10. Flask Tests.

Every 'package' containing radioactive material for transportation is subjected to a range of tests laid down by the IAEA. The aim of the tests is to ensure that the necessary safeguards are built into the design of the flask, and the conditions under which it is transported, so that it will withstand severe accident conditions without presenting a significant radiological hazard. Flasks are subjected to four main tests:

The Impact (Drop) Test involves the free-fall of a flask from a height of 9 metres onto an unyielding target. The test covers not only the accidental free-fall of the flask, but also the force impact of a collision whilst the flask transport is in motion.

The Penetration (Punch) Test involves the free-fall of a flask from 1 metre onto a 15cm diameter bar. The bar is based on an equivalent section of rail section.

In the **The Fire Test** a flask is engulfed in a uniform flame temperature of 800 degrees C for 30 minutes – and then allowed to stand for 3 hours before any firefighting measures are applied.

The Water Immersion Test involves firstly the immersion of a flask in water to a depth of 15 metres for 8 hours and secondly, the resistence to a pressure equivalent to immersion at a depth of 200 metres for 1 hour.

It is easy to see why extensive criticism continues to be levelled at this range of tests, calling into question the effectiveness of tests on flasks containing such toxic and radioactive material. Flask tests are carried out in a particular sequence which raises doubts as to whether the flask and its contents would survive adequately if the test sequence was changed. Added to the limitations of the tests themselves are the concerns that they are sometimes partly undertaken via computer modelling, or on scale models of flasks. This raises the question whether these forms of testing are indeed sufficient to guarantee radiological containment under the most severe conditions It is useful to list some of the test shortcomings:

For the Drop Test, a 9 metre drop is clearly inadequate when transport flasks routinely cross railway bridges over 40 metres high. The free-fall speed from 9 metres equals an impact velocity of around 30mph. Spent fuel transports travel regularly at speeds of up to 45mph, and in the event of a collision with another train the closing speeds of the two trains will be even greater. In similar vein, the Penetration Test is now interpreted to cover an attack on the flask's outer surface by a penetrating missile. Given the advancement in modern armour-piercing shells and the explosive and shock potential, the test could be insufficient.

Examples of transport fires show up further test weaknesses. The 1984 railway petrol tanker fire in Summit Tunnel near Manchester, burned for 4 days reaching temperatures of 8000 C. The average ship fire is reported by Lloyds Insurers to burn well in excess of 800C and to last significantly longer than 30 minutes. At sea, flasks will be shipped over areas of the ocean well in excess of 200 metres, and the ability to raise a flask submerged at 200 metres or more, within one hour, remains highly questionable.