Introduction

100 years ago there was a shooting in Sarajevo. Historians credit this act of violence as being the trigger event for the First World War. It is possible future historians will look back at the shoot down of MH17 as the trigger event for the Last World War.

The following report examines the circumstance surrounding the loss of the 298 lives aboard Malaysian Airways flight MH17. This work was undertaken in response to the current fact free public discourse coupled with the strident allegations increasingly reminiscent of the clamour for conflict that lead to WWI. It is hoped that a formal review of the known facts may serve to undermine any belligerent attempt to provoke a wider war.

Section 1 examines what is known about the Buk M-1. Section 2 reports factual data regarding the crash of MH17. Section 3 considers the possibility of the shoot down being the responsibility of rebel forces operating on behalf of the Donetsk Peoples Republic. Section 4 examines the possibility of the Ukrainian Armed Forces (UAF) being responsible for the shoot down. Section 5 provides a speculative interpretation of events surrounding the shoot down.

This report is based on information publicly available on August 1st 2014. As new information is released this report may need to be updated. It is anticipated that making this report available for public review will result in both suggestions for improvement and / or the identification of critical gaps in the factual record.



Section 1 The Buk M-1 Missile System

To understand what happened to MH17 we first need to understand the capabilities of the Buk M-1 surface to air missile system. The keyword here is system. The Buk consists of a number of independent components which operate in unison but which are typically situated at a distance from one another. The networked components provide medium range defense against aircraft, cruise, and ballistic missiles. The core system components consist of a primary search and target acquisition radar, a central command post, and one or more Transport Erector Launchers with Acquisition Radars which are known by the acronym TELARs.

The primary search radar scans the airspace out to a range of 140 km in each direction. MH17 was travelling at 900 km per hour, or 1 km every 4 seconds. At this speed, MH17 would transit the area surveyed by the search radar in less than 9.5 minutes. The amount of time available for decision making is therefore seen to be severely constrained.

Data from the search and acquisition radar is forwarded to the command vehicle. The command vehicle will be situated at a safe distance from the radar transmitter as any device emanating electronic signals will quickly become a battlefield target. The command vehicle is responsible for target identification, friend or foe determination, and the decision to engage. The operator in the command vehicle selects of the targets revealed by radar and assigns one or more missiles to intercept the designated target.

Once the command unit decides to engage, the target information will be relayed to one or more remote TELARs. Not all TELARs may be in range of the target. Some TELARs may be better positioned for the attack than others. It is desirable to avoid firing at a target moving away from the missile launch position. Engaging a fleeing aircraft is known as target pursuit and it does not result in an optimum firing solution.

Each TELAR carries four ready to launch missiles. The launch signal may be relayed from the remote command post, or the launch may be manually triggered by an operator in the TELAR. In the early versions of the Buk system the Transporter Erector Launcher, or TEL, was not equipped with an acquisition radar. The TEL was completely dependent on target information relayed from the command post. In a conflict, any adversary would seek to blind the system by destroying the primary search radar. This would render the rest of the system useless. To avoid this outcome the later versions of the Buk mounted a basic acquisition radar on each TEL. These were then renamed as TELARs. This secondary radar system is able to locate targets within 42 km of the TELAR. The information provided by the secondary radar is significantly less than what the primary radar makes available to the command vehicle. The radar scope in the TELAR displays a constant size blip regardless if the aircraft is a 777 or a Piper Club. No transponder, or IFF information, will be available. The operator selects a radar target, assigns one or more missiles to the target, and then fires the missile(s)

To engage an aircraft, the missile is aimed in the general direction of the target and fired. Each missile contains a radar seeker in its nose cone. The radar signal transmitted by the main search radar "paints" the target and is reflected back into space. The missile seeker scans the sky for these radar returns and navigates an interception course. This is a critical point.

If you hear a plane at night and rush out to your backyard with a flashlight, you are unlikely to be able to see the aircraft. The flashlight beam will be insufficient to illuminate a high flying aircraft. The strength of the flashlight beam will be attenuated by the distance to the plane and few photons will be reflected back to your eye. To see an aircraft at 33,000 feet you would need an extremely powerful searchlight.

The same holds true for radar. The missile seeker head searches the airspace, looking for radar energy reflected from a target. The missile will have a preference for a strong target return as opposed to a weaker one. Larger targets will give a stronger return. Most military aircraft are relatively small and are designed to minimize the amount of radar energy they reflect. In comparison to the diminished returns of a fighter aircraft, a Boeing 777 would light up like a blimp.

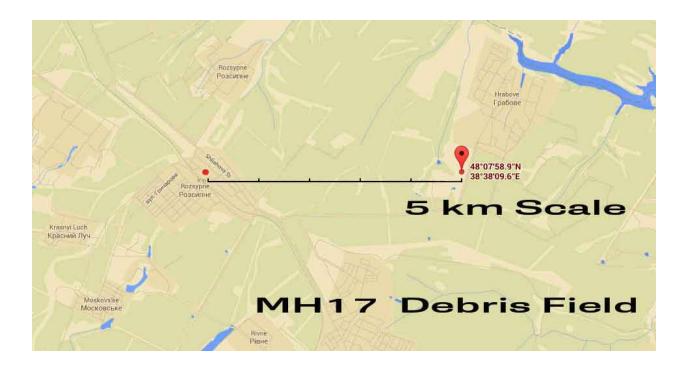
The missile contains a radar transmitter that provides active guidance for the final run in to the target. This radar also functions as a proximity fuse. It measures the time required for the radar pulse to bounce back from the target. When the measured interval equals 50 feet the missile warhead is detonated. The explosive charge, reported to be as powerful as six 155mm shells, sprays small cubes of white hot shrapnel toward the target. This shrapnel penetrates the

fuselage, severs control lines, injures, or kills, the occupants of the plane, and renders key components unserviceable. If hot shrapnel enters a fuel compartment it will likely ignite a fire.

It must be noted that while the primary radar has a search range of 140 km, the radar on each TELAR unit only has a range of 42 km. The Buk system was first deployed in 1980 and has been upgraded several times since then. The engagement range of the system is dependent on the missile that is fielded. The first Buk system used the 9M38 missile with a range of 30 km. The missile supplied with the Buk M-1 had a designation 9M38M1 and a range of 35 km. The Buk M-2 system used an upgraded missile 9M38 with a range of 42 km. The precise capabilities of the Buk system fielded by the UAF is not known but it is believed to be either a Buk M-1, or M-2.

Section 2 The Loss of Malaysian Airways Flight MH17

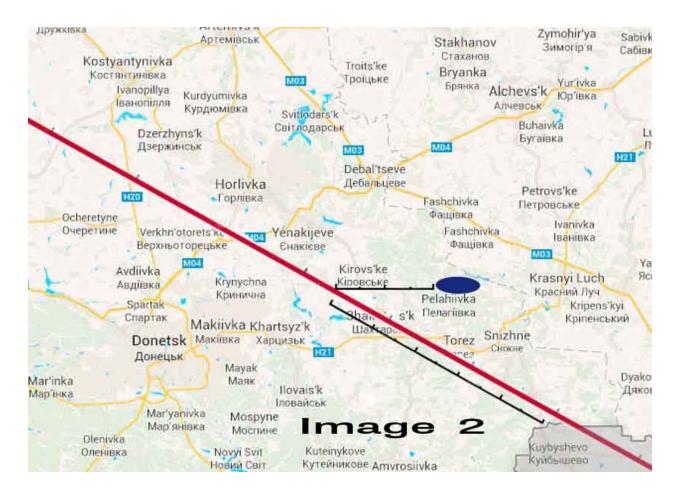
MH17 was flying at 33,000 feet. The cabin was pressurized to provide occupants with an environment similar to that found at an altitude of 7,000 feet. Due this internal pressure, any tears, or rents, in the aircraft fuselage would quickly enlarge as the interior air explosively vented to the outside atmosphere. After the missile explodes, momentum will continue to carry the aircraft forward at 1 km every 4 seconds. The damaged fuselage will be torn open by the high speed airstream. The missile initiates the destructive sequence but aircraft momentum completes it. As the airstream pulls the airframe apart, the aircraft will begin to loose speed. Its control systems may no longer function, its engines and fuel systems may be inoperable, its crew may be dead, the radios silenced. It will follow a ballistic trajectory toward the ground. Given the aircraft's height, and its initial high speed, it can be expected to travel 20 to 30 km before it strikes the ground.



While the exact cause of the loss of MH17 is subject to debate, there are a number of known facts. These facts are not disputed. Residents near the entrance to the town of Rozsypne reported bodies falling from the sky. This indicates MH17 suffered a major structural failure and spilled passengers out into the airstream. The aircraft engines, and heavy parts of the airframe, came down in a field of sunflowers adjacent to a chicken farm south of the town of Hrabove (also identified as Grabovo). The debris field was located between these two points with the heavier components located toward the eastern end of the field. Image 1 portrays the debris field. The line drawn between Rozsypne and Hrabove is 5 km long with intermediate marks at 1 km intervals. This line represents the track MH17 followed during its descent and suggests the aircraft travelled on a course of 090 degrees after it was struck.

Ukraine Air Traffic Control informed Malaysian Airways that radar contact with MH17 was lost at 1623 local time or 1423 GMT. MH17's last reported radar position showed it to be 50 km from the Russian border on a course of 118 degrees true, traveling at 490 knots, or 907 kmh.

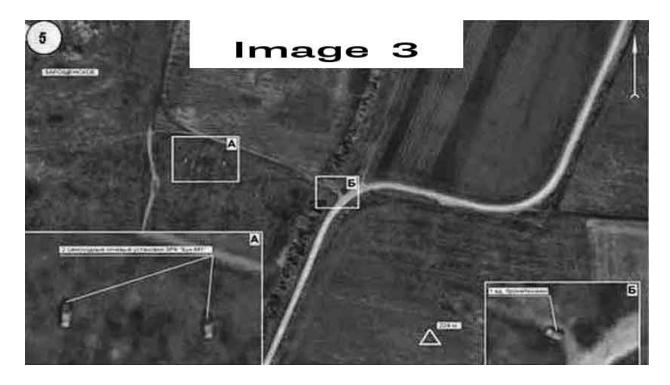
We can plot this data and begin to develop an understanding of what must have occurred. The debris field outside Hrabove is aligned along a track of 090 degrees. This is a significant deviation from MH17s last reported course of 118 degrees. We can extended this 090 degree track to the west until it intersects with MH17's course at a point 50 km from the Russian border. This point is near the likely point of catastrophic failure of the aircraft and its systems. These combined tracks are shown in Image 2.



Residents of Torez reported hearing two blasts at 1620 local time (1420 GMT). Others heard one blast. It is possible these blasts were the sound of the Buk missile exploding adjacent to MH17. Given the 3 minute time difference between the time of the blasts and the time MH17 disappeared from ATC radar, this suggests the point of missile impact was roughly 3 km further back along the aircraft track of 118 degrees. In the three minutes it took for the aircraft to traverse this distance, aerodynamic forces were pulling the aircraft apart. As MH17 turned into a shredded mass of metal it lost all of its prior aerodynamic characteristics and began falling from the sky.

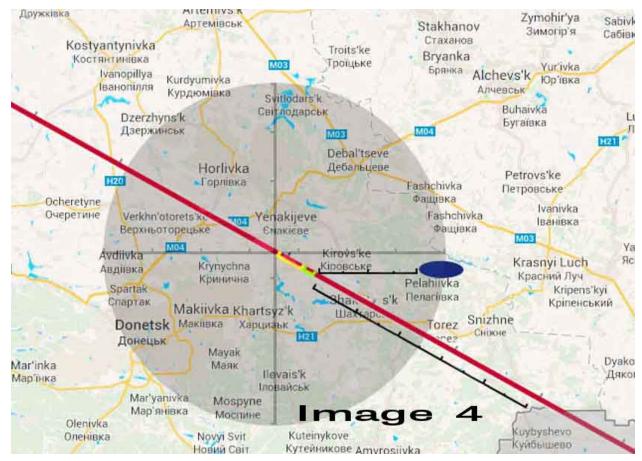
Buk-M1 missiles travel at a speed close to Mach 3. They must climb from the ground launch position to reach the target's altitude. In the case of MH17 the missile faced a vertical climb of almost 5.5 miles, or 8.85 km. A missile speed of mach 3 equals 2,284 miles per hour or 3,375 feet per second. Fired vertically the Buk missile would have required almost 10 seconds to reach the altitude of MH17. During this 10 second period MH17 would have travelled 2.5 km. If we move 2.5 km back along MH's course track (Green segment) we arrive at a point which represents the missile impact point if the launcher had been directly beneath MH17.

But it is unlikely the missile was located directly beneath MH17. The Buk-M1 system is equipped with the 9K37M missile which has a range of 35 km. This is equivalent to a range of 114,828 feet which is traversed at 3,375 feet per second.



Russia has released satellite imagery (see Image 3) which depicts a Ukraine Buk 1 emplacement 30 km east of Donetz and 8 km south of Shakhtars'k. A missile fired from this position would have a flight time of 21 seconds to reach MH17's track. During this period MH17 would have travelled 5.2 km. If we move 5.2 km back (Yellow segment) along MH17's course of 118 degrees and draw a circle with a diameter of 70 km we can identify an area within which the Buk launcher must have been located.

When we combine all this data in a map representation we see what is pictured in Image 4. The red line shows MH17s course of 118 degrees. The adjacent scale is 50 km long and depicts MH17's distance from the Russian border at the time it disappeared from ATC radar. The point of missile impact must have been to the northwest of this 50 km distance. The debris field between Rozsypne and Hrabove (Grabovo) is depicted by a blue oval approximately 10 km in length. The distance from the western end of the debris field to MH17's course of 118 degrees is 20 km. This accords with the expected trajectory of objects falling from 33,000 feet at MH17's speed of 1 km every 4 seconds. The green segment extending back along MH17's track represents the distance travelled between 1623 and 1620, the time the citizens of Torez reported hearing one or two loud explosions and the time MH17 disappeared from ATC radar. The yellow segment

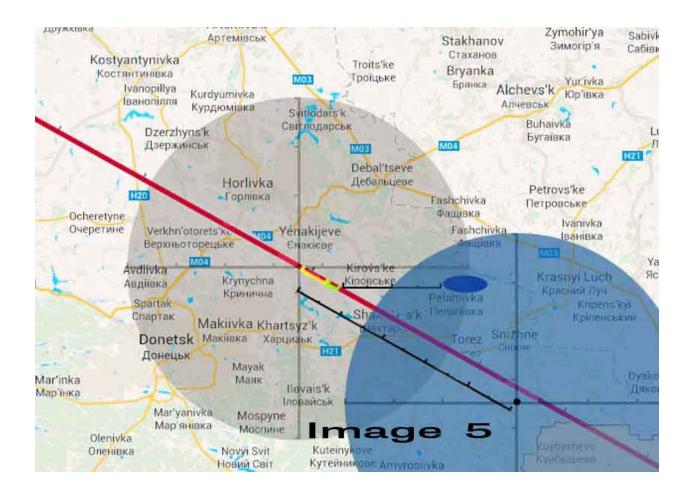


extending further back along MH17's track line represents the 21 second flight time of the missile. The gray circle depicts a range of 35 km centered on the end of the yellow time line segment. The missile that struck MH17 must have been located within this gray circle.

The Telegraph's Rebel Buk Position.

The Telegraph has reported locating a Buk firing position to the southeast of the town of Snizhne. The site was located using photographs provided by the Ukrainian SBU, the security department of the Ukraine Ministry of the Interior. The SBU image was taken in Torez and purports to depict the smoke contrail of a Buk missile fired by the rebel forces.

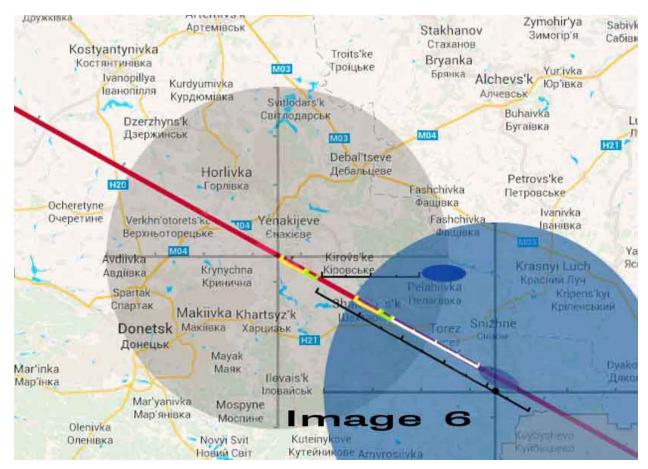
A blogger attempted to locate the ground position of this smoke contrail using landmarks contained in the photograph. This suggested a firing position to the south of Snizhne. A reporter from the London Telegraph inspected the suspect area and located a patch of scorched earth in a grain field. The adjacent farm track showed evidence of a vehicle, possibly tracked, having passed through this location. This position south of Snizhne accords with web imagery that shows a Buk traveling south on the divided highway leading from Snizhne toward the Russian border.



This firing location was located on Google maps. It is depicted in Image 5. The blue gray circle represents the 35 km missile range of the 9M38M1 missile. The black dot at the center marks the Telegraph's purported firing position.

What is immediately clear from this imagery is that the point of missile interception lies more than 50 km from the purported firing position located south of Snizhne. It is well outside the 35 km range of a Buk M-1 missile. There is absolutely no possibility that a Buk missile fired from this position could have struck MH17 and resulted in the ground impact outside Hrabove. The radar on the TELAR unit could not have seen MH17. The aircraft was outside both the 42 km radar range and the 35 km missile range.

Image 6 shows the likely placement of the debris field if a Buk TELAR south of Snizhne had engaged MH17 at the earliest possible opportunity. Using the same data as previously employed it is clear that the debris field would fall almost directly over the launch position.



The course of 118 degrees for the track of MH17 can be verified by flight radar tracking but the precise alignment of that track may be called into question. Some representations show MH17 passing directly over Horlivka. This would place MH17 even further out of range from a Buk M-1 firing position south of Snizhne. Image 7 imposes a 50 km circle on the periphery of the Russian border. Even if MH17 had passed directly over Horlivka, the engagement zone required to produce a debris field in the vicinity of Hrabove still lies outside the range of a Buk missile fired from south of Snizhne.

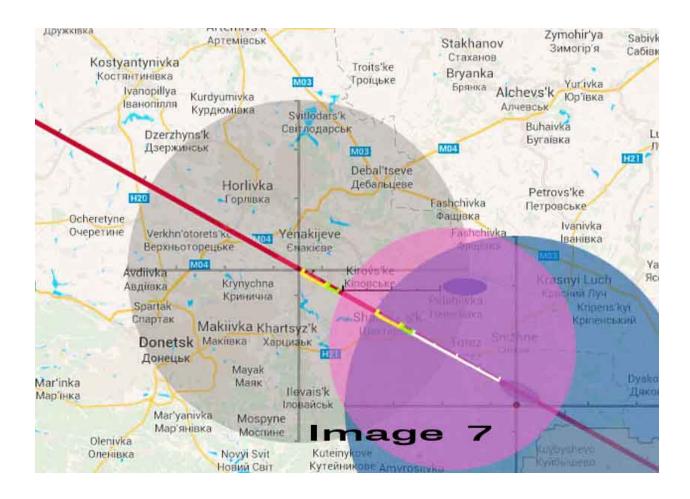
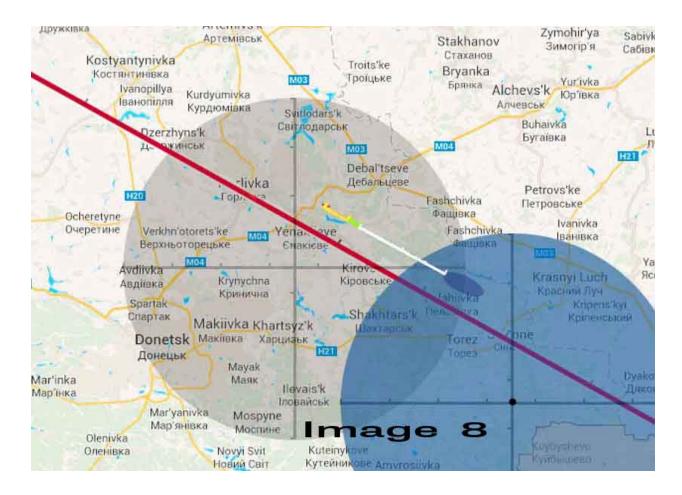


Image 8 shows a representation of a course track of 118 degrees passing directly over Horlivka. The debris field remains in approximately the same position but has been realigned with the course track. The white segment represents the free fall trajectory, the Green segment the distance travelled in the 3 minute interval between the reported explosions and the loss of radar contact and the Yellow segment represents the distance travelled during missile flight time. It is clearly impossible for a Buk M-1 located in the Telegraph's reported position south of Snizhne to have brought down MH17. This engagement location sits well north of a 50 km distance from the Russian border.



It is noted that the BBC had a team in the Snizhne area and they also searched for a Buk firing position. They found nothing and received no citizen reports of sighting a missile contrail. The Telegraph came along later and did locate a position marked by scorched earth and heavy equipment tracks. Regardless of what the Telegraph claims to have found, it is physically impossible for a missile fired from the Telegraph's position to have intercepted MH17. The next section examines the available data to identify the Buk position that fired the missile that intercepted MH17 and caused the loss of 298 lives.

Section 4 Investigation of Ukrainian Responsibility

Any system which emits electromagnetic energy can be tracked and geolocated with great precision. That is how your cellphone is able to determine your location. All militaries have an interest in determining what forces are situated adjacent to their borders. It is a natural and reasonable response for Russia to locate and identify weapons systems operating on its western borders just as it is natural and reasonable for NATO to seek to identify Russian forces.

Image 8-B is based on information publicly released by the Russians. The green shaded area represents the 140 km radar range of a Buk primary search and acquisition radar located in Styla, south of Donetsk. The shaded circles indicate the range of three UAF Buk missile TE LARs located within range of the flightpath of MH17. The range of the primary search radar compared to the 42 km range capability of an individual TELAR is immediately obvious. Despite this extended range, MH17 would have transited the green shaded radar search zone in under 9.5 minutes.

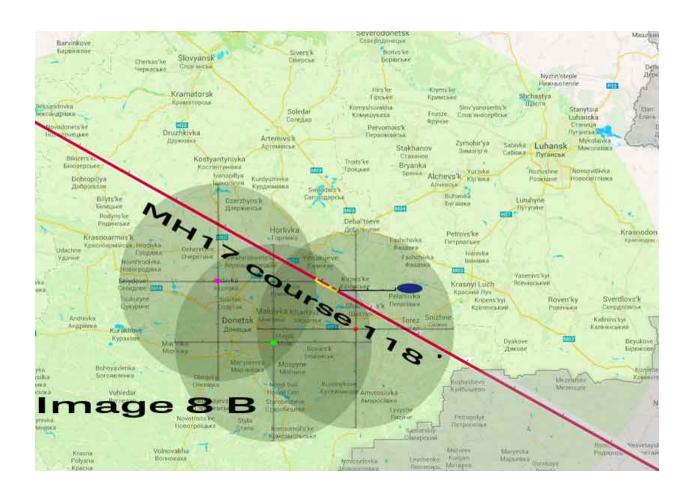
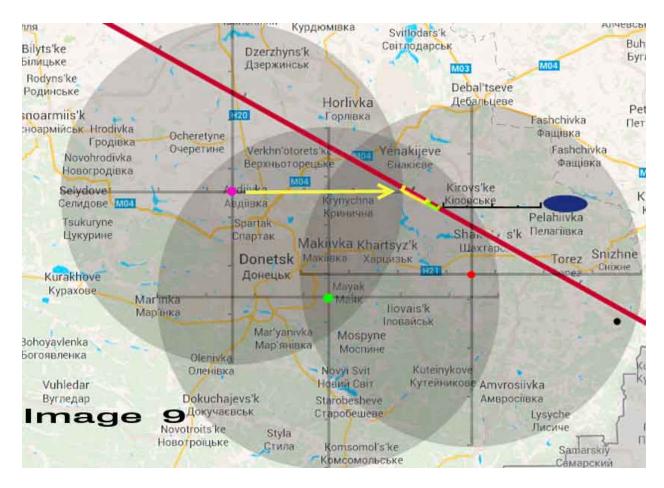
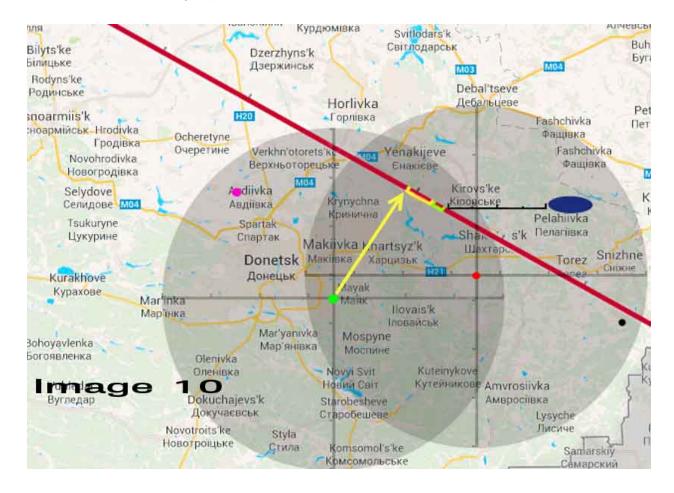


Image 9 presents a detailed close up of three Ukrainian Buk positions within range of MH17's course. Each position was triangulated by range and bearing from the data supplied by the Russian Federation in its July 21st presentation. The resulting positions were then transferred to the map imagery used in this post. Three Buk TELARs were within range of MH17: a TELAR at Avdiivka (Purple dot), Mayak (Green dot) and Shakhtars'k (Red dot). The Shakhtars'k emplacement is the same one shown in Image 3. All three of these positions were likely networked with the search radar in Styla and would therefore have had the benefit of the extended range and target discrimination offered by that radar.



The Avdiivka position is within range but would have engaged at the limit of its missile range. A missile fired from this position would have engaged in target pursuit and this is not an optimal firing solution. In addition, a missile fired from this position would have approached MH17 near its tail section and this area of the aircraft would have suffered the heaviest damage. The publicly available tail imagery shows the tail to be void of marks made by explosive shrapnel. For this reason the Avdiivka position is discounted.

Image 10 shows Mayak is within range but in this case the missile would approach MH17 from the beam. The midsection would suffer the greatest amount of damage. Since the missile explosion launches white hot shrapnel at the target, and a missile approaching from this bearing would explode over the wing area, it is highly likely that it would have ignited a fuel tank fire. The video imagery of MH17's descent show no sign of flame until the moment of ground impact at which point a fireball erupts. This fireball likely resulted when the intact fuel tanks, contained within the wing structure, struck the ground, burst open, and sprayed a cloud of fuel which immediately ignited. Images from the debris field show the central section of the aircraft to have burned completely away. If a missile from Mayak brought the aircraft down it would likely have fallen in flames. The Mayak position is therefore ruled out.



This leaves the position south of Shakhtars'k shown in Image 11. This position offers an optimum firing solution as the aircraft will be approaching the launch position rather than moving away from it, thus avoiding pursuit mode. MH17 is clearly within the 35 km missile range. The missile would have approached the aircraft from ahead on the starboard side. Buk missiles are designed to explode approximately 50 feet from the target and from a position slightly above the target. An explosion in this position would obliterate the starboard side of the aircraft cockpit (It is

doubtful the starboard side will ever be found) and the shrapnel would have blasted through the cockpit area and exited on the port side. This is consistent with imagery obtained from the debris field.

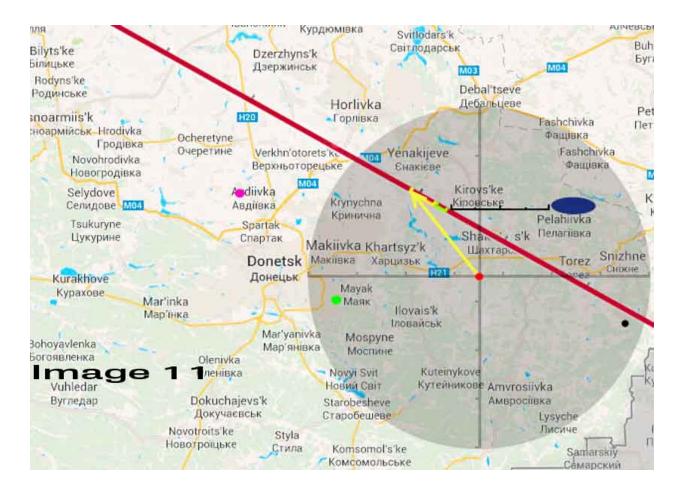
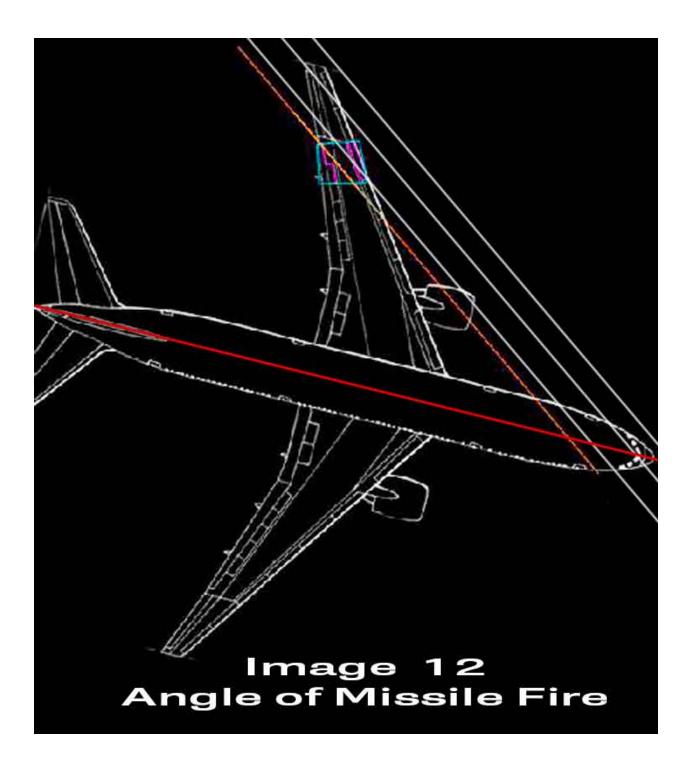


Image 12 has been used to support the hypothesis of an aircraft firing guns or cannon from the port quarter of MH17. This gunfire is alleged to have caused a graze across the top of the wing. This same image has been rotated to approximate the course track of MH17 which is displayed in red. Additional missile trajectory lines have have been added parallel to the original orange graze line.

It is obvious that this graze across the top of the port wind supports the hypothesis of missile shrapnel coming from a position to starboard and ahead of the cockpit. Some portion of the missile shrapnel, or part of the disintegrating aircraft fuselage, was likely driven back across the top of the wing surface and this created the wing damage that is being interpreted as a bullet graze.



The same image suggests a cloud of missile shrapnel entering from the starboard side and exiting on the port side resulting in the heavy damage observed to the portion of the fuselage below the port cockpit window. The purported 30mm cannon holes are larger than would be expected of 30mm cannon fire. It is believed that UAF SU-25 aircraft carry a mixed load of explosive and incendiary rounds. The explosive 30mm rounds would have burst on contact and completely disintegrated the fuselage. What is thought to be 30mm projectile entrance damage

is more likely to be exit damage associated with missile shrapnel exiting the airframe after having passed through the cockpit area. The larger voids likely represent cockpit equipment that was blown out the port side due to the missile blast.

A mixed load of explosive and incendiary rounds is normally fed in an alternating sequence. Any incendiary cannon fire that reached the cockpit area would likely have ignited a fire. The video image of the aircraft descent shows no sign of fire until after aircraft impact with the ground.

Aircraft cannon normally fire in bursts in order to place a cloud of lead on the target and ensure a hit. The damaged port side cockpit fuselage clearly shows evidence of multiple impacts. Why is it that the port wing surface shows only a single bullet graze?

The port wing graze also serves to rule out a missile fired from Mayak. Image 13 shows the direction shrapnel would have taken if fired from a position on the aircraft beam. Since the missile is designed to explode above with the shrapnel blasting down, it is evident that a missile interception from the Mayak position would have caused damage to the wing surfaces and likely ignited a fireball at altitude. Witness reports indicate the plane breaking up in the sky but they do not report a fireball.

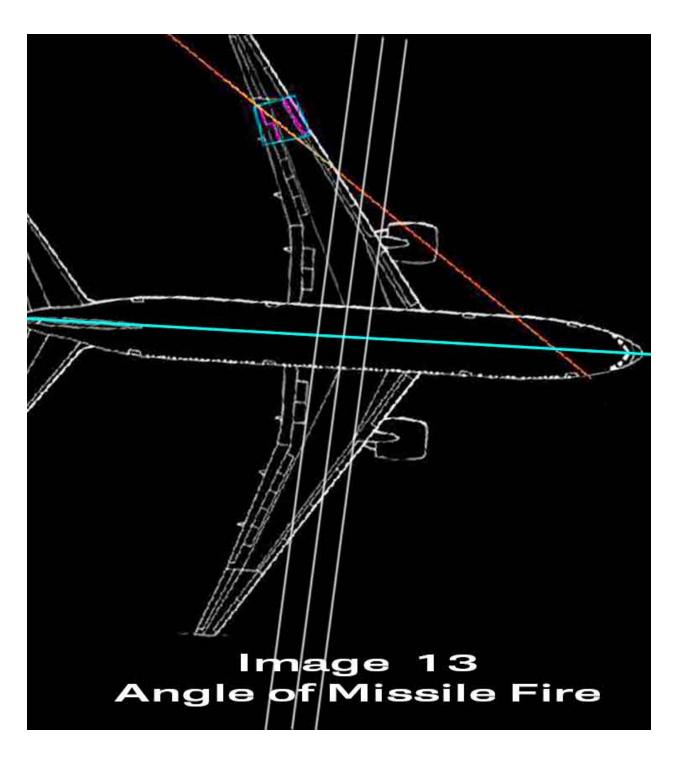


Image 14 shows the approximate direction of missile shrapnel if the missile had been fired from the UAF Buk position in Avdiika. Again, since the missile is designed to explode high and project shrapnel down and forward, an interception from Avdiika would likely have destroyed the tailplane and adjacent surfaces. Imagery from the debris field shows these aircraft components to be largely intact and unmarked.

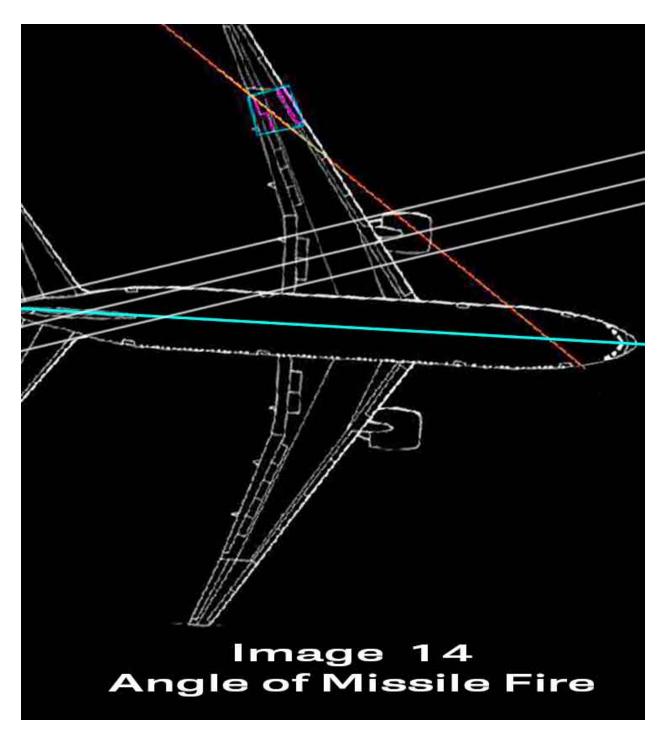
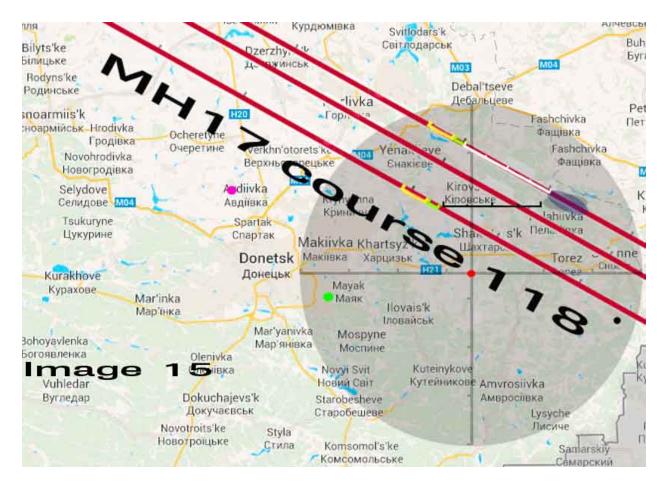


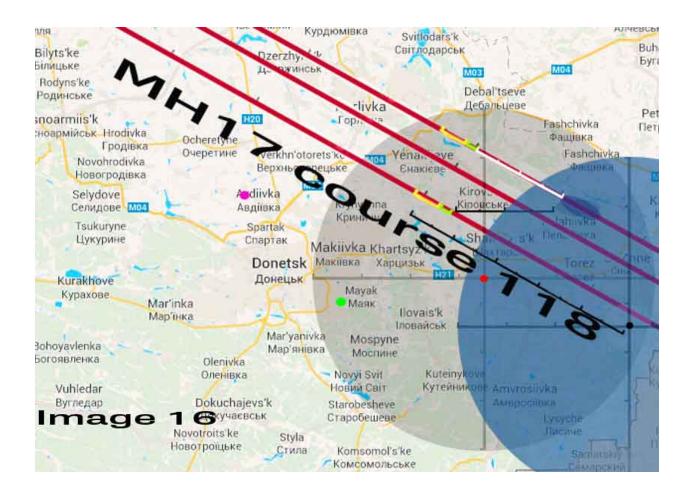
Image 15 shows that a missile at the Shakhtars'k position remains capable of an interception even if the course track is displaced to the Northeast. While the course of 118 degrees was reported by flight tracking services, the exact alignment of this track in relation to the ground has been subject to various interpretations.

Image 15 shows all possible variations. The lower of the three course lines represents MH17 passing to the south of Horlivka. The middle track represents MH17 passing directly over

Horlivka, while the most northerly track represents an alternate alignment with the extant debris field. In each instance an interception by the Buk position south of Shakhtars'k is possible. Note that in each case the missile would intercept on the starboard side of the cockpit.



When the Telegraph site is superimposed on the map (see Image 16) it is clear that a Buk TELAR deployed at Snizhne would not have been able to intercept MH17 at the calculated point of missile impact. If a Buk TELAR was located exactly at Snizhne it would have intercepted MH17 in a head on position. The resulting damage would be very different from the observed damage.



No evidence has been offered to show that the rebels captured a complete Buk M-1 system. What evidence does exist suggests rebel capture of a single TELAR from a Ukrainian military facility in Donetsk. There is no evidence that this captured system was in working condition. Most military forces are trained to destroy, or disable, equipment about to fall into enemy hands. It is therefore highly likely the TELAR captured by the rebels was inoperative. This explains why it was immediately moved east rather than being deployed to protect Donetsk from air attack. There is no evidence to suggest the rebels acquired a Buk search radar unit, or a Buk command post vehicle.

Lacking search radar capability, a Buk TELAR deployed at the Telegraph's reported position south of Snizhne would have a maximum radar search radius of 42 km. Its radar would be unable to see any aircraft beyond this distance. As image 16 shows, MH17 was struck by a missile when it was more than 50 km from the Telegraph's Snizhne position. At 33,000 feet, MH17 would not have been visible to the naked eye. The aircraft would not have been audible. The question which needs to be asked is "How did the rebels manage to identify a potential target outside the acquisition range of a Buk TELAR radar, and beyond the limits of visual range?" Perhaps the rebels are telepathic. Even if the rebels had telepathic powers, the range of the Buk missile is limited to a 35 km radius. If it was an older system (and much of the Ukrainian

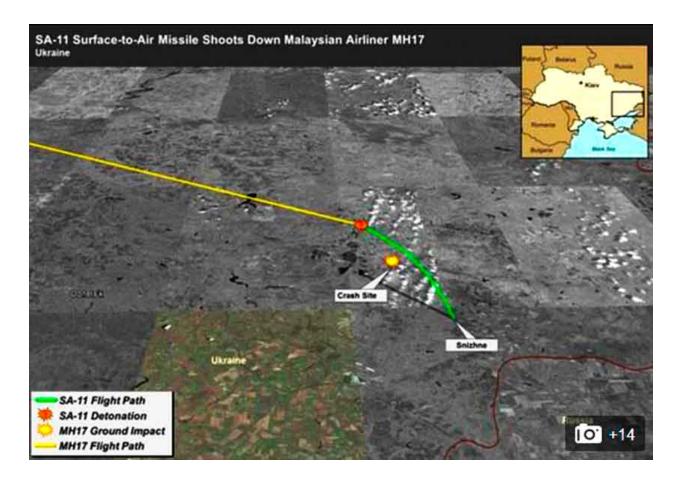
equipment is old, outdated, and in poor repair) the missile range would have been limited to 30 km. The damage evident from debris field images does not match the damage expected to be caused by a missile impact from directly ahead, or from slightly to port.

Finally, if a missile had been fired from a position close to Snizhne, it is likely the citizens of Snizhne would have observed and photographed either the missile launch, or the missile emplacement. The fact of the captured Buk's passage east has been well documented. Why are there no images of the rebel missile and its impressive launch contrail? Why is it that neither the BBC, nor the Telegraph reporters, both of whom undertook extensive surveys of Snizhne, and the area south of Snizhne, were unable to locate a single local eyewitness to the alleged missile launch events?

The reason no evidence was found was because the missile that downed MH17 was not fired from Snizhne.

In closing I wish to present two thoughts and one final image. Saker has previously presented his interpretation of the available crash data. This report contains my interpretation of the same data. Both interpretations likely contain flaws and both are likely to be amended as more information becomes available. I have attempted to present the evidence as accurately as I can and I welcome any critique or additional information presented in the comments section. That is the first thought.

Image 17 is provided courtesy of the US military.



The US military operates with an annual budget that exceeds the combined budgets of all other military forces worldwide. The US armed forces are awash in money, personnel, and equipment. In addition to overhead imagery available from reconnaissance satellites and from a drone squadron reported to be operating in Ukraine, the US military also fields satellites with infrared detectors as part of the Defense Support Program. These IR sensitive satellites are expressly designed to give immediate warning of any missile launches. These satellites are reported to be sufficiently sensitive that they are able to detect hot spots within forest fires. Despite these various advanced technical capabilities the only imagery released by the US military comes in the form of the cartoon shown in Image 17.

The citizens of the world must pay attention to the fact that the US has not provided any reasonable means to assist in the identification of the perpetrators of the MH17 shoot down. The bulk of its "evidence" consists of a rehash of what is found on social media. And much of what is found on social media has been shown to be forged by the Ukrainian Security Service and Ministry of the Interior.

When the neo-Nazis in Ukraine overthrow a democratically elected government, the west does nothing but rant against Putin. When the unelected government of Ukraine launches air strikes, MLRS Grad launches, and ballistic missile strikes against its own civilian population in Donbass, the west does nothing but rant against Putin. When the Kiev neo-Nazis burn people alive in

Odessa, shoot them down as they attempt to escape the flames, and rape a pregnant woman before strangling her with a telephone cord, the west does nothing but rant against Putin.

When 298 innocent lives are lost, the west again rants against Putin. But it finally does more. In the person of the USA, it issues a cartoon which seeks to implicate the rebels, individuals fighting against the outrages perpetrated against them by the unelected government in Kiev. By its actions the US, and all those leaders aligned with it, demonstrates complete, total, and utter disrespect for the basic tenets of democratic freedom and for those citizens of the Netherlands, Malaysia, Australia, and those others who lost their lives in the MH17 shoot down.

This year marks the launch of the First World War 100 years ago. Any reading of the history of that conflict shows the political leaders, and the media, doing all they could to provoke war, not prevent it. The actions of Ukraine, the irresponsible invective and blathering of Obama, Kerry, Cameron, and the rest, appear designed to provoke what will likely be the Last World War.

The citizens of the world should act to stop them.