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SCIENCE, TECHNOLOGY AND GLOBAL SECURITY WORKING GROUP

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German Foreign Ministryl
Berlin, Germany

Dear Sir or Madam:

I am writing to inform you of serious inaccuracies in the UN OPCW reports S/2017/904 and S/1510/2017 dated, 26 October 2017 and 29 June 2017 respectively on events at Khan Sheikhoun on April 4, 2017. These reports contain inaccurate descriptions of primary evidence from satellite imagery, photographs and videos cited by the OPCW. They also cite conclusions and analysis based on physics and phenomenology that are not based on sound scientific principles and show little evidence of real expertise on munitions, explosive effects, and delivery mechanisms.

The misleading information and conclusions from these reports led to a pointless exchange of vetoes between Russia and the United States in the UN Security Council on Nov 6, 2017. In addition, the erroneous findings in these reports pose a serious long-term threat to the credibility of the UN and its investigative agencies as enforcers of international law.

Attached are three key documents that back up these findings. We also have additional analysis and findings that we would be happy to provide the UN on request.

The first of the three documents is a scientific manuscript titled *Computational Forensic Analysis for the Chemical Weapons Attacks at Khan Sheikhoun on April 4, 2017*.

This manuscript has been accepted for publication by *Science and Global Security*, a refereed science-based journal published out of Princeton University. The paper has seven authors all of whom are established scientists plus it has been refereed under the supervision of the editors of the Journal.

The manuscript reports supercomputer calculations that show that the OPCW finding is incorrect that a crater at Khan Sheikhoun was produced by the kinetic impact of a bomb that was the source of a sarin release. The crater was instead produced by the explosion of an improvised artillery rocket warhead. The important physical characteristics of the crater production are that it was created by the detonation of an explosive warhead weighing roughly 6 to 10 kg with a large length to diameter ratio oriented at an angle to the ground of roughly 45 to 65° relative to horizontal.

The supercomputer calculations show that the geometry of the charge and its orientation relative to the ground produce a classic crater that has a tear-drop shaped perimeter (that is, a perimeter that is not circular).

Craters with this shape are known to be produced by artillery rockets, as is documented in the UN manual for peacekeepers in the document, *Introduction to UN Peacekeeping Pre Deployment Training Standards*:
http://repository.un.org/bitstream/handle/11176/89584/STM%20Military%20Expert%20on%20Mission.pdf?sequence=1&isAllowed=y
Section 1.2, titled, *Verification of Minefields, Explosive Remnants of war and Crater Analysis* contains the basic information on crater recognition used by UN peacekeepers in the field. Similar discussions can be found in US Army Artillery Officer Field Manuals. These characteristics of artillery rocket craters are therefore very well known to true professionals who deal with these matters.

The second document attached to this letter is an annotated and highlighted version of the *letter of 26 October 2017* transmitted by the *Leadership Panel* of the OPCW to the UN Security Council.

The third critical document is an *Attachment* to the annotated and highlighted version of the *letter of 26 October* 2017. The attachment is titled *Forensic Evidence Cited by the OPCW that Contradict Its Reported Analysis and Conclusions* henceforth referred to as *The Attachment.*

The discussion and supporting evidence in these three documents show, to professional scientific standards, the following.

1. The satellite imagery evidence cited as evidence in the OPCW report is not as described in the report. In particular:

   Satellite imagery of the area around the crater misidentified by the OPCW as produced from the kinetic impact of a bomb weighing 300 to 450 kg also shows two similar craters produced at the same time at a distance of only 150 and 180 meters to the north northeast. 130 meters directly to the east there is also damage to a concrete roof panel of a nearby grain storage warehouse (See pages 8, 9, and 10, and the image at the bottom of page 5 in *The Attachment*). All three craters in the satellite imagery (including the crater where the OPCW alleges a sarin release) are consistent with the impact and explosion of artillery rockets carrying the same explosive warhead (See image at the top of page 5 in *The Attachment*). The damage to the roof panel on the warehouse is also consistent with the impact and detonation of an artillery rocket with a similar explosive warhead.

   Three bomb-damage locations were supposedly found by the OPCW investigators using line-of-sight data from videos of bomb debris clouds taken from the north of Khan Sheikhoun looking south during the time of the attack on April 4, 2017 (See image at the bottom of page 11 in *The Attachment*). The bomb debris clouds appear to be from 500 pound (or possibly 1000 pound) standard high explosive bombs. However, the motion of the bomb debris clouds is in the opposite direction of the wind direction reported for Khan Sheikhoun at that time and on that day. This indicates that the ground-video was taken on another day of a different attack.

   Satellite imagery cited by the OPCW as derived from using the line-of-sight data from ground-video taken north of Khan Sheikhoun looking south shows that the three bomb-damage sites identified by the OPCW show no evidence of bomb damage (See pages 14, 15, and 16 for details of the satellite images in *The Attachment*).

2. Videos of dead animals that were poisoned with sarin indicate that the animals were almost certainly poisoned elsewhere and placed near the crater that was also misidentified as the source of a sarin release by the OPCW (See pages 1, 2, and 3 in *The Attachment*).

   OPCW laboratories identified sarin on the hair of a goat and on the feathers and internal organs of two dead birds that were provided by local Idlib authorities collecting samples for the OPCW. These detections by independent laboratories used by the OPCW are cited by the OPCW as strong evidence of a sarin release at that crater.

   However, video images of the goat show drag marks behind the dead carcass (Page 1 in *The Attachment*) and a rope attached to the neck of the goat that appears to have been used to drag it to the location where it was videoed.

   Video images also show two dead birds that have feathers of orange/yellow coloring at the bottom of a bird cage (Page 2 in *The Attachment*). The images show scattered seeds and bird droppings on the floor of the cage indicating that the birds were living in the cage at an earlier time. Other images (available on request) show an individual taking one of the dead birds from the cage and inserting it into a plastic bag. Still other images show individuals carrying a sample collection box to the crater scene where samples were allegedly collected and put in the box. The sample box is later shown with its lid open where two plastic bags containing dead birds with orange/yellow colored feathers can be seen.

   These data raise very serious questions about whether these animals were killed by exposure to sarin at another location (possibly in a confined room) and then planted as evidence of a sarin release at the

crater. We cannot understand why these images were not found by OPCW investigators during what they say was an extensive review of 250 videos taken at Khan Sheikhoun.

3. Annex II of the 26 October 2017 report to the UN Security Council argues (annotated and included in the annotated letter of 26 October 2016 included with this cover letter) that a bomb of weight roughly 300 to 450 kg hit the ground at "high speed" causing a crater and dispersing between 200 and 300 kilograms of sarin. This amount of sarin is roughly comparable to what we believe was delivered in the massive nerve agent attack of August 21, 2013 in Ghouta, Syria.

   There is absolutely no forensic evidence in any of the video images of the crater area to indicate that the crater was produced by a bomb impacting at high speed (See images and text on page 7 in *The Attachment*).

   In particular, such a bomb would leave behind large pieces of sheet metal from the thin outer wall of its barrel-shaped sarin container, heavy endplates from the front and back ends of the barrel, and tailfins which would be fitted with a parachute that would have not deployed because the proximity fuse in the front end-plate of the bomb did not work as designed. The only "objects" in the crater was a piece of metal of roughly 100 mm diameter that looks like it could be the filling cap for a chemical weapon, and a pipe of roughly 122 mm diameter and 1 m in length (Page 7 again).

4. The OPCW report never identifies the metal "object" in the crater as a pipe of roughly 120 mm diameter. It instead describes the pipe as an *object* that the investigators assess was produced by the impact of a bomb of roughly 300 to 500 mm diameter. There is no explanation for how a sheet of metal could be rolled into a uniform diameter pipe of 122 mm diameter. The object that is a pipe is never described as pipe in the reports while the other object is identified in the report as a filler cap.

   The JIM has no explanation for how a thin metal sheet torn off the walls of a barrel of diameter 300 to 500 mm could be rolled up into a pipe of near-uniform diameter of roughly 122 mm while also being bent along its axis of symmetry, and propelled in a near vertical orientation into the ground at the front end of the crater with the plane of the bend in the pipe pointing forward into the direction of arrival of the munition. The JIM provides no physical explanation of how this complex and convoluted set of events, reminiscent of a Rube Goldberg cartoon, could possibly occur.

5. The report also contains numerous false technical embellishments that no true expert would claim.

   One claim in the UN Annex II is that the alleged 300 to 450 kg bomb was dropped from an altitude of between 4 and 10 km. It is hard to for us to understand why an expert who actually knew what they were talking about would volunteer such a false technical embellishment, and it is also hard to understand why this kind of false technical embellishment was not caught during the review process of the letter of 26 October 2017 before it was transmitted by the Leadership Panel to the UN Security Council.

   Any truly knowledgeable expert would know that such a bomb reaches a terminal velocity due to atmospheric drag and tends to impact the ground at the same velocity regardless of the altitude from which it was dropped. Calculations we can provide to the UN show that such a postulated bomb would hit the ground at a speed of roughly 350 to 400 km/h (230 to 250 mph) – which is about the same velocity as the chemical munition artillery rockets that were used to deliver nerve agent in the attack on Ghouta in August 21, 2013. This is simply because the bomb eventually reaches a speed where aerodynamic drag is equal to the pull of gravity on the bomb. In this circumstance, the bomb neither increases nor decreases in speed. The gravity bomb postulated by the JIM would be constructed from metal pieces that are quite similar to the metal pieces from the rocket propelled barrels of sarin that hit the ground in Ghouta at roughly the same speed, producing copious and easily identified pieces a bent metal fragments around impact sites.

   Another false technical embellishment by experts cited in Annex II of the JIM report states a conclusion that the walls of a "metal cabinet" that was "3 to 5 m" would not be damaged by an exploding munition from an artillery rocket. A knowledgeable technical expert would have not referred so loosely to a range of 3 to 5 m. At 3 m range a 6 kg explosive would produce a peak overpressure of 441 kPa

(greater than 60 psi) while at 5 m range the overpressure would be more than three times lower (less than 20 psi). Anyone who understood the effects of blast waves on structures would know that a factor of three in this particular range of blast overpressures could be the difference between a wall showing no damage from the blast wave or a wall that fails catastrophically.

Yet another expert assertion that no expert would make is that the fact that there is no fragmentation damage to the nearby metal cabinet indicate that the crater could not have been produced by an exploding artillery rocket warhead. Any expert on munitions would have known that the fragments from the artillery rocket warhead would spray out in a direction slightly forward of perpendicular to the axis of arrival of the artillery shell. The shape of the crater indicates that the axis of arrival would result in fragments being directed *away* from the metal cabinet. Finally, the "metal cabinet" should have been identified as an *electrical substation*. Any expert would know that electrical substations are by design highly resistant to blast and other environmental insults. This is because they are designed for environments that can include tampering from malicious individuals. If there is sufficient interest at the UN in this matter, we can provide our analysis that shows that the conclusion voiced in this matter by the JIM is not a conclusion that a true expert on munitions effects would make.

Another expert false embellishment is that damage at the bombed sites where the satellite imagery shows no evidence of bomb damage was caused by either a *thermobaric bomb* or a *fuel-air-explosive*. We comment on this in detail in the annotated Annex II, but here it suffices to say if the satellite imagery shows no evidence of any bomb damage, it is hard to know how the expert determined that a thermobaric bomb or fuel-air-explosive was a source of bomb damage.

There are many other false technical embellishments in the JIM report that raise questions for us about whether the individuals relied on for expert input by the JIM were true experts on these matters.

In summary, there are glaring inaccuracies in the descriptions of cited evidence and embellished inaccuracies in the expert analysis associated with the report by the OPCW on the events in Khan Sheikhoun on April 4, 2017. Our review of the cited evidence from photographs and videos show that the descriptions of the cited materials are not accurate. We also find that the physics and phenomenology used to explain the data that is cited as evidence by the investigators is not based on sound scientific principles. The OPCW report shows no evidence of real expertise on munitions, explosive effects, and on delivery mechanisms. We have no idea how such glaring shortfalls could have occurred. It is possible that experts were involved but were not listened to, or the management with oversight responsibilities for the investigation failed to properly scrutinize the credentials of its team of experts.

It is clear, however, that no true expert was involved in the final review of the Leadership Panel letter of 26 October 2017 before it was transmitted to the UN Security Council resulting in two pointless vetoes by Russia and the United States. We have no way to explain this flawless record of flawed results.

We believe that the OPCW report on Khan Sheikhoun needs to be corrected so as to protect the credibility of the UN and its supporting agencies in their critical role as enforcers of international law. The UN and its supporting agencies is a uniquely important world institution and my colleagues and I are deeply committed to helping in every way we possibly can to facilitate an accurate report on this matter that is consistent with the substantial amount of publicly available data and the application of sound science-based analytical principles.

Most respectfully,

Theodore a. Postol

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