Dan Kaszeta looks into the ultimate press story: Suitcase nukes

Carry on or checked bags?

Every few years, Hollywood drums up the menace of the 'suitcase nuke' – a nuclear device small enough and light enough to be carried in normal luggage. And just when we'd had enough of George Clooney saving the world (or at least New York), the occasional disgruntled Russian makes dire statements about 'suitcase nukes' and gets US Congressmen and Senators worked up into a lather. I have seen such worries often conflated with fears of a terrorist improvised nuclear device (IND). I have also seen such spectacles as aides to US Senators (not well established as a repository for nuclear weapon expertise) mocking up 'authentic models' of suitcase devices for display to committee hearings. Where does the truth lay in this whole landscape? Much of the hype seems to originate from an interview (CBS Sixty Minutes, 7 September 1997) and subsequent congressional testimony of one Lt Gen Alexander Lebed, former national security advisor to Boris Yeltsin. Lebed claimed that a large number of such devices had gone missing. Later, a GRU defector, Stanislav Lunev, made further and more sensational claims, alleging that many 'suitcase weapons' had been secreted in the US. I remember this stuff making more than a few waves in Washington at the time. Such claims will always find fertile ground in the minds of the imaginative. But what's the real truth behind them? For the record, everything here is based on unclassified sources that I have unearthed in my research, as a wealth of historic material is now available.

First, has there really ever been such a thing as a suitcase nuke? Nuclear weapons, particularly the first few generations of them, are not exactly small. Little Boy (Hiroshima) and Fat Man (Nagasaki) both weighed over four tons. Bombs tended to get smaller from that point, although a few were even bigger. History tells us that it is indeed possible to make a functioning nuclear weapon that is small enough to fit into luggage, at least from the perspective of volume, if not weight. A nuclear weapon that can be made small enough to fire out of a cannon barrel can fit into a suitcase. The US and USSR had a number of compact nuclear weapons designed for use as nuclear artillery shells. The US military had warheads that were used as artillery shells in 155mm and 8 inch (203mm) artillery pieces. A nuclear artillery round can't really be much bigger (and obviously not any wider) or much heavier than its conventional brethren. But weight is a factor, and artillery rounds aren't light. One man can handle a normal conventional 155mm round (I did so, when I spent a few very hot and loud days in my distant Army past with a 155mm artillery battery) but you certainly get your exercise. They are 40+kg each. The US nuclear round for the 155mm howitzer was something called a W48, and it reportedly weighed in at around 55 kg. A 155mm round is about 60 cm long and, well, 155mm in diameter (sorry if I've insulted anyone's intelligence on that one…) It could fit in a suitcase, but it would be one hell of a schlep to move it with one person. Time for a wheely suitcase? I suspect the Soviet 152mm round would be roughly the same volume and weight. Some of the weight is the casing itself, so a non-ruggedized device with the same working parts, but not hardened to withstand the g forces of a cannon barrel would be a bit lighter. The 8 inch round is probably out of the question for use in luggage, being bigger and heavier still.

The closest that the US came, at least in operating principle, to a suitcase bomb was the 'Atomic Demolition Munition' – the ADM. An ADM was just as it sounded: a nuclear device designed for demolition purposes. In practice, these were designed to substitute conventional explosives for large demolition projects, such as those manufactured for dams, tunnels and bridges, where it might take days or weeks to lay many tons of conventional explosive material, with complex firing chains that were prone to error or malfunction. And with the 8th Guards Tank Army charging across the Fulda Gap, the US Army felt that it might not have the time to put hundreds of combat engineers to work, laying explosives to waylay the Soviet advance. But how big were these? The US had two basic forms of ADM: the MADM (Medium ADM) and the SADM (Special ADM). Despite the alleged man-portable nature of these devices, the MADM and SADM were not exactly petite briefcase devices. The MADM was 180 kg or so. The SADM did indeed fit into a rucksack, but it was a rucksack for the stout and strong, as the SADM weighed roughly 70 kg. By man-portable, the US Army meant schlepping it onto and off of the tailgate of a truck, not carryon baggage. A bit of the weight could probably be shaved off but not a lot. This is still out of the 'suitcase'

Now all I need to do is find a case big enough... ©DoD

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category. I do not know the extent to which the Soviet Union, or China, or any other nuclear power has fielded ADMs, but it is this grey area of uncertainty that provoked the whole suitcase nuke discussion in the first place.

Rather a lot of technical effort went into these systems to make them small and the bang was small too. They were not city-busting strategic weapon systems. While weapon yields are classified, many loose estimates have leaked out over the years and plenty of information is now available in the public domain. We know that the Hiroshima and Nagasaki bombs were in the 13 to 21 kiloton (KT – thousand tons of TNT explosive equivalent). But when we start looking at the notional yields of the small tactical devices, they are MUCH smaller. The W48 warhead used in the 155mm howitzer allegedly had a yield of about 70 tons of TNT, 0.07 KT, the barest 200th fraction of Fat Man or Little Boy. There have been many conventional situations that have released similar energy. The SADM is cloaked in a bit more mystery, but it used something called a W54 warhead as the business bit. Various configurations were used but the yield seems to be in the hundreds of tons of TNT equivalent, i.e., fractions of a kiloton.

As an important historical note, the smallest device tested in the US nuclear testing program (a test shot called Redwing Yuma in the Pacific, May, 1956) was like an artillery shell in size and shape and weighed about 55 kg. It had a yield of 190 tons of TNT (i.e., 0.19 KT – very small for a nuclear weapon). I found copious declassified information about Operation Redwing on the internet. While it did make a bang it wasn't exactly very impressive: nor was the measured fallout.

It is very important to remember, however, that small nuclear devices for use in artillery shells and similar battlefield weapons are actually very advanced. A small warhead and a small bang are not the point of entry into the nuclear weapon business. Such systems are the result of decades of very expensive technical development after the Manhattan Project. In other words, they are fourth or fifth generation

Is that a nuke in your pocket? ©DoD

descendents of Fat Man and Little Boy, and were developed with the aid of sophisticated live nuclear testing regimes to work out the flaws in the design. Without getting into any classified detail on the subject, making a small device with a small yield is actually quite hard. The weapons scientists on both sides of the Iron Curtain found that, once the frontiers of fission and fusion were breached, making bigger weapons wasn't that hard. But making them small was. Getting enough fissile material to make a first generation nuclear device (a la Hiroshima or Nagasaki) gives you a basic yield somewhere in the 10-20 KT range. Going higher or lower than 10-20 KT requires lots of very precise technology and engineering. A small lightweight device has to use every trick in the book (and there a lot of them that I can't get into) to get a nuclear yield out of small amounts of fissile material.

The artillery and ADM systems use a great deal of technical prowess to use the barest amount of fissile material possible, to cut down on weight and volume. If you wanted to make a bigger bang with something this small, that will add even more complexity to an already difficult technical problem. Is it possible? Yes, but only with access to really big science, like the vast weight of US or Soviet R&D programs.

So, where does this leave us in terms of suitcase nukes as a viable threat? Based on the artillery rounds, they are technically feasible – if we allow for the suitcase to be rather heavy. The technology to make one however, is not the same as a first or second generation nuclear weapon. The complexity and precision required to shrink the working bits down to suitcase size, while having them function reliably, was a decade into the US and USSR's giant nuclear R&D program and relied on some trial and error nuclear testing. Is it within the grasp of established possessors, such as the Indians or Chinese? Possibly, but probably not without some detectable testing. It is beyond the grasp a terrorist group, I think. If someone were to make an IND properly, a big IF, it would be something resembling a first generation system, needing a large truck to move it, not a suitcase.

The remaining possibility is that a terrorist could use an existing small weapon, presumably one of Soviet origin, as all of the American ones have been accounted for. Mr. Lebed's alleged stockpile of suitcase devices was supposed to have been manufactured in the 1970s. Much of the nuclear artillery

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stockpile was probably similar to the US arsenal and may have been even older. Would such devices be useable by a terrorist? Would it still function? Nuclear weapons require maintenance. The multi-billion dollar budget line items for nuclear stockpile stewardship in the US are testament to the fact that it takes effort to ensure old weapons are still in working order. The US Army, when it had tactical nuclear weapons in its inventory, devoted significant manpower and infrastructure to periodic maintenance of this special ammunition. Many critical components of nuclear weapons degrade over time. As a general rule, the more specialised a nuclear weapon is (e.g., high or low-yield; special size) the more fiddly and sophisticated its components are. I don't think the US Army would have fielded legions of technicians to fiddle with nuclear artillery rounds on a frequent basis if it wasn't needed.

Based on my own military experience, if the Army could have got away with a 'lock it in the bunker and don't touch it for decades' policy, it would have. Additionally, it is alleged that radiation gradually degrades the electronic components over time. After all, special nuclear material such as plutonium and uranium, are neutron emitters. Some components rely on materials with shelf life. Tritium, for example, is used in many nuclear weapon designs and has a twelve year half-life. Polonium, used in neutron initiators in some earlier types of weapon designs, has a very short half-life. US documents state that every nuclear weapon has 'limited life components' that require periodic replacement (do an internet search for nuclear limited life components and you can read for weeks).

After reading through a lot of things about limited life components, I'm stuck with the likely conclusion that any leftover device from the end of the Soviet Union is not going to work. Even at the time of the Lebed/Lunev controversy, many US and Russian commentators were of the view that hidden nuclear suitcase devices would need to be exchanged frequently due to deterioration of components.

Where does this leave us? Yes, a suitcase nuclear device is technically plausible. The US and USSR had devices close in concept, if not in exact form. Throw enough science and money at the problem and you can make a suitcase bomb. I do not think that a terrorist group has one or the capability to make one. I personally don't think that the extreme extra effort to shrink from a large steamer trunk to a suitcase is really going to suit anyone's CONOPS – terrorist or otherwise. So, my opinion is that the suitcase nuke, whilst plausible, isn't likely.

There better not be any liquids in there or TSA will be very cross! ©DoD