



## **Analysis of the reasons for the crash of flight MH17 (Malaysian Boeing-777)**

### **1. The event**

[Malaysia Airlines](#) Boeing 777 ([Amsterdam](#) — [Kuala-Lumpur](#)) departed from Amsterdam Airport Schiphol at 10:14 [UTC](#) (14:14 [Moscow Time](#)) and was scheduled to arrive at its destination at 18:10 local time (22:10 UTC/2:10 Moscow time).

Echelon 330, including the 10 kilometers altitude that the crashed Boeing was flying at, was open for international transit flights over the territory of Ukraine. According to the data provided by the airline, contact with the airplane was lost at 14:15 GMT, approximately 50km away from the Russian-Ukrainian border. However, according to internet portal [Flightradar24](#), the airplane stopped transmission of [ADS-B](#) over [Snezhnoe](#) (the last reported coordinates — [48.0403° northern latitude 38.7728° east longitude \(G\) \(O\)](#)) after 13:21:28 UTC (17:21:28 Moscow time, 16:21:28 [local time](#)) at an echelon of 33 thousand feet (a bit over 10 kilometers).

Later on, the wreckage of the airplane was found burning on the ground on the territory of Ukraine. The plane crashed in the area of village [Hrabove](#) (not far from [Torez](#)). No one from the passengers and aircrew members survived.

### **2. Investigated questions**

Under what circumstances did the airplane crash?  
Who could be responsible for the crash?

### **3. Analyst group**

A group of experts from the Russian Union of Engineers was gathered to analyze the situation. The expert group included retired AA officers, who had combat experience with surface-to-air missile systems, as well as pilots experienced in using air-to-air weapons. The problem was also discussed at the meeting of the Academy of Geopolitical Affairs, where many different versions were tested and discussed once again. In the course of the analysis, the experts used materials received from open sources published in mass media. The situation was also analyzed with the help of the Su-25 aircraft flight simulator.

Concluding the conducted research work, the following analytical materials are presented.

### **4. General source data for the purposes of analysis**

#### **4.1. Overall aerial situation in the area around Donetsk.**

The overall aerial situation in the area around Donetsk was presented at a Special briefing of the Russian Federation Ministry of Defense regarding the crash of MH-17 in the airspace of Ukraine, on 21.07.2014.

The **objective control** data, registered from **17.10 pm to 17.30 pm** Moscow time, were presented at the briefing, during the speech of head of the Main Operations Directorate, deputy of the Russian Air Force Chief of Defence, Lieutenant General Andrey Kartapolov.

During the time period in question, there were three civil airplanes in the sky, all of which were on their scheduled flights:

- Flight from Copenhagen to Singapore at 17:17;
- Flight from Paris to Taipei at 17:24;
- Flight from Amsterdam to Kuala-Lumpur

Apart from these, Russian civil airspace control facilities recorded an altitude gain by a Ukrainian Air Force aircraft, supposedly Su-25, towards the Malaysian Boeing-777. The distance between the Su-25 and the Boeing-777 was 3-5 km.



Image 1. The aerial situation in the area of the crash of Boeing 777 (according to the data of the Russian Federation Ministry of Defense)

#### 4.2. Meteorological conditions in the area of the crash of the Boeing 777

Record of weather conditions in Topez, Donetsk Oblast, Thursday, 17 July, 2014.					
Time	Weather conditions	Air temperature	Wind speed m/s	Atmospheric pressure	Relative humidity %
15:00	Overcast sky	+31°C	← 4.0	730	29
15:00	Overcast sky	+31°C	← 4.0	730	29

#### 4.3. Source data from the Boeing 777 crash site

A more complete picture of the reasons for the crash of Boeing 777 can be achieved through the analysis of its wreckage. Examining the pictures of the fragments, published on the Internet, one can notice various damage on its fuselage – disruptions and breaks, holes with edges from the internal and external sides of the fuselage, which speak of a powerful external pressure against the airplane.



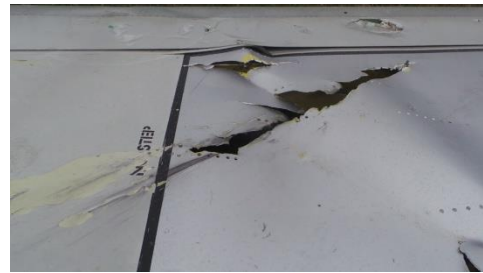
**Photo 1. A fragment from the wing of the Boeing 777**



**Photo 2. A fragment from the fuselage of the Boeing 777**



**Photo 3. A wing fragment from the aircraft**



**Photo 4. A wing fragment from the aircraft**



**Photo 5. A fuselage fragment from the aircraft**



**Photo 6. A cabin fragment from the aircraft**

Holes with inward edges catch the eye. These are round-shaped holes, which are normally grouped. Such holes could only have round shapes in the case of being cut with metallic elements, possibly with bars or aviation cannon projectiles. This brings up the question: by whom and how could such elements be delivered to the airplane and what could these elements actually be?

#### 4.4. Characterization of the Boeing 777 aircraft as an air target

The source data for the analysis of the given situation are technical specifications of the Boeing 777 aircraft; its flight path; the altitude and speed of the flight; heading alteration compared to the initial flight plan; site of the crash; photo and video materials of the plane wreckage; description of the range and the nature of wreckage dispersion.



**Photo 7. Boeing 777**

##### **The most significant parameters of Boeing 777 serving for the purposes of the current analysis**

Wing span, m	60.93
Length of the airplane, m	63.73
Height of the airplane, m	18.52
Wing area, m <sup>2</sup>	427.80
Maximum airspeed, km/h	965
Cruise airspeed, km/h	905
Operational range, km	8910
Service ceiling, m	13100

The Boeing 777 aircraft is not considered to be a difficult aerial target for AA systems. It is a high altitude aerial target (4000—12000 m) with a very large RCS (Radar Cross Section) – no less than 10m (the RCS for an airplane of the Su-25 type is 0.5—0.6m), it has limited maneuverability, and it has no capacity for anti-AA counteraction (active and passive jammers, false targets, etc). It can be effectively targeted both by military aircraft (interceptors or other types of aircraft acting in the same altitude and speed range) as well as by AA systems of object (S-200, S-300 type) or tactical (BUK-M1) types.

#### **5. Technical aspects of the problem**

In the present day practice of using anti-air systems engagement of aerial targets is classified according to the following types:

- A. type – termination of controlled flight
- B. type – restricted continuation of controlled flight without possibility of landing
- C. type – restricted continuation of controlled flight with possibility of landing and a subsequent repair of the aircraft

In this case, according to the available data, there is enough ground to claim that we deal with (A) type target engagement – termination of controlled flight.

*We examined all major versions which had already been published by experts from different countries. Turning to the technical aspect of the problem, it can be claimed that the Boeing 777 was destroyed by anti-air defense systems – either by using a surface-to-air missile, launched from the ground, or by another aircraft employing its missile or aircraft cannon.*

*Applying engineering methods and technical analysis, the experts of the Russian Union of Engineers discussed both of these versions, which represent almost the unanimous spectrum of opinions by experts and specialists.*



**6. Version I. Boeing 777 was shot down as a result of using a surface-to-air missile, for example BUK-M1**



Photo 8. AA missile 9K37M1 BUK-M1

Technical characteristics of the AA missile 9K37M1 BUK-M1	
The start of mass-production	1983
Targeting range, km	
— <a href="#">F-15</a> airplane types	3..32—35
Targeting altitude, km	
— <a href="#">F-15</a> airplane types	0,015..22
Number of simultaneously engaged targets	18
Single shot kill probability <a href="#">SAM</a>	
• <a href="#">Of a fighter</a>	0,8..0,95
• <a href="#">Of a helicopter</a>	0,3..0,6
• <a href="#">Of a cruiser</a>	0,4..0,6
Maximum velocity of engaged targets, m/s	800

6.1. Evidence supporting the first version.

6.1.1. The probability for the effective shooting down of an aerial target of the Boeing 777 type by an AA missile 9K37M1 BUK-M1 is high, as the plane was moving at a 10100 echelon, at the speed of 900 km/h. Such parameters could make it an aerial target for BUK-M1. The probability for successfully hitting such a target by a BUK-M1 AA system is 0.8-0.95, as a consequence, it is technically possible to hit an air target of this type.



Image.2. A group of Ukrainian AA missile systems

The Ukrainian troops group around the site of the crash site included 3—4 systems of the BUK-M1 type. This information was published by the Russian Ministry of Defense. Head of the main Operation Directorate of General Staff, Lieutenant General Andrey Kartapolov, emphasized the fact that the Russian military possesses photos of separate Ukrainian troop locations, made from space, including photos of Ukrainian army divisions in the southeast of Ukraine, particularly, BUK systems 8 km from Lugansk. In the morning following the crash of the Malaysian airliner, Russian control facilities discovered a BUK-M1 AA missile system around the Zaroshenskoe village.

On that same day that system was redeployed towards the Donetsk area - towards the area where the militia troops were positioned. We consider these data to be objective and reliable.

6.1.2. Also, the Russian Federation Ministry of Defense stated that Russian military officers recorded the operation of a radar of a Ukrainian BUK-M1 AA missile system on the day of the crash of the Malaysian liner Boeing 777. The target location and guidance system Kupol 9C18 is a three-axis coherent-impulse target locator performing the transmission of information about the aerial environment to the command observation post of the [9C470 AA missile system 9K37](#)

[BUK](#). The 9C18 radar is capable of detecting and identifying aerial targets at a distance of 110-160km, with an identification range for low-altitude targets (under 30m) of up to 45km. Such a radar could be used for the detection and tracking of a Boeing 777.



**Photo 9. Radar 9C18M1 «Kupol»**

Radar 9C18M1 Kupol	
Coverage area:	
In azimuth, degrees.	360
In elevation angle, degree.	0-40
Instrumented range, km	10-160
Resolving power:	
In range, m	400
In azimuth, degrees.	3-4,5
In elevation angle, degrees.	3-4,5
Continuous operation time, h	48
The set up and clotting time, min.	5
Maximum velocity, km /h	65

6.1.3. However, experts of the Russian Union of Engineers find it important to note that the launch of a BUK-M1 missile is accompanied by the following significant audio-visual factors:

- Significant noise effect, both at missile launch time and during its flight, especially at altitudes between 100 and 3000m.
- A powerful flash at the launch site (Photo 10).
- A condensation trail, formed by the missile as a result of missile fuel burning on its flight trajectory (Photo 11).
- A flash and a characteristic picture in midair at the point of convergence of the missile with the target. (Photo 12).

6.1.4. The version that a BUK-M1 AA missile was used in this incident, according to the experts, has a number of vulnerable aspects, making it questionable:

a) Up to now no one has provided reliable evidence of the a “surface-to-air” missile launch, which is known to be accompanied by significant noise and visual effects. Its condensation trail goes into the clouds and ~~stays in the air~~ for up to 10 minutes. The sound wave produced during the launch of the missile can be heard within a radius of 7-10 km around the launch site.



**Photo 10. Launch of a BUK-M1 AA missile**

b) The flight of a surface-to-air missile is accompanied by a very loud noise. Its flight can be visually traced due to the trail formed as a result of the missile fuel burning (condensation trail).

In this case, there is no record of a trail in the form of a dense white condensation from the burning of fuel, as well as of a vapor path, which appears and stays for a few minutes after the launch and is well visible within a radius of no less than 10km from the launch site.



**Photo 11. BUK-M1 AA missile during flight**

c) The detonation of the warhead has a characteristic configuration, which can be seen from the ground under clear weather conditions.



**Photo 12. Air target shot down by a BUK-M1 AA missile**

The surface-to-air missile 9M38 is equipped with a dual-mode solid-fuel engine (general operation time about 15 seconds).



**Photo 13. AA missile 9M38 BUK-M1**

Surface-to-air missile 9M38	
Missile length	5,5 m
Diameter	400 mm
Flaps width	860 mm
Missile weight	685 kg
Warhead weight	70 kg

The surface-to-air missile, with 40-70kg of warhead payload, explodes not inside of the target, but in its proximity, at a distance of 50-100 meters.

The warhead detonation causes an aerial shockwave, which results in a high-speed fragment distribution. The fragments are capable of breaking an airplane fuselage, but taking into account the dimensions of a Boeing 777 (63.7m length, with a large wingspan of over 60 m), they still cannot destroy the airplane, causing its fragmentation into several smaller parts, as is the case with aircraft that are 7-10 times smaller in size. When hitting a Boeing 777 such fragments may cause disruptions of fuel flow and lead to the leakage of fuel over the fuselage and wings and its subsequent ignition leading to a fire.

d) Similarly, in the case that the hydraulic system had been damaged, the Boeing-777 would have lost control, or control would have become extremely difficult (shooting down type «B»). If an aircraft as big as the Malaysia Airlines Boeing-777 had been hit by a surface-to-air missile, the crew might have been able to warn flight services of the situation created onboard the aircraft. However, according to the information presented by mass media, nothing of the kind has been registered in the decoded data of the aircraft recorders.

e) The crash of the airplane took place during daytime, in a highly populated area, where there were not only numerous military observers monitoring the air environment, but also many reporters equipped with video cameras, as well as local residents, having digital cameras and cellphones with cameras. It is also worth noting that the launch of a BUK-M1 surface-to-air missile requires the participation of at least a combat crew, which makes a stealthy launch rather difficult.

It would be logical to assume that pictures and video recordings depicting the situation from various angles and displaying several stages of the flight of the missile, would have instantly appeared on the internet (the numerous amateur video recordings of the meteor impact near Chelyabinsk are a good example of that). However, local residents recorded only the fact of an explosion in the air and the falling of body fragments near their houses.

f) During the crash of the Boeing-777 airplane, an American satellite was overflying the territory of Ukraine. Because of this, Russian military officers believe that the American side should publish satellite images made at the moment of its crash, if Washington possesses any such images.

#### **Conclusions from the first version:**

***The data and considerations above pose very significant challenges to the version according to which the Malaysian Boeing 777 airliner was shot down by a BUK-M1 surface-to-air missile system.***

#### **7. Version II. Boeing 777 was shot down as a result of another aircraft (one or multiple) using its missile and/or aircraft cannon equipment.**

##### **7.1. Evidence in favor of this version:**

7.1.1. In the airspace around the area where the Boeing has crashed, numerous witnesses claim to have seen a military aircraft (some people say there were two), supposedly an air superiority



fighter, as they derived from its characteristic features and speed (the flight altitude of an air superiority fighter is 5000-7000m, and the velocity is around 950km/h or more).

They also heard the sound of an airplane in the clouds. Presumably, these could have been airplanes of MiG-29 or Su-25 type.



**Photo 14. MiG-29**

MiG-29	
Maximum velocity –high altitude \on the deck	2450 km/h (M=2,3)\1300 km/h
Maximum rate of climb, m/s	330
Acceleration time from 600 to 1100 km/h, from 100 to 1300 km/h, s	13,5\8,7
Takeoff airspeed, km/h	220
Service ceiling, m	18000
Operational range (without a drop tank\with one drop tank\with 3 drop tanks), km	1500\2100\2900
Maximum turning rate, °/s	23,5
Operational acceleration, g units	+9

MiG-29 armament includes a single-barrel cannon GSh-301 (30 mm, 150 rounds of ammunition, firing rate of 1500 shots/minute) in the left wing root extension. For engaging air targets 6 short range R-60M or short range R-73 guided missiles with IR Seekers can be installed on the 6 below-wing stations of the MiG-29; 4 medium range guided missiles R-27RE with radar location or with R-27TE IR navigation system P-77.

Also, according to the data of the Ministry of Defense, on 17 July, Russian air control means registered altitude gain by an airplane of [Ukrainian Air Forces](#), presumably, a Su-25, moving towards the Malaysian Boeing 777. The distance between the two airplanes did not exceed 3-4 km.



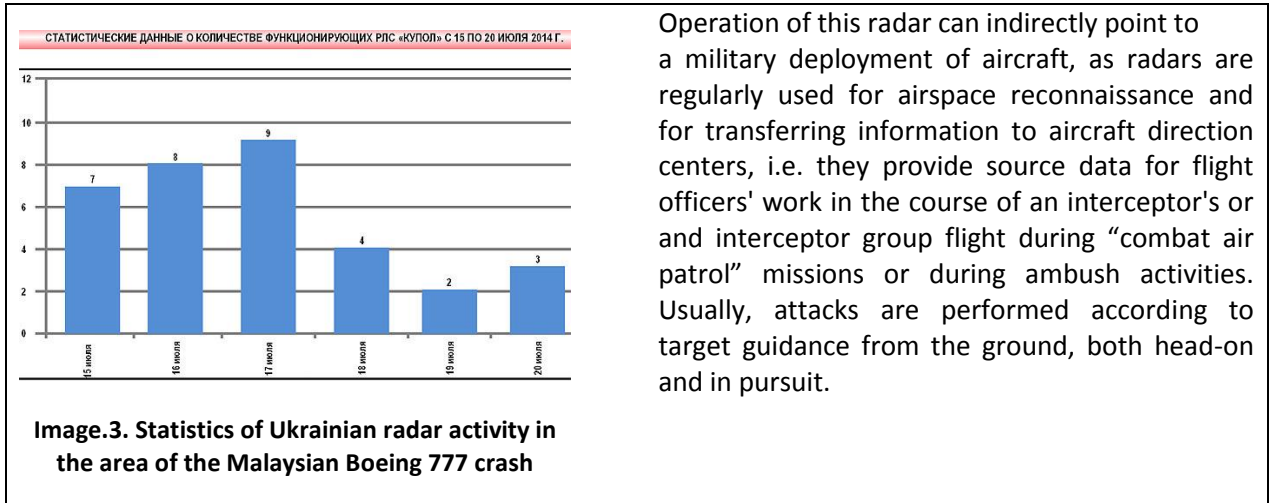
**Photo 15. Su-25**

Armament: One 30-mm 2-barrelled autocannon GSh-30-2 in the lower forebody with 250 rounds of ammunition. GM: air-to-air R-3 (AA-2) or R-60 (AA-8) air-to-surface Kh-25ML, Kh-29L or S-25L. Containers SPPU-22 with a 2-barrel 23-mm autocannon GSh-23L with 260 ammunition rounds.

Su-25	
Wing span, m	14.36
Weight, kg	
Maximum takeoff weight	17600
Maximum airspeed, km/h	
At cruise altitude	975
High altitude	M=0.82
Operation range, km	1850
Mission radius, km	
High altitude	1250
At cruise altitude	750
Service ceiling, m	7000—10000

It should be noted that Su-25 specifications allow it to gain an altitude of 10.000m and above for a short period of time. Its standard armament includes air-to-air missiles R-60, which are capable of engaging and hitting targets at a distance of 10km, of which 8km is a guaranteed range. Moreover, it does not even need to come close to the target, but only to reduce the distance down to the required engagement range.

7.1.2. The Russian Federation Ministry of Defense stated that Russian military officers fixed the operation of a Kupol radar, belonging to an Ukrainian AA missile BUK-M1 battery, on the day of the crash of the Malaysian liner Boeing 777.



7.1.3. On radars, the Su-25 is displayed in the same way as the MiG-29, as their radar cross sections are similar. The operational service ceiling of the MiG-29 is 18013m, so the altitude at which the Malaysian airliner was moving, 10100m, could easily be reached by a MiG-29. The MiG-29 has two high thrust engines, allowing it to attain a speed of 2000km/h.

7.1.4. The data on meteorological conditions can also count in favor of the version that the Boeing 777 was attacked by another aircraft. Meteorological conditions from 15:00 to 18:00, 17.07.2014 in and around the city of Donetsk, were marked by rain and an overcast sky. Flight paths of passenger airplanes lie above the lower border of high-echelon clouds. At this altitude, only cirrus cloud can form. Those are separate white-colored fibrous clouds, which are thin and transparent, and rarely contain dense or flaky formations. They are arranged in the form of bundles and stripes, passing all along the sky and meeting at the horizon. They show perfectly well through the sky. The average height of the lower border is 7-10km, while the width can be from hundred meters up to several kilometers.

An attack by a fighter aircraft with a rapid ascent, from below the cloud layer could be quite unexpected for the crew of the Boeing 777. Such an attack could not have been discovered visually from the earth either due to the dense layer of clouds in the medium and lower cloud echelons.

**Thus, it can be claimed with a certain degree of certainty, that the Boeing 777, conducting a horizontal flight at the altitude of 10000m, could actually be in the lethal range of aircraft cannon or missile armament of a fighter aircraft, be it MiG-29 or Su-25.**

7.1.5. Thus the logical question arises: which particular weapon was the cause of the shooting down of Malaysian Airlines Boeing 777?

### Missile armament

In terms of missile armament, MiG-29 as well as Su-25 can carry short range guided missiles R-60M



Photo 16. R-60M missiles on the external sling of the airplane

P-60M	
Length, m	2,14
Diameter, m	0,12
Wingspan, m	0,39
Weight, kg	45
Warhead weight, kg	3,5
Speed	2,5M
Target kill altitude range	0,03...20
Maximum launch range, Front/Rear hemisphere	10/8 km
Minimal launch range Rear hemisphere, km	0,3 - 0,25

MiG-29 is equipped with a 30mm GSh-301 cannon, with a fire rate of 1500 rounds per minute. The cannon is armed with 150 rounds, which contain a tungsten alloy. The effective range of firing at air targets is 200-800m, and 1200-1800m for ground targets. Such type of rounds exit cleanly, leaving holes of a perfectly circular shape. They do not explode inside the cabin, are not incendiary-based, but are able to kill the crew and cause the destruction of the cabin, which is typical for the entrance and exit holes configuration: entry holes – with edges bent inwards, exit holes - on the opposite wall - with edges bent outwards.



Photo 17. Aircraft Cannon GSh-301

The Su-25 is equipped with a **GSh-2-30** aircraft cannon.

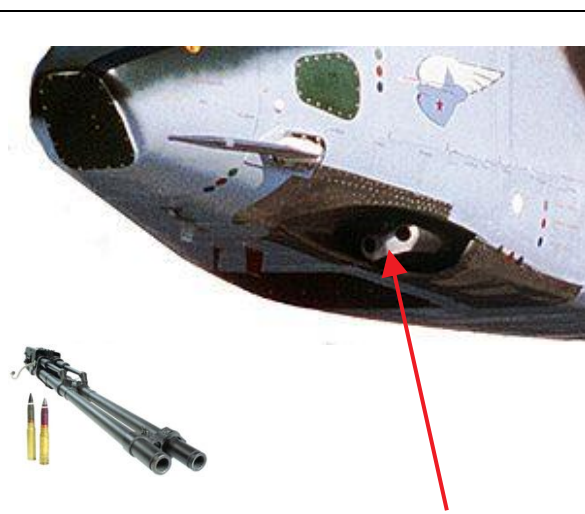


Photo 18. Aircraft cannon GSh-2-30

GSh-2-30 (GSH-2-30K)	
Delivery vehicles	<u>Су-25, Су-39, (Ми-24П)</u>
Weight	
Shot weight	390 г
Ammunition weight	832 г
Cannon weight	105 (126) кг
Specifications	
Caliber	30 мм
Number of barrels	2
Allotment of rounds	250 (750) патронов
Rate of fire	(300—2600) выст/мин
Effective range for air targets	200—800 м.

Apart from that, the Su-25 can carry SPPU-22 containers with the 2-barrelled 23-mm cannon GSh-23L.

During combat usage, both types of cannon ammunition can cause fuselage damage similar to that visible on the wreckage of the Boeing 777.

#### **Conclusions for the second version:**

***Thus, based on the opinion of the analysts of the Russian Union of Engineers, a complex shooting down of the Boeing 777 airplane has taken place, both by a short-range air-to-air guided missile and a 30-mm aircraft cannon or a SPPU-22 container with the 2-barreled Gsh23-L cannon. Furthermore, a laser rangefinder or a laser aiming device could have been used when firing the target, which allowed to significantly increase the shooting accuracy. This conclusion can be made from the nature of damage and the fragment distribution: there are both circular holes, which are usually caused by cannon fire, and explosive damage, which indicates a missile with arrow-type submunition.***

#### **8. Wreckage analysis**

If we examine the first version of the crash, the location of holes in the wreckage surfaces and the fuselage clearly shows that there is no typical picture of a plane being affected by the missile system BUK-M1 submunition, which would otherwise leave highly remarkable and typical evidence of damage. In this case we see that there is no such evidence on the wreckage fragments.

According to experts, in the case of a BUK-M1 AA missile system hit, there should have been traces of numerous specific holes caused by the submunition elements from the missile warhead. However, there is no such evidence present in the photos taken at the crash site.

As to the possibility of such damage being inflicted by the usage of short range “air-to-air” missiles, it should be noted that the R-60 (Su-27) and R-73 (MiG-29) missiles are short range low-duty missiles with infrared homing. Their lethal range only 3-5m, with a guaranteed kill only in case of a direct hit. The warhead of the prior weighs 3.5kg, while the latter carries a 5kg warhead. They have thinly chopped tungsten wire in their warheads. These are rather low-power missiles, meant exclusively for small-sized targets. Such missiles follow thermal wake and are mainly meant to destroy the engine of the targeted aircraft.

It would be more logical to assume that the damage presented in Photo 19 is more indicative for an aircraft cannon round of GSh or SPPU type.



**Photo.19. Boeing 777 wing surface damage**

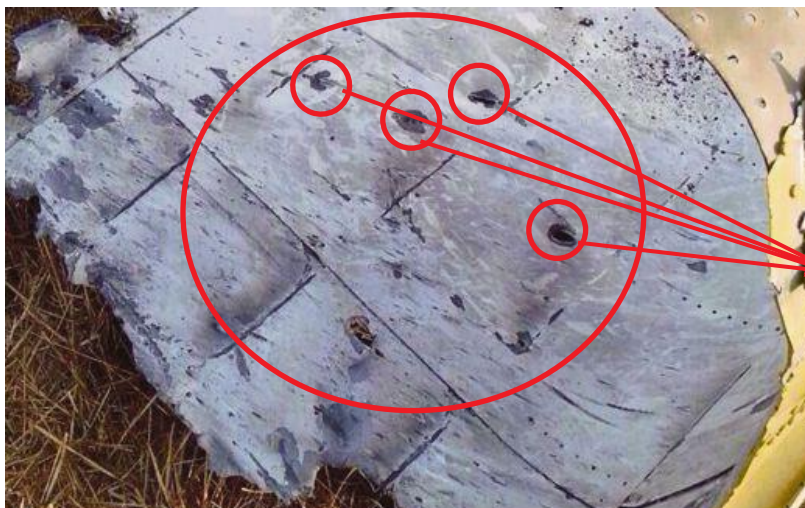




**Photo 20. Boeing 777 cabin damage**

The picture of entry and exit holes in the cockpit area (control cabin) of the Boeing 777 fully corresponds to the assumption that it was caused by being shot through by approximately 20-30mm rounds from a fighter cannon. This supports the second version of the crash. The same can be said about the nature of fragment distribution over the fuselage of the plane. From the left side the edges of fragments of the control cabin fuselage are rolled up from inside to outside, which points at significant damage inside the cabin as a result of dynamic pressure of missiles over its right side.

There are characteristic entrance holes and several exit holes visible on the fuselage. The edges of the holes are bent inwards, they are much smaller and are round-shaped. Exit holes are less precisely shaped, and their edges are bent outwards. Additionally, it is visible that the exit holes pierced the aluminum covering twice and bent it outwards. I.e., the striking elements (judging by the impact type, aircraft missile rounds) broke through the cockpit. Open rivets were also bent outwards.



Boeing 777 fragment Fuselage damage is clearly visible – break through holes, caused by a 20- to 30-mm cannon.

**Distinctive inward bends of the fuselage indicate a cannon round impact.**



Aircraft cannon  
GSh-2-30

**Photo 21. Boeing 777 cover damage nature**



Boeing777 fragment.  
Rivets blown out.

Destruction of the fuselage with edges bent outwards due to an internal dynamic impact, either caused by an explosion inside the plane, or a sudden and rapid change of internal pressure at high altitude.

**Photo 22. Boeing 777 fuselage damage nature**

The general typology of the holes and their location lead us to the conclusion that, most probably, the Boeing 777 was attacked by an aircraft cannon GSh-2-30, or an SPPU-22 container with a two-barreled 23mm cannon GSh-23L. The target zone was the control cabin, and the rounds, breaking through the cockpit, affected the wing surface as well. (see Photo. 20).

Both types of cannon rounds during combat usage cause damage to aerial targets similar to that which can be seen on the fragments of the Boeing 777.

The nature of the holes on the fragments of the plane fuselage, present in the currently available information sources, allows claiming that the airplane was shot down by aircraft cannon and missile armament of a combat aircraft.

## **9. Re-enactment of the event**

Based on the considerations stated above, the following conclusions can be made:

### **9.1. Regarding to the circumstances of the Malaysia Airlines Boeing 777 crash.**

Malaysia Airlines Boeing 777 was conducting the flight Amsterdam-Kuala-Lumpur, on 17.07.2014, according to the tunnel set by the air traffic controllers. It is most probable that manual steering was offline and the airplane was flying in autopilot mode, performing horizontal flight following the route which was laid out on the ground and adjusted by Ukrainian air traffic controllers.

At 17.17–17.20 the Boeing 777 was in Ukrainian airspace, in Donetsk area, at the altitude of 10100m. An unidentified fighter aircraft (presumably Su-25 or MiG-29), which was previously at a lower echelon, on a head-on course in a layer of clouds, ascended rapidly, unexpectedly emerging in front of the passenger plane out of the clouds and opened fire at the control cabin (cockpit), using 30mm or smaller cannon armament. The targeting could have been performed not only by the pilot of a fighter aircraft in “free hunt” conditions (using the aircraft radar), but also by a navigation officer on the ground, using the airspace data received from ground-based radars.

The cockpit of the airliner was damaged in the result of numerous rounds hitting the aircraft fuselage. The control cabin was depressurized, which caused the instant death of the crew, due

to mechanical influences and decompression. The attack was quite unexpected and lasted only a fraction of a second. Due to the surprise situation, the crew was unable to give any alarm signals intended for such situations, as the flight was following its scheduled route and the attack was unexpected for everyone.

As neither the engines, nor the hydraulic system, nor other devices crucial to the continuation of the flight, were set out of operation, the Boeing 777 continued its horizontal flight in autopilot mode (which is a standard situation), perhaps gradually losing altitude.

After that, the pilot of the unidentified fighter aircraft maneuvered and repositioned himself into the rear hemisphere of the Boeing 777. He entered an engagement course, performed the targeting using onboard target tracking equipment, and launched a R-60 or R-73 air-to-air missile (one or multiple).

As a result of the missile impact, the entire cabin was depressurized, the flight control system was incapacitated, the autopilot was switched off, the plane ceased its horizontal flight and went into a tail-spin. The created g-forces caused a mechanical disruption of the airframe at high altitude.

As indicated by the available flight recorder data, the plane fell apart in the air, but this is possible mainly in the case of vertical falling from a ~10000m altitude, which can typically happen only in a case of exceeding the maximum allowed g-force. As a rule, such a tail-spin can be explained by the inability of the crew to control the airplane as a result of some emergency case in the cabin and subsequent instant depressurization of the cockpit and passenger compartment. The destruction of the airplane took place at a high altitude, which explains the fact that the wreckage of the plane was dissimilated over a territory over 15 km<sup>2</sup>.

9.2. Regarding the party responsible for the death of 283 passengers and 15 crew members.

On 17.07.2014 the armed forces of the self-proclaimed Donetsk People's Republic possessed neither appropriate fighter aircraft capable of engaging an air target similar to the Boeing 777, nor an airfield network, nor radar detection devices, targeting and guidance equipment.

Fighter aircraft of the Russian Federation Armed Forces did not violate the airspace of Ukraine, which is confirmed by both the Ukrainian side and by third parties performing space-based reconnaissance over the territory of Ukraine and its airspace.

To ascertain the truth, it is required to objectively and impartially investigate all the circumstances of the Malaysian Boeing 777 crash, to question thousands of residents in the area who might have seen anything. Naturally, the surveys must be conducted by highly experienced specialists. Asking relevant questions is both a strict science and a sophisticated art of coming close to the truth. Crucial information is hidden in the wreckage and fragments of the crashed airplane, but this very information can easily be eliminated, distorted and concealed. It should not be forgotten that there are always people involved who seek to conceal each and every real fact. An indirect confirmation of this is the fact that on August 8th Ukraine, The Netherlands, Belgium and Australia signed an agreement allowing the disclosure of information regarding the investigation of the crash only at the consent of all parties involved.

"The investigation proceeds with inspections and other investigatory activities – declared the Speaker of Ukrainian General Prosecutor's Office, Yuri Boychenko, - their results will be announced upon the end of the investigation and at the consent of all the parties, who have signed the relevant agreement".

Delays and deviation from carrying out a comprehensive objective investigation with the participation of reputable international organizations, raise doubts that the involved parties will actually present the real circumstances of the Malaysia Airlines Boeing 777 crash.

**First Vice-President  
of the All-Russian Public Organization  
Russian Union of Engineers,  
Chairman of the Board of Engineering Company “2K”**

**Ivan Anatolievich Andrievsky**