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Depiction of Threat Outgrew Supporting Evidence

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His name was Joe, from the U.S. government. He carried 40 classified slides and a message from the Bush administration.

An engineer-turned-CIA analyst, Joe had helped build the U.S. government case that Iraq posed a nuclear threat. He landed in Vienna on Jan. 22 and drove to the U.S. diplomatic mission downtown. In a conference room 32 floors above the Danube River, he told United Nations nuclear inspectors they were making a serious mistake.

At issue was Iraq's efforts to buy high-strength aluminum tubes. The U.S. government said those tubes were for centrifuges to enrich uranium for a nuclear bomb. But the IAEA, the world's nuclear watchdog, had uncovered strong evidence that Iraq was using them for conventional rockets.

Joe described the rocket story as a transparent Iraqi lie. According to people familiar with his presentation, which circulated before and afterward among government and outside specialists, Joe said the specialized aluminum in the tubes was "overspecified," "inappropriate" and "excessively strong." No one, he told the inspectors, would waste the costly alloy on a rocket.

In fact, there was just such a rocket. According to knowledgeable U.S. and overseas sources, experts from U.S. national laboratories reported in December to the Energy Department and U.S. intelligence analysts that Iraq was manufacturing copies of the Italian-made Medusa 81. Not only the Medusa's alloy, but also its dimensions, to the fraction of a millimeter, matched the disputed aluminum tubes.

A CIA spokesman asked that Joe's last name be withheld for his safety, and said he would not be made available for an interview. The spokesman said the tubes in question "are not the same as the Medusa 81" but would not identify what distinguishes them. In an interview, CIA Director George J. Tenet said several different U.S. intelligence agencies believed the tubes could be used to build gas centrifuges for a uranium enrichment program.

The Vienna briefing was one among many private and public forums in which the Bush administration portrayed a menacing Iraqi nuclear threat, even as important features of its evidence were being undermined. There were other White House assertions about forbidden weapons programs, including biological and chemical arms, for which there was consensus among analysts. But the danger of a nuclear-armed Saddam Hussein, more potent as an argument for war, began with weaker evidence and grew weaker still in the three months before war.

This article is based on interviews with analysts and policymakers inside and outside the U.S. government, and access to internal documents and technical evidence not previously made public.

The new information indicates a pattern in which President Bush, Vice President Cheney and their subordinates -- in public and behind the scenes -- made allegations depicting Iraq's nuclear weapons program as more active, more certain and more imminent in its threat than the data they had would support. On occasion administration advocates withheld evidence that did not conform to their views. The White House seldom corrected misstatements or acknowledged loss of confidence in information upon which it had previously relied:

* Bush and others often alleged that President Hussein held numerous meetings with Iraqi nuclear scientists, but did not disclose that the known work of the scientists was largely benign. Iraq's three top gas centrifuge experts, for example, ran a copper factory, an operation to extract graphite from oil and a mechanical engineering design center at Rashidiya.

* The National Intelligence Estimate (NIE) of October 2002 cited new construction at facilities once associated with Iraq's nuclear program, but analysts had no reliable information at the time about what was happening under the roofs. By February, a month before the war, U.S. government specialists on the ground in Iraq had seen for themselves that there were no forbidden activities at the sites.

* Gas centrifuge experts consulted by the U.S. government said repeatedly for more than a year that the aluminum tubes were not suitable or intended for uranium enrichment. By December 2002, the experts said new evidence had further undermined the government's assertion. The Bush administration portrayed the scientists as a minority and emphasized that the experts did not describe the centrifuge theory as impossible.

* In the weeks and months following Joe's Vienna briefing, Secretary of State Colin L. Powell and others continued to describe the use of such tubes for rockets as an implausible hypothesis, even after U.S. analysts collected and photographed in Iraq a virtually identical tube marked with the logo of the Medusa's Italian manufacturer and the words, in English, "81mm rocket."

* The escalation of nuclear rhetoric a year ago, including the introduction of the term "mushroom cloud" into the debate, coincided with the formation of a White House Iraq Group, or WHIG, a task force assigned to "educate the public" about the threat from Hussein, as a participant put it.

Two senior policymakers, who supported the war, said in unauthorized interviews that the administration greatly overstated Iraq's near-term nuclear potential.

"I never cared about the 'imminent threat,' " said one of the policymakers, with directly relevant responsibilities. "The threat was there in Hussein's presence in office. To me, just knowing what it takes to have a nuclear weapons program, he needed a lot of equipment. You can stare at the yellowcake uranium ore; all you want. You need to convert it to gas and enrich it. That does not constitute an imminent threat, and the people who were saying that, I think, did not fully appreciate the difficulties and effort involved in producing the nuclear material and the physics package."

No White House, Pentagon or State Department policymaker agreed to speak on the record for this report about the administration's nuclear case. Answering questions Thursday before the National Association of Black Journalists, national security adviser Condoleezza Rice said she is "certain to this day that this regime was a threat, that it was pursuing a nuclear weapon, that it had biological and chemical weapons, that it had used them." White House officials referred all questions of detail to Tenet.

In an interview and a four-page written statement, Tenet defended the NIE prepared under his supervision in October. In that estimate, U.S. intelligence analysts judged that Hussein was intent on acquiring a nuclear weapon and was trying to rebuild the capability to make one.

"We stand behind the judgments of the NIE" based on the evidence available at the time, Tenet said, and "the soundness and integrity of our process." The estimate was "the product of years of reporting and intelligence collection, analyzed by numerous experts in several different agencies."

Tenet said the time to "decide who was right and who was wrong" about prewar intelligence will not come until the Iraqi Survey Group, the CIA-directed, U.S. military postwar study in Iraq of Hussein's weapons of mass destruction programs is completed. The Bush administration has said this will require months or years.

The possibility of a nuclear-armed Iraq loomed large in the Bush administration's efforts to convince the American public of the need for a preemptive strike. Beginning last August, Cheney portrayed Hussein's nuclear ambitions as a "mortal threat" to the United States. In the fall and winter, Rice, then Bush, marshaled the dreaded image of a "mushroom cloud."

By many accounts, including those of career officials who did not support the war, there were good reasons for concern that the Iraqi president might revive a program to enrich uranium to weapons grade and fabricate a working bomb. He had a well-demonstrated aspiration for nuclear weapons, a proficient scientific and engineering cadre, a history of covert development and a domestic supply of unrefined uranium ore. Iraq was generally believed to have kept the technical documentation for two advanced German centrifuge designs and the assembly diagrams for at least one type of "implosion device," which detonates a nuclear core.

What Hussein did not have was the principal requirement for a nuclear weapon, a sufficient quantity of highly enriched uranium or plutonium. And the U.S. government, authoritative intelligence officials said, had only circumstantial evidence that Iraq was trying to obtain those materials.

But the Bush administration had reasons to imagine the worst. The CIA had faced searing criticism for its failures to foresee India's resumption of nuclear testing in 1998 and to "connect the dots" pointing to al Qaeda's attacks of Sept. 11, 2001. Cheney, the administration's most influential advocate of a worst-case analysis, had been powerfully influenced by his experience as defense secretary just after the Persian Gulf War of 1991.

Former National Security Council official Richard A. Clarke recalled how information from freshly seized Iraqi documents disclosed the existence of a "crash program" to build a bomb in 1991. The CIA had known nothing of it.

"I can understand why that was a seminal experience for Cheney," Clarke said. "And when the CIA says 'in 2002' 'We don't have any evidence,' his reaction is . . . 'We didn't have any evidence in 1991, either. Why should I believe you now?' "

Some strategists, in and out of government, argued that the uncertainty itself -- in the face of circumstantial evidence -- was sufficient to justify "regime change." But that was not what the Bush administration usually said to the American people.

To gird a nation for the extraordinary step of preemptive war -- and to obtain the minimum necessary support from allies, Congress and the U.N. Security Council -- the administration described a growing, even imminent, nuclear threat from Iraq.

The unveiling of that message began a year ago this week.

Cheney raised the alarm about Iraq's nuclear menace three times in August. He was far ahead of the

president's public line. Only Bush and Cheney know, one senior policy official said, "whether Cheney was trying to push the president or they had decided to play good cop, bad cop."

On Aug. 7, Cheney volunteered in a question-and-answer session at the Commonwealth Club in San Francisco, speaking of Hussein, that "left to his own devices, it's the judgment of many of us that in the not-too-distant future, he will acquire nuclear weapons." On Aug. 26, he described Hussein as a "sworn enemy of our country" who constituted a "mortal threat" to the United States. He foresaw a time in which Hussein could "subject the United States or any other nation to nuclear blackmail."

"We now know that Saddam has resumed his efforts to acquire nuclear weapons," he said. "Among other sources, we've gotten this from firsthand testimony from defectors, including Saddam's own son-in-law."

That was a reference to Hussein Kamel, who had managed Iraq's special weapons programs before defecting in 1995 to Jordan. But Saddam Hussein lured Kamel back to Iraq, and he was killed in February 1996, so Kamel could not have sourced what U.S. officials "now know."

And Kamel's testimony, after defecting, was the reverse of Cheney's description. In one of many debriefings by U.S., Jordanian and U.N. officials, Kamel said on Aug. 22, 1995, that Iraq's uranium enrichment programs had not resumed after halting at the start of the Gulf War in 1991. According to notes typed for the record by U.N. arms inspector Nikita Smidovich, Kamel acknowledged efforts to design three different warheads, "but not now, before the Gulf War."

Systematic coordination began in August, when Chief of Staff Andrew H. Card Jr. formed the White House Iraq Group, or WHIG, to set strategy for each stage of the confrontation with Baghdad. A senior official who participated in its work called it "an internal working group, like many formed for priority issues, to make sure each part of the White House was fulfilling its responsibilities."

In an interview with the New York Times published Sept. 6, Card did not mention the WHIG but hinted at its mission. "From a marketing point of view, you don't introduce new products in August," he said.

The group met weekly in the Situation Room. Among the regular participants were Karl Rove, the president's senior political adviser; communications strategists Karen Hughes, Mary Matalin and James R. Wilkinson; legislative liaison Nicholas E. Calio; and policy advisers led by Rice and her deputy, Stephen J. Hadley, along with I. Lewis Libby, Cheney's chief of staff.

The first days of September would bring some of the most important decisions of the prewar period: what to demand of the United Nations in the president's Sept. 12 address to the General Assembly, when to take the issue to Congress, and how to frame the conflict with Iraq in the midterm election campaign that began in earnest after Labor Day.

A "strategic communications" task force under the WHIG began to plan speeches and white papers. There were many themes in the coming weeks, but Iraq's nuclear menace was among the most prominent.

The day after publication of Card's marketing remark, Bush and nearly all his top advisers began to talk about the dangers of an Iraqi nuclear bomb.

Bush and Prime Minister Tony Blair conferred at Camp David that Saturday, Sept. 7, and they each described alarming new evidence. Blair said proof that the threat is real came in "the report from the International Atomic Energy Agency this morning, showing what has been going on at the former nuclear weapon sites." Bush said "a report came out of the . . . IAEA, that they [Iraqis] were six

months away from developing a weapon. I don't know what more evidence we need."

There was no new IAEA report. Blair appeared to be referring to news reports describing curiosity at the nuclear agency about repairs at sites of Iraq's former nuclear program. Bush cast as present evidence the contents of a report from 1996, updated in 1998 and 1999. In those accounts, the IAEA described the history of an Iraqi nuclear weapons program that arms inspectors had systematically destroyed.

A White House spokesman later acknowledged that Bush "was imprecise" on his source but stood by the crux of his charge. The spokesman said U.S. intelligence, not the IAEA, had given Bush his information.

That, too, was garbled at best. U.S. intelligence reports had only one scenario for an Iraqi bomb in six months to a year, premised on Iraq's immediate acquisition of enough plutonium or enriched uranium from a foreign source.

"That is just about the same thing as saying that if Iraq gets a bomb, it will have a bomb," said a U.S. intelligence analyst who covers the subject. "We had no evidence for it."

Two debuts took place on Sept. 8: the aluminum tubes and the image of "a mushroom cloud." A Sunday New York Times story quoted anonymous officials as saying the "diameter, thickness and other technical specifications" of the tubes -- precisely the grounds for skepticism among nuclear enrichment experts -- showed that they were "intended as components of centrifuges."

No one knows when Iraq will have its weapon, the story said, but "the first sign of a 'smoking gun,' they argue, may be a mushroom cloud."

Top officials made the rounds of Sunday talk shows that morning. Rice's remarks echoed the newspaper story. She said on CNN's "Late Edition" that Hussein was "actively pursuing a nuclear weapon" and that the tubes -- described repeatedly in U.S. intelligence reports as "dual-use" items -- were "only really suited for nuclear weapons programs, centrifuge programs."

"There will always be some uncertainty about how quickly he can acquire nuclear weapons," Rice added, "but we don't want the smoking gun to be a mushroom cloud."

Anna Perez, a communications adviser to Rice, said Rice did not come looking for an opportunity to say that. "There was nothing in her mind that said, 'I have to push the nuclear issue,'" Perez said, "but Wolf & Blitzer" asked the question."

Powell, a confidant said, found it "disquieting when people say things like mushroom clouds." But he contributed in other ways to the message. When asked about biological and chemical arms on Fox News, he brought up nuclear weapons and cited the "specialized aluminum tubing" that "we saw in reporting just this morning."

Cheney, on NBC's "Meet the Press," also mentioned the tubes and said "increasingly, we believe the United States will become the target" of an Iraqi nuclear weapon. Defense Secretary Donald H. Rumsfeld, on CBS's "Face the Nation," asked listeners to "imagine a September 11th with weapons of mass destruction," which would kill "tens of thousands of innocent men, women and children."

Bush evoked the mushroom cloud on Oct. 7, and on Nov. 12 Gen. Tommy R. Franks, chief of U.S. Central Command, said inaction might bring "the sight of the first mushroom cloud on one of the major population centers on this planet."

In its initial meetings, Card's Iraq task force ordered a series of white papers. After a general survey of Iraqi arms violations, the first of the single-subject papers -- never published -- was "A Grave and Gathering Danger: Saddam Hussein's Quest for Nuclear Weapons."

Wilkinson, at the time White House deputy director of communications for planning, gathered a yard-high stack of intelligence reports and press clippings.

Wilkinson said he conferred with experts from the National Security Council and Cheney's office. Other officials said Will Tobey and Susan Cook, working under senior director for counterproliferation Robert Joseph, made revisions and circulated some of the drafts. Under the standard NSC review process, they checked the facts.

In its later stages, the draft white paper coincided with production of a National Intelligence Estimate and its unclassified summary. But the WHIG, according to three officials who followed the white paper's progress, wanted gripping images and stories not available in the hedged and austere language of intelligence.

The fifth draft of the paper was obtained by The Washington Post. White House spokesmen dismissed the draft as irrelevant because Rice decided not to publish it. Wilkinson said Rice and Joseph felt the paper "was not strong enough."

The document offers insight into the Bush administration's priorities and methods in shaping a nuclear message. The white paper was assembled by some of the same team, and at the same time, as the speeches and talking points prepared for the president and top officials. A senior intelligence official said last October that the president's speechwriters took "literary license" with intelligence, a phrase applicable to language used by administration officials in some of the white paper's most emotive and misleading assertions elsewhere.

The draft white paper precedes other known instances in which the Bush administration considered the now-discredited claim that Iraq "sought uranium oxide, an essential ingredient in the enrichment process, from Africa." For a speechwriter, uranium was valuable as an image because anyone could see its connection to an atomic bomb. Despite warnings from intelligence analysts, the uranium would return again and again, including the Jan. 28 State of the Union address and three other Bush administration statements that month.

Other errors and exaggerations in public White House claims were repeated, or had their first mention, in the white paper.

Much as Blair did at Camp David, the paper attributed to U.N. arms inspectors a statement that satellite photographs show "many signs of the reconstruction and acceleration of the Iraqi nuclear program." Inspectors did not say that. The paper also quoted the first half of a sentence from a Time magazine interview with U.N. chief weapons inspector Hans Blix: "You can see hundreds of new roofs in these photos." The second half of the sentence, not quoted, was: "but you don't know what's under them."

As Bush did, the white paper cited the IAEA's description of Iraq's defunct nuclear program in language that appeared to be current. The draft said, for example, that "since the beginning of the nineties, Saddam has launched a crash program to divert nuclear reactor fuel for . . . nuclear weapons." The crash program began in late 1990 and ended with the war in January 1991. The reactor fuel, save for waste products, is gone.

A senior intelligence official said the White House preferred to avoid a National Intelligence Estimate, a formal review of competing evidence and judgments, because it knew "there were disagreements over details in almost every aspect of the administration's case against Iraq." The president's advisers, the official said,

did not want "a lot of footnotes and disclaimers."

But Bush needed bipartisan support for war-making authority in Congress. In early September, members of the Senate Select Committee on Intelligence began asking why there had been no authoritative estimate of the danger posed by Iraq. Sen. Richard J. Durbin (D-Ill.) wrote Sept. 9 of his "concern that the views of the U.S. intelligence community are not receiving adequate attention by policymakers in both Congress and the executive branch." When Sen. Bob Graham (D-Fla.), then committee chairman, insisted on an NIE in a classified letter two days later, Tenet agreed.

Explicitly intended to assist Congress in deciding whether to authorize war, the estimate was produced in two weeks, an extraordinary deadline for a document that usually takes months. Tenet said in an interview that "we had covered parts of all those programs over 10 years through NIEs and other reports, and we had a ton of community product on all these issues."

Even so, the intelligence community was now in a position of giving its first coordinated answer to a question that every top national security official had already answered. "No one outside the intelligence community told us what to say or not to say," Tenet wrote in reply to questions for this article.

The U.S. government possessed no specific information on Iraqi efforts to acquire enriched uranium, according to six people who participated in preparing for the estimate. It knew only that Iraq sought to buy equipment of the sort that years of intelligence reports had said "may be" intended for or "could be" used in uranium enrichment.

Richard J. Kerr, a former CIA deputy director now leading a review of the agency's intelligence analysis about Iraq, said in an interview that the CIA collected almost no hard information about Iraq's weapons programs after the departure of IAEA and U.N. Special Commission, or UNSCOM, arms inspectors during the Clinton administration. He said that was because of a lack of spies inside Iraq.

Tenet took issue with that view, saying in an interview, "When inspectors were pushed out in 1998, we did not sit back. . . . The fact is we made significant professional progress." In his written statement, he cited new evidence on biological and missile programs, but did not mention Hussein's nuclear pursuits.

The estimate's "Key Judgment" said: "Although we assess that Saddam does not yet have nuclear weapons or sufficient material to make any, he remains intent on acquiring them. Most agencies assess that Baghdad started reconstituting its nuclear program about the time that UNSCOM inspectors departed -- December 1998."

According to Kerr, the analysts had good reasons to say that, but the reasons were largely "inferential."

Hussein was known to have met with some weapons physicists, and praised them as "nuclear mujahedeen." But the CIA had "reasonably good intelligence in terms of the general activities and whereabouts" of those scientists, said another analyst with the relevant clearances, and knew they had generally not reassembled into working groups. In a report to Congress in 2001, the agency could conclude only that some of the scientists "probably" had "continued at least low-level theoretical R&D & research and development"; associated with its nuclear program."

Analysts knew Iraq had tried recently to buy magnets, high-speed balancing machines, machine tools and other equipment that had some potential for use in uranium enrichment, though no less for conventional industry. Even assuming the intention, the parts could not all be made to fit a coherent centrifuge model. The estimate acknowledged that "we lack specific information on many key aspects" of the program, and

analysts presumed they were seeing only the tip of the iceberg.

According to outside scientists and intelligence officials, the most important factor in the CIA's nuclear judgment was Iraq's attempt to buy high-strength aluminum tubes. The tubes were the core evidence for a centrifuge program tied to building a nuclear bomb. Even circumstantially, the CIA reported no indication of uranium enrichment using anything but centrifuges.

That interpretation of the tubes was a victory for the man named Joe, who made the issue his personal crusade. He worked in the gas centrifuge program at Oak Ridge National Laboratory in the early 1980s. He is not, associates said, a nuclear physicist, but an engineer whose work involved the platform upon which centrifuges were mounted.

At some point he joined the CIA. By the end of the 1990s, according to people who know him casually, he worked in export controls.

Joe played an important role in discovering Iraq's plans to buy aluminum tubes from China in 2000, with an Australian intermediary. U.N. sanctions forbade Iraq to buy anything with potential military applications, and members of the Nuclear Suppliers Group, a voluntary alliance, include some forms of aluminum tubing on their list of equipment that could be used for uranium enrichment.

Joe saw the tubes as centrifuge rotors that could be used to process uranium into weapons-grade material. In a gas centrifuge, the rotor is a thin-walled cylinder, open at both ends, that spins at high speed under a magnet. The device extracts the material used in a weapon from a gaseous form of uranium.

In July 2001, about 3,000 tubes were intercepted in Jordan on their way to Iraq, a big step forward in the agency's efforts to understand what Iraq was trying to do. The CIA gave Joe an award for exceptional performance, throwing its early support to an analysis that helped change the agency's mind about Iraq's pursuit of nuclear ambitions.

"He grabbed that information early on, and he made a name for himself," a career U.S. government nuclear expert said.

Doubts about Joe's theory emerged quickly among the government's centrifuge physicists. The intercepted tubes were too narrow, long and thick-walled to fit a known centrifuge design. Aluminum had not been used for rotors since the 1950s. Iraq had two centrifuge blueprints, stolen in Europe, that were far more efficient and already known to work. One used maraging steel, a hard steel alloy, for the rotors, the other carbon fiber.

Joe and his supporters said the apparent drawbacks were part of Iraq's concealment plan. Hussein's history of covert weapons development, Tenet said in his written statement, included "built-in cover stories."

"This is a case where different people had honorable and different interpretations of intentions," said an Energy Department analyst who has reviewed the raw data. "If you go to a nuclear [counterproliferation official] and say I've got these aluminum tubes, and it's about Iraq, his first inclination is to say it's for nuclear use."

But the government's centrifuge scientists -- at the Energy Department's Oak Ridge National Laboratory and its sister institutions -- unanimously regarded this possibility as implausible.

In late 2001, experts at Oak Ridge asked an alumnus, Houston G. Wood III, to review the controversy.

Wood, founder of the Oak Ridge centrifuge physics department, is widely acknowledged to be among the most eminent living experts.

Speaking publicly for the first time, Wood said in an interview that "it would have been extremely difficult to make these tubes into centrifuges. It stretches the imagination to come up with a way. I do not know any real centrifuge experts that feel differently."

As an academic, Wood said, he would not describe "anything that you absolutely could not do." But he said he would "like to see, if they're going to make that claim, that they have some explanation of how you do that. Because I don't see how you do it."

A CIA spokesman said the agency does have support for its view from centrifuge experts. He declined to elaborate.

In the last week of September, the development of the NIE required a resolution of the running disagreement over the significance of the tubes. The Energy Department had one vote. Four agencies -- with specialties including eavesdropping, maps and foreign military forces -- judged that the tubes were part of a centrifuge program that could be used for nuclear weapons. Only the State Department's Bureau of Intelligence and Research joined the judgment of the Energy Department. The estimate, as published, said that "most analysts" believed the tubes were suitable and intended for a centrifuge cascade.

Majority votes make poor science, said Peter D. Zimmerman, a former chief scientist at the Arms Control and Disarmament Agency.

"In this case, the experts were at Z Division at Livermore & Lawrence Livermore National Laboratory and in DOE intelligence here in town, and they were convinced that no way in hell were these likely to be centrifuge tubes," he said.

Tenet said the Department of Energy was not the only agency with experts on the issue; the CIA consulted military battlefield rocket experts, as well as its own centrifuge experts.

On Feb. 5, two weeks after Joe's Vienna briefing, Powell gave what remains the government's most extensive account of the aluminum tubes, in an address to the U.N. Security Council. He did not mention the existence of the Medusa rocket or its Iraqi equivalent, though he acknowledged disagreement among U.S. intelligence analysts about the use of the tubes.

Powell's CIA briefers, using data originating with Joe, told him that Iraq had "overspecified" requirements for the tubes, increasing expense without making them more useful to rockets. That helped persuade Powell, a confidant said, that Iraq had some other purpose for the tubes.

"Maybe Iraqis just manufacture their conventional weapons to a higher standard than we do, but I don't think so," Powell said in his speech. He said different batches "seized clandestinely before they reached Iraq" showed a "progression to higher and higher levels of specification, including in the latest batch an anodized coating on extremely smooth inner and outer surfaces. . . . Why would they continue refining the specification, go to all that trouble for something that, if it was a rocket, would soon be blown into shrapnel when it went off?"

An anodized coating is actually a strong argument for use in rockets, according to several scientists in and out of government. It resists corrosion of the sort that ruined Iraq's previous rocket supply. To use the tubes in a centrifuge, experts told the government, Iraq would have to remove the anodized coating.

Iraq did change some specifications from order to order, the procurement records show, but there is not a clear progression to higher precision. One tube sample was rejected because its interior was unfinished, too uneven to be used in a rocket body. After one of Iraq's old tubes got stuck in a launcher and exploded, Baghdad's subsequent orders asked for more precision in roundness.

U.S. and European analysts said they had obtained records showing that Italy's Medusa rocket has had its specifications improved 10 times since 1978. Centrifuge experts said in interviews that the variations had little or no significance for uranium enrichment, especially because the CIA's theory supposes Iraq would do extensive machining to adapt the tubes as rotors.

For rockets, however, the tubes fit perfectly. Experts from U.S. national labs, working temporarily with U.N. inspectors in Iraq, observed production lines for the rockets at the Nasser factory north of Baghdad. Iraq had run out of body casings at about the time it ordered the aluminum tubes, according to officials familiar with the experts' reports. Thousands of warheads, motors and fins were crated at the assembly lines, awaiting the arrival of tubes.

"Most U.S. experts," Powell asserted, "think they are intended to serve as rotors in centrifuges used to enrich uranium." He said "other experts, and the Iraqis themselves," said the tubes were really for rockets.

Wood, the centrifuge physicist, said "that was a personal slam at everybody in DOE," the Energy Department. "I've been grouped with the Iraqis, is what it amounts to. I just felt that the wording of that was probably intentional, but it was also not very kind. It did not recognize that dissent can exist."

Staff writers Glenn Kessler, Dana Priest and Richard Morin and staff researchers Lucy Shackelford, Madonna Lebling and Robert Thomason contributed to this report.