

Uranium weapons being employed in Ukraine have significantly increased Uranium levels in the air in the UK

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### **Abstract**

Data covering the period November 2017 to November 2022 was obtained from the Atomic Weapons Establishment, Aldermaston to find if there was an increase in Uranium associated with the Ukraine war. Results from 9 High Volume Air Samplers deployed onsite and offsite by AWE showed that there were significantly increased levels of Uranium in all 9 HVAS samplers beginning in February 2022 when the war began. The result has significant public health implications for the UK and Europe.

Keywords: uranium, depleted uranium, particles, Ukraine War, Aldermaston, cancer, birth defect.

### **Background**

Uranium weapons have been increasingly employed in battle action since their first use by the US and UK forces in the Persian Gulf War in 1991. Since then, they have been used in the Balkans in the late 1990s, then Kosovo in 2000, probably in Afghanistan in 2002 and then also in the 2<sup>nd</sup> Gulf War (GW2) in March and April 2003. On impact, uranium penetrators burn fiercely to give an aerosol of sub micron diameter oxide particles which are largely insoluble and remain in the environment for many years [1].

There is considerable public and scientific concern that these radioactive particles may remain suspended for long periods, or may become resuspended and are therefore available for inhalation by non-combatants at some distance from the point of impact. Little research seems to have been carried out on the distance travelled by the uranium aerosols. The military maintain that the uranium remains near the point of impact, and the Royal Society report also states that the material does not travel more than some tens of metres. On the other hand, measurements of uranium in local populations in Kosovo some nine months after the use of uranium weapons tested positive for depleted uranium in urine and the United Nations (UNEP) found uranium particles in air filters in Bosnia and Kosovo some years after its use. The author visited both Kosovo in 2001 (with

Nippon TV) and South Iraq in 2000 (with Al Jazeera), and measured DU residues in the environment using scintillation counting for beta and alpha radiation. Samples were taken in Kosovo and analysed in Wales to show the presence of DU particles precipitated from snow and present in puddles far from the impact points. Later, information on Uranium in air samplers deployed by the Atomic Weapons Establishment showed the presence of Uranium from the 2<sup>nd</sup> Gulf War in 2003 [2] in a study similar to the present one.

The question of the dispersion of uranium aerosols from battlefields is of significant legal interest, since if a radioactive weapon resulted in the general contamination of the public in the country of deployment or elsewhere, the weapon would be classifiable as one of indiscriminate effect.

AWE have been routinely monitoring uranium in air since the early 1990s but since 2000 have carried out filter determinations from high volume air samplers (HVAS) roughly every two weeks. They were required to set up these monitors in the late 1980s following the discovery of a child leukaemia cluster near the plant [3]. There are monitors onsite but they also deploy them at various other sites some 15km distance from the plant. We previously, in 2006, obtained results using the Freedom of Information Act. Analysis carried out and published in 2006 showed that Uranium levels in air filters near AWE increased significantly at the time of the 2003 Gulf War [2]. The issue was widely reported in the media [4].

This report examines the trend in uranium shown by the measurements made on high volume air sampler filter systems (HVAS) deployed by the Atomic Weapons Establishment (AWE) Aldermaston Berkshire UK from 2018 to the end of 2022 and compares the period of the Ukraine war with the period before the war from 2018 to January 2022.

Modern Tank warfare has increasingly become dependent on the use of DU weapons since 1991. It is the key munition in tank warfare. It would therefore be unsurprising if Uranium is being employed in the Ukraine theatre. Furthermore, the fact that after Chernobyl, radioactivity arrived in the UK from the Ukraine, some 1800 miles away should make it clear that Uranium particles from the use of the various anti-tank weapons used by either the Russian armed forces or those supplied to Ukraine by the US and other Western States could contaminate the air in the UK. It has been reported that Bradley fighting vehicles being supplied to the Ukraine by the USA use DU penetrating munitions, and so levels of DU are likely to increase in the UK and Europe. This may have serious public health implications.

## **Method**

High Volume Air Sample data from the Atomic Weapons Establishment was obtained for the period 23/11/2017 to 17/11/2022. More recent data have been requested but have not been made available as yet. AWE measure Uranium at 2-weekly intervals for 4 onsite filters and for monthly intervals for the 5 offsite locations which are up to 15 miles or more distant from the nuclear site at Aldermaston. Thus, in the period there were 65 data points for the offsite filters and 130 data points for the onsite locations and also for the Atomic Weapons Site at Burfield, near the city of Reading. The method employed was to ask the simple question: did the level of Uranium in air increase significantly after the Ukraine war began in late February 2022?

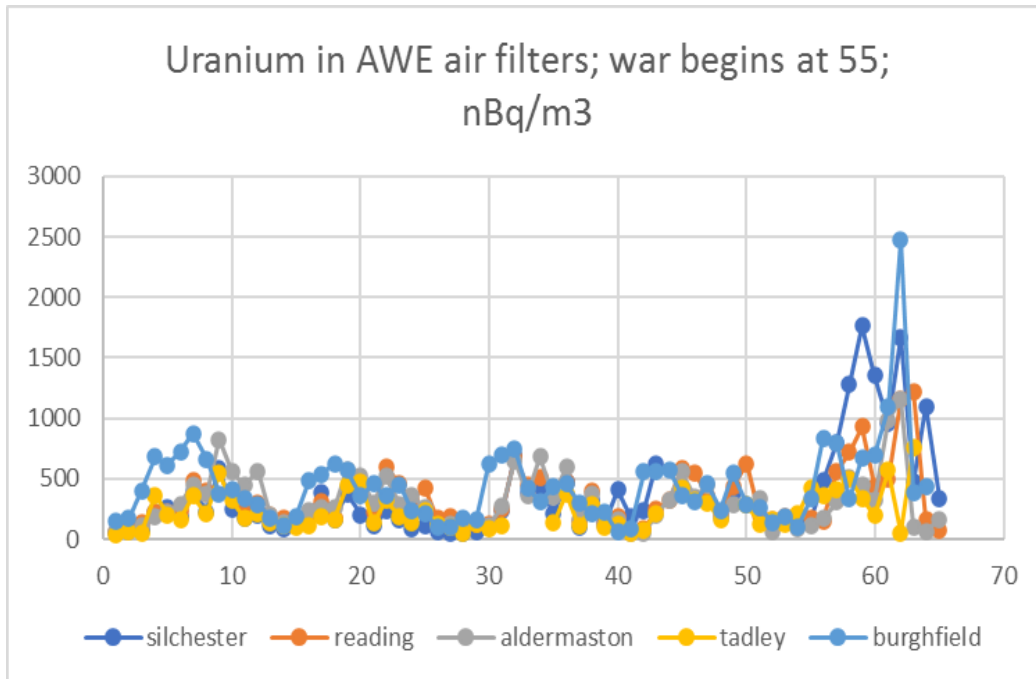
## Results

Mean general levels of Uranium in all the filters both offsite and onsite increased immediately following the start of the Ukraine war. They increased by a factor of around than 2 over this period in all the 9 filters, details in Table 1. This points to a global increase in Uranium following the start of the Ukraine war. A time series plot of the individual data points is given in Fig 1. A small number of outliers have been omitted mainly for Silchester only which showed an unusual increase in Uranium for a short period in the Summer of 2021, and for which there was no explanation. Outliers were removed if there was no supporting increase in other filters at the time, thus pointing to some local phenomenon e.g. dust from an excavation.

The increased levels of Uranium in the air began soon as the Ukraine war began (at data point 55) and are clear from the plot of the Uranium levels in the offsite air filters for Silchester, Reading, Aldermaston, Tadley and Burghfield shown in Fig 1.

A number of measurements exceeded the Environment Agency Reporting threshold of 1000nBq/m<sup>3</sup> during the war period.

**Fig 1.** Uranium (nBq/m<sup>3</sup>) in offsite High Volume Air Samplers deployed by the Atomic Weapons Establishment for Silchester, Reading, Aldermaston, Tadley and Burghfield. The Burghfield data points are reduced from 2-weekly data. The other data points are monthly. The Ukraine war began at point 55.



**Table 1.** Mean levels of Uranium in HVAS deployed by the Atomic Weapons Establishment for the war period (23/02/2022 to 17/11/2022) and the non-war period (23/11/2017 to 23/02/2022). Data for Burghfield reduced by averaging the 130-- 2-week data points

Filter Site (N data points)	Mean War (SD)	Mean Non-war (SD)	Odds Ratio War/ Non war
Silchester (65)	941(544)	231 (159)	4.07
Reading (65)	552 (409)	289 (163)	1.9
Tadley (65)	400 (203)	197 (121)	2.0
Aldermaston (65)	395 (365)	294 (187)	1.34
Burghfield (65)	837 (938)	359 (225)	2.33
006H (130)	290 (162)	226 (161)	1.28
009H	393 (216)	246 (166)	1.6
011H	468 (200)	343 (200)	1.36
020H	527 (273)	330 (213)	1.6
<b>Mean offsite sites</b>	<b>625</b>	<b>274</b>	<b>2.3</b>

<b>Mean difference</b>		<b>351</b>	
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*One way ANOVA gave  $p < 0.000$ ;  $F > 50$  for significance tests of differences between all offsite sites individually. For all offsite sites combined and also for all onsite sites combined  $p < 0.000$  for test of 'war' against 'not war'.*

## **Discussion**

The results show clearly that Uranium from the Ukraine war arrived in the air in England (and therefore also in Europe) as soon as the war began.

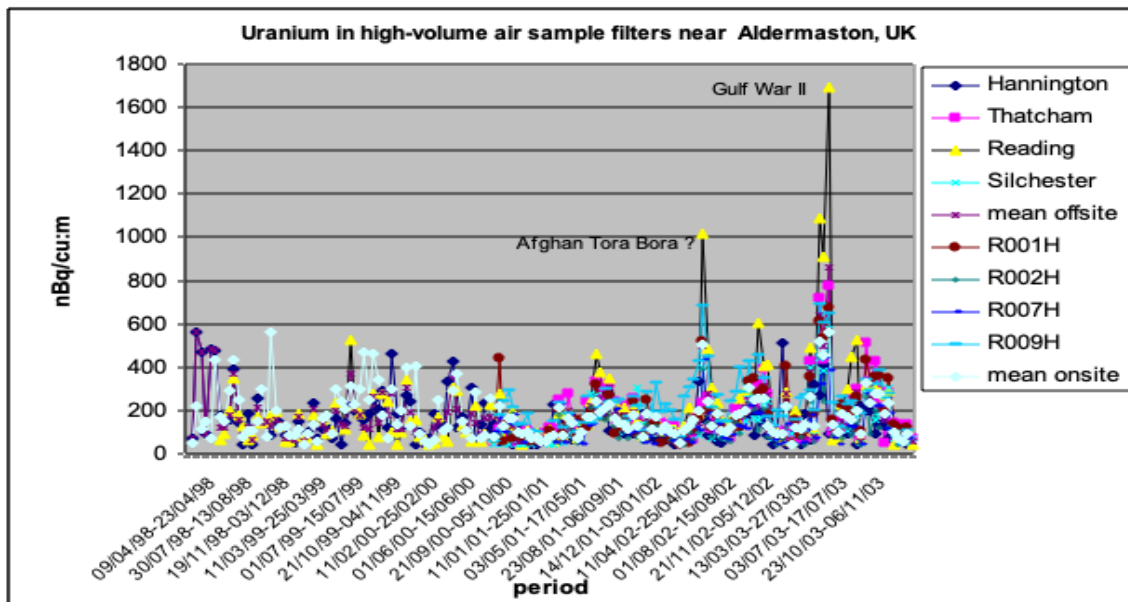
On the basis of a mean increase in uranium in air of about 500nBq/m<sup>3</sup> a model employing respiration data on standard man may be used to calculate that each person in the area inhaled some 23 million uranium particles of diameter 0.25 microns. In 2006 we suggested that health data, particularly birth data be examined for possible effects from the Iraq War exposures. Studies in Iraq after the 2<sup>nd</sup> Gulf War identified significant and serious health effects ranging from birth defects to cancer associated with exposure to Uranium [5,6,7,8].

There are major scientific questions over the risk models used to assess the health effects of uranium particle exposure from weapons use [9,10].

There is evidence of ill health in many of those exposed to uranium particles from Gulf veterans to the population of Iraq. A legal case in the UK in made history in 2010 when a coroner's jury found that the death from colon cancer of a Gulf War veteran had been caused by exposure to DU particles [11]. The issue of the validity of the current radiation risk model for internal exposures has been undermined recently [9,10].

It is of interest that the general levels of Uranium in the AWE filters have increased since the period studied in 2006 to examine the effects of the 2<sup>nd</sup> Gulf War. The reason for this is unknown. Fig 2 is taken from Busby and Morgan 2006. It is clear by comparing Figs 1 and Fig 2 that the increase in Uranium in air seen in the present study is greater than that seen in the 2006 study of the Iraq particles. Of course, the Ukraine is closer to Europe than Iraq. Nevertheless, it is arguable that a great deal of Uranium dust is being generated in Ukraine, comparable to the quantity used in Iraq in 2003, and which caused significant health harm.

**Fig 2** Uranium levels in the AWE samples over the period of the 2<sup>nd</sup> Gulf War in 2003 and reported by Busby and Morgan 2006.



Further than to refer to the issue of such possible health effects of exposure to weapons-derived Uranium nanoparticles the arguments relating to the issue will not be further rehearsed here. Neither will the issue of the weather and airflows over the period of the Ukraine war be examined, as they were in the 2006 report on the Gulf War Uranium. It is clear to all who saw the appearance in the UK and Europe of radioactive contamination from Chernobyl, essentially that part of Ukraine where the initial invasion began, that aerosols generated in Ukraine can appear quite quickly in the UK. This short report is intended only to answer the question it asked: which is, has Uranium from the Ukraine War contaminated Europe?

## Conclusion

Uranium levels in all the onsite and offsite High Volume Air Samplers deployed by the Atomic Weapons Establishment Aldermaston, UK increased significantly in the period beginning with the start of the Ukraine War. This supports the belief that Uranium weapons are being deployed in the theatre and that the fallout of Uranium nanoparticles, has contaminated Europe and the United Kingdom. Given the epidemiological and theoretical scientific evidence emerging in the last twenty years that Uranium particle exposure health effects cannot be safely predicted or explained using the current radiation risk models, this finding has serious public health implications. The finding may contribute to an urgency for discussions to end the war.

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