

SUPPLEMENTARY REPORT BY NORMAN DAVID DOMBEY

S1) It is now over seven years since I wrote my original report on November 13 2007 which has been submitted to the Inquiry. In this supplementary report I try to bring it up to date by including information available in 2007 but which I did not then have, and new information which is now available including evidence heard in this inquiry.

S2) Document B of the original report [which I now refer to as the OR] states that the Avangard plant in Sarov (previously the closed nuclear city called Arzamas-16) produces Po-210 as a major commercial activity [see Appendix I]. The US Department of Energy supported this activity under its Nuclear Cities Initiative with the goal of converting the facilities in the nuclear cities into commercial enterprises. The US team which produced Document B by Bukharin et. al. was based at Princeton.

S3) A companion project under the Nuclear Cities Initiative was entitled 'Review of Conversion Capabilities and Experience of the Avangard Warhead production plant'. This work was undertaken under a contract between the US Department of Energy and the Sarov Analytical Center for Nonproliferation in Russia, which was created to employ former weapons scientists in peaceful research activities. The Partnership for Global Security and Peace in Washington DC administered the project.

S4) The report of this companion project which deals with Po-210 production at Avangard is attached as Document SA. It was also published in 2000. I only became aware of the companion project two months ago while preparing this supplementary report.

S5) Document SA, like the OR, emphasizes that in early nuclear weapons Po-210 was used in conjunction with beryllium as a neutron source for ignition of the fission process. Avangard has been producing Po-210 since 1952 [SA, p.1].

S6) According to p.5 of Document SA

'Polonium-210 production at EMP Avangard is a unique one, because a unique element, polonium-210 is recovered from the irradiated bismuth and because it is the single production plant of such type not only in Russia, but all over the world also.

In 50's -70's, according to available data, similar production plants were in the United States, Great Britain, Canada, and China. However, these production plants were closed in 70's in the United States and Great Britain and in 90's in China'.

S7) Document SA continues

'Possessing unique capabilities, our polonium production facility was the site for verification and introduction of new developments by a number of the USSR institutes, namely:

- VNIINM (A.A. Bochvar All-Russian Research Institute for Inorganic Materials), Moscow;
- V.G. Klopov Radium Institute, St.-Petersburg;

- VNIIRT (All-Russian Research Institute of Technical Physics and Automatics), Moscow;
- K.Ya. Karpov Research Physical and Chemical Institute, Moscow;
- Institute for Biophysics of the RF Ministry for Health Protection, Moscow;

Thus Po-210 from Avangard was distributed to several national facilities within Russia.

S8) On p. 8 of Document SA appears

“B” preparation production for export purposes (United States and Great Britain) has been stabilized and currently reaches 100 items, ‘B’ refers to the production of a glass capsule to contain the Po-210.

S9) I corresponded by email with a Russian member of the team which produced Document SA. He stated on 12 February 2015 that

‘The main goal of the report [i.e. Document SA] you referred to was to describe the capabilities of the Avangard plant in terms of conversion and international cooperation (as 100% of polonium produced there was exported to the U.S.)’.

S10) I understand from the Russian official quoted in paragraph S14 below that the export of Po-210 to Reviss Services Ltd in the UK ceased some time before 2006. That agrees with the statement in the paragraph above that 100% of exports of Po-210 from Avangard went to the United States.

S11) In The Guardian of December 1 2006, Mark Rice-Oxley reported that ‘the Kremlin's deputy spokesman, Dmitry Peskov, told the Guardian... that Russia produced polonium at only one city, which is closed to foreigners, and kept strict controls on the eight grams it exports to American companies each month’. Der Spiegel Online of December 5 2006 also reported that Russia exported 8 grams/month of Po-210 to the United States.

S12) I thought it necessary to check on news stories: 8 gm/month seemed to me to be an extraordinarily large amount of Po-210. I therefore searched Russian sources for confirmation. I found that the Rossiiskaya Gazeta of October 6 2006 had the following interview with the Director of Avangard Academician Rarii Ilykaev [Appendix 3]. My translation of the relevant part is as follows:

Director: The basic material namely bismuth irradiated in the reactor, we obtain from Mayak; we separate the polonium and through the company Tekhsnabeksport we supply customers.

Rossiiskaya Gazeta: In what quantity?

Director: The production is relatively small: 9.6 grams per year.

Rossiiskaya Gazeta On this point I recall another number: 8 grams per month....

Director No. Each month there is a delivery from Avangard of 0.8 grams of Po-210. The prepared substance is in glass ampoules, welded in special containers in strict conformity with the rules...

S13) Paragraph 22 of the OR refers to a report in The Washington Post by Peter Finn which states that 'Po-210 production at Avangard constitutes 97% of the world's production of the isotope'. I went on to say that I could not confirm the amount but it sounded reasonable. Given the confusion over the monthly export figure, I asked Peter Finn for the name of the Russian official who was the source of the 97%. I contacted the official and asked him to confirm the 97% and who supplied the residual 3%.

S14) The correspondence of 3/4 February is reproduced here without the name of the official:

Dear Professor Dombey,

Thank you for your interest. As far as I know, Po from Sarov is the only commercial product now in the market. It is distributed from Russia by JSC Isotope. Earlier it was produced also in Oak Ridge National Laboratory, USA, but not now. Po is now imported to USA from Russia.

There are several places in the world where else Po may be produced. It is not a problem, but commercially not reasonable. I do not know a regular supplier besides JSC Isotope, though there are a number of places where it may be produced in small amounts for research: any research nuclear reactor as well as cyclotron with alpha-particles or deuterons.

Best regards,

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Norman Dombey писал 2015-02-03 16:00:

Peter Finn of the Washington Post told me that you were the source of his article some years ago stating that 97% of global Po-210 production comes from the Avangard facility. I should be grateful if you could tell me where the other 3% comes from.

Many thanks
Norman Dombey
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S15) Therefore neither the figure of 8 gm/month nor the figure of 97% of global production should be taken seriously. Avangard is the only place in the world where there is a Po-210 production line.

S16) I will show below that Po-210 produced or used elsewhere in small amounts for research could not be responsible for Mr Litvinenko's murder.

S17) The evidence which has been presented shows that Mr Litvinenko ingested a dose of 4.4 GBq on November 1 which is equivalent to a mass of 26.5 micrograms of Po-210 [Appendix 2]. The evidence also shows that the Po-210 was in the teapot and in the cup from which he drank.

S18) Mr Litvinenko said he poured only some of the tea that was in the pot and did not finish what was in his cup. So ignoring the Po-210 carried by Messrs. Lugovoi and Kovtun on October 16, and that carried by Mr Lugovoi during October 25-28, there must have been at least 50 micrograms of Po-210 brought from Russia into the UK, given

- (i) that there would have been residual tea containing Po-210 in the cup which Mr. Litvinenko had not drunk, and
- (ii) that there would have been residual tea containing Po-210 in the teapot which had not been poured.

100 micrograms is a more likely figure than 50 micrograms, but I will take a conservative view and use 50 micrograms.

S19) I now can address the origin of this Po-210. There are three different methods of producing Po-210:

- (i) by extracting it from uranium ore just as the Curies did originally;
- (ii) by irradiating a small sample of Bi-209 in a research reactor suitable for preparing isotopes, and
- (iii) by irradiating a large quantity of Bi-209 in a high flux reactor.

In (ii) and (iii) where Po-210 is produced in a reactor, the irradiated bismuth could not be handled as it is highly radioactive. Specialised equipment would be needed to manipulate the material. I call Po-210 produced by method (i) trace Po-210; by method (ii) source Po-210 and by method (iii) commercial Po-210.

S20) The concentration of Po-210 in uranium ore is less than 0.1 milligram of Po-210 per ton of uranium. That is a concentration of less than 1 part in 10^{10} .

S21) By comparison the concentration of natural uranium in seawater in the English Channel is about 3 micrograms per litre or 3 parts in 10^9 , which is thirty times larger than the concentration of Po-210 in uranium. Thus it would make more sense to extract uranium from the sea in the English Channel than to extract Po-210 from uranium ore.

S22) As for method (ii) the Russian official quoted in paragraph S14 above said that there are a number of places where Po-210 may be produced in small amounts for research: any research nuclear reactor with a reasonably high neutron flux could produce small amounts. There may be 30 such research reactors worldwide.

S23) An example of source Po-210 produced this way was given in paragraph 26 of OR showing that a Po-210 source of activity 0.1 microcuries could be bought online. The mass of Po-210 of activity 0.1 microcuries is 22.3 picograms (Appendix 2). Thus about 2 million such sources would be required to produce 50 micrograms of Po-210. Even if the Po-210 had activity 10 microcuries, 20000 sources would be required. Hence in order to be able to obtain 50 micrograms, the Po-210 would need to be produced in commercial quantities.

S24) There is only one producer of Po-210 in commercial quantities worldwide. That is the Po-210 facility in Avangard in Sarov, Russia.

S25) Avangard exports 9.6 grams of Po-210 each year to the USA. Po-210 is used in the USA in antistatic equipment for paint-spraying, removing dust on precision balances and so on.

S26) While it may seem absurd for the Po-210 used to poison Mr Litvinenko to have been produced at Avangard and then exported to the USA; bought or stolen in the USA; re-exported to Russia and then taken to the UK by Messrs. Lugovoi and Kovtun, I will consider that possibility.

S27) The US Nuclear Regulatory Commission issues regulations governing the use of nuclear material including Po-210. The regulations allow the sale and purchase of static elimination devices containing 'as a sealed source or sources, byproduct material consisting of a total of not more than 19 megabecquerel (MBq) (500 microcurie (μCi)) of ^{210}Po per device'.

S28) In order to conform to the regulations the sources made in the United States have a silver backing plate covered by a thin gold foil and a second composite foil of gold and Po-210. These foils are locked together by a pressure weld metallurgy process. The composite foil of gold and Po-210 is then gold plated to provide an encapsulated source that is insoluble and inert in most chemicals. The solid metal source is mechanically fastened within a rigid housing and steps are taken to prevent disassembly of the source housing.

S29) These sealed sources must be checked by the regulatory officials every six months. They are eventually returned to the seller or disposed of in a licensed disposal facility. Normally the antistatic device containing the sealed source is leased for a year or eighteen months rather than sold, because much of the Po-210 will have decayed in that time.

S30) 500 microcuries is the activity contained in 0.11 micrograms of Po-210 (Appendix 2). Hence 450 such sources would have been needed to obtain the 50 micrograms of Po-210 carried by Messrs. Lugovoi and Kovtun. That 450 sealed sources contained in antistatic devices could be bought or stolen in the USA, and then taken to Russia without anyone noticing their absence defies belief.

S31) Nor could the Po-210 be extracted from the sealed source without specialised equipment and detailed knowledge of the physics and chemistry of polonium unless those performing the extraction wished to commit suicide.

S32) It follows that the only other possible explanation is that the Po-210 used to poison Mr Litvinenko was produced at Avangard and distributed to one of the Russian state facilities listed in paragraph S7 above or a state facility not so listed.

S33) In paragraphs 28 and 29 of the OR, Dr Boris Zhuikov is quoted saying that "everything connected with polonium production and application is controlled by governments" while Konstantin Pulikovsky is quoted saying "I can say with complete certainty that no deviations from the rules of storage and transportation of nuclear materials, including polonium, have been discovered at any structures of our fuel and complex."

S34) I therefore conclude that the Russian State produced Po-210 at Avangard and arranged for Messrs. Lugovoi and Kovtun to take it to London for the purpose of poisoning Mr Litvinenko.

S35) This agrees with the conclusions I reached seven years ago which were expressed in paragraph 36 of the OR except in respect of points (c) and (d).

S36) My conclusions thus remain essentially the same as those of my original report of 2007, but can be stated in more succinct form:

- a) **the Po-210 used to poison Mr Litvinenko was prepared at the Avangard facility in Sarov, Russia. One of the isotope-producing reactors at the Mayak facility in Ozersk, Russia was used for the initial irradiation of bismuth;**
- b) **in my opinion the Russian state or its agents was responsible for the poisoning;**

Norman Dombey

February 24 2015