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Iran's nuclear plans

Do a satellite launch and a tonne of enriched uranium add up to an arsenal?

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Iranian flag Iran would need to purify its uranium-235 further to build weapons. Punchstock

According to the latest International Atomic Energy Agency (IAEA) report, released yesterday, Iran has produced around a tonne of low-enriched uranium. That number was well above the United Nations' nuclear watchdog's estimate of 660 kilograms in November 2008. Nature News examines the implications. Where did all that extra uranium come from?

Iran says that it produced 171 kilograms of the material between November 2008 and January 2009. The rest, around 179 kilograms, appears to have been discovered during the IAEA's annual inventory of materials at Iran's uranium-enrichment facility at Natanz. The origin of the material is "a little bit of a mystery", says Jeffrey Lewis, a nuclear expert at the New America Foundation in Washington, DC. He believes that the Iranians may have misreported their production in earlier statements to the nuclear watchdog – although whether this was accidental or intentional is unknown.

I've heard that all you need is about 25 kilograms of uranium to build a bomb. Could Iran build an arsenal of nuclear weapons?

No. To build a bomb requires around 25 kilograms of a very specific isotope of uranium known as uranium-235. The naturally occurring uranium is only 0.7% uranium-235, and the process of enrichment purifies it so that it can be used in a reactor or a nuclear bomb.

Bomb-grade uranium is around 90% pure uranium-235, while reactor-grade material is typically just 3-5%. Iran has enriched its uranium to 3.49% according to the IAEA. That's pure enough to use in reactors, which is Iran's stated reason for enriching its uranium, but the concentration is still well below what you'd need for a bomb.

So what's all the fuss?

Technically, if Iran has 1000 kilograms of 3.5% enriched uranium, then it could obtain about 35 kilograms of pure uranium-235. In other words, Iran has got enough uranium-235 to build a bomb.

But first it needs to further purify its uranium-235. Iranian engineers could do that the same way that they made their 3.5% uranium, by passing their material through a cascade of spinning centrifuges that separates the isotopes from the heavier, and more common, uranium-238. In fact, enriching to about 5% is "most of the work", according to Lewis.

The fear now is that Iran might be able to initiate a crash programme that could give

them a weapon in a matter of a month or two.

Iran also launched its first satellite into orbit on 2 February – is that related to all this?

Initial reports suggested that the rocket used, known as a Safir-2, was a beefed-up version of a simple type of Soviet-era missile known as a scud, with a small, third stage on top. But observations by amateur astronomers now suggest that it was actually a more powerful two-stage rocket.

A rocket capable of carrying a satellite can also carry a warhead, so Iran's scientific achievement has military implications. But while the Safir-2 could get a 25-kilogram satellite into orbit, it would have a much tougher time delivering a half-tonne "gun-type" uranium warhead of the sort the country could produce with its centrifuges, according to David Wright at the Union of Concerned Scientists in Cambridge, Massachusetts. The Safir-2 would only be able to carry such a weapon perhaps 2,000 to 3,000 kilometres. "To really get longer range they have to go back and design a whole new missile," he says.

So what does this all mean?

"I think this information is only Earth-shattering if people have an outdated view of the world," Lewis says. The Iranians have already demonstrated the ability to produce rockets and uranium. The latest advances are no more significant than previous improvements, and it will be some time before the Iranians get a true nuclear capability — if that is what they're after.

Still, he adds that "time is running out". He believes that the international community must work with Iran to create a regime of inspections that can verify their activities while building trust between it and other nations.