# MAJOR ERRORS OF THE OFFICIAL RUSSIAN AND POLISH INVESTIGATIONS OF THE SMOLENSK CRASH

Glenn Arthur Jørgensen

#### Abstract

On the 10th of April 2010 a TU-154M plane from the Polish Air Force crashed in the city of Smolensk, Russia, killing all 96 people on board. These included President of Poland Lech Kaczyński and his wife Maria, former President of Poland in exile Ryszard Kaczorowski, the founder of the Solidarity movement Anna Walentynowicz, the chief of the Polish General Staff and 9 other leading Polish NATO Generals. Various independent investigators, professors, engineerers and scientists have documented how the official investigation by the Russian authorities in several ways is inconsistent with the laws of physics, in contradiction with a large number of observations and studies, and how it gives no satisfactory answers to another series of important observations. The work presented here shows how the great number of different data, observations and studies - including aerodynamical studies - all tie together in a very consistent manner in agreement with the laws of physics supporting the hypothesis of a sudden loss of first the left wing tip just after the pilots aborted the controlled approach and then another sudden loss of left wing area occuring about 120m further downstream. Both wing losses happened while the plane was well above the ground and flying in free airspace where no obstacles exsist. To the authors knowledge none of the more than 1000 Russian built TU-154 planes have ever experienced such unmotivated wing loss, and the fact that the plane had been serviced just 6 months earlier with special focus on the wings - amongst other facts - rule out the possibility of fatigue as cause of the wing loss. The weather conditions and black box data show no evidence of the plane by any manner exceeding allowed operation conditions. Thus the curcumstances are strongly pointing towards the use of explosives. A new study utilizing the vertical acceleration sensor signal in combination with data obtained by the planes three GPS units and logged by the TAWS black box is also presented in this work. The recorded vertical speeds and the change in height as measured by the GPS units during the descent is utilized to minimize any calibration and/or angle effects on the recorded vertical acceleration data, allowing for an accurate determination of the trajectory during the descend through a double integration. By this study the trajectory based on the vertical acceleration data and GPS data meet in X,Y and Z positions within a few meters the trajectory found independantly through aerodynamics working backwards from the point of crash of the plane with the ground. With other words the trajectory calculated through the GPS data and vertical accelleration data confirm the trajectory calculated based on the aerodynamics and knowledge of the position of the crash site and vice versa. The trajectories agree with the recorded height and GPS positions of the TAWS 34 to TAWS38. The calculated final velocity towards the ground agrees with the recorded velocity within 4%. The predicted position of the two wing explosions and damage of the central fuel tanks furthermore agree with the damaged vegetation as can be observated about two months after the crash downstream in the direction of the 120° wind. The work presented here shows the pilots correctly initiated the go-around immediately following their proclamation hereof at the correct decision height of H=100m above runway 26. Opposite the official story the explaination given here does not require any strange and unlikely crew behaviour, nor requires any uncorrected misreading of an altimeter nor requires the plane doing a strange dive towards the ground 2km short of the runway at high speed with three channels in auto-pilot mode (roll, pitch, thrust) in total fog but is in full agreement with the normal and correct approach expected by a fully competent crew knowing their height and position at all times.

Keywords - CFD, Wing Damage, Trajectory, Smolensk, TU-154.

## **1. INTRODUCTION.**

#### **1.1.** The Official Explaination in short form.

The official Russian explanation<sup>1</sup> claims the pilots acted in a clash of motives under pressure laid upon them by the president on board to land the plane at Smolensk even though the airfield was covered by a thick local fog. According to the russians the crew descented with the elevator (height control), ailerons (roll angle control) and engine power controlled in auto-pilot mode and at the initial descent seemed to aim for a height above the runway at the middle marker of around 100m. Then about 3km before the runway 26 the plane was allowed to make a sudden dive approaching the ground in front of them with a speed of up to about 23m/s at a height of 70m despite normal descent speeds are between 2m/s to 4m/s. During this dive the one pilot declared the crew would do a "go-around" meaning they would abort the descend. According to the Russian explaination the pilots failed to abort the descend and instead allowed the plane to continue towards the ground in heavy fog with no visual ground sight while the navigator constantly and loudly read out the current lower and lower heights above the local ground to the plane scrapped against some tree tops about 1100m short of the runway in 11m height above the local ground (ground elevation of 233m) and a lateral deviation 35m left of the extended runway without damaging the plane at this point. By the Russian story the pilots cancelled the auto-pilot control of pitch and shortly after this cancelled the auto-pilot mode of engine power when forcing the three engines at full power. By the black box data provided

in the Russian report the plane was accelerating upwards with about 1.25g to 1.30g when its left wing according to the Russians struck a 30cm to 40cm thick birch tree at 5m above the local ground another 244m closer to the runway. (The elevation of the ground at the claimed birch being 248m). By the Russians the latter birch tree cut through the left wing removing about 5.5m of the left wing span, and this supposedly caused the plane to do an intensive left roll and forcing the plane to crash into a swamped area with a left roll of  $150^{\circ}$  to  $160^{\circ}$  (nearly upside down) 580m from the first tree impact or 336m from the birch tree claimed to cut the wing. Based on the human tissue damage the Russians claim the people on board died due to severe deceleration of more than 100g, when the plane made ground contact. The Russians claim the plane was damaged due to the contact with trees and the final crash with the ground, and the crash *is classified by the Russians as a controlled flight into terrain.* 

#### **1.2.** About the Russian and Polish Investigations.

The Polish President and the vast majority of the passengers on board were known as patriots of Poland and many were in opposition to the Polish government lead by Prime Minister Donald Tusk from the P.O. party. Originally the visit to Katyn was planned as a common memorial of participants from the entire Polish political spectrum including the Polish president and Polish prime minister from their different respective opposite political platforms. The plan was to meet with the president of Russia, Vladimir Putin, and the Russian Prime Minister Mendelev on the 10th of April 2010 memorizing the dreadful assassination of 22.000 Polish officers captured and killed in cold blood by the Russian soldiers in 1940. Shortly before Putin changed the plan and instead invited Donald Tusk for the 7th of April. Hereby Putin was playing a political game which outcome could split the Polish society. For unknown reasons Donald Tusk agreed and the impact of this was, that the first delegation arriving on the 7th of April consisted of governmental authorities mainly loyal to Donald Tusk, and the politicians and authorities mainly loyal to the President of Poland stayed with the 10th of April.

The executive of the official investigation of the crash was Russia as Poland's Prime Minister Donald Tusk immediately stood back from Poland's right to participate on equal terms as the Russians in the official investigation. If this act by Donald Tusk is proven against the interests of the Polish state, this can be punished according the Polish law with up to 10 years of prison. On the other hand if reasons exist, that he believed he acted in the interest of the Polish state by stepping back, these should be openly laid forward to the Polish people. Instead of participating on equal foot with the Russians in the official investigations Poland did an internal Polish investigation based primarily on the copies and work done by the Russians. After the crash it is clear, that many safety procedures were violated by governmental authorities in Poland even before the plane took off. The minister of Interior and Administration Jerzy Miller had the overall responsibility for the president's safety. The following internal Polish investigations were led by the same Jerzy Miller. Russia denies to hand back to Poland any parts of the wreckage or any of the original black boxes.

No X-ray of the victims was performed, and the bodies came to Poland in sealed coffins with the prohibition to open them by the families. Severe and significant errors were present in the Russian autopsy reports, and 12 families complained. After more than 2 years 6 of the families were allowed to exhume their loved ones, and in all cases the bodies were found to be misplaced with other victims. The military prosecutors have denied the request of the son of Ms. Anna Walentynowicz, that a DNA test in Switzerland could be performed, as he has good reasons to believe a different person is buried in their family grave. In one case of the exhumations the aluminum rivet fell out of the body tissue. Dr. Michael Baden, US pathologist invited by families to help in exhumations associated the rivets in the bodies with an explosion effect.

Dr. Michael Baden was invited by the families to participate in the exhumations, but was for unexplained reasons not allowed by the Polish government. Dr. Baden has been doing autopsies for more than 50 years and investigated 15-20 plane crashes. About the Polish government obstructing the investigations Dr. Baden says: "*Family always has the right to do what wish is of the family. In the twenty first century a body of a person no longer belongs to the state - it belongs to the family. So it is just unusual. Whether it is in Zimbabwe or Israel or Philippines, and the government may not like the outside person checking to make sure that they make it right, they never interfered with that. I have never experienced before when the government is not permitting the family what it is wishing to do with the body, when the body is returned to them."* 

Conclusion : Severe and significant errors were present in the Russian autopsy reports. The Polish authorities through the Polish prosecutors have obstructed the investigations by forbidding the families to have independent autopsies performed, by forbidding the families to open the sealed coffins after they returned, by neglecting to obtain the full amount of data from the TAWS and FMS black boxes now in the hands of the American authorities.

#### 1.3. Review of The Official Reports.

British Investigation expert Frank Taylor has recently stated after closely studying both the Russian and Polish reports, that these investigations have serious deficiencies and omissions. He strongly doubts that all passengers died in the same manner, and he is surprised that the plane can disintegrate into such small fragments when hitting muddy grounds with low vertical speed at such shallow angle. By his experience he doubts the plane would make the claimed roll. Several cases with B707's loosing even larger percentages of wing span and safely landing shows him, that a plane can lose even a substantial portion of the wing without rolling and crashing.



Figure 1. Photo with courtisy of Frank Taylor of one B707 that lost 7.6m or about 19% of it's wing span, flew 24min and landed safely.

# Frank Taylor[<sup>2</sup>]:

" This disaster just bothers me. The fact is that the investigation had been conducted too superficially, and the conclusions drawn from it are too hasty. Here is where you drill down deeper. That to me is undisputed and I do not understand how anyone could say anything else with any kind of conviction."

Member of the International Society of Air Safety Investigators Dr. Bogdan Gajewski (Ph.D., M.Sc., M. Eng.) is a continuing airworthiness expert and lecturer with over 40 years of experience in civil aviation and a retired senior corrective action engineer at the Safety and Security Directorate of Transport Canada. Dr. Gajewski's recent activities include assisting Canadian and foreign Transportation Safety Boards in the investigation of aircraft accidents and incidents and reviewing accident investigation reports and safety recommendations to confirm technical accuracy and to assess the need for further corrective action. Dr. Bogdan Gajewski has reviewed the official Russian and Polish reports. Here follows a summary of his review.

# 1.3.1. Crash site inventory

The inventory of the crash site is fundamental for any crash investigation. Securing the crash site is paramount for further investigation. However, the crash site was not secured. Locals were allowed on the site, compromising vital evidence. The satellite pictures show that the Smolensk crash site has been altered. The left horizontal stabilizer has been moved closer to the main wreckage.

Conclusion: The crash site was not adequately secured. Locals were allowed on the site, compromising vital evidence. The location of the aircraft parts was altered, as shown on satellite pictures. The point of impact of the aircraft with the ground has not been determined.

# 1.3.2. Airworthiness Certificates

There were two Model Tu-154 aircraft, tail numbers 101 and 102, servicing Polish VIP government officials. As stated in both Reports, aircraft Model Tu-154, nr 101 had crashed in Smolensk.

The Russian Report states that there were two airworthiness certificates found at the accident site: An invalid one for aircraft 101 and a valid one for aircraft 102.

However, according to Polish officials, no Certificates of Airworthiness were ever issued for both aircraft. Instead, the specific military airworthiness requirements were in place.

Conclusion: The presence of both certificates at the accident site suggests that these certificates were purposely placed, compromising the evidence. The investigation team was not able to explain why these documents were found at the accident site.

# 1.3.3. Cabin arrangement

According to both Reports, a Tupolev 154-M, tail number 101 with 88 passengers on board, had crashed. However, there is a major discrepancy regarding the number of passenger seats in this aircraft.

The Polish Report states that four days before the accident, the aircraft was reconfigured to increase cabin capacity to 100 passenger seats. The Russian Report indicates 90 passenger seats on this aircraft.

The Russian Report claims that all the passenger seats were accounted for, with details that some of them were not buckledup before the crash. This statement does not address the existence of 12 empty seats listed in the Polish Report.

Conclusion: The Russian Report lacks basic inventory data like the number of passenger seats found at the crash site. Since no passengers were found with the seatbelts, and all bodies were spread across the crash site among the badly damaged seats, the aircraft seat configuration as well as the state of the safety belts before landing are a mystery.

## 1.3.4. Cockpit Voice Recording (Black box) read-outs.

According to Polish Military Prosecutor General, at least five (5) copies of CVR recording during investigation were made. The same office also states on their web site, that at present time the office is in possession of nine (9) copies of the cockpit recording. All these recordings of different transcripts are claimed to be "certified working copies" of the original aircraft cockpit voice recorder.

Conclusion: There is no explanation regarding the existence of these recordings. There is no possibility to verify the original recording because the black boxes are still being held by the Russians. Any access by independent body was denied.

## 1.3.5. Investigation procedure

The crucial point is to determine, from the crash site inventory, if any of the aircraft parts were found along the flight path before the point of initial contact with the ground. If some aircraft parts were found before the point of contact, there is a possibility that the aircraft was having technical problems and the pilot could have had difficulty in controlling the flight. It has been documented that many aircraft parts (including part of the wing and horizontal stabilizer) were found well before the initial point of contact with the ground. Additionally, a serious electrical problem during flight is reported on page 107 of the Russian Report: the Flight Management System power was lost at 10:41:05 at altitude of 15m with Air Speed about 270 km/h. These statements suggest that the accident aircraft had some serious technical problems during flight and the pilot may have lost control of the aircraft.

If, in fact, the pilot had lost control of the aircraft, due to aircraft disintegration during the flight, the investigating team should explore a scenario of Uncontrolled Flight Into Terrain (UFIT), where the pilot was not able execute a normal landing. In such a case, the original claim of pilot's error is unfounded.

Conclusion: Based on the crash site inventory and the reported power failure during flight, the investigating team failed to explore the scenario of Uncontrolled Flight Into Terrain. Therefore, the statement of CFIT [pilot's error] is premature.

### 1.3.6. General conclusion:

Both accident Reports fell short of the proper in-depth investigation. There were some basic discrepancies found in both official Reports which cast doubt on the professionalism and trustworthiness of the official investigation.

## 2. MAIN FLAWS OF THE OFFICIAL EXPLAINATION.

#### 2.1. The Birch tree and its surroundings.

#### 2.1.1. 100 times more energy is needed to cut the wing than to cut the tree.

Professor W. Binienda and a group of Ph.D. students from the University of Akron, Ohio USA have documented in several scientific papers and conference presentations<sup>3</sup>, that the energy required (area under the stress-strain curves for AL2024 T351 and the Birch tree material) to cut the wing is more than 100 times higher, than the energy required to cut the birch tree. They have performed parametric studies of the wing hitting the tree including all relevant aircraft velocities and positions. They used a state of the art description of the aluminum material developed by NASA, FAA and a number of Universities. Their results clearly show, that the birch tree is by farthest the weakest part.

It could also be noted that the airplane velocity on impact allowed wings of the airplanes cut through the steel columns outside of the World Trade Center buildings<sup>4</sup>. Steel is three times stronger than aluminum while birch material is 20 times weaker than aluminum. Hence, one should anticipate that cutting through the birch tree should be much easier than through the steel columns.

The Russians claim that both the wing and the tree were cut simultaneously $^{5}$ .

#### 2.1.2. Birch tree top in wrong direction.

The dynamic studies show, that the top of a cut tree should lay in the direction of flight. In the Smolensk case it was found perpendicular to the direction of the flight.

#### 2.1.3. Birch tree did not bleed sap at all.

A birch tree (betula pendula) cut in April should bleed significant amount of  $sap^6$ , an observation many people know from own experience. It is documented, that the birch tree claimed to have cut the wing was totally dry without the abdundant bleeding of sap from the damaged tree cambium on the day of the crash, the following days, and ever since. This in the spring season where the local population was collecting birch sap and where other damaged birch trees in the Smolensk area were visibly sipping large amounts of sap,

#### 2.1.4. Birch tree was broken before the crash.



Figure 2. Photo of the birch tree claimed by the Russians to have cut through the wing, Note the loosely hanging wing fragment to the left.



Figure 3 The fence and surroundings showed no sign of an 80 ton plane flying 5m above the ground with its three tail engines bursting at full speed.

An analysis of satellite photos published in the journal "Mathematical and Computational Forestry & Natural Resources Sciences" shows, that the birch tree was broken already at least five days before the crash<sup>7</sup>.

#### 2.1.5. Surroundings show no impact from jet blast.

An 80 ton TU-154M jet plane with its engines at take-off power and passing at 75m/s will send a pressure against its surroundings<sup>8</sup> - including an old ramshackle wooden fence - in the order of 15-20 tons for a duration of more than 0.5s. Calculations show, that the pieces of wooden fence near the claimed birch tree, would be accelerated within the first 0.1s to a velocity of more than 16m/s and be shattered in the downstream direction. The main part of the fence is standing as nothing happened.

#### 2.1.6. Inner parts of the left wing found 50m before the birch tree.

Inner parts of the left wing were found 50m prior to the claimed birch tree and others are shown hanging loosely in the birch tree (see figure 1). This is not a possible cause of the claimed impact with the birch tree given the initial velocity of the wing parts were 75m/s.

# 2.1.7. Direction of wing cut was not in the direction of the flight. Front edge was undamaged.

If the birch tree was the cause of the wing cut, the line of cut should be in the direction of flight<sup>9</sup>, and the slats located on the leading edge of the wing should be damaged by the tree. This is not the case<sup>10</sup>. The line of cut forms a 12deg angle to the direction of flight, and the slat edge supposed to be hit by the tree is undamaged as seen below.



have been damaged and the line of cut should have been in the direction of flight if the birch tree cut the wing. This was not the case. Earlier an angle of  $20^{\circ}$  was found, but when taking the slats extension into account this is closer to  $12^{\circ}$ .



Figure 4. The front edge of the slat in the line of the birch tree was completely undamaged.

Conclusion: The birch tree could and did not cut the wing of the TU-154M. The plane started to break up before the birch tree.

## 2.2. Site of Crash.

#### 2.2.1. Plane broke in 60.000 pieces with no crater formed in soft ground.

Tearing material apart requires energy, and the energy can in this case only come from two sources: either as kinematic energy or internal energy from one or several explosions. The Russians claim, that the plane hit the ground in an angle 6deg to 10deg, and the vertical velocity was about 22m/s according to the black box data when the plane hit the ground<sup>11</sup>. This is confirmed by aero dynamical calculations.

In Smolensk the plane broke up into 60.000 pieces, without the formation of a crater at all. All ground marks suddenly stop about 0.3s after the left wing made a scratch into the ground at the crash site. For comparison the plane above Lockerbie that was brought to the ground by explosives in 10km height with lots of fuel on board, hit the ground with a large vertical velocity and broke into about 11.000 pieces<sup>12</sup>.



Figure 6. The plane broke up into 60.000 pieces, without the formation of a crater in the soft swamped soil what so ever. According to studies this is only possible, if the plane was disintegrated prior to the parts hitting the ground. Russians claim the passengers experienced more than 100g impact and Newton's Third law of action and reaction would dictate that the 80ton plane should make a significant impact.

#### 2.2.2. Contradiction to Newton's third law.

It is against Newton's third law of action and reaction, that the 80ton plane can experience such forces, that it is divided into 60.000 pieces and the people on board are exposed to more than 100g, without any traces or marks into the soft swamped soil. Some passengers showed signs of being exposed to more than 350g and the clothes were torn off many of the passengers as after being exposed to an extreme pressure wave.

### 2.2.3. Human body parts found deep in the ground before the crash site.

One hand and bone fragments were found about one meter into the soil before the crash site<sup>13</sup>, and this observation is incompatible with the official explanation. That would mean that some energy broke this hand from the body with velocity high enough to penetrate fuselage walls and get into the soil one meter deep.

#### 2.2.4. High internal pressure opened the fuselage prior to it hitting the ground.

Professor Binienda contributed to the development of the methodology used to simulate creating damage in the wing of



Figure 7. Sandia National Laboratories have independently of Prof. Binienda's group proved, that only by an explosion in the fuselage in the air can the fuselage end in such open shape as seen in Smolensk.

the methodology used to simulate creating damage in the wing of the Challenger space shuttle that caused its destruction. Same methodology has been used by R. T. Bocchieri<sup>14</sup> to demonstrate how the wing of Constellation cut through the light poles as in experiment conducted by FAA. The same validated multiple times methodology was used to calculate what will happen to a TU-154M hitting the ground at various angles without explosion. The results show, that a 1-2m deep crater should be formed, and the plane should break up into a several large parts. This is in agreement with the experience from other plane crashes. Through a large number of simulations Sandia National Laboratories have independently of Prof. Binienda's group proved, that only by an explosion in the fuselage in the air can the open shape of the fuselage fragment as seen in Smolensk be produced (one wall on left side, second wall and ceiling on the other side away from the floor of the inverted fuselage segment).

#### 2.2.5. Fragmented parts show clear sign of explosion.

According to a number of Polish professors and experts the

fragmented parts show clear signs of explosion with rivets torn out as from high internal pressure and signs of high temperature.

#### 2.2.6. Ground traces cannot be formed by the plane described in the official story.

Analysis of the wing damage and ground traces published in the proceedings of the Smolensk conference in 2013 and presented to the Polish Parliament show these are incompatible with the official story and can only be created by a wing with a significant larger wing loss than just the claimed wing tip.

Conclusion: The plane breaking up into 60.000 pieces and people on board experiencing more than 100g impact forces is according to Newton's third law of action and reaction in clear contradiction with the fact that no crater is formed in the swamped and soft soil. This can only be explained when the plane is disintegrated before hitting the ground. This is supported by the fuselage showing clear signs of being opened prior to hitting the ground and parts showing clear signs of explosion.

#### 2.3. 3. Trajectory of the TU-154M.

#### 2.3.1. The plane was in free air space without obstacles, when the left wing was damaged.

In theory an integration of the vertical acceleration data should lead to knowledge of the change in the planes velocity, and another integration of these velocity data should lead to knowledge of the change in the planes height. In practice however it is well known, that the results hereof will be strongly influenced by any exsisting signal error such as a simple scale error or an error in the signal caused by an instrument angle etc.

For the first time trajectories of the final minutes of flight are based on a technique that utilizes the height changes as measured by the three GPS units and recorded at the TAWS 34 to TAWS 37 events together with the logged vertical speeds to strongly reduce the effect of the various sources of error on the vertical acceleration sensor data, allowing for an accurate determination of the planes height through a double integration. The bias is found that gives the best agreement between the calculated velocities based on the integration of the accelration data and height changes through minimizing the least squared error. The bias leading to the best agreement between the calculated and measured height change as a function of time can be seen in figure (Bias=1.035 or b=-0.035). The resulting trajectory is shown in figure (black line). This agrees completely with the trajectory found through aerodynamics and presented at the recent Smolensk conference. A Monte Carlo analysis shows, that the plane with 99.9% certainty flew more than 28m above the ground of the birch tree claimed to have cut the wing at 5m height. [21].



With other words two totally different methods based on two independent sets of data both tell within a few meters the same position of the plane 57m above the runway altitude, when it lost the first part of its left wing. No obstacles exist at this height.



Figure 8. Two totally different methods based on two independent sets of data both result within about 10m the same position of the plane 55m±10m above the runway altitude, when it lost the first part of its left wing. The plane was in free air space where no obstacles exist when losing wing area. The calculated trajectories agree with the recorded GPS positions and a long list of other field data recorded by the black boxes.

#### One can ask, what can cause the plane to lose its wing tip in free air where no obstacles exist?

The first method is based on a double integration of calibrated vertical acceleration sensor data and GPS heights both recorded by the black boxes.

The second method is based on knowledge of the aerodynamic performance of the damaged plane working backwards from the crash site and up. The aerodynamic data are obtained through state of the art CFD calculations done by Metacomp Inc. USA, one of the world's leading companies within this field and a sub supplier of Boeing.

#### 2.3.2. To explain the recorded roll speed the plane had to lose more than twice the claimed wing area.

If a plane loses a part of the wing on one side, a moment of turn will arise trying to rotate the plane about its length axis, this is called roll. Independent calculations<sup>15,16</sup> done with very different methods both show similar results. Namely that if only the wingtip was lost as claimed by the Russians, the speed of roll would be less than half the black box recorded value. With other words: the recorded roll speed indicates that more than two times the lifting capacity of the left wing was lost compared to only loosing the wing tip as claimed by the Russians<sup>15,16,17,18</sup>. This is in agreement with the cases of B707 planes loosing 19% wing span due to fires in the outmost engine not making a roll but being able to safely land after 24min flight.

"28 June 1965 (PanAm, flight from San Francisco). The plane lost 7.6 m of right wing due to explosion of fourth engine. The crew prepared the plane for emergency landing, lowered the landing gear and landed without any problems at Travis Air Force, California. After the explosion of the engine, the plane was flying with shorter right wing and therefore lift asymmetry for 24 minutes."

"Carmel incident, NY, 4 December 1965. In-flight collision of Boeing 707-131B with Lockheed Super Constellation on the altitude around 3000 m. Boeing lost again 7.6 m of the left wing. After uncontrollable dive pilots were able to take control over the plane and exit the dive. Lift asymmetry caused by wing asymmetry was controllable during next 20 minutes of the flight and the crew was able to safely land."

#### 2.3.3. The bigger the wing loss, the higher the plane must be when loosing this in order to reach the crash site.

The higher the loss of lifting capacity of the wing the higher the plane has to be in order to reach to the crash site from the birch tree area. The calculated roll speed agrees with the recorded roll speed within a few percent when including the middle section in the loss.

#### 2.3.4. Trajectory is confirmed by black box recordings of three GPS units on board.

The calculated trajectory of the plane agrees completely with the measured heights from the three GPS units on board logged during descend prior to the loss of wing.

### 2.3.5. Vertical acceleration sensor on board show two significant losses of lifting power.

This work is confirmed further by the vertical acceleration sensor data after the loss of the wing tip. The sensor clearly shows first a loss of lift capacity (of about 7%) followed by another even bigger loss of lift capacity 120m down the line<sup>19</sup>. The first lift loss is explained by the Russians as a result of hitting the birch tree. The Russians gave no explanation to the second loss of lift.



Figure 9 The left wing was found in three sections. The outmost 5.5m part (wing tip) was found in one piece. The next about 4.5m section was found in many tiny irregular and sharp edged fragments. The inner section was broken, where the wing is strongest. Note the inner front slat shows sign of ground contact, the middle slat portion not, this does not agree with the official explanation.

## 2.3.6. Damage to vegetation in wind direction agrees with the calculated positions of wing losses.

Downstream in the direction of the wind (120deg) the vegetation is damaged as poisoned by the fuel in three distinct zones starting at the calculated points of the two wing losses and the third and hardest damaged zone at the point where the plane was rotated 90deg, this zone most likely from the dumping of the central fuel tanks by a third directional type explosion. This can explain why the landing sensor falsely indicated the plane had landed at this position in 55m height as measured by the GPS<sup>20</sup>.



Figure 10. Three distinct zones of damaged vegetation can be found 2 months after the crash downwind to the calculated positions of wing loss indicating the damaged zones are caused by poisoning of jet fuel and hydraulic oil, when the wing sections were damaged. Calculations show this toke place in 45m-55m height above the runway in free airspace where no obstacles exist. Wing part was found prior to the tree the Russians claimed to cause the damage to the wing. Blue curve shows calculated trajectory of the plane's center of gravity, the white curve shows the calculated trajectory of the left wing tip. The green squares are black box recorded GPS positions.



Figure 11. The green squares are recorded GPS positions of the plane during descend. The blue triangles show the middle marker zone. According to black box data the wing tip was lost at the right most red marker 55m height above the runway, followed by the center section 120m closer to the crash site. The calculated trajectories of both the fuselage and wing tip end at the correct positions and with correct heading at the crash site, and the final calculated vertical speed matches the recorded value within 5%. The positions of wing losses correlate well with the zones of damaged vegetation as seen two months later during the following summer season.

#### 2.3.7. Black box data show the pilots aborted the landing approach at 100m.

Calculations<sup>21</sup> of the plane trajectory based on the logged vertical acceleration data of the black box during the descend towards the Smolensk runway, shows the pilots initiated the "go-around" (aborted landing) at the correct height of 100m, just as the pilots according to the Russian radio transcripts declared, and as the procedures required.

Conclusion: The left wing lost lift capacity in two events about 120m apart when the plane was in free airspace well above any ground obstacles. The pilots were 100m above the height of the runway when they initiated the go-around. The go-around was hindered by the second loss of wing capacity.

# 2.4. QUESTIONS TO THE OFFICIAL INVESTIGATION TEAMS:

## 2.4.1. QUESTION #1:

Officially the plane hit the muddy ground at a shallow angle with low vertical speed. How do you explain that in such conditions the plane broke up into 20.000-60.000 pieces, the people on board were exposed to more than 100G with signs of upto 350G, there was no crater and no marks in the ground? This disagrees with Newton's 3rd law of action and reaction.

## 2.4.2. QUESTION #2

How do you explain that a human hand was found deep into the ground before the main crash site? This implies that some force had to cut the hand, penetrate this through the fuselage wall with enough force to end 1m into the ground?

## 2.4.3. QUESTION # 3

Calculations clearly show the officially claimed trajectory during the descend is against the law of physics and would require the plane to fly from 248MSL at the birch tree (claimed to have cut the wing) to more than 294MSL at TAWS 38, a change of 44m in 1.6s or more than 27m/s vertical speed <u>in average</u>. The necessary vertical acceleration far exceeds the performance of the TU-154M. How do you explain this?

## 2.4.4. QUESTION #4

The published and peer reviewed work of Professor Binienda from Akron University proves the single about 30-44cm diameter birch tree by no means as claimed could cut the wing tip of the Tu-154M flying 80 m/s. The birch tree needed to be at least 4 times stronger to cut the wing. The energy required to cut the tree by the wing is less than 1% the energy required for the tree to cut the wing. Have you done calculations and experiments that show such a tree can cut the wing? How do you explain this?

## 2.4.5. QUESTION #5

Studies show, in full agreement with a number of incidents with similar loss of wing span, that in this case the span loss of 15% as stated only explains about 30% of the recorded roll speed. The officially published recorded roll speed and final roll angle together with the vertical acceleration data tell us the plane lost more than double the lift power in at least two strikes 1.6 sec part. In light of this data, how can you claim the crash was caused by loosing just the wing tip?

### 2.4.6. QUESTION #6

The larger wing loss dictates that the plane was higher than 40 meter above runway when it lost the wing area. This agrees with the trajectory based on the vertical acceleration sensor and GPS data. This also agrees with the three damaged zones of vegetation appearing 8 weeks after the crash east of the runway 26. How do you explain the cause of the wing loss in the free air space at more than 40m height were no obstacles exist?

# References

<sup>1</sup> "Final Report Eng. Ver. Jan. 10th 2011", Interstate Aviation Committee, Air Accident Investigation Commission.

- <sup>2</sup> Interview with Frank Taylor 23rd of August 2015 in the Brussels Times.
- <sup>3</sup> Chao Zhang, Wieslaw K. Binienda, Frank E. Horvat, Wenzhi Wang, Department of Civil Engineering, University of Akron, 302 Buchtel Common, Akron, OH, 44325, USA, Department of Mechanical Engineering, University of Akron, 302 Buchtel Common, Akron, OH, 44325, USA, School of Aeronautics, Northwestern Polytechnical University, Xian, Shaanxi 710072, China. "APPLICATION OF NUMERICAL METHODS FOR CRASHWORTHINESS INVESTIGATION OF A LARGE AIRCRAFT WING IMPACT WITH A TREE"
- <sup>4</sup> Bazant, Z.P., and Y. Zhou. 2002. "Why did the World Trade Center collapse? Simple analysis." Journal of Engineering Mechanical. 128(1): 2-6.
- <sup>5</sup> "Final Report Eng. Ver. Jan. 10th 2011", Interstate Aviation Committee, Air Accident Investigation Commission.
- <sup>6</sup> Chris J Cieszewski, Smolensk Conference Proceedings 2014, ISBN 978-83-936018-2-0, "ADDITIONAL LESSONS FROM SATELLITE IMAGERY AND INVESTIGATION OF BIRCH AND ITS BREAKAGE".
- <sup>7</sup> Chris J Cieszewski, Roger C Lowe, Pete Bettinger, Arun Kumar. WSFNR, University of Georgia, Athens GA 30602 USA. ISSN 1946-7664.MCFNS 2013, Vol. 5, Issue 1, pp. 16–37, Mathematical and Computational, Forestry&Natural-Resource Sciences. "MICRO-DETAIL COMPARATIVE FOREST SITE ANALYSIS USING HIGH-RESOLUTION SATELLITE IMAGERY".

<sup>8</sup> https://www.youtube.com/watch?v=mj\_bB6cUWCs

- <sup>9</sup> Wieslaw K Binienda, Smolensk Conference Proceedings 2014, ISBN 978-83-936018-2-0. "ANALIZA UDERZENIA W BRZOZE LEWEGO SKRZDLA Z WPUSZCZONYM SLOTEM".
- <sup>10</sup> Glenn A Jørgensen, Smolensk Conference Proceedings 2014, ISBN 978-83-936018-2-0. "AN ENGINEERS VIEW ON HOW THE SMOLENSK CRASH COULD TAKE PLACE".
- <sup>11</sup> "*FMS Data Extraction for NTSB Identification: ENG10SA025, Original*", Universal Avionics Systems Corporation June 25, 2010.
- <sup>12</sup> Kazimierz Nowaczyk "Vladimir Putin's Russian Government Inquiry Into the Crash of the Polish Air Force One In Smolensk, Russia, April 10, 2010", 2014, ISBN 978-83-933564-7-8
- <sup>13</sup> <u>http://wpolityce.pl/smolensk/234238-znalazl-sie-dol-w-smolensku-wykopany-na-metr-w-glab-a-w-nim</u>
- <sup>14</sup> Bocchieri R.T., R.M.MacNeill, C.N. Northrup, and D.S. Dierdorf. 2012. "Crash simulation of transport aircraft for predicting fuel release: First phasesimulation of the Lockheed Constellation model L-1649 full-scale crash test." DOT/FAA/TC-12/43. US Department of Transportation, Federal Aviation Administration, Atlantic City International
- Airport, New Jersey.
- <sup>15</sup> Glenn A. Jørgensen, Smolensk Conference Proceedings 2014, ISBN 978-83-936018-2-0. "The Last Seconds of Flight of the Tu-154M in Smolensk 10th of April 2010".
- <sup>16</sup> Grzegorz Kowaleczko "Rekonstrukcja Ostatniej Fazy Lotu Samolotu TU-154M.", 31-dec-2013. (Published 04.01.2014).
- <sup>17</sup> Glenn A. Jørgensen "CFD results for TU-154M in landing configuration for an asymmetrical loss in wing length". Rev H. 06.02.2014
- <sup>18</sup> "Reconstruction of Trajectories of Tu-154M in Smolensk during Last Seconds of Flight". Ms.Sc.Mech. Eng. Glenn A. Jørgensen, Materiały Konferencyjne, Konferencja Smolenska II, 21-22.10.2013, ISBN 978-83-936018-1-3
- <sup>19</sup> Glenn A. Jørgensen, Smolensk Conference Proceedings 2014, ISBN 978-83-936018-2-0. "The Last Seconds of Flight of the Tu-154M in Smolensk 10th of April 2010",
- <sup>20</sup> "Taws Data Extraction for NTSB Identification: ENG10SA025, Original", Universal Avionics Systems Corporation June 28, 2010.
- <sup>21</sup> "Combining Vertical Acceleration Data with GPS and Vertical Velocity Data Glenn A Jørgensen, Report published 11. Aug 2015.