid-propellant missile design and production. [REDACTED]

[REDACTED] There was no intelligence provided to the Committee to suggest that Iraq had obtained the permanent magnet production capability.

(U) In an interview with the NIO and CIA analysts, Committee staff asked if there was any additional information to support the assessment that "There was activity at suspect nuclear sites." The CIA analyst told Committee staff that the only activity was continuing work of personnel at these suspect facilities, but no new activity was taking place.

[REDACTED]

[REDACTED]

C. Niger

(U) Although not listed as a reason the IC believed Iraq was reconstituting its nuclear program, the NIE did discuss Iraqi attempts to acquire uranium from Africa. The NIE said:

Iraq has about 550 metric tons of yellowcake and low-enriched uranium at Tuwaitha, which is inspected annually by the IAEA. Iraq also began vigorously trying to procure uranium ore and yellowcake; acquiring either would shorten the time Baghdad needs to produce nuclear weapons.

- A foreign government service reported that as of early 2001, Niger planned to send several tons of “pure uranium” (probably yellowcake) to Iraq. As of early 2001, Niger and Iraq reportedly were still working out arrangements for this deal, which could be for up to 500 tons of yellowcake. We do not know the status of this arrangement.
- Reports indicate Iraq has also sought uranium ore from Somalia and possibly the Democratic Republic of the Congo.

We cannot confirm whether Iraq succeeded in acquiring uranium ore and/or yellowcake from these sources.

([REDACTED]) The Committee has examined the Niger uranium issue in depth and reported the information and findings on the issue in a separate section of this report. The Committee notes, however, that there were a number of intelligence reports which indicated Iraq was attempting to procure uranium from several countries in Africa, including Niger, the Democratic Republic of the Congo, and Somalia. At the time the NIE was written the forged foreign language documents were not available to the IC, but there was intelligence reporting that indicated Iraq may have approached Niger either to procure uranium or for another unidentified purpose. The Committee did not find that the information showed Iraq was “vigorously trying to procure uranium” as indicated in the NIE, but it did indicate that Iraq may have been trying to acquire uranium. See the Niger section of this report for a detailed explanation of the treatment of the Niger uranium information by the IC prior to, during, and after the NIE process.

[REDACTED]

D. Explaining Uncertainties

(U) The NIE provided a “tone box” that listed the IC’s “confidence levels for selected key judgements in this estimate.” The NIE’s key judgements were broken down into three categories of high, moderate and low confidence. Assessments related to Iraq’s nuclear capabilities listed under the “High Confidence” heading were:

- “Iraq is continuing, and in some areas expanding, its chemical, biological, nuclear and missile programs contrary to UN resolutions.”
- “We are not detecting portions of these weapons programs.”

(U) The only key judgment noted under the “Moderate Confidence” heading related to Iraq’s nuclear capabilities said:

- “Iraq does not have a nuclear weapon or sufficient material to make one but is likely to have a weapon by 2007 to 2009. (See INR alternative view, page 84)”

(U) There were no assessments of Iraq’s nuclear capabilities listed under the “Low Confidence” heading.

E. Intelligence Agencies’ Analysis on Reconstitution Prior to Publication of the NIE

(U) The assessment that Iraq had begun reconstituting its nuclear program was a new Community assessment in 2002, but individual IC agencies began to change their assessments about the nuclear program more gradually, beginning in 2001, as new intelligence reports began to come into the IC.

([REDACTED]) As mentioned previously, the CIA began assessing that the aluminum tubes “have little use other than for a uranium enrichment program” as early as April 10, 2001 (SEIB - 1-083CHX) – almost immediately after the detailed intelligence reports on Iraq’s attempts to procure 60,000 aluminum tubes started coming to the IC. The April 2001 assessment also suggested that the tubes, and purchases of other dual use items, such as magnets and specialized balancing equipment, could revive Iraq’s nuclear program. The CIA produced about a dozen more assessments of the aluminum tubes and their applicability in Iraq’s nuclear program over the course of the next year.

[REDACTED]

[REDACTED]

(U) It is clear from the CIA's finished intelligence that the procurement of aluminum tubes and other dual use equipment was key to the CIA shifting its position on reconstitution of Iraq's nuclear program. The CIA wrote in January 2002, that "Procurement activities detected in the past year are consistent with Iraq attempting to jump-start a clandestine uranium enrichment program to produce fissile material needed to make a nuclear weapon, potentially by late this decade." (SPWR011102-02) On March 12, 2002, the CIA published a Senior Executive Memorandum which assessed that "Iraq currently may be trying to reconstitute its gas centrifuge enrichment program" and on the same day the CIA said "Iraq could develop enough fissile material for a nuclear weapon by mid-to-late decade." (SPWR031202-07) In August 2002, the CIA published a paper titled *Iraq: Expanding WMD Capabilities Pose Growing Threat* in which it assessed that "Iraq's procurement of nuclear-related equipment and materials indicates it has begun reconstituting its uranium enrichment gas centrifuge program to produce fissile material for a nuclear device, a process that could be completed by late this decade." The same paper later noted, "Iraq's persistent interest in high-strength aluminum tubes indicates Baghdad has renewed an indigenous centrifuge uranium enrichment program." The CIA's nuclear analysts also told Committee staff that the aluminum tube procurement was the principal part of the agency's assessment that Iraq was reconstituting its nuclear program.

(U) On April 11, 2001, almost immediately after the reports on Iraq's procurement efforts came to the IC, the DOE assessed that the aluminum tubes were likely not intended for Iraq's nuclear program. The DOE noted that "While the gas centrifuge application cannot be ruled out, we assess that the procurement activity more likely supports a different application, such as conventional ordnance production." The DOE continued to assess that the tubes were intended for the Nasser 81 rocket program in numerous assessments throughout the next year.

(U) Despite the DOE's assessment that the tubes were not intended for Iraq's nuclear program, DOE analysts did note other intelligence in their assessments that led them to believe Iraq may be reconstituting its nuclear program. On August 17, 2001, in an intelligence paper (TIN000064) the DOE assessed that "Iraq is engaged in activities, such as establishing a permanent magnet production capability, that could be preliminary steps intended, at least in part to support a gas centrifuge program restart. However, we cannot determine from information now available whether or when Iraq may have begun program reconstitution in earnest or if it intends to do so in the immediate future." On July 22, 2002, the DOE assessed that Iraq's efforts to procure magnets, Saddam's meetings with Iraq's nuclear scientists, and possible Iraqi attempts to acquire uranium from Niger suggest "that Saddam Hussein is seeking to reconstitute Iraq's nuclear weapons program."

[REDACTED]

(U) The DIA first assessed that the aluminum tubes could be part of Iraq's nuclear program on August 2, 2001. The background paper outlined the CIA's assessment that the tubes were suitable for an uranium enrichment program and also explained the DOE's assessment that the tube's thickness, length, and anodized finish made it more likely they were for other uses. The paper indicated that "DIA analysts found the CIA presentation to be very compelling." The DIA wrote little else on the procurements of aluminum tubes or other dual use items until it published a large defense intelligence assessment on "Iraq's Reemerging Nuclear Weapon Program" in September 2002. This assessment became the basis for most of the nuclear section of the October 2002 NIE on *Iraq's Continuing Programs for Weapons of Mass Destruction*.¹⁹ The DIA paper used the term "revitalized" rather than "reconstituted" to refer to Iraq's nuclear efforts saying "Iraq revitalized its nuclear weapon efforts after the departure of UNSCOM and IAEA inspectors in December 1998."

(U) INR did not publish intelligence papers on Iraq's procurement of aluminum tubes or papers indicating its position on nuclear reconstitution until after publication of the NIE. A draft of an in-depth analysis paper on the aluminum tubes issue was provided to the NIC staff prior to the NIE, so the NIC would be aware of INR's position. The finished paper was published on October 9, 2002.

F. Analysis of Iraq's Currently Accurate, Full and Complete Disclosure

(U) On December 17, 2002, CIA analysts produced a review of Iraq's WMD declaration to the UN titled, *U.S. Analysis of Iraq's Declaration, 7 December 2002*. On December 30, 2002, the points from the paper were worked into talking points for the National Intelligence Officer for Science and Technology titled, *Talking Points on US Analysis of Iraq's Declaration*. The two assessments reviewed Iraq's "Currently Accurate, Full and Complete Disclosure" to the UN of its WMD programs and made only two points regarding the nuclear program. The assessments said the declaration, "fails to acknowledge or explain procurement of high specification aluminum tubes we believe suitable for use in a gas centrifuge uranium effort. Fails to acknowledge efforts to procure uranium from Niger, as noted in the U.K. Dossier." The titles of both of these assessments said, "U.S. analysis," suggesting that they represented more than just CIA's position. Yet, known dissenting views from INR and the DOE regarding the purpose

¹⁹ The aluminum tube section of the NIE was taken from a September 2002 CIA assessment, *Iraq's Hunt for Aluminum Tubes: Evidence of a Renewed Uranium Enrichment Program*.

[REDACTED]

of the aluminum tubes were not included in the assessments. INR's view that the Niger reporting was "highly dubious" also was not included in the assessments.

(U) Information provided to the Committee indicates that the December 17, 2002 assessment was passed to the President without INR or the DOE having an opportunity to review or comment on the draft. An INR analyst sent an e-mail to CIA asking, "Do you happen to know offhand if INR will get to review and clear the draft 'detailed analysis' of the declaration before it's issued in its capacity as a 'U.S.' position? We were not invited to review or clear on the draft preliminary 'U.S.' assessment, which subsequently went to POTUS, et al." A CIA analyst responded to the INR analyst that all agencies had been invited to participate in the analysis. The INR sent another e-mail noting that INR and DOE analysts had been able to review the declaration and make comments, but had left CIA prior to the preparation of the talking points for the NSC. He said INR and DOE analysts did not even know that such points were being prepared or provided to the NSC, but said the CIA was well aware of their positions and should have included them in the points. Although the INR analyst's concerns were passed to the CIA on December 23, 2002, their alternative views also were not included in the December 30, 2002 talking points.

(U) The INR analyst forwarded his e-mail comments to a DOE analyst who responded that "It is most disturbing that WINPAC is essentially directing foreign policy in this matter. There are some very strong points to be made in respect to Iraq's arrogant non-compliance with UN sanctions. However, when individuals attempt to convert those 'strong statements' into the 'knock out' punch, the Administration will ultimately look foolish - i.e. the tubes and Niger!"

G. Nuclear Conclusions

(U) Conclusion 27. After reviewing all of the intelligence provided by the Intelligence Community and additional information requested by the Committee, the Committee believes that the judgment in the National Intelligence Estimate (NIE), that Iraq was reconstituting its nuclear program, was not supported by the intelligence. The Committee agrees with the State Department's Bureau of Intelligence and Research (INR) alternative view that the available intelligence "does not add up to a compelling case for reconstitution."

(U) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

(U) Conclusion 28. The assessments in the National Intelligence Estimate (NIE) regarding the timing of when Iraq had begun reconstituting its nuclear program are unclear and confusing.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 29. Numerous intelligence reports provided to the Committee showed that Iraq was trying to procure high-strength aluminum tubes. The Committee believes that the information available to the Intelligence Community indicated that these tubes were intended to be used for an Iraqi conventional rocket program and not a nuclear program.

([REDACTED]) [REDACTED]

(U) Conclusion 30. The Central Intelligence Agency's (CIA) intelligence assessment on July 2, 2001 that the dimensions of the aluminum tubes "match those of a publicly available gas centrifuge design from the 1950s, known as the Zippe centrifuge" is incorrect. Similar information was repeated by the CIA in its assessments, including its input to the National Intelligence Estimate (NIE), and by the Defense Intelligence Agency (DIA) over the next year and a half.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

(U) Conclusion 31. The Intelligence Community's position in the National Intelligence Estimate (NIE) that the composition and dimensions of the aluminum tubes exceeded the requirements for non nuclear applications, is incorrect.

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

(U) Conclusion 32. The [REDACTED] intelligence report on Saddam Hussein's personal interest in the aluminum tubes, if credible, did suggest that the tube procurement was a high priority, but it did not necessarily suggest that the high priority was Iraq's nuclear program.

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 33. The suggestion in the National Intelligence Estimate (NIE) that Iraq was paying excessively high costs for the aluminum tubes is incorrect. In addition, 7075-T6 aluminum is not considerably more expensive than other more readily available materials for rockets as alleged in the NIE.

(U) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 34. The National Ground Intelligence Center's (NGIC) analysis that the material composition of the tubes was unusual for rocket motor cases was incorrect, contradicted information the NGIC later provided to the Committee, and represented a serious lapse for the agency with primary responsibility for conventional ground forces intelligence analysis.

(U) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) Conclusion 35. Information obtained by the Committee shows that the tubes were [REDACTED] to be manufactured to tolerances tighter than typically requested for rocket systems. The request for tight tolerances had several equally likely explanations other than that the tubes were intended for a centrifuge program, however.

([REDACTED]) [REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 36. Iraq's attempts to procure the tubes through intermediary countries did appear intended to conceal Iraq as the ultimate end user of the tubes, as suggested in the National Intelligence Estimate (NIE). Because Iraq was prohibited from importing any military items, it would have had to conceal itself as the end user whether the tubes were intended for a nuclear program or a conventional weapons program, however.

([REDACTED]) [REDACTED]

([REDACTED]) Conclusion 37. Iraq's persistence in seeking numerous foreign sources for the aluminum tubes was not "inconsistent" with procurement practices as alleged in the National Intelligence Estimate (NIE). Furthermore, such persistence [REDACTED] was more indicative of procurement for a conventional weapons program than a covert nuclear program.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 38. The Central Intelligence Agency's (CIA) initial reporting on its aluminum tube spin tests was, at a minimum, misleading and, in some cases, incorrect. The fact that these tests were not coordinated with other Intelligence Community agencies is an example of continuing problems with information sharing within the Intelligence Community.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

[REDACTED]

(U) Conclusion 39. Iraq's performance of hydrostatic pressure tests on the tubes was more indicative of their likely use for a rocket program than a centrifuge program.

([REDACTED]) [REDACTED]

[REDACTED]

(U) Conclusion 40. Intelligence reports which showed [REDACTED] were portrayed in the National Intelligence Estimate as more definitive than the reporting showed.

[REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

([REDACTED]) **Conclusion 41.** [REDACTED]
[REDACTED] in that it was only presented with
analysis that supported the CIA's conclusions. The team did not discuss the issues with
Department of Energy officials and performed its work in only one day.

([REDACTED]) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

([REDACTED]) [REDACTED]

(U) Conclusion 42. The Director of Central Intelligence was not aware of the views of all intelligence agencies on the aluminum tubes prior to September 2002 and, as a result, could only have passed the Central Intelligence Agency's view along to the President until that time.

([REDACTED]) [REDACTED]

(U) Conclusion 43. Intelligence provided to the Committee did show that Iraq was trying to procure magnets, high-speed balancing machines and machine tools, but this intelligence did not suggest that the materials were intended to be used in a nuclear program.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 44. The statement in the National Intelligence Estimate that “a large number of personnel for the new [magnet] production facility, worked in Iraq’s pre-Gulf War centrifuge program,” was incorrect.

([REDACTED]) [REDACTED]

(U) Conclusion 45. The statement in the National Intelligence Estimate that the Iraqi Atomic Energy Commission was “expanding the infrastructure - research laboratories, production facilities, and procurement networks - to produce nuclear weapons,” is not supported by the intelligence provided to the Committee.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

(U) Conclusion 46. The intelligence provided to the Committee which showed that Iraq had kept its cadre of nuclear weapons personnel trained and in positions that could keep their skills intact for eventual use in a reconstituted nuclear program was compelling, but this intelligence did not show that there was a recent increase in activity that would have been indicative of recent or impending reconstitution of Iraq's nuclear program as was suggested in the National Intelligence Estimate.

([REDACTED]) [REDACTED]

([REDACTED]) [REDACTED]

(U) Conclusion 47. Intelligence information provided to the Committee did show that Saddam Hussein met with Iraqi Atomic Energy Commission personnel and that some security improvements were taking place, but none of the reporting indicated the IAEC was engaged in nuclear weapons related work.

([REDACTED]) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]