

# CRS Report for Congress

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## Iran's Ballistic Missile Capabilities

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### Summary

Iran's extensive inventory of ballistic missiles is considered by some as its primary means to deliver weapons of mass destruction (WMD) to a variety of potential targets in the region. Recent missile tests and reports that Iran is actively pursuing nuclear weapons have helped to increase regional tensions. This report will be updated as events warrant. Additional information is provided in CRS Report RL30427, *Missile Survey: Ballistic and Cruise Missiles of Foreign Countries*, CRS Report RL30551, *Iran: Arms and Weapons of Mass Destruction Suppliers*, and CRS Report RL30699, *Nuclear, Biological, and Chemical Weapons and Missiles: Status and Trends*.

### Iran's Short Range Ballistic Missiles (range < 1,000 km)

Table 1. Short Range Ballistic Missiles

Missile	Range	Payload	CEP <sup>a</sup>	Estimated Numbers
CSS-8	150 km	190 kg	unknown	200
M-11	280 km	800 kg	600 m	30-50
SCUD-B	300 km	985 kg	450 m	100-400
SCUD-C	500 km	600 kg	700 m	100-170

Information for this table is from Jane's Strategic Weapons Systems, *Jane's Information Group*, edited by Duncan Lennox, Issue 37, January 2002.

<sup>a</sup> CEP is defined as the radius of a circle centered at the target within which 50 % of all missiles aimed at the target would be expected to impact and is the standard for measuring accuracy for missiles and bombs, 1 kilometer = .62 miles; 1 meter = 39 inches.

**CSS-8.** Iran is believed to have imported as many as 200 CSS-8 missiles from China in late 1989.<sup>1</sup> This solid-fueled version of the SA-2 surface-to-air missile is

<sup>1</sup> "Ballistic Missiles National Briefing: Iran," Center for Defense and International Security  
(continued...)

designed to be launched from a tracked launcher vehicle.<sup>2</sup> Iran is believed to have received about 35 tracked launchers from China in late 1989.<sup>3</sup> The two-staged CSS-8 is believed to be armed with a 190 kg high explosive warhead and some experts suggest that there are also submunition and chemical warheads for the CSS-8.<sup>4</sup> Other experts believe that China did not sell chemical or biological warhead technology to Iran for the CSS-8.<sup>5</sup>

**M-11 (CSS-7).** Although denied by China, Iran is believed to have received 30 to 50 M-11, 280 km range, single-stage, solid propellant<sup>6</sup> missiles and wheeled transporter-erector-launcher (TEL) vehicles from China in 1995.<sup>7</sup> In addition to carrying an 800 kg high explosive warhead, the M-11 is thought to be capable of delivering a 2, 10, or 20 KT nuclear device, chemical agents, and also fuel-air explosives or high explosive submunitions.<sup>8</sup>

**SCUD-B.** SCUD-B's are considered the core of Iran's ballistic missile forces. The SCUD-B is a Russian-designed, liquid propellant, single-stage missile which has been operational in many Middle Eastern countries since 1965.<sup>9</sup> Russia developed a number of different types of warheads for the SCUD-B, including high explosive, chemical, and nuclear.<sup>10</sup> The SCUD-B is believed to be able to accommodate a nuclear warhead with a 5 to 70 KT yield. The SCUD-B is transported on an eight-wheeled MAZ 543 transporter-erector-launcher (TEL) vehicle with a 650km unrefuelled range on hard roads and, in this configuration, the SCUD-B can be erected and launched in about one hour.

Some believe Iran received a limited number of SCUD-B's from Libya in response to Iraq's 1980 invasion, and received its first shipment of 100 SCUD-B's from North

<sup>1</sup> (...continued)

Studies, Lancaster, U.K., May 28, 2003, [[http://www.cdiss.org/iran\\_b.htm](http://www.cdiss.org/iran_b.htm)], p. 3.

<sup>2</sup> Duncan Lennox, editor, Jane's Strategic Weapons Systems, Jane's Information Group, Issue 37, January 2002, p. 49.

<sup>3</sup> "Ballistic Missiles National Briefing: Iran," p. 3.

<sup>4</sup> Jane's Strategic Weapons Systems, p. 49. High explosive submunitions are bomblets that are part of a warhead that are intended to be scattered over a target area and then detonated. Chemical or biological submunitions allow for a wider and more effective dispersion and concentration of chemical or biological agents and also permits a larger portion of agent to survive a missile intercept or release at high speeds and temperatures.

<sup>5</sup> Anthony Cordesman, Weapons of Mass Destruction in the Middle East, Center for Strategic and International Studies, Washington D.C., June 16, 2002, p. 47.

<sup>6</sup> Solid propellants are generally favored as they are safer to store and easier and quicker to put into action than liquid propellant-filled missiles. Countries that produce solid propellant missiles are generally considered to have a more technologically-advanced missile program than those countries who produce strictly liquid propellant missiles.

<sup>7</sup> Jane's Strategic Weapons Systems, p. 48.

<sup>8</sup> Ibid.

<sup>9</sup> Ibid, p. 136.

<sup>10</sup> Discussions in this paragraph on warheads and transporters is taken from Jane's Strategic Weapons Systems, p. 134-137.

Korea in 1988.<sup>11</sup> Iran is believed to have received another 200 to 300 SCUD-B's and 15 TELs from North Korea in the early 1990s.<sup>12</sup> Because some U.S. experts believe that Iran can manufacture all but the most sophisticated guidance and rocket motor components indigenously, it is considered difficult to estimate how many SCUD-B's Iran currently possesses.<sup>13</sup>

**SCUD-C.** The SCUD-C is a single-stage, liquid-fueled variant of the SCUD-B developed by North Korea with Chinese assistance.<sup>14</sup> Iran's SCUD-C's extended range permits a deeper penetration of target countries within range of Iran's SCUD-B's. Some experts feel that the SCUD-C's payload capacity is limited in terms of a chemical payload, but suggest that by using the most lethal chemical agents such as VX nerve agent or selected biological agents, Iran could employ these missiles effectively out to their maximum range.<sup>15</sup> Some analysts speculate that North Korea may have provided Iran with chemical and biological warhead technology for its SCUD-C's and, if so, would have saved Iran a number of years in terms of developing and testing its own warheads.<sup>16</sup> The SCUD-C is also capable of carrying a variety of high explosive warheads but is not believed capable of delivering a substantial nuclear payload. The SCUD-C can also be transported and fired from the MAZ 543 TEL vehicle or fired from a fixed site.<sup>17</sup>

Iran was reported to have taken delivery of between 100 and 170 SCUD-C's from North Korea by 1994, together with related tooling and assembly equipment which was believed installed in an assembly facility near Hama.<sup>18</sup> While some analysts believe that the provision of such equipment would permit Iran to produce entire SCUD-C's on its own, others believe that this capability would permit it to assemble only knock-down kits while possibly producing a limited number of indigenous components, much like its SCUD-B's.<sup>19</sup> This assembly capability also makes estimating the number of Iranian SCUD-C's a somewhat speculative exercise.

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<sup>11</sup> "Ballistic Missiles National Briefing: Iran," p. 3.

<sup>12</sup> Ibid.

<sup>13</sup> Cordesman, p. 47.

<sup>14</sup> "Ballistic Missiles National Briefing: Iran," p. 3.

<sup>15</sup> Cordesman, p. 47.

<sup>16</sup> Ibid.

<sup>17</sup> Jane's Strategic Weapons Systems, p. 134-137.

<sup>18</sup> "Ballistic Missiles National Briefing: Iran," p. 3.

<sup>19</sup> Ibid.

## Iran's Longer Range Missiles (range > 1,000 km)

**Shahab-3.** Iran's Shahab-3 missile is a road-mobile, single stage, liquid propellant, single warhead ballistic missile which many experts believe is based on imported North Korean No Dong-1 missiles.<sup>20</sup> The Shahab-3 has a reported range of 1,300 km and a 1,200 kg payload capacity.<sup>21</sup> In 1993, some analysts speculated that North Korea, Iran, and Pakistan entered into a cooperative development agreement. Pressure from several countries reportedly led to North Korea abandoning its cooperative agreement with Iran in 1994.<sup>22</sup> In 1997, allegations of Russian assistance in providing missile components, training, and testing assistance for the Shahab-3 program became a prominent topic for discussion of the Gore-Chernomyrdin Commission.<sup>23</sup> United States Central Intelligence Agency (CIA) Nonproliferation Center Director John Lauder told Congress in June 1998 that Russian assistance "has helped Iran save years in its development of the Shahab-3...and is playing a crucial role in Iran's ability to develop more sophisticated and longer-range missiles". One source says the CIA reported that Russia continued to cooperate with Iran on missile technology as late as July 2001.<sup>24</sup>

Some experts consider Iran's ballistic missile infrastructure to be more sophisticated than that of North Korea. Further, they believe that with Russian, North Korean, and Chinese assistance, it is progressing towards becoming self-sufficient in the production of medium-range ballistic missiles.<sup>25</sup> It has also been reported that Iran has a considerable network of research institutes and production facilities which has received foreign assistance, and is dedicated to missile development throughout the country with some of its facilities hardened or underground to protect them from aerial attack.<sup>26</sup>

The Shahab-3 is believed to have a 800 kg separating warhead that would be capable of carrying high explosive submunitions, chemicals, or possibly a nuclear warhead.<sup>27</sup> The Shahab-3's accuracy is rated by some experts at 2,500 m CEP.<sup>28</sup> In October of 2001, press reports stated that Iran had begun serial production of Shahab-3s, using North Korean No

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<sup>20</sup> Jane's Strategic Weapons Systems, p. 94.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> "Russia's Missile Assistance to Iran," Carnegie Non-Proliferation Project Brief, Vol III-No. 22, August 7, 2000. p. 1.

<sup>24</sup> Paul Kerr, "U.S. Missile Sanctions," Arms Control Association Fact Sheet, March 2002, p. 3.

<sup>25</sup> Unclassified Report on Proliferation-Related Acquisition in 1997, Director of Central Intelligence, pp. 2-3.

<sup>26</sup> Center for Nonproliferation Studies database abstract from Jane's Defence Weekly, April 23, 1997, p. 4 and related articles and an abstract of Iran Brief, September 9, 1996, pp. 1-2, Washington Times, February 24, 1998, p. A3.

<sup>27</sup> Ibid.

<sup>28</sup> Jane's Strategic Weapons Systems, p. 94.

Dong engines, at a rate of 20 missiles a year.<sup>29</sup> One recent report suggests that Iran intends to produce at least 150 Shahab-3s and has presently amassed an arsenal of at least 20 missiles.<sup>30</sup>

**Recent Shahab-3 Activities.** On August 11, 2004, Iran's Defense Minister, Ali Shamkhani, reportedly stated that Iran had conducted a flight test of its latest version of the Shahab-3 which some experts believe is capable of striking all of Israel as well as selected U.S. bases in the Persian Gulf region.<sup>31</sup> In early August, Defense Minister Shamkhani was reported to have claimed that Iran was working on improvements to the range and accuracy of the Shahab-3, and would not limit future improvements to just its range – leading some observers to speculate that Iran intends to develop a nuclear payload for the missile.<sup>32</sup>

**Other Shahab Versions.** There has been a great deal of speculation surrounding upgraded versions of the Shahab - the so-called Shahab-4, 5, or 6. On October 3, 2002, Iranian Brigadier General Ahmad Vahid, the chairman of the Iranian Aerospace Industries Organization, told journalists that Iran “had no plans to develop long-range missiles in order to strike the United States, since the U.S. is not one of Iran's strategic defense targets and instead had oriented its ballistic missile development against its principal regional adversary-Israel.”<sup>33</sup> Some believe that this statement suggests that Iran will not pursue specific Shahab-4,5, and 6 programs as the improved Shahab-3 is capable of striking Israel and regional targets. One expert postulates that Iran's previously discussed “improved Shahab-3” might in fact be Iran's way of developing more capable, longer range Shahab missiles without hanging politically contentious Shahab-4, 5, and 6 labels on such programs.<sup>34</sup> Still others suggest that Iran's space launch program is a surrogate for longer range versions of the Shahab-3.

**Iran's Space Launch Vehicle Program.** On January 5, 2004, Iran's Defense Minister, reportedly announced that Iran would launch a satellite within 18 months.<sup>35</sup> This possible June 2005 launch has some analysts concerned. Some experts believe that Iran could use its space launch vehicle (SLV) program as a technical base for developing intermediate and intercontinental range ballistic missiles.<sup>36</sup> These experts suggest that

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<sup>29</sup> Ibid., p. 6.

<sup>30</sup> “Iran's Ambitious Missile Programs,” *Center for Defense Information Press Release*, July 1, 2004, p. 4.

<sup>31</sup> Paul Hughes, “Iran Tests Missile Capable of Hitting Israel,” *Reuters*, August 11, 2004.

<sup>32</sup> Ibid.

<sup>33</sup> *Missile Defense Briefing Report No. 74*, American Foreign Policy Council, October 8, 2002, p. 1.

<sup>34</sup> Paul Hughes.

<sup>35</sup> “Iran Plans to Launch Satellite Within 18 Months,” *CNN.com*, January 6, 2004.

<sup>36</sup> “Iran Missile Update, 2004,” p. 2.

developing Shahab 4, 5, and 6 missiles under the guise of a SLV program could permit Iran to avoid the possible political and economic costs of missile testing.<sup>37</sup>

## Operational Considerations

**The Shahab-3 and Iran's Nuclear Program.** In July 2004, Iran reportedly told British, French, and German officials that it could produce enough weapons grade uranium for a nuclear bomb within one year.<sup>38</sup> Some intelligence estimates claim that Iran is concealing its nuclear capabilities, which it claims are for peaceful purposes, and could be five years away from constructing a nuclear weapon.<sup>39</sup> Iran's apparent pursuit of a nuclear weapons capability and reported statements such as "the entire Zionist territory, including its nuclear facilities and atomic arsenal, are currently in range of Iran's advanced missiles," from the head of Iran's Revolutionary Guards political bureau,<sup>40</sup> have served to heighten regional tensions. Some analysts suggest that this is mere "saber rattling" designed to dissuade pre-emptive strikes on Iran's nuclear sites by the United States or Israel.<sup>41</sup> Many express concern that Iran, particularly if they receive outside assistance, may be able to develop a nuclear warhead for its Shahab-3 missile. While Iran may be on the critical path to developing a nuclear device, others note that developing a nuclear warhead and reentry vehicle are difficult scientific and technological undertakings which could take Iran years to accomplish even if they are able to produce a nuclear device.

**The Shahab-3 and Israel's Arrow-3 Ballistic Missile Defense System.** Some experts believe that the joint U.S./Israeli Arrow ballistic missile defense system may provide a credible deterrent to the Shahab-3 as well as future improved versions of the missile. The Arrow has had a number of successful tests against both short and medium range ballistic missile targets, to include a successful July 29, 2004 intercept of a Scud-type target over the Pacific Ocean conducted by the U.S. Missile Defense Agency.<sup>42</sup> The Arrow-3 incorporates a number of improvements, specifically designed to improve the system's capabilities against medium range missiles like the Shahab-3, and future versions of the Arrow, are intended to enhance its performance against even longer-range missiles.<sup>43</sup> Some contend the Arrow-3 reduces the threat of an Iranian conventional or nuclear missile strike against Israel while others suggest that it might cause Iran to produce even more missiles and perhaps penetration aids to offset the Arrow-3's alleged capabilities.

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<sup>37</sup> Ibid.

<sup>38</sup> Dafna Linzer, "Iran a Nuclear Threat, U.S. Says," *Washington Post*, August 18, 2004, p. 14.

<sup>39</sup> Ibid.

<sup>40</sup> "Iran:Shihab-3 Can Hit Anywhere in Israel," *Jerusalem Post*, August 16, 2004.

<sup>41</sup> Ibid.

<sup>42</sup> Alon Ben-David, "Arrow Points to Change in Middle East Balance," *Jane's Defence Weekly*, August 4, 2004, p. 5.

<sup>43</sup> Ibid.