After the Impact

If Korean Air Lines Flight 007 was not destroyed instantly by Major Osipovich's missiles early on the morning of September 1, 1983, then what did happen? The following excerpts from the book Rescue 007: The Untold Story of KAL 007 and Its Survivors by Bert Schlossberg (Xlibris, 2000), explains what we know.

Excerpt from **Chapter Two, Impact Plus 104 Seconds**, pages 46-52:

"The target is destroyed," Major Osipovich said. "I am breaking off attack."

But Osipovich, winging his way back to Sokol Airbase on Sakhalin, was mistaken.

In a two-second interval, the Soviet pilot launched two R-98 (ANAB) air-to-air missiles. The first missile was designed to "home in" onto the exhaust of aircraft engines, exploding on contact. As the evidence will show, this missile completely missed. The second missile was radar-controlled and designed to detonate 50 meters from an aircraft. It exploded at exactly 6:26:02—exactly five hours, 26 minutes and 18 seconds after KAL 007 began its taxi to takeoff from Anchorage, Alaska. (Osipovich delayed a number of seconds in his reporting). We are able to reconstruct events with great detail from this point on.

Almost immediately upon detonation, KAL 007's nose pitched gradually up until, 23 seconds after missile detonation, it was at its greatest angle—15 degrees. At the same time, the plane gradually arced upward until, 48 seconds after detonation, it was at an altitude of 38,250 feet. From that point, the aircraft began its downward leg of the arc for approximately 25 seconds, until it reached the altitude it maintained prior to missile impact—approximately 35,000 feet. The entire arc lasted one minute and 13 seconds.

The arc was moderate enough that any passenger standing would probably not have been thrown to the floor, though food and drink would have toppled over and slipped off the trays. The reason for this arc was damage to the tail of the aircraft. The crossover cable from the left inboard elevator to the right outboard elevator was damaged causing the cable to unravel.

From the Cockpit Voice tapes, we can see the struggle into which Captain Chun and his copilot were immediately thrown:

Captain: (6:26:06)
What happened?

Copilot: (6:26:08)
What?

Captain: (6:26:10)
Retard throttles.

Copilot: (6:26:11)

Engines normal, sir.[1]

From this last statement by the copilot, it is evident that the heat-seeking missile, which would have homed in on one of the engines, missed. This is verified by the Digital Flight Data Recorder. At this point, 11 seconds after missile impact, the Cabin Altitude Warning Alert sounds. Air has been rushing out of the punctured fuselage. The fact that it took as much as eleven seconds after impact before the alert sounded indicates that the total area of damage to the passenger compartment of the aircraft was only 1 3/4 square feet.[2]

As the missile hadn't hit the fuselage itself, but rather exploded 50 meters away, that 1.75 square feet area was probably made up of many small puncture holes caused by flying fragments—all toward the rear of the fuselage. Congressman Larry McDonald, seated in an aisle seat of the first class section—as well as Exie's father and cousin, seated in row 40 over the wings—were most likely unharmed. Furthermore, it would have been impossible for anyone to have been sucked out of the plane, though there may well have been wounded or dead in the rear section struck by missile fragments[3].

What were the passengers and crew experiencing at this time? There have been many conjectures, ranging from "nothing, as they had all died in the explosion," to "undergoing the excruciating pains of asphyxiation at high altitude." These conjectures are incorrect. Certainly, fear would have run through the passengers, and there would have been many prayers for safety and salvation. But there was a sufficient supply of oxygen for comfortable breathing. Aviation Specialist Dr. Malcolm Brenner[4] explains:

"Crew members and passengers would have about one minute of expected useful consciousness unless they successfully began receiving oxygen from an oxygen mask."[5]

Well within that critical "one minute of expected useful consciousness," the oxygen masks had already dropped and, because of the upward pitch of the aircraft's nose for most of its ascent leg of the arc, the masks were drifting back toward or behind the heads of the passengers, within easy reach. If airline regulations, routinely

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[1] KAL 007 CVR Transcript, p. 13.

[2] ICAO Report 1993, p. 54. "Eleven seconds after the CAM recorded the first sounds of the attack, the sound of the cabin altitude warning was heard... It was possible to estimate the approximate area of holes which would result in a decompression and subsequent cabin altitude warning after eleven seconds. An estimate, taking into account the output of the air-conditioning packs, indicated holes with a total area in the order of 1.75 square feet."

[3] It would have been impossible for anyone to be sucked out of a hole (assuming one hole instead of many small punctures) of only 1 ¾ foot area. Compare with TWA Flight 840 (Boeing 727) with a 4 foot hole in its side blown open by a bomb. Three adults and a child were sucked out and found on the ground 15,000 feet below.

[4] Associated with Aviation Safety Association International, a firm in the aviation accident investigation field.

[5] KAL 007—The Coverup by David Pearson (Summit Books: New York, 1987) p. 77.

demonstrated by the flight attendants, were followed by the passengers, adults would have donned their masks first before putting them on their children.

At 6:26:34, thirty-two seconds after missile detonation, the following consecutive messages were broadcast over the public address system in English, Korean, and Japanese: "Attention, Emergency Descent. Put out your cigarette. This is an Emergency Descent. Put the mask on your nose and mouth and adjust the headbands." When Captain Chun radioed Tokyo Airport, one minute and two seconds after missile detonation, his voice was already muffled as he was then speaking through the mike located in his oxygen mask[6], "Korean Air 007 ah… We are… Rapid compressions. Descend to 10,000."

… The rest of the one minute and 13 second arc—and the subsequent leveling out at pre-missile impact altitude—display the remarkable ability of the pilots to control the damaged aircraft. With only one of the four hydraulic systems fully operational (making control difficult, but by no means impossible)[7], and with wing flaps up, "control was reduced to the right inboard aileron and the innermost of the spoiler section on each side."[8] From 17 to 40 seconds after missile impact, the pilots struggled unsuccessfully to bring the plane to a lower altitude.

Captain: (6:26:24)
Altitude is going up, altitude is going up![9]

Captain: (6:26:25)
Speed brake is coming out.

Copilot: (6:26:26)
What? What?

Captain: (6:26:29)
Check it out.

(6:26:30)
[*Sound of Public address and chime for automatic cabin announcement.*]

Copilot: (6:26:33)
[*Sound of cabin call*] I am not able to drop altitude—now unable.

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[6] "Accentuated breathing during the transmission indicated that an oxygen mask was being worn." ICAO Report, 1993, p. 35.

[7] See Appendix E, pp xx-xx, for the detailed substantiation for the above assertion.

[8] ICAO Report, 1993, p. 54.

[9] See Appendix E, pp xx-xx for a reconstruction of the drama taking place in the cockpit—using simultaneous Cockpit Voice Recorder and Digital Flight Recorder tapes.

Captain: (6:26:38)
Altitude is going up.

Captain: (6:26:40)
This is not working. This is not working!

(Captain Chun now switches off the autopilot in order to manually move the column forward to bring down the airplane.)

Captain: (6:26:41)
Manually.

Copilot: (6:26:42)
Cannot do manually.

(Captain Chun has now moved the column forward but the plane has not responded. It is still ascending.)

Copilot: (6:26:43)
Not working manually, also.

Copilot: (6:26:45)
Engines are normal, sir.
(This is the second announcement of the normal operational functioning of the engines.)[10]

It is at this point in their struggle that Captain Chun succeeds in bringing the plane on its downward leg of the arc. It is not evident from the Digital Flight Data Recorder exactly how Captain Chun has succeeded but, nose down, KAL 007 begins to rapidly accelerate. It continues to pick up speed until, at a point almost exactly at KAL 007's pre-hit altitude, Captain Chun quickly reduces the plane's downward acceleration, sharply raising the pitch of the nose for eight seconds. He then levels the plane out. After maintaining this altitude for 16 seconds, he points the nose of the plane gently down for a graduated descent.[11] This, then, is the end of the minute and 44 second tape handed to the International Civil Aviation Organization by Boris Yeltsin and the Russian Federation.

Good work, Captain Chun!

This beginning of perhaps the most remarkably documented air emergency and descent—a descent which was to last for at least 12 minutes—indicates that KAL 007 had a good measure of both potential and actual controllability. Seven indications of this controllability are:

1. Sufficient oxygen for pilot alertness.

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[10] ICAO Report, 1993, KAL 007 CVR Transcript, p. 13.

[11] See annotated Digital Flight Data Recorder Chart in Appendix G.

2. All engines were operating normally.
3. Electrical system was operative (otherwise the radio and engines would not have operated).
4. Demonstrated pilot ability to decrease speed of KAL 007 in its downward phase (If he would not have been able to do so, the aircraft would continue to increase its downward acceleration—only to collide with the water in from 2 to 2 1/2 minutes. (KAL 007's flight lasted at least 12 minutes).[12]
5. KAL 007 was able to regain its pre-hit altitude almost exactly. (It is highly unlikely that KAL 007 regained exact altitude after its arc by chance.)
6. KAL 007 was able to regain its pre-missile hit rate of forward acceleration.
7. Captain Chun was able to bring KAL 007's nose (pitch) to the plane's exact level of flight.

These many key parameters of aircraft controllability were met at the beginning of KAL 007's post-impact flight. More would be met during the calculated and graduated duration of the over-twelve-minutes flight[13]—until the aircraft rested safely on the water's surface off Moneron Island.

Excerpt from **Appendix E, Last Moment Comparisons**, pages 165 to 169:

Comparisons of CVR transcripts of actual air emergencies are invaluable tools for understanding what the pilots of KAL 007 could have done, and indeed did do, to ensure the survival of their aircraft and safety of its passengers. These comparisons also provide us with a scenario of what could have happened to KAL 007 if its pilots had been less skillful and/or less able to work together in bringing their airplane to a safe water ditching.

Firstly, the 1993 ICAO report examined damage done to the aircraft—but none of the areas of damage, not all put together, can account for the sudden termination of its flight. The report would conclude that "all four engines must still have been functioning normally. The flight engineer also twice stated that the engines were normal. This suggested that the infrared guidance missile had not homed directly onto an engine."[14] But this "normal" working of engines strengthened the indications, as did the Digital

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[12] On October 31st, 1999, Egypt Air Flight 990, a Boeing 767 with a complement of 217 passengers and crew on a flight from New York to Cairo, crashed off Nantucket Island in the Atlantic Ocean. Radar trackings show that the plane took just 36 seconds to fall 13,900 feet—from 33,000 feet to 19,100 feet (a fall of about 386 feet per second or about 23,160 feet per minute. With a truly plunging and increasingly accelerating Egypt Air flight 990 as our comparison and control, if KAL 007 had been truly plunging out of control and its flight had lasted at least twelve minutes (verified by radar trackings) its altitude would have had to be an absurd 277,920 feet, not 35,000 feet, its altitude when rocketed. Compare, also, the fall of a Chinese Airline 747 on Feb. 20, 1985, of 32,000 feet, from 41,000 feet to 9,000 feet (falling about 267 feet per second. This fall took only slightly less than 2 minutes.

[13] See full list on pages xx and xx.

[14] ICAO report, 1993, pg. 55, section 2.16.10.

Flight Data Recorder information and the cockpit electronic transmits, that the electrical systems were also working normally.

Furthermore, aside from the damage to the tail portions from the Anab missile detonated 50 meters from the aircraft (a missile containing 20 kg high explosive warhead designed to produce 1,400 steel fragments, each of three to 18 grams.[15]), there was no evidence of damage to the jumbo jet anywhere except "holes with a total area of 1.75 square feet."[16]

This meant that structural damage itself to the fuselage of this aircraft could not account for the supposed disintegration of the aircraft or its "crash." The 11 second lapse between fragment impact and the warning alert of escaping air furthermore indicated, supported by CVR transcripts (pilot now speaking through his oxygen mask) that the plane could not have gone out of control because of pilot disorientation due to oxygen insufficiency.

This then left the malfunctioning of the control surfaces due to the missile impact itself (tail section) or due to loss or damage of hydraulic systems as the only apparently supportable explanation for both the supposed loss of pilot control and supposed loss of aircraft ability—required to explain a cataclysmic (and undocumented) crash.

The damage to the tail section involved damage to, and almost immediate unraveling of, the cable that connected the left inboard elevator to the right outboard elevator,[17] which resulted in the ensuing upward pitch of the aircraft. The CVR reveals this to be the immediate concern of the pilots.

Captain: (6:26:24)
Altitude is going up. Altitude is going up!

Captain: (6:26:25)
Speed brake is coming out.

Copilot: (6:26:26)
What? What?

Captain: (6:26:29)
Check it out.

Copilot: (6:26:33)
I am not able to drop altitude—now unable.

Captain: (6:26:38)
Altitude is going up.

Captain: (6:26:40)

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[15] ibid., pg. 39, section 1.16.22.

[16] ibid., pg. 54, section 2.16.4.

[17] ibid., pg. 54, section 2.16.2

This is not working. This is not working…[18]

The effect of the above mechanical damage would be evaluated by ICAO investigators in the light of failures in KAL 007's hydraulic systems as an aircraft's hydraulic systems are designed to maintain control of its moveable surfaces during its flight ensuring stability of the aircraft's three axes.[19]

Based on the triple axes Digital Flight Recorder charts of KAL 007's post-hit flight (charts which also provide other information such as altitude and acceleration changes), as well as investigators' conclusions from these charts which bear on hydraulic functioning, we can recreate the in-cockpit drama from the time of missile impact relating that to aircraft functioning—until the end of the black box recording—a span of one minute and thirteen seconds. For our purposes, we need only deal with the first 50 seconds of the post-hit flight.

Here, then, is the reconstruction. The missile detonates. Captain Chung calls out, "What was that?" The plane has suddenly increased its forward acceleration and begins to both pitch its nose upward and to ascend in altitude. The copilot responds, "What?" The aircraft, now a few seconds after missile impact, begins roll to the right. This motion will eventually end after 40 seconds, with the right wing down 50 degrees. 60 degrees is considered dangerous. "The aircraft rolled very slightly right wing down."[20] The captain calls out, "Reduce throttles." The copilot responds, "What?" The rate of aircraft acceleration decreases slightly, but the aircraft is still rising. Yaw, which had begun immediately upon missile detonation, diminishes slightly. Chun, who had been turning the wheel (to control aircraft roll) with large movements, at eight seconds after detonation has been able to reduce his movements to small corrections. But at eight seconds after detonation, Chun says, "Altitude is going up. Altitude is going up." The control column, which ought to have moved forward automatically to put the nose down (the plane was on autopilot), does not move forward. This failure indicates that hydraulic system number three, which operates the autopilot Actuator A control system of the elevators was damaged or out. Hydraulic system number three also provided one half of the power for the inboard left and outboard right elevator surfaces. KAL 007 was flying with one half power to its elevator surfaces.

Captain: (6:26:38)
Altitude is going up.

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[18] ibid., pg. 13.

[19] These three axes are:
Lateral axis—conceptually an axis through the side of the plane, rotation about which is called "pitch" (determining the positioning of the plane relative to the forward horizon.) The elevators located in the trailing edge of the horizontal tail section control this axis.
Longitudinal axis—conceptually an axis through the length of the plane, rotation about which is called "roll" (determining the positioning of the plane relative to the lateral horizon). The ailerons located in the trailing edge of the wings control this axis.
Vertical axis—conceptually an axis through the plane, top to bottom, rotation about which is called "yaw" (determining the positioning of the plane relative to its flight path). The rudder located in the trailing edge of the vertical tail controls this axis.

[20] ibid., pg. 54, section 2.16.

Captain: (6:26:40)
This is not working. This is not working.

The autopilot is either tripped or switched off by Captain Chun—presumably to move the column forward himself. The column does move sharply forward but the aircraft does not respond and continues its upward arc.

Captain: (6:26:41)
Manually.

Copilot: (6:26:42)
Cannot do manually.

This failure of the elevator to respond to manual control of the column indicates that there were failures in hydraulic systems one and two. These systems also controlled the yaw dampers, which explain why oscillating, yawing motions were experienced immediately upon missile detonation.

CVR transcripts of actual air emergencies provide us with an incident that fleshes out for us what it might have been like in the cockpit of KAL 007. There are striking similarities in the cases of KAL 007 and this incident, but KAL 007 might indeed have been in a more enviable position.

---End of Quote---

Additional Notes:

The incident referred to above is the 18-minute flight of United Air Lines Flight 232, a DC-10, with no hydraulics whatsoever, piloted by Capt Al Haynes on July 19, 1989. See rest of this appendix in Rescue 007: The Untold Story of KAL 007 and Its Survivors for details.

See FAQ 5, http://www.rescue007.org/faq.htm#5, *What happened to KAL 007 When the Missile Exploded?* for the complete transcript of the cockpit conversation after missile detonation correlated with the Digital Flight Data Recorder data.