potential production of ricin toxin.<sup>7</sup> Castor bean pulp, left over from castor oil production, can be used to extract ricin toxin. Iraq admitted to UNSCOM that it manufactured ricin and field-tested it in artillery shells before the Gulf war. Iraq operated this plant for legitimate purposes under UNSCOM scrutiny before 1998 when UN inspectors left the country. Since 1999, Iraq has rebuilt major structures destroyed during Operation Desert Fox. Iraqi officials claim they are making castor oil for brake fluid, but verifying such claims without UN inspections is impossible.

In addition to questions about activity at known facilities, **there are compelling reasons to be concerned about BW activity at other sites and in mobile production units and laboratories.** Baghdad has pursued a mobile BW research and production capability to better conceal its program.

- UNSCOM uncovered a document on Iraqi Military Industrial Commission letterhead indicating that Iraq was interested in developing mobile fermentation units, and an Iraqi scientist admitted to UN inspectors that Iraq was trying to move in the direction of mobile BW production.
- Iraq has now established large-scale, redundant, and concealed BW agent production capabilities based on mobile BW facilities.

## **Ballistic Missile Program**

**Iraq has developed a ballistic missile capability that exceeds the 150km range limitation established under UNSCR 687.** During the 1980s, Iraq purchased 819 Scud B missiles from the USSR. Hundreds of these 300km range missiles were used to attack Iranian cities during the Iran-Iraq War. Beginning in 1987, Iraq converted many of these Soviet Scuds into extended-range variants, some of which were fired at Tehran; some were launched during the Gulf war, and others remained in Iraq's inventory at war's end. Iraq admitted filling at least 75 of its Scud warheads with chemical or biological agents and deployed these weapons for use against Coalition forces and regional opponents, including Israel in 1991.

Most of the approximately 90 Scud-type missiles Saddam fired at Israel, Saudi Arabia, and Bahrain during the Gulf war were al-Husayn variants that the Iraqis modified by lengthening the airframe and increasing fuel capacity, extending the range to 650 km.

Baghdad was developing other longer-range missiles based on Scud technology, including the 900km al-Abbas. Iraq was designing follow-on multi-stage and clustered medium-range ballistic missile (MRBM) concepts with intended ranges up to 3,000 km. Iraq also had a program to develop a two-stage missile, called the Badr-2000, using solid-propellants with an estimated range of 750 to 1,000 km.

<sup>&</sup>lt;sup>7</sup> Ricin can cause multiple organ failure within one or two days after inhalation.



• Iraq never fully accounted for its existing missile programs. Discrepancies in Baghdad's declarations suggest that Iraq retains a small force of extended-range Scud-type missiles and an undetermined number of launchers and warheads. Further, Iraq never explained the disposition of advanced missile components, such as guidance and control systems, that it could not produce on its own and that would be critical to developmental programs. Iraq continues to work on UN-authorized short-range ballistic missiles (SRBMs)—those with a range no greater than 150 km—that help develop the expertise and infrastructure needed to produce longer-range missile systems. The al-Samoud liquid propellant SRBM and the Ababil-100 solid propellant SRBM, however, are capable of flying beyond the allowed 150km range. Both missiles have been tested aggressively and are in early deployment. Other evidence strongly suggests Iraq is modifying missile testing and production facilities to produce even longer-range missiles.

• The Al-Rafah-North Liquid Propellant Engine Research, Development, Testing, and Evaluation (RDT&E) Facility is Iraq's principal site for the static testing of liquid propellant missile engines. Baghdad has been building a new test stand there that is larger than the test stand associated with al-Samoud engine testing and the defunct Scud engine test stand. The only plausible explanation for this test facility is that Iraq intends to test engines for longer-range missiles prohibited under UNSCR 687.



## SA-2 (AI Samoud) Engine Test

Iraq conducted static tests of the SA-2 SAM sustainer engine to support development of the AI Samoud SRBM. This test stand is capable of testing engines for Iraq's UN-authorized liquidpropellant ballistic and anti-ship cruise missiles. The new test stand at AI-Ratah is larger than both this test stand and the defunct Scud engine test stand, indicating Iraqi intentions to test engines for longer-range missiles.







- The Al-Mutasim Solid Rocket Motor and Test Facility, previously associated with Iraq's Badr-2000 solid-propellant missile program, has been rebuilt and expanded in recent years. The al-Mutasim site supports solid-propellant motor assembly, rework, and testing for the UN-authorized Ababil-100, but the size of certain facilities there, particularly those newly constructed between the assembly rework and static test areas, suggests that Baghdad is preparing to develop systems that are prohibited by the UN.
- At the Al-Mamoun Solid Rocket Motor Production Plant and RDT&E Facility, the Iraqis, since the December 1998 departure of inspectors, have rebuilt structures damaged during the Gulf war and dismantled by UNSCOM that originally were built

to manufacture solid propellant motors for the Badr-2000 program. They also have built a new building and are reconstructing other buildings originally designed to fill large Badr-2000 motor casings with solid propellant.

• Also at al-Mamoun, the Iraqis have rebuilt two structures used to "mix" solid propellant for the Badr-2000 missile. The new buildings—about as large as the original ones—are ideally suited to house large, UN-prohibited mixers. In fact, the only logical explanation for the size and configuration of these mixing buildings is that Iraq intends to develop longer-range, prohibited missiles.

**Iraq has managed to rebuild and expand its missile development infrastructure under sanctions.** Iraqi intermediaries have sought production technology, machine tools, and raw materials in violation of the arms embargo.

- The Iraqis have completed a new ammonium perchlorate production plant at Mamoun that supports Iraq's solid propellant missile program. Ammonium perchlorate is a common oxidizer used in solid propellant missile motors. Baghdad would not have been able to complete this facility without help from abroad.
- In August 1995, Iraq was caught trying to acquire sensitive ballistic missile guidance components, including gyroscopes originally used in Russian strategic nuclear SLBMs, demonstrating that Baghdad has been pursuing proscribed, advanced, long-range missile technology for some time. Iraqi officials admitted that, despite international prohibitions, they had received a similar shipment earlier that year.

## **Unmanned Aerial Vehicle Program and Other Aircraft**

**Iraq is continuing to develop other platforms which most analysts believe probably are intended for delivering biological warfare agents.** Immediately before the Gulf war, Baghdad attempted to convert a MiG-21 into an unmanned aerial vehicle (UAV) to carry spray tanks capable of dispensing chemical or biological agents. UNSCOM assessed that the program to develop the spray system was successful, but the conversion of the MiG-21 was not. More recently, Baghdad has attempted to convert some of its L-29 jet trainer aircraft into UAVs that can be fitted with chemical and biological warfare (CBW) spray tanks, most likely a continuation of previous efforts with the MiG-21. Although much less sophisticated than ballistic missiles as a delivery platform, an aircraft—manned or unmanned—is the most efficient way to disseminate chemical and biological weapons over a large, distant area.

• Iraq already has produced modified drop-tanks that can disperse biological or chemical agents effectively. Before the Gulf war, the Iraqis successfully experimented with aircraft-mounted spray tanks capable of releasing up to 2,000 liters of an anthrax simulant over a target area. Iraq also has modified commercial crop sprayers successfully and tested them with an anthrax simulant delivered by helicopters.