Iraq: WMD and Delivery Capabilities After Operation Desert Fox ~~(S)~~

A Joint Intelligence Report

~~Secret~~

OTI 99-10005
NPC 99-003
NIR 30223-99
February 1999

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Iraq: WMD and Delivery Capabilities After Operation Desert Fox ~~(S)~~

A Joint Intelligence Report

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Iraq: WMD and Delivery Capabilities After Operation Desert Fox ~~(S)~~

Executive Summary

During Operation Desert Fox, conducted against Iraq during the period 16-19 December 1998, 16 sites related to weapons of mass destruction (WMD) were damaged. These sites supported Iraq's known liquid-propellant ballistic missile program; development of the L-29 unmanned aerial vehicle (UAV), which we assess to have a WMD delivery role; suspect chemical and biological warfare development; double-base solid-propellant motor development (for explosives and artillery weapons); and military R&D:

- Several important developmental and industrial capabilities at these WMD facilities were damaged or destroyed, including equipment and machinery at some sites where dispersal was not possible or fully achieved before the airstrikes. ***We believe that some destroyed equipment and certain structures were one-of-a-kind elements supporting Iraq's WMD programs that will have to be replaced in order to restore pre-strike capabilities.***

- 25X1

  25X1 ***Critical pieces of equipment that could be moved to safety almost certainly were.***

- The airstrikes occurred late at night, minimizing loss of life and collateral damage. ***Iraq probably retains the personnel, documentation, and much of the critical equipment necessary to continue and advance its WMD and delivery programs.*** ~~(S NF)~~

The damage to structures and equipment caused by airstrikes to known liquid-propellant missile-related facilities could take one to two years to rebuild. ***By using alternate facilities and redundant capabilities, however, Iraq's known liquid-propellant missile development program could be operating at prestrike levels within one year. In addition, Iraq probably retains a small, covert force of Scud-type ballistic missiles and launchers hidden from UN inspectors.*** The airstrikes probably had no impact on Iraq's current assessed capability to strike its neighbors with such missiles, which could be armed with chemical or biological warheads. ~~(S NF)~~

The airstrikes probably had little impact on Iraq's UAV program, and few of the chemical, biological, and nuclear facilities were targeted:

- ***Many of the critical elements associated with Iraq's L-29 UAV program probably escaped destruction during Operation Desert Fox.***

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- ***Iraq retains significant capabilities that could help it resume full-scale nuclear, biological, and chemical weapons programs, and R&D activities probably are ongoing. Moreover, the chemical and biological weapons programs can be scaled up rapidly.*** ~~(S NF)~~

Contents

Figure 1
Iraqi WMD Sites Damaged During Operation Desert Fox ~~(S NF)~~

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WMD Related Sites (U)

Of the many sites struck during Operation Desert Fox, 16 were associated with weapons of mass destruction (WMD) production or development (see figure 1). Of those facilities, nine supported liquid-propellant ballistic missile development; one was primarily a SAM maintenance and repair facility that contributed components to ongoing liquid-propellant ballistic missile R&D authorized by the United Nations; three supported development of the L-29 unmanned aerial vehicle (UAV), which we assess to have a WMD delivery role; one was associated with suspected chemical and biological agent production; one supported double-base solid-propellant development, primarily for explosives and artillery weapons; and one was the headquarters for all military industry (including WMD). ~~(S NF)~~

Iraq's Ballistic Missile Program (U)

After the Gulf war in 1991, Iraq was authorized by the United Nations to possess and/or develop short-range ballistic missiles (SRBMs) with ranges not to exceed 150 km. Iraq used this opportunity to develop both liquid-propellant and composite solid-propellant missile systems. The liquid-propellant program—known as the Al Samoud SRBM—advanced steadily while the composite solid-propellant program—known as the Ababil-100 SRBM—lagged behind (see figure 2). Both systems probably were being used to maintain the skills and production infrastructure for Iraq's eventual return to longer range missile production. ~~(S NF)~~

Flight-testing of the Al Samoud started in October 1997 and continued through October 1998. Of the nine test launch attempts to date, four Al Samoud missiles cleared the launcher and traveled downrange. The longest range attained was reported to be approximately 112 km, but the assessed range of the system remains 150 to 180 km. Work continued on composite solid-propellant initiatives before and after the 1991 Gulf war, with the Ababil-100 receiving increased priority in 1997, although we assess it to be in the design and developmental stage. ~~(S NF)~~

Equipment Dispersal

Iraq's known ballistic missile facilities were the hardest hit WMD sites during the airstrikes. Before the Operation Desert Fox airstrikes, Baghdad effectively was warned that airstrikes were imminent when the UN Special Commission (UNSCOM) inspectors left. ***Large-scale dispersal activity at most of the targeted sites probably began as soon as the inspectors began to leave, thus giving Iraq roughly 18 hours to prepare.*** 25X1 25X1 25X1 (see figure 3):

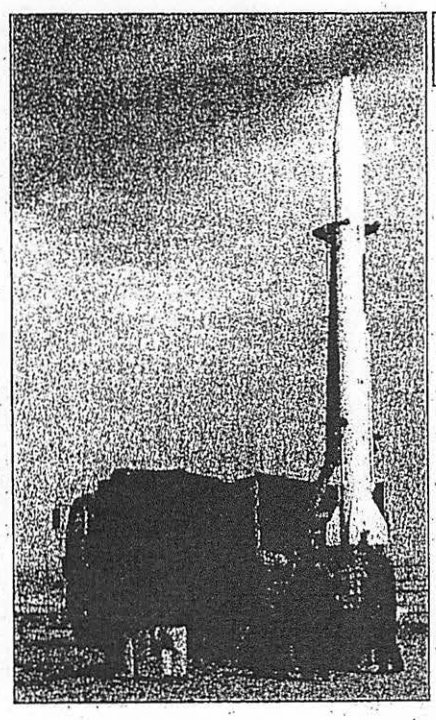
- After the initial wave of strikes, officials at Mosul Al Kindi—a key missile R&D facility—reported only minor damage after receiving five cruise missile strikes, 25X1 The officials noted previous discussions regarding the removal of equipment before the airstrikes.

- Dispersed machinery 25X1 17 and 18 December at the Al Karama Electronics Plant, the Ibn Al Haytham Missile R&D Center, and the Mosul Al Kindi R&D Center, 25X1 25X1 25X1 (see figures 4, 5, 6). These three facilities are the primary known liquid-propellant ballistic missile development and production sites in Iraq. ~~(S NF)~~

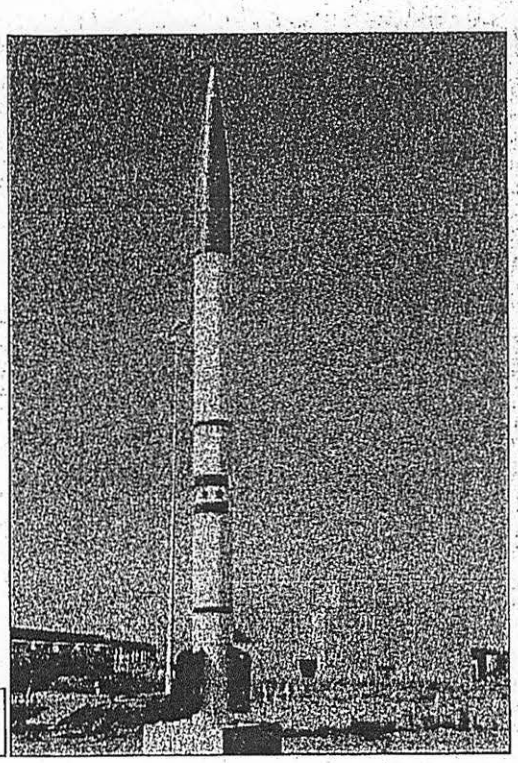
25X1 25X1 ***Iraq has become well versed in the art of equipment dispersal as a result of several crises and actual attacks experienced over the past eight years***:

Figure 2

Iraqi SRBMs Under Development ~~(S NF)~~



Al Samoud SRBM on indigenous transporter-erector-launcher ready for flight-test.



Notional design for the Ababil-100 SRBM. This system is in the early stages of development.

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Figure 3

Iraq: Ballistic Missile Facility Functions and Capabilities (S NF)	
Location	**Function and Capability Degradation**
Al Karama Electronics Plant	Primary R&D facility for the Al Samoud—particularly guidance and control (G&C), but also engine, airframe, and warhead development. 25X1
Ibn Al Haytham Missile R&D Center	Leading facility for engine component production and airframe production and assembly. Also launcher development for the Al Samoud and other missile systems. 25X1 25X1
Mosul R&D Center Al Kindi	Primary R&D facility for aerodynamic testing, solid-propellant R&D, and G&C development for ballistic missiles. 25X1 25X1
Zaafaraniyah Nuclear Fabrication (Al Nida Moulds)	Machining complex that supported development of ballistic missiles, including production of solid-propellant mixing bowls. 25X1 25X1
Taji Steel Fabrication (Tho Al Fekar)	Primary steel plant supporting the military industries and ballistic missile development. 25X1 25X1
Khan Azad Production Plant (Badr State Establishment)	Large machining complex supporting the military industries, including ballistic missile production. 25X1 25X1
Baghdad State Establishment for Heavy Engineering (Al Dawrah)	Heavy machining and metal-forming facility supporting the military industries, including ballistic missile warheads and CW/BW vessels 25X1 25X1
Latifiyah Liquid–Propellant Production Facility	Primary facility supporting explosives and attempted IRFNA production. 25X1 25X1
Shahiyat Liquid-Engine Testing Facility (Al Rafah)	Only known liquid-engine test stand in Iraq. 25X1 25X1
Iraq: Other WMD Facility Functions and Capabilities ~~(S NF)~~	
Habbaniyah I Suspect CW/BW Production Facility	Facility suspected of supporting production of the BW toxin ricin. 25X1 25X1
Taji SAM Maintenance & Repair Facility (Al Harith)	Primary SAM maintenance and repair facility that contributed to Al Samoud SRBM development. 25X1 25X1
Latifiyah Explosives and Ammunition Plant	Facility supporting development of double-base solid-propellant for artillery and explosives, to include RDX that can be used in composite solid-propellants and warheads. 25X1
Al Sahra Airfield	Airfield supporting development of the L-29 UAV. 25X1 25X1
Samarra East Airfield	Airfield supporting development of the L-29 UAV. 25X1 25X1
Tallil Airfield	Airfield supporting development of the L-29 UAV. 25X1
Ministry of Industry and Military Industrialization	Headquarters for the military industry, including WMD. 25X1 25X1

Figure 4

Poststrike Dispersal Area at the Al Karama Electronics Plant
Baghdad, Iraq
17 December 1998 ~~(S Rel UK CAN AUS)~~

25X1

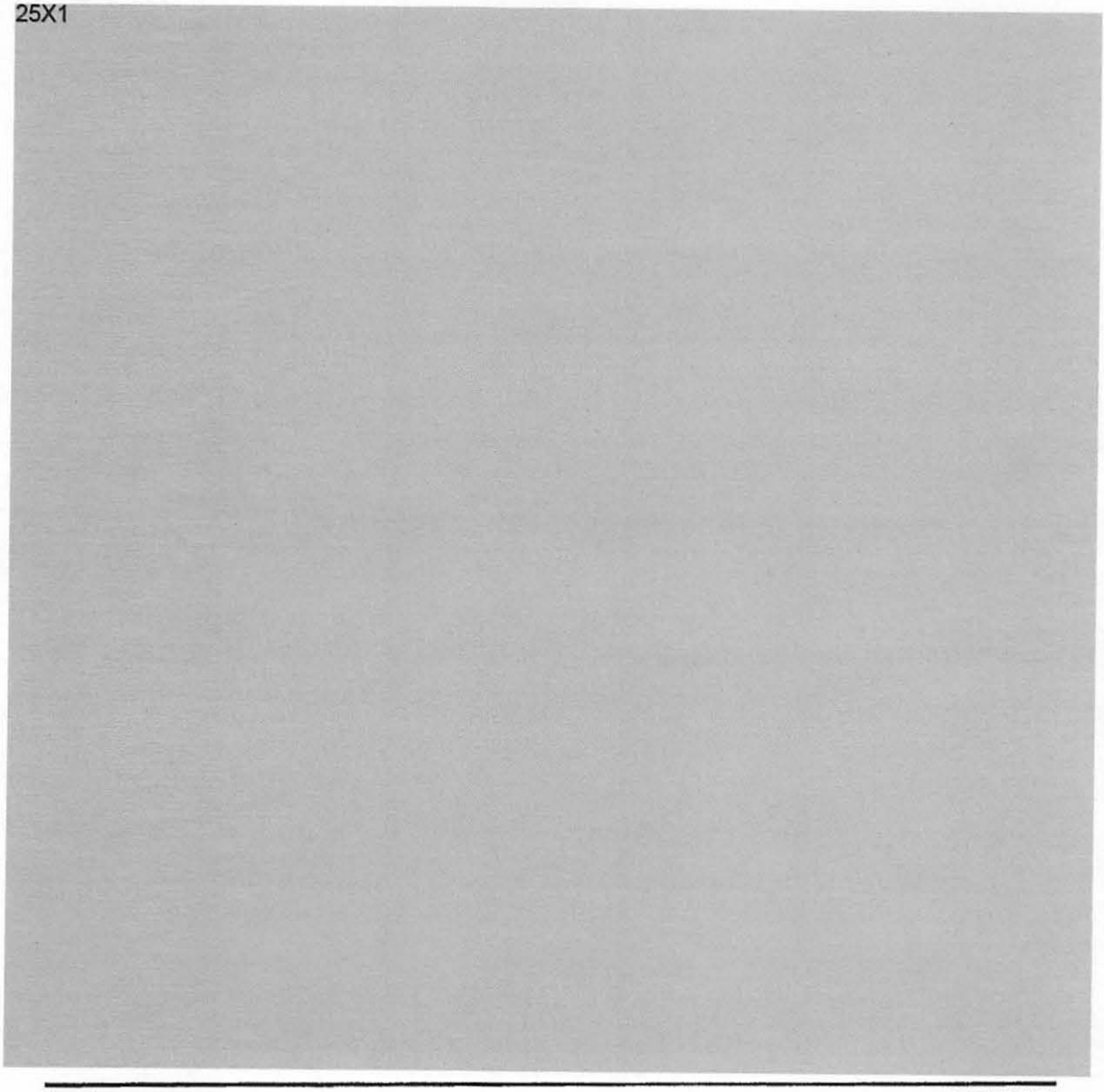

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Figure 5

Poststrike Dispersal Areas at Ibn Al Haytham Missile R&D Center
Baghdad, Iraq
18 December 1998 ~~(S Rel UK CAN AUS)~~

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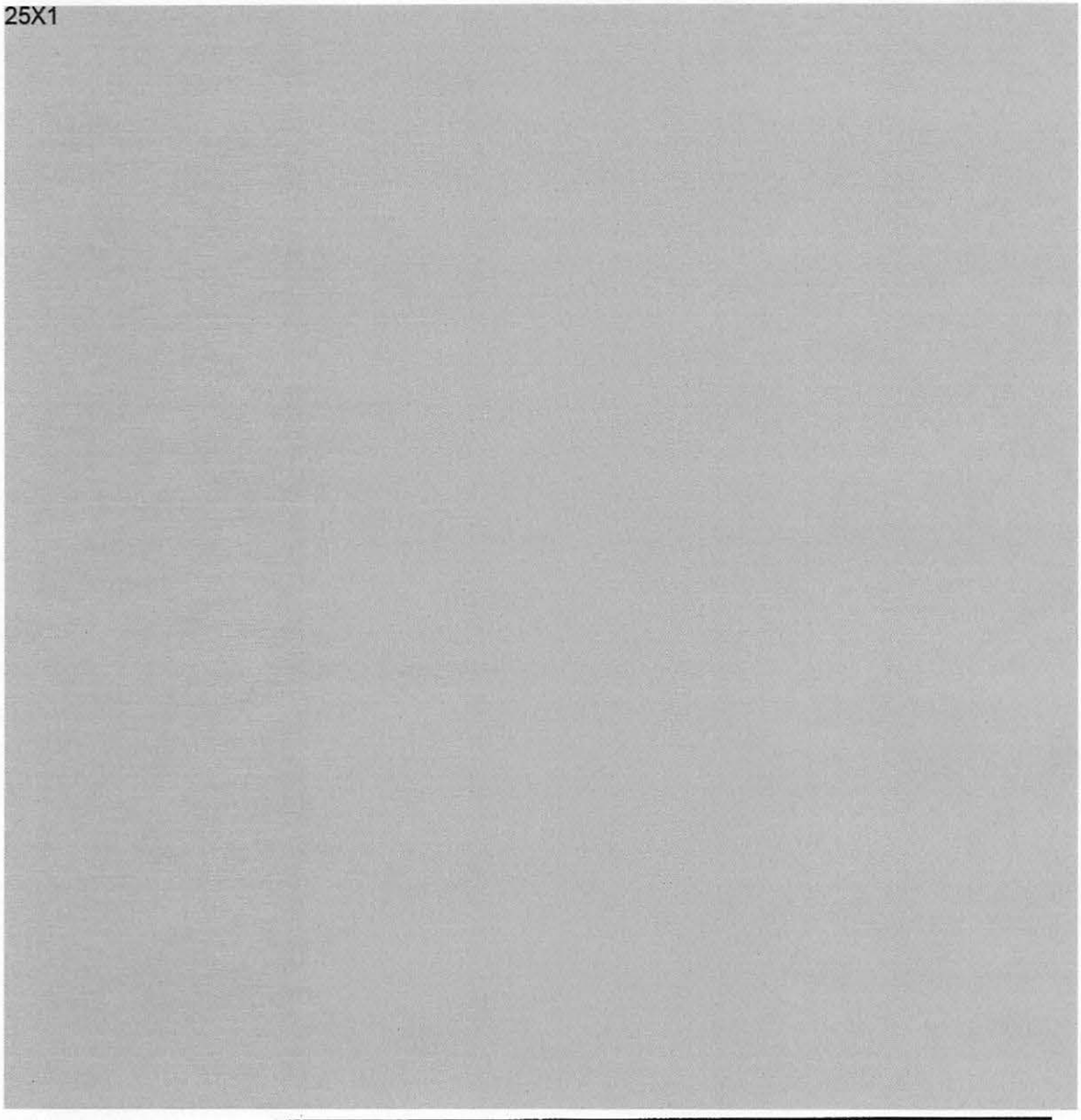

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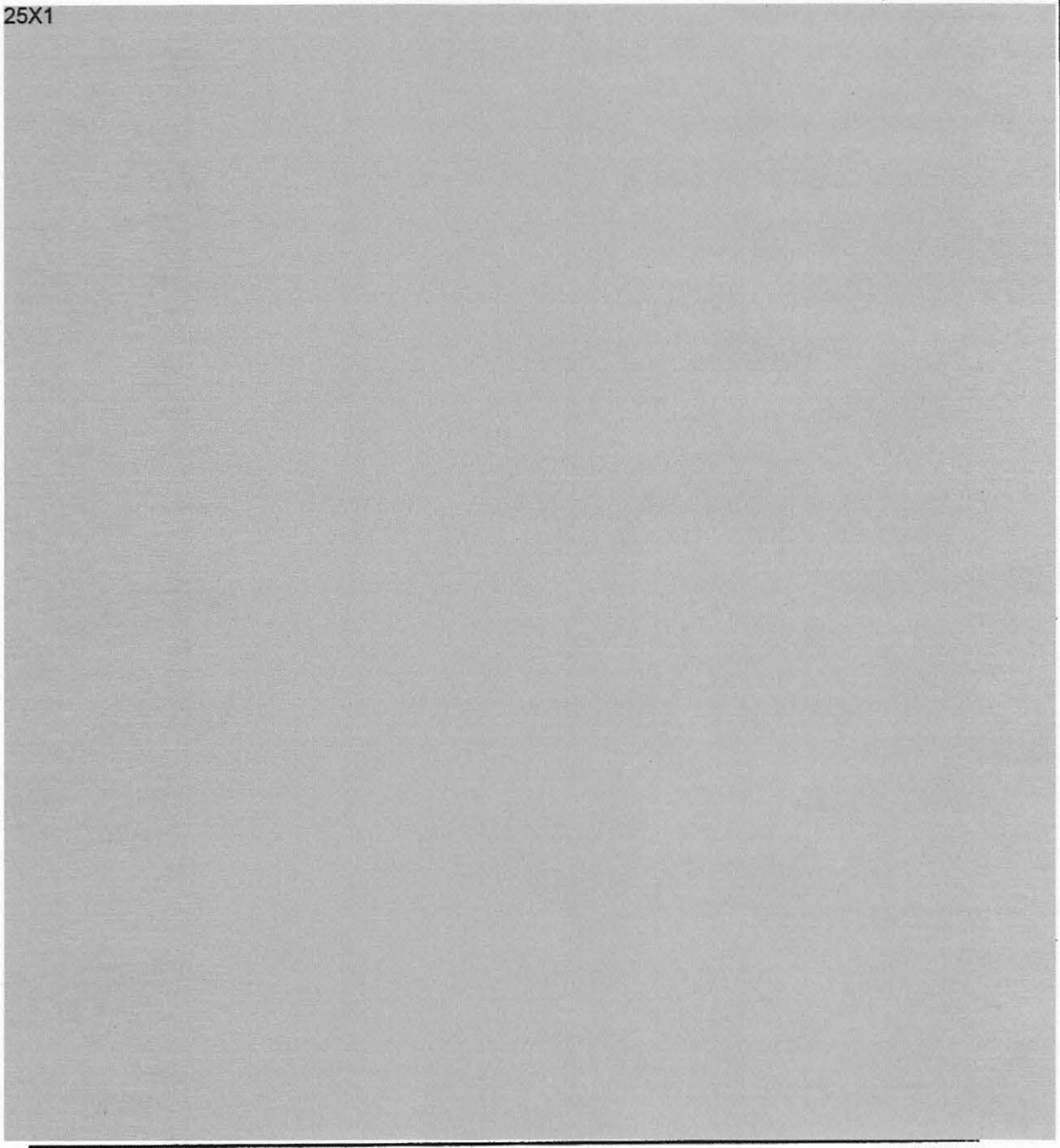
Figure 6

Poststrike Dispersal Areas at the Mosul Al Kindi R&D Facility
Mosul, Iraq
17 December 1998 ~~(S Rel UK CAN AUS)~~

25X1



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- In November 1998, 25X1 that equipment had been dispersed at Mosul Al Kindi and Al Nida missile sites shortly after the UNSCOM inspectors had been withdrawn (see figures 7 and 8).

- At Mosul Al Kindi, Al Nida, and other sites 25X1 25X1 from November 1997 and November and December 1998 25X1 that the Iraqis dispersed equipment to the same areas (figures 6 and 7). ~~(S NF)~~

Even with a leadtime of at least 18 hours, some large equipment could not be moved and probably was destroyed:

- The Boldrini press at Al Dawrah—identified as a missile facility but also having chemical weapons and biological weapons utility—was probably destroyed. This was the only known press of this type in Iraq, but its contribution to the missile program was minimal, mainly supporting missile warhead and airframe production. This press was more suitable for manufacturing large pressure vessels for use in Iraq's chemical and biological warfare programs. Iraq probably retains other hydraulic presses to support the missile program.

- A large vacuum furnace that had recently been installed at Ibn Al Haytham may have been damaged. This furnace was fairly unique because of its size and ability to support Scud-size engine production. Iraq has smaller vacuum furnaces that will allow it to continue Al Samoud–class engine development, but larger engine production will be difficult without this furnace.

- Wind tunnels at Mosul Al Kindi—believed to be the only two operational wind tunnels in Iraq—probably were destroyed. This represents a significant loss to missile R&D, but the wind tunnels are not involved in missile production.

- The liquid-engine test stand at Shahiyat Al Rafah was destroyed. This stand was critical to Iraq's liquid-engine development program for the UN-approved Al Samoud but was not suitable for larger, Scud-type engines. No known alternate test facilities exist in Iraq, so the Iraqis must rebuild this stand or construct a new one—probably with enhanced capabilities—in order to continue liquid-engine development. Construction could probably be completed in several months.

- A nitric-acid absorption tower that is critical to the production of inhibited red fuming nitric acid (IRFNA) probably was severely damaged. This represents a serious setback to any Iraqi efforts to produce the oxidizer used in its liquid-propellant ballistic missiles. Nonetheless, Iraq probably retains a sizable inventory of IRFNA that could sustain ballistic missile and surface-to-air missile operations, at least for the short term. ~~(S NF)~~

Although we suspect that much of the critical equipment was dispersed and/or salvaged, some of it probably suffered damage during dispersal. Computer-numerically-controlled (CNC) machines that make use of computer hardware and software may have been damaged, and some precision instruments most likely will have to be recalibrated. Before Operation Desert Fox, Iraq still had high-quality equipment from the Desert Storm period that was inoperable and sat idle because of a lack of spare parts or diagnostic hardware for technical maintenance and calibration. Other sophisticated equipment may have been damaged during the dispersal, but the extent of damage or degradation is impossible to quantify without on-site inspections. ~~(S NF)~~

Impact on the Missile Program

The damage caused by airstrikes to known liquid-propellant facilities and capabilities could take one to two years to rebuild if Iraq chooses to repair or replace all damaged equipment and restore missile development to damaged facilities. By moving to alternate locations and using remaining or redundant production equipment and machinery, however, the Al Samoud liquid-propellant missile development and testing program probably could recover in less than one year, depending on the priority level placed on its reconstitution. The Ababil-100 composite solid-propellant program probably has not been set back to any extent:

- Within a six-month period in 1998, Iraq had nearly completed movement of the Al Samoud production capability from the Al Karama missile facility to the

Figure 7

Prestrike Dispersal Areas at Mosul Al Kindi R&D Facility
Mosul, Iraq
13 November 1998 ~~(S Rel UK CAN AUS)~~

25X1

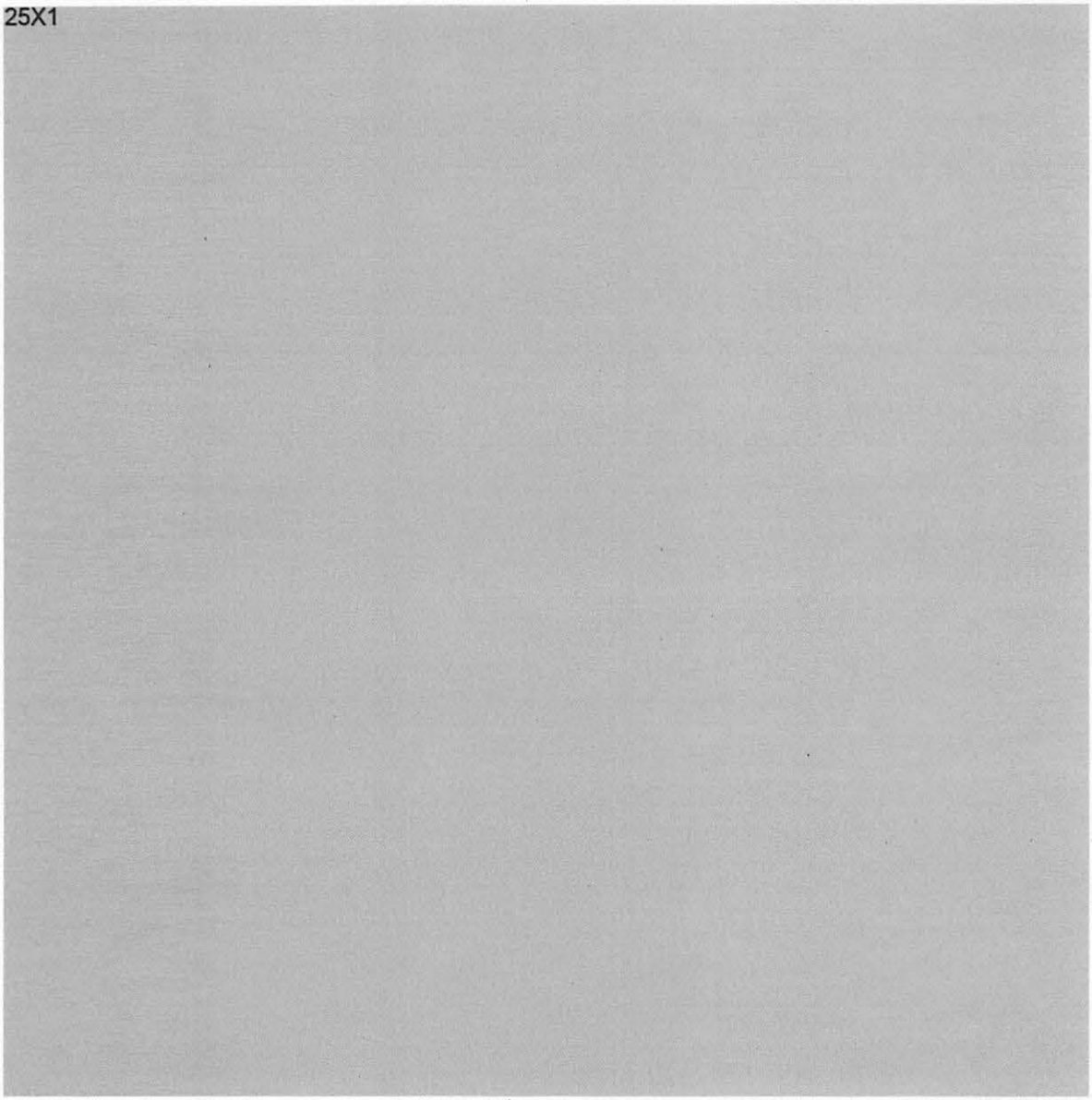

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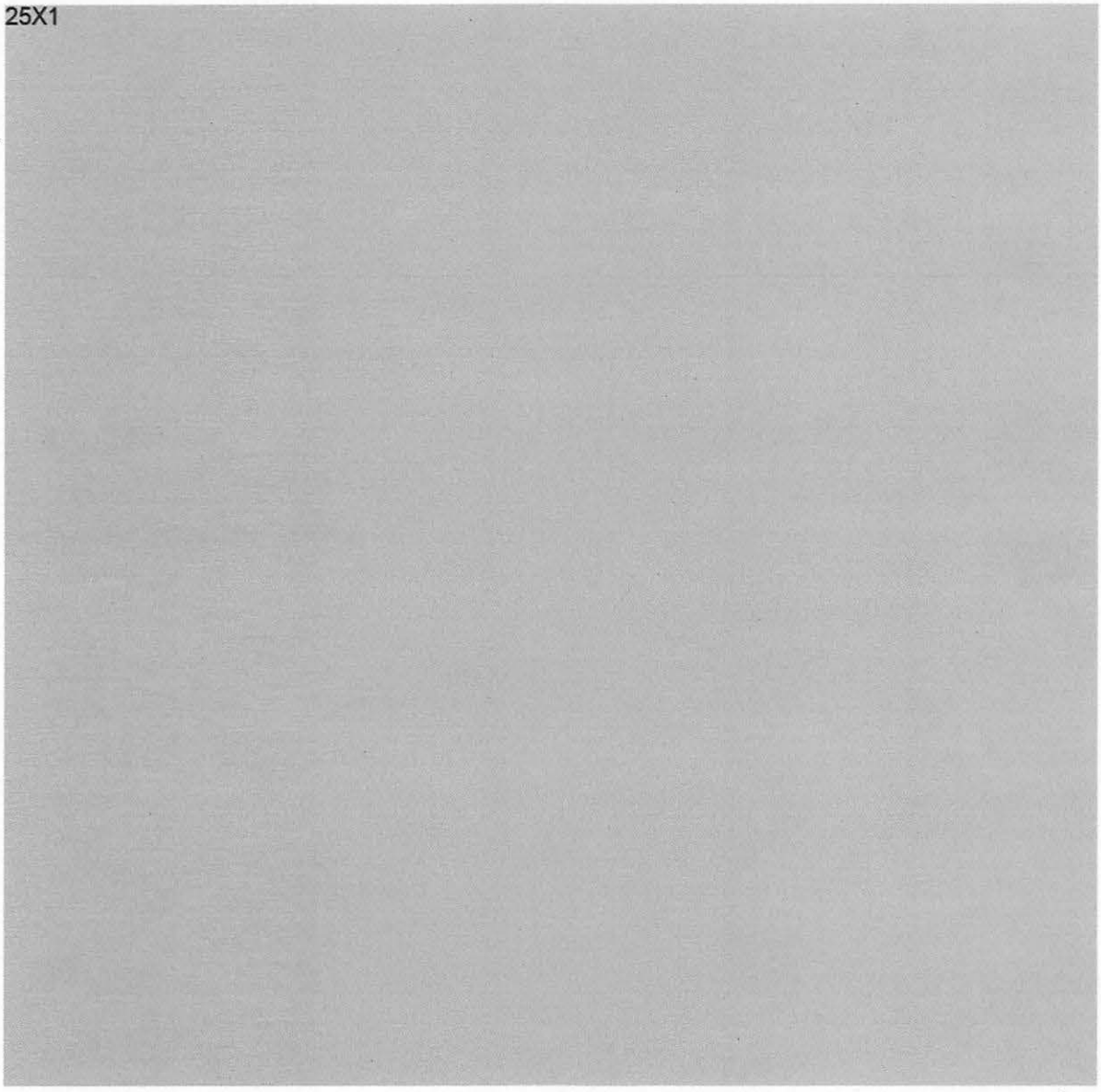
Figure 8

Prestrike Dispersal Areas at Al Nida Moulds Plant
Baghdad, Iraq
17 November 1998 ~~(S Rel UK CAN AUS)~~

25X1



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Ibn Al Haytham missile facility, although both facilities were damaged during the December airstrikes. Iraq could conduct a similar operation in a shorter time period if it placed priority on the move to alternate facilities.

- Iraqi dispersal activity and preparations before the airstrikes limited the damage caused to Iraq's known liquid-propellant ballistic missile program. ***Much of the critical equipment in the damaged buildings probably was removed before the airstrikes.***

- Additional, unknown sites in Iraq probably support liquid-propellant missiles. Various reports suggest that an unknown level of Scud-type component production occurs at unidentified facilities throughout Iraq.

- Most of the Iraqi missile engineers and technicians probably survived the airstrikes. In addition, various sources indicate that documents essential to the missile program are maintained by the Special Security Organization or in personal residences, rather than in known missile facilities.

- Iraq's composite solid-propellant production facilities that support ballistic missile development were not damaged. ~~(S NF)~~

Impact on the UAV Program (U)

25X1
25X1 strongly suggests that many of the critical elements associated with Iraq's L-29 UAV program—probably developed to deliver chemical and biological weapons—escaped destruction during Operation Desert Fox. Available evidence suggests that the L-29 program, known as the Al Bai'aa Project, had achieved the potential to deliver 240 kg of chemical or biological agents to ranges of at least 50 km (see figure 9). Iraq's efforts to extend the UAV's range may have been set back by Operation Desert Fox airstrikes on facilities related to the UAV program only to the extent that flight-testing was interrupted. ~~(S NF)~~

The critical elements associated with the Al Bai'aa Project—including some of the L-29 "Maya" air vehicles, the "Alamak" ground control station (GCS), the Marconi truck-mounted directional antenna, and project personnel—were almost certainly dispersed to unknown locations before the airstrikes:

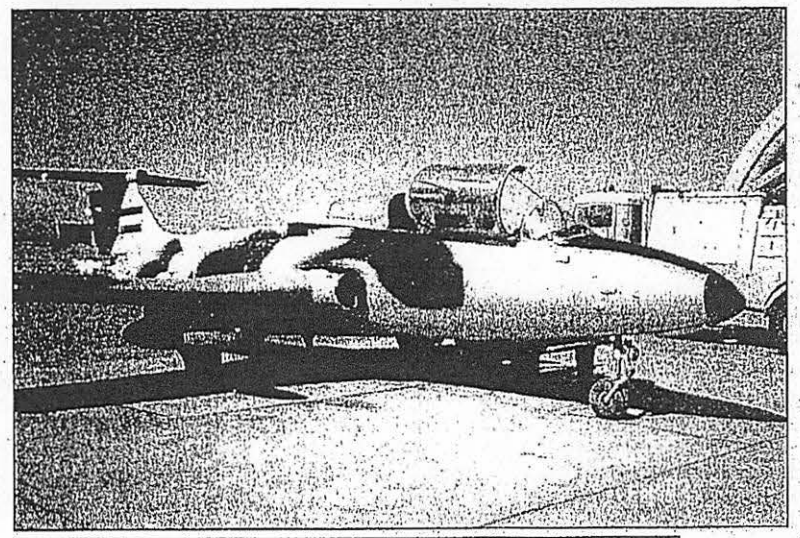
- Hangars and aircraft ramp areas known to house Al Bai'aa equipment in the past were struck during Operation Desert Fox at three separate airfields—Samarra East, Al Sahra, and Tallil. 25X1
25X1

- 25X1 Al Sahra airfield on 17 December
25X1 that four L-29s were moved from their original positions on a ramp in front of the south hangar and dispersed to other locations around the airfield.
25X1 also shows two or more additional L-29 aircraft dispersed among derelict L-29 airframes; it is possible that only one of these six aircraft sustained damage from submunitions (see figure 10).

- 25X1 post–Desert Fox L-29 flight-testing may have resumed at Samarra East, with the first flight apparently scheduled for 4 February 1999. For this UAV flight-testing to occur, at least one aircraft, the GCS, and the antenna truck must have survived Desert Fox airstrikes and are available for possible operational use.

- 25X1 from 14 November 1998, L-29 air vehicles were removed from their hangars and dispersed at Samarra East, probably in response to the threat of airstrikes. In addition, 25X1
25X1 in November 1997 unidentified aircraft were moved to Tallil airbase in southern Iraq. An Iraqi brigadier general and senior member of the National Monitoring Directorate Missile Group subsequently admitted 25X1
25X1 that these aircraft were in fact L-29s. ~~(S NF)~~

Figure 9
Iraqi L-29 UAV Under Development ~~(S NF)~~



L-29 UAV test aircraft on the ground at Samarra East airbase in July 1998.

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Impact on Chemical Warfare, Biological Warfare, and Nuclear Capabilities (U)

Few of Iraq's CW, BW, and nuclear facilities were targeted or damaged. Operation Desert Fox probably had very little impact on Iraq's ability to reconstitute its CW, BW, or nuclear programs. ~~(S NF)~~

Chemical and Biological Warfare Programs
Three buildings involved in Iraq's CW or BW programs were damaged—the Castor Oil Production Plant, the Main Production Building at the Habbaniyah suspect CW production facility 1 (see figure 11), and a building at the Al Dawrah factory (Baghdad State Establishment for Heavy Engineering Equipment, also identified as a missile-related facility).

The Main Production Building at Habbaniyah 1 suffered only slight damage that probably could be repaired within a month. Damage to the Castor Oil facility may limit Iraq's ability to produce the BW toxin ricin, but not significantly. Damage to the Dawrah facility—specifically the Boldrini press—degrades Iraq's ability to manufacture large fermenters or large chemical reactor vessels, dual-use process equipment that can be used for BW or CW. The personnel with CW or BW expertise, the agent stocks, some raw materials, and some legitimate dual-use facilities with the capability for production of CW or BW agents probably are still intact. ~~(S NF)~~

Figure 10

L-29 UAV Dispersal Activity at Al Sahra Airfield
Tikrit, Iraq
19 December 1998 ~~(S Rel UK CAN AUS)~~

25X1

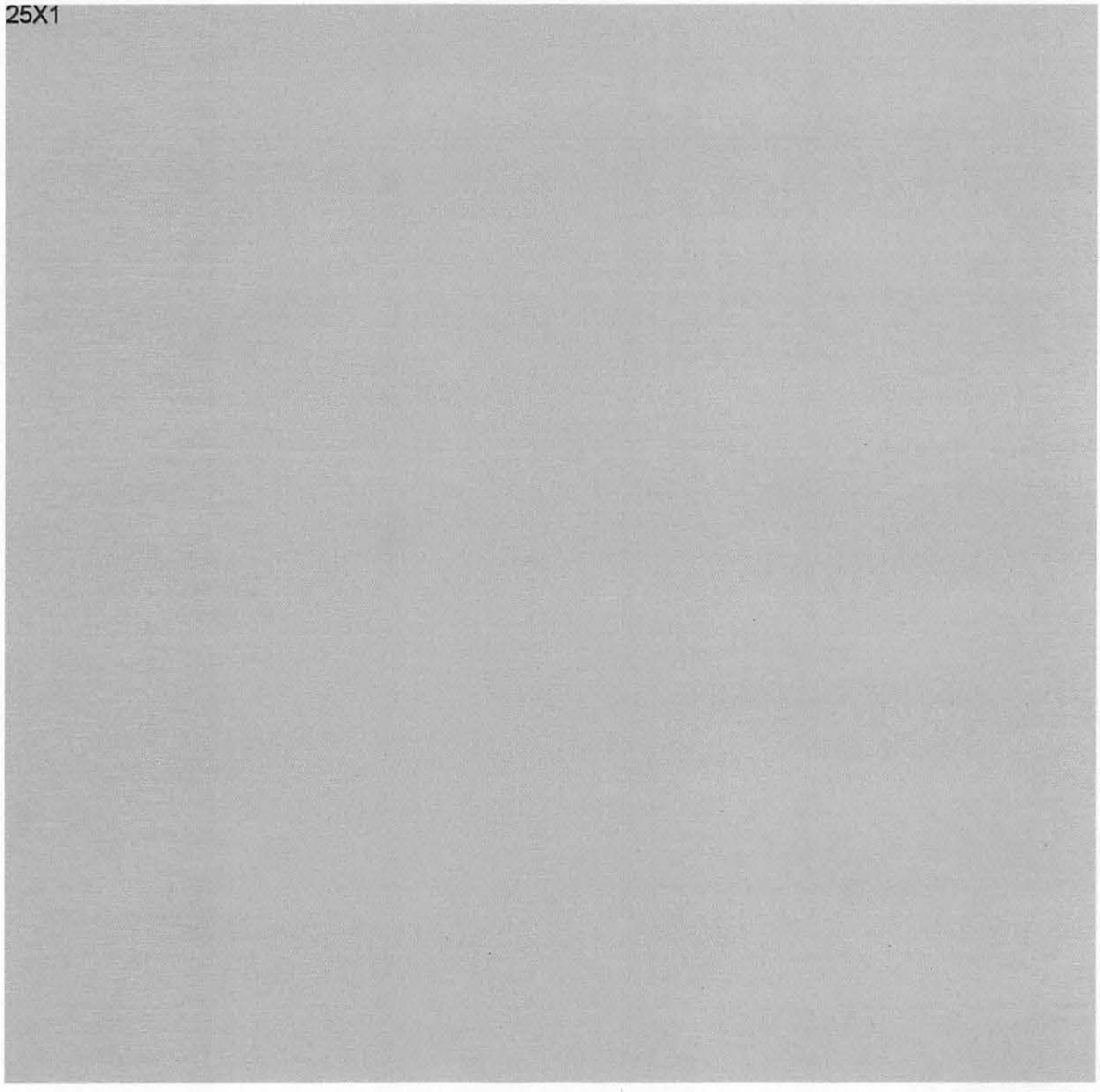

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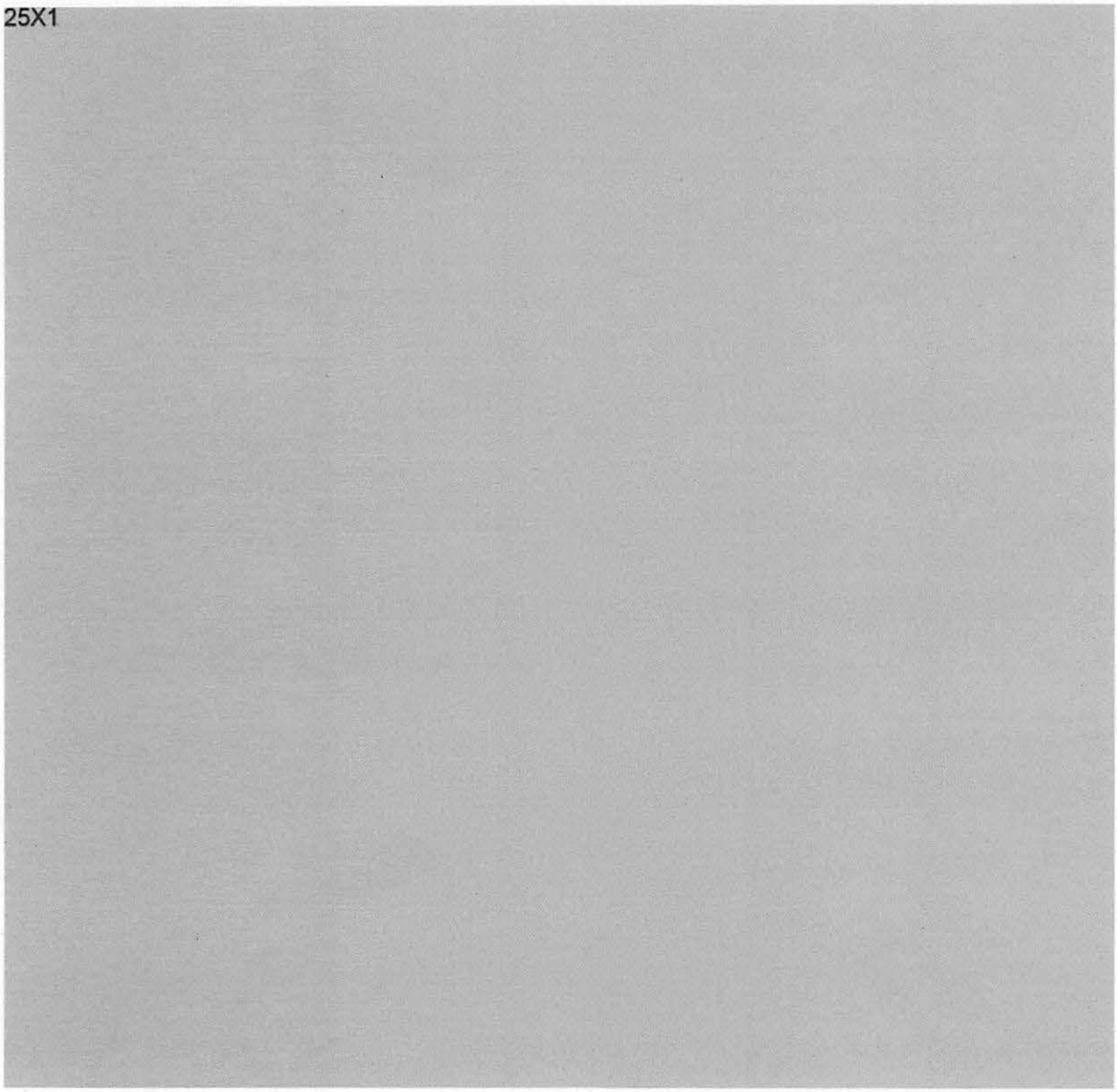
Figure 11

Poststrike Dispersal Areas at Al Habbaniyah I Suspect CW/BW Facility
Al Habbaniyah, Iraq
17 December 1998 ~~(S Rel UK CAN AUS)~~

25X1



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Nuclear Program

The airstrikes will have a minimal impact on Iraq's ability to reconstitute its nuclear program. We know of no facilities currently engaged in nuclear-weapons-related activity. A few of the facilities hit during Operation Desert Fox were formerly nuclear-related sites. Those dual-use manufacturing plants have been under both IAEA and UNSCOM surveillance and/or inspections and are assessed to be currently involved in missile-related, nonnuclear activity. ~~(S NF)~~

Prospects for the Future (U)

We believe that Iraq will place high priority on repairing any damage to its WMD programs as a result of Operation Desert Fox. Several scenarios are possible for future developments: some form of WMD monitoring returns to Iraq in combination with economic sanctions, no WMD monitoring function is in place but sanctions remain, WMD monitoring is in place with eased economic sanctions, or no WMD monitoring or economic sanctions are in place:

- Without UN economic sanctions or an effective monitoring presence, Iraq will become bolder in its efforts to evade the embargo and improve its access to foreign markets. Iraq would still face other obstacles, such as the Missile Technology Control Regime (MTCR) and the Nonproliferation of Nuclear Weapons Treaty (NPT) that could limit its access to WMD materials, but these probably will be easier to evade than in-country monitoring.

- When UNSCOM was in place, Iraq was successful in acquiring some restricted materials, such as precision machine tools and missile-guidance components. ~~(S NF)~~

Ballistic Missiles

If a monitoring presence is restored and if Iraq chooses to do so, it probably could reconstitute the Al Samoud SRBM developmental program to pre–Desert Fox levels within one year by consolidating remaining capabilities and moving salvaged or dispersed equipment and components into undamaged facilities. In addition, Iraq could launch an existing Al Samoud at any time by making use of at least one missile that we believe is still in its inventory from before the airstrikes. ~~(S NF)~~

On the other hand, if no monitoring presence is restored, Iraq probably would choose to abandon the Al Samoud program in favor of reconstituting a production capability for Scud-variant ballistic missiles:

- Iraq probably retains a small, covert force of Scud-type ballistic missiles hidden in operational and component-storage readiness. The airstrikes probably had no effect on Iraq's assessed capability to strike its neighbors with Scud-type ballistic missiles that could be armed with chemical or biological warheads. Nonetheless, these missiles probably would be used only if Saddam perceived his survival or that of his regime were threatened.

- In the absence of effective monitoring, Iraq could begin assembly of Scud-variant missiles within one year by making use of hidden components in combination with minor production and procurement efforts.

- In an eased sanctions environment, indigenous Scud production with some foreign-supplied components could begin in three to five years, but the airstrikes may cause Iraq to change locations and facilities it had planned to use for such an effort. For example, one building at the Ibn Al Haytham Missile R&D Center—assessed to be for future Scud production—was destroyed. The damage, however, most likely will result in only a short-term delay and will not affect our long-term assessment. ~~(S NF)~~

Whether Iraq chooses to focus its reconstitution efforts on the Al Samoud SRBM or Scud-variant production remains to be seen, but there are certain items and equipment that Iraq probably will try to procure in the future, with or without UN monitoring:

- Iraq probably will seek to procure machine tools to replace any that were damaged or destroyed by the airstrikes. Iraq probably will focus on newer CNC machines with more capability than those in its current or pre–Operation Desert Fox inventory.

- Iraq will continue its efforts to acquire guidance and control components from countries like Romania,

Russia, Ukraine, and others. Technical characteristics of such components could help in determining if the guidance systems were destined for Al Samoud or Ababil-100 SRBMs, Scud-variant SRBMs, or potentially longer range systems.

- Iraq may attempt to procure raw materials, such as specialty steels, for missile airframe production or engine development.

- Iraq probably will continue its efforts to obtain ingredients for composite solid propellants and may begin procurement efforts for liquid propellants as well. ~~(S NF)~~

UAV Systems

Iraq is known to have allocated five to six L-29s for conversion to UAVs. Conversion of at least one of these L-29s to unmanned capability is known to be complete and two other L-29s were 95 percent complete in July 1998 and are assumed to be operational by now. Before Operation Desert Fox, one Alamak GCS and one Marconi antenna truck were known to be operational, with construction of a second GCS and antenna truck under way. ~~(S NF)~~

Flight-testing to extend the range of the L-29 system probably has resumed. This effort could be complete within one year and result in a system with a range in excess of 300 km. Moreover, the absence of an effective monitoring presence would remove most impediments to the continued development of this system as a delivery platform for chemical and/or biological agents. ~~(S NF)~~

Chemical Warfare, Biological Warfare, and Nuclear Programs

We believe that today Iraq possesses both chemical and biological agent stockpiles that can be, or already are, weaponized and ready for use. The size of those stockpiles is uncertain and is subject to debate. The location, nature, and condition of those stockpiles is also unknown. ~~(S NF)~~

We assess Iraq's production of chemical and biological weapons to be largely dormant: however, Baghdad has the infrastructure necessary to support offensive programs. Iraq may have produced biological agent, even while UNSCOM inspectors were in the country, although such production was limited in scale because of the risk of exposure. We estimate that Baghdad is capable of:

- Rapid scaleup of biological agent production within days to weeks. Iraq could achieve 1990 production levels in less than one year.

- Limited production of mustard agent within a few weeks, limited sarin and GF production within a few months, and limited VX production within six months. Iraq could reach 1990 agent production levels within two to three years. ~~(S NF)~~

The airstrikes probably had little impact on Iraq's chemical, biological, and nuclear programs. Without an effective monitoring presence, Iraq could probably resume its CW and BW programs immediately, if it has not already done so. The strike did little to change our assessment that Iraq could begin CW production within weeks and BW production within days to weeks of a decision to do so. ~~(S NF)~~

Iraq's nuclear program is currently at a standstill as a result of International Atomic Energy Agency (IAEA) and UNSCOM actions over the last seven years, but clandestine research and training of personnel at Iraqi universities probably continues. The absence of the IAEA inspectors could enable Iraq to begin rebuilding its nuclear infrastructure to support a weapons program. Acquisition of sufficient weapons-grade fissile material remains the most significant hurdle for the reconstitution and further development of a nuclear weapons capability. All known fissile material has been removed from the country, and all identified nuclear facilities have been destroyed. Still, it is likely that Baghdad has retained important nuclear design documentation, which—along with its cadre of nuclear scientists and technicians—could give Iraq a noteworthy restart capability. We do not believe, however, that Baghdad could produce enough fissile material for a nuclear weapon in less than five years, even if it receives foreign assistance. But if Iraq has solved its pre–Gulf war technical hurdles and acquires a sufficient quantity of fissile material, Baghdad could have a nuclear weapon within one year. ~~(S NF)~~