INTERNATIONAL CIVIL AVIATION ORGANIZATION
ORGANISATION DE L'AVIATION CIVILE INTERNATIONALE
ORGANIZACIÓN DE AVIACIÓN CIVIL INTERNACIONAL
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ГРАЖДАНСКОЙ АВИАЦИИ
منظمة الطيران المدني الدولي
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Ref. LE 4/19.4 - 93/68

16 July 1993

Subject: Destruction of Korean Air Lines
Flight 007 on 31 August 1983
Action required: None - for information only

Sir,

I have the honour to refer to the decision by the Council on 18 December 1992 (C-Dec 137/15). In its decision the Council instructed the Secretary General to complete the investigation relating to the flight and destruction of Korean Air Lines (KE) flight 007 on 31 August 1983 and to report back to the Council as soon as possible.

The Council, at the seventh meeting of its 139th Session on 14 June 1993, reviewed the report of the Secretary General, decided that the fact-finding investigation had been completed, and adopted a resolution pertaining to the report. The Council did not endorse the conclusions and recommendations of the report.

I am attaching the resolution at Attachment A, the report on the completion of the investigation at Attachment B, and background information related to the report at Attachment C. Attachment D contains the Analysis and Conclusions submitted by the Russian Federation.

Accept, Sir, the assurances of my highest consideration.

Philippe Rochat
Secretary General

Enclosures:
Attachment A - Resolution adopted by the Council on 14 June 1993
Attachment B - Report of the completion of the fact-finding investigation
Attachment C - Background information related to the report of the completion of the fact-finding investigation
Attachment D - Analysis and Conclusions submitted by the Russian Federation

ATTACHMENT A to State letter LE 4/19.4 - 93/68

RESOLUTION ADOPTED BY THE COUNCIL OF THE INTERNATIONAL CIVIL AVIATION ORGANIZATION AT THE SEVENTH MEETING OF ITS 139TH SESSION ON 14 JUNE 1993

The Council of the International Civil Aviation Organization

Recalling the Resolutions adopted and the decisions taken on 16 September 1983 at the Extraordinary Session of the ICAO Council and endorsed by the 24th Session of the ICAO Assembly in October 1983 as well as the Council Resolutions of 13 December 1983 and 6 March 1984, and the Council decision of 18 December 1992, concerning the shooting down of Korean Air Lines Boeing 747 (Flight KE 007) on 31 August 1983;

Having considered the Report of the completion of the fact-finding investigation instituted by the Secretary General pursuant to the decision of the Council of 18 December 1992;

Recalling that the 25th Session (Extraordinary) of the Assembly in 1984 unanimously recognized the duty of States to refrain from the use of weapons against civil aircraft in flight;

Recognizing with appreciation the contribution of the Governments of Canada, France, Japan, the Republic of Korea, the Russian Federation and the United States, including making available experts, material and technical installations which facilitated the completion of the fact-finding investigation;

1. *Expresses* again its profound sympathy and condolences to the families bereaved in this tragic incident;

2. *Expresses* appreciation for the full co-operation extended to the fact-finding mission by the authorities of all States concerned;

3. *Expresses* appreciation to the Secretary General for the professionalism of the ICAO team and to the experts from the parties concerned;

4. *Requests* the Air Navigation Commission, in its continuing review of the technical Annexes to the Chicago Convention, to take into account the new facts contained in the Report, Addendum No. 1 and Information Papers Nos. 1 and 2 related to it;

5. *Appeals* again urgently to all Contracting States that have not yet done so to ratify, as soon as possible, the Protocol introducing Article 3 *bis* into the Convention on International Civil Aviation, which reaffirms the fundamental principle of general international law that States must refrain from resorting to the use of weapons against civil aircraft;

6. *Urges* States to take all necessary measures to safeguard the safety of air navigation of civil aircraft, in compliance with the relevant rules, Standards and Recommended Practices enshrined in the Chicago Convention and its Annexes;

7. *Decides* that the fact-finding investigation has been completed and that the Report of the completion of the fact-finding investigation regarding the shooting down of Korean Air Lines Boeing 747 (Flight KE 007) on 31 August 1983 in C-WP/9781 no longer has a restricted character.

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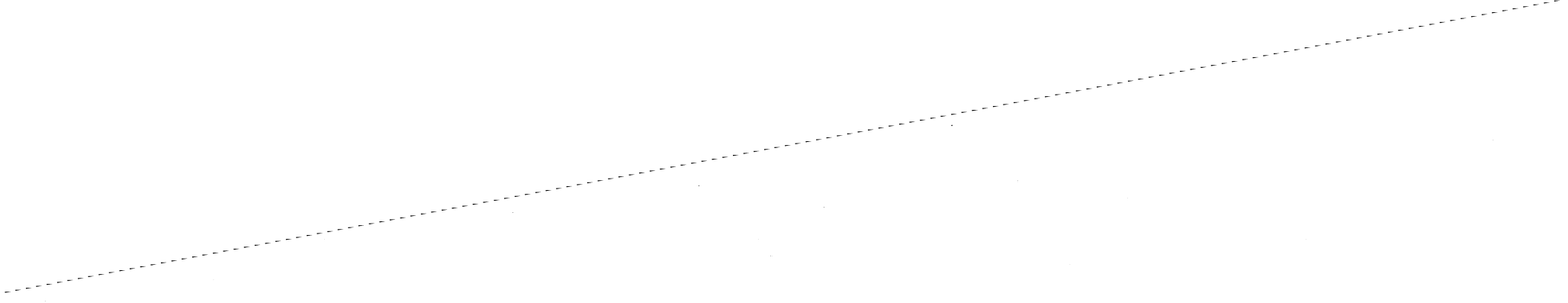
ATTACHMENT B to State letter 93/68

DESTRUCTION OF KOREAN AIR LINES BOEING 747 ON 31 AUGUST 1983

REPORT OF THE COMPLETION OF THE ICAO FACT-FINDING INVESTIGATION

This report complements the report of the
ICAO fact-finding investigation in 1983

JUNE 1993



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Note.- Unless stated otherwise, all dates and times in this report are Co-ordinated Universal Time (UTC). Local time in Anchorage was UTC - 9 hours, on Kamchatka Peninsula UTC + 13 hours, on Sakhalin Island UTC + 12 hours, in Seoul and Tokyo UTC + 9 hours, and in Moscow UTC + 4 hours.

SUMMARY OF FINDINGS AND CONCLUSIONS

On 31 August 1983, a Korean Air Lines (KAL) Boeing 747, designated KE 007, departed John F. Kennedy International Airport, New York, United States, on a one-stop scheduled flight for Kimpo International Airport, Seoul, Republic of Korea. The en-route stop occurred at Anchorage International Airport, Alaska, United States. At Anchorage, the aircraft was refuelled and serviced for the remainder of the flight to Seoul and, in accordance with company practice, the flight and cabin crews were changed.

The flight departed at the planned time of departure which, in keeping with Korean Air Lines' procedure, was calculated for each KE 007 flight. The departure from Anchorage was flexible to ensure arrival in Seoul at the scheduled arrival time of 21:00 hours* (06:00 hours local time). The actual departure time of 13:00 hours on 31 August would have resulted in an on-time arrival of KE 007 in Seoul, had the flight been completed in accordance with its flight plan.

On departing Anchorage, the flight had 269 persons on board consisting of 240 passengers, 3 flight crew members, 20 cabin attendants, and 6 crew members of KAL being repositioned to Seoul.

Soon after departure from Anchorage, KE 007 deviated to the right (north) of its direct track to Bethel. This deviation resulted in a progressively greater lateral displacement to the right of its planned route which, ultimately, resulted in its penetration of adjacent high seas airspace in flight information regions (FIRs) operated by the Union of Soviet Socialist Republics (USSR), as well as of sovereign USSR airspace overlying Kamchatka Peninsula and Sakhalin Island and their surrounding territorial waters.

No evidence was found during the investigation to indicate that the flight crew of KE 007 was, at any time, aware of the flight's deviation from its planned route in spite of the fact that it continued for over five hours. According to representatives of the United States, military radar installations in Alaska were not aware in real time that the aircraft was proceeding west with an increasing northerly deviation from the recognized airways system. The military radar installations of the Japanese Defence Agency were aware that an aircraft was tracking in USSR airspace over Sakhalin Island. According to representatives of Japan, they were not aware that it was a civil aircraft off its intended track.

Approximately between 16:40 and 17:08 hours military aircraft operated by the USSR attempted to intercept KE 007 over Kamchatka Peninsula. The interception attempts were unsuccessful. From about 18:00 hours when KE 007 was approaching Sakhalin Island, USSR, the flight was intercepted by USSR military aircraft. At 18:26:02 hours the aircraft was hit by at least one of two air-to-air missiles fired by the pilot of one of the USSR interceptor aircraft who had been directed, by his ground command and control units, to shoot down an aircraft which they assumed to be a United States RC-135.

As a result of the attack, KE 007 collided with the sea and sank off the southwest coast of Sakhalin Island. There were no survivors. The flight recorders, fragmentary pieces of the aircraft and a small number of items of personal property were salvaged by divers from the USSR during a two-month period following the accident. In addition, some flotsam from the aircraft was dispersed by tidal currents and recovered later.

The cockpit voice recorder (CVR) and the digital flight data recorder (DFDR) tapes were recovered by the USSR in 1983 and were handed over to ICAO in January 1993 by the representatives

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*Unless stated otherwise, all dates and times in this report are Co-ordinated Universal Time (UTC).

of the Russian Federation. They also made available recordings and transcripts of the communications between the pilots of the intercepting fighter aircraft and their ground controllers as well as the communications between the command centres. The representatives of the United States made available certified copies and transcripts of the Anchorage ATC tapes, and the representatives of Japan made available the Tokyo ATC tape. In the course of the investigation, all practical steps were taken to confirm the authenticity of the communications tapes. A comprehensive assessment of the physical characteristics of the CVR and the DFDR tapes and the information recorded thereon was made to ensure that they contained authentic records. The material on the communications tapes and the CVR and DFDR tapes showed no evidence of contradiction with known information and correlated well with other sources of data.

There was no evidence to suggest that the crew of flight KE 007 was aware that their aircraft was flying to the north of its planned route or that they knew of the presence of the intercepting fighter aircraft.

The DFDR record established that flight KE 007 maintained a constant magnetic heading from soon after departure from Anchorage until the attack by the fighter aircraft. The maintenance of the constant magnetic heading was so accurate it could only have resulted from the autopilot controlling the aircraft. The CVR and the DFDR records also established that the aircraft did not sustain an extensive avionics or navigation systems failure or malfunction prior to the attack by the USSR fighter aircraft.

The evidence obtained supported the first hypothesis of those listed in the 1983 ICAO report, i.e. that the crew inadvertently flew virtually the entire flight on a constant magnetic heading. The maintenance of a constant magnetic heading and the resulting track deviation was due to the KE 007 crew's failure to note that the autopilot had either been left in heading mode or had been switched to INS when the aircraft was beyond the range (7.5 NM) for the INS to capture the desired track.

Concerning the interception and associated identification, signalling and communications the investigation found the following:

1) Interceptions of KE 007 were attempted by USSR military aircraft over Kamchatka Peninsula and made in the vicinity of Sakhalin Island.

2) The USSR command centre personnel assumed that KE 007 was a United States RC-135 aircraft. KE 007's climb from FL 330 to FL 350 during the time of the interception over Sakhalin Island was interpreted as being an evasive action, thus further contributing to the USSR presumption that it was an RC-135 aircraft.

3) No attempt was made by the USSR to contact the crew of KE 007 by radio on the distress frequency 121.5 MHz or on any other VHF or HF frequency. However, the interceptor pilot was instructed by his ground control to attempt to attract the attention of the crew of the intruding aircraft by firing his aircraft's cannon and flashing its navigation lights. It was not possible to assess the distance of the interceptor aircraft from the intruder nor their relative positions when the interceptor's lights were flashed and the cannon fired.

4) The USSR command centre personnel on Sakhalin Island were concerned with the position of the intruder aircraft in relation to USSR sovereign airspace as well as its identity. The time factor became paramount as the intruder aircraft was about to coast out from Sakhalin Island. Therefore, exhaustive efforts to identify the intruder aircraft were not made, although apparently some doubt remained regarding its identity.

5) It was not possible to determine the position of KE 007 at the time of the missile attack in relation to USSR sovereign airspace.

1. FACTUAL INFORMATION

1.1 History of the flight

1.1.1 The Korean Air Lines (KAL) flight KE 007 originated in New York at 04:05 hours on 31 August 1983. It landed in Anchorage at 11:30 hours after an uneventful flight. The three inertial navigation systems (INS) and the weather radar system operated normally.

1.1.2 The flight crew for the Anchorage-Seoul sector of flight KE 007 had arrived in Anchorage from New York via Toronto on a non-scheduled cargo flight on 30 August 1983 at 22:37 hours. They had been accommodated in the KAL hostel. The crew was picked up from the hostel by a crew bus one hour and twenty minutes before the revised time of departure. The KAL flight operations briefing was conducted by the KAL dispatcher and covered aircraft ramp position, departure time, ATS flight plan, route, flight level, alternate airports; departure, destination and alternate airport weather; en-route winds, temperatures and upper air conditions; details of the computer flight plan, fuel requirements, passengers, and cargo; notices to airmen (NOTAMs); and the maintenance status of the aircraft. The pilot-in-command checked and approved the computer flight plan, the ATS flight plan, the Flight Release Sheet and the Weight and Balance Manifest.

1.1.3 The KAL procedure was for the co-pilot to switch on the three inertial navigation systems, insert the present (ramp) position confirmed from the Route Manual, and initiate system alignment. Each flight crew member was required to check the present position entry. Waypoint co-ordinates would then be entered during the system alignment. The pilot-in-command accepted the aircraft by signing the Flight and Maintenance Log.

1.1.4 The KAL schedule listed KE 007 to depart at 12:20 hours. The scheduled flight time for Anchorage-Seoul was eight hours twenty minutes with a scheduled time of arrival of 21:00 hours (06:00 hours Korean standard time). Due to less than average head winds, the computed flight time was seven hours fifty-three minutes. The practice of KAL was to reschedule the Anchorage departure for arrival in Seoul at 21:00 hours since passenger handling and customs services were not available prior to that time. Accordingly the departure from the gate at Anchorage was rescheduled to 12:50 hours.

1.1.5 The flight was to depart on the Standard Instrument Departure (SID) No. 8 and to proceed to Bethel VORTAC on ATS route J501. The flight was then to proceed on ATS route R20 in the North Pacific (NOPAC) composite route system to reporting point NIPPI where the flight would enter Tokyo Oceanic FIR and later enter the Taegu FIR for landing at Seoul. Route R20 was adjacent to USSR airspace along the Kamchatka Peninsula and the Kuril Islands. The initial flight level (FL) was 310 with planned changes en route to FL 330 after NUKKS and to FL 350 after NIPPI.

1.1.6 KE 007 called Anchorage Tower at 12:50 hours, reported receipt of automatic terminal information service (ATIS) Sierra and requested en-route clearance to Seoul. KE 007 was cleared to Seoul at FL 310 and was assigned secondary surveillance radar (SSR) transponder code 6072. At 12:58 hours KE 007 was cleared for take-off from runway 32 and was airborne at 13:00 hours. Radar contact was established shortly after take-off and KE 007 was cleared to climb to FL 310 maintaining a heading of 220°, and to proceed direct to the Bethel VORTAC when able. The Anchorage VOR/DME was out of service. Radar service was terminated at 13:27 hours when the aircraft was close to Cairn Mountain NDB, which was on ATS route J501. The Kenai air route surveillance radar showed that the

aircraft deviated from its track to BETHEL about ten minutes after departure and that the aircraft was about 6 NM north of J501 when radar service was terminated. The aircraft reported passing BETHEL at 13:49 hours and estimated NABIE at 14:30 hours. A display of the King Salmon radar was located near the controller in the Anchorage ARTCC; however, it was not certified for the provision of radar separation in civil air traffic and it was not required to be monitored by the controller. Recorded data from this radar showed that the aircraft was about 12 NM north of track when the crew reported BETHEL.

1.1.7 KE 007 reported NABIE at 14:32 hours, maintaining FL 310, estimating NEEVA at 15:49 hours. This report was relayed to Anchorage ARTCC by flight KE 015, another KAL flight from Anchorage to Seoul which departed Anchorage fourteen minutes after KE 007. At 14:44 hours KE 007, still unable to contact Anchorage ARTCC on VHF, provided its position report for NABIE to Anchorage IFSS on HF with a revised estimate for NEEVA of 15:53 hours. At 16:00 hours KE 015 again relayed to Anchorage ARTCC a position report from KE 007 for NEEVA at 15:58 hours, maintaining FL 310 and estimating NIPPI at 17:08 hours. KE 007 was requested to report NIPPI to Anchorage IFSS.

1.1.8 Anchorage ARTCC cleared KE 007 to FL 330 at 16:06 hours after this level had been vacated by KE 015.

1.1.9 At 17:09 hours KE 007 established HF communication with Tokyo Radio and reported passing NIPPI at 17:07 hours, maintaining FL 330, and estimating NOKKA at 18:26 hours. A Selcal check was also made. At 18:15 hours KE 007 requested FL 350. Five minutes later Tokyo Radio transmitted the clearance for KE 007 to climb to this level, KE 015 having reported reaching FL 370. KE 007 reported reaching FL 350 at 18:23 hours.

1.1.10 At 18:27 hours KE 007 attempted to advise Tokyo Radio of a rapid decompression and descent but the signal was noisy and weak and was not understood. Over the next fifteen minutes Tokyo Radio attempted to establish communication with KE 007 by voice and Selcal, as well as through relay by KE 015. All transmissions remained unanswered.

1.2 Eyewitness statement

1.2.1 At the time of the destruction of KE 007, a Japanese fishing boat, the 58th Chidori Maru, was in a position approximately 46°36'N, 141°16'E. The chief fisherman stated in interviews with the Japanese Maritime Safety Agency that he was on the bow deck when he heard the sound of an aircraft which gradually grew louder. He concluded from the sound that the aircraft was at a low altitude but did not see it. Then he heard a loud sound followed by a bright flash of light on the horizon, then another dull sound and a less intense flash of light. He estimated that the flashes of light that he saw took place in a southeasterly direction from him somewhere south of the beacon light of Mys Lopatina on Sakhalin Island. Ten to fifteen minutes later he experienced a strong smell of oil which gradually faded away.

1.2.2 During the day he observed several Soviet vessels, an aircraft at low altitude and a patrol vessel of the Japanese Maritime Safety Agency in the same general area.

1.3 **Injuries to persons**

Injuries:	Flight crew	Cabin attendants	Positioning crew	Passengers	Total
Fatal:	3	20	6	240	269

The following were the number of casualties by State and/or area:

Republic of Korea 105, United States 62, Japan 28, Taiwan 23, Philippines 16, Hong Kong 12, Canada 8, Thailand 5, Australia 2, United Kingdom 2, Dominican Republic 1, India 1, Islamic Republic of Iran 1, Malaysia 1, Sweden 1 and Viet Nam 1.

1.4 **Damage to aircraft**

1.4.1 The aircraft was struck by one or two air-to-air missiles fired from an SU-15 fighter aircraft. In-flight damage resulting from the detonation lead in eleven seconds to a decompression of the aircraft's cabin to a pressure of less than the equivalent of that at 10 000 ft. It also resulted in some aircraft controllability problems. One rudder control cable was apparently severed. The crew was able to retain limited control of the aircraft and to respond to the loss of cabin pressure. The power supply to the DFDR and CVR was subsequently interrupted one minute forty-four seconds after the attack. Radar data showed that the aircraft flew for at least nine minutes in a descending spiral after the attack. Subsequently KE 007 collided with the sea and sank.

1.5 **Personnel information**

1.5.1 **General**

1.5.1.1 The factual information regarding the licences, qualifications and experience of the flight crew, cabin crew and other personnel involved remained valid as contained in section 1.5 of the 1983 ICAO report.

1.5.2 **Rest and flight hours**

1.5.2.1 Rest in excess of the minimum required by the KAL Operations Manual was obtained by the flight crew of KE 007 between the route segments which they operated subsequent to their departure from Seoul on 27 August 1983. This roster included flights from Seoul to Anchorage, Anchorage to New York, New York to Toronto and Toronto to Anchorage. There were rest periods of 22 hours on the first visit to Anchorage, 31 hours in New York and 11 hours 43 minutes on returning to Anchorage. Their flying hours during the previous month had been 80 hours for the pilot-in-command, 71 hours for the co-pilot, and 66 hours for the flight engineer; the maximum flight time allowed being 90 hours.

1.6 Aircraft information

1.6.1 General

1.6.1.1 The factual information regarding the history of the aircraft, its engines, equipment and instrumentation remained valid as contained in section 1.6 of the 1983 ICAO report.

1.6.1.2 The aircraft was equipped with the following instruments and equipment relevant to some degree to the investigation: three VHF transceivers, two HF transceivers, two SSR transponders, one Selcal, two weather radars, three INS, two ADF receivers, two VOR/ILS receivers, one marker beacon receiver, two DME, two compass systems, two autopilots, one auto-throttle, two horizontal situation indicators (HSI), two attitude director indicators (ADI), four radio magnetic indicators (RMI), one DFDR and one CVR.

1.6.1.3 The aircraft communication radio aerials were positioned as follows: HF 1 - left wing tip, HF 2 - right wing tip, VHF 1 - above upper deck fuselage area, VHF 2 - under central fuselage, and VHF 3 - on top of rear fuselage.

1.6.2 Aircraft flight log

1.6.2.1 During the flight from New York to Anchorage the flight crew recorded the following discrepancies:

- heading flag was in view on co-pilot's HSI. The central instrument warning system (CIWS) light was flashing but went out with compass transfer switch
- VHF 2 was noisy
- map table spring was damaged.

1.6.2.2 The aircraft was dispatched from Anchorage in accordance with the Minimum Equipment List with the defect in the No. 2 compass system deferred. The VHF 2 was ground checked and found to operate normally. Repair of the map table spring was deferred for rectification in Seoul.

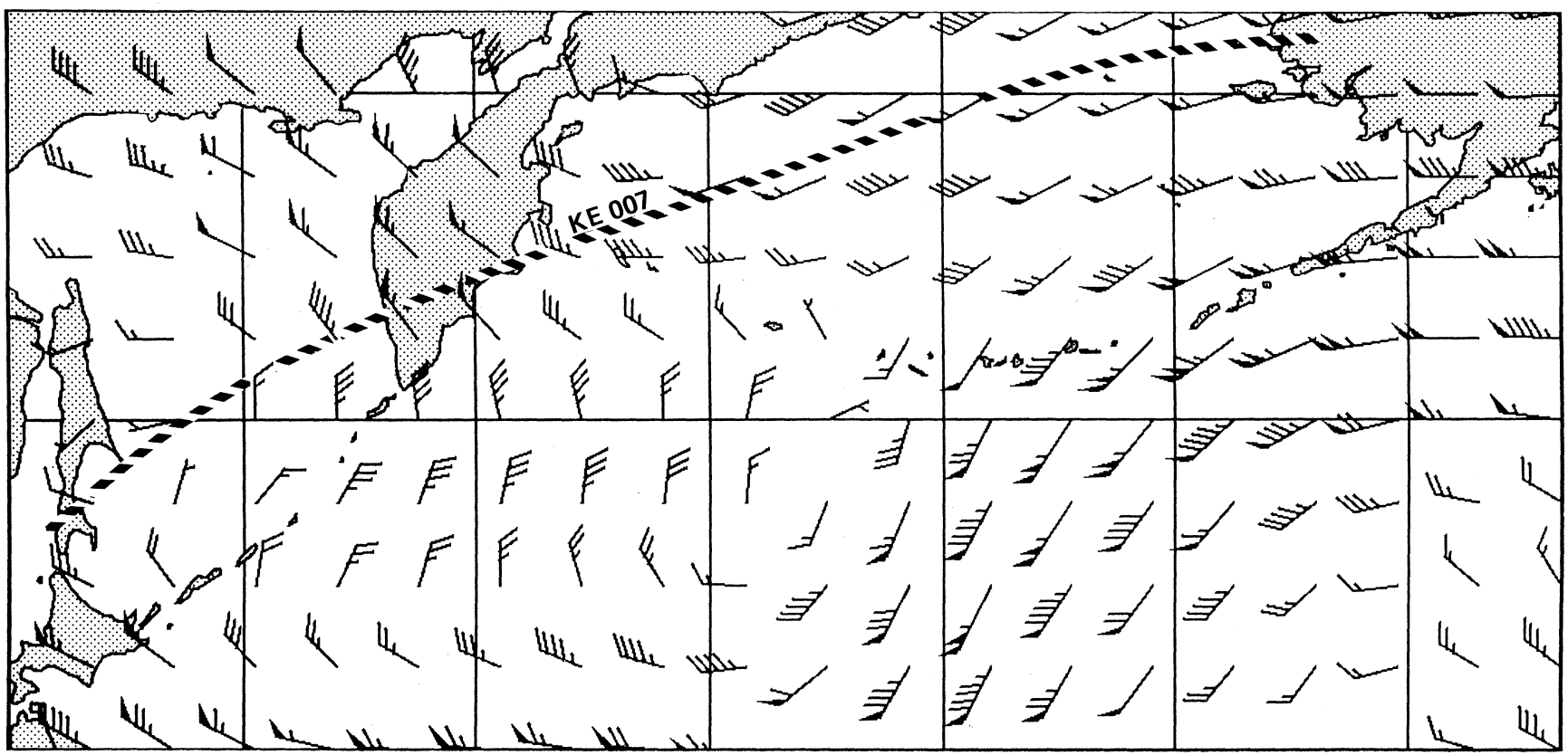
1.6.3 Inertial navigation system

1.6.3.1 The aircraft was equipped with three Litton LTN-72R-28 INS units. The INS was not modified for radio updating.

1.6.3.2 Each INS consisted of three units. The mode selector unit (MSU) was used to control the operating modes of the system. The control display unit (CDU) was used to enter and display navigation data. Both units were located on the flight deck. The inertial navigation units (INU) contained the inertial sensors plus a computer to perform the navigational computations. The INUs were located in the aircraft electronics bay with a battery for each as a backup source of power.

1.6.3.3 The INS allowed the pilot to, *inter alia*, store flight plans of up to nine waypoints, display navigational data, and provide steering commands to the autopilot for automatic flight control.

Chart 1. Final Analysis for the 250 hPa Pressure Level for 18:00 hours 31 August 1983
Graphique 1. Analyse finale au niveau de pression 250 hPa à 18:00 heures de 31 août 1983
Carta 1. Análisis final del nivel de presión de 250 hPa para las 18:00 horas del 31 de agosto de 1983
Карта 1. Заключительный анализ для уровня давления в 250 гПа по состоянию на 18.00 31 августа 1983 года
الخارطة (١) : التحليل النهائى لمستوى الضغط ٢٥٠ هكتوباسكال بالنسبة للساعة ١٨:٠٠ من يوم ١٩٨٣/٨/٣١



1.6.4 **Weather radar**

1.6.4.1 The aircraft was equipped with two Bendix RDR-IF weather radar sets and the associated wave guide and aerial system. This radar had a maximum range of 200 NM with a 180° scan capability.

1.7 **Meteorological information**

1.7.1 **Weather over the North Pacific**

1.7.1.1 There was extensive coverage of low, medium and high level clouds over southern Kamchatka associated with an active cold front. Over the Sea of Okhotsk the cloud decreased to scattered low clouds in a ridge of high pressure lying roughly northwest to southeast across R20. Cloud coverage increased again approaching southern Sakhalin to a condition of mostly overcast low cloud with scattered medium and high clouds, the latter in streaks, due to the approach of a warm front located at 18:00 hours over the extreme south of Sakhalin Island.

1.7.2 **Light conditions**

1.7.2.1 The moon was in the last quarter with approximately 45 per cent of the disc illuminated. At 18:00 hours the moon was about 60° above the horizon. The sun rose at 20:13 hours on 31 August in the area of interception. At 18:30 hours at FL 350 night time darkness still prevailed.

1.7.3 **Winds**

1.7.3.1 The estimation of the wind field along the track of KE 007 was based on the final analysis for the 250 hPa pressure level valid for 18:00 hours 31 August 1983 obtained from the Canadian Meteorological Centre, the 250 hPa wind forecast valid at 18:00 hours 31 August 1983, routine air-reports given by KE 007, data provided by the Russian Federation and routine air-reports made by KE 015 east of 180 W.

1.7.3.2 The winds were generally westerly (260-290°) and the wind speeds were between 30 and 50 kt with local maxima (50-55 kt) between 170-175 W, and 155-145 E, respectively. In addition, an area of very weak winds was experienced between 150-145 E over the Sea of Okhotsk. The presence of this minimum was evident from KE 007's exchange of wind information with KE 015 as recorded on the CVR at 18:05 hours; KE 007 reported 215/15 kt. The weak wind fitted well with the final analysis for 250 hPa for 18:00 hours 31 August 1983.

1.7.3.3 The wind field indicated that the jet stream was well south of the track of KE 007. Under these circumstances, the presence of any significant turbulence was unlikely.

1.8 **Aids to navigation**

1.8.1 The en-route ground based aeronautical aids to navigation available on the assigned route were the following:

a) Anchorage airport surveillance radar (ASR), with a coverage of 60 NM and completely overlapped by the Kenai radar;

b) Kenai air route surveillance radar (ARSR), with a coverage which varied from 150 to 175 NM above FL 280;

c) Cairn Mountain non-directional beacon (NDB), located on route J501;

d) Bethel VORTAC (VOR and TACAN combination), with a coverage which extended approximately 135 NM east and 160 NM west of Bethel;

e) St. Paul Island NDB and DME, which was 140 NM from NABIE; and

f) Shemya VOR with a coverage which extended to approximately 175 NM. A DME element of a TACAN located at Shemya was also available.

1.8.2 There were no recordings of defects to any of the above aids at the time of the flight's passage. The VOR/DME at Anchorage was out of service from 22:17 hours on 23 August to 00:39 hours on 2 September 1983. The information that Anchorage VOR/DME was out of service had been disseminated by a NOTAM.

1.8.3 Radials to the north and south of the Shemya VOR were flight checked after the incident and confirmed that reporting points abeam Shemya, including NEEVA, were within the range of the VOR.

1.9 **Communications**

1.9.1 The facilities which were involved in communications related to flight KE 007 were as follows:

a) Facilities providing aeronautical mobile service (AMS)—air-ground communications:

Anchorage ATC clearance delivery, tower and radar approach control (CD/TWR/APP)
Anchorage air route traffic control centre (ARTCC)
Anchorage international flight service station (IFSS) (Anchorage Radio)
Tokyo aeronautical station (Tokyo Radio)
Tokyo area control centre (ACC)

b) Facilities providing aeronautical fixed service (AFS):

Anchorage ARTCC
Anchorage AFTN communication centre
Tokyo ACC
Tokyo AFTN communication centre
Sapporo ACC
Seoul AFTN communication centre
Khabarovsk ACC
Khabarovsk AFTN communication centre
Moskva AFTN communication centre

1.9.2 **VHF communications with Anchorage CD/TWR/APP**

1.9.2.1 Communications regarding ATC clearances took place with Anchorage CD/TWR and APP between 12:50 and 13:05 hours. At 13:05 hours Anchorage APP instructed KE 007 to contact Anchorage ARTCC on 125.7 MHz. This frequency was that of the Kenai remote control air-ground (RCAG) facility.

1.9.3 **VHF communications with Anchorage ARTCC**

1.9.3.1 At 13:27 hours Anchorage ARTCC terminated the radar service for KE 007 and instructed the flight to contact them on 125.2 MHz, the frequency of the Bethel RCAG. KE 007 used this frequency for communication with Anchorage ARTCC until 13:50 hours when it was directed by the ARTCC to change to 127.8 MHz, the frequency of the St. Paul RCAG, when reporting NABIE.

1.9.3.2 There was no indication of difficulty in establishing or maintaining communication with KE 007 until 14:32 hours. Between that time and 14:34 hours Anchorage ARTCC called KE 007 and although some unintelligible signals were received, contact could not be made. At 14:35 hours KE 015 relayed KE 007's position report for NABIE. In response Anchorage requested KE 015 to instruct KE 007 to make its next position report on 128.2 MHz, the frequency for Shemya RCAG. This request was acknowledged by KE 015 but KE 007 did not establish any further direct VHF contact with Anchorage. Between 16:00 and 16:10 hours KE 015 relayed a position report from KE 007 for NEEVA and acknowledged clearances issued by Anchorage ARTCC for relay to KE 007. KE 015 communicated with KE 007 on 123.4 MHz.

1.9.4 **HF communications with Anchorage Radio**

1.9.4.1 Beginning at 16:04 hours, KE 007 tried to establish contact with Anchorage Radio. Although several calls were recorded they were weak and apparently not heard by Anchorage Radio. While another aircraft was transmitting a message, KE 007 initiated another call which was not answered by Anchorage Radio. At 16:22 hours KE 007 established contact with Anchorage Radio for a radio check on 5628 kHz. The radio check was effected but the transmission was difficult to read. At 17:08 hours KE 007 again called Anchorage Radio but no reply was received. KE 007 then called Tokyo Radio on the same frequency.

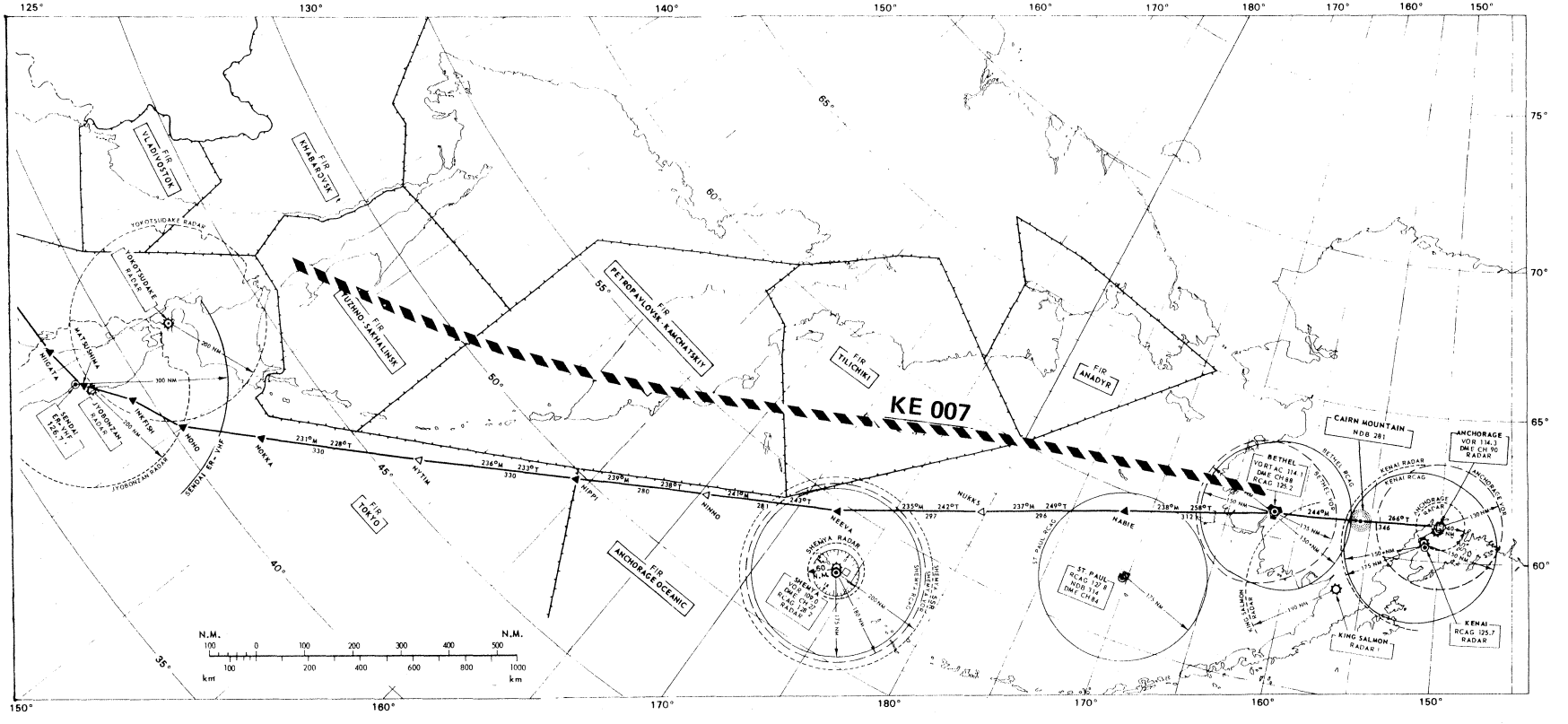
1.9.5 **Communications with Tokyo**

1.9.5.1 At 17:09 hours KE 007 contacted Tokyo Radio on 5628 kHz to make a position report and was given 10048 kHz as a secondary frequency. A Selcal check was made at the request of KE 007.

1.9.5.2 At 18:15 hours KE 007 contacted Tokyo Radio and requested FL 350. At 18:20 hours KE 007 was cleared to climb to and maintain FL 350. At 18:23 hours KE 007 reported that it had reached FL 350.

1.9.5.3 At 18:27 hours KE 007 again called Tokyo Radio. The message, the last recorded transmission of KE 007, was not understood as it was noisy, garbled and weak. Tokyo Radio requested KE 007 to make a radio check on 10048 kHz. No reply was received and repeated voice and Selcal

Chart 2. VHF Communications, Navigation Aids and Radar Coverages
Graphique 2. Couverture des communications VHF, des aides de navigation et des radars
Carta 2. Comunicaciones en VHF, ayudas para la navegación y coberturas radar
Карта 2. Зоны действия ОВЧ-связи, навигационных и радиолокационных средств
الخارطة (٢) : الاتصالات على التردد العالى جدا ، والأجهزة الملاحية المساعدة ومدى التغطية الرادارية



LEGEND	LÉGENDE	CLAVE	ЛЕГЕНДА	توضيحات			
FLIGHT INFORMATION REGION RÉGION D'INFORMATION DE VOL REGIÓN DE INFORMACIÓN DE VUELO РАЙОН ПОЛЕТНОЙ ИНФОРМАЦИИ اقليم تأمين الطيران		REPORTING POINT POINTE DE COMPTE RENDU PUNTO DE NOTIFICACIÓN ПУНКТ ПЕРЕДАЧИ ДОНЕСЕНИЙ نقطة الابلاغ	compulsory obligatoire obligatorio обязательный الزامى	▲	VOR	limit of range limite de portée alcance límite граница зоны действия حد المدى	RCAG (VHF)	limit of range limite de portée alcance límite граница зоны действия حد المدى
AIR ROUTE ROUTE AÉRIENNE RUTA AÉREA АВИАТРАССА الطريق الجوى			non-compulsory non obligatoire no obligatorio необязательный غير الزامى	△	DME		RADAR РЛС	limit of range limite de portée alcance límite граница зоны действия حد المدى
		NDB		•	VORTAC			

transmissions were unanswered. After 18:30 hours further unsuccessful attempts were made on HF and VHF to establish communications with KE 007 as well as through relay by KE 015.

1.9.6 **Communications between ground stations**

1.9.6.1 Communications related to KE 007 took place between Tokyo ACC and Anchorage ARTCC and between Sapporo and Khabarovsk ACCs, using direct speech, and between Anchorage/Tokyo, Anchorage/Seoul, Tokyo/Seoul, Tokyo/Moskva and Tokyo/Khabarovsk communication centres using AFTN circuits. All of these circuits were operating satisfactorily.

1.9.6.2 Communications related to the transfer of control of KE 007 from Anchorage ARTCC to Tokyo ACC and co-ordination data for the transfer of control at NIPPI were exchanged between the two centres at 16:12 hours.

1.10 **Air traffic services**

1.10.1 **Airspace organization**

1.10.1.1 The flight from Anchorage to Seoul was planned along J501, R20 and Oceanic Transit Route (OTR) 1, then to cross Japan and the Sea of Japan. The route was situated within Anchorage, Anchorage Oceanic, Tokyo and Taegu FIRs. Route J501 connected Anchorage with BETHEL, the first reporting point of R20. The latter route was the northernmost of the five-route North Pacific (NOPAC) composite route system.

1.10.1.2 The NOPAC composite route system within the Tokyo and Anchorage FIRs was established with effect from 18 March 1982 and consisted of five routes: R20, R80, A90, R91 and G44. Routes R20 and R80 were used for westbound flights. On R20 the compulsory reporting points were: BETHEL, NABIE, NEEVA, NIPPI, NOKKA, NOHO and NANAC; the non-compulsory reporting points were: NUKKS, NINNO and NYTIM.

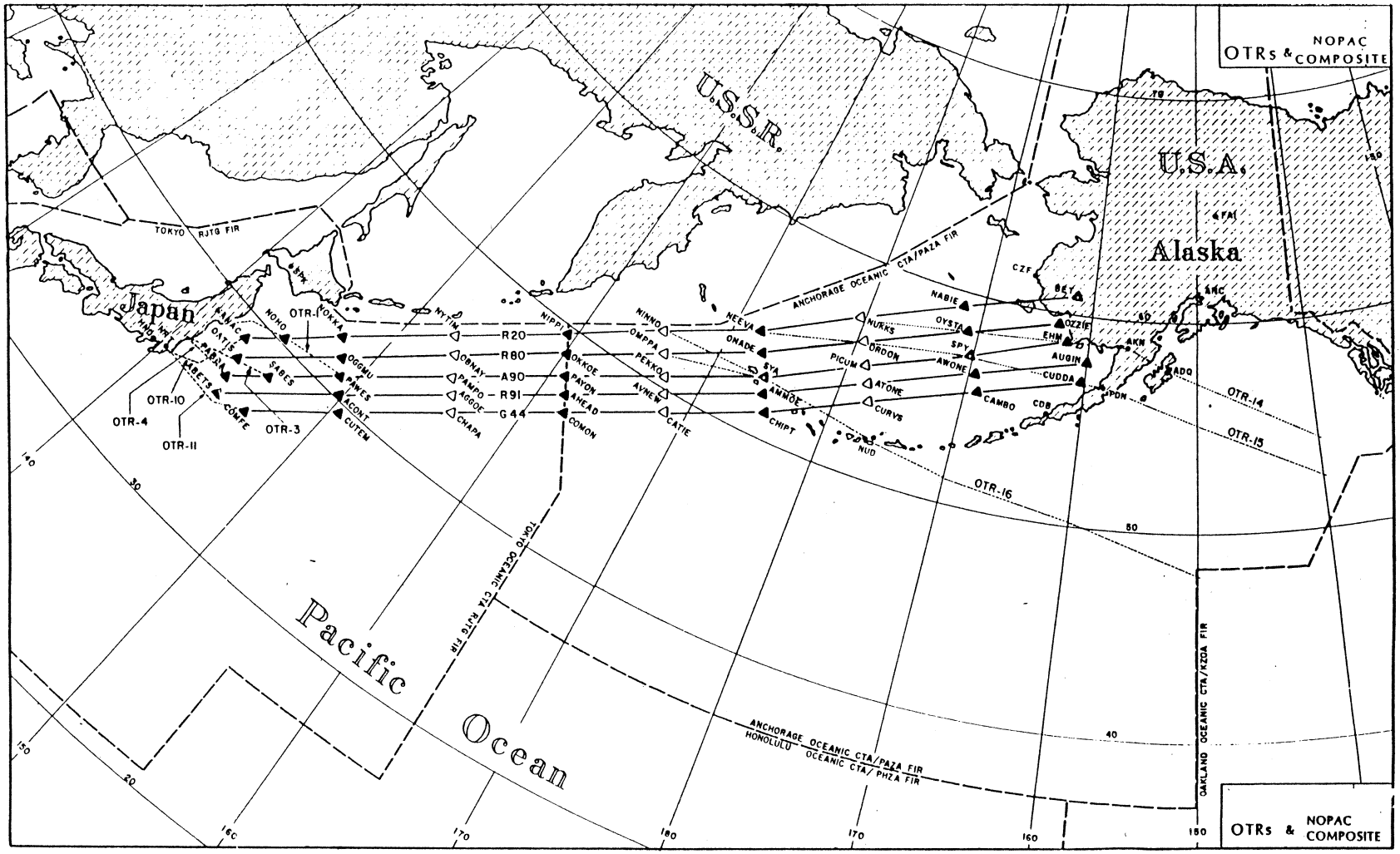
1.10.2 **ATS units and air-ground control radio stations**

1.10.2.1 Within the Anchorage and Anchorage Oceanic FIRs, KE 007 was provided with ATC service by Anchorage CD/TWR, APP and Anchorage ARTCC. In ICAO terminology the Anchorage ARTCC would be described as a combined area control centre/oceanic area control centre (ACC/OAC).

1.10.2.2 The Anchorage ARTCC maintained two-way VHF radio communications with aircraft under its control through RCAG facilities at Kenai, Bethel, St. Paul and Shemya. Outside the coverage of these RCAGs, air-ground communications were handled on HF by Anchorage flight service station/international flight service station (FSS/IFSS) using the call sign "Anchorage Radio".

1.10.2.3 In Anchorage ATC, because of the light traffic at night, the flight data, clearance delivery and ground control position were combined; the aerodrome control and the approach control positions were also combined. During the time that KE 007 was controlled by Anchorage ARTCC, it was successively under control of combined radar sectors 5 and 6 (RD 5/6), combined non-radar sectors 2 and 3 (D 2/3) and oceanic (non-radar) sectors 10 and 11 (D 10/11).

Chart 3. OTRs and NOPAC Composite
Graphique 3. Routes de transit océaniques (OTR) et réseau de routes organisées NOPAC
Carta 3. OTR y sistema de rutas compuesto NOPAC
Карта 3. Океанические маршруты перехода (OTR) и комбинированная система маршрутов NOPAC
الخارطة (٣) : طريق العبور المحيطى والشبكة المركبة للطرق الجوية فى المحيط الهادى الشمالى



1.10.2.4 Within Tokyo FIR traffic was controlled by Tokyo ACC, Sapporo ACC and Fukuoka ACC. Traffic along the route for which KE 007 received its ATC clearance was controlled by Tokyo ACC, until the transfer to Taegu ACC (Republic of Korea). Until westbound traffic on R20 was within the coverage of the extended range VHF air-ground communication station at Sendai, two-way communications were conducted on HF by Tokyo Radio.

1.10.3 **Air traffic control service**

1.10.3.1 At 08:47 hours, the filed flight plan message was transmitted by Anchorage FSS/IFSS to all ATS units along the route of flight, the addressees being added automatically on the basis of a stored list, taking account of aircraft identification and the planned route of the flight. The ETD in the flight plan was 13:00 hours.

1.10.3.2 At 12:50 hours KE 007 received its clearance to Seoul via the Anchorage SID No. 8, thence via its flight plan route at cruising level FL 310 and with an assigned secondary surveillance radar (SSR) transponder code of 6072. KE 007 received push-back clearance at 12:51 hours and taxi clearance at 12:55 hours followed by clearance for take-off from runway 32 at 12:58 hours. The aircraft was airborne at 13:00 hours and after radar contact was established, clearance was given to climb to FL 310 on heading 220° and to proceed direct to Bethel VORTAC when able. Transfer of radar control to Anchorage ARTCC was effected at 13:04 hours.

1.10.3.3 Shortly after radar transfer KE 007 reported leaving 5 000 ft climbing to FL 310. Radar control of westbound flights was provided until leaving the coverage of the Kenai air route surveillance radar, some 160 NM from Anchorage, approximately at Cairn Mountain NDB. Radar service was terminated at 13:27 hours and control of the aircraft was transferred to the combined non-radar control sectors D 2/3 (Anchorage ARTCC on 125.2 MHz) shortly before radar contact was lost. At 13:28 hours KE 007 reported leaving FL 300 climbing to FL 310 and at 13:49 hours reported passing BETHEL maintaining FL 310 and estimating NABIE at 14:30 hours. At 13:50 hours Anchorage ARTCC requested KE 007 to report NABIE on 127.8 MHz. The request was acknowledged by KE 007.

1.10.3.4 At 14:32 hours, two minutes after the estimated time over NABIE, the controller at combined sectors D 10/11 tried to establish communications with KE 007 on 127.8 MHz (St. Paul RCAG). When these efforts failed, the controller requested the Anchorage IFSS to contact KE 007 and request the aircraft to contact Anchorage ARTCC on VHF. At 14:35 hours, KE 015 relayed KE 007's report of passing NABIE at 14:32 hours maintaining FL 310 and estimating NEEVA at 15:49 hours. ARTCC subsequently requested KE 015 to relay an instruction to KE 007 to report over NEEVA on 128.2 MHz (Shemya RCAG).

1.10.3.5 At 14:44 hours KE 007 contacted Anchorage Radio on HF and transmitted its position report for NABIE. It also gave a revised ETA for NEEVA of 15:53 hours and requested FL 330. Anchorage Radio advised KE 007 to make the request for FL 330 on 127.8 MHz (St. Paul RCAG).

1.10.3.6 At 16:00 hours KE 015 relayed to ARTCC the position report from KE 007 for NEEVA at 15:58 hours maintaining FL 310 and estimating NIPPI at 17:08 hours. KE 015 was asked to relay a request to KE 007 to report NIPPI to Anchorage Radio.

1.10.3.7 KE 015 reported passing NEEVA at 16:02 hours and requested FL 350. Having received clearance to climb to and maintain FL 350 KE 015 reported reaching this level at 16:06 hours. Through relay by KE 015, ARTCC then cleared KE 007 to climb to and maintain FL 330. At 16:10 hours KE 015 relayed a report that KE 007 had reached FL 330.

1.10.3.8 At 16:12 hours Anchorage ARTCC co-ordinated with Tokyo ACC the transfer of control of KE 007 and KE 015, which were estimating NIPPI at 17:08 hours and 17:14 hours, respectively.

1.10.3.9 At 17:09 hours KE 007 reported to Tokyo Radio on 5628 kHz that it had passed NIPPI at 17:07 hours, maintaining FL 330, and estimating NOKKA at 18:26 hours. At 18:15 hours KE 007 requested a climb to FL 350. At 18:20 hours KE 007 was cleared to climb to and maintain FL 350. At 18:23 hours KE 007 reported that it had reached FL 350.

1.10.3.10 While under radar control by Anchorage ARTCC KE 007 squawked the assigned SSR code 6072. According to the NOPAC Airspace Operations Manual, between 170°E and 150°E, flight crews should select a non-discrete SSR code, i.e. a four-digit code with the last two digits zero zero. According to information provided by Japan an aircraft, which was later identified as KE 007, was observed by the Japanese Defence Agency radar installations between 18:12 and 18:29 hours squawking SSR code 1300. The reported selection of SSR code 1300 was as appropriate as any other code ending with zero zero. In addition, according to AIP Japan, code 1300 might be assigned to flights at or above FL 240 when leaving Tokyo radar coverage. When entering Tokyo radar controlled airspace in the vicinity of NOHO, the aircraft would have been required to squawk SSR code 2000 unless instructed otherwise by ATC.

1.11 Search and rescue

1.11.1 At 18:56 hours, thirty minutes after KE 007's estimated time over NOKKA and after repeated attempts to re-establish communication had failed, Tokyo ACC notified several ATS units and military units, via direct-speech links, of its inability to establish radio contact with KE 007, and requested them to conduct a communication search. These units included Sapporo ACC, the Japan Defence Agency (JDA), Tokyo (Narita) TWR and Yokota APP. At 19:05 hours the same information was transmitted via the AFTN to Anchorage and Honolulu ARTCCs. At 19:15 hours Tokyo ACC informed Tokyo rescue co-ordination centre (RCC) about the missing KE 007. Tokyo RCC was responsible for the search and rescue operations within the Tokyo search and rescue region, which coincided with Tokyo and Naha FIRs. At 19:22 hours Tokyo ACC declared an alerting phase in respect of KE 007 and transmitted an appropriate message to relevant units in Japan and the United States including Anchorage and Honolulu ARTCCs.

1.11.2 At 20:30 hours through relay via Sapporo ACC on a direct-speech circuit, Tokyo ACC inquired whether Khabarovsk ACC in the USSR had any information on the missing KE 007. At 21:50 hours Khabarovsk ACC replied that it had no information.

1.11.3 At 20:50 hours Tokyo RCC originated a message declaring a distress phase in respect of KE 007. This message was transmitted to Anchorage ARTCC and Anchorage/Elmendorf RCC, Honolulu RCC, Khabarovsk RCC and aeronautical fixed station, Taegu ACC and Seoul air traffic services reporting office (ARO), and to Korean Air Lines' offices in Anchorage, Tokyo and Seoul.

1.11.4 Between 21:00 and 23:00 hours on 31 August 1983 Tokyo RCC determined a search area around reporting point NOKKA. Tokyo RCC requested the Japan Maritime Safety Agency (JMSA), the JDA and the United States Forces in Japan to conduct the search and rescue operations. Subsequently, JMSA dispatched twelve vessels and five aircraft to the search area.

1.11.5 At 23:30 hours JMSA received information from JDA that an aircraft had been observed on radar about 100 NM northeast of Wakkanai, moving in a southwesterly direction. This contact was last observed by the JDA radar installations at 18:29 hours. Following receipt of the above information, JMSA dispatched two patrol vessels to the area west of Sakhalin Island and prepared two aircraft for take-off at Wakkanai Airport. Between 06:10 and 14:30 hours, JMSA dispatched eight additional patrol vessels to the waters west of Sakhalin Island.

1.11.6 During the interception of KE 007 the USSR command centres of the Air Defence Forces alerted the USSR rescue services at Nevelsk to be on standby in the event search and rescue efforts were required. Immediately after the destruction of KE 007 the USSR rescue services were directed to the area north of Moneron Island. Military vessels, fishing vessels, submersibles, helicopters and aeroplanes of the USSR participated in the search. Upon their arrival in the area many small objects were seen in the water, and the area of search was more precisely determined. Trawlers recovered numerous items in this area. Later USSR naval divers were able to locate the wreckage on the sea bottom.

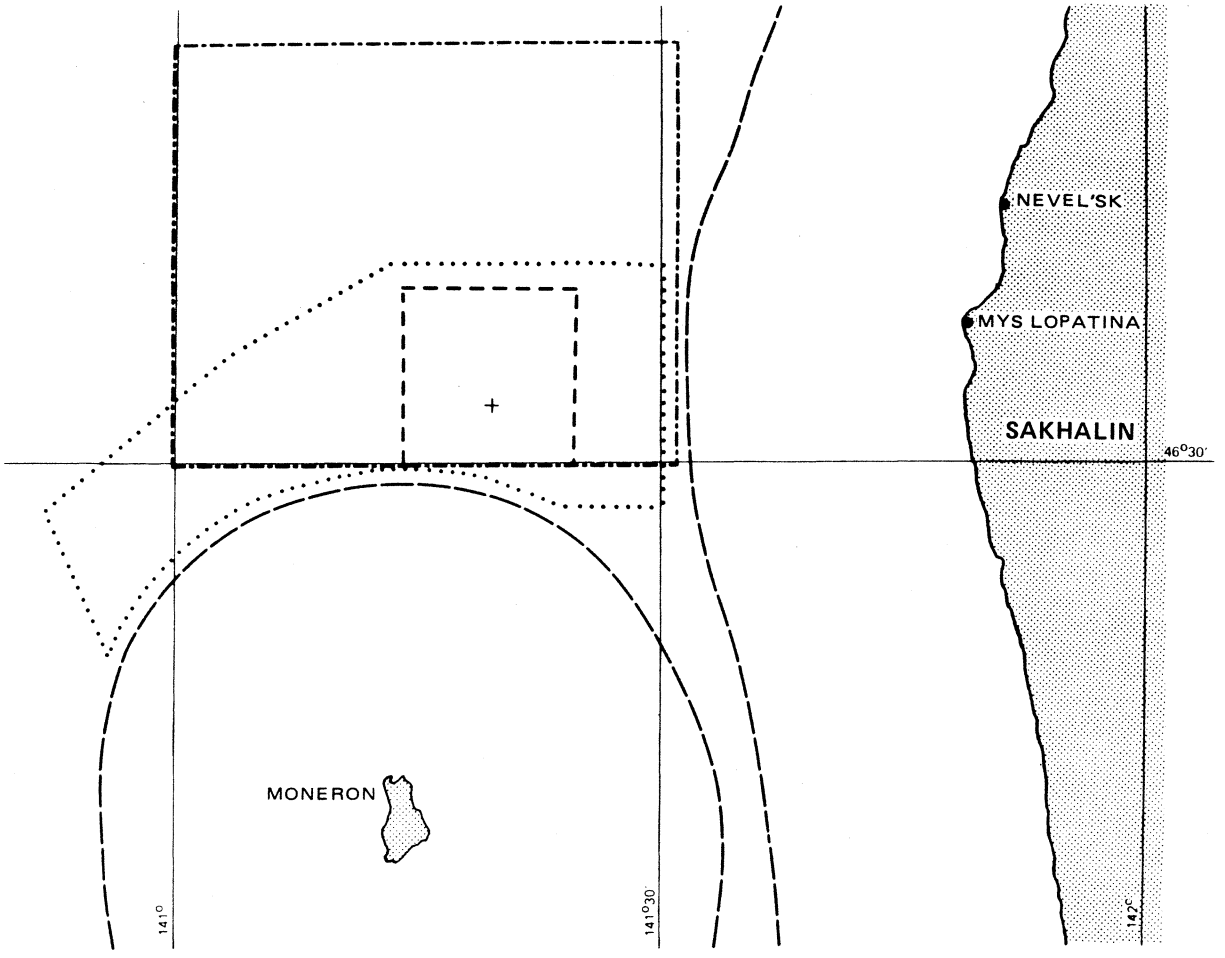
1.11.7 Aircraft of the United States Fifth Air Force were in the general area of the shoot-down by 1 September 1983, and were joined the next day by naval units. From 1 to 13 September these forces searched for surface debris. Underwater search operations began on 14 September using homing equipment to detect the underwater locator device attached to KE 007's DFDR, sidescan sonars, sonobuoys and an underwater remote-controlled vehicle. These efforts were aimed at detecting KE 007's underwater locator device. Three ships reported possible contact from 19 to 24 September; contact was held generally within a two-mile radius from 46°25'30"N, 140°56'30"E. Search of a 60 square mile "high probability" area associated with these possible contacts was completed on 21 October without success. A "large probability" area was established east of the contact area, based on Japanese radar track data and interviews with Japanese fishermen; the search of this area was also unsuccessful. The search operations lasted until 5 November and covered an area approximately 225 square miles in international waters, extending in an arc from northwest to northeast of Moneron Island.

1.11.8 From 3 to 29 September 1983 four ships from the Republic of Korea were searching the area. On 11 and 13 September the Republic of Korea sent teams to Wakkanai, Japan, to identify wreckage debris and human remains.

1.11.9 On 26 September 1983 USSR officials handed over to United States and Japanese officials, at Nevelsk on Sakhalin Island, sixty items of wreckage and eighteen articles of personal property.

1.11.10 Over 700 items of wreckage and personal possessions, some of which had drifted ashore on the northeast side of Hokkaido Island, were found by the Japanese authorities. The wreckage handed over by USSR officials and that recovered by the Japanese authorities was handed over to the Government of the Republic of Korea. The wreckage was examined in Seoul by members of the ICAO fact-finding investigation on 6 October 1983. Several items of wreckage could be identified as coming from a

Chart 4. Search and Rescue Areas
Graphique 4. Zones de recherches et de sauvetage
Carta 4. Zonas de búsqueda y salvamento
Карта 4. Районы поиска и спасания
الخارطة (٤) : مناطق البحث والانقاذ



LEGEND LÉGENDE CLAVE УСЛОВНЫЕ ОБОЗНАЧЕНИЯ توضيحات	
PROMULGATED SEARCH AREA (THE UNITED STATES) ZONE DE RECHERCHES DÉCLARÉE (ÉTATS-UNIS) ZONA DE BÚSQUEDA PROMULGADA (ESTADOS UNIDOS) ОБЪЯВЛЕННЫЙ РАЙОН ПОИСКА (СОЕДИНЕННЫЕ ШТАТЫ АМЕРИКИ) منطقة بحث معلنة (الولايات المتحدة)	
AREA SEARCHED BY U.S. TASK FORCE 71 ZONE DE RECHERCHES PAR LA MISSION 71 DES ÉTATS-UNIS ZONA EXPLORADA POR LA FUERZA DE TAREAS DE LOS ESTADOS UNIDOS 71 РАЙОН ПРОВЕДЕНИЯ ПОИСКОВЫХ ОПЕРАЦИЙ ОПЕРАТИВНОЙ ГРУППОЙ 71 США منطقة جرى البحث فيها بواسطة القوة الأمريكية رقم ٧١	
USSR SEARCH AREA ZONE DE RECHERCHES DE L'URSS ZONA DE BÚSQUEDA USSR РАЙОН ПОИСКА (СССР) منطقة البحث الذى أجراه الاتحاد السوفيتى	
WRECKAGE ÉPAVE RESTOS ОБЛОМКИ حطام	+

Boeing 747 and some had colours or text associated with Korean Air Lines. Some of the wreckage had an odour of kerosene but none showed evidence of fire.

1.12 **Wreckage and impact information**

1.12.1 The location of the main wreckage was at position 46°33'32"N, 141°19'41"E, 17 NM due north of Moneron Island off the southwest coast of Sakhalin Island. The wreckage area was on an underwater ridge with an average depth of water of 200 m. The wreckage area was in international waters.

1.12.2 About a month after the accident USSR civilian divers operating out of a drilling ship, the Mikael Mirchink, began inspecting the wreckage primarily to find and recover the flight recorders. These divers had been called to the area after USSR naval divers had located the wreckage on the sea bottom. The ICAO investigation team interviewed the supervisor of this diving team and two of the divers on 12 February 1993.

1.12.3 According to the divers, the sea bottom was sandy and level with a few coral outcrops. The water depth was 174 metres. The visibility was 8 to 10 metres which prevented the divers from getting a general view of the wreckage. The main parts of the wreckage were located in an area approximately 60 metres by 160 metres. The general impression of the divers was that the wreckage was severely fragmented and no large pieces of the aircraft were left intact. Due to the limited visibility and the severe break-up of the aircraft no inventory was made of the main structural parts in the area.

1.12.4 The largest piece recovered was a four-metre long part of the fin. Some larger pieces (about one metre square) of fuselage skin were also recovered to help identify the aircraft. The divers reported seeing one or two engines and a few wheels. In addition to the scraps of metal, they observed personal effects, such as clothing, documents and wallets. Although some evidence of human remains was noticed by the divers, they found no bodies. After about a week of diving, the divers found and recovered the protected container from the DFDR. Three days later the protected container from the CVR was recovered. These containers were found loose on the sea bottom, not attached to any aircraft structure. The diving operations were gradually reduced and ended in early November 1983.

1.12.5 On 9 February 1993 representatives of Japan made available a video produced in 1992 by a television station located in Hiroshima, Japan. The video contained interviews with the USSR SU-15 fighter pilot and a short footage of the wreckage under water taken from a small submersible craft.

1.12.6 On 11 February 1993 representatives of the Russian Federation made available a video taken in 1983 of the wreckage under water and ninety-three photographs from 1983 of wreckage pieces and personal belongings. Some of the photographs had been taken of the wreckage under water and others displayed items recovered.

1.12.7 Due to the limited visibility under water no general view of wreckage was available from the photographs or the videos. A number of details were displayed which identified the aircraft as a Boeing 747, and other details linked the aircraft to Korean Air Lines.

1.13 Korean Air Lines flight operations

1.13.1 Company Operations Manual

1.13.1.1 The Company Operations Manual was approved by the Korean Civil Aviation Bureau. It was divided into three volumes: Volume I - Policies and Procedures, Volume II - KAL Route Manual, and Volume III - Operations Manual.

1.13.1.2 Volume I contained the following paragraphs of relevance to the investigation:

- Paragraph 2.5 - Navigation. This paragraph contained instructions on the use of self-contained navigational equipment and procedures in the case of INS becoming inoperative during flight. Training and check procedures were also included.

- Paragraph 4.11 - Flight crew duty and rest periods.

- Paragraph 7.1 to 7.6 - Communication including radio monitoring during flight, and distress and emergency communication.

1.13.1.3 As a supplement to Volume I, Flight Operations Bulletins had been issued. Bulletin No. 55 - North Pacific Routes Operations Procedures was based on the North Pacific Airspace Operations Manual published in March 1983 by the FAA in the United States. This was issued in the Korean language on 14 June 1983 to provide guidance for flight crews on the NOPAC composite route system.

1.13.1.4 The Operations Engineering Bulletin Number 81-4 of 29 June 1981 contained information on the airborne weather radar operating procedures based on the manufacturer's handbooks.

1.13.1.5 Volume II was produced by Jeppesen. It was divided into seven volumes covering specific geographical areas. Each flight crew received two copies of the relevant manual from the KAL dispatch office on departure from Seoul. The "Emergency" chapter included information on the ICAO interception procedures.

1.13.1.6 Volume III contained an Operations Manual for each type of aircraft used by KAL, e.g. B747 Operations Manual, Volume I (Systems) and Volume II (Performance, Mass and Balance, Loading). These manuals were based on the manufacturers' manuals.

1.13.2 Pre-flight preparation

1.13.2.1 The operational flight plan for KE 007 was computer-generated by a contracting company in Los Angeles and forwarded to the KAL dispatch office in Anchorage. The plan was based on an average wind component of -26 kt, an outside air temperature of -45°C and a cruise Mach number of 0.84 at an initial cruising level of FL 310.

1.13.2.2 A KAL flight release sheet was prepared by the flight operations officer on duty. It contained the following information:

a) general data: flight number (KE 007) aircraft registration (HL7442), estimated time of departure and estimated time of arrival;

b) mass and balance calculation;

c) take-off data;

d) fuel calculations including reserve fuel for diversion to alternate airport (Kimhae - 40 minutes), holding (30 minutes) and contingencies (10 per cent);

e) weather information; and

f) copies of NOTAMs regarding airport maintenance work at Seoul/Kimpo International Airport and the closing of runway 09/27 at Osan Airport. The pilot-in-command was informed that the Anchorage VOR/DME was out of service.

1.13.2.3 The flight release sheet was signed by the pilot-in-command. He also approved the mass and balance calculations which showed that the mass and balance of the aircraft were within limits for take-off and for the landing in Seoul.

1.13.3 **Use of headset/speaker**

1.13.3.1 The use of headsets during climb and approach was a company requirement. At cruising altitude, the use of either headsets or speakers was at the discretion of the pilot-in-command.

1.13.4 **Aircraft lighting**

1.13.4.1 Aircraft HL7442 was not equipped with white strobe anti-collision lights. The red anti-collision rotating beacons and the navigation lights were on when KE 007 left Anchorage. The KAL logo light on the vertical fin was normally illuminated but its use was at the discretion of the pilot-in-command. It was common practice for many airlines, including KAL, to fly at night with window shades lowered.

1.13.4.2 The lighting of the flight deck during cruise (dimmed or fully illuminated) was at the discretion of the pilot-in-command.

1.13.5 **Radio communication**

1.13.5.1 Company procedures required the distress frequency 121.5 MHz to be monitored throughout flight. The procedure with the VHF radios was for 121.5 MHz to be set on VHF 1, leaving VHF 2 to be used for ATC while VHF 3 was on standby and was normally used for company communications and ATIS. The DFDR radio transmission keying parameters showed that KE 007 used VHF 2 for communications with ATC and VHF 3 for company communications including communications with KE 015. As VHF 1 was to be tuned to 121.5 MHz no transmissions were

expected. However, the DFDR record indicated two one- to three-second transmissions with an interval of ten seconds at 15:59 hours. It could not be established on which frequency, to whom, or why these two transmissions were made. However, between 15:58:52 and 16:00:09 there were eight other transmissions by KE 007 on VHF 3. This activity was followed, at 16:00:39, by KE 015 calling Anchorage ARTCC to relay KE 007's position report for passing NEEVA.

1.13.5.2 VHF 2 was reported to be "noisy" after the previous sector, New York to Anchorage. The set was ground tested at Anchorage and found to be serviceable. The DFDR radio transmission keying parameters showed that the VHF 2 set was used by KE 007 in its radio communications with Anchorage CD/TWR, APP and ARTCC between 12:50 hours and 14:35 hours, indicating that the VHF 2 set was functioning normally at least in this time period.

1.13.5.3 The HF transmissions with Tokyo Radio were identified as being spoken by the co-pilot. Since the pilot-in-command of KE 007 was not an instructor pilot, he was required by KAL procedures to fly the aircraft and the co-pilot was expected to carry out the radio communications.

1.13.6 **Flight crew training programme**

1.13.6.1 **INS training**

1.13.6.1.1 KAL trained its flight crews in the procedures for the use of the INS. The six hour ground course included practical training using a CDU mock-up and was followed by in-flight training in conjunction with route training on two flights of a distance exceeding 1 000 NM.

1.13.6.2 **Interception procedures**

1.13.6.2.1 KAL flight crews were taught the interception procedures including the visual signals to be used by intercepting and intercepted aircraft, as contained in ICAO Annex 2 and the KAL/Jeppesen Route Manual.

1.14 **Flight recorders**

1.14.1 **General**

1.14.1.1 Some DFDR and CVR information was recovered by the USSR in 1983. A copy of the CVR tape and the CVR and DFDR armoured containers were given to the Republic of Korea in late 1992. The original CVR and DFDR tapes were handed over to ICAO in Paris, France, on 8 January 1993 by representatives of the Russian Federation.

1.14.1.2 ICAO entered into an agreement with the Government of France which provided for ICAO to rely upon the technical resources of the Bureau Enquêtes-Accidents (BEA) in Paris for the read-out and processing of the flight recorders. The agreement stipulated that the French experts worked under the aegis of ICAO. Accordingly the recovery of information was made by BEA. The Centre d'Essais en Vol at Brétigny-sur-Orge assisted in the primary recovery of DFDR information.

1.14.1.3 A comprehensive assessment of the physical characteristics of the tapes and the information recorded was made to ensure that they contained authentic records from the CVR and the DFDR installed on KE 007.

1.14.2 **Cockpit voice recorder**

1.14.2.1 **CVR design and installation**

1.14.2.1.1 KE 007 was equipped with a Collins 642C-1 CVR, part number 522-4057-002 and serial number 1397. The CVR was designed to record four channels of information on a continuous loop of tape that was 0.25 inches wide and approximately 215 ft in length. The tape was driven at 1.33 inches/second by a synchronous motor that rotated at a speed dictated by the frequency of the aircraft's 400 Hz AC power supply. The CVR was required to retain a minimum of the last thirty minutes of recorded information.

1.14.2.1.2 The CVR had a light-weight outer case into which was slid a chassis containing the tape transport which was housed in an armoured and heat-insulated container. Forward and aft of the container were the associated connectors, power supply and electronic circuits. The armoured container was designed to protect the tape from exposure to fires and high speed impacts.

1.14.2.1.3 The CVR was installed adjacent to the DFDR in the Aft Equipment Centre located in the pressure cabin aft of the left rear passenger door and above the level of the top of the door.

1.14.2.1.4 The 400 Hz power supply to the CVR was fed from the circuit breaker panels near the Flight Engineer's station on the flight deck, in a raceway along the upper right side of the main passenger cabin to a point opposite the CVR and then across the top of the cabin to the CVR. The CVR signals were fed in a raceway along the upper left side of the fuselage.

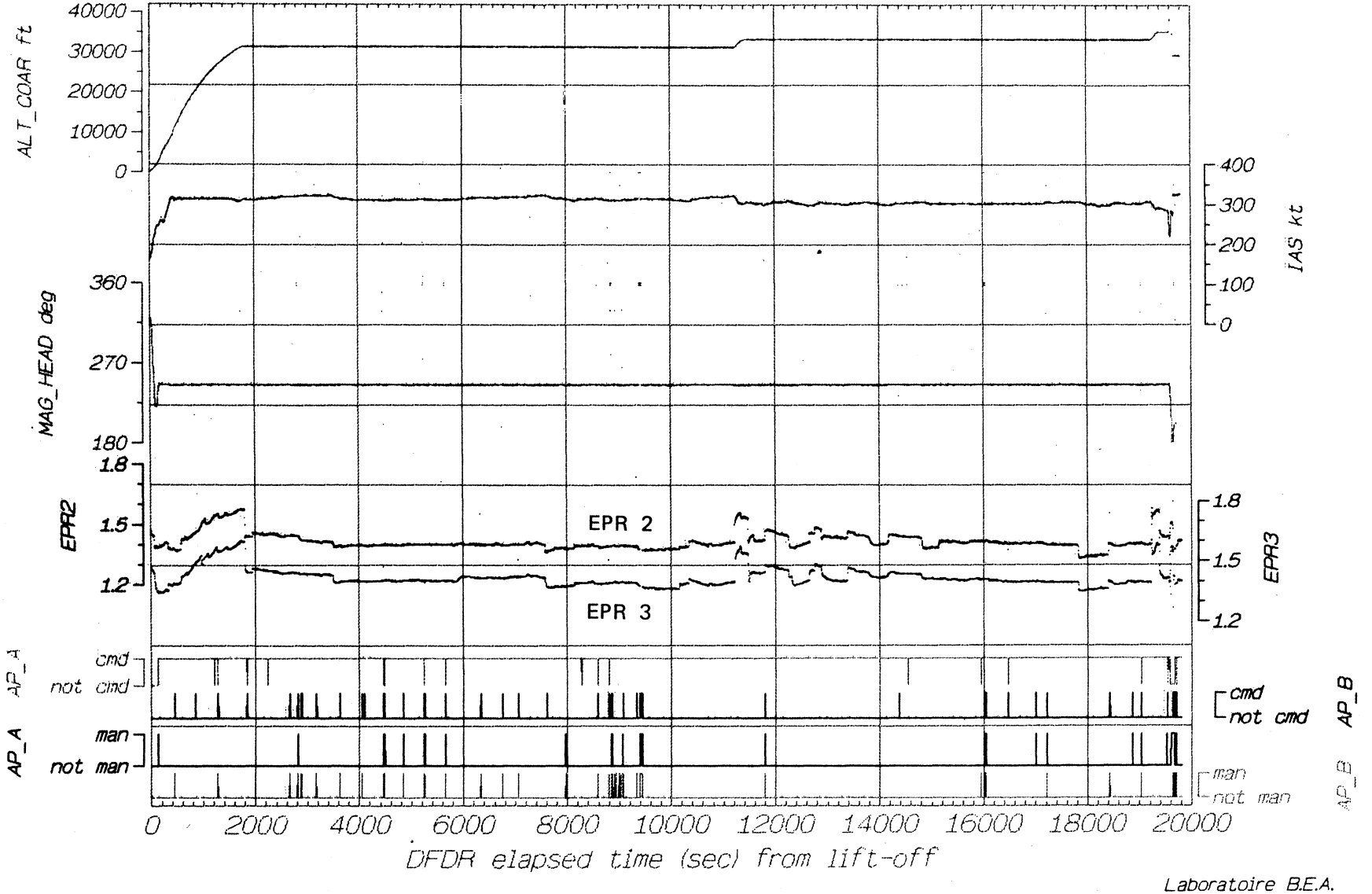
1.14.2.1.5 The information recorded on the individual crew member's audio channels depended on the selections each had made on his audio selector panel. This could have included any combination of incoming information from the three VHF and two HF radios together with intercom and public address messages. Audio through hand, boom or oxygen mask microphones of the crew member concerned were also recorded.

1.14.2.2 **Inspection of the CVR components**

1.14.2.2.1 Examination of the tape transport identified it as being from a Collins 642C-1 CVR. The unit had suffered structural and corrosion damage and components inside had been dismantled. The corrosion was similar to that seen on other recorders that had been immersed in sea water.

1.14.2.2.2 The armoured container had suffered a severe blow on the front side, which had deformed it inwards. Marks in one corner of the box that formed the inner layer of the armoured container were consistent with damage to the turntable and its metal cover which indicated that those items had become detached from their mountings. Also, the side of the container had been subjected to a large distributed force, such as a high speed water impact.

Chart 5. Flight KE 007 from Anchorage to Shoot-down
Graphique 5. Vol KE 007 - D'Anchorage au point d'attaque
Carta 5. El vuelo KE 007 desde Anchorage hasta el derribo
Карта 5. Полет KE 007 от Анкориджа до пункта, в котором воздушное судно было сбито
الخارطة (٥) : مسار طيران الطائرة KE 007 من انكوريدج حتى اسقاطها



Laboratoire B.E.A.

1.14.2.3 **Inspection of the CVR tape**

1.14.2.3.1. The full length of the tape was examined visually. Only one tape splice was found for which both ends of the tape had been cut precisely at a 45° angle. This was the original splice necessary to create the tape loop. The length of the tape was not measured though the duration of the recording was determined from the playback and indicated a length of approximately 224 ft as compared with 215 ft specified in the manual. Apart from increasing the duration of the recording, this additional length would not have affected the functioning of the CVR.

1.14.2.3.2 There were traces of mineral deposits, particularly along the edges of the tape, that were consistent with salt water immersion. Significant physical damage at the beginning of the tape matched that of the inside diameter of the CVR tape stack. The tape damage was consistent with that on the tape transport and its armoured container. A point mark and a line across the tape, 2.92 inches and 1.77 inches from the end of the tape, respectively, corresponded to the distance between the erase and record heads. The distance of these marks from the end of the tape and playback of the audio information, indicated that the tape loop was cut before the erase head when it was being removed from the container in the USSR in 1983. This was the normal procedure to ensure that the cut was made a short distance into the oldest information.

1.14.2.4 **CVR tape playback**

1.14.2.4.1 The CVR tape was played back at the BEA cockpit voice recorder laboratory. The frequencies of the power supply interference on one of the channels were monitored by spectral analysis and the tape speed synchronized before the copy tapes were started in the record mode. A working copy was used to make the written transcription of communications and initial noise analyses.

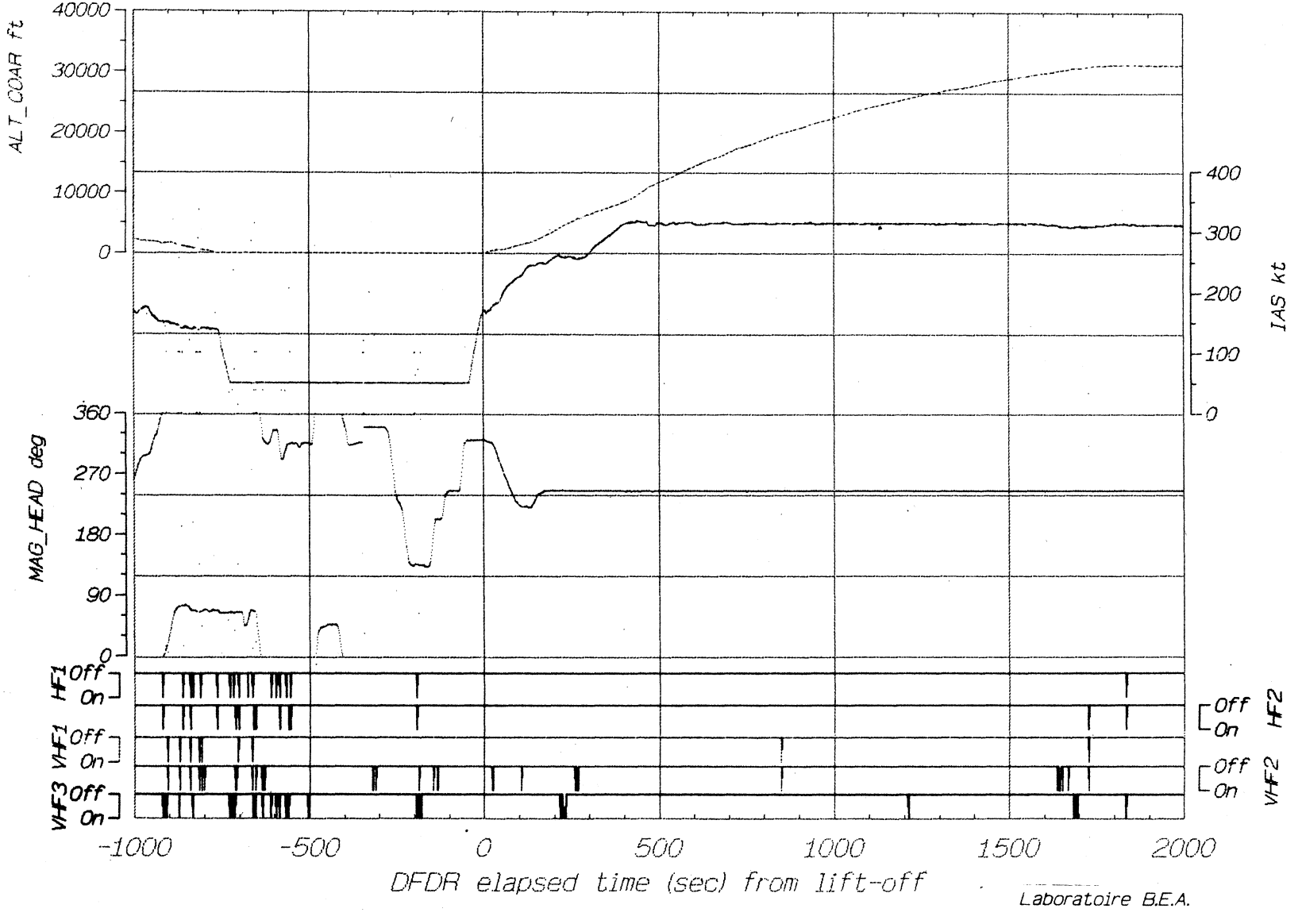
1.14.2.4.2 The task of producing a transcript of the CVR involved translation from Korean to English. In addition to Korean Air personnel, the assistance of a Korean translator was arranged by the French authorities. The elapsed time of the copy tape to the nearest second was displayed and noted for each audio record.

1.14.2.4.3 For the first nine minutes, voice recordings were confined to casual conversation on the flight deck and public address announcements. Apart from the voice recordings, a number of background noises were examined. Intermittently through the first seven minutes forty-five seconds of recordings some unusual sounds occurred which were identified as a keyed continuous wave semi-automatic Morse code tone. Due to the poor quality of the recorded signal and the limited activity no read-out or user identification was possible.

1.14.2.4.4 From 18:15:42 to 18:20:10 hours radio telegraphy signals of varying amplitudes with a carrier frequency of 500 Hz were evident. Analysis confirmed that the signal was a keyed continuous wave semi-automatic Morse code sequence of numbers transmitted at forty words per minute. A transcript was made but no user identification was possible. The reception of such signals on HF by aircraft was a common occurrence.

1.14.2.4.5 At 18:22:56 hours KE 007 reported reaching FL 350. Just over three minutes later, at 18:26:02 hours, a rapid series of loud noises was heard on the cockpit area microphone (CAM) track. This was the moment of missile detonation.

Chart 6. Flight KE 007 Take-off at Anchorage
Graphique 6. Vol KE 007 - Dëcollage d'Anchorage
Carta 6. Despegue del vuelo KE 007 en Anchorage
Карта 6. Взлет рейса KE 007 в Анкоридже
الخارطة (٦) : اقلاع الطائرة KE 007 من انكوريدج



1.14.2.5 **Validation of the CVR recordings**

1.14.2.5.1 Using the garnet film technique developed by Schlumberger Industries, it was confirmed that the track widths and spacings were compatible with those of the record head used in the Collins' CVR.

1.14.2.5.2 During playback of a copy tape, each crew audio channel was monitored throughout the duration of the recording to ensure that no changes in the frequency of the power supply interference occurred.

1.14.2.5.3 The HF radio communications were correlated with those recorded on the Tokyo ATC tape and their relative timings checked with the radio transmission keying parameters recorded on the DFDR tape. The timings of the VHF radio communications, the change of flight level, and the autopilot disconnect warnings after the attack, were consistent with the DFDR record.

1.14.3 **Digital flight data recorder**

1.14.3.1 **Recording system design**

1.14.3.1.1 KE 007 was equipped with a Teledyne flight data acquisition unit (FDAU). Electrical signals of various types from the numerous sources monitored were fed to this unit where they were processed to a common 0 to 5 volt DC format and then multiplexed into an ARINC 573 serial digital signal that consisted of a string of binary zeros and ones in the form of square waves.

1.14.3.1.2. The signal processing depended on the type of signal input. One group of parameters, which included the magnetic heading, was measured by synchros from which outputs were fed to the FDAU. In the Teledyne FDAU, the conversion from recorded digital numbers to synchro angles was not a linear relationship but a trigonometric function which deviated from linear values by up to $\pm 4°$.

1.14.3.1.3 In the ARINC 573 format, parameters were monitored in a basic four-second cycle known as a frame. This was divided into subframes 1 to 4, each of which spanned one second and contained sixty-four twelve-bit words. The first word in each subframe was a synchronization word that was unique to that subframe number.

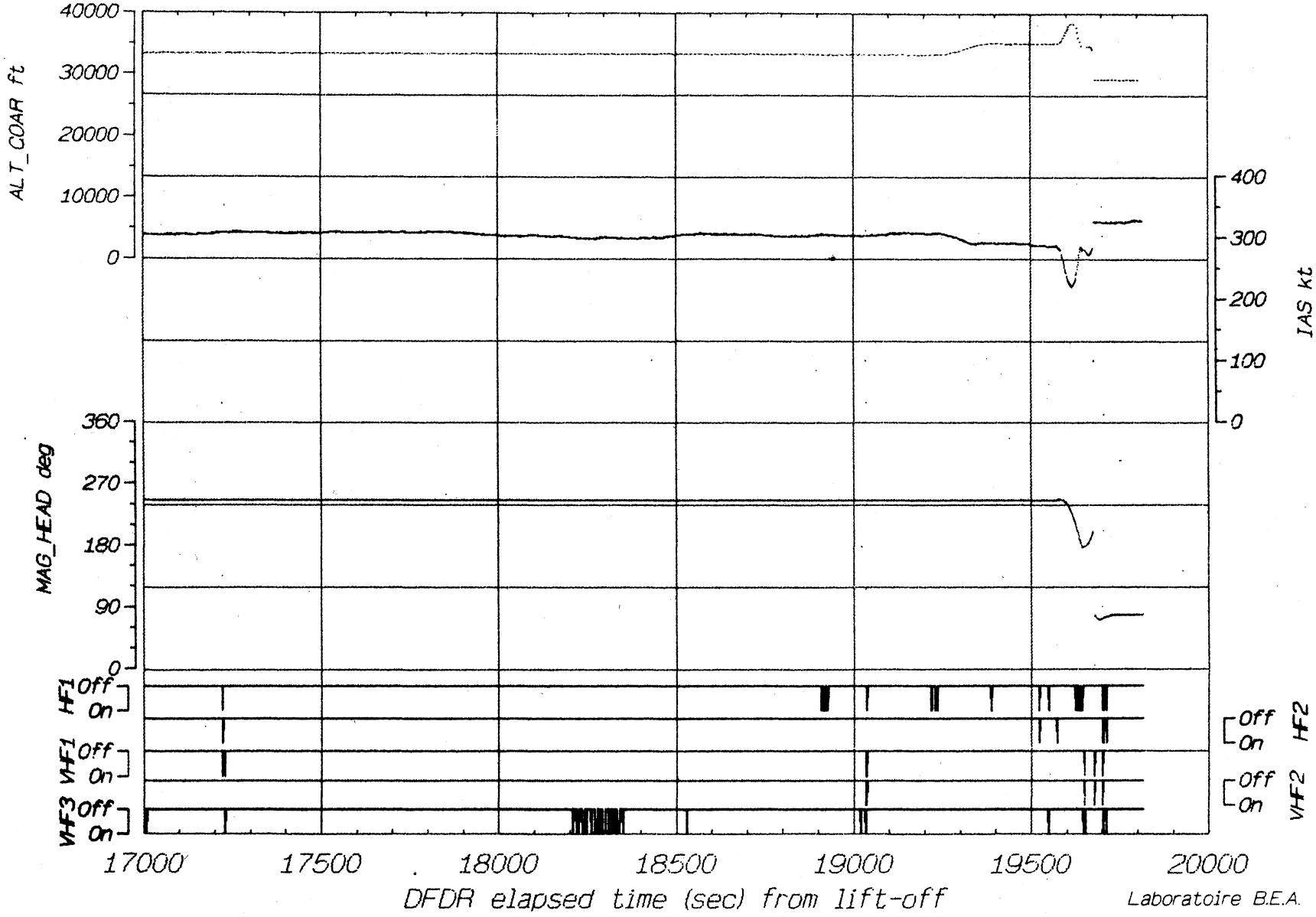
1.14.3.1.4 There was a fixed grouping of words in the frame in which certain words contained measurements with a twelve-bit resolution whilst others had a ten-bit resolution with two bits reserved for bistate signals. Some words were also grouped together so that a parameter could be sampled at rates varying from once per four seconds to four times per second.

1.14.3.2 **DFDR description**

1.14.3.2.1 KE 007 was equipped with a Sundstrand 573A DFDR, part number 981-60009-010 and serial number 3069. The DFDR recorded the ARINC 573 serial digital signal that was generated in the FDAU sequentially on the four tracks of a reversing 0.25 inch Vicalloy metal tape at a tape speed of 0.43 inches/second with a packing density of 1 786 bits/inch. The tape had a length of approximately 800 ft which enabled it to retain the previous twenty-five hours of information.

Chart 7. Flight KE 007 Last 45 Minutes
Graphique 7. Vol KE 007 - Quarante-cinq dernières minutes
Carta 7. Últimos 45 minutos del vuelo KE 007
Карта 7. Последние 45 минут полета KE 007

الخارطة (٧) : الدقائق الـ ٤٥ الأخيرة فى رحلة الطائرة KE 007



1.14.3.2.2 During recording, the old data was erased immediately prior to the recording of new data. The erase feature was incorporated on the Sundstrand DFDR because of the magnetic characteristics of the metal tape.

1.14.3.2.3 As with the CVR, the tape transport was installed in an armoured and heat insulated container mounted on a chassis that was slid into a light outer box. Power supplies and associated electronics were mounted on the chassis ahead of and behind the container. Again, only the tape in its container was expected to survive a major accident.

1.14.3.2.4 The FDAU was installed in the Main Equipment Centre immediately ahead of the forward cargo compartment. The DFDR was installed in the Aft Equipment Centre adjacent to the CVR. Cables carrying both the serial digital signal and the power supply to the DFDR were fed along the fuselage on the left side above the main passenger cabin in the same raceway as the signal inputs to the CVR.

1.14.3.3 **DFDR parameter list**

1.14.3.3.1 The DFDR recorded the following parameters:

Acceleration (lateral, longitudinal and vertical), altitude (coarse and fine), calibrated airspeed, control column position in pitch, control wheel position in roll, engine pressure ratio for engines No. 2 and 3, flap configuration, VHF and HF keying for HF 1 and 2 and VHF 1, 2 and 3; magnetic heading, pitch and roll attitude; rudder pedal position, horizontal stabilizer position, thrust reverser state for each engine, radio altimeter; autopilot (in and out of Manual, and in and out of Command), and marker beacon (outer and middle).

1.14.3.3.2 A parameter list provided by representatives of the Republic of Korea contained also the following parameters: UTC, VOR/ILS localizer and glide slope, engine pressure ratio for engines No. 1 and 4, and GPWS. However, these parameters showed no activation throughout the duration of the recordings.

1.14.3.3.3 As UTC was not recorded, reliance had to be placed on elapsed time based on the data clocking rate. Although this rate was based on a crystal oscillator and was therefore inherently accurate, difficulties were encountered when there were losses of data synchronization.

1.14.3.4 **Inspection of the DFDR components**

1.14.3.4.1 Examination of the tape transport confirmed that it was from a Sundstrand 573A DFDR. A handwritten "S/N 3069" on the plate that covered the tape reels and also on one of the posts supporting this plate, was the same as the serial number of the DFDR installed on KE 007.

1.14.3.4.2 The armoured container had a crack, approximately 1.5 inches in length, emanating from the lower corner of the top cover nearest to the front face of the recorder. The four screws which attached the cover to the container had suffered excessive shear loads along the plane of the joint between the two parts. The lack of evidence of any concentrated mechanical loads being applied to the exterior of the container indicated that the damage might have resulted from a high speed water impact.

1.14.3.4.3 The tape transport was relatively intact, although the top cover plate of the reels had been detached and the upper reel removed. In addition, a number of the wires to the tape heads had been disconnected. There was evidence of salt water corrosion.

1.14.3.5 **Inspection of the DFDR tape**

1.14.3.5.1 The DFDR tape was handed over to ICAO wound on a reel of the type missing from the tape transport.

1.14.3.5.2 On the first 11.8 inches of the Vicalloy tape, the side that would have been adjacent to the hub of the reel showed a white deposit that appeared to be the result of salt water corrosion. The length of tape affected by the deposit was consistent with the length that would have been in contact with the light alloy hub.

1.14.3.5.3 A short distance along the tape there were three holes, each 2.0 inches apart, used to trigger tape reversal. The garnet film technique was used to determine on which side of the tape the recordings had been made. The magnetic patterns were noticeably sharper on the inside face of the tape. This was consistent with the configuration of the tape in the DFDR. The garnet film technique was also used to determine the width and spacing of the four tracks of data recorded on the tape. These were found to agree with the nominal values to within an acceptable degree of tolerance.

1.14.3.5.4 The full length of the tape was subject to examination. Spliced joints were found at approximately 108, 440, 442 and 463 ft from the beginning of the tape. The middle two were spaced at a distance corresponding to the length of the tape between the two reels and the last data was recorded between these two joints. It was not unusual for the tape to break as a result of high speed impacts, near where it left the reels.

1.14.3.6 **DFDR tape playback**

1.14.3.6.1 To provide maximum capability to validate the information from the last flight, all of the data recorded during the previous twenty-five hours was studied.

1.14.3.6.2 At the time of missile detonation, a brief loss in synchronization lasting 1.4 seconds occurred at the first indication of abnormal measurements. Further losses occurred over a 14 second period about 37 seconds later. For each of these losses, bit dumps of the serial digital data were obtained and edited manually to recover the majority of the lost measurements. These were then incorporated into the engineering unit data files that were used for analysis and plotting of graphs.

1.14.3.7 **Flights recorded on the DFDR**

1.14.3.7.1 The oldest recorded data commenced during an easterly flight 6.5 hours prior to a landing at Anchorage on a flight which originated in Seoul as the first leg of flight KE 008 on 30 August 1983. This was followed by the second leg of this flight from Anchorage to JFK Airport in New York on the same date. The next data recorded was for the first leg of flight KE 007 from JFK to Anchorage on 31 August 1983, and the last data was for the flight from Anchorage to the end of recording, approximately 5.5 hours after take-off. The record of these flights constituted approximately 27 hours of recording.

1.14.3.7.2 The basic parameters of coarse altitude, calibrated airspeed and magnetic heading for these four flights recorded on the DFDR were consistent with the known details of the flights.

1.14.3.8 **Validation of the data recovered from the DFDR**

1.14.3.8.1 The DFDR record showed that the magnetic heading was constant throughout most of the last flight. The recorded headings were plotted on a sensitive scale on which the resolution of the measurements was clearly evident. This showed that the recorded headings were predominantly 245.4° with variations from 244.9° to 246.0°. The validity of the heading indication was confirmed by the record of the associated roll attitudes of the aircraft. The variations in roll attitude were minimal and were themselves supported by the lack of any significant control wheel movement.

1.14.3.8.2 The magnetic heading was studied for validation at appropriate stages in the recording of the previous flights. Also, the recorded magnetic headings during take-offs and landings were compared with runway directions and were found to be within acceptable tolerances.

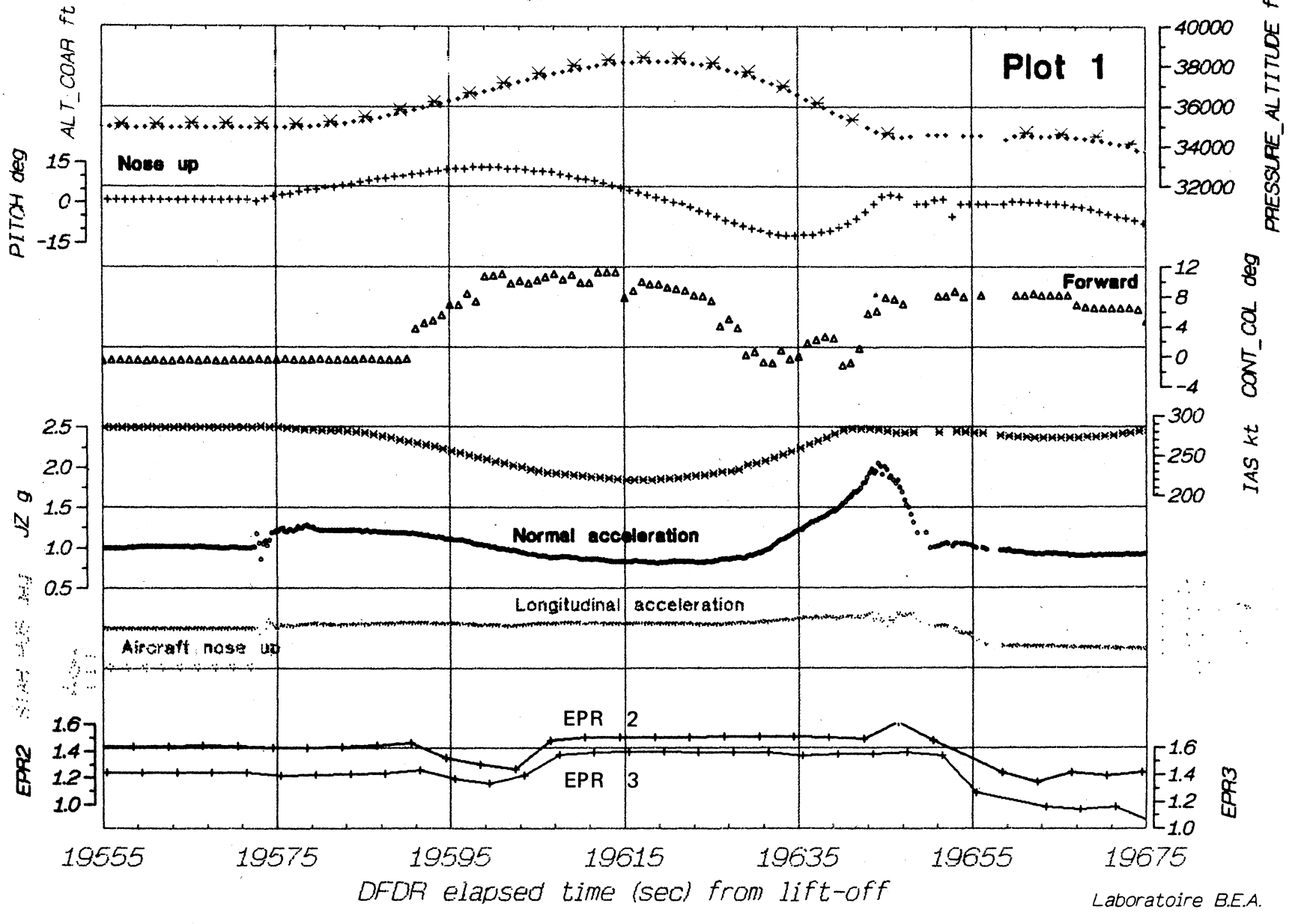
1.14.3.9 **The take-off and cruise phases**

1.14.3.9.1 The DFDR record confirmed that KE 007 turned on to runway 32 at Anchorage and immediately commenced its take-off run. About 23 seconds after lift-off, a turn to the left was initiated onto a magnetic heading of about 220° which was reached approximately 110 seconds after lift-off. Autopilot A was selected to Command mode 130 seconds after lift-off. The aircraft then executed a turn with up to 17° of bank angle on to the magnetic heading of approximately 245° which it reached about 180 seconds after lift-off and then maintained until the attack. Autopilot A remained in Command mode until the attack phase.

1.14.3.9.2 The aircraft reached FL 310 thirty minutes after take-off, and remained at that level for the next two hours thirty-seven minutes. It then climbed to FL 330, maintaining that level for two hours ten minutes and then ascended to FL 350. The attack occurred only three minutes after reaching that level. These changes in flight level matched the ATC clearances.

1.14.3.9.3 A list of 191 radio transmissions from KE 007 recorded on the DFDR during the last flight was compiled. The time and duration of each transmission were noted together with which radio was used. The DFDR information was studied in detail to eliminate any false indications of transmitter keying due to synchronization losses in the recovered serial digital data.

Chart 8. Flight KE 007 Attack Phase (Plot 1)
Graphique 8. Vol KE 007 - Phase d'attaque (graphe 1)
Carta 8. Fase de ataque al vuelo KE 007 (Trazado 1)
Карта 8. Этап атаки рейса KE 007 (график 1)
(الرسم ١) KE 007 مرحلة الهجوم للطائرة : الخارطة (٨)



1.14.3.10 **The attack phase**

1.14.3.10.1 The first abnormality associated with the missile attack was a momentary reduction in the background noise level on the Flight Engineer's audio channel of the CVR. Its duration was of the order of 0.02 seconds. The first of several bursts of noise was detected by the CAM 0.22 seconds later. At the same time, a loss of one zero bit in the recovered serial digital signal from the DFDR occurred. This most likely resulted from a momentary shock to the DFDR that caused a small disturbance in the tape motion.

1.14.3.10.2 Almost immediately, a vertical acceleration of 1.17 g was found as compared with 1.00 g recorded 0.25 seconds earlier. Within a further 0.03 seconds, a reasonable value of lateral acceleration was recorded as compared with obviously incorrect values which had been recorded up to 0.25 seconds earlier. Both these observations suggested that the accelerometer was subjected to a sudden vibration.

1.14.3.10.3 A maximum deflection of the rudder pedal was recorded after the vertical acceleration sample of 1.17 g, and subsequent values stayed constant at the maximum. A near neutral value had been recorded before the attack commenced. Based on a performance analysis of the aircraft's manoeuvres during the attack phase, this was caused by a failure of one of the two cables or their attachments that transmit the rudder pedal motion to the hydraulic actuators at the rear of the aircraft. In this event, the feel centring mechanism would have held the rudder in neutral.

1.14.3.10.4 The first sample of horizontal stabilizer angle recorded after the attack was well outside the maximum range of movement. The previous value had been normal. This change indicated either a failure associated with the transducer installation or an electrical fault in its output.

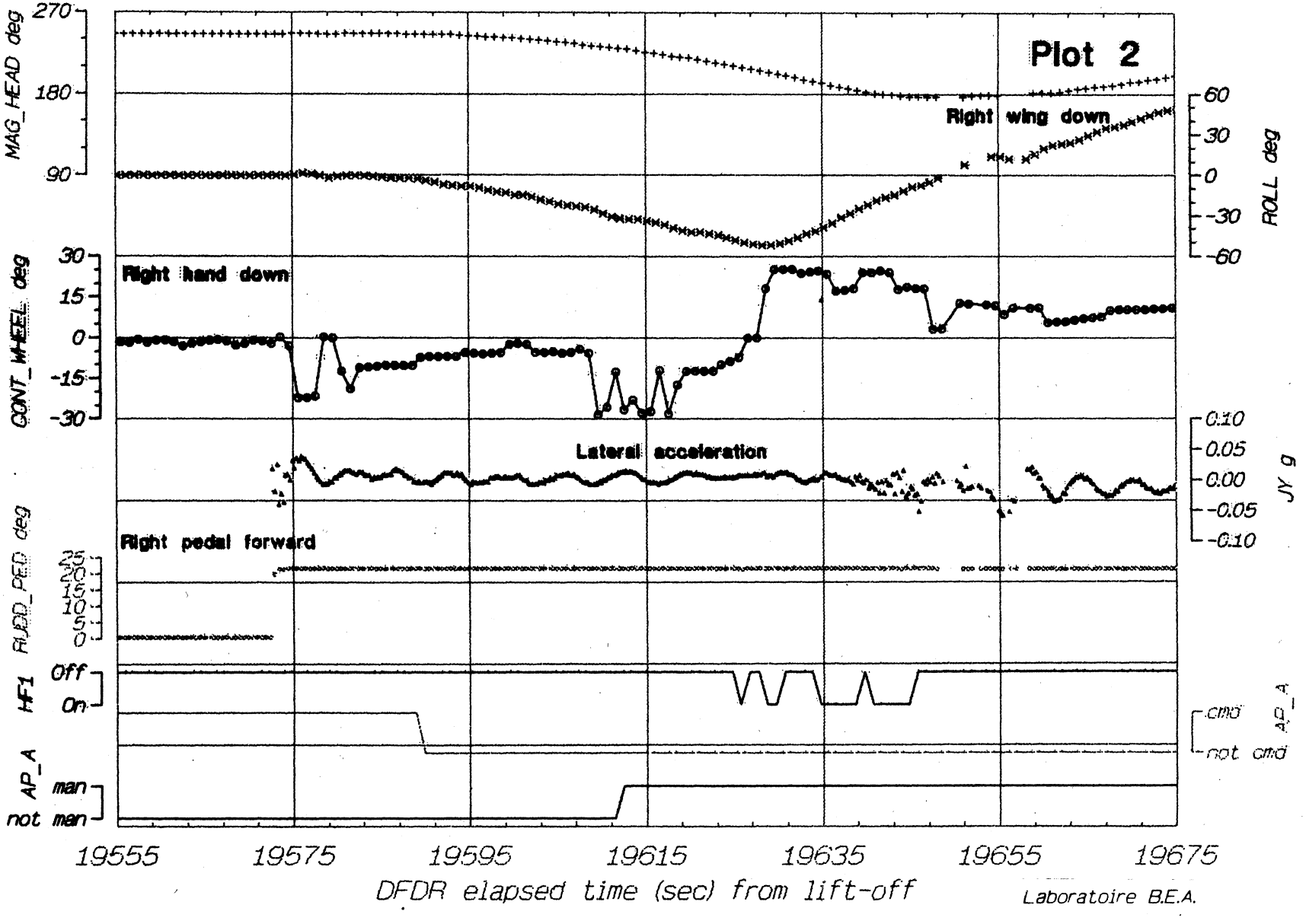
1.14.3.10.5 The bursts of noise on the CAM recording lasted over a period of 0.87 seconds and the background noise level returned to its pre-attack level 0.23 seconds later. The CVR noises and the initial events recorded on the DFDR were synchronized to within one second by correlation of autopilot disconnect signals with the associated audio warnings, and HF 1 transmit signals with the audio messages.

1.14.3.10.6 Initially the aircraft pitched up and the vertical acceleration increased to approximately 1.2 g over 3 to 5 seconds. There was no indication of control column movement. During this period, the aircraft rolled slightly right wing down. Autopilot A remained in the Command mode.

1.14.3.10.7 Eleven seconds after the CAM recorded the first sounds of the attack, the sound of the cabin altitude warning was heard. The vertical acceleration remained at approximately 1.2 g for about 17 seconds with the aircraft entering a climb at 7 000 ft/min. At this time, the autopilot tripped or was selected to OFF and the sound of the autopilot disconnect warning occurred. The control column then moved forward significantly.

1.14.3.10.8 From 17 to 40 seconds after the attack the aircraft continued to climb, though at a gradually reducing rate, and the vertical acceleration reduced through the 1 g level to 0.82 g. At the same time there was a reduction in the engine power settings. The aircraft also started to roll left wing down. At that point, a crew member reported that the speed brakes were coming out. Neither the vertical nor the longitudinal accelerations showed any evidence that this actually occurred. The indications of speed brake application available to the crew were the spoiler lever position and an amber master caution warning light.

Chart 9. Flight KE 007 Attack Phase (Plot 2)
Graphique 9. Vol KE 007 - Phase d'attaque (graphe 2)
Carta 9. Fase de ataque al vuelo KE 007 (Trazado 2)
Карта 9. Этап атаки рейса KE 007 (график 2)
الخارطة (٩) : مرحلة الهجوم للطائرة KE 007 (الرسم ٢)



1.14.3.10.9 When the roll angle reached about 23°, larger erratic control wheel movements were recorded up to almost 30° left hand down, but there was no noticeable increase in the rate of roll to the left. The DFDR then indicated that autopilot A was selected to the Manual mode in which it remained for the rest of the recording. The DFDR may have recorded the position of the selector only. The selection was accompanied by the sound of a second autopilot disconnect warning.

1.14.3.10.10 The aircraft reached a maximum altitude of 38 250 ft with a reduction in calibrated airspeed from the initial 286 kt to 220 kt. As the aircraft started to descend, the control column first slowly and then more rapidly returned towards the neutral position; the vertical acceleration then increased significantly. For a short period, the rate of descent increased to over 12 000 ft/min and the speed increased to 284 kt. Simultaneously with the more rapid movements of the control column to neutral, the control wheel moved to 25° right hand down, the roll attitude reached 52° left wing down and then decreased.

1.14.3.10.11 During this period, KE 007 contacted Tokyo Radio and transmitted "rapid compressions" and "descend to one zero thousand." Accentuated breathing during the transmission indicated that an oxygen mask was being worn.

1.14.3.10.12 The vertical acceleration increased to just over 2.0 g, at which level it started to fluctuate. With a forward movement of the control column, the aircraft recovered to level flight and rolled right wing down.

1.14.3.10.13 The recordings ceased simultaneously on both the DFDR and the CVR 104 seconds after the attack as the aircraft rolled through 49° right wing down on a magnetic heading of 200° at an altitude of 33 850 ft with a speed of 282 kt CAS and a rate of descent of about 5 000 ft/min.

1.15 Communications recordings

1.15.1 Anchorage ATC recordings

1.15.1.1 The representatives of the United States reported that the original Anchorage ATC tapes were no longer available, but provided certified authentic copy tapes of the recordings as follows: Anchorage CD/TWR/APP (118.3 MHz) between 12:45 and 13:10 hours, Anchorage ARTCC Sector RD 5/6 (125.7 MHz) between 12:59 and 13:39 hours, Anchorage ARTCC Sector D 2/3 (125.2 MHz) between 13:00 and 14:13 hours, Anchorage ARTCC Sector D 10/11 (127.8 MHz and 128.2 MHz) between 13:45 and 17:47 hours, and Anchorage IFSS (HF) between 14:44 and 17:22 hours.

1.15.1.2 The Anchorage CD/TWR/APP, ARTCC and IFSS communications were recorded by separate recording equipment in Anchorage and minor adjustments were made to the recorded times of transmissions to achieve synchronization.

1.15.1.3 The representatives of the United States also made available a copy tape that contained a segment of the Anchorage ARTCC recording at 14:34 hours. This segment of the tape contained nearly inaudible and unintelligible words that had been alleged in 1985 to be the phrase "persons should warn them". This segment had been analyzed by the laboratory of the Federal Bureau of Investigation (FBI) of the United States in 1985 and a copy of the report was made available. The FBI report concluded that "an aural examination of the designated portion of channel 4 ... revealed that no decision can be made

as to the words spoken, due to the very low recording level." The report also concluded that simultaneous crosstalk from channel 3 to channel 4 occurred ten seconds later.

1.15.1.4 The segment of the tape in question was not recorded during or as a radio transmission. The comment could have been recorded as a result of crosstalk from a landline that was recorded at the same time on a different audio channel in Anchorage ARTCC. However, because the original Anchorage ARTCC tape was no longer available, it was not possible to listen to the other nineteen channels in this specific time period to determine if an intelligible recording of this comment existed on another channel.

1.15.1.5 It was concluded that it was not possible to determine what was said. At that particular time, 14:34 hours, KE 007 tried to establish radio communication with Anchorage ARTCC to report passing NABIE at 14:32 hours. The report was relayed by KE 015 at 14:35 hours. At 14:34 hours KE 007 was about to penetrate the Alaskan Air Command buffer zone in the vicinity of Saint Matthews Island.

1.15.2 **Tokyo ATC tape**

1.15.2.1 The representatives of Japan made available the Tokyo ATC tape from 31 August 1983. The Tokyo ATC tape confirmed the radio communications between KE 007 and Tokyo Radio, and to a large extent also the radio communications between KE 007 and Anchorage Radio, because Tokyo and Anchorage Radio operated on the same HF frequencies.

1.15.2.2 The Tokyo ATC tape contained a time signal which was used as a time reference. The radio communications with Anchorage IFSS, Anchorage ARTCC, Anchorage CD/TWR/APP, and the communications at the Soviet Air Defence command centres as well as the CVR and the DFDR, were adjusted to UTC using Tokyo time.

1.15.2.3 During the transcription of the Tokyo working HF channel for the North Pacific (channel 3) twenty-two silent periods were noted between 15:59 and 18:47 hours. The silent periods varied in length: eight were less than a minute and five were over four minutes. In addition, between 18:35:25 and 18:40:10 hours, and between 18:59:09 and about 19:11:30 hours, all channels including the time signal channel were silent.

1.15.2.4 The representatives of Japan provided the following explanations on 29 April 1993:

> "1. Since the channel 3 was the 'NP [North Pacific] WORKING' channel, the channel 3 will automatically be 'silent' when an operator changes the operating mode from 'WORKING' to 'GUARD'.
>
> 2. It is impossible to trace the facts on the 'silence' of all channels from 18:35:25 to 18:40:10 and from 18:59:09 to 19:11:30 because almost 10 years has passed since the tragedy."

1.15.2.5 It appeared that the radio transmissions during the silent periods on channel 3 were recorded on either channel 4 (the guard HF frequencies for the North Pacific) or channel 11 (the Tokyo-Haneda local HF frequency). A copy tape of radio communications on the Tokyo ATC tape, which had

been released in 1985, was also obtained. The copy tape which did not contain silent periods and covered the time period from 17:07:40 to 18:35:40 hours, appeared to contain a mixture of channels 3 and 4.

1.15.2.6 The period between 18:59:09 and about 19:11:30 hours, in which all channels including the time signal channel were silent, was examined. The length of tape for this time period corresponded to about three minutes recording at normal speed. The recorder may have been stopped about thirty-two minutes after the last communications from KE 007 and rewound for checking. It had then been wound forward past the end of the recordings on the tape and restarted about twelve minutes later. This was normal procedure in circumstances involving search and rescue and aircraft accidents.

1.15.2.7 Regarding the period between 18:35:25 and 18:40:10 hours, in which all channels including the time signal channel were silent, the representatives of Japan provided the following additional explanation on 21 May 1993:

> "... the silent periods [between 18:35:25 and 18:35:40 hours, and between 18:39:41 and 18:40:10 hours, were] caused by the change of the operating mode from 'work' to 'guard'. During these periods the channel 4 contained the recordings corresponding to the time period of the clock signal channel. All channels including the clock signal channel were silent in the period between 18:35:40 and 18:39:41.
>
> The duration of the silent period of all channels was 4 minutes and 1 second and the length of tape for this time period corresponded to 3 minutes and 34 seconds.
>
> From these points, it is considered that the recorder may have been stopped about 8 minutes after the last unrecognizable communication from KE 007 and rewound for checking. It had then been wound forward past the end of the recordings on the tape and restarted about four minutes later. This was normal procedure for the aeronautical ground station operator in circumstances involving message which was difficult to recognize and further attempt to clarify with the aircraft involved had failed."

1.15.3 USSR Air Defence command centre recordings

1.15.3.1 The representatives of the Russian Federation made available two original tapes and transcripts containing air-ground communications between the USSR interceptor aircraft and their command centres, and ground-ground communications between the USSR Air Defence command centres. The audio quality on the two USSR command centre tapes was good and contained a Morse code time signal. These tapes matched the air to ground communications by the USSR interceptor pilots as monitored by Japanese and United States sources in 1983.

1.15.4 Time correlation of CVR, DFDR and radio communications

1.15.4.1 The CVR was time correlated to Tokyo time based on thirty-seven radio transmissions to or from Tokyo Radio between 18:08:57 and 18:27:21 hours. The CVR contained ten radio transmissions between KE 015 and Tokyo Radio from 18:08:57 to 18:14:15, seven radio transmissions between KE 007 and Tokyo Radio from 18:14:59 to 18:15:21, two radio transmissions between KE 015 and Tokyo Radio from 18:17:44 to 18:17:49, seven radio transmissions between KE 007 and Tokyo Radio from 18:20:02 to 18:23:00, five radio transmissions between Dynasty 312 and Tokyo Radio from

18:25:55 to 18:26:35, and six radio transmissions between KE 007 and Tokyo Radio from 18:26:55 to 18:27:21. Based on the times of these radio transmissions the beginning of the CVR elapsed time 00:00 was 17:54:10 and the end of the CVR recording at elapsed time 33:36 was 18:27:46.

1.15.4.2 The CVR and the DFDR data were correlated based on the radio transmission keying parameters, which also identified the radio used. There were fifteen radio transmissions on the CVR from KE 007 to KE 015 between 18:03:19 and 18:08:37 on VHF 3, and ten radio transmissions on the CVR from KE 007 to Tokyo Radio on HF 1 also registered by the DFDR.

1.15.4.3 The Anchorage IFSS recordings were adjusted to Tokyo time based on twenty-eight radio transmissions recorded on both the IFSS tape and the Tokyo ATC tape, as well as on twelve radio transmissions from KE 007 and registered by the DFDR. The Anchorage ARTCC recordings were adjusted to Tokyo time based on seven radio transmissions from KE 007 and registered by the DFDR. Equally, the Anchorage CD/TWR/APP recordings were adjusted based on seven radio transmissions from KE 007.

1.15.4.4 The USSR Air Defence command centre recordings were adjusted to Tokyo radio time by correlating the SU-15 interceptor pilot's radio communications "launch" and "target is destroyed" with the times for missile detonation evident on the CVR and the DFDR records.

1.16 Additional information

1.16.1 The USSR interceptor pilot

1.16.1.1 The ICAO team was unable to meet with the SU-15 interceptor pilot in February 1993, but was provided with articles published by Izvestia in January 1991 containing extensive interviews with him. The contents of the articles were confirmed as authentic by representatives of the Russian Federation. Paragraphs 1.16.1.2 to 1.16.1.5 contain a summary of the interceptor pilot's statements as contained in these articles.

1.16.1.2 The interceptor pilot stated that 1983 was a difficult year for Soviet interceptor pilots in the Far East region as there had been numerous intrusions into Soviet airspace by military aircraft of the United States. On 31 August 1983 he was based at Sokol on Sakhalin Island when at 06:00 hours local time (18:00 hours UTC) he was ordered to be airborne. Eight minutes later he was informed that an aircraft was violating Soviet airspace. He soon saw the intruding aircraft through thin clouds, and he described it as a flying dot about two to three centimetres across, with its flashing lights (rotating beacon) on.

1.16.1.3 The interceptor pilot described how he then locked on with his radar sight. Staying about 13 km from the target, he reported to ground command that he had locked-on. He was a short while later ordered to destroy the target, but that order was rescinded and he was instead told to match altitude with the target and to force it to land. He approached the target from below and started flashing his navigational lights. He was further ordered to fire warning bursts. More than 200 rounds were fired, of the armour-piercing variety, not tracers, as his aircraft did not have the latter. He also reported that he did not try to establish radio contact with the aircraft because he would not have had the time to do so, he would have had to tune to that frequency and in so doing he would have lost contact with his ground command.

1.16.1.4 The target then reduced speed to "about 400 km/h". The interceptor pilot was again ordered to destroy the target. At that stage he was above the target, but dropped altitude, armed the missiles, and obtained lock-on. He explained that the first missile was fired when he was approximately 5 km from the target. At that stage he could more clearly see the aircraft, but could not identify its type as Soviet pilots did not "study" foreign civilian aircraft. The flashing lights (rotating beacon) of the aircraft were on. He said that he had no idea that it was a passenger aircraft.

1.16.1.5 The interceptor pilot stated that the first missile hit near the tail, while the second missile took off half the left wing of the aircraft.

1.16.1.6 The interceptor pilot's statement that the second missile took off half of the left wing was probably incorrect. The missiles were fired with a two-second interval and would have detonated at an equal interval. The first missile detonated at 18:26:02 hours. The last radio transmissions from KE 007 to Tokyo Radio were between 18:26:57 and 18:27:15 hours using HF 1. The HF 1 radio aerial of the aircraft was positioned in the left wing tip, suggesting that the left wing tip was intact at this time. Also, the aircraft's manoeuvres after the attack did not indicate extensive damage to the left wing.

1.16.1.7 The USSR Air Defence recordings showed that the interceptor pilot was airborne at 17:42 hours, not 18:00 hours as he recalled in the interview.

1.16.1.8 The representatives of the Ministry of Defence of the Russian Federation stated that at that time the cannons of interceptor aircraft were routinely loaded with a mixture of rounds so that every fourth or fifth was a tracer.

1.16.2 **Details of the missiles used in the attack**

1.16.2.1 The SU-15 aircraft that carried out the attack was fitted with two R-98 air-to-air missiles. One missile had a heat-seeking guidance with a passive system which locked on to a source of infra-red radiation such as the exhaust of the aircraft engines. The heat-seeking missile had a contact fuse. The other missile had a semi-active radar guidance. The radar guided missile had a proximity fuse that detonated the warhead by a non-contact radio detonator at a range of 50 metres.

1.16.2.2 The missiles had a maximum range of 18 km and a maximum velocity of 2 000 km/h. The launch mass was 230 kg with a 20 kg high explosive warhead designed to produce 1 400 steel fragments, each of 3 to 18 grams, which were dispersed over an 18° to 21° angle from the forward direction of flight.

1.16.2.3 The heat-seeking missile was fired first at a range of 8 to 11 km from the target with the radar-guided missile following two seconds later. The time of missile flight to the target was about 30 seconds.

1.16.3 **Incidents involving deviation from track due to unintentional maintenance of constant magnetic heading**

1.16.3.1 A total of 101 reports involving INS navigation errors made to the NASA Aviation Safety Reporting System during two periods, one between September 1978 and May 1983, and the other between January 1986 and November 1992, were reviewed. Almost twelve per cent of the incidents

involved significant track deviations as a result of flight crews failing to detect instances where the autopilot had been switched from the INS navigation mode to that required for the maintenance of a constant magnetic heading. While the majority of these errors amounted to less than 60 NM off the intended track, one occurred in May 1983 in which the aircraft reached 250 NM off track. In the latter case the autopilot was in a heading mode, and complacency, boredom and fatigue on all-night, over water flights were cited by the crew as probable factors for their failing to detect the deviation from track through two waypoint passages.

1.16.3.2 An incident in September 1983 involved a B-747 that was rerouted. The captain altered the heading using the autopilot. Following this adjustment he did not reselect INS mode on the navigation mode selector and thus the autopilot did not lock onto the INS track. Neither pilot on the flight deck subsequently checked the mode indicators and thus the absence of a NAV armed and NAV captured indication was overlooked. The crew made no reference to other navigational facilities to monitor the progress of the flight until the flight engineer queried the aircraft's position some two hours later when the aircraft had diverged some 60 NM from track. All of the aircraft's navigation equipment was serviceable. Subsequent information suggested that despite high standards of crew discipline, long flights over the ocean or featureless terrain, at night, in a confined sleep inducing atmosphere have a significant adverse effect on the crew's state of arousal.

1.16.3.3 Several similar cases of an excessive time being taken by crews in such circumstances, to discover errors in INS navigation, were recorded. Not all of the incidents resulted from the flight crew forgetting they had switched the autopilot to heading mode. In some cases it was believed that the autopilot had disengaged without attracting their attention.

2. ANALYSIS

2.1 Operational flight plan

2.1.1 In 1983 the Korean Air Lines operational flight plans were provided by a contracting company. A copy of the operational flight plan, purported to have been annotated by the pilot and taken on the flight by the crew of KE 007, had been given to the ICAO investigation team by the Korean Air Lines Anchorage office in 1983. In 1993 Korean Air provided another copy of the same flight plan with the same annotations but the fuel table was not crossed out.

2.1.2 In January 1993 representatives of the United States provided another copy of the operational flight plan. This copy was annotated differently from the other two copies and had "ATD 1259" written near the top and waypoint numbering from 1 to 17. This numbering system would not have been used by a flight crew since numbers above 9 would not correspond to waypoints in the INS.

2.1.3 An annotation concerning the equal time point appeared on KE 007's flight plan as well as on the one used by the crew of KE 015 on 31 August 1983 and provided by Korean Air in February 1993. A statement dated 31 July 1985 by the flight dispatcher in the Korean Air Lines' Anchorage office in August 1983 confirmed that he had made these notes on the flight plans for both flights.

2.1.4 Statements by Korean Air personnel in February 1993 established the significance of two groups of numbers and letters written at the top of the flight plan for KE 007, "JCA9" and "GXXO".

These were specific route identifiers for a teletype request for a computer flight plan; both had been added by the flight dispatcher. The fuel table was crossed out because it had to be revised to take account of the actual take-off mass and holding fuel. The remaining annotations against the text of the flight plan, other than the waypoint numbers 1 to 9, were made in the Korean Air Lines' Anchorage office during the alert and distress phases as information became available and the possibilities were evaluated following the loss of communication with KE 007.

2.1.5 Apparently the only annotations that may have been made by the flight crew of KE 007 were those indicating waypoint numbers from 1 to 9. None of the copies available was an exact reproduction of the document taken by the flight crew for use during the flight to Seoul.

2.2 Deferred defect

2.2.1 The aircraft arrived in Anchorage with a defect in the No. 2 compass system. The defect was noted in the maintenance record. It produced a heading warning flag on the first officer's horizontal situation indicator (HSI) and caused the central instrument warning system (CIWS) lights to flash. In such a fault condition, fail flags should also have shown on the first officer's VOR radio magnetic indicator (RMI) and the captain's ADF RMI but these were not indicated in the maintenance record. These warning lights and flags could be cancelled or cleared by selecting the compass system selector switch on the captain's panel to CAPT 1/FO 1. The maintenance record showed that this action was taken. The indicator light adjacent to the selector would then have remained lit to show that compass information to each pilot's instruments was provided by the No. 1 compass system. This defect was deferred for rectification in Seoul.

2.2.2 The existence of such a defect in one of the compass systems could be expected to promote a more than normal vigilance by the flight crew in monitoring the performance of the navigation systems and the navigation of the flight.

2.3 Clearance, taxi and departure

2.3.1 KE 007 was cleared for an Anchorage SID No. 8 departure and assigned SSR code 6072. Take-off was at 13:00 hours. At 13:01 hours KE 007 was cleared to climb to and to maintain FL 310, and was instructed to turn left onto a heading of 220° magnetic. The DFDR record started 5 minutes 18 seconds prior to lift-off and showed heading changes commensurate with the taxi route from gate N2 to line up on runway 32. The DFDR record showed the take-off on a magnetic heading of 320°. The left turn to 220° was commenced 23 seconds after lift-off and completed 1 minute 50 seconds after lift-off. Autopilot A was selected to Command mode 2 minutes 10 seconds after lift-off.

2.3.2 At 13:02:08 hours Anchorage APP cleared KE 007 to proceed "direct BETHEL when able". Korean Air personnel indicated that Anchorage VOR/DME would have been inserted as waypoint 1. This matched the annotation on the operational flight plan, which further indicated that Cairn Mountain NDB was inserted as waypoint 2, and Bethel VORTAC as waypoint 3.

2.4 Navigation to Bethel VORTAC

2.4.1 Anchorage VOR/DME had been out of service since 23 August 1983. The clearance given indicated that the normal means for ensuring navigation on route J501 west of Anchorage VOR/DME was not available.

2.4.2 There were two ways of using the INS to navigate to Bethel VORTAC with autopilot A already in use. Selection of the navigation mode switch to INS would have initiated the INS navigation mode to capture the desired INS track from the Anchorage VOR/DME (waypoint 1) to Cairn Mountain NDB (waypoint 2), provided that the aircraft was both west of the Anchorage VOR/DME and within 7.5 NM of the desired track. The flight director and the autopilot annunciator panels would have indicated that the NAV mode was in operation in each case. Had the aircraft been displaced more than 7.5 NM from the desired track the flight director and auto-pilot annunciator panels would have indicated that the INS NAV modes had armed but not come into operation. In that case the flight director and the autopilot mode annunciator panels would have indicated that the NAV modes were armed until the aircraft was within 7.5 NM of the desired track when both would have indicated that the INS NAV modes were in operation. The fact that the heading modes of the flight director and autopilot would have been in operation during the armed phase of the INS navigation modes would not have been indicated.

2.4.3 Alternatively, a similar selection of INS on the navigation mode switch followed by a selection of track change 0 to 3 on the No. 1 INS CDU would have initiated the INS navigation mode from the position at the time of the selection (waypoint 0) to BETHEL (waypoint 3). The flight director and autopilot mode annunciators would have indicated that the INS NAV modes were in operation. This track change would then have been made on the No. 2 and No. 3 INS CDUs.

2.4.4 In either of these cases the aircraft would have been expected to navigate to BETHEL with no or very little error. Either would have resulted in some small alterations in magnetic heading as the INS achieved the true track towards BETHEL. Indications available to the crew would have been a reducing or zero track bar displacement with the HSI display set to INS and a similar reducing or zero cross-track error on the CDUs. There would have been a similar effect with the VOR track displacement subsequent to receipt of Bethel VORTAC if the VOR/ILS display had been selected on the HSI.

2.5 Constant magnetic heading

2.5.1 The navigation mode switch was selected to HDG for take-off. The DFDR record indicated that an appropriate heading towards Bethel VORTAC was then selected. If the navigation mode switch was left in the HDG position, then the aircraft would have maintained the heading selected. Neither the flight director nor the autopilot annunciator panels would have indicated that the heading modes were in operation.

2.5.2 Alternatively, had the navigation mode switch been selected to INS outside the INS desired track capture envelope and had a closing heading not been selected the flight director and autopilot NAV modes would have been armed, and would have remained armed so long as this condition persisted, whilst the heading modes would have remained in operation. The flight director and the autopilot annunciator panels would have indicated that the INS navigation modes were armed but there would have been no direct indication that the systems were operating in the heading modes.

2.5.3 The lack of an indication on the flight director and autopilot mode annunciator panels of the operative status of the heading select mode deprived the crew of a cue which might have drawn their attention to the fact that the autopilot was not being controlled by the INS. A review of incidents involving navigation errors of a similar nature found that it was not uncommon for a crew to overlook a failure to revert to INS navigation after using the heading select mode for weather avoidance or re-routing by ATC. Most aircraft of more recent manufacture display heading select modes on the annunciator panels.

2.6 Anchorage radar record

2.6.1 The radar record available from Anchorage in 1983 showed that there was initial closure by KE 007 towards route J501 from the north while it maintained a heading of 220° magnetic. The recorded change in heading from 220° to about 245° matched the ATC clearance "proceed direct BETHEL when able". The heading selected caused the aircraft to deviate to the right of its cleared track direct to BETHEL. The aircraft maintained this magnetic heading and passed approximately 6 NM abeam Cairn Mountain NDB and 12 NM abeam of Bethel VORTAC. According to representatives of the United States, there was no requirement for Anchorage ATC to inform KE 007 of its position when the radar service was terminated at 13:27 hours since a direct BETHEL clearance had been given and the track to be flown was not defined.

2.7 Navigation requirements

2.7.1 Korean Air Lines used the North Pacific Airspace Operations Manual (March 1983) as the basis for their guidance for flight crews operating in the North Pacific composite route system. The manufacturer's B-747 Operations Manual was also included in the Korean Air Lines' Operations Manual. The North Atlantic MNPS Airspace Operations Manual (September 1980) had also been used as guidance material for Korean Air Lines' flight crews in 1983. These three manuals each contained procedures for the conduct of inertial navigation. Particularly relevant were the procedures for checking navigation system accuracy at the commencement of oceanic navigation. These procedures required careful overflight of the last available external navigational aid, in this case Bethel VORTAC, and specific checks of INS accuracy. The procedures also provided for an outbound track check when the oceanic fix was a VOR. These procedures, included in the KAL Operations Manual, were not observed since KE 007 did not pass over Bethel VORTAC.

2.7.2 On approaching Bethel VORTAC, information on the track displacement would have been available from the VOR RMIs, the track bar of HSI's VOR/ILS display and the DME. Further information on track displacement would have been available from the track bar of the HSI's INS display, the cross-track error displays on the INS CDUs, error in position co-ordinates between the actual position and the desired position and the distance to go on the INS displays. Any error in one of the three INS would have been apparent from comparison with the other two systems. The accuracy of the INS was better than 2 NM per hour of flight. The lateral displacement of 12 NM from Bethel VORTAC after 49 minutes of flight should have alerted the flight crew to a possible problem and prompted an immediate assessment of the situation. The guidance material on INS navigation in the North Pacific and North Atlantic oceanic areas emphasized that ATC be informed in any case of doubt as to the accuracy of the INS.

Chart 10. Flights KE 007 and KE 015 as Recorded by Kenai Air Route Surveillance Radar
Graphique 10. Trajectoires de KE 007 et KE 015 enregistrées par le radar de surveillance de route de Kenai
Carta 10. Vuelos KE 007 y KE 015 según los registros del radar de vigilancia en ruta de Kenai
Карта 10. Полеты KE 007 и KE 015 по данным, зарегистрированным маршрутной обзорной РЛС в Кенаи
الخارطة (١٠): الرحلة KE 007 و KE 015 حسب تسجيلهما برادار كيناى الباحث للطرق الجوية

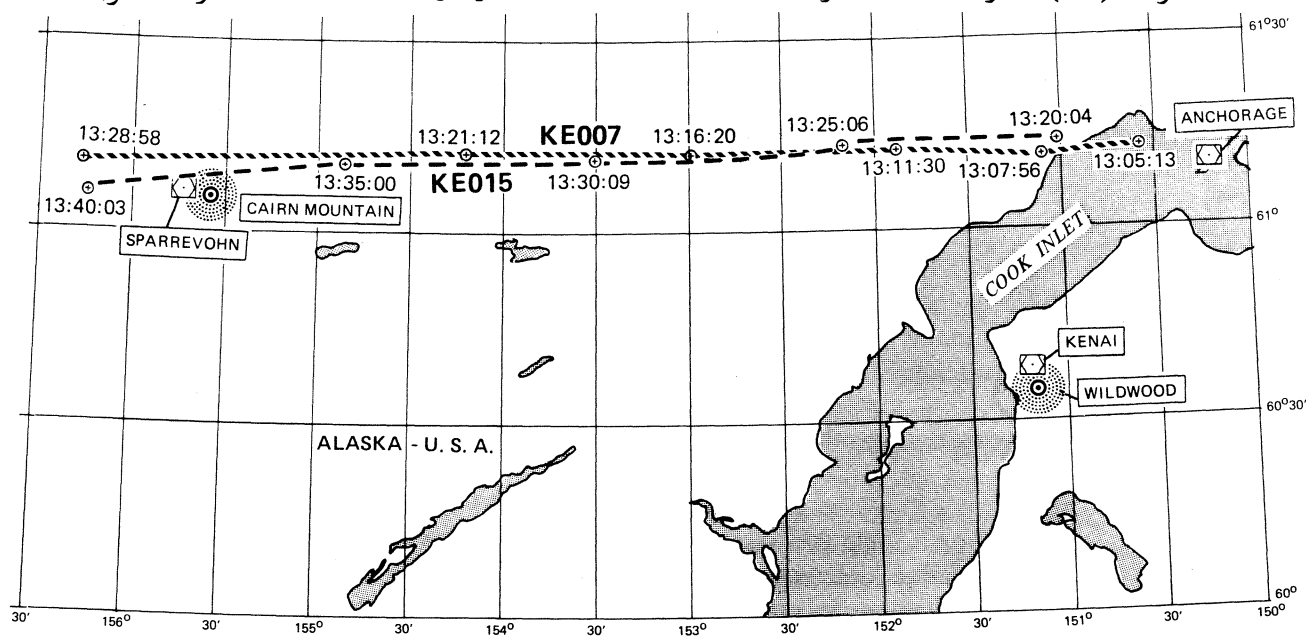
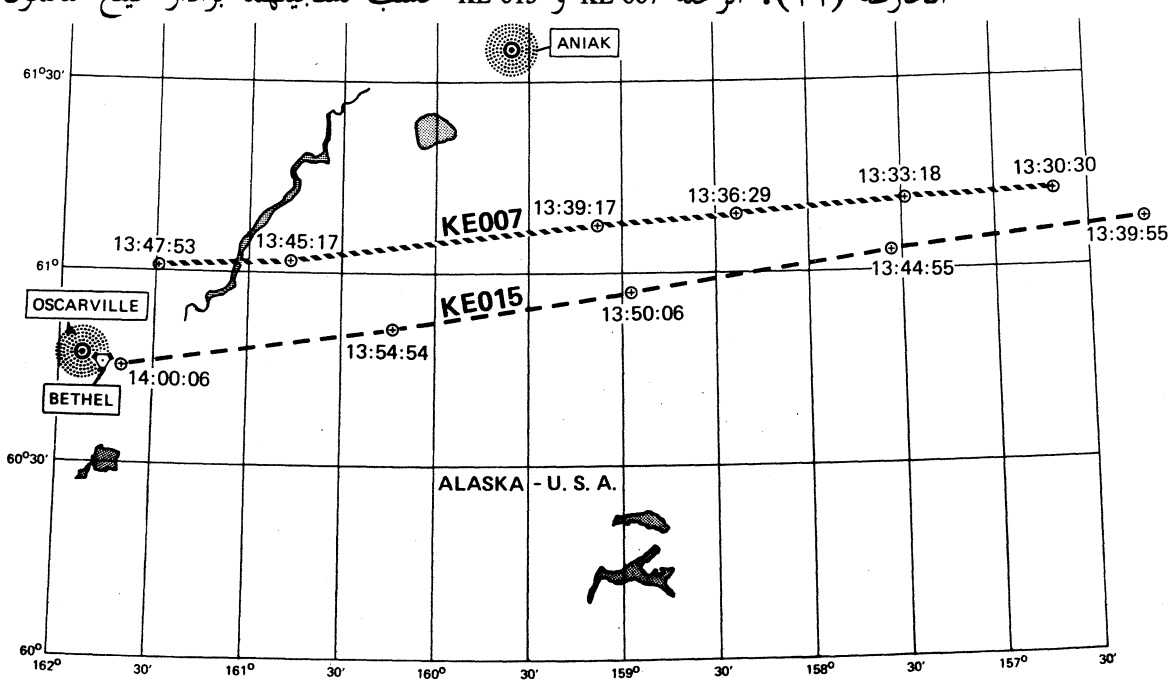


Chart 11. Flights KE 007 and KE 015 as Recorded by King Salmon Radar
Graphique 11. Trajectoires de KE 007 et de KE 015 enregistrées par le radar de King Salmon
Carta 11. Vuelos KE 007 y KE 015 según los registros del radar de King Salmon
Карта 11. Полеты KE 007 и KE 015 по данным, зарегистрированным РЛС в Кинг Салмон
الخارطة (١١): الرحلة KE 007 و KE 015 حسب تسجيلهما برادار كينغ سالمون



2.7.3 Further checks from ground-based navigation aids were available in the first half of the oceanic transit to aircraft using R20. St. Paul Island DME should have indicated 140 NM at NABIE, and Shemya VOR and TACAN should have provided cross-bearing and distance checks at NEEVA. These aids were serviceable on 31 August 1983. As a result of the aircraft's deviation from the desired track it is unlikely that the flight crew of KE 007 would have been able to receive these aids but the crew made no report to that effect.

2.8 KE 007 in Alaskan ADIZ and DEWIZ

2.8.1 KE 007 was already outside the boundaries of the air route when it passed north of Bethel VORTAC. As the aircraft proceeded west, it continued to deviate to the north and, from the track as estimated based on DFDR and radar information, passed approximately 60 NM north of NABIE, 100 NM north of NUKKS and 160 NM north of NEEVA. In 1983 the United States stated that traffic westbound from Alaska to Southeast Asia was not monitored and that there was no requirement for communication between the FAA and the USAF. In January 1993 United States representatives confirmed the situation was applicable as stated in 1983. KE 007 proceeded westbound out of the Alaskan Domestic ADIZ, through the Alaskan DEWIZ and through the Alaskan Air Command buffer zone well north of R20 towards the USSR Asian Coastal buffer zone surrounding Kamchatka and the Komandorski Islands.

2.8.2 The relevant rules (FAR, Part 99) for operating civil aircraft in or out of the Alaskan ADIZ and DEWIZ did not differentiate between eastbound or westbound traffic. The requirements included the filing of a flight plan and reporting the time, position, and altitude at an appropriate reporting point along the route of flight before penetrating an ADIZ. A non-adherence to the rules for ADIZ penetration made an aircraft subject to interception by the United States Air Defence Command for positive identification, and an ADIZ violation would be filed with the FAA.

2.8.3 According to representatives of the United States:

> "[The United States] was unable to uncover any observations of radar returns by either civil or military facilities between 13:00 and 15:00 hours UTC within the Alaskan airspace of a westbound aircraft north of the airways, north of the transoceanic tracks , and crossing the Alaskan Air Command buffer zone."

2.9 Use of the onboard weather radar for ground mapping

2.9.1 The aircraft weather radar was serviceable and used on the New York to Anchorage sector of flight KE 007. It was common practice for pilots of aircraft equipped with weather radar to observe landfalls, and to assess their navigational accuracy by means of the ground mapping capability of such equipment. Nearby to the left and to the right of route R20, well within the range of weather radar of the type installed on KE 007, were Shemya, the Komandorski Islands, the Kamchatka Peninsula and the Kuril Islands, with readily discernible topography. Use of the radar on this route was required by some operators. This practice was not required by Korean Air Lines but was common with their crews, although in adverse weather preference was given to using the radar for weather surveillance. Its use would have indicated to the flight crew of KE 007 that the flight was straying to the right of R20. It was concluded that the radar either was not functioning properly or that the ground mapping capability was not used.

2.10 Possibility of INS malfunction

2.10.1 Possible malfunctions of the INS which might have resulted in an aircraft deviating from track to the extent experienced by KE 007 were examined. It was concluded that it was virtually impossible for any technical malfunction or combination of malfunctions in the INS to have resulted in the aircraft maintaining a constant magnetic heading for over five hours.

2.10.2 Malfunctions or failures of one INS with a drift error without a warning on the CDU was not a common event. A similar and concurrent failure of three systems was regarded as a virtual impossibility. The effect of triple mixing involving an undetected error in one or two systems was examined. If one system position differed from the other two by more than 35 NM, the CDU warnings would flash. The actual, unmixed, position indicated by each system could always be checked against the mixed position and against the unmixed positions of the other sets. Because of the 35 NM limit on the acceptable error between sets when triple mixing was used, a supposition that use of triple mixing in the presence of an undetected drift error in one or two sets could not be accepted as a cause of the track deviation experienced. At the least there would have been CDU warnings, except in the virtually impossible event of similar drift errors in all three systems.

2.11 Consideration of the magnetic heading record

2.11.1 The DFDR recorded a constant magnetic heading from three minutes after take-off. The functioning of the INS was based upon true north. The INS, through the autopilot, controlled the aircraft on a true heading calculated from the true great circle track from one waypoint to the next, the true airspeed and the wind experienced. The magnetic heading on any leg reflected the true heading and the magnetic variation and compass deviation. At any waypoint involving a change in the true track, the true heading, and therefore the magnetic heading, would also change. Changes in the true tracks on R20 were small but sufficiently significant to show as alterations in the magnetic heading record. Such alterations with track changes would have shown in the record whether or not there was an error in the controlling INS. No such alterations showed in the DFDR record.

2.11.2 The magnetic variation along the track flown by KE 007 changed from 24°E in the Anchorage area, through 12°E north of NABIE, 4°W on the east coast of Kamchatka and to more than 8°W at Sakhalin Island. Thus the magnetic variation was continuously changing throughout the flight, although the rate of change was reduced with progress to the west. With the maintenance of a set of true headings under INS control the magnetic heading record would have shown changes in concert with the change in magnetic variation, in addition to the alterations resulting from track changes.

2.11.3 It was considered virtually impossible that an INS fault condition could exist that would result in the maintenance of a constant magnetic heading over a long period, particularly with such a large change in magnetic variation and the effect of varying winds. The DFDR record showed that the aircraft was controlled by autopilot A in Command mode for over five hours and maintained a constant magnetic heading. It was concluded that the autopilot could not have been controlled by an INS. It was also concluded from the constant heading record that manual control of the autopilot was not exercised by the crew by use of heading selection.

2.12 Position reporting

2.12.1 Position reports were made in accordance with the operational flight plan, though with some difficulty in the communications. These position reports were commensurate with a functioning INS from which to take navigational information at least so far as waypoint passage was concerned together with forward time estimates and spot winds. In the off-track situation, waypoint passage would have been indicated when the aircraft reached the perpendicular from the waypoint on the desired track. This would have applied regardless of the extent of the cross-track error. Reasonable forward time estimates were possible in the off-track condition because the INS calculated time to go along the desired track and not from the actual position to the position of the next waypoint. The time would therefore run towards zero as the next fictitious waypoint was approached. Conversely the distance to go shown on the INS CDU was the distance from the actual position to that of the next actual waypoint. The indicated distance to the next actual waypoint could not reduce to less than the cross-track error. Such an indication would have been readily apparent when the CDU alert light came on prior to waypoint passage, if any significant cross-track error was present.

2.12.2 The CDU display showed distance and time on the same selection. However, immediately following waypoint passage an inconsistency between distance and time would not have been readily apparent until the cross-track error became large. On a 300 NM leg, a 50 NM cross-track error would have given a distance error of 4 NM whilst a 100 NM error gave a distance error of 16 NM. As this error became larger it would have become readily apparent when compared with the track distance on the flight plan.

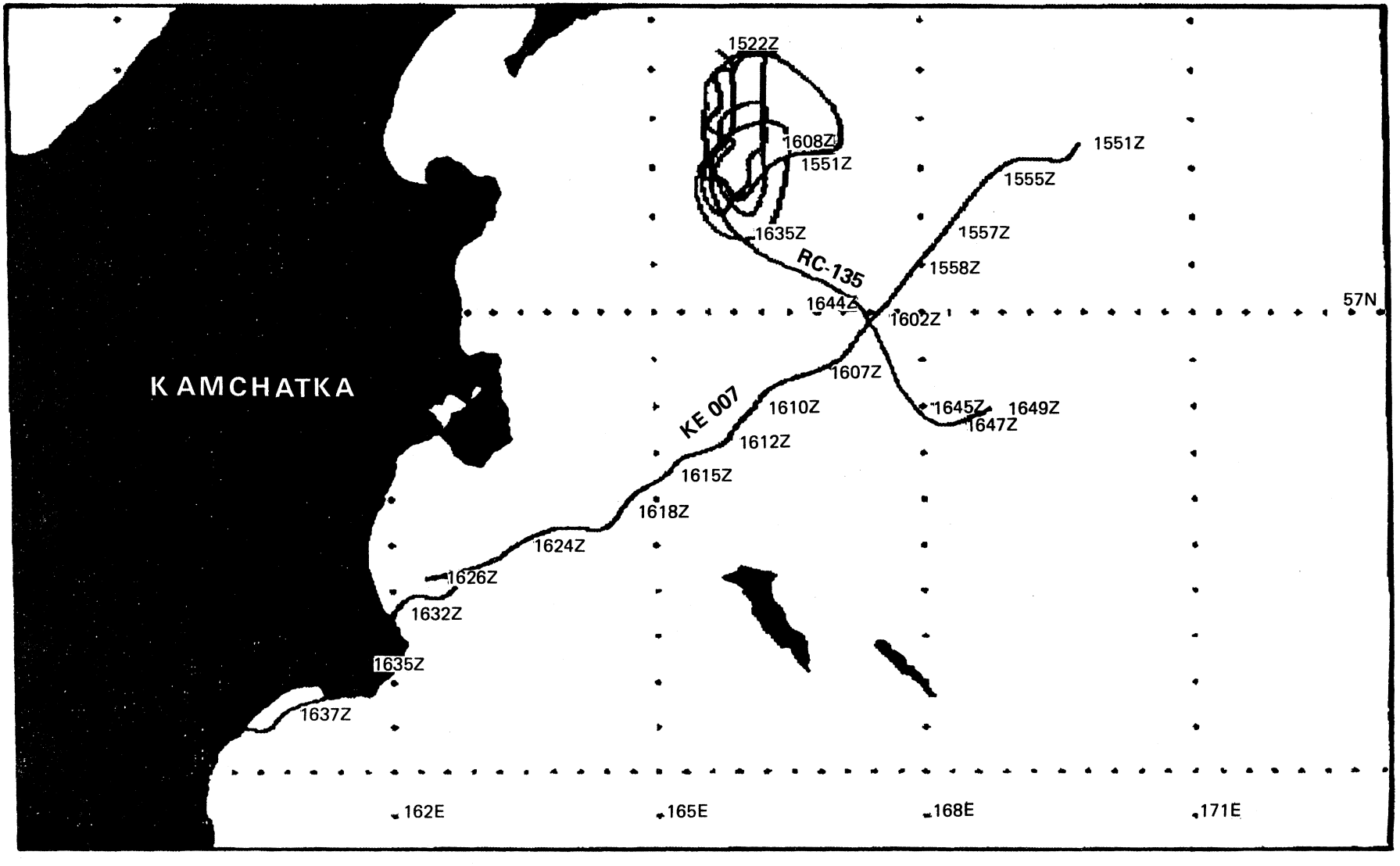
2.12.3 The long range navigation manuals previously mentioned specifically covered actions that should be taken at oceanic waypoints. In particular these included, when the CDU alert light illuminated, a check of each INS position's co-ordinates against the current ATC clearance, the observation of any turn associated with the track-change, the verification of the next waypoint co-ordinates against the flight plan and, after the waypoint passage, plotting the present position on a chart as a further tracking check.

2.13 RC-135 northeast of Kamchatka

2.13.1 In 1983 the USSR stated that at the time that KE 007 was now known to have been flying towards Kamchatka a United States RC-135 was operating in the area to the northwest of NEEVA. This was confirmed by the United States. In 1993, representatives of the Russian Federation provided a track plotted from radar observations, which was allocated a track number 6065 and which indicated some manoeuvring, of an aircraft through this area. The United States provided position information, derived from monitored USSR communications, for KE 007 and for the RC-135, the area of operations of which was centred on 58°00'N, 160°00'E. The proximity of the RC-135 and KE 007 resulted in 1983 in confusion and the plotting of the track of only one aircraft. The United States stated that the closest distance between the two aircraft was 75 NM, based on monitored USSR information; this distance was confirmed by representatives of the Russian Federation in 1993.

2.13.2 The United States, whilst it provided information derived from monitored USSR communications, stated that it was not in possession of first-hand information on the track of KE 007.

Chart 12. RC-135 Northeast of Kamchatka
Graphique 12. RC-135 - Nord-est du Kamchatka
Carta 12. Un RC-135 al noreste de Kamchatka
Карта 12. RC-135 к северо-востоку от Камчатки
الخارطة (١٢): الطائرة RC-135 الى شمال شرق كمشاتكا



Equally, information regarding the movements of the RC-135 was given as derived from monitored USSR communications. To a question whether the movements of the RC-135 were available from its flight plan or mission report, the representatives of the United States responded that:

> "The [United States] is not aware of any residual information on the movements of the RC-135 from the RC-135 itself or from other U.S. sources."

As KE 007 passed south of the orbiting RC-135 at about 16:00 hours, the question arose whether the RC-135 was monitoring the airspace around it and up to what range, or whether the RC-135 was covered by other ground- or air-based radar facilities. The representatives of the United States stated that:

> "There was no radar coverage of the RC-135 while in orbit from [U.S.] ground, sea, or air facilities. The RC-135 used normal navigational equipment and on-board monitoring equipment to monitor airspace around it for protection only. No recorded data is available."

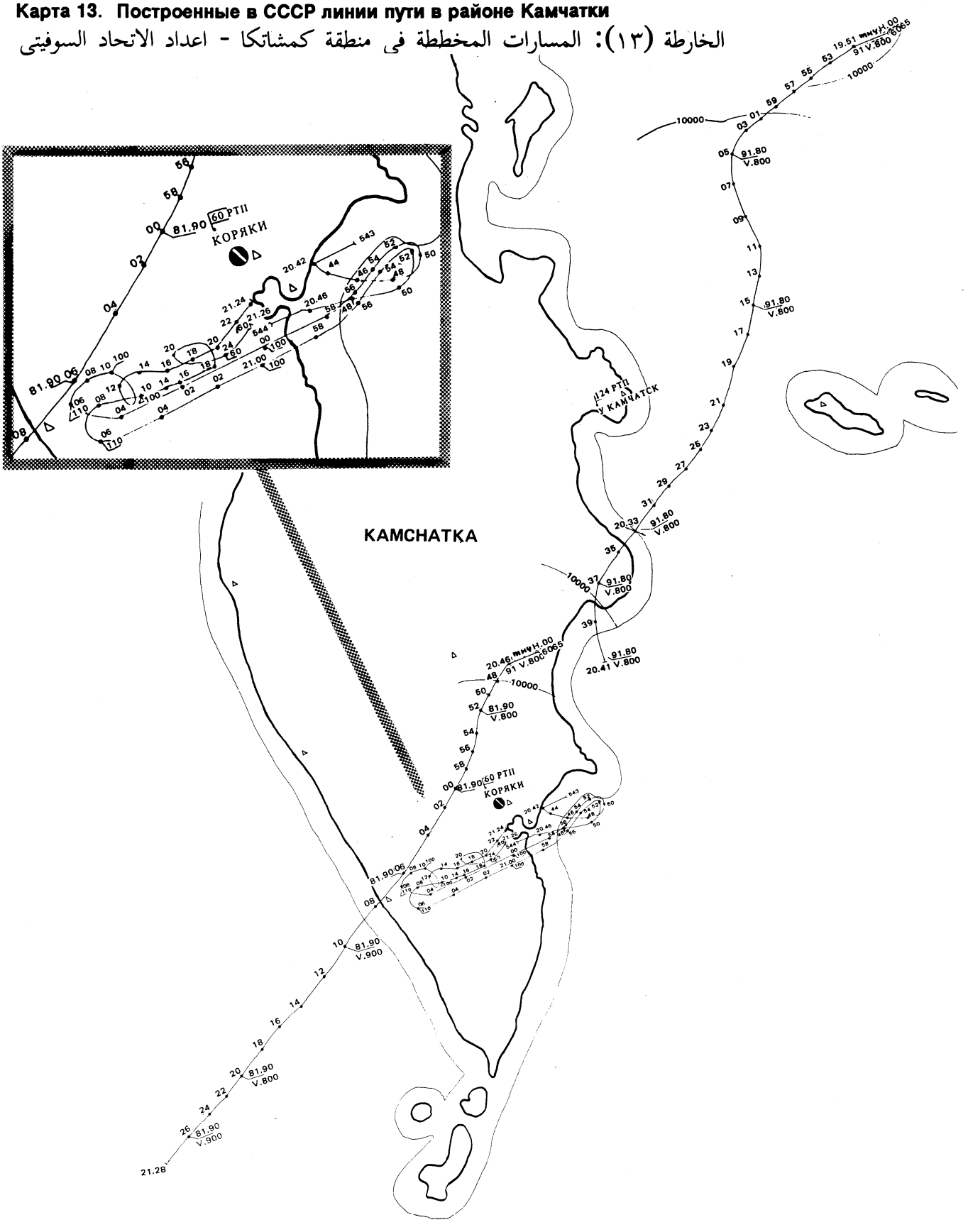
2.14 KE 007 over Kamchatka

2.14.1 The track plotted by the USSR showed that the aircraft steadied in a southwesterly direction at 16:23 hours, at 8 000 metres and flying at 800 km/h. Track 6065 was annotated "81" to indicate one unidentified aircraft. This track was plotted until 16:41 hours. However, contact had been lost at 16:37 hours and a curve to the south shown after that time was stated to have been the result of a forecast by the plotting team based upon previous experience of the actions of intruder aircraft. The observed behaviour of the aircraft on track 6065 and the pattern of radio transmissions on military frequencies by the orbiting RC-135 resembled those of previous intrusions. Therefore, USSR Air Defence command assumed that the aircraft was an RC-135. At least four interceptor aircraft were scrambled from airfields in Kamchatka. Plotted tracks of two of these interceptors were provided which showed them vectored east at about 16:41 hours to intercept the apparently southerly moving intruder. Radar contact with the intruder was re-established at 16:46 hours, approximately in position 54°12'N, 159°30'E and again labelled track 6065, one unidentified aircraft, at 9 000 metres and 800 km/h, tracking steadily southwest. The fighters were then vectored to the west to intercept the intruder. The fighters were unable to make an interception and at 17:06 hours were forced to return to base. Radar contact with the intruder was lost by radars on Kamchatka at 17:28 hours and the last position plotted was 51°12'N, 151°31'E. Records of the communications between the interceptors and ground control in Kamchatka were not available.

2.15 KE 007 over Sakhalin and activities at the Soviet command centres

2.15.1 The tapes and transcripts provided by the Russian Federation indicated that the Sakhalin command centre was aware of the intruder over Kamchatka before 17:20 hours. It was known that the airbase at Elizovo, Kamchatka, had sent up interceptors which were unable to establish contact with the intruder. At 17:23 hours a check on possible Soviet long-range traffic was instituted whilst two fighter aircraft were brought to immediate readiness. At 17:29 hours it was reported that there were no Soviet aircraft in the area. A few minutes earlier, at 17:27 hours, the commanding general in the Sakhalin area had been informed that there had been a border violation over Kamchatka and that an RC-135 was moving towards Sakhalin Island tracking on a heading of 240° over the Sea of Okhotsk at a range of 500 km. Identification as an RC-135 was still provisional at that time. The USSR Air Defence forces

Chart 13. USSR Plotted Tracks in the Kamchatka Area
Graphique 13. Trajectoires dans la région du Kamchatka (relevées par l'URSS)
Carta 13. Derrotas en la zona de Kamchatka trazadas en la URSS
Карта 13. Построенные в СССР линии пути в районе Камчатки
الخارطة (١٣): المسارات المخططة فى منطقة كمشاتكا - اعداد الاتحاد السوفيتى



on Sakhalin Island were fully alerted by 17:36 hours. The radar contact was established by Sakhalin based radars and the track was plotted from 17:45 hours and position 49°42'N, 148°38'E, altitude 9 000 metres and speed 800 km/h. The contact, again labelled track 6065, was identified thereafter on the Sakhalin operational plots by the annotation "91", which indicated one military aircraft. At 17:52 hours the steady track of the contact again raised doubts and the command centres recordings contained a question as to whether it could be a Soviet aircraft.

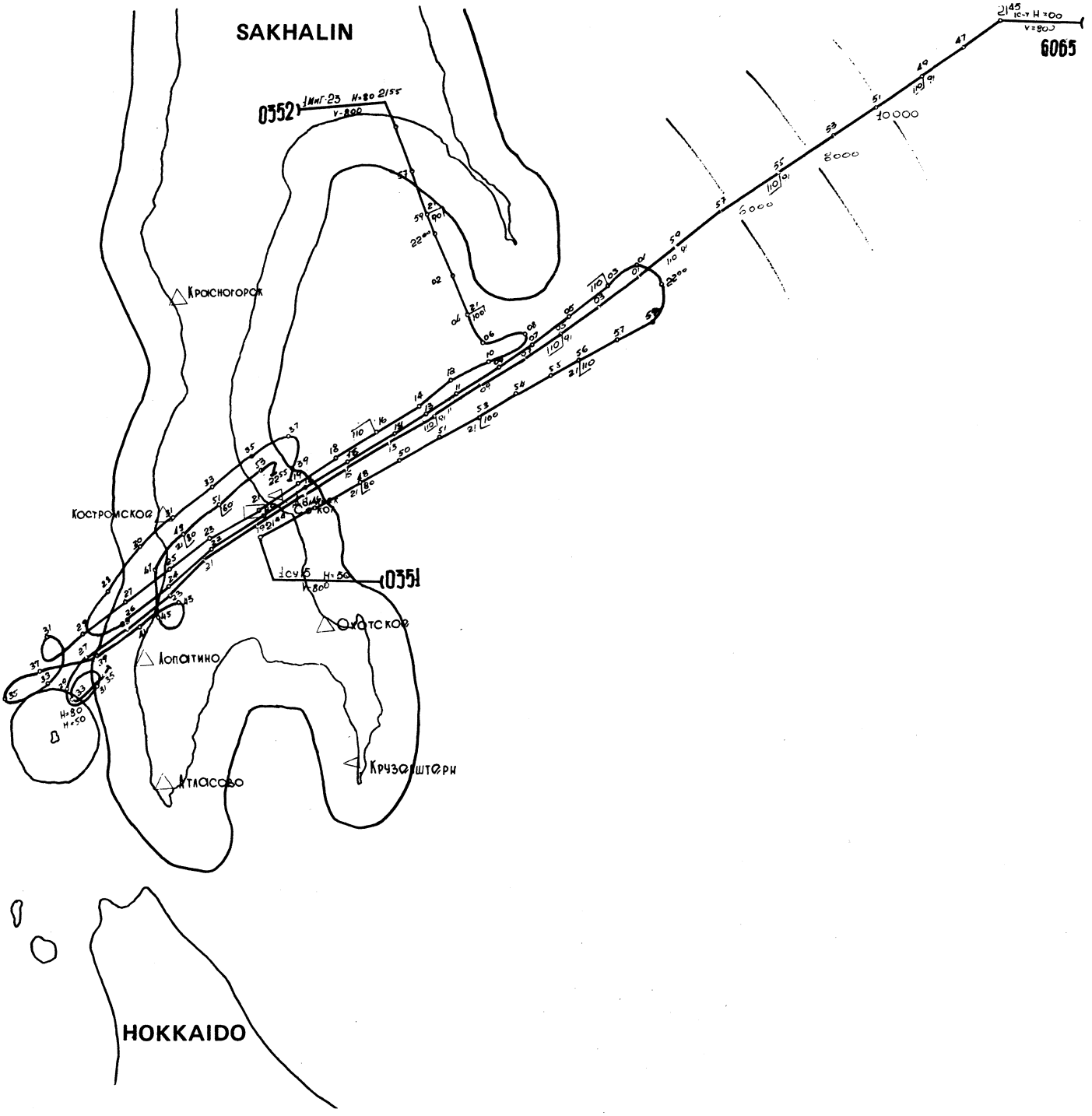
2.15.2 Two SU-15 fighter aircraft were scrambled from the airbase at Sokol: 805 at 17:42 hours and 121 at 17:54 hours; a MIG 23, 163, was scrambled from Smirnykh at 17:46 hours. More interceptors were brought to readiness for immediate take-off at various airbases. There was concern with the early morning frontal weather which had resulted in more than one airfield, including Smirnykh, being below the operational weather minima.

2.15.3 At 17:53 hours an order was given to the ground control that the contact was a combat target, which was to be destroyed if it violated the State border. At 17:58 hours interceptor 805 was ordered to follow and identify the target which by that time was about to enter the Bay of Terpenie. At the same time conflicting instructions were given to 805 to hold a position suitable for an immediate attack. 805 and 163 were at altitude and following the contact from 18:00 and 18:08 hours, respectively. Controllers were ordered not to close the interceptors directly astern of the target because of the cannon carried in the tail. At 18:08 hours the pilot of 805 reported that he could see the target, at a distance of 4.5 to 5 km, but because of darkness he could not identify the aircraft type. It was suggested that if there were four contrails then it would be an RC-135. At 18:09 hours an order was given to the controller to destroy the target. However, the order was immediately changed to require him to wait until the State border had been violated, because concerns had been expressed about taking action over the high seas.

2.15.4 The plot of the tracks of the intruder, 6065, and two of the interceptors, 805 (track 0351) and 163 (track 0352) showed 805 consistently astern of and to the right of the intruder from 18:00 hours when 805 turned in behind; 163 was shown as following further behind and further to the right. This information on the relative position of 805 did not agree with the information from the communication transcripts and the recollections of the pilot of 805. The command centre transcripts suggested that 4.5 to 5 km was the closest that 805 came to the target, in various relative positions from slightly ahead through abeam to astern, but for most of the time during the interception the range was 8 to 12 km. Shortly after 18:12 hours the intruder was interrogated by 805 using the Soviet electronic identification system, but there was no response. At 18:15 hours limitations in radar coverage necessitated the handover of control of the interceptors from one ground control station to another. By 18:16 hours the intruder had re-entered USSR sovereign airspace and was about to cross the southern end of Sakhalin Island. An officer of the USSR Air Defence command mentioned at 18:17 hours that the unidentified aircraft might be a passenger aircraft. There was then confusion over whether the intruder aircraft displayed lights. Subsequently the task to destroy the aircraft was confirmed with the comment, "If there are no lights it cannot be a passenger [aircraft]." Based on the transcripts it was evident that command centre personnel were concerned with the position of the intruder aircraft in relation to USSR sovereign airspace as well as its identity.

2.15.5 The CVR record showed that between 17:54 and 18:15 hours the flight crew of KE 007 was engaged in casual conversation on the flight deck and in light-hearted exchanges with the flight crew

Chart 14. USSR Plotted Tracks in the Sakhalin Area
Graphique 14. Trajectoires dans la région de Sakhaline (relevées par l'URSS)
Carta 14. Derrotas en la zona de Sajalin trazadas en la URSS
Карта 14. Построенные в СССР линии пути в районе Сахалина
الخارطة (١٤): المسارات المخططة فى منطقة سخالين - اعداد الاتحاد السوفيتى



of KE 015, before discussing, with the flight crew of KE 015, the question of their arrival times in Seoul, the different headwinds being experienced and a change in flight levels. At about 18:15 hours both aircraft were also in contact with Tokyo Radio on HF.

2.15.6 At 18:18 hours the pilot of 805 reported, in response to questions from his ground control, that the target's navigation lights and flashing beacon were on. At 18:19 hours the Soviet ground control instructed the pilot of 805 to flash his lights as a warning signal and to force the intruder to land at Sokol. At 18:20 hours he was instructed to fire a warning burst from his cannon. He reported at 18:19 hours having flashed his lights and at 18:21 hours having fired a burst from the cannon. It was not possible to assess the distance of the interceptor from the intruder nor their relative positions when the interceptor's lights were flashed and the cannon fired. The CVR did not contain any indication that the flight crew of KE 007 was aware in any respect of the interception in progress. Shortly after 18:20 hours KE 007 commenced a climb from FL 330 to FL 350 which it reached at 18:23 hours. The pilot of 805 reported that this climb by the target resulted in his aircraft forging ahead into a position where engagement was not possible.

2.15.7 At 18:22 hours the Soviet command again ordered the destruction of the target. Based on the transcripts it was evident that the time factor became a paramount consideration in the command centres, as the intruder aircraft was about to coast out from Sakhalin Island. Consequently, exhaustive efforts to identify the intruder aircraft were not made, although apparently some doubt remained regarding its identity. The pilot of 805 was instructed to destroy the target with cannon fire but he reported falling back to try with missiles. Two air-to-air missiles were launched by 805 at about 18:25:30 hours. The command instructed ground control to bring 163 into position to ensure the destruction of the target since it was about to exit Soviet airspace. It was reported to the command that the pilot of 805 had fired two missiles and had observed explosions.

2.15.8 Subsequent to the strike by one or two missiles the target was reported to be descending and turning to the right. The plotted radar information showed turns to the left. Ground control expressed concern that the target was still flying, despite being hit by missiles and that having exited Soviet airspace it was re-entering this airspace in the area of Moneron Island. The last plotted radar position of the target was at 18:35 hours at 5 000 metres. The USSR air defence command instructed ground control to have aircraft 163 and 121 close the target and destroy it with cannon fire. Whilst efforts were made to vector these aircraft onto the target, radar contact with the target was reported lost at 18:37 hours. Reports indicated that at 18:41 hours these interceptors were still searching but that there was no contact with the target. The cloud was full cover at a height of 2 000 metres which made further search impracticable.

2.15.9 The USSR radar positions of KE 007 over Sakhalin Island were plotted every minute or every two minutes. The distance travelled by KE 007 in one minute on the plot varied considerably, for instance the distance between 18:25 and 18:26 hours was about 14 NM, but should have been about 7 NM based on the DFDR data. The radar plot of KE 007 provided by Japan contained a time (18:12 hours) at the beginning of the track and 18:29 hours at the end. Between these times KE 007 changed flight level and after the missile attack at 18:26:02 hours significant changes in heading, speed and altitude took place. Due to these inconsistencies and limited information on the radar plots it was not possible to determine the position of KE 007 at the time of the missile attack in relation to USSR sovereign airspace.

2.16 **The attack phase based on the CVR and the DFDR**

2.16.1 As a result of the damage caused by the missile the aircraft initially pitched up and the vertical acceleration increased to approximately 1.2 g over three to five seconds. During this period, the aircraft rolled very slightly right wing down.

2.16.2 The Boeing 747-200 aircraft had four separate hydraulically powered elevator control surfaces. Each outboard elevator was driven by the inboard elevator on the opposite side by means of a cross-over cable. Simulations by the aircraft's manufacturer suggested that the initial pitch up was probably caused by damage to the cross-over cable from the left inboard elevator to the right outboard one that caused the cable to unravel over a few seconds. The failure of the cable would command the right outboard elevator to move up to the maximum angle that it could attain with the force available from its hydraulic actuator.

2.16.3 Although autopilot A remained in the Command mode through this period, there was no control column movement to correct the pitch up. The aircraft's manufacturer concluded that this was probably due to a loss of hydraulic system No. 3 that powered the autopilot A actuator in the elevator control system. Hydraulic system No. 3 also provided half of the power to the hydraulic actuators driving the inboard left and outboard right elevator surfaces. With only half the power operating the latter surface, in the flight condition at which the attack occurred, the maximum available deflection would be about 5°.

2.16.4 Eleven seconds after the CAM recorded the first sounds of the attack, the sound of the cabin altitude warning was heard. Since any initial airflow out of holes in the pressure cabin at high altitude would be choked i.e. with a local speed of sound at the restriction, and as long as that condition persisted, it was possible to estimate the approximate total area of the 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 sq.ft.

2.16.5 The vertical acceleration remained at approximately 1.2 g for about seventeen seconds with the aircraft entering a climb at 7 000 ft/min. At this time, the autopilot tripped or was selected to OFF and the sound of the autopilot disconnect warning occurred. The control column then moved forward significantly. From the lack of response of the aircraft to this control input, it was concluded that there had probably also been failures of hydraulic systems No. 1 and 2. Such failures would have disabled the right inboard and left outboard elevators. Loss of systems 2 and 3 would have also disabled the yaw damper systems. This could account for the presence of oscillations in the lateral acceleration measurements and the roll attitudes from the start of the attack phase at a frequency close to that of the dutch roll of the undamped aircraft.

2.16.6 With the wing flaps up, lateral control of the Boeing 747 aircraft was achieved with the inboard ailerons and the five outer spoiler segments on each wing. When the only hydraulic power available was system No. 4, control was reduced to the right inboard aileron and the innermost of the spoiler segments on each side. Simulations by the aircraft's manufacturer showed that this reduction could account for most of the lack of aircraft response in roll to the control wheel inputs that were applied.

2.16.7 Even with the above failures, the pitch control that should have been available still exceeded that evident from the DFDR data. The aircraft's manufacturer found that a reduction in aerodynamic effectiveness of the left inboard elevator to at least half its normal value would have been required in order for their simulation to match the measured response. It was presumed that this had occurred due to surrounding structural damage.

2.16.8 In summary, it was evident that within a second or two of the first signs of a missile attack, the aircraft suffered the following damage :

a) failure of a rudder control cable or one of its attachments;

b) failure of a cross-over cable between the left inboard and right outboard elevators;

c) damage to the synchro monitoring the stabilizer angle for the DFDR that was mounted just aft of the stabilizer centre box or of its mechanical installation or wiring;

d) failure of hydraulic systems No. 1, 2 and 3;

e) structural damage in the region of the left inboard elevator that significantly reduced its aerodynamic effectiveness; and

f) puncturing of the pressure cabin with holes in the order of 1.75 sq.ft.

2.16.9 Although other alternatives were possible in view of the fact that two missiles were involved and reported to have exploded near the aircraft, all of the above damage could be associated with damage inflicted by a missile in the area of the stabilizer centre section. The rear pressure bulkhead was only about 7 ft ahead of that area.

2.16.10 From seventeen to forty seconds after the initial attack, the aircraft continued to climb and reached a maximum altitude of 38 250 ft with a reduction in calibrated airspeed from the initial 286 kt to 220 kt. From this combination of altitude and airspeed, estimates made by the aircraft's manufacturer indicated 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 infra-red guidance missile had not homed directly onto an engine.

2.16.11 After the aircraft started to descend and at the time of temporary recovery to about level flight, there were also significant fluctuations in the lateral acceleration that is a measure of the lateral aerodynamic force on the aircraft. This was probably indicative of a premature fin stall. At the time that the buffet commenced, the aircraft was still in a left turn but with a bank angle less than that normally required for zero sideslip; therefore, it would have been slipping out of the turn. The stall could have been aggravated by external damage to the fin or to the rudder mechanism.

2.16.12 It could not be established why both flight recorders simultaneously ceased to operate 104 seconds after the attack. The power supply cables were fed to the rear of the aircraft in raceways on opposite sides of the fuselage until they came together behind the two recorders.

2.17 The possibility of instrument failure

2.17.1 The flight crew of KE 007 did not report any problem, call for assistance, or indicate in any way that they were unable to comply with the navigational requirements of their assigned route. The fact that no difficulties were reported and that the flight crew provided position reports and forward estimates, and reported spot winds indicated that at least two of the INS systems were functioning normally. The aircraft departed Anchorage with a defect to the No. 2 compass system, which was deferred for rectification in Seoul. There remained four heading reference systems as well as the standby compass. There was no indication of an in-flight failure in the aircraft's instrumentation or navigation systems.

2.17.2 The CVR record of conversation on the flight deck and with KE 015 did not include any indication of an instrument failure or problems with navigation. At 18:05 hours the two crews discussed the anomaly of each aircraft experiencing different winds in what they believed to be the same vicinity and again there was no reference to navigation difficulties being experienced by KE 007.

2.18 The inertial navigation system

2.18.1 The flight crew used the autopilot in the heading select mode to fly a selected heading towards Bethel VORTAC before the aircraft was within the range of that facility. If subsequently, they either did not select the navigation mode switch to INS or made such a selection when the aircraft was outside the 7.5 NM envelope for the capture of a desired INS track and was flying away from that track, then the aircraft would have continued on the magnetic heading selected previously.

2.18.2 In the above situations the INS CDUs would have displayed the alert light as was normal prior to waypoint passage, and would have indicated waypoint passage when the aircraft passed abeam of the waypoint position. The indications to the crew that they were not making good the programmed waypoints would have included:

a) at waypoint passage the present position co-ordinates would have differed from those of the desired position;

b) the cross-track error would have progressively increased and would have become unacceptable at BETHEL and at the waypoints thereafter;

c) the distance to go to the waypoint when the alert light began flashing would not have been reconcilable with the time to go;

d) depending upon the selection of the VOR/ILS and INS switch, the captain's and/or the first officer's HSI would have indicated a maximum deviation from the desired track at BETHEL and thereafter;

e) the correct indications for the INS controlled automatic flight would not have been displayed on the flight director and autopilot mode annunciator panels; and

f) the aircraft would not have made the required heading changes at waypoint passage.

2.19 **Comparison of winds reported by KE 007 and KE 015**

2.19.1 The winds reported by KE 007 were 270/55 kt for NEEVA (15:58 hours) and 320/45 kt for NIPPI (17:07 hours); KE 015 reported 355/40 kt at NIPPI (17:14 hours) and 310/65 kt at NOKKA (18:31 hours). At 18:05 hours KE 007 and KE 015 exchanged wind information, KE 007 reported 215/15 kt whilst KE 015 reported 040/35 kt.

2.19.2 As a result of the exchange of wind information at 18:05 hours the crew of KE 015 asked why their aircraft was encountering a tailwind component not experienced by KE 007 and was overhauling KE 007. The crews believed that both aircraft were on R20 and that KE 015 was four minutes behind KE 007 and 2 000 ft higher up. The crew of KE 007 after a pause responded "maybe it can be so." The acceptance of the inconsistency between the winds reported by each aircraft pointed to a reduction in the situational awareness amongst the crew of KE 007.

2.20 **KE 007 crew activities**

2.20.1 There was no indication of physical incapacitation of the flight crew evident in their conversations on the flight deck or with KE 015 recorded on the CVR.

2.20.2 A study of the schedules of the crew since they left Seoul on 27 August 1983, revealed that although they had not exceeded the crew duty time limits they had significant time zone changes on each flight. After flying from Seoul to Anchorage they had a 22 hour break and after continuing to New York 31 hours rest where the local time was 13 hours behind Korean time. Having started their adjustment to the eastward time zone change they then headed west to Anchorage with a 5 hour time zone difference and after 11 hours 45 minutes rest in Anchorage departed for Seoul.

2.20.3 This disruption to their Circadian rhythms had the potential to affect their fitness for duty particularly as Korean Air Lines' schedules were typically long haul east/west flights with basic three member flight crews and the crews were operating a high percentage of the permitted crew duty time. There was thus a potential for fatigue due to the continual disruption of the crew member's basic rhythms. Such fatigue might have suppressed the crew's ability to take an active interest in the progress of the flight. On the long overwater flight, which was planned along an airway system with only minor heading changes required at waypoints, the crew might have been content to accept the indication of waypoint passage without performing the normal navigational checks.

2.20.4 Analysis of the CVR indicated a normal, relaxed atmosphere on the flight deck associated with long flights. The crew was interacting jovially with each other and, as was commonplace in such circumstances, discussing matters unrelated to the flight which indicated they were unaware that the aircraft was off its intended track. There was some indication by the first officer that he was finding the flight tedious which would be improbable if the crew was deliberately transgressing a prohibited area.

2.21 Computer simulation of flight KE 007

2.21.1 Since no INS data was recorded on the DFDR, computation of the track of the aircraft was determined using the following information:

a) pressure altitudes, calibrated airspeeds and magnetic headings from the DFDR;

b) elapsed time based on the FDAU clock that controlled the serial digital output to the DFDR;

c) wind directions and magnitudes based on meteorological data and four air-reports from KE 007 and one observation at 18:05 hours recorded on the CVR;

d) air temperatures from the four air-reports made by KE 007;

e) magnetic variations based on the International Geomagnetic Reference Field corrected to the date of the occurrence; and

f) conversion of incremental distances on the earth's surface into changes in latitude and longitude based on United States Coast and Geodetic Survey tables.

The accuracy of these computations was limited by the nature and quality of some of the information available, and small adjustments were made to the wind velocities, the calibrated airspeeds and the magnetic headings. The adjustments to the winds were within the tolerances of the established windfield, and corrections for airspeed and magnetic heading were -2.0 kt and +2.2°, respectively, which was within the tolerances of the measuring systems. The computed track matched the track of KE 007 as known from the radar records available.

2.22 Full-scale simulation of flight KE 007

2.22.1 A full-scale simulation of flight KE 007 from Anchorage to the area east of Sakhalin Island was conducted in the Korean Air flight crew training centre in Inchon, Republic of Korea, from 1 to 4 June 1993. A B747-200 flight simulator was programmed for flight KE 007 using flight planning information and DFDR data. The results of the computer simulation described in section 2.21 were confirmed. The simulation confirmed the indications which would have been available to the flight crew that they were not following the programmed waypoints as summarized in paragraph 2.18.2 above.

2.22.2 A further scenario was simulated representing the first hour and a half of flight with a generated drift error in two of the INS. Using the INS triple-mix navigation function, a track similar to that flown by KE 007 was produced. The simulation confirmed the analysis in sections 2.10 and 2.11 above, regarding the virtual impossibility of INS malfunction combined with the record of a constant magnetic heading over a long period.

3. CONCLUSIONS

3.1 The flight crew was properly certificated and qualified for the flight.

3.2 The flight crew were physically fit but extended time zone crossings and the level of utilization of crew flight and duty times had the potential for one or more of the flight crew to experience fatigue and a reduction of situational awareness.

3.3 The aircraft was properly certificated and had been maintained in accordance with approved procedures. The aircraft was serviceable when dispatched from Anchorage.

3.4 There was no indication of an in-flight failure of the navigation systems, the weather radar, the instrumentation or other equipment of the aircraft.

3.5 The adjustment of the departure time for the flight was in accordance with Korean Air Lines' standard practice.

3.6 The actual time of departure of KE 007 would have resulted in an on-time arrival in Seoul.

3.7 KE 007 turned to a magnetic heading of about 245° which it reached three minutes after lift-off and then maintained until the attack.

3.8 KE 007 passed approximately 6 NM north of Cairn Mountain NDB and 12 NM north of Bethel VORTAC.

3.9 The maintenance of a constant magnetic heading and the resulting track deviation was due to the crew's failure to note that the autopilot had either been left in heading mode or had been switched to INS when the aircraft was beyond the range (7.5 NM) for the INS to capture the desired track.

3.10 The maintenance of a constant magnetic heading was not due to any aircraft system malfunction.

3.11 The autopilot was not controlled by an INS.

3.12 Manual control of the autopilot was not exercised by the crew by the use of heading selection.

3.13 The flight crew's failure to detect that the navigation systems had not been selected correctly to maintain the desired track may have been contributed to by inadequate displays of the operative modes selected.

3.14 The flight crew did not implement the proper navigation procedures to ensure the aircraft remained on its assigned track throughout the flight.

3.15 The failure to detect the aircraft's deviation from its assigned track for over five hours indicated a lack of situational awareness and flight deck co-ordination on the part of the crew.

3.16 Korean Air Lines training procedures on the use of INS were adequate.

3.17 The flight crew had the necessary training and experience in long-range navigation procedures.

3.18 The deviation from its assigned track resulted in KE 007 penetrating USSR sovereign airspace over Kamchatka Peninsula and Sakhalin Island and the surrounding territorial waters.

3.19 According to the representatives of the United States, the military radar installations in Alaska were not aware in real time that the aircraft was proceeding west with an increasing northerly deviation from the recognized airways system.

3.20 KE 007 proceeded westbound out of the Alaskan ADIZ, through the Alaskan DEWIZ and the Alaskan Air Command buffer zone well north of R20. According to the representatives of the United States, no radar observations were made of a westbound aircraft north of R20 and crossing the Alaskan identification zones.

3.21 There were no indications that the crew of KE 007 deliberately maintained a constant magnetic heading.

3.22 There was a normal, relaxed atmosphere on the flight deck of KE 007.

3.23 The proximity of an RC-135 (a United States intelligence aircraft) and KE 007 northeast of Kamchatka Peninsula resulted in confusion and the assumption by the USSR air defence that the aircraft proceeding towards the USSR was an RC-135.

3.24 USSR military aircraft attempted to intercept KE 007 over Kamchatka Peninsula.

3.25 Information was freely available to flight crews that an aircraft penetrating prohibited areas of USSR sovereign airspace over Kamchatka Peninsula and Sakhalin Island might be fired upon without warning.

3.26 The USSR air defence command centre personnel on Sakhalin Island were concerned with the position of the intruder aircraft in relation to USSR sovereign airspace as well as its identity.

3.27 The time factor became paramount in the USSR air defence command centres as the intruder aircraft was about to coast out from Sakhalin Island.

3.28 Exhaustive efforts to identify the intruder aircraft were not made, although apparently some doubt remained regarding its identity.

3.29 USSR military aircraft intercepted KE 007 over Sakhalin Island.

3.30 It was not possible to assess the distance of the interceptor aircraft from the intruder nor their relative positions when the interceptor's lights were flashed and the cannon fired.

3.31 The USSR military aircraft did not comply with the ICAO standards and recommended practices for interception of civil aircraft before attacking KE 007.

3.32 The USSR air defence command assumed that KE 007 was a United States RC-135 reconnaissance aircraft before they ordered its destruction.

3.33 The military radar installations of the Japanese Defence Agency were aware that an aircraft was tracking into USSR airspace over Sakhalin Island. According to the representatives of Japan, they were not aware that it was a civil aircraft off its intended track.

3.34 According to the representatives of Japan KE 007 was squawking SSR code 1300 when observed by the Japanese military radar installations.

3.35 It was common practice among flight crews to squawk a non-discrete SSR code ending with zero zero before selecting code 2000 for entry into Tokyo radar controlled airspace in the vicinity of NOHO.

3.36 The flight crew of KE 007 was not aware of the presence of the USSR interceptor aircraft before or at the time of the attack.

3.37 KE 007 was hit by at least one of two air-to-air missiles fired from a USSR SU-15 interceptor aircraft.

3.38 As a result of the attack there was substantial damage to KE 007 which affected the controllability of the aircraft and caused a loss of cabin pressure. The flight crew of KE 007 retained limited control of the aircraft and responded correctly to the loss of cabin pressure.

3.39 It was not possible to determine the position of KE 007 at the time of the missile attack in relation to USSR sovereign airspace.

3.40 The flight recorders simultaneously ceased operation 1 minute 44 seconds after the missile impact.

3.41 The aircraft descended in a spiral and radar contact was lost at 5 000 metres at 18:35 hours. It could not be established whether the crew was able to maintain limited control.

3.42 The aircraft was destroyed on impact with the sea. The impact was not survivable.

3.43 During the interception USSR rescue services were alerted and following the destruction of KE 007 they were directed to the area.

3.44 The Tokyo ACC and RCC took the appropriate steps to alert the emergency services when the aircraft became overdue.

4. SAFETY ACTIONS TAKEN SINCE 1983

4.1 Following the ICAO fact-finding investigation of the destruction of Korean Air Lines flight KE 007 in 1983, the ICAO provisions pertaining to interception of civil aircraft were examined and amendments were made to Annexes 2, 6 (Parts I and II), 10 (Volume I) and 11, the PANS-RAC (Doc 4444) and the PANS-OPS (Doc 8168). The Annex amendments became applicable in November 1986. Associated guidance material concerning interception of civil aircraft was developed and the Manual concerning Interception of Civil Aircraft (Doc 9433) was published in 1984.

4.2 Following the ICAO fact-finding investigation of the destruction of Iran Air flight 655 in 1988, a second edition of the Manual concerning Interception of Civil Aircraft (Doc 9433) was published in 1990. It consolidated all ICAO provisions and special recommendations relating to the interception of civil aircraft and contained guidance material in amplification of the various provisions and special recommendations. In addition, the Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations (Doc 9554) was developed and published in 1990.

4.3 Guidance on the use of weather radar in long range navigation has been included in the North Atlantic MNPS Airspace Operations Manual and the North Pacific Airspace Operations Manual published since 1983.

4.4 Significant enhancements in the fields of communications, navigation and surveillance have been implemented since 1983 for operations in the NOPAC route system. The United States has integrated several civil and military surveillance radars into the Anchorage ARTCC. Mandatory navigation cross-checking procedures have been implemented. Following the signing in 1985 of a trilateral Memorandum of Understanding between Japan, the USSR and the United States, a dedicated voice circuit was commissioned in 1986 between Anchorage, Khabarovsk and Tokyo, with corresponding operating procedures. Further improvements are being pursued between the Russian Federation and the United States to accommodate a growing demand for safe, regular, efficient and economical civil flight operations in the area.

5. RECOMMENDATION

5.1 It is recommended that where existing aircraft are not already fitted with a clear indication when the autopilot and flight director are in the heading mode:

a) operators remind crews of the consequences of leaving the autopilot and flight director in heading select mode;

b) procedures for long-range navigation include a specific check that INS has captured the navigation mode before entering oceanic airspace; and

c) consideration be given to retrofitting all aircraft not so equipped with a mode annunciator with an indication of "heading select" mode operation.

GLOSSARY

AC	Alternating current
ACC	Area Control Centre
ADI	Attitude Direction Indicator
ADIZ	Air Defence Identification Zone
AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AMS	Aeronautical Mobile Service
APP	Approach Control
ARINC	Aeronautical Radio Incorporated
ARO	ATS Reporting Office
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Centre
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Service
BEA	Bureau Enquêtes-Accidents (France)
B747	Boeing Commercial Airplane Company 747 series of aircraft
CAM	Cockpit Area Microphone
CAPT	Captain
CD	Clearance Delivery (ATC)
CDU	Control Display Unit
CIWS	Central Instrument Warning System
CVR	Cockpit Voice Recorder
DEWIZ	Distant Early Warning Identification Zone
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
EPR	Engine Pressure Ratio
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration (United States)
FBI	Federal Bureau of Investigation (United States)
FDAU	Flight Data Acquisition Unit
FIR	Flight Information Region
FL	Flight Level
FO	First Officer
FSS	Flight Service Station
ft	foot/feet

g	Acceleration due to gravity
GPWS	Ground Proximity Warning System
HDG	Heading
HF	High Frequency (3000 to 30 000 kHz)
HL	Letters prefixing Korean aircraft registration
hPa	Hectopascals
HSI	Horizontal Situation Indicator
Hz	Hertz
ICAO	International Civil Aviation Organization
IFSS	International Flight Service Station
ILS	Instrument Landing System
INS	Inertial Navigation System
INU	Inertial Navigation Unit
JDA	Japanese Defence Agency
JFK	John F. Kennedy Airport, New York
JMSA	Japanese Maritime Safety Agency
KAL	Korean Air Lines
KE	Designator for Korean Air Lines' flight
kHz	Kilohertz
kt	Knots
LTN	Identifying prefix for equipment manufactured by Litton
MHz	Megahertz
MIG	Prefix for USSR military aircraft designed by the Mikoyan Bureau
min	Minute
MNPS	Minimum Navigation Performance Specifications
MSU	Mode Selector Unit
NAV	Navigation
NDB	Non-Directional Beacon
NM	Nautical Miles
No.	Number
NOPAC	North Pacific
NOTAM	A notice containing information, the timely knowledge of which is essential to personnel concerned with flight operations
OAC	Oceanic Area Control Centre
OTR	Oceanic Transit Route
RCAG	Remote Control Air-Ground
RCC	Rescue Co-ordination Centre
RD	Radar Sector

RMI	Radio Magnetic Indicator
SID	Standard Instrument Departure
SSR	Secondary Surveillance Radar
sq	Square
SU	Prefix for USSR military aircraft designed by the Sukhoi Bureau
TACAN	Tactical Air Navigation Aid
TWR	Aerodrome Control Tower
USAF	United States Air Force
USSR	Union of Soviet Socialist Republics
UTC	Co-ordinated Universal Time
VHF	Very High Frequency (30 to 300 MHz)
VOR	Very High Frequency Omni-directional Radio Range
VORTAC	VOR and TACAN Combination

ATTACHMENT C to State letter 93/68

BACKGROUND INFORMATION RELATED TO THE REPORT OF THE COMPLETION OF THE FACT-FINDING INVESTIGATION REGARDING THE SHOOTING DOWN OF KOREAN AIR LINES BOEING 747 (FLIGHT KE 007) ON 31 AUGUST 1983

Attachment C is issued as background information and reproduces only material that is already available in English.

BACKGROUND INFORMATION

KE-007 CVR AND RADIO COMMUNICATIONS TRANSCRIPTS

TABLE OF CONTENTS

KE-007 CVR TRANSCRIPT

17:54:10 to 18:27:46 UTC

Abbreviations:

F/D	—	Flight deck
C	—	Captain
FO	—	First officer
FE	—	Flight engineer
CA	—	Cabin attendant
PA	—	Public announcement
HF	—	High frequency (radio)
VHF	—	Very high frequency (radio)
English	—	words spoken in English are in uppercase letters
Korean	—	words spoken in Korean have been translated into English and are in lowercase letters
Dynasty	—	radio communications call sign for China Air Lines

KE-007 CVR TRANSCRIPT

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	00.16	17:54:26	F/D			Have you had a long flight recently?	
	00.18	17:54:28	F/D			From time to time	
	00.20	17:54:30	F/D			Sounds good, as far as I know Chief Pilot Park has a long flight occasionally, but Chief Pilot Lee has ... (unreadable)	
	00.53	17:55:03	F/D			... (unreadable)	
	01.34	17:55:44	F/D			Ah (yawn)	
	04.25	17:58:35	F/D			Ah (yawn)	
	04.31	17:58:41	F/D FO			Having a dull time please write down a comment now	
	04.37	17:58:47	F/D C			Yes ... (unreadable) ... give it to me	
	04.39	17:58:49	F/D FO			If you don't write it I might not pass the document check	
	04.48	17:58:58	F/D			Please write down separately I have already done it three times but write down two here. One landing is Narita the other is Anchorage ... (unreadable)	
	05.03	17:59:13	F/D FO			No I cannot do that	
	05.05	17:59:15	F/D C			Why? You can do that	
	05.08	17:59:18	F/D FO			The instructor will not write here so I will have to write it all myself	
	05.16	17:59:26	F/D C			I am not an instructor either	
	05.17	17:59:27	F/D FO			No if you are not an instructor, you can do it anyway	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	05.23	17:59:33	F/D C			Don't you have anything else to sign?	
	05.28	17:59:38	F/D FO			Please sign here	
	05.42	17:59:52	F/D FO			I heard that last time Chief Pilot Lee Sang Tuk checked nine persons seven failed the document check	
	05.50	18:00:00	F/D			[NOISE – COCKPIT DOOR ?]	
	05.58	18:00:08	F/D FE			Let's reduce ... (unreadable)	
	06.01	18:00:11	F/D CA			Captain sir, would you like to have a meal?	
	06.03	18:00:13	F/D C			What?	
	06.05	18:00:15	F/D C			Meal? Is it already time to eat?	
	06.08	18:00:18	PA		(Cabin announcement in Korean, see English announcement at 18:00:36)		
	06.09	18:00:19	F/D			... (unreadable)	
	06.14	18:00:24	F/D CA			... (unreadable)	
	06.16	18:00:26	F/D			Do you want to eat now?	
	06.19	18:00:29	F/D			Let's eat later	
	06.26	18:00:36	PA		GOOD MORNING LADIES AND GENTLEMEN, WE WILL BE LANDING AT SEOUL KIMPO INTERNATIONAL AIRPORT IN ABOUT THREE HOURS. LOCAL TIME IN SEOUL RIGHT NOW IS THREE A.M. BEFORE LANDING WE WILL BE SERVING BEVERAGES AND BREAKFAST. THANK YOU.		
	06.28	18:00:38	F/D C			Well, if you say it too many times, it becomes a lie	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	06.31	18:00:41	F/D C			Well, if you say too many times the good things, it becomes bad. Doesn't it?	
	06.47	18:00:57	PA		(Cabin announcement in Japanese, see English announcement at 18:00:36)		
	06.53	18:01:03	F/D			... The person must live this way ...	
	06.58	18:01:08	F/D			[NOISE – COCKPIT DOOR ?]	
	07.08	18:01:18	F/D			... (unreadable)	
	07.12	18:01:22	F/D			... (unreadable	
	07.46	18:01:56	F/D FO			... Why is it still so dark?	
	07.49	18:01:59	F/D FE			It is still a long way to go	
	07.52	18:02:02	F/D FO			Isn't it time for sunrise yet?	
	08.29	18:02:39	F/D C			... (unreadable) ... after doing ... (unreadable) ... check	
	08.35	18:02:45	F/D FO			This is who writes ... I won't write	
	08.37	18:02:47	F/D C			Do it yourself	
	08.40	18:02:50	F/D FO			Please write	
	08.41	18:02:51	F/D C			Write it yourself	
	08.42	18:02:52	F/D FO			How can I write it down myself	
	08.45	18:02:55	F/D C			I don't care if you do it or not	
	08.48	18:02:58	F/D FO			If I write it myself, in my own handwriting, I will fail the document check because ... (unreadable)	
	09.04	18:03:14	015 VHF	ZERO ZERO SEVEN	AS 1	AS 1	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
19293	09.09	18:03:19	007 VHF 3	GO AHEAD	AS 1	AS 1	
	09.11	18:03:21	015 VHF	What are you doing?	AS 1	AS 1	
	09.14	18:03:24	007 VHF 3	What?	AS 1	AS 1	
	09.16	18:03:26	015 VHF	I said what are you doing?	AS 1	AS 1	AS 1
19304 - 19309	09.20	18:03:30	007 VHF 3	We are ... we have a pleasant chat because Mr. Kim here is giving us a little fun	AS 1	AS 1	AS 1
	09.28	18:03:38	015 VHF	(Laughter) Well, after arrival in Seoul ... it is better for you to study all those things	AS 1	AS 1	AS 1
19319 - 19325	09.35	18:03:45	007 VHF 3 C	Study what? There is nothing to be studied ... By the way, what a good season, it's autumn. I hope I could take a day off and for autumn leaves viewing	AS 1	AS 1	AS 1
	09.43	18:03:53	015 VHF	Make a schedule. Make a schedule	AS 1	AS 1	AS 1
19330 - 19331	09.46	18:03:56	007 VHF 3	Why don't you take some time off and go to Sorak Mountain	AS 1	AS 1	AS 1
	09.54	18:04:04	F/D			Why ... (unreadable) do you do that ... (unreadable)	
	09.55	18:04:05	015 VHF	Are you about three minutes ahead of us?	AS 1	AS 1	AS 1
	09.56	18:04:06	F/D			Yes	
19344	10.00	18:04:10	007 VHF 3	AH AH	AS 1	AS 1	AS 1
19354 - 19362	10.10	18:04:20	007 VHF 3	NOKKA ESTIMATE is ONE EIGHT TWO er TWO FIVE OVER	AS 1	AS 1	AS 1

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	10.20	18:04:30	015 VHF	AH AH TWO FIVE we estimate ONE EIGHT TWO NINE, ONE EIGHT TWO NINE	AS 1	AS 1	AS 1
19369 - 19371	10.25	18:04:35	007 VHF 3	One minute late one minute FOUR minutes faster it's TWO FIVE	AS 1	AS 1	AS 1
19375 - 19383	10.32	18:04:41	007 VHF 3	It will be very complicated to go through customs. If you want to go faster, go faster if you want to go slower, go slower. That's the complication	AS 1	AS 1	AS 1
	10.45	18:04:55	015 VHF	Um Um We are now having an unexpected strong tailwind	AS 1	AS 1	AS 1
19393 - 19394	10.49	18:04:59	007 VHF 3	How much do you get there? How much and which direction?	AS 1	AS 1	AS 1
19396 - 19398	10.53	18:05:02	007 VHF 3	TWO ZERO SIX	AS 1	AS 1	AS 1
	10.54	18:05:04	F/D	AS 3	AS 3	Ask him how many knots?	AS 3
	10.56	18:05:06	015 VHF	THIRTY-FIVE KNOTS	AS 1	AS 1	AS 1
19401 - 19403	10.57	18:05:07	007 VHF 3	Um which direction, which direction	AS 1	AS 1	AS 1
	11.02	18:05:12	015 VHF	ZERO FOUR ZERO, ZERO FOUR ZERO	AS 1	AS 1	AS 1
19409 - 19410	11.05	18:05:15	007 VHF 3	Thirty degrees? Thirty knots?	AS 1	AS 1	AS 1
	11.08	18:05:18	015 VHF	Thirty um forty degrees direction THIRTY FIVE KNOTS	AS 1	AS 1	AS 1
19417 - 19423	11.13	18:05:23	007 VHF 3	Ah! You got so much! We still got headwind. Headwind two hundred fifteen degrees FIFTEEN KNOTS	AS 1		AS 1

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	11.22	18:05:32	015 VHF	Is it so? But according to FLIGHT PLAN wind direction THREE SIX ZERO FIFTEEN KNOTS approximately	AS 1	AS 1	AS 1
19434	11.30	18:05:40	007 VHF 3	Well it may be like this	AS 1	AS 1	AS 1
	11.37	18:05:47	F/D			(noise – yawn)	
	11.41	18:05:51	F/D			(noise – yawn)	
	11.42	18:05:52	F/D			The reason why to do this	
	11.45	18:05:55	F/D			Is he ahead of us?	
	11.47	18:05:57	F/D			Is he ahead of us?	
	11.48	18:05:58	F/D			... (unreadable)	
	11.56	18:06:06	F/D			... (unreadable)	
	12.22	18:06:32	F/D			[NOISE – COCKPIT DOOR ?]	
	13.18	18:07:28	F/D			Let him go faster. ZERO ONE FIVE is same TWO NINE at NOKKA as us. Let him go faster.	
	13.33	18:07:43	F/D			Why are they in such a hurry?	
	13.36	18:07:46	F/D			They have tailwind	
	13.37	18:07:47	F/D			What?	
	13.38	18:07:48	F/D			They have tailwind THIRTY-FIVE KNOTS	
	13.39	18:07:49	F/D			Oh oh	
	13.42	18:07:52	F/D			... (unreadable)	
	14.22	18:08:32	F/D			[NOISE – COCKPIT DOOR ?]	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	14.26	18:08:36	015 VHF	ZERO ZERO SEVEN	AS 1	AS 1	AS 1
19613	14.29	18:08:37	007 VHF 3	Go ahead	AS 1	AS 1	AS 1
	14.32	18:08:42	015 VHF	Can you go up to flight level THREE FIVE ZERO	AS 1	AS 1	AS 1
	14.36	18:08:46	007 VHF 3	Sure we can	AS 1	AS 1	AS 1
	14.38	18:08:48	015 VHF	OK we will REQUEST THREE SEVEN ZERO	AS 1	AS 1	AS 1
	14.41	18:08:51	007 VHF 3	OK	AS 1	AS 1	AS 1
	14.47	18:08:57	015 HF	TOKYO RADIO KOREAN AIR ZERO ONE FIVE		AS 1	
	14.54	18:09:04	TOKYO HF	STATION CALLING TOKYO GO AHEAD	AS 1	AS 1	
	14.56	18:09:06	015 HF	AH ROGER KOREAN AIR ZERO ONE FIVE NOW MAINTAINS THREE FIVE ZERO REQUEST FLIGHT LEVEL THREE SEVEN ZERO OVER	AS 1	AS 1	AS 1
	15.04	18:09:14	TOKYO HF	TOKYO ROGER STAND BY CALL YOU BACK	AS 1	AS 1	AS 1
	15.07	18:09:17	015 HF	ROGER STANDING BY	AS 1	AS 1	AS 1
	17.17	18:11:27	F/D			I have heard that there is currency exchange at our airport	
	17.20	18:11:30	F/D			In the airport currency exchange? What kind of money?	
	17.23	18:11:33	F/D			Dollar to Korean money	
	17.26	18:11:36	F/D			... (unreadable)	
	17.29	18:11:39	F/D			That is in the domestic building too, domestic building too	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	17.30	18:11:40	F/D			Domestic. Where?	
	17.31	18:11:41	F/D			That is Cho-Hung Bank in the domestic building	
	17.33	18:11:43	F/D			Can I exchange in Cho-Hung Bank?	
	17.34	18:11:44	F/D			Sure. There used to be no place in the domestic building	
	17.39	18:11:49	F/D			If you go to Cho-Hung Bank in the domestic building ... What kind of money do you wish to exchange? Dollar to Korean money is all right, is all right	
	17.45	18:11:55	F/D			Yes	
	17.47	18:11:57	F/D			That is in the domestic building also	
	17.49	18:11:59	F/D			It could be open nine o'clock in the morning. It could be ten o'clock in the morning.	
	17.51	18:12:01	F/D			It might be nine thirty	
	19.18	18:13:28	F/D			... (unreadable) ...	
	20.20	18:14:30		[SELCAL]			
	20.25	18:14:35	015 HF	... KOREAN AIR ZERO ONE FIVE SELCAL GO AHEAD	AS 1	AS 1	
	20.29	18:14:39	TOKYO HF	KOREAN AIR ZERO ONE FIVE. CLEARANCE TOKYO ATC CLEARS KOREAN AIR ZERO ONE FIVE CLIMB AND MAINTAIN FLIGHT LEVEL THREE SEVEN ZERO REPORT REACHING	AS 1	AS 1	
	20.40	18:14:50	015 HF	... CLEARS ... CLIMB AH THREE SEVEN ZERO NOW LEAVING THREE FIVE ZERO FOR REPORT REACHING	AS 1	AS 1	AS 1

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	20.47	18:14:57	TOKYO HF	TOKYO	AS 1	AS 1	AS 1
19992 - 19993	20.49	18:14.59	007 HF 1	TOKYO RADIO KOREAN AIR ZERO ZERO SEVEN	AS 1	AS 1	AS 1
	20.53	18:15:03	TOKYO HF	KOREAN AIR ZERO ZERO SEVEN TOKYO	AS 1	AS 1	AS 1
19999 - 20003	20.57	18:15:07	007 HF 1	KOREAN AIR ZERO ZERO SEVEN REQUESTING CLIMB THREE FIVE ZERO	AS 1	AS 1	AS 1
	21.03	18:15:13	TOKYO HF	REQUESTING THREE FIVE ZERO?	AS 1	AS 1	AS 1
20007 - 20010	21.05	18:15:15	007 HF 1	THAT IS AFFIRMATIVE NOW MAINTAIN AT THREE THREE ZERO KOREAN AIR ZERO ZERO SEVEN	AS 1	AS 1	AS 1
	21.09	18:15:19	TOKYO HF	ROGER STAND BY CALL YOU BACK	AS 1	AS 1	AS 1
	21.11	18:15:21	007 HF 1	ROGER	AS 1	AS 1	AS 1
	21.15	18:15:21	F/D			Oh my God! This RADIO is very bad	
	21.42	18:15:52					[AUDIBLE MORSE TRANSMISSIONS START]
	23.34	18:17:44	015 HF	TOKYO RADIO KOREAN AIR ZERO ONE FIVE REACHING ER THREE SEVEN ZERO	AS 1		AS 1
	23.39	18:17:49	TOKYO HF	KOREAN AIR ZERO ONE FIVE TOKYO ROGER	AS 1		AS 1
	23.56	18:18:06		AS 3	AS 3	[MORSE TRANSMISSIONS AUDIBLE]	[MARKED INCREASE IN VOLUME OF MORSE TRANSMISSIONS]
	24.56	18:19:06				... (unreadable)	
	25.10	18:19:20				... (unreadable)	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	25.16	18:19:26				... (unreadable)	
	25.30	18:19:40				... (unreadable)	
	25.52	18:20.02	TOKYO HF	[SELCAL]	AS 1	AS 1	AS 1
20301 - 20302	25.59	18:20:09	007 HF 1	KOREAN AIR ZERO ZERO SEVEN SELCAL	AS 1	AS 1	AS 1
	26.00	18:20:10		AS 4	AS 4	AS 4	[MORSE TRANSMISSIONS END]
	26.01	18:20:11 18:20:20	TOKYO HF	KOREAN AIR ZERO ZERO SEVEN CLEARANCE TOKYO ATC CLEARS KOREAN AIR ZERO ZERO SEVEN CLIMB AND MAINTAIN FLIGHT LEVEL THREE FIVE ZERO	AS 1	AS 1	AS 1
20313 - 20318	26.11	18:20:21 18:20:27	007 HF 1	AH ROGER KOREAN AIR ZERO ZERO SEVEN CLIMB AND MAINTAIN AT THREE FIVE ZERO LEAVING THREE THREE ZERO AT THIS TIME	AS 1	AS 1	AS 1
	26.18	18:20:28	TOKYO HF	TOKYO ROGER		AS 1	AS 1
	27.38	18:21:48	F/D			[SOUND – ALTITUDE ALERT]	
	28.45	18:22:55	F/D				(KEYED MICROPHONE)
20469 - 20471	28.46	18:22:56	007 HF 1	TOKYO RADIO KOREAN AIR ZERO ZERO SEVEN REACHING LEVEL THREE FIVE ZERO	AS 1	AS 1	AS 1
	28.50	18:23:00	TOKYO HF	KOREAN AIR ZERO ZERO SEVEN TOKYO ROGER	AS 1	AS 1	AS 1
	31.45	18:25:55	DYNASTY 312 HF				TOKYO RADIO DYNASTY THREE ONE TWO ON FIVE SIX
	31.50	18:26:00	TOKYO HF				DYNASTY THREE ONE TWO TOKYO

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	31.52	18:26:02				[SOUND – EXPLOSION?]	
	31.53	18:26:03 18:26:28	DYNASTY 312 HF				DYNASTY THREE ONE TWO POSITION PAYON ONE EIGHT TWO FIVE LEVEL THREE THREE ZERO ESTIMATE SHEMYA ONE NINE THREE FIVE REMAINDER ... REMAINING ONE TWO SIX DECIMAL ZERO MINUS FIVE ZERO ... ONE ZERO DIAGONAL FOUR ZERO GO AHEAD
	31.56	18:26:06	F/D			What's happened?	
	31.58	18:26:08	F/D			What?	
	32.00	18:26:10	F/D			Retard THROTTLES	
	32.01	18:26:11	F/D			ENGINES normal	
	32.04	18:26:14	F/D			LANDING GEAR	
	32.05	18:26:15	F/D			[SOUND – CABIN ALTITUDE WARNING]	
	32.07	18:26:17	F/D			LANDING GEAR [NOISE – POSSIBLE SOUND OF SELECTION]	
	32.08	18:26:18	F/D			[SOUND – ALTITUDE DEVIATION WARNING]	
	32.11	18:26:21	F/D			[SOUND – AUTO PILOT DISCONNECT WARNING]	
	32.12	18:26:22	F/D			Altitude is going up	
	32.13	18:26:23	F/D			[SOUND – CABIN CALL]	
	32.14	18:26:24	F/D			Altitude is going up	
	32.15	18:26:25	F/D			SPEED BRAKE is coming out	
	32.16	18:26:26	F/D		[SOUND – CABIN CALL]	What? What?	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	32.17	18:26:27	F/D				(unreadable)
	32.19	18:26:29	F/D			CHECK it out	
	32.20	18:26:30	PA		[SOUND – PA CHIME FOR AUTOMATIC CABIN ANNOUNCEMENT]	[SOUND – PA CHIME]	
	32:20	18:26:30	TOKYO HF				DYNASTY THREE ONE TWO ... CONTACT ANCHORAGE
	32.23	18:26:33	F/D			[SOUND – CABIN CALL] I am not able to drop altitude now unable	
	32.24	18:26:34	PA		Attention emergency descent		
	32.25	18:26:35	DYNASTY 312 HF				THANK YOU OUT
	32.28	18:26:38	PA F/D		ATTENTION EMERGENCY DESCENT	Altitude is going up	
	32.30	18:26:40	F/D			This is not working. This is not working	
	32.31	18:26:41	F/D			Manually	
	32.32	18:26:42	PA		Attention emergency descent (in Japanese)	Cannot do MANUALLY	
	32.33	18:26:43	F/D			[SOUND – A/P DISCONNECT WARNING] Not working manually also	
	32.35	18:26:45	F/D			ENGINES are normal Sir	
	32.36	18:26:46	PA		Put out your cigarette. This is an emergency descent		
	32.38	18:26:48	F/D			... (unreadable)	
	32.39	18:26:49	PA		PUT OUT YOUR CIGARETTE. THIS IS AN EMERGENCY DESCENT		
	32.40	18:26:50	F/D	(KEYED MICROPHONE)		Is it POWER COMPRESSION?	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	32.41	18:26:51	F/D			Is that right?	
	32.42	18:26:52	PA F/D FE		Put out your cigarette. This is an emergency descent (in Japanese)	... all of both ... (unreadable)	
	32.44	18:26:54	F/D C			Is that right?	
20708	32.45	18:26:55	F/D PA 007 HF 1	(KEYED MICROPHONE)	Put the mask over your nose and mouth and adjust the head band		(KEYED MICROPHONE)
20711 - 20712	32.47	18:26:57	007 HF 1 F/D	TOKYO RADIO KOREAN AIR ZERO ZERO SEVEN		AS 1	AS 1
	32.51	18:27:01	PA		PUT THE MASK OVER YOUR NOSE AND MOUTH AND ADJUST THE HEAD BAND		
	32.52	18:27:02	TOKYO HF	KOREAN AIR ZERO ZERO SEVEN TOKYO		AS 1	AS 1
20717 - 20721	32.54	18:27:04	007 HF 1 FO	ROGER KOREAN AIR ZERO ZERO SEVEN ... (UNREADABLE) AH WE (ARE EXPERIENCING) ...		AS 1	AS 1
	32.58	18:27:08	PA		Put the mask over your nose and mouth and adjust the head band (in Japanese)		
	32.59	18:27:09	F/D C			ALL COMPRESSION	
20723 - 20727	33.00	18:27:10	007 HF 1 FO	RAPID COMPRESSIONS DESCEND TO ONE ZERO THOUSAND			
	33.05	18:27:15	PA		Attention emergency descent		
	33.09	18:27:19	PA		ATTENTION EMERGENCY DESCENT		
	33.10	18:27:20	F/D			Now... (unreadable) ... we have to set this	

TIME				CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
DFDR	CVR	UTC	FROM	FIRST OFFICER	3RD CREW MEMBER AND PA	COCKPIT AREA MICROPHONE	CAPTAIN
	33.11	18:27:21	TOKYO HF	KOREAN AIR ZERO ZERO SEVEN UNREADABLE UNREADABLE RADIO CHECK ON ONE ZERO ZERO FOUR EIGHT		AS 1	AS 1
	33.13	18:27:23	F/D PA		Attention emergency descent (in Japanese)	Speed	
	33.16	18:27:26				Stand by Stand by Stand by Stand by set	
	33.17	18:27:27	PA		Put out your cigarette. This is an emergency descent		
	33.20	18:27:30	PA F/D		PUT OUT YOUR CIGARETTE. THIS IS AN EMERGENCY DESCENT	(INCREASING NOISE ON ALL CHANNELS)	
	33.23	18:27:33	PA		Put out your cigarette. This is an emergency descent (in Japanese)		
	33.28	18:27:38	PA		Put the mask over your nose and mouth and adjust the head band		
	33.33	18:27:43	PA		PUT THE MASK OVER YOUR NOSE AND MOUTH AND ADJUST ...		
	33.36	18:27:46		END OF RECORDING			

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RADIO COMMUNICATIONS RECORDED IN ANCHORAGE

ANCHORAGE CLEARANCE DELIVERY, TOWER AND APPROACH (CCD, TWR/APP)

118.3 MHz, 12:45 to 13:10 UTC

TIME	STATION	TRANSMISSION
12:49:40	KE 007	Clearance Korean Air zero zero seven have information sierra Seoul at three one zero
12:49:46	Anchorage CD	Korean Air zero zero seven heavy is cleared to Seoul via the Anchorage eight departure then as filed, climb and maintain flight level three one zero departure frequency one one eight point six, squawk six zero seven two
12:50:02	KE 007	Korean Air zero zero seven cleared to Seoul Anchorage eight departure climb and maintain three one zero one one eight six, six zero seven two
12:50:11	Anchorage CD	Korean Air zero zero seven heavy readback was correct
12:50:27	KE 007	Ground Korean Air zero zero seven request push gate two
12:50:32	Anchorage TWR	Korean Air zero zero seven heavy push at your discretion plan runway three two
12:50:36	KE 007	Roger
		— KE 007 Push back and engine start —
12:55:07	KE 007 VHF 2	Uh ground Korean Air zero zero seven taxi
12:55:13	Anchorage TWR	Korean Air zero zero seven heavy taxi to runway three two
12:55:17	KE 007 VHF 2	Runway three two roger
12:58:01	KE 007 VHF 2	Korean Air zero zero seven ready for take-off
12:58:04	Anchorage TWR	Korean Air zero zero seven heavy roger, departure frequency will be one one eight point three same as tower cleared for take-off runway three two

TIME	STATION	TRANSMISSION
12:58:13	KE 007 VHF 2	Roger one one eight three
13:00		*— KE 007 take-off —*
13:00:40	Anchorage APP	Korean Air zero zero seven heavy Anchorage departure radar contact, climb and maintain flight level three one zero, turn left heading two two zero
13:00:50	KE 007 VHF 2	Roger two two zero, climb and maintain three one zero roger
13:01:21	KE 015	Clearance Korean Air zero one five good morning
13:01:26	Anchorage CD	Korean Air zero one five heavy good morning, cleared to Seoul Airport via Anchorage eight departure then as filed, climb and maintain flight level three one zero, departure frequency one one eight point six, squawk six zero seven three
13:01:41	KE 015	Ah roger Korean Air zero one five cleared to Seoul Anchorage eight departure then as filed expect a climb to three one zero departure will be one eighteen six squawk six zero seven three we are requesting flight level three three zero
13:01:57	Anchorage CD	Roger climb and maintain flight level three three zero
13:02:01	KE 015	Roger to three three zero thank you very much
13:02:08	Anchorage APP	Korean Air zero zero seven heavy proceed direct Bethel when able
13:02:13	KE 007 VHF 2	Roger, proceed direct to Bethel roger
13:02:25	KE 015	Ground Korean Air zero one five (unreadable) request push back for start
13:02:31	Anchorage TWR	Korean Air zero one five heavy Ground push back and start up at your discretion plan runway three two
13:02:36	KE 015	Roger runway three two
13:03:07	Anchorage TWR	Handoff forty-seven line

TIME	STATION	TRANSMISSION
13:04:13	Anchorage ARTCC	Go ahead
13:04:15	Anchorage TWR	About seven west of the VOR Korean Air zero zero seven heavy going direct Bethel
13:04:19	Anchorage ARTCC RD 5/6	He's radar
13:04:22	Anchorage TWR	He's off on the hour TD
13:04:24	Anchorage ARTCC RD 5/6	(Acknowledges)
13:04:41	Anchorage APP	Korean Air zero zero seven heavy contact Anchorage Center one two five point seven good day
13:04:46	KE 007 VHF 2	Zero zero seven good day
13:07:02	Anchorage TWR	(Call on interphone)
13:07:08	Anchorage ARTCC RD 5/6	Control
13:07:10	Anchorage TWR	Clearance delivery Korean Air zero one five is requesting three three o instead of three one
13:07:14	Anchorage ARTCC RD 5/6	Okay I'll show that
13:07:16	Anchorage TWR	Thank you TD
13:07:42	KE 015	Ground Korean Air zero one five request taxi
13:07:46	Anchorage TWR	Korean Air zero one five heavy taxi to runway three two
13:07:50	KE 015	Roger taxi to runway three two

(Note.- Transmissions not involving or concerning KE 007 and KE 015 omitted.)

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ANCHORAGE ARTCC SECTOR RD 5/6

125.7 MHz, 12:59 to 13:39 UTC

TIME	STATION	TRANSMISSION
13:04:09	Anchorage TWR	Handoff forty-seven line
13:04:14	Anchorage ARTCC RD 5/6	Go ahead
13:04:18	Anchorage TWR	About seven west of the VOR Korean Air zero zero seven heavy going direct Bethel
13:04:20	Anchorage ARTCC RD 5/6	He's radar
13:04:22	Anchorage TWR	Well he's off another hour TD
13:04:51	KE 007 VHF 2	Anchorage Korean Air zero zero seven leaving five thousand for three one zero good morning
13:04:57	Anchorage ARTCC RD 5/6	Good morning Korean Air zero zero seven roger
?	Anchorage TWR	(Call)
13:07:08	Anchorage ARTCC RD 5/6	Control
13:07:09	Anchorage TWR	This is clearance delivering Korean Air zero one five is requesting three three O instead of three one
13:07:13	Anchorage ARTCC RD 5/6	Okay I'll show that
13:07:16	Anchorage TWR	Thanks TD
13:17:31	Anchorage TWR	Handoff forty-seven
13:17:33	Anchorage ARTCC RD 5/6	Go ahead
13:17:34	Anchorage TWR	Eight miles west of the VOR. Korean Air zero one five going direct Bethel he was off at fourteen after the hour

TIME	STATION	TRANSMISSION
13:17:41	Anchorage ARTCC RD 5/6	Radar contact
13:17:42	Anchorage TWR	TD
13:18:11	KE 015	Anchorage Center Korean Air zero one five good morning approximately seven thousand direct Bethel for three three zero
13:18:19	Anchorage ARTCC RD 5/6	Good morning Korean Air zero one five roger
13:27:38	Anchorage ARTCC RD 5/6	Korean Air zero zero seven radar service is terminated contact Center on one two five point two good morning
13:27:44	KE 007 VHF 2	Two five two good morning
13:38:21	KE 015	Anchorage Center Korean Air zero one five now reaching three three zero
13:38:27	Anchorage ARTCC RD 5/6	Korean Air zero one five roger radar service is terminated. Contact Center one two five point two good morning
13:39:34	KE 015	Roger one two five decimal two good morning
13:39		End of record

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ANCHORAGE ARTCC SECTOR D 2/3

125.2 MHz, 13:00 to 14:13 UTC

TIME	STATION	TRANSMISSION
13:05:20	Anchorage ARTCC D 2/3	Data
13:05:24	Anchorage Data	Anchorage Data I'm sorry data
13:05:26	Anchorage ARTCC D 2/3	Korean Air zero zero seven departure
13:05:28	Anchorage Data	Korean Air zero zero seven go ahead
13:05:30	Anchorage ARTCC D 2/3	Departed one three zero zero Bethel one three five five three one zero. TJ
13:05:36	Anchorage Data	ME Anchorage Data
13:18:04	Anchorage Data	Data
13:18:05	Anchorage ARTCC D 2/3	Yes, Korean Air zero one five departure
13:18:08	Anchorage Data	Go ahead
13:18:09	Anchorage ARTCC D 2/3	Okay he departed at one three one four Bethel one four zero nine three three zero TJ
13:18:18	Anchorage Data	Three three zero
13:18:19	Anchorage ARTCC D 2/3	Yes
13:18:20	Anchorage Data	Thank you
13:27:49	KE 007 VHF 2	Anchorage Center Korean Air zero zero seven good morning now leaving three zero zero for three one zero
13:27:54	Anchorage ARTCC D 2/3	Korean Air zero zero seven roger report Bethel
13:27:59	KE 007 VHF 2	Report Bethel, roger

TIME	STATION	TRANSMISSION
13:39:37	KE 015	Anchorage Center Korean Air zero one five, good morning
13:39:41	Anchorage ARTCC D 2/3	Korean Air zero zero five good morning report progressing Bethel
13:39:46	KE 015	Roger ah maintaining three three zero estimate Bethel one four zero zero over
13:39:54	Anchorage ARTCC D 2/3	Roger
13:49:57	KE 007 VHF 2	Anchorage Korean Air zero zero seven
13:50:00	Anchorage ARTCC D 2/3	Korean Air zero zero seven go ahead
13:50:03	KE 007 VHF 2	Zero zero seven Bethel at four niner flight level three one zero estimate NABIE at one four three zero, two one niner decimal zero, minus four niner, two niner five diagonal two five
13:50:16	Anchorage ARTCC D 2/3	Korean Air zero zero seven roger report NABIE to Anchorage on one two seven eight
13:50:22	KE 007 VHF 2	One two seven eight roger
13:50:30	Anchorage ARTCC D 10/11	Go ahead
13:50:31	Anchorage ARTCC D 2/3	Korean Air zero zero seven says NABIE one four three zero TJ
13:50:35	Anchorage ARTCC D 10/11	KD
14:00:50	KE 015	Anchorage Center Korean Air zero one five position
14:00:54	Anchorage ARTCC D 2/3	Korean Air zero one five go ahead
14:00:56	KE 015	Roger position Bethel at one four zero one flight level three three zero estimate NABIE at ah NABIE be one four four one ah fuel remaining two two three decimal zero, minus five six, spot three one zero diagonal two zero, go ahead

TIME	STATION	TRANSMISSION
14:01:23	Anchorage ARTCC D 2/3	Korean Air zero one five report NABIE to Anchorage one two seven eight
14:01:28	KE 015	Roger one two seven eight good morning
14:01:30	Anchorage ARTCC D 2/3	One four four one NABIE estimate Korean Air zero one five
14:01:32	Anchorage ARTCC D 10/11	KD
14:01:33	Anchorage ARTCC D 2/3	TJ

Recording ends 14:13.

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ANCHORAGE ARTCC SECTOR D 10/11

127.8 MHz and 128.2 MHz, 13:45 to 17:47 UTC

TIME	STATION	TRANSMISSION
13:50:42	Anchorage ARTCC D 10/11	Go ahead
13:50:43	Anchorage ARTCC D 2/3	Korean Air zero zero seven says NABIE one four three zero TJ
13:50:47	Anchorage ARTCC D 10/11	KD
14:01:38	Anchorage ARTCC D 10/11	Go ahead
14:01:42	Anchorage ARTCC D 2/3	One four four one, NABIE estimate Korean Air zero one five
14:01:44	Anchorage ARTCC D 10/11	KD
14:01:45	Anchorage ARTCC D 2/3	TJ
14:18	Anchorage ARTCC D 10/11	Aircraft calling Anchorage Centre say again
14:32:21	Anchorage ARTCC D 10/11	Korean Air zero zero seven Anchorage Centre
14:32:32	Anchorage ARTCC D 10/11	Korean Air zero zero seven Anchorage Centre
14:33:37	Anchorage ARTCC D 10/11	Korean Air zero zero seven Anchorage Centre
14:33:47	KE 007 VHF 2	... Unintelligible
14:33:52	Anchorage ARTCC D 10/11	Korean Air zero zero seven Anchorage Centre how do you read
14:34:18	KE 007 VHF 2	*Ah! It was cut out. Would you try to call again*

TIME	STATION	TRANSMISSION
14:34:37	Anchorage ARTCC D 10/11	Korean Air zero zero seven Anchorage Centre
14:34:50	?KE 007 VHF 2	*Unable to get flight level three three zero, wait for a while*
14:34:54	?KE 007 VHF 2	*We are maintaining flight level three three zero now*
?	?	Roger
14:35:02	KE 015	Anchorage Korean Air zero one five
14:35:08	Anchorage ARTCC D 10/11	Korean Air zero one five Anchorage Centre go ahead
14:35:11	KE 015	Roger Korean Air zero one five ah forwarding report ah Korean Air zero zero seven position NABIE one four three two flight level three one zero estimating ah NEEVA one five four nine, fuel remaining two zero zero decimal zero, minus four nine, spot two five zero diagonal six zero go ahead
14:35:38	Anchorage ARTCC D 10/11	Korean Air zero one five roger ah have Korean Air zero zero seven report NEEVA to Anchorage Centre one two eight decimal two
14:35:52	KE 015	Roger NEEVA one two eight decimal two good day
14:36:00	KE 015	Zero zero seven
14:36:12	Anchorage Radio	Four five nine
14:36:14	Anchorage ARTCC D 10/11	Four five nine Centre channel eleven reference ah Korean Air zero zero seven
14:36:19	Anchorage Radio	Go ahead
14:36:21	Anchorage ARTCC D 10/11	Ah you can re-cancel it
14:36:22	Anchorage Radio	GB
14:36:23	Anchorage ARTCC D 10/11	KD

TIME	STATION	TRANSMISSION
14:43:08	KE 015	Anchorage Centre Korean Air zero one five position
14:43:11	Anchorage ARTCC D 10/11	Korean Air zero one five Anchorage Centre go ahead
14:43:15	KE 015	Roger Korean Air zero one five position NABIE one four four three, flight level three three zero estimate ah NEEVA one six zero four, fuel remaining two zero three decimal five, minus five two, spot two zero five diagonal five zero go ahead
14:43:38	Anchorage ARTCC D 10/11	Korean Air zero one five roger report NEEVA Anchorage Centre one two eight decimal two
14:43:45	KE 015	Roger report NEEVA one two eight decimal two
		— — —
16:00:39	KE 015	Anchorage Centre Korean Air zero one five
16:00:43	Anchorage ARTCC D 10/11	Korean Air zero one five Anchorage Centre go ahead
16:00:46	KE 015	... relay NEEVA report for zero zero seven their position NEEVA one five five eight, flight level three one zero estimate NIPPI one seven zero eight, fuel remaining one six one decimal zero, minus four eight, spot two seven zero diagonal five five go ahead
16:01:20	Anchorage ARTCC D 10/11	An Korean Air zero one five understand this is a position report for Korean Air zero zero seven and advise Korean Air zero zero seven to ah report NIPPI to en-route radio thank you very much
16:01:32	KE 015	Roger
16:02:58	KE 015	Anchorage Centre Korean Air zero one five position
16:03:08	KE 015	Anchorage Centre Korean Air zero one five
16:03:11	Anchorage ARTCC D 10/11	Korean Air zero one five Anchorage Centre go ahead

TIME	STATION	TRANSMISSION
16:03:14	KE 015	Korean Air zero one five position ah NEV NEEVA one six zero two, flight level three three zero estimate NIPPI ah one seven one four, fuel remaining one six eight decimal five, minus five six, spot two six zero diagonal three five request flight level three five zero
16:03:42	Anchorage ARTCC D 10/11	Korean Air zero one five climb and maintain flight level three five zero report reaching
16:03:48	KE 015	We are now leaving three three zero go to three five zero
16:03:51	Anchorage ARTCC D 10/11	Roger
		— — —
16:06:25	KE 015	Anchorage Centre Korean Air zero one five now reaching flight level three five zero
16:06:31	Anchorage ARTCC D 10/11	Korean Air zero one five roger flight level three five zero and would you ask Korean Air zero zero seven if he would like higher altitude prior to NIPPI
16:06:40	KE 015	Ah yes zero zero seven requested three three zero
16:06:44	Anchorage ARTCC D 10/11	An ATC clears Korean Air zero zero seven climb and maintain flight level three three zero report reaching through you or en-route radio
16:06:53	KE 015	Roger they are now leaving three one zero for three three zero and ... Korean Air zero zero seven
16:07:04	Anchorage ARTCC D 10/11	Roger
16:10:30	KE 015	Anchorage Centre Korean Air zero one five
16:10:34	Anchorage ARTCC D 10/11	Korean Air zero one five go ahead, Sir
16:10:37	KE 015	... three three zero Korean Air zero zero seven we talk on one two three four point zero
16:10:45	Anchorage ARTCC D 10/11	Korean Air zero one five thank you and report NIPPI to en-route radio have a good flight

TIME	STATION	TRANSMISSION
16:10:50	KE 015	Good morning
16:12:30	Anchorage ARTCC D 10/11	(Call)
16:12:35	Tokyo ARTCC	This is Tokyo Centre
16:12:37	Anchorage ARTCC D 10/11	Anchorage Centre two transfers first Korean Air zero zero seven
16:12:44	Tokyo ARTCC	Go ahead
16:12:45	Anchorage ARTCC D 10/11	Korean Air zero zero seven flight level three three zero, NIPPI one seven zero eight, the next Korean Air zero one five (Japan Air four two transmission) Korean Air zero one five, three five zero, NIPPI one seven one four go ahead
16:13:04	Tokyo ARTCC	Roger Korean zero zero seven NIPPI ah ah Korean zero zero seven flight level three three zero NIPPI one seven zero eight and the Korean zero one five flight level three five zero, NIPPI one seven one four, India Alpha
16:13:19	Anchorage ARTCC D 10/11	Thank you Tango Alpha

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Note.- Text in italics is translated from Korean.

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ANCHORAGE IFSS

14:44 to 17:22 UTC

TIME	STATION	TRANSMISSION
14:44:10	KE 007	Anchorage Radio Korean Air zero zero seven
14:44:15	Anchorage Radio	Korean Air zero zero seven Anchorage
14:44:20	KE 007	Roger Korean Air zero zero seven position NABIE one four three two three one zero estimating NEEVA one five five three remaining fuel two zero zero decimal zero minus four nine wind two five zero diagonal five ah diagonal six five ah Selcal code Golf Kilo Foxtrot Hotel requesting level three three zero when available
14:44:50	Anchorage Radio	Korean zero zero seven Anchorage understand NABIE one four three two three one zero NEEVA one five five three is that correct
14:45:00	KE 007	Affirmative Korean Air zero zero seven that's affirmative
14:45:20	Anchorage Radio	Korean Air zero zero seven roger progress stand by for Selcal check
14:45:30	KE 007	Korean zero zero seven Selcal okay thank you
14:45:40	Anchorage Radio	Korean zero zero seven Anchorage roger and ah contact Anchorage Centre now one two seven decimal eight make your request with them
14:45:40	KE 007	Roger one two seven decimal eight roger
		— — —
16:03:55	KE 007	Anchorage Radio Korean Air zero zero seven
16:04:05	KE 007	Anchorage Korean Air zero zero seven
16:04:12	Anchorage Radio	United one eight Anchorage Radio
16:04:21	KE 007	Anchorage Radio Korean Air zero zero seven
16:04:31	Anchorage Radio	Aircraft calling on two niner one zero unable to copy you would you give me a radio check on five six two eight now

TIME	STATION	TRANSMISSION
16:04:49	UA 18	Anchorage Radio United one eight
16:04:51	Anchorage Radio	United one eight I have you loud and clear this frequency go ahead, Sir
16:04:58		(Stand by ten) (unintelligible)
16:05:06	Anchorage Radio	United one eight ATC is requesting you forward one five zero west progress and say again your request
16:05:10	UA 18	Okay requesting three seven zero we crossed ah
	KE 007	(Anchorage Radio Korean Air zero zero seven)
	UA 18	Four eight north one five zero west one five zero zero three five zero four seven north one four zero west one five five one
		(pilot report six)
	UA 18	minus four six
	KE 007	(Korean Air zero zero seven)
	UA 18	Go ahead
16:05:35	Anchorage Radio	Roger I copied that earlier my mistake, Sir, I have your request and will give it back to ATC stand by
16:05:41	UA 18	Thank you
		— — —
16:23:00	Anchorage Radio	Calling Anchorage on five six say again you (unintelligible) and go ahead, Sir
16:23:06	KE 007	Korean Air zero zero seven on five six radio check
16:23:11	Anchorage Radio	Korean Air zero zero seven Anchorage five by five
17:20:40	KE 015	Anchorage Korean Air zero one five
17:20:48	KE 015	Anchorage Korean Air zero one five
17:20:49	Tokyo Radio	Korean Air zero one five (unintelligible)
17:20:50	Anchorage Radio	Go ahead

TIME	STATION	TRANSMISSION
17:20:56	KE 015	(Unintelligible) position NIPPI one seven one four flight level three five zero estimating NOKKA one eight three three departed Anchorage one three one three ETA Seoul two one one zero fuel remaining one three eight decimal five minus five four spot three five five diagonal four zero Selcal Kilo Lima Alpha Charlie go ahead
17:21:39	Anchorage Radio	Confirm (unintelligible) Korean Air zero one five
17:21:43	KE 015	Affirmative Korean Air zero one five
17:21:53	Anchorage Radio	Korean Air zero one five NIPPI one seven one four three five zero NOKKA one eight three three is that correct
17:22:05	KE 015	Charlie
17:22:07	Anchorage Radio	Roger at your next position contact Tokyo standby for Selcal (unintelligible)
17:22:08	Tokyo Radio	Korean Air zero one five Tokyo
17:22:09	Anchorage Radio	(Selcal)
17:22:20	KE 015	Ah loud and clear Selcal okay thank you

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RADIO COMMUNICATIONS RECORDED IN TOKYO

TOKYO GUARD HF FOR NORTH PACIFIC (CHANNEL 4)

14:35 to 14:50 UTC and 16:00 to 16:40 UTC

TIME	STATION	TRANSMISSION
		— — —
14:38:20	KE 007	Anchorage radio Korean Air zero zero seven
14:38:27	KE 007	Anchorage radio Korean Air zero zero seven ...
		— — —
14:39:39	KE 007	Tokyo radio Korean Air zero zero seven ... five six
14:39:50	KE 007	Tokyo radio ... Korean Air zero zero seven go ahead
14:40:01	JA 34	Tokyo radio Japan Air three four ...
14:40:05	KE 007	Tokyo radio Korean Air zero zero seven
14:40:14	KE 007	... Korean Air zero zero seven go ahead
14:40:22	Tokyo	...
		— — —
14:43:50	KE 007	Anchorage radio Korean Air zero zero seven
14:43:56	Anchorage	Korean Air zero zero seven Anchorage
14:43:59 14:44:33	KE 007	Roger Korean Air zero zero seven position ... one four ... zero estimating NEEVA one five five three ... zero diagonal five ... diagonal six five ... Selcal ... Golf Kilo Foxtrot Hotel ...
14:44:42	Anchorage	Korean Air zero zero seven Anchorage ... one ... three two, three one zero, NEEVA one five five three, is that correct
14:44:54	KE 007	... Korean Air zero zero seven that's affirmative
14:44:58	Anchorage	Korean Air zero zero seven ... stand by for Selcal check

TIME	STATION	TRANSMISSION
14:45:16	Anchorage	Selcal (KE 007)
14:45:20	KE 007	... Korean Air zero zero seven Selcal ... thank you
14:45:25	Anchorage	Korean Air zero zero seven Anchorage roger and contact Anchorage ... one one two seven decimal eight ...
14:45:35	KE 007	... one two seven eight roger.
		— — —
16:03:48	KE 007	Anchorage radio Korean Air zero zero seven
16:03:56	KE 007	Anchorage Korean Air zero zero seven
16:04:04	Anchorage	United one eight Anchorage radio
16:04:13	KE 007	Anchorage radio Korean Air zero zero seven
16:04:18	Anchorage	Aircraft calling one two niner one zero unable to copy you would you give me a radio check on five six two eight now
		— — —
16:22:17	KE 007	Anchorage Korean Air zero zero seven on two nine
16:22:31	Anchorage	... (calling Anchorage) on two nine five six say again your callsign and go ahead, Sir
16:22:39	KE 007	Anchorage Korean Air zero zero seven on five six radio check
16:22:47	Anchorage	... zero zero seven Anchorage (go ahead)

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TOKYO WORKING HF FOR NORTH PACIFIC (CHANNEL 3)

15:59:20 TO 18:35:40 UTC

TIME	STATION	TRANSMISSION
		— — —
16:04:41	Anchorage	United one eight I have you loud and clear this frequency go ahead, Sir
16:04:45	KE 007	Anchorage Radio Korean Air zero zero seven
16:04:51	Anchorage	United one eight ... one five zero west ...
16:05:05	KE 007	Anchorage Radio Korean Air zero zero seven
16:05:21	KE 007	Anchorage Radio Korean Air zero zero seven. Five six two eight
16:05:26	Anchorage	United one eight roger I copied, that earlier my mistake, Sir, thank you, I have your request and will give it back to ATC stand by
16:05:38	United 18	Thank you
		— — —
16:23:02	Anchorage	Korean Air ... Anchorage Radio go ahead
16:23:07	KE 007	Roger Korean Air zero zero seven position overhead NEEVA one five five eight now maintaining three three zero estimating NIPPI one seven zero eight remaining fuel one six one decimal zero minus four eight wind two seven zero diagonal five five requesting Selcal check Golf Kilo Foxtrot Hotel
16:23:33		
16:23:36	Anchorage	Korean ... by another aircraft ... stand by one moment
16:23:49	Anchorage	Korean Air ... copied five two ... one ... zero west ... and I'll answer
16:23:58		No recording from 16:23:58 to 16:24:04. No time signal from 16:23:59 to 16:24:07.
16:24:16		No recording from 16:24:16 to 16:24:53.

TIME	STATION	TRANSMISSION
		— — —
17:08:40	KE 007	... Korean Air zero zero seven
17:08:47	KE 007	Anchorage Anchorage Korean Air zero zero seven do you read?
17:08:54	?	...
17:08:58	KE 007	Tokyo Radio Korean Air zero zero seven
17:09:01	Tokyo	Korean Air zero zero seven Tokyo go ahead
17:09:03	KE 007	Roger Korean Air zero zero seven position over NIPPI one seven zero seven level three three zero estimating NOKKA one eight two six one three two decimal zero minus four niner three two zero diagonal four five requesting Selcal
17:09:28		check Golf Kilo Foxtrot Hotel
17:09:32	Tokyo	(Selcal 007)
17:09:36	KE 007	Check Korean Air zero zero seven Selcal okay
17:09:38	Tokyo	Tokyo and secondary one zero zero four eight
17:09:46	KE 007	Roger one zero zero four eight roger
		— — —
17:20:32	KE 015	Anchorage Korean Air zero one five
17:20:41	KE 015	Tokyo Radio Korean Air zero one five
17:20:44	Tokyo	Korean Air zero one five Tokyo go ahead
17:20:47	KE 015	Tokyo Korean Air zero one five position NIPPI one seven one four flight level three five zero expecting NOKKA one eight three three departed Anchorage one three one three ETA for Seoul two one one zero fuel remaining one three eight decimal five minus five four spot three five five
17:21:30		diagonal four zero Selcal Kilo Lima Alpha Charlie, go ahead
17:21:34	Tokyo	Confirm Korean Air zero one five
17:21:38	KE 015	Affirmative Korean zero one five

TIME	STATION	TRANSMISSION
17:21:47	Tokyo	Korean Air zero one five NIPPI one seven one four three five zero NOKKA one eight three three. Is that correct?
17:21:57	KE 015	Charlie Charlie
17:21:59	Tokyo	Roger next position contact Tokyo ...
17:22:05	Tokyo	Korean Air zero one five Tokyo copied okay, stand by for Selcal check
17:22:11	KE 015	... (unreadable) ...
17:22:19	Tokyo	Korean Air zero one five Tokyo roger roger
		— — —
18:09:05	Tokyo (CVR 14.54)	Station calling Tokyo ...?
18:09:06	KE 015 (CVR 14.50)	... roger Korean Air zero one five now maintains three five zero request flight level three seven zero over
18:09:14	Tokyo (CVR 15.04)	Tokyo roger stand by call you back
		— — —
18:14.30	Tokyo (CVR 20.20)	(Selcal)
18:14.35	KE 015 (CVR 20.25)	Roger Korean Air zero one five Selcal go ahead
18:14.39	Tokyo (CVR 20.29)	Korean Air zero one five clearance Tokyo ATC clears Korean Air zero one five climb and maintain flight level three seven zero, report reaching
18:14.50	KE 015 (CVR 20.40)	Tokyo clears Korean Air climb ... three seven zero now leaving three five zero ... report reaching
18:14.57	Tokyo (CVR 20.47)	Tokyo
18:14.59	KE 007 (CVR 20.59)	... Korean Air zero zero seven

TIME	STATION	TRANSMISSION
18:15:03	Tokyo (CVR 20.53)	Korean Air zero zero seven Tokyo
18:15:07	KE 007 (CVR 20.57)	Korean Air zero zero seven requesting climb three five zero
18:15:13	Tokyo (CVR 21.03)	Requesting three five zero?
18:15:15	KE 007 (CVR 21.05)	That is affirmative now maintain at three three zero Korean Air zero zero seven
18:15:19	Tokyo (CVR 21.09)	Roger stand by call you back
18:15:21	KE 007 (CVR 21.11)	Roger
18:15:36		No recording from 18:15:36 to 18:17:28 on the Tokyo ATC tape.
		— — —
18:17:44	KE 015 (CVR 23.34)	Tokyo Radio Korean Air zero one five reaching ... three seven zero
18:17:49	Tokyo (CVR 23.39)	Korean Air zero one five Tokyo roger
18:18:15		No recording from 18:18:15 to 18:19:53 on the Tokyo ATC tape.
18:20:02	Tokyo (CVR 25.52)	(Selcal 007)
18:20:09	KE 007 (CVR 25.59)	Korean Air zero zero seven Selcal
18:20:11	Tokyo (CVR 26.01)	Korean Air zero zero seven clearance Tokyo ATC clears Korean Air zero zero seven climb and maintain flight level three five zero
18:20:21	KE 007 (CVR 26.11)	Roger Korean Air zero zero seven climb and maintain three five zero leaving three three zero at this time ...
18:20:28	Tokyo (CVR 26.18)	Tokyo roger

TIME	STATION	TRANSMISSION
18:22:56	KE 007 (CVR 28.46)	Tokyo Radio Korean Air zero zero seven ... three five zero
18:23:00	Tokyo (CVR 28.50)	Korean Air zero zero seven Tokyo roger
18:25:55	Dynasty 312 (CVR 31.45)	Tokyo Radio Dynasty three one two on five six
18:26:00	Tokyo (CVR 31.50)	Dynasty three one two Tokyo
18:26:03 18:26:28	Dynasty 312 (CVR 31.53 to 32.18)	Dynasty three one two position PAYON one eight two five level three three zero estimate SHEMYA one nine three five remainder remaining one two six decimal zero minus five zero, zero one zero diagonal four zero, go ahead
18:26:30	Tokyo (CVR 32.20)	Dynasty three one two Tokyo roger contact Anchorage
18:26:35	Dynasty 312 (CVR 32.25)	Thank you out
18:26:57	KE 007 (CVR 32.47)	Tokyo Radio Korean Air zero zero seven
18:27:02	Tokyo (CVR 32.52)	Korean Air zero zero seven Tokyo
18:27:04 18:27:15	KE 007 (CVR 32.54)	... Korean Air zero zero seven rapid ah ... we are ... rapid compressions descend to one zero thousand
18:27:21	Tokyo (CVR 33.11)	Korean Air zero zero seven unreadable unreadable radio check on one zero zero four eight
18:27:33	Dynasty 312	... zero one zero diagonal four zero and Romeo Delta Alpha go ahead
18:27:42	Anchorage	Roger roger, thank you, one five zero south west of SHEMYA contact Anchorage one two eight decimal two
18:27:55	Dynasty 312	One two eight two thank you
18:28:08	Tokyo	(Selcal 007)
18:28:26	Tokyo	(Selcal 007)

TIME	STATION	TRANSMISSION
18:28:40	Tokyo	(Selcal 007)
18:28:52	Tokyo	Korean Air zero zero seven Tokyo
18:29:12	Tokyo	Korean Air zero zero seven Tokyo
18:29:20	Tokyo	(Selcal 007)
18:30:00	Tokyo	(Selcal 007)
18:30:26		Please go ahead
18:30:27		... nine zero one six five zero one five north one six zero west one eight three zero flight level three three zero esti ...
18:30:42	Tokyo	(Selcal 007)
18:30:50	KE 015	Tokyo Radio Korean Air zero one five position
18:30:57	KE 015	Tokyo Radio Korean Air zero one five position
18:31:01	Tokyo	Korean Air zero one five Tokyo go ahead
18:31:04	KE 015	Ah roger Korean Air zero one five position NOKKA one eight three one flight level three seven zero estimate NOHO one eight five one fuel remaining one zero eight decimal two minus four eight spot three one zero diagonal six five go ahead
18:31:26	Tokyo	Confirm wind three one zero diagonal six five
18:31:31	KE 015	Charlie Charlie
18:31:33	Tokyo	Roger would you attempt to contact Korean Air zero zero seven Korean Air zero zero seven please and er ----- relay his position please.
18:31:51	KE 015	Roger stand by
18:31:54	KE 015	Zero zero seven
18:32:18	KE 015	Zero zero seven
18:32:28	KE 015	Zero zero seven Korean Air zero zero, zero one five

TIME	STATION	TRANSMISSION
18:33:05	KE 015	Tokyo this is Korean Air zero one five
18:33:08	Tokyo	Korean Air zero one five go ahead
18:33:10	KE 015	Unable to contact Korean Air zero zero seven
18:33:13	Tokyo	Ah would you use VHF please er VHF over
18:33:19	KE 015	Ah roger
18:34:03	KE 015	Korean Air zero zero seven zero one five
18:34:50	KE 015	Korean Air zero zero seven zero one five
18:35:06	KE 015	Tokyo Korean air zero one five unable to contact
18:35:12	Tokyo	Ah ... Korean Air zero one five Tokyo roger Thank you for your co-operation
18:35:23		No recording from 18:35:23 to 18:40:08 on the Tokyo ATC tape and no time signal from 18:35:40 to 18:39:43.
18:41:17	Tokyo	(Selcal 007?)
18:41:55	Tokyo	Korean Air zero zero seven Korean Air zero zero seven this is Tokyo Radio if you read me re ... request radio check
18:42:13		Tokyo requests radio check one two seven decimal six one two seven decimal six
18:42:22		No recording from 18:42:22 to 18:47:20.

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TOKYO LONG RANGE VHF 126.7 MHz (CHANNEL 9)

18:16:01 to 18:59:07 UTC

AND TOKYO RADIO/TOKYO ATCC (INTERPOSITION) (CHANNEL 14)

18:11:33 to 18:59:07 UTC

TIME	STATION	CHANNEL 9	CHANNEL 14
18:13:53	Tokyo Radio		Yes
18:13:54	ATCC		Korea Air zero one five
18:13:56	Tokyo Radio		Go ahead
18:13:57	ATCC		ATC clears Korean Air zero one five to climb and maintain flight level three seven zero report reaching
18:14:03	Tokyo Radio		ATC clears Korean Air zero one five to climb and maintain flight level three seven zero report reaching Kilo Foxtrot
18:15:39	ATCC		Tokyo
18:15:40	Tokyo Radio		Korean zero zero seven request
18:15:43	ATCC		Go ahead
18:15:44	Tokyo Radio		Requesting flight level three five zero
18:59:49	ATCC		... call you back
18:15:52	Tokyo Radio		... Korean Air zero one five leaving three five zero at one five
18:15:58	ATCC		... (unreadable)
18:15:59	Tokyo Radio		Kilo Foxtrot
18:19:23	ATCC		(call - buzzer)
18:19:25	Tokyo Radio		Yes

TIME	STATION	CHANNEL 9	CHANNEL 14
18:19:26	ATCC		... clearance for Korean Air zero zero seven
18:19:28	Tokyo Radio		Go ahead
18:19:29	ATCC		ATC clears Korean Air zero zero seven climb and maintain flight level three five zero
18:19:35	Tokyo Radio		ATC clears Korean Air zero zero seven climb and maintain flight level three five zero Kilo Foxtrot
18:19:40	ATCC		... (unreadable)
18:35:36		No recording from 18:35:36.	No recording from 18:35:36.
18:35:40		No time signal from 18:35:40.	No time signal from 18:35:40.
18:39:39		Recording recommences at 18:39:39.	
18:39:43		Time signal recommences at 18:39:43.	Time signal recommences at 18:39:43.
18:39:47			Recording recommences at 18:39:47.
18:42:57	Tokyo	Korean Air zero zero seven Tokyo on one two six decimal seven	
18:43:08	Tokyo	Korean Air zero zero seven Tokyo	
18:43:18	Tokyo Radio		Tokyo hello
18:43:21	ATCC		*I cannot get contact with Korean Air zero zero seven. Have you received any relevant voices?*
18:43:25	KE 015	Tokyo Radio Korean Air zero one five good morning	
18:43:32	Tokyo Radio		*I asked Korean Air zero one five to relay the position of Korean Air zero zero seven but Korean Air zero one five could not get contact with zero zero seven either*

TIME	STATION	CHANNEL 9	CHANNEL 14
18:43:35	KE 015	Tokyo Radio Korean Air zero one five	
18:43:39	Tokyo	Station calling Tokyo say your callsign	
18:43:43	KE 015	Ah this is Korean Air zero one five now maintaining three seven zero estimating NOHO one eight five one over	
18:43:48	ATCC		*I noted. I wonder if there are any other aircraft flying nearby?*
18:43:52	Tokyo	Roger report NOHO	
18:43:53	Tokyo Radio		*No aircraft*
18:43:55	KE 015	Roger	
18:43:56	ATCC		*I will wait further. If you receive something please let me know*
18:44:02	Tokyo Radio		*Okay*
18:44:21	Tokyo	Korean Air zero one five Tokyo	
18:44:24	KE 015	... (go ahead)	
18:44:26	Tokyo	Would you try to contact Korean zero zero seven on ... use the frequency one two one point five	
18:44:35	KE 015	Stand by	
18:44:56	KE 015	zero zero seven zero one five	
18:45:03	KE 015	zero zero seven zero one five	
18:45:28	KE 015	zero zero seven	
18:45:32	KE 015	zero zero seven zero one five	
18:46:10	KE 015	zero zero seven zero one five	
18:46:47		No recording and no time signal from 18:46:47 to 18:47:16.	No recording and no time signal from 18:46:47 to 18:47:16.

TIME	STATION	CHANNEL 9	CHANNEL 14
18:47:21	KE 015	zero zero seven zero one five	
18:47:30	Tokyo	... (unreadable)	
18:47:32	KE 015	Roger	
18:47:36	Tokyo	... (unreadable)	
18:47:39	KE 015	Korean Air zero one five we are unable to contact zero zero seven	
18:47:44	Tokyo	Ah roger	
18:51:18	KE 050	Tokyo Radio Korean Air zero five zero. One two seven for position good morning	
18:51:27	Tokyo	Korean Air zero five zero Tokyo	
18:51:29	KE 050	Roger good morning position ... one eight five one maintaining flight level three five zero estimating OSHIMA one niner three six fuel remaining six two decimal four minus four three. Three one five diagonal six five spot wind go ahead	
18:51:54	KE 015	Tokyo Radio Korean Air zero one five position	
18:51:59	Tokyo	Korean Air zero one five stand by	
18:52:01	Tokyo	Korean Air zero five zero confirm ... one eight five one flight level three five zero OSHIMA one nine two six remaining six two decimal four temperature minus four three say again wind please	
18:52:16	KE 050	Spot wind is three one five diagonal six seven over	
18:52:23	Tokyo	Korean Air zero five zero Tokyo roger contact Tokyo Control one three three decimal six. One eight zero miles out of OSHIMA	

TIME	STATION	CHANNEL 9	CHANNEL 14
18:52:33	KE 050	Confirm Tokyo Control one three three six hundred miles out of OSHIMA	
18:52:39	Tokyo	One hundred eighty miles one eight zero	
18:52:44	KE 050	I understand now one eight zero miles out of OSHIMA one three three six good day, Sir	
18:52:49	Tokyo	[Keyed microphone]	
18:53:25	Tokyo	Korean Air zero one five Tokyo	
18:55:28	KE 015	... Korean Air zero one five position NOHO one eight five one flight level three seven zero estimating INKFISH one nine zero seven fuel remaining nine nine decimal zero minus four nine spot three zero five diagonal eight five go ahead	
18:53:51	Tokyo	Confirm fuel remaining nine nine decimal zero	
18:53:56	KE 015	Thanks Charlie	
18:53:58	Tokyo	Roger contact Tokyo Control on ... one one eight decimal nine one five zero miles out of MATSUSHIMA	
18:54:08	KE 015	Roger one fifty miles ... one eight decimal nine good morning	
18:54:15	Tokyo	Good morning	
18:57:20	Tokyo Radio		Tokyo
18:57:21	ATCC		*Have you received any information on Korean Air zero zero seven?*
18:57:24	Tokyo Radio		*I have not received anything. You still have not received anything?*

TIME	STATION	CHANNEL 9	CHANNEL 14
18:57:29	ATCC		*I have received not contact from zero zero seven*
18:57:34	Tokyo Radio		*I noted. Thank you* Kilo Foxtrot
18:59:07		No recording and no time signal from 18:59:07 to about 19:11:30.	No recording and no time signal from 18:59:07 to about 19:11:30.

Note.- Text in italics is translated from Japanese.

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TRANSCRIPT OF COMMUNICATIONS
USSR AIR DEFENCE COMMAND CENTRES ON SAKHALIN ISLAND

121	—	SU-15 fighter from Sokol
163	—	MiG-23 fighter from Smirnykh
731	—	MiG-21 fighter from Postovaia
805	—	SU-15 fighter from Sokol
808	—	SU-15 fighter (reserve)
Burevestnik	—	41st Fighter Regiment call sign
Burminski	—	Deputy commander, Fighter Division
Chaika	—	Call sign of FEMD Air Force command post
CPO	—	Sokol Airbase Command Post Officer
Deputat	—	Sokol Airbase Command Post Fighter Controller
FCP	—	Fighter Control Post at Cape Terpenie
GCP	—	Airbase Ground Command Post
GCT	—	Airbase Ground Control Tower also Start Line Command Post
Gerasimenko	—	41st Fighter Regiment acting commander
IL-22	—	Transport aircraft departing Sokol airbase
Ivlichev	—	Commander, Fighter Regiment, Smirnykh airbase
Kamenski	—	Commander, FEMD Air Force
Karnaval	—	GCP of IF 7 Regiment
Kostenko	—	Operations duty officer, combat control centre of fighter division
Kostroma	—	Radio unit call sign
Kozlov	—	Fighter controller, Sokol airbase
Kutepov	—	Combat control officer, fighter division
Lirik	—	Sokol Airbase Radar Controlled Approach
Maistrenko	—	Operations duty officer, combat control centre of Far Eastern Military District (FEMD) Air Force
Melnikov	—	Chief of CP, Fighter Division
Met	—	Sokol airbase Meteo Service
Mozgovoi	—	Operations duty officer, CP of AD Forces, FEMD
Novoseletski	—	Smirnyhk AB Fighter Division acting Chief of Staff
Oblozhka	—	Area GCP on Cape Terpenie
Pavlov	—	Smirnykh airbase command post duty officer
Petronin	—	Controller, combat control centre Fighter Division
Plantatsia	—	Smirnykh airbase Fighter Reg CPO
RCA	—	Radar Controlled Approach
Solodkov	—	Sokol airbase command post duty officer
Strogov	—	Deputy Commander, FEMD
Suchogruz	—	Call sign of command post
Tanker	—	Call sign of command post
Tarasov	—	Fighter pilot, call sign 121
Titovnin	—	Fighter controller, combat control centre of fighter division
Tricotazh	—	Fighter Control Post
Zakharov	—	Controller, combat control centre Fighter Division

Note 1.- A horizontal dotted line without letters indicates unintelligible voice fragments and words.
Note 2.- A horizontal dotted line with a letter indicates obscene words.

TRANSCRIPT OF COMMUNICATIONS RECORDED ON REEL NUMBER 1

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
5.43.40	Deputat - 805		Turned on ... RCA ... 805.		
			...		
	805 - Deputat		Deputat, 805, finish ...		
	Deputat - 805		805, Deputat, Roger, this heading.	805, Deputat, Roger, this heading.	
5.44	CPO - RCA		...	Radar Controlled Approach (RCA).	RCA.
	CPO - RCA		...	RCA.	RCA.
	RCA - CPO		...	RCA answered.	RCA answered.
	CPO - RCA			Were they turned on?	Were they turned on?
			... did not answer.		
	RCA - CPO			Yes.	Yes.
				..., I answered.	
5.46	Deputat - RCA		Check ..., check ..., is there no key?	Check ...	
	RCA - Deputat		Roger.	Roger.	
	Deputat - 121			121, come in.	
	Deputat - 121			121, come in.	
	Lirik - 121		121, Lirik, come in.	121, Lirik, come in.	
	121 - Lirik		121, answering.		
5.47	Deputat - 805	805, Deputat.	805, Deputat.	805, Deputat.	
	805 - Deputat		Answered.	...	
	Deputat - 805	Set economical cruising speed.	Set economical cruising speed.	Set economical cruising speed.	
	805 - Deputat		Roger.	...	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - GCT			Look ... the light is on. Is the GCT ready to operate?	GCT your call sign Mastak number light is on. Is the GCT ready to operate?
	GCT - Deputat			I did not understand.	I did not understand.
	Deputat - GCT			... your ... number light is on ...	Your call sign Mastak number light is on, the receiver is probably lying wrongly.
	GCT - Deputat			Understood.	Understood.
	GCT - Deputat			... weather ... gave 9 at 500, visibility 10.	
5.48	Deputat - 805	805, the target is 60 degrees in azimuth from me, distance 440 kilometres.	805, the target is 60 degrees in azimuth from me, distance 440 kilometres.	805, the target is 60 degrees in azimuth from me, distance 440 kilometres.	
	805 - Deputat	Roger.	Roger, azimuth 60, distance ...	Roger.	
	Deputat - 805	805, channel 3.	805, channel 3.	805, channel 3.	
	805 - Deputat		Roger.	Roger.	
	GCT - CPO				Comrade Senior Lieutenant, how is the weather there in Khomuty?
	CPO - GCT				Khomutovo for 5 gave 9 at 600 visibility 10.
	GCT - CPO				Understood, check their weather again.
	GCT - CPO				Just as the forecaster (synoptic meteorologist) was calling Khomutovo, I was on the telephone.
	GCT - CPO				Whatever is happening there, has the wind there changed or what, the cloud amount is spreading, you know.
	805 - Deputat			Deputat, 805.	
	Deputat - 805			805, Deputat, you are radar contact, controlling, your distance 75.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Roger, heading ..., seven thousand in a climb to eight.	
	Deputat - 805			Report 8000.	
	805 - Deputat			Roger.	
	GCT - CPO				CP, are you observing 805?
	CPO - RCA			RCA are you working?	RCA, are you working?
	RCA - CPO			...	I did not understand.
	CPO - RCA			Are you working?	Are you working?
	RCA - CPO			Yes, Sir.	Yes, Sir.
5.49	Lirik - 121	... Lirik, come in.	121, Lirik, come in.		
	121 - Lirik	Excellent.	Excellent.		
	Lirik - 121	Good.	Good.		
	Deputat - Lirik	Check landing lights, floodlights.	[Check?] ... landing ...		
	Deputat - Lirik	Lirik understood, no?	Lirik understood, no?		
5.50	Deputat - 121	121 cleared for take-off.	121 cleared for take-off.	121 cleared for take-off.	121 cleared for take-off.
	121 - Deputat	Roger.	Roger.		
	GCT - CPO				The rescuer was put on readiness 2.
	CPO - GCT				Is Khoroshov there?
	GCT - CPO				Do we have Volosin, yes?
	CPO - GCT				No, they communicated from Division, for Petlyakov to take care of the rescuer.
	GCT - CPO				Good, do it, how taken out, tell me.

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	CPO - GCT				Good, I shall call him at his apartment, he will report when ready.
	Deputat - 121			Good, how ...?	
	Deputat - 121			For 121, heading 90 degrees, 100 degrees 8000.	
	121 - Deputat			Roger.	
	121 - Deputat			Altitude 8000.	
	Deputat - 121			Roger ... thousand, to the right 10.	
	121 - Deputat			Roger heading 70.	
	Deputat - 121			On heading.	
	121 - Deputat			Roger.	
5.51	GCT - 121				GCT, that means 121 departure heading 90 degrees, well more accurately 100 degrees, 8000.
	121 - GCT				Understood.
	GCT - 121				You will tell the time, or rather you will say the take-off, I shall give the time.
	121 - GCT				Good.
5.52	Deputat - 805			805, fuel remaining?	
	805 - Deputat			Fuel remaining 4 tonnes.	
	Deputat - 805			4 tonnes.	
5.53	Deputat - 121	121, your heading is 100 degrees, 8000.	... heading 100 degrees, 8000.		
	121 - Deputat	Roger.	Roger.		
	GCT - MET				MET.

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	MET - GCT				Answering.
	GCT - MET				Who?
	MET - GCT				Captain Parshin.
	GCT - MET				Parshin, come immediately to the GCT.
	MET -GCT				Understood.
	GCT - MET				Take transport there or run, I do not know, immediately to the GCT.
	MET - GCT				Understood.
	MET - CPO				CP changes: 10/8 average, stratocumulus at 500. Visibility 10, calm + 12, humidity 94%.
	CPO - MET				Who was reporting?
	121 - Deputat	Roger, 121.			
	121 - Deputat	121 on heading ... three.			
	Deputat - 121	According to mission, 121.			
	121 - Deputat	Roger.			
	163 - Deputat			163 roger 150, 8000.	
	CPO - MET				Who was reporting?
5.54	CPO - MET				Do you know Russian or not, who was reporting?
	121 - Deputat		Roger, 121.		
	Deputat - 121		... 121.		
	MET - CPO				MET, MET.
	CPO - GCT				Did 121 take-off?

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	GCT - CPO				Take-off 121.
	GCT - CPO				54 minutes, Controller.
	CPO - GCT				Copied 54 (fifty-four).
	CPO - GCT				On what heading has he gone?
	GCT - CPO				I gave 100 degrees.
	CPO - GCT				Understood.
5.55	CPO - GCT				GCT, that means 808 is assuming readiness, report when ready.
	GCT - CPO				Good.
	Deputat - 121		Do it.		
5.56	Deputat - 808	808, readiness one.	808, readiness one.		
	808 - Deputat	... 808 ...			
	Deputat - 805			805, Deputat, the target is at 5 to the left, distance 130.	
	805 - Deputat			Roger, heading 70.	
	Deputat - 805			Target is on heading 240.	
	805 - Deputat			The target is on heading 240?	
	Deputat - 805			The target is on heading 240, at 5 to the left, distance 120.	
	805 - Deputat			Roger	
5.57	Deputat - 805			805, Deputat, ... 15.	
	805 - Deputat			Roger.	
	Deputat - 805			The target ... fifty-five.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Roger.	
	IL-22 - GCT				GCT, GCT requesting IL-22, Chagozayev to Elizovo.
	CPO - GCT				Who is speaking?
	Deputat - GCT			Is he requesting start-up?	Is he requesting start-up?
	CPO - GCT				Give him permission.
5.58	Deputat - 805			805, the target is on your heading, 70 to the target, altitude 10.	
5.59	Deputat - 805			805, the target is exactly on heading, distance 55.	
	Deputat - 805			The target's heading is 240, altitude 10.	
	163 - Oblozhka			Oblozhka, Oblozhka, 163.	
	Oblozhka - Karnaval			Oblozhka answered Karnaval.	
	Deputat - 805			805, turn to the left with 45 degrees bank to heading 330.	
	805 - Deputat			Heading 330 with bank 45.	
6.00	Deputat - 121	121, channel 3.	121, channel 3.		121, channel 3.
	121 - Deputat	Roger.	Roger.		Roger.
	163 - Oblozhka			Oblozhka, 163, can you see it?	
	Karnaval - 163			Karnaval, say again that position.	
	Karnaval - 163			Karnaval, for 163, say again the position.	
	163 - Oblozhka			Oblozhka, 163, bearing 300, distance 50.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 805	805, to heading 210.			
	805 - Deputat	Roger, 805.			
	Deputat - 805	Roger, 805.			
	121 - Deputat			121, heading 100, distance 80.	
	Deputat - 121			Roger, Deputat, controlling you, maintain heading two minutes.	
	121 - Deputat			I did not understand, which heading?	
	Deputat - 121			Heading 100 degrees maintain for two minutes.	
	121 - Deputat			That's all, Roger.	
	163 - Oblozhka			Oblozhka, Oblozhka, how ... for 163.	
6.01	163 - Oblozhka			Roger.	
	Deputat - 805			805, the target is at 90 to the right, distance 15, heading 240, altitude 10.	
	805 - Deputat			Roger.	
	163 - Karnaval			Karnaval, 163, Oblozhka has no contact yet.	
	Deputat - 121			121, Deputat, turn left, heading seven ... sixty.	
	121 - Deputat			Roger.	
	Deputat - 805			Turn left 805, heading 240.	
	121 - Deputat			121, heading 60.	
6.02	Deputat - 805			805, to heading 210.	
	163 - Deputat			Now heading 160, 8 thousand.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 163			Roger, Karnaval, Oblozhka has contact with 163.	
	163 - Deputat			Roger.	
	805 - Deputat			805, observing the target at altitude 10 thousand.	
	Deputat - 805			Roger, 805.	
	805 - Deputat			On heading 210.	
	CPO - GCT				GCT.
	GCT - CPO				Answered.
	CPO - GCT				Has the meteorologist arrived?
	GCT - CPO				No.
	CPO - GCT				No?
	GCT - CPO				No.
	CPO - GCT				Who else is at the GCT? There's no one else, is there?
	GCT - CPO				No one, no one.
	Controller - GCT				Comrade Lieutenant Colonel, the meteorologist left for the GCT.
	GCT - Controller				Who is speaking?
	Controller - GCT				The controller. He went there by bicycle.
6.03	Deputat - 805	Roger, the target is on your heading, to the target 12, 15 kilometres.		Roger, the target is on your heading, to the target 12, 15 kilometres.	
	805 - Deputat			No, I have the target somewhere at 20 to the left.	
	Deputat - 805	At 20 to the left?		At 20 to the left?	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 805	805, prepare the radar.		805, prepare the radar.	
	Deputat - 805	805, Deputat, prepare the radar.		805, Deputat, prepare the radar.	
	805 - Deputat			Roger.	
6.04	Deputat - 805	805, Deputat, the target is military, upon violation of the State border destroy the target. Arm the weapons.		805, Deputat, the target is military, upon violation of State border destroy the target. Arm the weapons.	
	805 - Deputat			Turned on.	
	Deputat - 805			Turn to the right, heading 220.	
	805 - Deputat			On heading 220.	
	Deputat - 805			The target is on the heading, 10 to the target.	
	163 - Deputat			Maintaining heading 60.	
	805 - Deputat			Request the target's speed.	
	Deputat - 805			The target's speed is 900.	
	805 - Deputat			Roger.	
	Deputat - 805			805, 163 is flying at 5 to the right on heading 150, one hundred and fifty, one hundred and sixty three.	
	805 - Deputat			Good.	
	Deputat - 163			163, distance 12, exactly on heading.	
6.05	Deputat - 805			805, 163 is being brought up from the front hemisphere to the target.	
	163 - Deputat			Roger, 163, I will drop the tanks.	
	Deputat - 163			Roger.	
	Deputat - 163			163, Deputat, 805 at eight.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			163, turning to the left heading 300.	
	Deputat - 805			805, to the right heading 240.	
	805 - Deputat			On heading 240, 805.	
	Deputat - 805			Do you see the target?	
	805 - Deputat			Yes, I do.	
	Deputat - 805			Roger. Angle of approach within 30 degrees.	
	805 - Deputat			Roger, flying behind.	
	163 - Deputat			163, heading 30, 8000.	
6.06	163 - Deputat			Turning to heading 100.	
	Deputat - 805			10 to the target, two above.	
	805 - Deputat			Roger 805, request distance to the base.	
	Deputat - 805			Distance 175.	
	805 - Deputat			Roger.	
	Deputat - 121			121 distance 140.	
	121 - Deputat			Roger.	
	Deputat - 163			163, ...	
	Deputat - 121			121, Deputat, make a right two minute loop, heading 180, 360.	
	163 - Deputat			Roger.	
	121 - Deputat			121, I did not understand.	
	Deputat - 121			121, right two minutes, heading 180, 360.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	121 - Deputat			Wilco.	
	121 - Lirik		Answering		
	Lirik - 121		... Have you taken up?		
	121 - Lirik		Taken up a long time ago, already reported, 12 minutes ago.		
6.07	163 - Deputat			163, in turn to heading 220.	
	Deputat - 808			808, in readiness.	808 in readiness.
	808 - Deputat				Yes, yes.
	163 - Deputat			163, heading 220, seven and a half.	
	Deputat - 805			805, to the right heading 220, remainder.	
	805 - Deputat			Remainder three tonnes. Say again heading?	
	Deputat - 805			220.	
	805 - Deputat			To the left or maybe to the right.	
	Deputat - 805			To the right heading 260.	
	805 - Deputat			Turning to 260.	
	805 - Deputat			On heading 260.	
	Deputat - 805			Roger. Heading 260 maintain for one minute.	
	805 - Deputat			Roger.	
6.08	163 - Deputat			163, heading 220, seven and a half.	
	805 - Deputat			Deputat, 805, should I disarm the weapons?	
	Deputat - 805			Turn them off.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Roger.	
	163 - Deputat			163 needs to drop the wing tanks.	
	Deputat - 805			805, can you see the target?	
	805 - Deputat			Yes, it has turned.	
6.09	Deputat - 805			805, the target is at 10 to your left, distance 12 kilometres, altitude 10 thousand.	
	805 - Deputat			The target is at 80 to my left already.	
	Deputat - 805			805, to the left heading 240.	
	805 - Deputat			Turning to 240.	
	805 - Deputat			On heading 240.	
	Deputat - 805			Roger, the target is at 20 to the left, distance 15.	
	805 - Deputat			Roger.	
	Deputat - 805			805, to the left heading 220.	
6.10	805 - Deputat			Turning to 220.	
	Deputat - 121			121, turn to the right, heading 280.	
	121 - Deputat			Roger.	
	Deputat - 163			245 for 163.	
	163 - Deputat			Roger.	
	805 -Deputat			Heading 220.	
	Deputat - 805			805, can you determine the type?	
	805 - Deputat			Unclear.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 805			Roger, 12 kilometres to the target.	
	805 - Deputat			(interference) it is flying with flashing lights.	
	163 - Deputat			163 heading 245, seven and a half.	
6.11	Deputat - 805			805, request your altitude.	
	805 - Deputat			8000.	
	Deputat - 805			Roger.	
	Deputat - 805			The target is on your heading, 12 to the target.	
	805 - Deputat			Roger.	
	121 - Deputat			121, heading 280.	
	163 - Deputat			... five hundred.	
	121 - Deputat			Deputat, 121 heading 280.	
	Deputat - 121			Roger, maintain heading.	
	Deputat - 805			805, set to lock-on mode.	
	805 - Deputat			Wilco.	
	163 - Deputat			Roger, 163.	
	Deputat - 805			Can you see the target, 805?	
	805 - Deputat			I see it both visually and on the screen.	
	Deputat - 805			Roger, report lock-on.	
	805 - Deputat			Roger.	
6.12	163 - Deputat			Turning left 10.	
	Deputat - 163			163 dropped tanks?	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			Dropped them.	
	Deputat - 805			805, are you contact the target?	
	805 - Deputat			I am locked-on.	
6.13	Deputat - 805			805, interrogate the target [IFF].	
	805 - Deputat			Roger.	
	805 - Deputat			The target is not responding to the call [IFF].	
	Deputat - 805			805, is the target's heading 240?	
	805 - Deputat			The target's heading, yes, is 240 degrees.	
	Deputat - 805			Roger, arm your weapons.	
	805 - Deputat			Turned on.	
	Deputat - Lirik			RCA, are you contact the target and the interceptor?	RCA, are you contact the target and the interceptor?
	Lirik - Deputat			Contact.	Contact.
	Deputat - 805			805, Deputat, maintain the target's heading.	
	805 - Deputat			Roger, for now it is maintaining the previous heading	
	Deputat - 805			Changes ...	
6.14	805 - Deputat			Roger.	
	CPO - RCA				Understood. Good. But at what distance are they?
	RCA - CPO				805 is flying exactly on the target's heading.
	Deputat - RCA			RCA.	RCA, RCA.

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	RCA - CPO				Answered.
	CPO - RCA				Switch to radio communications channel 3.
	RCA - CPO				I am on three.
	CPO - RCA				On three, yes?
	RCA - CPO				Yes, Sir.
	CPO - RCA				Good. Be prepared to control the interceptor if need be. On my command.
	Deputat - 805			805, Deputat, prepare to fire, be ready.	
	805 Deputat			Roger, my speed ... and I have to turn on the afterburner.	
	Deputat - 805			Remainder.	
	805 - Deputat			My remainder is 2700.	
	163 - Deputat			Dropped tanks ... four thousand, 3800.	
	Deputat - 805			Afterburners on command.	
	805 - Deputat			On heading 230.	
	Deputat - 805			Roger, the target's heading?	
	805 - Deputat			The target is maintaining 240.	
	Deputat - 805			Roger.	
6.15	Deputat - Lirik			Contact, contact, bring up 121. Contact ...	Contact, contact, bring up 121. Contact. Do not hurry.
	Deputat - Lirik			... 121	RCA, I do not see 121.
	Lirik - Deputat			Do you see him?	Do you see him?
	Deputat - Lirik				121 is not there.

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Lirik - Deputat			Roger.	Roger.
	Lirik - Deputat			RCA.	RCA.
	Deputat - Lirik			Listening.	Listening.
	Lirik - Deputat				Between them 18 kilometres.
	Deputat - 805			805, are you still locked-on?	
	805 - Deputat			I am locked-on.	
	Deputat - 805			Roger, is the target's heading 240?	
	805 - Deputat			240.	
6.16	Deputat - Lirik			RCA.	RCA.
	Lirik - Deputat			Answered.	Answered.
	Deputat - Lirik			Control our fighter, bring up ... to rear hemisphere to distance 6 kilometres, be ready to open fire, in a minute there will be the command to open fire ...	Control our fighter, bring up and keep in the rear hemisphere distance 4 kilometres. Be prepared to open fire. In a minute there will be the command to open fire.
	Lirik - Deputat				To control 805, yes?
	Deputat - Lirik			And check monitoring systems.	And check monitoring systems.
	Lirik - Deputat				Roger, roger.
	Deputat - 805			805, the target's heading?	
	805 - Deputat			The target's heading is 240.	
	Deputat - 805			Roger.	
	163 - Karnaval			Say again bearing.	
	Deputat - Lirik			RCA, ask if the air navigation light is on or not?	RCA, ask if the air navigation light is on or not?
	RCA - CPO				I did not understand.

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			Deputat, 163 ... from Karnaval. Bearing 45, distance 60.	
	Deputat - 163			Roger, I have contact with you.	
6.17	163 - Karnaval			Roger, Karnaval, Karnaval, Deputat has no contact with 163.	
	Deputat - 163			163, Deputat, ask Karnaval if he has contact with the target or not?	
	163 - Karnaval			Karnaval, Karnaval, 163, Deputat is asking if you have contact with the target?	
	163 - Karnaval			Ask if the enemy's air navigation light is on or not?	Ask if the enemy's air navigation light is on or not?
	RCA - CPO				Now.
	163 - 805			Are you contact?	
	805 - Deputat			Contact.	
	Deputat - 805			Roger.	
	163 - Deputat			Deputat, Deputat, 163, Karnaval is not contact.	
	Deputat - 805			... stroy.	
	CPO - RCA				Eh?
	CPO - RCA				RCA, RCA.
	RCA - CPO				Answered.
	CPO - RCA				Ask ...
	805 - Deputat			Say again.	
	Deputat - 805			805, the target has violated the State border, destroy the target!	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Wilco.	
	Deputat - RCA			RCA.	RCA.
	RCA - Deputat			Answered.	Answered.
	Deputat - RCA			Did you ask if the target has the air navigation light on or not?	Did you ask if the target has the air navigation light on or not?
	RCA - CPO				I am inquiring now.
6.18	805 - Deputat			The air navigation light is on, the flashing light is on.	
	Deputat - 805			Roger.	
	RCA - Deputat			It is on.	It is on.
	163 - Deputat			Roger. I have seven and a half on heading 230.	
	Deputat - 805			805 ... position.	
	805 - Deputat			805 ... closing on the target.	
	Deputat - 805			Flash your lights.	
	CPO - RCA				Now he is in my blind spot.
	Deputat - 121			121, right turn.	
	121 - Deputat			Say again.	
6.19	Deputat - 805			805, flash your lights briefly.	
	Deputat - 121			121 right turn.	
	? - Deputat			Wilco.	
	163 - Deputat			Deputat, Deputat, 163, flying behind the target at a range of 25, are you contact?	
	163 - Deputat			Deputat, Deputat, 163.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 163/805			163, stand by, 805, force it to land at our aerodrome.	
	Deputat - 805			805	
	805 - Deputat			Answering.	
6.20	805 - Deputat			Answered, 805.	
	Deputat - 805			A warning burst from the cannons.	
	805 - Deputat			Must approach him.	
	805 - Deputat			Turning off "lock-on", approaching it.	
	Deputat - 805			Give a burst from the cannons.	
	Deputat - 805			A warning burst from the cannons in front.	
	Deputat - RCA			RCA, is your monitoring system turned on?	RCA, is your monitoring system turned on?
	RCA - CPO				I do not see 805 now. He is in my blind spot.
	163 - Deputat			For 163?	
	Deputat - 805			For 805.	
	805 - Deputat			Turned off "lock-on", giving a burst from the cannons.	
	Deputat - 805			Go on.	
	163 - Deputat			How (can) I contact him?	
	Deputat - 805			Have you fired the guns, 805?	
6.21	805 - Deputat			Yes Sir.	
	163 - Deputat			Wilco.	
	Deputat - 805			Are you contact the target?	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Yes, approaching it, approaching closer.	
	Deputat - 805			Roger.	
	805 - Deputat			The target has a flashing light. I already approached it to a distance of somewhere like 2 kilometres.	
	Deputat - 805			Is the target descending?	
	805 - Deputat			The target? No, at ten thousand.	
	Deputat - 805			Roger.	
	163 - Deputat			163, contact with both, range 10-15 kilometres.	
	805 - Deputat			805, my instructions.	
	163 - Deputat			Roger.	
	805 - Deputat			The target is reducing speed.	
	CPO - RCA				So, RCA, do you have contact with 163 from Smirnykh's airbase?
	RCA - CPO				I see 805.
	CPO - RCA				Roger. Monitor 805, 163 and 121 is approaching.
	RCA - CPO				Into this area?
	CPO - RCA				All in a close area.
	RCA - CPO				I monitor all of them.
	Deputat - 805			Roger, 805.	
	805 - Deputat			I ... am already moving out in front of the target.	
6.22	Deputat - 805			Increase speed, 805.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Increased speed.	
	Deputat - 805			Has the target increased speed, yes?	
	805 - Deputat			... reducing speed.	
	Deputat - 805			805, open fire on the target.	
	805 - Deputat			Well, it should have been earlier, where do I go now, I am already abeam of the target.	
	Deputat - 805			Roger, if possible take up a position for attack.	
	805 - Deputat			Now, I have to fall back from the target.	
	Deputat - 805			The target's position in relation to ... 805.	
	805 - Deputat			Say again.	
	Deputat - 805			Your position in relation to the target.	
	805 - Deputat			The target's altitude is ten thousand.	
	Deputat - 805			Report position, position.	
	805 - Deputat			Position? Just now it was at seventy degrees to the left.	
6.23	Deputat - 805			Roger.	
	Deputat - 805			805, try to destroy the target with cannons.	
	805 - Deputat			I am already falling back, now I will try with missiles.	
	Deputat - 805			Roger.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			163, 12 to the target, I see both.	
	Deputat - RCA			... contact with the target and Osipovich?	RCA ..., do you have contact with the target and Osipovich?
	RCA - Deputat			Contact with all of them.	Contact with all of them.
	Deputat - RCA			Give the command to Osipovich to 805, to move out to the target and destroy the target with missiles and turn on afterburner.	Give the command to Osipovich to 805, to move out to the target and destroy the target with missiles and to turn on afterburner.
	Deputat - 121			121, your intentions?	
	121 - Deputat			... turn on heading 30.	
	Deputat - 121			Roger, heading, to the right to heading 30 degrees, this heading two minutes.	
6.24	121 - Deputat			Wilco.	
	Deputat - 805			805, approach target and destroy target!	
	805 - Deputat			Roger. Locked-on already.	
	RCA - CPO				He is flying in lock-on.
	Deputat - 121			121, in right turn?	
	121 - Deputat			On heading 30 in turn.	
	Deputat - 121			Your distance fifty.	
	Deputat - 805			805, are you closing on the target?	
	805 - Deputat			Closing, the target is locked-on, distance to target 8.	
	Deputat - 805			Afterburner.	
6.25	Deputat - 805			Afterburner, 805!	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	805 - Deputat			Already switched on.	
	121 - Deputat			121, on heading 30.	
6.25.31	805 - Deputat			Launch.	
6.25	805 - Deputat			Executed launch.	
6.26.01	805 - Deputat			The target is destroyed.	
	Deputat - 805			Break off attack to the right, heading 360.	
	805 - Deputat			Breaking off attack.	
	163 - Karnaval			For 163 instructions.	
	163 - Karnaval			Karnaval, 163.	
	Karnaval - 163			Remainder.	
	163 - Karnaval			My wing tanks indicators lit up. The remainder differs by 600 litres for now.	
	Deputat - 805			805 remainder.	
	805 - Deputat			Remainder 1500.	
	Deputat - 805			Roger, turn to the right, heading 60 degrees, to homing, altitude 8.	
	805 - Deputat			Wilco, request distance to the base.	
	Deputat - 805			Your distance 125.	
	805 - Deputat			Roger.	
	Karnaval - 163			For 163, "that's all".	
6.27	163 - Karnaval			Karnaval, 163.	
	Deputat - 163			163, Deputat, Deputat, controlling you and contact with you, controlling, turn to the left, to heading 180.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			Turning to the left, heading 180, I have seven and a half.	
	Deputat - 163			163, turn on afterburner, turn to the left to heading 150.	
	163 - Deputat			Heading 150, Roger.	
	Deputat - 805			805, did you launch one missile?	
	805 - Deputat			Launched both.	
	Deputat - 805			Roger, well done.	
	Deputat - 163			163, Deputat, the target is on your heading, 30 kilometres to the target, the target's heading is 180.	
	163 - Deputat			Roger, heading 150, seven and a half.	
6.28	Deputat - 163			Prepare your radar.	
	Deputat - 805			805, ... did you see bursts?	
	163 - Deputat			Maintaining heading 210.	
	Deputat - 163			Set lock-on mode.	
	163 - Deputat			Wilco.	
	Deputat - 163			The target is in a right turn to heading 300 degrees.	
	163 - Deputat			Roger, heading 300, 210, 8 thousand.	
	Deputat - 163			The target's altitude is 9000.	
	Deputat - 163			The target is on your heading.	
	Deputat - 163			On the right, heading ...	
	163 - Deputat			... along heading ...	
	163 - Deputat			Distance to the target.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 163			Distance to the target is 8 kilometres, are you contact?	
	163 - Deputat			No, no contact.	
	Deputat - 163			Right turn with 45 degrees roll, heading 360.	
6.29	163 - Deputat			Turning to 360.	
	CPO - RCA				RCA, 805 is returning to the base. Remainder 1500, distance 110, be more careful with the remainder.
	RCA - CPO				I see, I see. For now I am on channel 3.
	CPO - RCA				For now it will fly at 8.
	CPO - RCA				RCA, request 805's distance from the base.
	RCA - CPO				Distance 85.
	CPO - RCA				Roger.
	Deputat - 163			163, Deputat, the target is in a right turn.	
	163 - Deputat			Roger, heading 360, turn.	
	Deputat - 163			The target is now on heading 180, turn to the right.	
	163 - Deputat			To heading 180.	
	Deputat - RCA			RCA, 805's distance?	
	Deputat - 163			163, heading 360.	
	Deputat - 163			The target's heading is 240 in a turn to 360.	
6.30.03	163 - Deputat			Roger.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	Deputat - 163			Remainder.	
	163 - Deputat			Remainder 2500.	
	Deputat - 163			Roger 2500, 163.	
	163 - Deputat			On heading 360.	
	Deputat - 163			Turn to the right, heading 180, the target is in a right turn.	
	163 - Deputat			Wilco.	
	CPO - RCA				RCA. Switch to 7?
	RCA - CPO				Wait for now. We shall see.
	CPO - RCA				Good.
	RCA - CPO				805 distance 75.
	CPO - RCA				Has he been switched to 7?
	RCA - CPO				He is flying to the homing.
	CPO - RCA				Do you see 121?
	Deputat - 121			On heading 30, 121, altitude 80.	
	121 - Deputat			Roger, Wilco.	
6.31	Deputat - 121			121, turn to the left, heading 150.	
	121 - Deputat			Wilco.	
	Deputat - 121			To the left to heading 210.	
	Deputat - 121			121, to the left heading 210.	
	121 - Deputat			Wilco.	
	Deputat - 121			121, the target is on your track, 25 to the target.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	121 - Deputat			Roger, ... switching on.	
	Deputat - 121			121, to the left heading 210, 163, the target is in a turn, 25 to the target.	
	121 - Deputat			Roger.	
	Deputat - 805			For 805, to homing 5500, distance 55.	
	805 - Deputat			Roger.	
	Deputat - 163			163 report heading.	
	163 - Deputat			To the left heading 210.	
	Deputat - 163			Roger.	
	163 - Deputat			To the right 210, to the right.	
6.32	Deputat - 163			Are you contact with the target?	
	163 - Deputat			The target's altitude for 163, heading 210.	
	Deputat - 163			It was at nine thousand.	
	163 - Deputat			Roger.	
	163 - Deputat			Distance to the target for 163.	
	163 - Deputat			No contact with the target, 163.	
	Deputat - 163			Roger.	
	163 - Deputat			Me neither.	
	Deputat - 163			Roger.	
	163 - Deputat			Instructions for 163.	
	Deputat - 163			163, maintain heading.	
	163 - Deputat			Roger.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	731 - Deputat			731 ... heading 120, 7000.	
	Deputat - 163			163, check your altitude.	
6.33	163 - Deputat			Seven and a half, seven five hundred.	
	163 - Deputat			Turning to the left heading 200.	
	Deputat - 163			Roger.	
	121 - Deputat			... 121 on heading ... turning ...	
	805 - Deputat			Altitude 5000, 805.	
	Deputat - 805			Roger, on five.	
	805 - Deputat			Deputat, request channel 7 for 805.	
	Deputat - 805			Channel 7.	
	805 - Deputat			Roger.	
	Deputat - 121			121, altitude.	
	121 - Deputat			Altitude 8, 121, on heading 150.	
	Deputat - 121			Roger, to the right heading 240.	
6.34.01	121 - Deputat			Wilco.	
	Deputat - 805		... 805 to heading 90, 5000 805 move out to homing ...		
	Deputat - 805		Altitude 1300		
	805 - Deputat		Roger.		
	163 - Deputat			163, heading 210, seven and a half.	
	Deputat - 163			Your distance 170.	
	163 - Deputat			What are my further instructions?	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			Deputat, 163.	
	Deputat - 163			Answering.	
	163 - Deputat			My further instructions ... remainder, remainder, 2000	
	Deputat - 163			163, turn to the right, heading 60.	
	163 - Deputat			Turning to the right heading 60.	
	163 - Deputat			Roger, heading 250, say again altitude.	
6.35.03	163 - Deputat			Roger ...	
	121 - Deputat			121 on heading 240, altitude 8.	
	Deputat - 121			121, Deputat, call Tricotazh.	
	121 - Tricotazh			Tricotazh, 121, come in.	
	121 - Tricotazh			Tricotazh, 121, come in.	
	Tricotazh - 121			I read you.	
	121 - Deputat			Tricotazh is answering.	
	Deputat - 121			Is Tricotazh in contact with the target, ask?	
	121 - Tricotazh			Tricotazh, 121, are you in contact with the target or not?	
	121 - Deputat			He is not in contact with the target.	
	Deputat - 121			Roger.	
6.36.06	Deputat - 121			121, remainder.	
	121 - Deputat			121, remainder 2200.	
	Deputat - 121			Roger, 95 to the base.	

Time	Station: From - To	Track 1	Track 4	Track 6	Track 7
	163 - Deputat			Deputat, 163, heading 60, seven and a half.	
	Deputat - 163			Roger, this heading to homing. Your distance 180.	
	163 - Deputat			To you?	
	Deputat - 163			How do you read, 163?	
	163 - Deputat			I said "to you".	
	Deputat - 163			Yes, Yes.	
6.37	163 - Deputat			Roger, heading 60. Wilco.	

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 1, REEL NUMBER 2

Time	From	Transmission
17:34	Operator	135
	Solodkov	Good morning, Miss. This is a request under password Oblako [Cloud] 535
	Operator	Just a minute, what do you wish to order?
	Solodkov	Mezhgorod [long distance telephone switchboard] Yuzhkurilsk. Stop, hello. Get me Burevestnik. I need Burevestnik. Burevestnik.
	Operator	Burevestnik
	Solodkov	Yes. Burevestnik
	Operator	Who, there?
	Solodkov	[Get] me, ah, Burevestnik 145
	Operator	145
	Solodkov	Yes
	Solodkov	Account password Oblako 536
	Operator	Five hundred?
	Solodkov	532, 532
	Operator	532 Oblako
	Solodkov	Yes, high priority. Urgent
	Operator	Your telephone [number]
	Solodkov	My telephone is 2-23-55
	Operator	Who will be speaking?
	Solodkov	Solodkov
	Operator	I didn't understand
	Solodkov	Solodkov
	Solodkov	This is urgent, high priority
17:35	Operator	Very well. Wait
17:36 17:37	Operator	Hello. Hello. I am calling Burevestnik. There's no need to click [the button]
17:38	Operator	There is no answer at the Burevestnik number

Time	From	Transmission
	Solodkov	No answer?
	Operator	No
	Solodkov	But why?
	Operator	I don't know why, there is no answer
	Solodkov	Did Burevestnik [itself] not answer?
	Operator	There was no answer at the number at Burevestnik
	Solodkov	That cannot be, 145
	Operator	What is that? What kind of organization is that?
	Solodkov	It's military organization. I need it now, Miss, whatever it takes, but I must call there. It is a matter of national importance. I'm not joking.
	Operator	Just a minute, just a minute
17:39	Solodkov	Miss, well what [is happening], eh?
17:40	Operator	Calling ... no answer
	Solodkov	No answer, eh? Well, I understand
	Solodkov	Understood, hello, I am not withdrawing my order. I will call again a little later, in about 10 minutes maybe there is a technical problem or something
	Operator	Very well
17:41	Solodkov	Well, come on, hurry up
	Solodkov	Hello, 790, haze 3
	Solodkov	Go ahead, send [them] up, that's all
	Smirnykh CPO	Roger, sending [them] up
	Solodkov	With three tanks. Alternate aerodrome Sokol. Terpenie region. Have [them] hold in the area of Terpenie.
	Smirnykh CPO	Roger
	Solodkov	Altitude 8 thousand
	24th AD Div CPO	Roger
	Solodkov	Just do not rush, take it carefully
	24th AD Div CPO	Roger
17:41	Solodkov	They've sent [them] up, have they?

Time	From	Transmission
	24th AD Div CPO	Affirmative
	Solodkov	Well, good, send [them] up. Who is there at your command post now?
	24th AD Div CPO	Division commander General Kremenchuk is at the command post
	Solodkov	Right, and who else of ours is there?
	24th AD Div CPO	Of ours, for the moment the commander is arriving now, I will report to you
	24th AD Div CPO	Just a minute
	24th AD Div CPO	... sending [them] up to point one
	Solodkov	Who?
17:43 17:52	Solodkov	Good, understood
	Solodkov	I say again 200 metres ...
17:53	Solodkov	So, I assigned a task to the first, I have not yet assigned a task to the third ...
	Solodkov	Just a second
	Solodkov	Hello
	24th AD Div CPO	The reinforcements have arrived
	Solodkov	Good, so, go ahead [send up] 163. Zone 406
	24th AD Div CPO	Roger 406
	Solodkov	Watch more carefully: the target is already approaching him about 180 km.
	24th AD Div CPO	Roger
	Solodkov	To Terpenie, go ahead
	24th AD Div CPO	Roger
17:54	Solodkov	Hello
	Solodkov	Hello
	Solodkov	Who?
	24th AD Div CPO	... 121 took off at 54 [minutes]
	Solodkov	121 take-off at fifty-four

Time	From	Transmission
	24th AD Div CPO	Affirmative
	Solodkov	Zone 404
	24th AD Div CPO	Right, zone 404
	24th AD Div CPO	Yes the target is moving on track
	Solodkov	Hello
	24th AD Div CPO	Yes
	Solodkov	So the controller reports - he can see the target
	Solodkov	Good, go ahead
	24th AD Div CPO	Roger
	Novoseletski	Well, what [is happening], who has arrived there at your command post?
	Sokol CP	Lieutenant Colonel Gerasimenko, Major Zagorovich and Lieutenant Colonel Barvakhin
	Novoseletski	To the phone, please
	Sokol CP	Lieutenant Colonel Gerasimenko
17:55	Novoseletski	Lieutenant Colonel Novoseletski, hello
	Sokol CP	Good morning
	Novoseletski	So now the commander has assigned your task. First, send 121 and 805 to intercept target 60-65. If the border is violated, destroy the target.
	Sokol CP	Roger
	Novoseletski	Military target
	Sokol CP	Roger
	Novoseletski	Hello
	Gerasimenko	Good morning, Comrade Colonel
	Novoseletski	Hello
	Gerasimenko	Ours is tracking 150, altitude 9000
	Novoseletski	Good, zone 406, the target, 60-65, is proceeding on track. It is now from you. Do you see it?
	Gerasimenko	I see it

Time	From	Transmission
	Novoseletski	Good. Military target. To be destroyed if it violates the State border.
	Gerasimenko	Yes, sir
	Novoseletski	The commander is also here at the command post now, he is reporting to Chaika and will go there
17:56 17:57 17:58	Novoseletski	Send a messenger there
17:59 18:02	Pavlov	Senior Lieutenant Pavlov
	Novoseletski	Novoseletski, keep yours at altitude 9000
	Novoseletski	Hello
	Pavlov	Yes, yes, yes
	Novoseletski	So, keep in mind that the neighbours are working at eight
	Pavlov	Roger
	Kozlov	Senior Lieutenant Kozlov
	Novoseletski	Kozlov, who has arrived at GCT
	Kozlov	No one has arrived at GCT yet, he is coming
	Kozlov	Kozlov
	Novoseletski	Go ahead, report
	Kozlov	Major Rudenko will be there
	Novoseletski	Kozlov
	Kozlov	Senior Lieutenant Kozlov here
	Novoseletski	Kozlov, where are you leading 805
	Kozlov	805 is beside the target at a distance
		10, 11 km at approach angle
	Kozlov	Hello
18:03	Novoseletski	Yes, yes
	Kozlov	From an approach angle of two-fourths
	Novoseletski	Good, altitude 8?
	Kozlov	I did not understand

Time	From	Transmission
	Novoseletski	Altitude?
	Kozlov	At the moment he is at an altitude of 8 thousand
	Novoseletski	Good. 163 is operating from point one, his altitude is 9
	Kozlov	Roger
	Novoseletski	Go ahead
18:04 18:08	Novoseletski	... Are the clouds getting in the way?
	Solodkov	Solodkov, hello
	Operator	2-23-55?
	Solodkov	Yes
	Operator	There is no answer at your number at Burevestnik
	Solodkov	Oh, well, I withdraw my order ...
18:09	Titovnin	Titovnin
	Novoseletski	Well, what [is happening], what is the situation? Has the target gone within the 100 kilometres?
	Titovnin	It has gone into the 100-kilometre [zone]. The pilot cannot determine the type
	Novoseletski	When did following begin?
	Titovnin	Ah, at 6 [minutes]
	Novoseletski	Following began at 6 [minutes], is it flying with lights?
	Titovnin	Just a moment, the commander is talking, I cannot
	Titovnin	Uh-huh
18:10 18:11	Titovnin	Captain Titovnin
	Novoseletski	Titovnin, well, give me the tracking data, from the time [our aircraft] began following
	Titovnin	Just a moment. Bearing 45
	Novoseletski	And the range?
	Titovnin	So, the range, range is 110 km
	Novoseletski	110 km. Altitude?
	Titovnin	So, target is at 9 thousand

Time	From	Transmission
	Novoseletski	9 thousand
	Novoseletski	With lights, without lights?
	Titovnin	Without for the moment
	Novoseletski	Eh?
	Titovnin	Without lights
18:12	Titovnin	For the moment the pilot cannot see anything
	Novoseletski	Well why isn't he picking up [the phone]?
	Novoseletski	Hello
	Novoseletski	Hello
	Titovnin	Yes
	Novoseletski	So, but our fighters are flying with lights, aren't they?
	Titovnin	Of course, ours [are flying] with lights
	Novoseletski	So, ours [are] also without lights, are you sure the target is flying without lights?
	Titovnin	I'll find out right now, I'll find out right now
	Novoseletski	Does he see it on the radar or not?
18:13	Titovnin	He sees it on the screen, he sees it on the screen. He is locked on
	Novoseletski	He is locked on
	Titovnin	Locked on
		Well Roger
18:14	Titovnin	Hello
	Maistrenko	Maistrenko!
	Titovnin	Maistrenko Comrade Colonel, that is, Titovnin
18:15	Maistrenko	Yes
	Titovnin	The commander has given orders that if the border is violated - destroy [the target]
	Maistrenko	... may [be] a passenger [aircraft]. All necessary steps must be taken to identify it
	Titovnin	Identification measures are being taken, but the pilot cannot see. It's dark. Even now it's still dark.

Time	From	Transmission
	Maistrenko	Well, okay The task is correct. If there are no lights -- it cannot be a passenger [aircraft]
	Titovnin	You confirm the task?
	Maistrenko	Eh?
	Titovnin	You confirm the task?
	Maistrenko	Yes
	Titovnin	Roger
18:16	Novoseletski	Kostenko, Kostenko!
	Novoseletski	Hello
	Novoseletski	Hello
	Novoseletski	Hello
18:17 18:22	Novoseletski	Calling operations duty officer
	Titovnin	Titovnin
	Novoseletski	Titovnin ... we have lost [it] on our screens. I gave orders to switch on radar. He can see both targets: both the [aircraft from] Sokol and the real target
	Titovnin	Well, roger, I understand
	Novoseletski	Hello
	Novoseletski	Hello
	Titovnin	Titovnin
	Novoseletski	Titovnin, give me the commander
	Titovnin	Just a second, just a second
	Novoseletski	Hello
	Flight Div CP	Hello
	Novoseletski	Yes
	Fighter Reg CP	Who is this?
	Novoseletski	Novoseletski
	Fighter Reg CP	Comrade Colonel, we have lost [them] from the screen, we are losing contact, reporting: we turned the radar on high mode, he is observing the rear interceptor and the target, operating radar on high mode

Time	From	Transmission
	Novoseletski	Good
	Fighter Reg CP	But it is already not visible on the screen
18:23	Novoseletski	Okay, have him observe the target, transmit to him: 805 has been ordered to destroy [the target]. What, isn't he firing, is [it] still flying? Has he fired the warning burst? Roger, understood, so let Sokol take control, we ...
	Fighter Reg CP	Roger, roger, roger
18:24	Novoseletski	Hello
18:25	Titovnin	Titovnin
	Novoseletski	Hello
	Novoseletski	Titovnin, what is going on, why don't you pick up the phone?
	Titovnin	I picked it up, Comrade Colonel, I picked it up
	Novoseletski	Well, what is happening? Give me an account of the operation
	Titovnin	So, they have guided [him] in to destroy [it], they have guided [him] in to destroy [it],
	Novoseletski	They have guided [him in]
	Titovnin	Yes
	Novoseletski	Well, go ahead, we are waiting
	Titovnin	Yes, sir, as soon as there is ...
18:26 18:27 18:28	Novoseletski	Hello
	Titovnin	Hello Titovnin
	Novoseletski	Titovnin, well, what [is happening]?
	Titovnin	Nothing for the moment
	Novoseletski	Well what [is happening], what is the matter, who guided [him] in, they guided [him] in, he locked on, why didn't he shoot it down?
	Titovnin	They fired, they fired. We are now waiting for the results, Comrade Colonel
	Novoseletski	Well, good

Time	From	Transmission
	Titovnin	We are waiting for the results
18:29 18:30	Novoseletski	Hello
	Novoseletski	Who [is it]?
	Novoseletski	Titovnin well tell me everything
18:31	Titovnin	Well, he fired two missiles
	Novoseletski	Who?
	Titovnin	Ours, article 37 [code word for SU-15 fighter]
	Novoseletski	Call sign?
	Titovnin	So, call sign 805
	Novoseletski	805, right?
	Titovnin	Yes
	Novoseletski	So, 2, one?
	Titovnin	Two missiles
	Titovnin	So he saw explosions in the area of the target
	Novoseletski	So, he saw explosions. Well, what happened next?
	Titovnin	The target has now turned to the north
	Novoseletski	To the north?
	Titovnin	Eh?
	Novoseletski	To the north?
	Titovnin	Yes, well, to the north-east
	Novoseletski	Uh-huh
	Titovnin	Well, so, now we are going to see what happens next. So we are bringing in the MiG-23
	Novoseletski	Understood
	Titovnin	The task remains exactly the same
	Novoseletski	Uh-huh, good, understood. Go ahead more carefully
	Novoseletski	Hello
	Titovnin	Yes
	Titovnin	What are you saying, I didn't understand

Time	From	Transmission
	Novoseletski	I said, [tell] ours more carefully. Don't fire on our own
18:32 18:38	Titovnin	Titovnin
	Novoseletski	Hello
	Titovnin	Titovnin
	Novoseletski	Titovnin, well, go ahead, tell me. Well, why, they lost the target? Titovnin!
	Titovnin	They lost the target, Comrade Colonel, in the area of Moneron
	Novoseletski	In the area of Moneron?
	Titovnin	The pilots do not see it, neither the one nor the other.The radio forces have reported, RTF has reported that after the launch, the target entered a right turn over Moneron.
	Novoseletski	Uh-huh
	Titovnin	Descending
	Titovnin	And lost over Moneron
		Well, there, now, that's what they drew , but I don't know maybe Sokol can't see. Well probably [the one from] Kostroma will see it. He is just reporting. Kostroma sees it.
18:39	Novoseletski	So, the task. They say it has violated the State border again now?
	Titovnin	Well, it is in the area of Moneron, of course, over our territory
	Novoseletski	Get it, get it. Go ahead, bring in the MiG-23.
	Titovnin	Roger. The MiG-23 is in that area. It is descending to 5000. The orders have been given: destroy upon detection.
	Novoseletski	Good, understood.
	Novoseletski	So, the pilot reported that the target was hit?
	Titovnin	Yes, of course
18:43	Novoseletski	I am calling
		... here
		Hello

Time	From	Transmission
	Operator	We are checking with "Tanker", and "Suchogruz". He cannot hear me, I [hear] him. He hears me, I [hear] him ... Or rather I hear him, he doesn't [hear] me
		[He] doesn't [hear] you
	Novoseletski	Hello, hello
	Novoseletski	What is happening?
	Operator	Hello, who, who?
	Novoseletski	I need ...
	Operator	Who?
		At ... yes?
		What is that?
	Novoseletski	I am asking you, who are you?
		I?
		So ...
		Technician ... you are not answering here
18:44		Well, why are you there ... I need ... urgently
	Novoseletski	Hello, hello
	Novoseletski	Get Kornukov here. Strogov is going to speak
	Titovnin	Strogov?
	Novoseletski	Yes
	Titovnin	Just a second
	Kornukov	Hello
	Novoseletski	Hello
	Strogov	General Strogov here
	Kornukov	Comrade General, Kornukov. Reporting: Target 60-65 reported lost at 22.39. The pilot who fired weapons has reported that there were explosions in the area of the target. After that the target began to lose altitude.
	Strogov	Wait, wait. What, did he observe the target?
	Kornukov	He observed it.
	Strogov	Who is the pilot?

Time	From	Transmission
	Kornukov	Osipovich
	Strogov	Captain?
	Kornukov	Major, Lieutenant Colonel, deputy commander of the regiment
	Strogov	Osipovich is deputy commander, is he?
18:45	Kornukov	Affirmative.
	Strogov	Of the regiment. What did he fire?
	Kornukov	He fired warning bursts from his cannons. There was no reaction. Then he fired two large missiles.
	Strogov	Which ones?
	Kornukov	R-98
	Strogov	R-98. Two, right?
	Kornukov	Two
	Strogov	Two R-98s. From an approximate range not ... Is he still in the air?
	Kornukov	He has already landed. I will be talking with him right away.
	Strogov	Uh-huh.
	Kornukov	He just landed
	Strogov	Uh-huh what, did he see the target visually?
	Kornukov	He saw the outline visually. Just the outline. He was not able to determine ownership because it was night.
	Strogov	Uh-huh. Good
	Kornukov	He saw it on the [radar] screen. It did not answer. And he used weapons
	Strogov	Uh-huh. Good
	Kornukov	From a range of 4 kilometres, somewhere around 3-4 kilometres
	Strogov	Well, look carefully. We need, that, what?
	Kornukov	I did not understand
	Kornukov	What aircraft?
	Kornukov	Comrade General, hello?

Time	From	Transmission
18:46	Strogov	Hello. Cloud cover there is 10/10
	Strogov	Hello
	Strogov	Hello, hello
		...
	Strogov	He saw visually ...
	Strogov	Hello, hello
	Strogov	... it's already light there at your [location]
		Hello, hello
	Novoseletski	Hello
	Titovnin	Titovnin here
	Novoseletski	Titovnin
	Titovnin	Yes
18:47	Novoseletski	You don't have the sunrise there yet?
	Titovnin	No. It will be in about 30 minutes
	Novoseletski	Prepare whatever helicopters there are. Rescue [helicopters]
	Titovnin	Rescue?
	Novoseletski	Yes. And there will probably be a task set for the area where the target was lost. [To] there ...
	Titovnin	Roger. Is this to be done through your SAR [search and rescue]?
	Novoseletski	Eh?
	Titovnin	Assign the task to Chaika through your SAR, Comrade Colonel, Khomutovo does not come under us and neither does Novoaleksandrovka. We have nothing here
	Novoseletski	Very well
	Titovnin	Novoaleksandrovka must be brought to readiness, and Khomutovo
	Titovnin	The border guards and KGB are at Khomutovo
18:48 18:49	Novoseletski	Hello, hello
	Novoseletski	In the area of Vladivostok ...

Time	From	Transmission
	Novoseletski	... give the order. Maistrenko
	Titovnin	Comrade Colonel, the fighter, article 37, landed at point [airbase] two at 43 [minutes]. At 47 [minutes] one more was sent up to that area from the reinforcements
	Novoseletski	But, look, it is 10/10, 500 metres there. Are you going to descend under the clouds, then, or what?
18:50	Titovnin	We will not descend for the moment. The weather there is okay. The pilot just landed. We are just asking him how the weather is
	Novoseletski	Good. Now will you land [the aircraft] from Postovaya at your location?
	Titovnin	From Postovaya?
	Novoseletski	Yes
	Titovnin	Hell! What's [wrong] there, is everything closed?
	Novoseletski	Look [the aircraft] from Postovaya must land at your [location]
	Titovnin	It's 200 metres at their [base]. Why did they send them up?
	Titovnin	200 metres
	Novoseletski	200 metres? Have him ask about the [fuel] remaining
	Novoseletski	Ask for Postovaya's call sign
	Titovnin	731, 731 Comrade Commander
	Novoseletski	731, 731
	Titovnin	We have to land him here, Comrade Commander. They don't have the weather [for it].
		...
	Novoseletski	Uh-huh, take control of both
	Titovnin	Both what? Did they send up another one, or what?
	Novoseletski	Eh?
	Novoseletski	Did they send up two there, or what?
	Kamenski	So, where is Kornukov?
	Titovnin	Here
	Titovnin	Take the phone

Time	From	Transmission
	Kamenski	Hello
	Kamenski	Hello
	Titovnin	Captain Titovnin
	Kamenski	Where is Kornukov?
	Titovnin	Just a second
18:51	Kornukov	Comrade General, Kornukov, hello
	Kamenski	Mikhailich, the 21 will be landing there at Sokol
	Kornukov	Roger. I have already given orders. Only it seems they turned him back home
	Kamenski	Right away. Right away. Right away.
	Kornukov	I gave the orders, everything, there ... is [located] ...
	Kamenski	Take over control
	Kornukov	Let them transfer control - we will take [it]
	Kornukov	And they are occupied with nonsense
	Kornukov	Of course, understood, yes sir
18:52 18:53		And he will not obey, why would he obey. That's idle chatter
	Novoseletski	The division commander hasn't spoken with the pilot yet
18:54	Strogov	Hello
	Strogov	Hello, Titovnin
	Strogov	You s....., I'll lock you up in the guardhouse. Why don't you pick up the phone?
	Titovnin	Comrade General, everyone was busy here
	Strogov	You have nothing there to be busy with, busy. What kind of nonsense is that? So where is Kornukov?
	Titovnin	Kornukov is here
	Strogov	Put him on the phone
	Titovnin	One moment. He is reporting to Kamenski, Comrade General.
18:55	Strogov	So, what you need to do now. Contact these e....., these sailors, these, what do you e.....?

Time	From	Transmission
	Titovnin	Border guards?
	Strogov	Huh?
	Titovnin	Border guards?
	Strogov	Well, the civilian sailors
	Titovnin	Understood.
	Strogov	The border guards. What ships do we have now near Moneron Island, if [they are] civilians, sent [them] there immediately
	Titovnin	Understood, Comrade General
	Strogov	Call immediately
	Titovnin	Yes, sir
18:56	Maistrenko	Hello
	Titovnin	Comrade Colonel, Titovnin
	Maistrenko	Yes
	Titovnin	At 52 the second article 37 landed at point two
	Maistrenko	And the first, when?
	Titovnin	The first at 43, I reported [it]
	Maistrenko	43. And the second?
	Titovnin	One second, the first landed at 43, right?
	Maistrenko	And the second?
	Maistrenko	So, Maistrenko. You have taken control of the MiG-21
	Titovnin	One moment. I'll find out right away
	Maistrenko	You were ordered to take the MiG-21 to ...
	Titovnin	Affirmative. The commander gave the orders
	Maistrenko	Go ahead, take over control. They can't stay up in the air forever. What are you doing?
	Titovnin	So they, what, they were turned back home there, I don't know
	Maistrenko	They must not go home. You have your orders
	Titovnin	Understood, understood

Time	From	Transmission
	Maistrenko	There's no reason to beat around the bush
	Titovnin	We are not beating around the bush
	Maistrenko	Take control and land them there
	Titovnin	Yes, sir
	Maistrenko	Go ahead
18:58 18:59 19:00	Kutepov	Captain Kutepov
	Maistrenko	Colonel Maistrenko. They have taken control of the MiG-21
	Kutepov	We're taking it now. Everybody has taken control
	Maistrenko	Huh? I don't understand
	Kutepov	Yes, yes, we took control of the 21 ourselves. Kostroma took it
	Kutepov	Hello
	Maistrenko	[We] [They] have taken control of the Mig-21
	Kutepov	We are taking it, we are taking it. Something is wrong
	Kutepov	There is a second one in the air there.
	Maistrenko	Go on, so see how long are they in the air already
	Kutepov	Roger, roger
	Maistrenko	Keep in touch with ..., take control, I see they are headed back to Postovaya
	Maistrenko	Maistrenko
	Titovnin	Titovnin, so taken at 59 [minutes], we are guiding
	Maistrenko	Good
	Titovnin	We are guiding it to Sokol, the second there at nine fifty one
	Maistrenko	Yes, contact the "Tanker" and stay in contact
	Titovnin	Uh-huh, roger
	Titovnin	Control taken at 59 [minutes]. Roger. Go ahead
	Maistrenko	What is their level, okay?

Time	From	Transmission
	Titovnin	Everything okay
	Maistrenko	Roger
		They have 350 at 4. We have enough

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 4, REEL NUMBER 2

Time	From	Transmission
		Captain Kusnitsin, for your information target 065 unidentified target, border violation
17:23 17:24 17:25		To Plantatsiia 123
17:26	Fighter Div CPO	So, Met [Meteorological service], all three regiments placed on readiness 1, so now when the commander arrives
	Met	Roger
	Met	Burevestnik below minima, fog
	Met	Smirnykh below minima, Sokol ...
17:27 to 17:39		
17:40	Fighter Div CPO	Met, analyze weather at Sokol; I'm sending up the pilot on duty
17:41	Met	Sokol maintaining 7-10 upper moderate, visibility 6-10 km, wind 100-90 degrees, 3-6 metres per second
17:42	Fighter Div CPO	Comrade Colonel, flight at 42 [minutes], the duty pilot has taken off
		...
		805 fifty 805
	Novoseletski	Roger
	Fighter Div CPO	Met can ... communications to take the weather
17:45 17:46	Novoseletski	Rescue plane at readiness
	Fighter Div CPO	He's at Khomutovo at readiness 3 now.
	Novoseletski	Call him, instruct him to go to readiness
	Fighter Div CPO	There's no way you can call him right now.
	Novoseletski	Go and look, Kolya, go on
	Fighter Div CPO	If it were only at Sokol, at Khomutovo no way
	Novoseletski	Let's call Sokol, call Sokol there, they will arrive faster.
	Fighter Div CPO	Roger
	Novoseletski	And tell regional ATC centre to ...
	Fighter Div CPO	I didn't understand

Time	From	Transmission
17:47 to 17:53		
17:54	Met	-- ... ... low 8/10, medium at 500 metres too, visibility 10
	Fighter Div CPO	Give me the changes ... change, change, that it is not possible to accept now
	Met	... change
	Fighter Div CPO	Second SU-15 took off from Sokol at fifty-four [minutes]
17:55	Fighter Div CPO	Call sign 121
	Met	Roger
	Fighter Div CPO	So, Met, there are three pilots in the air, two from Sokol and one from Smirnykh
	Met	Roger
	Met	Sokol actual 10/10 at 500, visibility 10
	Fighter Div CPO	Okay
17:56 to 17:59		
18:00	Fighter Div CPO	Met
	Met	Met answered
	Fighter Div CPO	Give me the situation
	Fighter Div CPO	Quickly, bring me the material
18:01	Met	Yes, sir
18:02 to 18:20		
18:21	Fighter Div CPO	Do not talk by loudspeaker, bring in readiness Sokol and Khomutovo SAR, Khomutovo through civil ..., through KGB bring Khomutovo to readiness 1
	Fighter Div CPO	Use of missile in the air ... do not give
18:22 to 18:26		
18:27	Fighter Div CPO	Chaika
	Fighter Div CPO	Chaika, I'm asking ... command post
18:28 to 18:37		

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 10, REEL NUMBER 2

Time	From	Transmission
17:53		Orders have been given to destroy [it]
	Chaika	Name? "Chaika"
	Kornukov	Attention. To command post personnel. Target 6065 21.53 upon violation of State borders destroy the target. Assign the task to Sokol and Smirnykh ...
		Right away. Well, how will we identify the target? [It's] night, night
	Chaika	"Chaika" here
	Kornukov	"Chaika" please get me Kamenski, General Kornukov
		Well, we'll guide them in, if we see in sunlight
		Well, [it's] night, well
		Simply destroy [it], even if it is over neutral waters? Are the orders to destroy it over neutral waters? Oh, well
	Kornukov	Hello, good morning, is General Kamenski not there?
	Kornukov	Please be so kind
17:54	Kornukov	Roger, good
	Kornukov	"Chaika" the duty officer in charge, the duty officer in charge of the command post
	Chaika	"Chaika", you are welcome
	Kornukov	So, one from Sokol, one from Smirnykh, yes, Aleksandr Ivanovich Kornukov
	Kamenski	Hello
	Kornukov	I will be at the command post, target 60-65 is in the air
	Kornukov	Provisionally an RC-135
	Kamenski	What [is happening], do you see it or what?
	Kornukov	We see it and we are providing guidance, two fighters have gone up already, they had to send them up below minima, Postovaya has been brought to readiness
	Kamenski	Roger, we will bring in Postovaya right away
	Kornukov	And we are sending up a third from Sokol now
	Kamenski	So you have sent up everyone at Sokol

Time	From	Transmission
	Kornukov	Take-off from Sokol at fifty-four minutes
	Kornukov	There is still one pilot left, [there are] three pilots
	Kamenski	So, when did the second go up?
	Kornukov	I have the first at 42
	Kornukov	First at 42, second at 46, third at 54
	Kamenski	At 54?
	Kornukov	Yes
	Kornukov	Okay, roger
	Kamenski	Good, at what [is the] range here, what are you using for observation?
17:55	Fighter Div CPO	Observe, Cape Terpenie. Observe Cape Terpenie, the target is 140 km from the state border, tracking 240 at 20 km from the boundary of territorial waters, well I mean the 100-km waters.
	FCP	The 100-km [waters], roger
	Fighter Div CPO	Yes, yes it is not entering the 100-km [zone]
	FCP	Roger, now it is flying perpendicular to the island, right?
	Fighter Div CPO	No, no, at the moment it is tracking 210-220, so, well, towards Cape Kruzanshtena. So
	FCP	Uh-huh, well, so, understood
	Fighter Div CPO	It is not flying perpendicular
	Fighter Div CPO	Almost parallel
	Fighter Div CPO	Almost parallel towards the south
	FCP	Uh-huh, roger
	Fighter Div CPO	Good
	FCP	Roger
	Kornukov	Kamenski has not arrived there [at your location]?
	Chaika	No ...
	Kornukov	Well, okay, I ... you report later
	Chaika	Yes, sir

Time	From	Transmission
17:56 18:13	Kornukov	Captain
	Kornukov	"Chaika"
	Titovnin	Yes, sir
	Titovnin	He sees [it] on the radar screen, he sees [it] on the screen. He has locked on, he is locked on, he is locked on
	Kornukov	No answer. Roger. Be ready to fire, the target is 45-50 km from the State border
	Kornukov	Officer in charge at the command post, please, for a report
	Titovnin	Hello
	Kornukov	Kornukov, please put Kamenski on the line
	Kornukov	... General Kornukov, put General Kamenski on
	Kamenski	Kamenski here
18:14	Kornukov	Comrade General, Kornukov, good morning. I am reporting the situation. Target 60-65 is over Terpenie Bay tracking 240, 30 km from the State border, the fighter from Sokol is 6 km away. Locked on, orders were given to arm weapons. The target is not responding, to identify, he cannot identify it visually because it is still dark, but he is locked on.
	Kamenski	We must find out, maybe it is some civilian craft or God knows who
	Kornukov	What civilian, [it] has flown over Kamchatka. It [came] from the ocean without identification. I am giving the order to attack if it crosses the State border.
	Kamenski	Go ahead now, I order ...?
	Kornukov	Yes, sir; yes, sir
20.15	Burminski	...
18:16	Novoseletski	Comrade Colonel, Novoseletski
	Burminski	This is Burminski, I say
	Burminski	This is Burminski, I say
	Burminski	Hello, hello. Good morning
	Burminski	Well what is happening there, have you sorted it out?

Time	From	Transmission
	Novoseletski	Well, for the time being we cannot identify [what it is], the pilot only sees a shadow
	Burminski	Well, but it did not turn away? Is it still flying that way?
	Novoseletski	No, it is now headed straight for Shkolny, that is, toward Uriuk, towards Uriuk
18:17	Burminski	How [far] now, has it crossed Cape Terpenie?
	Novoseletski	Yes, it is right here, about at the border, about 20 kilometres from the border
	Burminski	Already over the bay of Terpenie?
	Novoseletski	Yes
	Burminski	He cannot determine [what it is]?
	Novoseletski	That's all, they report [it] has crossed the border
	Burminski	Roger
18:18 18:22	Solodkov	Captain Solodkov
	Burminski	Burminski, well what [is happening] there.
	Solodkov	Well, so, the commander has given the order to attack. Destroy the target with missile fire. Warning cannon shots were fired and now, well, the order has been given to destroy ...
	Burminski	What area is it in?
	Solodkov	It is now in the area of Sokol
	Solodkov	Somewhere about 20 km north of Sokol
	Burminski	Now, that, anti-aircraft missile force is operating, right?
	Solodkov	No, no, ours, our aviation
	Burminski	What [is his status] is he in the attack area now?
	Solodkov	That's all, that's all, he is now in visual contact
	Solodkov	Locked on, he can see everything on the radar screen
	Burminski	Well, he has determined what type it is, hasn't he?
	Solodkov	Well, no, it's dark
	Burminski	It is not visible?
	Burminski	Well, okay, I am going out now

Time	From	Transmission
	Solodkov	Roger
18:23 18:33	Titovnin	Mastak
	Titovnin	Operations duty officer
	Kozlov	Hello
18:34	Titovnin	Kozlov, well what is happening to you there, have you all died or something?
	Kozlov	Who is this?
	Titovnin	Titovnin
	Kozlov	Hello
	Titovnin	Is the target on the screen or not?
	Kozlov	Eh?
	Titovnin	Is the target on the screen?
	Kozlov	The target is not on the screen, it went, it went into a right turn. Yes, descending and now we cannot see it either on the screen or on the altimeter.
	Titovnin	What is its altitude now?
	Kozlov	Well, we cannot see what its altitude is
	Titovnin	Has the pilot reported anything
	Kozlov	Eh?
	Titovnin	Has the pilot reported anything?
	Kozlov	I did not understand
	Titovnin	Has the pilot reported anything?
	Kozlov	Osipovich only reported when the launch took place ...
	Kozlov	He destroyed the target.
	Titovnin	Can [he] see [it]?
	Kozlov	... ... the MiG-23 cannot see the target
	Titovnin	Cannot see it?
	Kozlov	Yes
	Titovnin	Bring Osipovich down and lead [him] out, and have that one descend

Time	From	Transmission
		Descend to the twenty-three
		...
	Titovnin	Bring him down to an altitude of 5000
18:35	Kozlov	Roger

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 2, REEL NUMBER 2

Time	From	Transmission
17:36	Kozlov	Senior Lieutenant Kozlov
	Maistrenko	So, Kozlov, so, who do you suggest, so, who is the squadron leader there, e..... 600 at 6
	Kozlov	Well, the weather here is now 10, visibility 10, yes
	Maistrenko	So
	Kozlov	... they are both ready, both 121 and 805, but 805 is more experienced
	Maistrenko	So, send up 805
	Kozlov	Roger, send him up, where to?
	Maistrenko	Get him up, then I will set the task
	Kozlov	Roger
	Kozlov	Hello
	Kozlov	Comrade Colonel, air defence told me something, that [pilots] are to be sent up from Smirnykh, is that true?
	Maistrenko	Who says so? Maistrenko has given you your orders
	Kozlov	Well, I've received them, but here
17:37	Maistrenko	You don't have the weather, what are you talking about?
	Kozlov	I, air defence here is saying that they have orders [to send someone up] from Smirnykh, that is why I am calling you. I am sending [someone] up from Sokol
	Maistrenko	Send [someone] up from Sokol
	Kozlov	Yes sir, Roger
	Maistrenko	Maistrenko!
	Kozlov	Comrade Colonel, the divisional commander General Kremenchuk has arrived here at the command post, he is giving the order to send [someone] up from point [airbase] one
	Maistrenko	Smirnykh is below minima, do not send [anyone] up for the time being
17:38	Maistrenko	Send [someone] up from Sokol in the probable direction
	Kozlov	Sending [someone] up from Sokol, do not send [anyone] up from Smirnykh, Roger

Time	From	Transmission
	Maistrenko	Yes
17:39	Kozlov	Senior Lieutenant Kozlov
	Kutepov	Captain Kutepov
	Kozlov	Just a moment, just a moment, yes, just a moment! Hello, so, clarify that task, [he] is on the runway now ... will ...
	Kutepov	Has he taken off?
	Kozlov	Taking off now, on the runway and taking off
	Kutepov	So, the task: zone 405, altitude 8 thousand
	Kozlov	Roger
17:40	Kozlov	Senior Lieutenant Kozlov
	Kutepov	[Has he] taken off?
	Kozlov	Taking off now
	Kutepov	Well e.....
	Kutepov	Hello
	Kozlov	Yes
	Kozlov	Met is reporting low, very low cloud
	Kutepov	Send the pilots up
	Kozlov	Roger
	Kozlov	Met, analyze the weather at Sokol, I am sending up the duty pilot
17:41	Met	To Sokol, it remains 7-10 upper medium, visibility 6-10 km, wind 100-90 degrees, 3-6 metres per second
	Pavlov	Senior Lieutenant Pavlov
	Kutepov	Pavlov, will Litvin be able to take off from there?
	Kutepov	Well, come on, hurry up
	Kutepov	Hello, 790, haze 3
	Kutepov	I say, go ahead, send [them] up, that's all
	Kozlov	Roger, sending [them] up
	Kutepov	With three tanks. Alternate aerodrome Sokol. Terpenie region. Have [them] hold in the area of Terpenie.

Time	From	Transmission
	Pavlov	Roger
	Kutepov	Altitude 8 thousand
	Pavlov	Roger
	Kutepov	Just do not rush, be careful
	Pavlov	Roger
17:42	Kostenko	Kostenko!
	Pavlov	805 take-off at 42 [minutes]
	Pavlov	42 [minutes], area 405, altitude 8
	Kostenko	Roger
	Gerasimenko	Gerasimenko here
	Zakharov	Comrade Colonel, take-off from point [airbase] two at 42 [minutes], I am sending [someone] up from point [airbase] one, below established minima
	Gerasimenko	So, Zakharov, ... take-off from [point] two
	Zakharov	So, call sign 805
	Gerasimenko	805, Roger
	Zakharov	I say again, I am sending [someone] up from point [airbase] one with three auxiliary tanks
	Gerasimenko	[You've] sent [them] up, have you?
	Zakharov	Affirmative
	Gerasimenko	Well, okay, send [them] up. Who is there at your command post now?
	Zakharov	Divisional commander General Kremenchuk is at the command post
	Gerasimenko	Right, and who else of ours is there?
	Zakharov	Of ours for the moment, the commander is arriving now, I will report to you. Just a minute
17:43	Maistrenko	Hello
	Kostenko	Major Kostenko!
	Maistrenko	Kostenko, do not send [anyone] up from Smirnykh until you see the target. [A pilot has] taken off from Sokol, do you understand?

Time	From	Transmission
	Kostenko	Roger, later will be too late
	Kostenko	Comrade Colonel, later will be too late. It would be better to send [them] up with three auxiliary tanks
	Maistrenko	With three tankers, with a landing at Sokol?
	Kostenko	With a landing at Sokol, absolutely, at Sokol
	Maistrenko	Oh, well, send [them] up to the area in the probable [direction] ... ah that, our commander has arrived
	Kostenko	The chief has arrived, the chief of staff has arrived
	Maistrenko	Well, let him direct operations
	Kostenko	Yes sir, Roger. Record chief of staff at the command post at 44 [minutes]
	Maistrenko	Good, good, Roger
17:45	Pavlov	Senior Lieutenant Pavlov
	Maistrenko	How is your pilot?
	Pavlov	Taking off
	Maistrenko	Taking off, eh? Take it easy, do not hurry there
	Pavlov	Roger, I warned them
	Maistrenko	No need to hurry, [do] everything normally. So, in the area of Terpenie, somewhere even in zone 405, south of Terpenie, some 50 km.
	Pavlov	Roger, Roger
	Maistrenko	Hold there
	Melnikov	Captain Melnikov
	Kozlov	Melnikov, I sent up the duty pilot from Sokol, you will be my alternate, that is all
17:46	Melnikov	I will be the alternate
	Kostenko	Major Kostenko
	Maistrenko	Kostenko, what is the name of your chief of staff
	Kostenko	Chief of staff is Lieutenant Colonel Novoseletski
	Maistrenko	Is he chief of staff?
	Kostenko	He is acting [chief of staff]

Time	From	Transmission
	Maistrenko	Acting [chief of staff], Roger
	Maistrenko	Khomutovo is at readiness 3 now. Call him, instruct him to go to readiness
	Kostenko	There's no way you can call him right now.
	Maistrenko	Go and look, Kolya, go on
	Kostenko	If it were only at Sokol, at Khomutovo no way
	Maistrenko	Let's call Sokol, call Sokol there, they will arrive faster. And tell ACC to
	Kostenko	I didn't understand
17:47	Kostenko	Major Kostenko
	Kostenko	163 took off at 46 [minutes]
	Maistrenko	Roger, 163. Okay, zone 405. So [the aircraft] from Sokol there is travelling at an altitude of 8000. Watch more carefully
	Kostenko	Roger
		Duty pilot from Smirnykh took off at 46 [minutes], 46 [minutes] from Smirnykh. When did Burevestnik go to readiness state?
	Kostenko	Comrade Colonel, there is no contact with Burevestnik, I cannot get it at all at the moment, ... I cannot manage ...
	Maistrenko	No contact with Burevestnik, okay, Roger, take steps, to get in communication ...
	Kostenko	All steps have been taken, all steps have been taken. Record [time] at 46 [minutes]
	Maistrenko	Good
	Pavlov	Senior Lieutenant Pavlov
	Pavlov	Hello
	Novoseletski	Pavlov, who do you have in the air?
	Pavlov	163, Litvin
	Novoseletski	163. So, [send] him to zone 406, or rather 405, zone 405
	Pavlov	Roger, 8000
	Novoseletski	8000, yes
	Pavlov	Roger

Time	From	Transmission
	Novoseletski	Do you see the target? Are they sending [it] to you for tracking?
	Pavlov	Yes, they are
17:48	Novoseletski	That's all, go ahead, [send] to that area. Watch more carefully: 805 is up from point [airbase] two
	Pavlov	Roger
	Kozlov	Senior Lieutenant Kozlov
	Novoseletski	Kozlov, Novoseletski, do you see the target?
	Kozlov	I cannot see the target with my own equipment at this time. [Going] by reports for the time being
	Novoseletski	And are you not drawing anything on the board yet?
	Kozlov	They are not drawing anything on the board yet, [going] by reports for the time being
17:49	Novoseletski	Well, watch more carefully. Its location is east of Terpenie, 200-230 km east, so, heading 240, toward your location.
	Kozlov	Roger. I see. So, I have 805 in zone 405 at the moment on economizing cruise speed. The commander and chief of staff are arriving. Communications equipment ... engaged, everything else on readiness
	Novoseletski	Reinforcements?
	Kozlov	Reinforcements are arriving
	Novoseletski	Good
	Novoseletski	Listen, please run over, to those b..... plotters, and tell them I'll kill them if they are not here in [one] minute. Well, what did I just say?
	Novoseletski	Hello
	Kozlov	Hello Senior Lieutenant Kozlov
	Novoseletski	Kozlov, second pilot, 121 into the air. Zone 404
	Kozlov	Roger, Wilco
	Novoseletski	Same altitude 8000
17:50	Kozlov	Roger
	Maistrenko	Maistrenko!

Time	From	Transmission
	Kozlov	Comrade Colonel, by order of General Kremenchuk I am sending up a second pilot from Sokol
	Maistrenko	Right, go ahead
	Kozlov	Yes, sir
	Maistrenko	Maistrenko
	Kozlov	My commander is at the command post at 50 [minutes]
	Maistrenko	Who?
	Kozlov	General Kornukov
	Maistrenko	Kornukov is there, good, roger, let him take control
17:51	Maistrenko	Colonel Maistrenko
	Kozlov	Comrade Colonel, well, I just had a communication from point [airbase] three, at 36 [minutes] two pilots in readiness one there
	Maistrenko	Good, roger, at 36 [minutes] two at Burevestnik in readiness
	Maistrenko	Good
	Solodkov	Captain Solodkov
	Maistrenko	Give me the call sign [of the aircraft] from Sokol please
	Solodkov	The one we sent up?
	Maistrenko	Yes
	Solodkov	We sent up 163
	Maistrenko	That is from Smirnykh, from Sokol?
17:52	Solodkov	Ah, so, 805
	Maistrenko	Roger
	Solodkov	So, hello, are you observing on network 106?
	Maistrenko	Observing on network 106
	Maistrenko	6065?
	Solodkov	Yes, yes, yes, yes
	Maistrenko	Well, now, send him straight ahead to the interception point, there [you] have to do a good job
	Solodkov	Roger

Time	From	Transmission
	?	It is not working
	?	We have ... of control facilities
	Petrunin	Petrunin
	Pavlov	Comrade Captain, reporting: commander, chief of staff, chief of the political department at the command post, ... also
	Petrunin	Roger, roger, just a second
17:53	Pavlov	It violated the border somewhere in the area of Elizovo
	Petrunin	Hello, hello
	Petrunin	Hello, hello
	Pavlov	Senior Lieutenant Pavlov here
	Pavlov	Hello, hello
	Petrunin	Just a second
	Pavlov	Hello
	Pavlov	Reinforcements have arrived
	Petrunin	Good, so, go ahead [and send up] 163. Zone 406
	Pavlov	Roger 406
	Petrunin	Watch carefully: the target is already approaching them about 180 km.
	Pavlov	Roger
	Petrunin	To Terpenie, go ahead
	Pavlov	Roger
	Petrunin	Hello, Captain Petrunin
	Pavlov	Comrade Captain, reinforcements arrived at 54 [minutes]
	Petrunin	Roger
	Petrunin	So, 808, 464
17:54	Petrunin	Good
	Pavlov	Yes
	Petrunin	I am ... sending a second [aircraft] from Sokol
	Pavlov	Hello

Time	From	Transmission
	Pavlov	Here
	Petrunin	Who?
		...
	Pavlov	..., 121 took off at 54 [minutes]
	Petrunin	121 took-off at 54?
	Pavlov	Affirmative
	Petrunin	Zone 403, that is four [404]
	Pavlov	Right, zone 404
17:55	Fighter Reg CP	Hello
	Kutepov	Captain Kutepov
	Fighter Reg CP	... commander has arrived there, hasn't he?
	Kutepov	Affirmative, he is here
	Fighter Reg CP	Put him on the line
	Kutepov	He is talking with "Chaika" now
	Kutepov	The chief of staff is taking the line now
	Fighter Reg CP	Well, go ahead
	Fighter Reg CP	Hello
	Fighter Reg CP	Good morning, Comrade Colonel
	Novoseletski	Hello
	Fighter Reg CP	Ours is on heading 150, altitude 9000
	Novoseletski	Good, zone 406, the target is manoeuvring, 60-65, on track. It is now from you. Do you have contact with it?
	Fighter Reg CP	I have contact
	Novoseletski	Good. Military target. To be destroyed if it violates the State border.
	Fighter Reg CP	Yes, sir
	Novoseletski	The commander is also here at the command post now, he is reporting to Chaika and will go there
	Fighter Reg CP	Roger
17:56	Petrunin	Petrunin!

Time	From	Transmission
	Novoseletski	Has the third [aircraft] taken off?
	Petrunin	Yes, the third [aircraft] took off at 54 [minutes], article 37 [SU-15]
	Petrunin	121
	Novoseletski	121, Roger
	Petrunin	Captain Petrunin
	Fighter Reg CP	Comrade Captain, at 56 [minutes], 808 at readiness one
	Petrunin	Roger, okay
	Fighter Reg CP	[Should we] seat two [pilots] or one for the moment?
	Petrunin	Seat two
	Fighter Reg CP	Seating two
	Petrunin	Well, seat one for the moment, no need for the second
	Fighter Reg CP	808 is at readiness
	Petrunin	Good
	Novoseletski	Hello
17:57	Fighter Reg CP	Comrade Colonel, the duty pilots of point two has arrived, one of them is already sitting [in the aircraft] in readiness one. [Should they] seat a second?
	Novoseletski	Roger, seat both
	Fighter Reg CP	[Maybe] we [can] wait a bit, not seat the other [pilot]
	Novoseletski	Well, one is in [readiness] one, that is enough for the moment
	Kozlov	Senior Lieutenant Kozlov
	Pavlov	Kozlov, answer, Kozlov
	Kozlov	Hello Senior Lieutenant Kozlov
	Pavlov	Senior Lieutenant Pavlov
	Kozlov	Roger
	Gerasimenko	Lieutenant Colonel Gerasimenko
	Ivlichev	Ivlichev
	Gerasimenko	Hello

Time	From	Transmission
17:58	Gerasimenko	Hello
	Ivlichev	Lieutenant Colonel Ivlichev, hello
	Gerasimenko	We have contact
	Gerasimenko	Hello, Gerasimenko
	Kornukov	Do you see the target on the screen?
	Gerasimenko	I see the target on the screen, I heard the task, I transmitted that same task to the operational control officer
	Kornukov	Roger
17:59	Gerasimenko	Roger
	Kornukov	Lieutenant Colonel Ivlichev, did you understand the task?
	Ivlichev	Lieutenant Colonel ... I understood the task
	Kornukov	Roger
18:00	Kozlov	Senior Lieutenant Kozlov
	Kornukov	Kozlov, situation, the black [marks] are being properly plotted on the board, aren't they?
	Kozlov	They are being plotted properly here
	Kornukov	Do you now have the relative positions of our interceptor and the target
	Kozlov	Just a moment
	Kornukov	Give me the bearing and range of the target, bearing of the interceptor please
	Kornukov	Hello
	Kozlov	Yes
	Kozlov	So, target bearing 55, range 250
	Kornukov	okay
	Kozlov	Interceptor: bearing 55, range 235
18:01	Kornukov	Is there, what, about 25 km between them?
	Kozlov	Well, now, he has [it] on his right at 90, that's where his target is, they are now guiding [him] up in the aft hemisphere for identification
	Kornukov	Does the target have no identification?

Time	From	Transmission
	Kozlov	They are guiding [him] in for identification, guiding [him] in I say
	Kornukov	Bring him up, bring Osipovich in to the prescribed distance. You do not engage him to the target from the aft hemisphere, you do not engage him right on his tail, keep the angle of approach.
	Kozlov	Roger, executing
	Kornukov	Don't forget it [the target] has cannons in the rear, there
	Kozlov	Roger, executing
	Kornukov	But faster, for the fighter, or rather the target is entering the zone above the one-hundred-kilometer waters [identification zone]
	Kozlov	Wilco
	Kornukov	Major Kostenko
	Maistrenko	Maistrenko
	Kostenko	Yes
	Maistrenko	Well, what, I see you sent the fighter beyond the hundred-kilometer [zone], right?
	Kostenko	Why? It [the target] is there already [at] 100 kilometers
	Maistrenko	No
	Maistrenko	But that is what the board shows
18:02	Kostenko	Not at all, Comrade Colonel
	Maistrenko	Good
	Kostenko	So, the commander at the command post has set the task: if, there, the target enters the 100 kilometer [zone] now, the task has been set
	Maistrenko	To follow [it]?
	Kostenko	Affirmative. If the State border is violated we will destroy the target
	Maistrenko	Wait?
	Kostenko	Affirmative
	Maistrenko	Uh-huh. Identify?
	Kostenko	Well, everything, of course, in accordance with the rules

Time	From	Transmission
	Maistrenko	Everything in accordance with the rules
	Kostenko	Yes, sir, roger
	Maistrenko	Senior Lieutenant Pavlov
	Pavlov	Hello, Novoseletski, keep yours at altitude 9000.Hello, keep in mind your neighbours are operating at 8.
	Novoseletski	Roger
	Kozlov	Senior Lieutenant Kozlov
	Novoseletski	Kozlov, who has arrived at GCT?
	Kozlov	No-one has arrived at GCT yet, they are arriving soon
	Kozlov	Kozlov
	Novoseletski	Report
	Kozlov	Major Rudenko will be there
	Kozlov	Kozlov
	Pavlov	Senior Lieutenant Pavlov
18:03	Novoseletski	Hello
	Pavlov	Yes, yes, yes
	Pavlov	From a 2/4 approach angle
	Novoseletski	Good, altitude 8?
	Pavlov	Say again
	Novoseletski	Altitude?
	Pavlov	At the moment he is at an altitude of 8 thousand
	Novoseletski	Good. 163 is operating from point [airbase] one, his altitude is 9
	Pavlov	Roger
	Novoseletski	Go ahead
	Petrunin	Petrunin
	Novoseletski	Khomutovo has no runway floodlights
	Novoseletski	It will be dawn soon, you warned them, didn't you?
	Novoseletski	Well, uh, you, someone in operations said, they just warned [us] that there are no runway floodlights

Time	From	Transmission
	Kornukov	Mastak, Mastak
	Kozlov	Senior Lieutenant Kozlov
	Pavlov	Senior Lieutenant Pavlov
	Kornukov	Put Gerasimenko on [the phone]. Where is your fighter?
18:04	Kornukov	I am afraid he went to zone 406. Where is Osipovich?
	Kornukov	Hello
	Kornukov	Where is Osipovich, I said?
	Pavlov	I think you at Smirnykh ended up with ...
	Kozlov	Kozlov!
	Kornukov	Mastak
	Kornukov	Mastak
	Fighter Reg CP	So, 805 is beside the target at a range of 8 km
	Kornukov	Can he see the target?
	Fighter Reg CP	At the approach angle, at two-fourths
	Kornukov	Can he see the target?
	Fighter Reg CP	We are bringing him into attack position
	Kornukov	No, I said, can the fighter see the target or not?
	Fighter Reg CP	He cannot see the target for the moment
	Kornukov	Roger, bring him closer for identification
	Fighter Reg CP	Yes, sir
	Kornukov	Hello
	Kozlov	Senior Lieutenant Kozlov
	Kornukov	Senior Lieutenant Pavlov
	Kornukov	Pavlov, Kozlov, keep that receiver to your ear and don't put it down
	Fighter Reg CP	Roger
18:05	Kornukov	Operate without calling
	Kornukov	Hello
	Kozlov	Senior Lieutenant Kozlov

Time	From	Transmission
	Kornukov	You understood me, Kozlov, don't put down the receiver, that's all ...
	Kornukov	Where is 121, Kozlov?
	Kozlov	121 is in that area, his bearing now, bearing 75 degrees, range 130. Don't forget about the second [aircraft], they will bring it up if anything happens
	Kornukov	Bring [it] up, hello, Mastak, Kozlov
	Kozlov	Hello
	Kornukov	Give the phone to Gerasimenko
	Kozlov	Comrade Lieutenant Colonel, take the phone
	Gerasimenko	Lieutenant Colonel Gerasimenko
	Kornukov	Kornukov, so, follow Osipovich at launch range if necessary, send Comrade Tarasov down between zones 404 and 414.
18:06		Understood? And not to the north, no need to go near the target, hold nearby four hundred, south of zone 404, if necessary we can come in from there, do you understand the orders?
	Gerasimenko	Roger
	Kornukov	So everyone to the north
	Gerasimenko	Roger
	Kornukov	Good, report when following
	Gerasimenko	Roger
	Kornukov	Second ... second ... in zone four hundred, four hundred four, so he will not get in the way. He is following in our area, right? Give me bearing and range
	Gerasimenko	Hello
	Kornukov	Yes
	Gerasimenko	Bearing 55, range 160, 805 following
18:07	Kornukov	Hello, Kozlov
	Kozlov	Hello
	Kornukov	805's [fuel] remaining
	Kornukov	Find out [how much fuel] Osipovich has left

Time	From	Transmission
	Kozlov	805 has three tonnes remaining
	Gerasimenko	Hello
	Kornukov	Yes
	Kornukov	I don't need Pavlov, Kozlov
	Kozlov	Answering
	Kornukov	Well, are you observing by phase on your screen?
	Kozlov	Affirmative, I am observing, there, and the commander's radar is engaged and ...
	Kornukov	Well, then, bring Osipovich immediately to a range of 3 km. I authorize bringing him in at the angle of approach
	Kozlov	Roger, 3 kilometres at the angle of approach
	Kornukov	What range is he at now?
18:08	Kornukov	What range is he at now?
	Kornukov	How much?
	Kozlov	There is 4 kilometers between them now
	Kornukov	Can the fighter see the target?
	Kornukov	He is observing it, isn't he? Well, perhaps visually
	Kozlov	So, he is not observing it visually, he has not turned on the emissions yet?
	Kornukov	Roger, bring [him] to a range of 4 kilometers, are there any clouds in the way?
	Kozlov	Yes, there are apparently clouds, because visually ...
	Kornukov	I don't need your "apparently" you must ask the fighter about that
	Kozlov	Hello
	Kornukov	Yes
	Kozlov	He has the target in sight
	Kornukov	He can see it? How many jet trails are coming from it?
	Kozlov	Say again
	Kornukov	How many jet trails are there, if there are four jet trails, then it's an RC-135

Time	From	Transmission
	Kozlov	Roger
	Kornukov	Well, find out, hurry
18:09	?	Calmly, calmly, calmly, calmly, calmly
	Kornukov	Mastak
	Kornukov	Hello
	Kozlov	He sees it, four and a half to five [kilometres] between them, he cannot determine the type
	Kornukov	He cannot determine the type?
	Kozlov	No way ... it is dark, dark
	Kornukov	Turn on radar in high mode, prepare to lock-on. Give the order to fire on our command
	Kozlov	Roger
	Kornukov	Turn on high mode, lock-on
	Kornukov	Lock-on?
		...
	Kornukov	Hello
	Kornukov	Hello
	Kornukov	Well, what is the situation, has the target entered the hundred-kilometer [zone]?
	Kozlov	It has entered the hundred-kilometer [zone] ... the pilot cannot determine the type
	Kornukov	When did the following begin?
	Kozlov	Ah, at 6 [minutes]
	Kornukov	Following began at 6 [minutes], is it flying with lights?
18:10	Kozlov	Just a moment, the commander is talking, I cannot
	Kornukov	Uh-huh
	Novoseletski	I am answering
	Fighter Reg CP	Hello, who?
	Novoseletski	Novoseletski
	Novoseletski	Novoseletski, ask the commander, ... jettison the tanks, otherwise he will drop behind

Time	From	Transmission
	Fighter Reg CP	Okay, just a minute
18:11	Novoseletski	Hello
	Novoseletski	Hello
	Kornukov	No need for the moment
	Fighter Reg CP	But he will fall behind at that speed
	Kornukov	Well, okay, but did he use them up?
	Fighter Reg CP	Well, there was some left there, now about 4700, and we have 4200, about 500 kilograms have not been used
	Kornukov	Drop the tanks
	Fighter Reg CP	Yes, sir, jettison the tanks
	Kornukov	... don't understand, do you think he can identify the target at 10 km?
	Fighter Reg CP	It is at an altitude of 11 thousand according to reports ...
	Kornukov	So what?
18:12	Kornukov	Gerasimenko!
	Fighter Reg CP	Yes
	Kornukov	Well, what, don't you understand? I said bring [him] up to a range of 4 kilometers, 4-5 kilometers, identify the target. You understand that weapons are going to have to be used now and you are holding [him] at a range of 10. Give [the pilot] his orders.
	Pavlov	Senior Lieutenant Pavlov
	Novoseletski	Hello, Novoseletski
	Pavlov	Hello
	Novoseletski	So, the fighters are to maintain [their] distance from the target, understand?
	Pavlov	Yes sir, hold our fighters at a distance, we have jettisoned the tanks
	Novoseletski	Good, roger
18:13	Fighter Reg CP	No response from the target, Comrade General
	Kornukov	No response, roger, be ready to fire. The target is 45-50 km from the State border
	Fighter Reg CP	Roger

Time	From	Transmission
	Kornukov	Hello
18:14	Kornukov	Mastak, Mastak
	Kozlov	Hello, Kozlov
	Kornukov	Put Gerasimenko on the line
	Kozlov	Yes, sir
	Gerasimenko	Gerasimenko
	Gerasimenko	Hello
	Kornukov	So, in, be ready to fire, bring everything to ready status, I will give Osipovich the order in two minutes or even less, in a minute and a half I will give the order to open fire, bring Tarasov into the same area
	Gerasimenko	Yes sir
	Kornukov	Watch more closely, 163 is also there at point [airbase] one
	Gerasimenko	Roger
18:15	Gerasimenko	Hello
	Kornukov	Yes
	Gerasimenko	So ... target and interceptor are disappearing [on the screen], they are entering the near zone, RCA has a steady contact at the moment
	Kornukov	Good, take control, guide [him] by RCA, issue the commands from RCA
	Gerasimenko	Roger, RCA is monitoring on channel 3
	Kornukov	Be careful: behind the target and our fighter we still have the MiG-23 from Smirnykh
	Ivlichev	Comrade ... me the target ...
	Kornukov	Ivlichev, Ivlichev
	Ivlichev	Yes
	Kornukov	Kornukov, have the tanks been jettisoned?
	Ivlichev	Jettisoned, everything normal
	Fighter Reg CP	Comrade Commander, [they are] approaching my limit of visibility, who shall I hand over control to
	Kornukov	Sokol will now take control, transfer control to Sokol, we will now open fire, order Litvin to ready his weapons

Time	From	Transmission
18:16	Ivlichev	Yes, yes ... ready
	Kornukov	Good
	Ivlichev	Roger, we are handing over to Sokol
	Kornukov	Transfer control. Mastak!
	Fighter Reg CP	Answered
	Kozlov	Kozlov
	Novoseletski	Verify monitoring systems
	Kozlov	Kozlov
	Novoseletski	Gerasimenko
	Novoseletski	Gerasimenko, the commander orders you to take control of 163 from Smirnykh. Do you see him?
	Novoseletski	Ask 163 ...
	Novoseletski	Mastak
	Kornukov	Gerasimenko, Gerasimenko
	Gerasimenko	163 is not yet visible on the screens
	Kornukov	Gerasimenko
	Gerasimenko	Yes
	Kornukov	Well, then, ask Osipovich whether there are any navigation lights? Are there any navigation lights?
	Gerasimenko	Say again
	Kornukov	Are the enemy's navigation lights on or not?
	Kornukov	RCA, ask whether or not the navigation lights are on
	Gerasimenko	I did not understand
	Kornukov	Nav lights -- are they on or not?
	Gerasimenko	Eh?
18:17	Kornukov	Hello
	Kornukov	Seventeen thirty one, target 60-5 violated the State border of the USSR. I order you to destroy the target
	Gerasimenko	Roger, I am issuing the order
	Kornukov	Are there nav lights or not? Are there nav lights or not?

Time	From	Transmission
	Gerasimenko	Gerasimenko?
	Gerasimenko	I issued the order to destroy the target
	Kornukov	Are there nav lights or not?
	Kornukov	Gerasimenko!
	Gerasimenko	Comrade general, I still do not understand
	Kornukov	I am asking, well, ask the pilot, does the target have nav lights or not?
	Gerasimenko	RCA
18:18	Kornukov	Well, what has RCA got to do with it?
	Kornukov	Ask whether or not the target has nav lights
	Kornukov	Gerasimenko
	Gerasimenko	Yes
	Kornukov	Well, what are you doing, he is on channel 3, ask the pilot from the command post. Does the target have nav lights or not?
	Kornukov	There are nav lights? Who said [so]?
	Gerasimenko	There are nav lights, Comrade General
	Kornukov	There are nav lights?
	Gerasimenko	Yes, sir
	Kornukov	Flash the interceptor's lights to it, interrogate, interrogate [IFF], flash navigation lights as a warning signal. Does it answer or not?
	Kornukov	Well, tell Osipovich to flash his nav lights, order him to flash his nav lights
	Gerasimenko	I issued the order, I ordered him to flash his lights
18:19	Kornukov	Gerasimenko
		...
	Kornukov	Order him to approach the fighter, rock [wings] at the fighter, or rather at the target, rock wings at it and force it to land at Sokol
	Gerasimenko	Roger
	Kornukov	And bring the second [aircraft] in

Time	From	Transmission
	Ivlichev	Hello
	Kornukov	Yes
	Ivlichev	Hello
	Fighter Div CP	Yes
	Ivlichev	Comrade Colonel, Ivlichev, for some reason we cannot see it from Sokol, range of target is 20 kilometers, they are going away ...
	Fighter Div CP	They have entered the blind spot
	Kornukov	Ah, the blind spot, e....., I gave ...
	Kornukov	Gerasimenko, with cannons or not?
	Gerasimenko	Well, of course with cannons and with missiles
	Ivlichev	I gave ...
	Kornukov	Don't bother [me], Gerasimenko
	Gerasimenko	Yes
	Kornukov	Fire a warning burst
	Gerasimenko	Yes, sir
	Kornukov	Fire a warning burst with cannons and rock wings to show the direction to Sokol. Bring Tarasov in for the attack as well
	Gerasimenko	Wilco
	Kornukov	Order to 805: warning burst from cannons
18:20	Gerasimenko	Borisov, order to 805: warning burst from cannons
		... with them impossible ...
	Kornukov	Kozlov
	Kozlov	Hello, Kozlov
	Kornukov	Check monitoring systems
	Kozlov	Roger
	Kornukov	Do not forget the monitoring systems. Tell the pilot as well ...
	Kornukov	Gerasimenko!
		...

Time	From	Transmission
	Kornukov	Well, you heard the radio transmissions, did the pilot fire the warning burst?
	Gerasimenko	I cannot hear the radio transmissions
	Kornukov	Well, tune to channel 3 and listen
	Kornukov	Tune to channel 3 there and listen and stop that horsing around at the command post, only you, I and the controller are to talk, no one else
	Gerasimenko	Yes, sir
	Kornukov	Has Osipovich opened fire or not?
	Gerasimenko	..... warning burst
	Kornukov	Has he fired the warning burst?
	Gerasimenko	Affirmative, he has
18:21	Kornukov	Ask for reaction of target 60-65, turning south.Target tracking 240, about 240
	Gerasimenko	And now ... turned south
	Kornukov	Gerasimenko!
	Kornukov	Gerasimenko!
	Kornukov	Gerasimenko!
	Gerasimenko	Gerasimenko here
	Kornukov	Gerasimenko, cut the horseplay at the command post, what is that noise there? I repeat the combat task: fire missiles, fire on target 60-65 destroy target 60-65
18:22	Gerasimenko	Wilco
	Kornukov	Comply and get Tarasov here
	Kornukov	Take control of the MiG-23 from Smirnykh, call sign 163, call sign 163, he is behind the target at the moment. Destroy the target!
	Gerasimenko	Task received. Destroy target 60-65 with missile fire, accept control of fighter from Smirnykh
	Kornukov	Carry out the task, destroy [it]!
	Novoseletski	Attention, Mastak!
	Mastak	Yes, sir
	Novoseletski	Hello

Time	From	Transmission
	Mastak	Yes
	Novoseletski	Novoseletski
	Fighter Reg CP	Comrade Colonel, we have lost [them] from the screen, we are losing contact, reporting: we turned the radar on high mode, he is observing the rear interceptor and the target, operating on high
	Novoseletski	Good
18:23	Fighter Reg CP	But it is not yet visible on the screen
	Novoseletski	Okay, have him observe the target, transmit to him: 805 has been ordered to destroy [the target].
	Fighter Reg CP	What, isn't he firing, is [it] still flying?
	Fighter Reg CP	Has he fired the warning burst?
	Ivlichev	Roger, understood, so let Sokol take control, we have lost them now
	Fighter Reg CP	Roger, Roger, Roger
	Novoseletski	Have they taken control of the MiG-23 from Smirnykh?
	Kornukov	Gerasimenko!
	Gerasimenko	... Comrade General ... gone to attack position
18:24	Kornukov	Oh, e....., how long [does it take him] to go to attack position, he is already getting out into neutral waters. Engage afterburner immediately. Bring in the MiG-23 as well, ... while you are wasting time it will fly right out
	Kornukov	Gerasimenko
	Gerasimenko	Here
	Kornukov	So, 23 is going behind, his radar sights are engaged, draw yours off to the right immediately after the attack. Has he fired or not?
	Gerasimenko	Not yet, not at all
	Kornukov	Why?
	Gerasimenko	He is closing in, going on the attack
	Gerasimenko	163 is coming in, observing both
	Kornukov	Okay, Roger, understood, so bring 163 in behind Osipovich to guarantee destruction

Time	From	Transmission
18:25	Kornukov	Well, what? Gerasimenko
	Gerasimenko	Yes
	Kornukov	Well what [is happening] there?
	Gerasimenko	Afterburner has been ordered, he is closing in, closing in ...-dicator
	Kornukov	E....., well how long can it take to close in from a range of 5 kilometers, I do not understand
	Gerasimenko	Brought in to destroy [the target]
	Kornukov	Gerasimenko
18:26	Gerasimenko	Yes
	Kornukov	Well, what do you hear there?
	Gerasimenko	He has launched
	Kornukov	I did not understand
	Gerasimenko	He has launched
	Kornukov	He has launched, follow the target, follow the target, withdraw yours from the attack and bring the MiG-23 in there
	Kornukov	Do you see the target on the screen?
	Gerasimenko	We can see [it] for the moment
	Kornukov	Did he fire both missiles or one?
	Gerasimenko	Both missiles ...
	Kornukov	Bring in the MiG-23
	Kornukov	Gerasimenko
	Gerasimenko	Yes
18:27	Kornukov	This is the task: 22:27 bring the MiG-23 in to destroy [the target]
	Gerasimenko	Yes, sir
	Kornukov	Gerasimenko
	Gerasimenko	163 has been ordered to engage afterburner, we are bringing him to attack position.
	Kornukov	Roger. Did Osipovich see the missles explode? Hello?

Time	From	Transmission
	Gerasimenko	He fired two missiles
	Kornukov	Ask him, ask him yourself, get on channel 3 and ask Osipovich, did he or did he not see the explosions?
	Gerasimenko	Right away
18:28	Kornukov	Kozlov
	Kornukov	Gerasimenko
	Kornukov	Or Pavlov, or rather Kozlov
	Kornukov	Mastak, Mastak, Mastak
	Titovnin	Hello, Titovnin
	Kornukov	Titovnin, well what [is happening]?
	Kornukov	Gerasimenko
	Kornukov	Do not leave communications at all, you must put someone on communications. Did Osipovich fire both missiles or one?
	Gerasimenko	He fired both missiles, and saw the explosions
	Kornukov	What, near the target, what?
	Gerasimenko	The target, the target turned north
	Kornukov	Say again
	Gerasimenko	The target turned to the north
	Kornukov	The target turned to the north?
	Gerasimenko	Affirmative
	Kornukov	Bring the 23 in to destroy [it]
	Gerasimenko	Yes, sir
	Kornukov	[Fuel] remaining, what [fuel] does 805 have left?
	Gerasimenko	... 5 minutes ago it was 3 tonnes
18:29	Kornukov	Roger, understood, bring the 23 in to the target
	Kornukov	Gerasimenko
	Gerasimenko	... 40 degrees ...
	Kornukov	I did not understand
	Gerasimenko	Target tracking 40 degrees

Time	From	Transmission
	Kornukov	Well, understood, bring in the 23, has Osipovich reported the result of his fire or not?
	Gerasimenko	Comrade General, the target is in a right turn ...
	Kornukov	Well, I understand, I do not understand the result, why is the target flying, missiles were fired, why is the target flying e.....? Well, what [is happening]?
	Gerasimenko	Yes
	Kornukov	Well, I am asking, give the order to the controller, what is [wrong] with you there, have you lost your tongues?
	Gerasimenko	Comrade General, [I] gave the order to the chief of staff, the chief of staff to the controller, and the controller is giving the order to ...
18:30	Kornukov	Well how long does it take for this information to get through, well what, [you] cannot ask the result of firing the missiles, where, what, did [he] not understand, or what?
	Gerasimenko	805 has reported that the target has been destroyed, ... it is in a left right turn
	Kornukov	Bring up the 23
	Gerasimenko	Wilco
	Kornukov	And bring him in, have him open fire
	Kornukov	Hello, hello, hello
	Gerasimenko	Yes, yes, hello
	Kornukov	So, then, do you have contact with our fighters?
	Gerasimenko	Affirmative, yes
	Kornukov	So, we have a cloud base of 50 metres, you know they will land him at Sokol?
	Gerasimenko	Yes, we are watching the remainder
	Kornukov	So, look, he has about 3000 [tonnes] left
	Gerasimenko	... waiting, going in to attack the target
	Kornukov	He?
	Gerasimenko	Affirmative
	Kornukov	And the one from Sokol completed firing?

Time	From	Transmission
	Gerasimenko	The one from Sokol completed firing, reported that the target was hit, it is in a right turn
	Kornukov	So, roger, you are bringing ours in to fire?
	Gerasimenko	Affirmative, yes
	Kornukov	Roger, good, I will be on the line
18:31		... Hello
		Yes, yes
		Ah, now we can hear properly
		Good
		I am going over to Mastak
	Kornukov	Gerasimenko
	Kornukov	Gerasimenko
	Gerasimenko	Yes
	Kornukov	Report to me fully on the actions of the 23, listen to radio transmissions and report range, locking on, firing, report everything
	Gerasimenko	Radio transmissions ...
	Kornukov	I did not understand
	Gerasimenko	I hear the radio transmissions from ...
	Kornukov	I did not understand anything you said
	Gerasimenko	Radio reception is intermittent
18:32	Kornukov	It has nothing to do with intermittent, well, you ask the controller, Kostroma must be involved. Eh ... tell the 23 ... afterburner, open fire, destroy target then land at home base
	Gerasimenko	Roger
	Kornukov	Altitude, what is the altitude of our fighter and the altitude of the target?
	Kornukov	Quickly, the altitude of the target and the altitude of the fighter!
		...
	Kornukov	Why don't you say anything? Gerasimenko!

Time	From	Transmission
18:33	Gerasimenko	I am asking ...
	Kornukov	Hurry up, guys, that's a real target. Hello Mastak, Mastak, Mastak, Mastak, Mastak, Mastak, Mastak, Mastak
	Gerasimenko	Gerasimenko, altitude of target is 5000
	Kornukov	5000 already?
18:34	Gerasimenko	Affirmative, turning left, right, apparently ... it is descending
	Kornukov	Destroy it, use the 23 to destroy it, I said!!
	Gerasimenko	Roger, destroy it
	Kornukov	Well where is the fighter, how far from the target?
	Gerasimenko	Comrade General, they cannot see the target
	Kornukov	They cannot see the target?
	Kornukov	Order Kostroma to, ... set the task, transmit the command to the 23 ... follow, be there the whole time and fire. Is that understood or not?
	Gerasimenko	Roger
	Kornukov	Do it
	Gerasimenko	Wilco
	Kornukov	Gerasimenko
18:35	Gerasimenko	I am assigning the task, Comrade General
	Kornukov	Well hurry up, e..... I gave you that task a long time ago. Can a MiG-23 really close in like that, a fighter moving at a speed like that
	Gerasimenko	Comrade General
	Kornukov	Yes
	Gerasimenko	Area cannot see the target
	Kornukov	And Kostroma?
	Gerasimenko	Neither can they
	Kornukov	Well, wait a bit
18:36	Kornukov	And Kostroma, ask Kostroma, does Kostroma see the target?
	Gerasimenko	Kostroma does not see it either

Time	From	Transmission
	Gerasimenko	They do not see the target either?
	Kornukov	Gerasimenko?
	Gerasimenko	Here
	Kornukov	And what does the pilot report, the 23?
	Gerasimenko	He cannot see the target either
	Kornukov	He cannot see [it]?
	Gerasimenko	He cannot see [it]
	Kornukov	Oh e....., well you know the range, where the target is, it is over Moneron. Well go on, send him there to that area, tell Kostroma, they must have the 23 descend, he must descend. At what altitude are you holding the MiG 23?
	Kornukov	Gerasimenko
18:37	Gerasimenko	Yes
	Kornukov	What is the altitude of the MiG-23?
	Gerasimenko	... 5000 and descending
	Gerasimenko	I say ... altitude of fighter 5000
	Kornukov	5000, well, it is somewhere in the area of the target, it must be at 4000-4500. You are real slowpokes at carrying out orders e....., back when I gave the order to bring in the 23. He has no tanks, he can maintain any speed, e..... to destroy the target
	Kornukov	Where is the MiG, your SU-15, Osipovich?
	Gerasimenko	He is on approach, they are reporting bad weather
	Kornukov	Roger
18:38	Kornukov	Gerasimenko
	Gerasimenko	Yes
	Kornukov	Can Kostroma see it or not, ask them again
		Ah, just now ... is speaking with Kostroma
		So
	Gerasimenko	Comrade General, Kostroma reports: the target has been observed: the enemy was in a descending right turn and then disappeared. Kostroma now has contact with the [MiG] 23

Time	From	Transmission
	Kornukov	Well what [happened], did they lose the target?
	Gerasimenko	Comrade General
	Kornukov	Yes
	Gerasimenko	Reporting: Kostroma reported: the enemy was observed in a descending right turn, then the target disappeared
	Kornukov	Well, Roger, understood
18:39 18:40	Gerasimenko	... launch, target entered a right turn ... descending
	Gerasimenko	And lost
	Gerasimenko	According to the report from Kostroma ...
	Kornukov	So the task, now they say that the target again violated ... finish [it] off, bring in the MiG-23
	Gerasimenko	Roger, the MiG-23 is in that area, descending to 5000. The task has been set: destroy upon detection
	Kornukov	Good, Roger
	Gerasimenko	So, the pilot reported that [it] obviously was falling
18:41	Kornukov	Hello, Kozlov
	Kornukov	Gerasimenko
	Kornukov	Gerasimenko, so send Tarasov up from reinforcements, send him up
	Gerasimenko	Tarasov is in the air
	Kornukov	Ah, from reinforcements
	Kornukov	Well, what [is happening] there, has that 23 reported anything, does he see [it] or not? Bring him down to 4000, have him look visually and on the radar sight
	Gerasimenko	Comrade General, the 23 reported tops of 10/10 cloud cover at 2000 metres. He cannot ... go any lower
	Kornukov	What is the cloud cover?
	Gerasimenko	10/10, tops 2000
	Kornukov	Ah, Roger, well no need to go below two thousand, but he can descend to three thousand, ask him how much [fuel] he has left and depending on the reserve to hold in the area of Moneron, then you will land him at your location

Time	From	Transmission
	Gerasimenko	Roger. Send Tarasov up on readiness one?
	Kornukov	Yes, send Tarasov up, to the region of zone 412
	Gerasimenko	Roger, to Moneron, to Moneron
	Kornukov	Yes, yes, to Moneron
	Kornukov	Ask the 23 what his remainder is
18:42	Gerasimenko	1700 remaining
	Kornukov	Hello
	Kornukov	Hello, well what [is happening], Gerasimenko
	Gerasimenko	1700 remaining
	Kornukov	1700?
	Gerasimenko	Affirmative
	Kornukov	Maintain until the reserve is one and a half tonnes, with 1.5 tonnes remaining [he is to go] back to the aerodrome, landing at your location
	Gerasimenko	Roger, Comrade General ... base 110 metres ... visibility more than 5
	Kornukov	Is that what Osipovich reported?
	Gerasimenko	That is what they are reporting from RCA from ...
18:42	Kornukov	I did not understand

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 3, REEL NUMBER 2

Time	From	Transmission
17:22		Have they answered?
		What
		Have they answered ... ?
		No, no, no
		I don't have the weather at the third ...
		Roger, roger, roger. I'm receiving ...
		It's now over the Sea of Okhotsk there ... 60-65. Affirmative.
		Hello
	Kostenko	Major ... here
	Kutepov	Captain Kutepov, so, for your information: target now in the Elizov region, it will be Target 6065 - type unidentified, border violation
	Kutepov	Just a moment, just a moment. So.
17:23		So this is what we need, it's now been designated a type unidentified target, that is, without identification signal, now tracking 240 somewhere over the Sea of Okhotsk, so, it crossed Elizovo, going to (Sea of] Okhotsk heading roughly towards us. I've looked at the plan, we have to check routes of our long-range aircraft, is someone flying there of those long-range aircraft or not? Could that aeroplane be ours? It's already somewhere abeam Noglikov, but closer to Elizovo.
	Kostenko	I'll call the zone right away, but they would hardly be there now.
	Kutepov	Well, you haven't opened anything there, no requests from long-range aircraft, right?
	Kostenko	No
	Kutepov	Well, we need to find out, if one of ours is flying out there.
	Kostenko	Uh-huh
	Kutepov	Well, that's all
	Kostenko	Okay, I'll find out right away
	Kutepov	Uh-huh

Time	From	Transmission
17:24	Kostenko	"Plantatsia"
	Kostenko	Pavlov, go ahead and seat the second [pilot in his aircraft], readiness one, call the "queens" [code word for commanding officers], everything in accordance with procedures. Commander at the command post, chief of staff, everything, go ahead.
	Kostenko	Kozlov, seat two, commander to the command post, all flight control officers to GCT.
	Flight Reg CP	... 25 [minutes], readiness ... 60-65, RC-135, State border violation
	Kostenko	I'm calling
17:25	Kostenko	Go on, faster s....., faster. I [can't] ... anyone, go on, call, s..... [get] me a driver there
	Kostenko	Plantatsia 123, Plantatsia 123
	Kostenko	Plantatsia 123
	Operator	Go ahead
	Kostenko	Hello
	Area ATC	Who
	Kostenko	Major Kostenko
	Area ATC	Major ...saev
	Kostenko	Where are you [calling] from?
	Area ATC	Area centre, and you?
	Kostenko	Wait a moment e....., area centre, wait a moment, Comrade Major, wait a moment
	Area ATC	Yes, yes, yes, yes
	Kostenko	... connection area centre, what the ... do I need your area centre for
17:26	Operator	Plantatsia isn't there ... I'll hand [it] in for verification
	Kostenko	Oh, e.....!
	Kostenko	Hello
	Kostenko	[Get me] Kornukov's apartment
17:27	Kostenko	Comrade General
	Kornukov	Yes

Time	From	Transmission
	Kostenko	Excuse me for waking you. We have, well, 00 [a code for alert] at 4 o'clock there was a border violation in the Elizovo area, an RC-135, now tracking 240 over the Sea of Okhotsk, moving toward us. That's all for the moment. Distance somewhere around 500 km, abeam Noglikovo
	Kornukov	Okay, brief the officer on duty
	Kostenko	The officer on duty has been briefed, [car number] 02 is on its way to you
	Kornukov	Okay, I'm getting dressed, that's all
17:28	Kutepov	Captain ...ov
	Valiuntovich	Major Valiuntovich
	Kutepov	Valiuntovich, so, I'm reporting, in the Elizovo area target No. 60-65, type not yet identified but provisionally an RC-135, is being shown on the board, tracking 250, it made a zig-zag in the area of Elizovo, I have the distance here somewhere, about 40 km, so, and is now tracking 240, let's say, if you imagine the map of Kamchatka, there, on the cape, that very thin cape there, that thinnest one, there opposite this, about there, the southernmost cape on the peninsula ... nor islands.
17:29	Kutepov	And it is tracking 240. Right there, there.
	Kutepov	Altitude now 9000, speed 800. Crews on duty at Shkolny and Ugol are ready. At all points ...
	Kutepov	... Yes, everything will be okay, our controller at Cape Terpenia ... track
	Valiuntovich	Uh-huh, will, I just talked with the zone
	Kutepov	So
	Valiuntovich	They say none of ours are there, none ... on that route ...
	Kutepov	What?
	Valiuntovich	I'm saying, that is the only time they have taken that route
	Valiuntovich	Uh-huh, so that is exactly what I reported to the controller at the zone, he says none of ours are there
	Valiuntovich	Well, generally, [there are] still Tupolevs, if some sort of Tupolevs could fly across like that. Because there they reported what looked like our aircraft near the target. There.
17:30	Kutepov	Well, understood

Time	From	Transmission
17:31	Solodkov	How is Plantatsia?
	Operator	Still checking there
		...
	Solodkov	Get me Burminski's apartment
17:32	Operator	Uh-huh, okay here
	Solodkov	Good morning, Captain Solodkov, operations duty officer
	Burminski	Hello
	Solodkov	Comrade Colonel, so time, well, now, we will calculate the tracking in the Elizovo area from 21 [minutes]
	Burminski	Yes
	Solodkov	For the time being, we have a presumed breach of regime, a border violation by the target, type not yet identified, there in the area of Elizovo, well, there further to the south it veered towards the Sea of Okhotsk, violated the border, passed if you calculate across Kamchatka and is now over the Sea of Okhotsk, tracking 240 towards Terpenia, Terpenia is still, to Terpenia it still has something like 600 km to go, 600-700.
17:33	Burminski	So, did they send [anyone] up there?
	Solodkov	Well, yes, Elizovo sent [someone] up, but couldn't catch it ... high speed, altitude 9000, speed 900, there
	Burminski	Type not identified, eh?
	Solodkov	Type not identified, maybe even now, well, we're checking, what kind of target it is, what type of target, command has been informed, those higher up have been informed
	Burminski	Well. Roger, [they] have brought [us to readiness] here, too uh ...
	Solodkov	At all points
	Burminski	Well, okay, call me later if there is anything
	Solodkov	Roger
	Burminski	Right, good
17:34	Kostenko	Roger, later will be too late
17:43		
		...

Time	From	Transmission
	Kostenko	I am asking for "Chaika"
	Kostenko	Comrade Colonel, later will be too late, it would be better if we sent [them] up with three auxiliary tanks
	"Chaika"	Let division ... division made the decision, division.
	Kostenko	Chaika, I ...
	Solodkov	The chief has arrived, the chief of staff has arrived
	Solodkov	Captain Solodkov, Comrade Colonel, the duty pilot from Sokol was sent up at 42 [minutes]
	Maistrenko	42
	Solodkov	At 42 [minutes]
17:44	Maistrenko	So, 42, Sokol, one?
	Solodkov	One, one pilot at 9.37. The command was just given at 9.30 from point one from Shkolny
	Maistrenko	Take a look at the weather there
	Solodkov	Comrade Colonel, I [can] tell you, it's okay, 10/10 visibility 3 km.
	Maistrenko	That's Smirnykh, right?
	Solodkov	Affirmative ... [have] to go up
	Maistrenko	What?
	Solodkov	... [have] to go up ...
	Maistrenko	Understood, understood, fine, take a careful look, work calmly, don't get excited
	Solodkov	Roger
	Maistrenko	It's, hello
	Solodkov	Yes, hello
	Maistrenko	Transmit calmly that they are to send [someone] up, put the pilots in the cockpits there according to procedure and everything, calmly
	Solodkov	Roger, the chief arrived at the command post at 44 [minutes]
	Maistrenko	The commander has not arrived?
	Solodkov	He is at the door now, at the door

Time	From	Transmission
	Maistrenko	Fine, roger, record everything
	Solodkov	Roger
17:45	Kostenko	... I am asking
	Kostenko	Melnikov, I [sent] up the duty pilot from Sokol ... [you will] ... That's all Major Kostenko
17:46	Melnikov	Well, I will be right there. Hello, hello.
		Hello, hello
		Hello
		Hello
		Hello
	Solodkov	Captain Solodkov, who am I speaking to
	Valiuntovich	Major Valiuntovich
	Solodkov	Valiuntovich, this is the situation: border violation, we have sent [someone] up, we are sending up two duty pilots, the weather here at the northern point is unstable, Sokol is still more or less
17:47	Solodkov	We are asking for alternates, your point, the flight control officer will be arriving at your tower there
	Valiuntovich	So tell me this, what is the weather at Shkolny now?
	Solodkov	At Shkolny? At Shkolny the weather is presently 10, 120 visibility 3 km
	Valiuntovich	Visibility 3 km
	Solodkov	Yes. At Sokol visibility, base 100 metres
	Valiuntovich	Eh?
	Valiuntovich	Visibility?
	Solodkov	Visibility 6 kilometres, well, lo--
		...
	Valiuntovich	Uh-huh
	Solodkov	And which took off, [which] took off?
		Article[s] such and such [two types of fighters]
	Valiuntovich	Two took off, right?

Time	From	Transmission
	Valiuntovich	Eh?
	Solodkov	Ah, wait, [they] reported to me
	Solodkov	They sent up two pilots article 3
	Solodkov	Article 3
	Solodkov	Yes, they went up from Shkolny, from Shkolny ... went up
	Solodkov	That's all I have
	Valiuntovich	They sent [them] up from Shkolny?
	Solodkov	Yes
	Valiuntovich	What is happening there ...?
	Solodkov	Around Terpenia we will work zone 406
	Valiuntovich	And afterwards, where will they land?
17:48	Solodkov	To zone 415.
	Valiuntovich	And afterwards where will they land?
	Solodkov	Well, for the moment I am saying Khomutovo they are asking ... We will keep "Vodolei" and that's it
	Valiuntovich	Uh-huh, so what is the altitude?
	Solodkov	[They] will operate at 8-9 thousand
	Valiuntovich	... took off at 21.43, and which others?
	Solodkov	163 took off
	Valiuntovich	163?
	Solodkov	Yes, 163 took off
	Valiuntovich	163?
	Solodkov	Affirmative, it's a MiG-23
	Valiuntovich	When?
	Solodkov	At 46 [minutes]
		...
	Valiuntovich	Well
	Solodkov	Good
17:49	Solodkov	Captain Solodkov

Time	From	Transmission
	Burminski	This is Burminski, well what's happening?
	Solodkov	Two pilots have just been sent up, command at the command post, we do not know what is happening just now, it's heading straight for our island, to Terpenie, somehow this all looks very suspicious to me, I don't think the enemy is stupid, so. Can it be one of ours?
	Burminski	Maybe, now, we will sort it all out there right now
	Burminski	Two have been sent up, right?
	Solodkov	Yes, straight to Terpenie, distance from Terpenie 160 km.
	Burminski	Where did they go up [from]?
	Solodkov	They were sent up from Sokol, Smirnykh is below weather minima
	Burminski	Below minima
	Solodkov	Yes
	Burminski	And where will they land?
17:53	Solodkov	At Pastovaya
	Burminski	Well, okay, I am at home for the time being.
	Solodkov	Roger, I will [call] you in about 5-10 minutes [when something] turns out
17:54 17:55 17:56 17:57	Solodkov	Captain Solodkov
	Valiuntovich	This is ...
	Solodkov	Go ahead
	Valiuntovich	Well, what [is the situation], you will probably land them at Khomutovo?
17:58	Solodkov	Well, the flight control officer will be arriving at your aerodrome soon, Lieutenant Colonel Dubinkin
	Valiuntovich	Well, Dubinkin
	Solodkov	Affirmative
	Valiuntovich	And landing at Khomutovo, right?
	Solodkov	Khomutovo, possibly, yes ... we will decide on the basis of fuel remaining

Time	From	Transmission
	Valiuntovich	Uh-huh, and that weather is 100 metres at Sokol?
	Solodkov	Weather is now 10 moderate 8/10 at 500 ten
	Valiuntovich	Yes
	Solodkov	Weather at Sokol is now okay
	Valiuntovich	It is?
	Solodkov	Yes
	Valiuntovich	Then why did [they] transmit ...
	Solodkov	That is what it was at the beginning
	Valiuntovich	Now it is okay
	Solodkov	Okay
	Valiuntovich	10/10 at 500?
	Solodkov	Yes, visibility 10
	Valiuntovich	You [have] 10/10 at 500, visibility 10
	Solodkov	And at Shkolny the weather is definitely bad, below minima
	Valiuntovich	120 metres?
	Solodkov	90 metres
	Valiuntovich	90, so we will be landing at that one
	Solodkov	Eh?
	Valiuntovich	Both are coming here, or are we landing at Sokol?
	Solodkov	Ah, no, I think one may be able to [land] at "Vodolei".
	Valiuntovich	Ah, at Vodolei still?
17:59	Solodkov	Yes, or at Sokol, but now, judging by the situation, what will happen, on what track, fuel consumption.
	Valiuntovich	No, well, something serious is going on there, isn't there?
	Solodkov	Eh?
	Valiuntovich	Something serious?
		Yes, it looks serious. Like on the fourth, but a bit worse.
		Well, you [did] everything normally, like an alert, right?
		Oh no, right now we are just about to guide him in

Time	From	Transmission
		Ah, is everything going okay?
		For the moment, God knows, I don't
		...
		Uh-huh
18:00		Transmit to communications [officer] on duty
18:01		
18:02		
18:03		
18:04		
		Kozlov
		Mastak
		Mastak
		Are you observing the target?
		Ensign Loginov
		Loginov is not here, the tape was finished
		[That's] all, he has already [gone] with the tape
		But why ... so
		Roger
		Are you observing the target?
18:05		We are issuing another warning
18:06		
		... (call sign)
		Give me ...
		Hello, Migal
18:07		Captain Solodkov, hello
		Ah
		So it seems to us, we ... this border intruder, something like our TU-95, I hope nothing bad has happened
		I'll ask right away, right, I'll find out
		It's very suspicious, extremely - the altitude and track and speed
		Right away, right away, wait, we'll ask

Time	From	Transmission
		Captain Solodkov
		Comrade Captain, Loginov
		Yes
		Reading, ah, well, reading bearing to target sixty, sixty-five, 340, distance 340, tracking 200 from Plantatsia. You have the cable downstairs now.
		Roger
18:08		Captain Solodkov
18:09		
		Hello
		Hello
		Hello, hello, hello, hello Plantatsia
18:10		Captain Solodkov
		So I called the zone, they say there is nothing of ours in the air
		Roger
		Well, what is it then, where is it going?
		Well, it is south of Terpenie, somewhere about 100 km. heading straight for our island
18:11		in the region of Makarov there, that's where it's going out
		In the region of Makarov?
		Yes, well I say that is much too stupid an intruder
		What is happening, how is it going as of the [last] check?
		It was tracking 240, 240 south of Terpenie, distance 100 km. Well, in the Makarov area it is going straight like this. I say ... ... include everything you can. Short-range radio navigation system because, well, an intruder can't operate that way... that's according to us, you are fine sitting below
		Well, it's not fate, the way it turned out, in that case we have here
		It hasn't bombed us.

Time	From	Transmission
18:12		We have to live, well, understood, well there it is now boxed in, between range 4 km, 4 km to target. At the moment, they're investigating, they cannot determine the type, I'm hanging up now, I'll call you as soon as something interesting happens.
		Uh-huh, call and tell me where it goes
18:13		Captain Solodkov
18:14		
		Solodkov
		Yes
		Commander, commander to that phone
		What, hello
		Hello
		Captain Solodkov here
		Well why the e..... can't I get through to you, why doesn't [somebody] ... the receiver?
		... perhaps?
18:15		Yes, the commander is directing [operations] now, Comrade Colonel. The operational task is being set, locked on the target and closing in ... 1 km, ten, just one minute's flight for the target
		Roger, ... take the phone
		I am handing over the phone now
		... Comrade Colonel
		... disgraceful, hand control over to Sokol, it is approaching my limit of visibility
		Right away, just a moment
		Hello
		Comrade Colonel, it would be more appropriate for me ...
		What, what? Say again
		Dropped, everything normal
		Roger

Time	From	Transmission
		Comrade commander, ... area of visibility. Control should be handed over.
		Okay, we are handing over, hand it over.
		Transfer control to Sokol, we are now going to open fire, order Litvin to ready his weapons.
		I have given the order, he is ready
		Good
		Roger, we are transferring control to Sokol
18:16		Kozlov, Kozlov
		Gerasimenko. The commander orders you to take control of 163 from Smirnykh, do you see him?
		Mastak
		Gerasimenko
18:17		Captain Solodkov
18:21		
		Where ...
		Here
		Give [him] the phone
		He is issuing mission orders at the moment
		Very well, let him issue [them]
		I'll hand [you] over to the chief of staff
		...
		Novoseletski
		Hello
		Novoseletski
		Lieutenant Colonel Novoseletski
		Kamenski, what is the situation
		Well, the target is now 20-30 km ea--, west of Uriuk, proceeding on track, so, it is being accompanied by 805 Osipovich article 37 ...
		Is it ... on our territory?

Time	From	Transmission
18:22		Affirmative, affirmative, over the middle of the island
		...
		So, he was ordered to fire a warning burst
		Command has ordered our forces to destroy the target
		Roger
		... fast
		Roger, yes, sir
		Comrade General ... transmit
		Kornukov, hello
18:23		Captain Solodkov
18:24		
		What frequency is Uriuk operating on, eh?
		What?
		What frequency is Uriuk operating on?
		Number three, channel three, quartz 301, 370
		Quartz 370?
		Yes
		Understood
		We are working now, they have guided him in directly for the attack
		Eh?
		I [said] the crew has been guided in for the attack
		What are you saying?
18:25		Affirmative, in the area of Kostrom, in the area of Kostrom, in the area of Kostrom about 50 km. Please, you must go to readiness one, tell your SAR, isn't Khomutovski on duty now?
		...
		Roger, I understand, they gave [it], the command has been given, I have assigned the task
		In the Kostrom area?

Time	From	Transmission
		Yes
		What track is it on?
		210
		Heading south
		Yes
		Roger
		So, SAR at readiness one, right?
		Right, all at readiness one
		okay, roger
		Missile fired in the air
		A missile?
		Yes
		And now Oguslaev is our flight control officer there. That's all I have.
18:26		Could I have Chaika?
18:28		
		Busy
		With whom?
		Chaika went out to Met
		Well, as soon as [he's] free, have [him] call us right away.
18:29		Captain Sokodkov
		Go ahead, Chaika
		Chaika, I request ... at the command post
		Right away ...
		Hello
		Yes
		... Captain Solodkov, Emir command post, at 26 minutes 25 seconds article 37 fired a missile at the target, how do you read?
		Roger, I understood

Time	From	Transmission
		Okay, we are now continuing the operation with article 3
		No results?
		We have none yet
		...
		Unknown
18:30		Record the time at ...
		Captain Solodkov
		Solodkov
		Hello
		Give [me] Novoseletski
		Right away
		Bring in the 23 and guide it in, have him open fire
		Hello, Novoseletski
		Comrade Colonel, I cannot reach you on a direct line, why?
		I don't know, I have been here all the time ...
		So, I don't know why, I haven't been able to [reach] you
		We are all, all, all in contact
		Hello
		Yes, yes, yes, yes, hello
		So, the base here is at 50 metres
		Captain Solodkov
		Listen, the SAR today is Kislyakov
		He comes on in the morning, Kislyakov comes on in the morning. Yes
18:31		We are bringing Kislyakov in, ... they have already gone up, give the command, he even ...
		I sent [it/him?] up, too
		Excellent, so a missile has been fired in my area, results unknown so far. Maybe SAR will have to be raised. That's all I have for the time being

Time	From	Transmission
		... we do not know why?
		I am saying a missile was used, a missile was launched, I am saying it may be necessary to send out SAR
		Did they shoot it down or not?
		I do not know, unknown so far, I am hanging up now
		Hello, hello, hello, hello
		Yes
		Captain Solodkov, hello
		General Kamenski
		Comrade General, I am passing the telephone to the commander
		General Kamenski
18:32		Lieutenant Colonel Novoseletski
		Novoseletski, report on the situation
		Well, the 805 launched two articles at 26 [minutes], according to the report the target was hit, but it is now in a right turn, descending
		The target was hit, in the area of Moneron?
		North of Moneron, north of Moneron somewhere on the boundary, about 30-40 km.
		Descending in a right turn?
		Affirmative
		So it is over our territory?
		Now it is being drawn on the board a bit into neutral [waters]
		And why did the pilot [think that he] hit it, did he see an explosion or what?
		Affirmative, yes.
		Aha.
		But he hit it [when it was] still over our territory?
		He fired over our territory?
		Affirmative, but during the turn, it apparently went out

Time	From	Transmission
		Descending in a right turn?
		Affirmative, yes
		Over neutral waters?
		Affirmative
		Good, understood. Keep me informed
		So, we bring in the 23
		Uh-huh
		From point one for a second attack
		... over neutral waters watch carefully
18:33		Affirmative, we will watch
		Well, go ahead, [give me] all information if there is ...
		Yes, sir
		So the target is descending, what is its altitude now?
		Just a minute
		Novoseletski, Novoseletski, Novoseletski, Novoseletski
		Hello
		Yes
		Altitude of the target is 5000
18:34		Descending, right?
		Affirmative
		Where is it now?
		It is in the Moneron area
		In our territory?
		Affirmative
		... we will probably finish him off now
		Good, now report to the commander-in-chief
		Yes, sir
18:35		Ensign ...
18:36		

Time	From	Transmission
		Please give [me] transit
		Ensign Goncharov
		They brought in ... SAR
		Eh?
		Have they brought in SAR?
		Oh yes, at Sokol
		At Sokol, who do we have there?
		Kislyakov
		One?
		Eh?
		At [readiness] one?
		No, two
		He must go to [readiness] one
		Why ...?
		A missile has been launched
		Eh?
		A missile has been launched
		Well, so?
		Well, now we may have to send [him] up
		One, right?
		Yes, readiness state one
		Okay, roger
		And I gave Migal the command, Migal brought his own in there too
		His own -- who?
		Oh, God knows, I don't know he says that he also brought in someone of his own
		But there is nobody there
		He says he brought [them] in
		Civilians are not on duty, ...

Time	From	Transmission
18:37		I don't know, he says that he brought [them] in, I don't know
		Captain Solodkov
		... area of the attack Ivrichev
		Hello
		Lieutenant Colonel Novoseletski
		This is ... Ivrichev, well what [is happening] has our [aircraft] opened fire or not?
		No, the target is descending, he lost it and no one can see the target now
		It departed downward?
		Over Moneron, yes it is flying below 5000 now
		He can't see it, well then, locate it whatever is there
		Well, only, the commander gave the command to descend
18:38		Roger, can't you tell me how much fuel he has left?
		Not at the moment, we don't know yet.
		Keep an eye on how much he has left, it might already be time for him to come back, see?
		Very well, we must [do that] of course.
		The end? The end?
		Hello, hello
		Yes, yes, that is all
18:39		Captain Solodkov
18:40		
		Tarasov
		Hello
		Chief of PDS, Tarasov, Comrade General
		Hello
		And Stepin
		Stepin
		Stepin, Stepin, Stepin

Time	From	Transmission
		Hello
18:41		Captain Solodkov
18:42		
		So, now where are you going to land [them]? [He] has arrived
		Ah, he has arrived, has he? Excellent. Let him be, let him be in the tower, we will call you
		Where to land, right?
		Now we have three crews in this area: two land-based and one
		But you are already guiding them to a landing
		No, not yet, we are returning
		Well, so, what is the result?
		They lost the target in the area of Moneron and we don't know
		Roger
		After the missiles were fired
		Roger
		Well that is all I have for the moment
18:43		...
		Captain Solodkov
		Hello, who is that?
		Hello, Captain Solodkov
		Tell me, what ...?
		This is General Arkharov, I understand?
		Hello
		Yes
		I am asking, is this General Arkharov?
		Yes
		Reporting: target was 6065, violated crossed Kamchatka in the Elizov area, four crews sent up from Elizovo, they were unable to affect the target, speed, speed 900

Time	From	Transmission
18:44		Speed 800, altitude 8000, no effect
		Why did they not affect [the target]?
		Say again
		Why did they not affect [the target]?
		It was detected late, late, Elizovo detected it late, because the speed of the target was 800, altitude 8000, they were unable to affect it. So it passed over from Kamchatka, tracking 230 degrees, speed 800, altitude 9000, and came in our direction south of Cape Terpenia at a range of 100 km, there, passed about 40 km north of Sokol ...
		... what result?
18:45		Weapons were used. Warning shots were fired first, warning cannon shots were fired, target did not respond, two article 37 missiles were fired at the target. We have no results yet, radar, according to radar data, the target was lost in the area of Moneron Island descending
		...
		Say again
		Did the pilots report what the target was?
		The pilots saw a four-engined [aircraft], a four-engined [aircraft], they were not able to identify it, it was flying with navigation lights [on]
		...
		They flashed their lights, the target did not respond
		A four-engined [aircraft], big, eh?
		Yes, big, big, four[-engined]. Weapons were used, weapons authorized at the highest level. Ivan Moiseevich authorized it. Hello, hello
		...
		Say again
		...
		I cannot hear you clearly now
		...
		He gave the order Hello, hello, hello

Time	From	Transmission
		Yes, yes
		Ivan Moiseevich gave the order, Tretyak
		Roger, roger
		Weapons were used at his orders

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 5, REEL NUMBER 2

Time	User	Content
		Roger
		Well
		By the way ...
17:19		Right away
		Copy
		Copying
		Okay. Where is the meteorologist?
		Hello?
		Yes
		Where is the meteorologist?
		Are they right here?
		No
		In the equipment room
		In the equipment room?
		So, copy weather
		Copying
17:20		Okay, 10/8, so, moderate, visibility 10, 0, 92 12 95. Sky obscured, fog 200 0,94. Okay, 9 at 600, visibility 10 122 1493, 10 at 300 drizzle 6 calm, 10/8 at 600 moderate 10 northerly 3; no [report for] Kulon; Bronya 10/500, uh, 8/10 at 180, visibility 10 74. Got it?
		Yes
		Go ahead
		Don't you need the meteorologist?
		Answer me
		Chaika
		Met [service] please

Time	User	Content
17:21		Hello Call Chaika again
17:22		
17:23		Chaika doesn't answer
		Chaika here
		Chaika, for some reason Met isn't answering
		Call again
		Met ...
		... give me the weather for [various] points [airbases]
		Local, right?
		Yes, yes. Yumor, Pshenitsa, Chaika and Okantovka
		Okay, copy Yumor
		Copying
		10 at 360 strato-cumulous, haze 3 341 plus 17, 100
		Pshenitsa 10/5 strato-cumulous at 600, haze 8, moderate 1 plus 17, 89. What else?
		Chaika and Okantovka
		9 and 1 moderate
		That's Chaika?
		Yes
		9 and 1 moderate 10, 201, 18, 97
		So, 18
		97
		And Okantovka
		4 upper 10,210 at 8 plus 2, plus 19, 96
		Got it
		Hello
		... me. Busy

Time	User	Content
17:25		So, Met, all three regiments have been placed in readiness
17:26		1. So, the commander will be arriving here soon
		Roger
		Burevestnik below minima, fog, Smirnykh below minima, Sokol IFR conditions
17:27		... Isn't it free yet? ... not there, being checked
17:28		Met, Private Pustuyev here
		Pustuyev?
		Yes
		Mastak went on readiness one at 24 [minutes]
		So, hello
		Yes, yes
		24 [minutes]
		Readiness one
		Readiness state 1?
		Yes
		Roger
		Give me the weather
17:29		Copy. 10/10 at 120, haze 3 140 at 3. So, 140 at 3 plus 12 96, 10/10 moderate
		Where is the meteorologist?
		Zhen [proper name]
		Eh?
		Visibility 10
		Are you giving me Burevestnik now?
		Ah! Hell, damn it!
		I started to read you your own
		Burevestnik. Sky obscured, fog 300, 190 at 2, plus 9, 100, 9/10

Time	User	Content
		Hello
		Eh?
		Just a moment
		Comrade captain, ... readiness state 1 transmitted at 24 [minutes]
		Go ahead, I am copying
17:30		9/10 at 600, visibility 10 120 at 2, plus 14 93, 10/10 at 300 drizzle 6, calm, plus 15 100, 10/8 at 600 moderate, visibility 10, northerly 3, plus 17 92. No [report for] Kulon; Bronya - 10/10 at 500, 8 at 180, visibility 10, 70 at 4, plus 18 97. Got it?
		Roger
17:31		Primier
		Mastak, please
17:32		Hello!
		Hello, Mastak?
		Yes, yes
		Give me Met please
		Met, junior ...
		Put the meteorologist on the line, please
		Just a moment
		Hello, Parshin here
17:33		Hello!
		Hello, Parshin
		Who?
		Parshin
		Morozov, hello
		Good morning
		So, the weather there is still okay, right?

Time	User	Content
		Yes, it's okay
		Uh, I think it's going to hold?
		No, well, the humidity, of course, will go up, so
		Well, [if the humidity] goes up, that's nothing
		Well, then, let's keep you as one alternate aerodrome
		Okay
		Go and take a closer look
		Yes, sir ...
		Plantatsia layers
		Plantatsia is to be checked at ... I say
17:34		Met, Private Pustuyev here
17:41		
		[Put the] meteorologist on [the phone]
		Yes, sir
		Morozov here, hello
		Captain Parshin
		Hello
		I just went outside - we have 10/10 low cloud here. Tell the operational control centre they must not send [anyone] up, I am reporting to the operations [duty officer] now
		Well, where? You have a crew up, and now you call and tell me you have low cloud
		Well, I went out and checked
		What did you check? What is the height there? I just measured, it's below 100 metres, 10/10
		Well, 10/10 and below, well I just issued [it], take-off clearance has been given there [at your location]
		Well, it's all correct, I just went out, I went out, I had relied on a soldier, I just went out myself to look, checked carefully - low cloud, 10/10

Time	User	Content
		Oh, d... . .
17:42		Hello
		So, copy the weather please
17:43		Hello! Hello!
		For points, by ... I did not understand that
		Copy weather
		Where is that from
		...
		Ah, I'm copying
		So, at 40 [minutes] we are reporting
		95, 130, 81, 502, 10 116 humidity 109, 3 00 73 57 003 510 22 686 // 903//
		903, got it
		Hello
		Get me Mastak
		It's busy, talking
17:44		Mastak
		Weather, please
		He's talking with operations
		Roger
17:45		... call Khomutovo
17:46		
		Go ahead ...
		Yes, yes
		Mastak
		Mastak
		Mastak, Met
		Captain Parshin

Time	User	Content
		Ah, well, so, have you clarified the situation further?
		I'm looking into it, I'm calling Dolinsk. We have an instrument, overhead here, I say there is a break
		So
17:47		Overhead. It's to the side, well, over us to the south-west here.
		Well, so, what is over [your] point, over [your] point?
		Over [our] point the instrument specifically indicates below 100 metres and there you can see it, east ...
		Well, you can see it, wake up and analyze the weather. So we are going to keep looking into this, this matter.
		Well, the fact is that ...
		Hello, I'm listening, hello. Is that Khomutovo? Ah! Well, have you got [through to] the apartment?
		Hello
		What?
		Yes, during the night the instrument measurements were all haywire, it's true, overhead, overhead, you can see the stars, then - low [cloud]
		And so you're looking it over, looking it over there, looking it over, and here there is a crew in the air, at your one single point in Sakhalin. And you mumble away. Look into it and call me back again in 5 minutes with weather, check and give [me] the forecast, too, understand
17:48		It was busy
		Primier
		Mastak please
17:49		Busy
		Mastak
		Met
		Met, Private Pustuyev here
		You're going to talk with Mastak now

Time	User	Content
		Hello!
		Go ahead
		Hello, Mastak
		Met, Captain Parshin
		Please give me the weather for ...
		We're just putting it together now, we'll call right back
		Roger
17:52		Primier
		Mastak, please
		Mastak
		Give me Met please
		Met, Captain Parshin
		Weather, please give me the weather for ...
		Hello
		Yes, yes
		Copy
		I'm copying
17:53		48 moderate strato-cumulous at 500, 10 calm, plus 12, 94 per cent
		Hello
		Please say again cloud cover
		Moderate strato-cumulous at 500
		Cloud cover, cloud cover
		Ah, 10 plus 8
		Roger
		Put the meteorologist on the line
		Roger

Time	User	Content
		Comrade Captain!
		Hello
		Just a minute
		Hello, Morozov
		So, we're co-ordinating the forecast, I ran over to runway control myself. So, the visual [i.e. visually estimated] visibility now is good
		Well, give it to me exactly. Visual visibility. What is your weather like?
		Right now we have 10/8 at 500, visibility 10, wind calm
		Oh, so, 500 or 100, what have you been feeding me, now you give me 500.
17:54		500, 500
		That's all?
		That's all
18:03		Roger
		Primier
		Mastak, please
		Mastak
		Mastak, give me Met please
		Met, Junior Sergeant ...
		Put the meteorologist on
18:04		The meteorologist went to runway control
		Wait a moment
		The command post says the meteorologist has left
		Hello
		Yes, yes
		[They] called ... no
		No

Time	User	Content
		So call right away ... messenger there. Understood?
		Yes, sir
		Call the barracks, send the messenger there right away. Quick. What's the weather now?
		We now have 10/10, 10/8
		At 500, right?
		Uh-huh, visibility 10
		Good, monitor it
		Hello, hello
		We're talking
		Primier
		Tanketka
18:05		Tanketka
		Give me Met, please
		Met, Private ...
		Weather, put the meteorologist on the phone
		The meteorologist?
		He's not here, he's not here
		Where is he?
		I don't know
		Hello, this ...
		Yes, yes, wait a minute
		Hello, and where's the meteorologist?
		He's not here
		Well, where is he, isn't he there?
		I got here at two o'clock, he was already gone
		Well what, is he taking a break, maybe?

Time	User	Content
		He's not [here]
		Well how can he not be there? Eh?
		He went somewhere, he's not here and now ... need to issue [it] already, we already have cloud at height of 50 metres, 10/10
		So does this Kalanchuk have a phone?
		Yes, sir
		Call him in right away.Captain Morozov's orders, urgent.
		Yes, sir
		That's all
18:10		Captain Morozov
		Comrade Captain, this is Parshin
		Wait a minute
		Hello, Comrade Major Morozov. Tell me the weather for Armatur, please, at 1800, right. And your forecast is okay, isn't it?
18:11		So, here, here it's now ... visibility 10. At Shkolny it's 10 at 90 haze 3. Right ... steady at ... 95 per cent just a second, on the phone here
		Hello, Morozov here
		What's the weather like there in Khomutakh?
		It's 10/10 at 600, at 640 9/10, at 640 visibility 10, calm.
		There's Dolinsk, [they] were sleeping at the time, I just got a call - they're reporting 100 metres
		How much?
		100 metres
		It was given on take-off
		Dolinsk, Dolinsk ...
		Ah, Dolinsk is at 100 metres, right? Well, they've

Time	User	Content
18:12		had 100 metres all night. Where you are, it's normal, what did you give on take-off?
		I didn't give anything on take-off. They went off without a word
		Well, now, is it still okay where you are?
		Yes, it's still okay, visually, as I see it visually. The fact is, we have a patch right overhead. But here the approach path they'll follow, there it's 10 km ...
		10 km, eh? Well, okay, okay, Roger ... So for the time being it's fine overhead there, right?
		It's fine overhead
		Roger, well. Give me the weather changes every 15 minutes, understand?
		Roger.
		That's all.
18:18		What is it?
		182
		It went there through [the] Kurils
		Has it already passed?
		Looks like it
		Yes
		Hello, who [is it]?
		Grishkova
		Ah, Tanya, excuse me, Morozov, may I speak with Stanislav Ivanovich
		Misha, hello
18:19		Stanislav Ivanovich, good morning
		Good morning
		So all the commanders are here. I would of course recommend coming here

Time	User	Content
		What has happened?
		Huh?
		Something has happened
		Well, the situation there is complicated
		Roger, I'll wash up now and go.
		Uh-huh, roger
		Hello, that situation, in the air, right?
		Yes, in the air
		Primier
		Mastak
		Yes
		Hello, Mastak
		Mastak Met runway control
		Hello
18:20		You [want] Met, right?
		Runway control, runway control
		... Met, please
		They answered you
		They answered you
		Yes, yes
		Hello, Morozov. Good morning.
18:21		So ... that's what he's hoping for. 200 visibility 6-8. They had 300 with 3, with 2, with 2 km.
		Roger. So copy the forecast for Uriuk: 7-10, 300-500, visibility 4-6 haze, wind light and variable. You can't write in Shkolny because it's below minima. Yes. And Gvardeets is below minima. Khomutovo is 400-600 metres, visibility 4
		Go ahead

Time	User	Content
		Yes, yes
		Wind is variable, visibility 6-10
18:22		Hello, so, which alternates can you still [give me], which can be ... And Ognyonnye, right? Aha, Aha. Roger, just a minute
		Hello
		Yes
		Mastak again
		Hello
		Command post, Captain Parshin
18:23		Morozov, well, what's [happening]?
		Well, dawn is just barely breaking, as they say, you can make out the hills, the hills to the east ...
		I couldn't care less about the hills for the moment. What's it like there?
		Landing [track] 110 ... reporting visibility 10 km
		Visibility 10, right?
		... looking, their field is under night cloud cover. Over us, it's obviously not. Well, the wind is calm. Also calm at altitude. Roger, calm. But the landing [track] is low closed here ... calculations ... clearly visible.
		Wait a minute
		Well, visibility is good, like it was ...
		Well, okay Good, go ahead. Let me know right away if there are any changes.
18:24		Right, clear
		Met, Private ... here
		... at Mastak
		At Mastak copy
		Copying

Time	User	Content
		10/10 at 90, haze 3, 150 at 2, plus 12 95. Listen, I don't have Burevestnik - Gvardeyets
		Give the old ones - shall I?
		None [for] Khomuta, is there?
		None [for] Gvardeyets
		Which is this - Burevestnik?
		Yes
		Give me Khomuta
		Khomuta: 9 at 640 visibility 10, calm, plus 14, 94. So, 10 at 200 haze 6 calm +15, 100 10/8 at 600 moderate 10 northerly 2, +17 91
18:25		... go ahead
		So, 10/3 at 600 visibility 10 150 at 4 +17 94. Uh, Bronya 10/10 at 508 at180
		Give me the type
		Say again
		Type, type
		It will be 10/8 and 500/180
		No, type of cloud, what [do you have] there strato-cumulous, nimbostratus
		Well, why didn't they tell me anything then?
		okay, go ahead then, dictate
		So, rain, visibility 8, 180 at 3, +17, 96
		Is there?
		[Have a] smoke [i.e. cigarette]
18:26		Weather, Private ... here
		Give ... by points
		Just write faster
		I'm writing

Time	User	Content
		10/8 at 500, 10 calm. For Gvardeets I only have the old [reports].
		Oh, well. Khomutovo
		Khomutovo 9 at 640, 10 at 200 haze 6 calm, 10/8 at 600 moderate 10 360 at 2 10/3 at 60 10 150 at 4. 10/10 at 500 8 at 180, rain 8 180 at 3. That's it
		All right.
18:27		Is that Met?
		Hello
18:28		Met, Private Pustuyev here
		Give me the weather at Chaika
		Chaika, copy
		10/10 at 90, haze 3 150 at 2 +12 95 10/8 at 500 visibility 10 calm +12 94. I only have the old one for Gvardeyets. Shall I give it [to you] or not?
		Give me the latest
18:29		So, sky obscured, fog, 300, 190 at 2, +9, 100.That's it
		Wait, give me Khomutovo again. Hello
18:41		[Give] me Tanketka please
		Tanketka, Met
		Where is the meteorologist?
		Here
		Just wait a minute. Captain Morozov
		Hello, hello
		Hello, Kavalchuk here
		Who
		Captain Parshin here
		Just a minute, Comrade Major, I'm [talking] with Shkolny right now, just a second
		Hello

Time	User	Content
		Hello
		Where is Mikhaliuk?
		I don't know ...
		So that is [his idea of being on] duty, pilots up in the air and he's not there
		Wait there, hold the line, wait, hold the line
		Morozov here
		Hello, hello
18:42		No, I'll let you know as soon as there is a change. No change for the moment. Still 500 metres at Uriuk. Khomutovo is 640, but cannot serve as alternate to Vodolei; there is a storm warning out there. Yes, yes, they cannot be alternates. The only alternate they have is Khomuty. For the time being Uriuk
18:43		... Humidity is still 94 per cent. I'll call you right away afterwards
		Hello, hello
		Morozov?
		Morozov?
		Yes
		Eh?
		...
		Well, it's clear what [it's like] at Uriuk, but what is the situation where you are, what's overhead?
		... within limits ...
		Understood
		... 60 metres ...
		just reported ... reporting 10/10 at 160 there, below ...
18:44		Well, okay, monitor [the situation], because right now we have only Uriuk - there's nothing else
		Very well, I'll be here, I'll monitor

Time	User	Content
		Good, this has to be sorted out with the meteorologist on duty. [People] should be locked up for things like that ...
		Uriuk has a situation, too. On the landing [track] they're reporting a range of 100 metres
		Oh, hell!
		It's 100 metres, but over the point it's 500 metres, 10/8 at 500
		Good, as a last resort ...
		Eh?
		Well, at Khomutovo it's 640 metres now
		Roger, good
		Let him give you the weather there
		Good, he'll give the weather
		Tanketka
		Hello
		Hello, Tanketka
		...
		at 40
		Copying
		10/10, stratus 50 haze visibility 250
18:45		**Say again**
		...
		260, how much?
		260
		...
		Hello, hello
		Yes
		What is the height - 60 or 50

Time	User	Content
		50, 50
		Copying weather
		...
		Wait 97 130, 8 zero, 10
		...
18:46		Hello
		Yes
		Say again that group, 20 - what did you say there?
		...
		Roger
		Captain Morozov
		Comrade Captain, this is Parshin ... 1400 or which?
		1400 base, right?
		Eh?
		Base 1400?
		Yes. [I] went out, you could see it was low ... they're not complete
		I understand. So, one landed, right?
		Yes
		Aha, okay
		... they found a peak there
		Okay, roger
		Well, even [abeam] the landing [track] you can see it's blocked. The lower it is ...
		Okay, I see. The fact is, you can see it's still calm. If it were not calm, it would have been suitable
		Of course. The main thing is that visibility is okay for the moment.
		Right. Understood

Time	User	Content
18:47		Get me Mastak, please
18:48		Met, please
		Met
		Yes, yes
		Roger
		Met
		Weather at Primier
		Wait a minute. I'll call myself

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TRANSCRIPT OF COMMUNICATIONS RECORDED ON TRACK 9 OF REEL NUMBER 2

Time	From	Transmission
17:45		Senior Lieutenant Pavlov
		How is your crew?
		Taking off
		Taking off, eh? Take it easy, do not hurry there
		Roger, I warned him, gave him the weather
		No need to hurry, [do] everything normally. So, in the area of Terpenie, somewhere even in zone 405, south of Terpenie, some 50 km
		Roger, Roger
		Hold there
17:46		Major Kostenko
17:47		163 took off at 46 [minutes]
		Roger, 163. Okay, zone 405. So [the aircraft] from Sokol there is travelling at an altitude of 8000. Watch more carefully
		Roger
		Hello, hello
		Senior Lieutenant Pavlov
		Pavlov, who do you have in the air?
		163, Litvin
		163. So, [send] him to zone 406, or rather 405, zone 405
		Roger, 8000
		8000, yes.
		Roger
		Do you see the target? Are they sending [it] to you for tracking?
		Yes, they are

Time	From	Transmission
		That's all, go ahead, [go] to that area
17:48		Watch more carefully: 805 is up from point two
		Roger, 805
		Hello
		Yes
		It is all I have south of Kamchatka
		Who, the target or what?
		Yes, 60-65
		So, 60-65 I am orienting, 200 kilometers east of Terpenie. Tracking 240
		That's the bastard, is it?
		Yes
		Not bad
		East of Terpenie 200-250 that's it
		Roger
		Go ahead
		Uh-huh
		Hello
		Senior Lieutenant Kozlov
		Kozlov, Novoseletski, do you see the target?
		I cannot see the target with my own equipment at this time. [Going] by reports for the time being
		And are you not drawing anything on the board yet?
		They are not drawing anything on the board yet, [going] by reports for the time being
17:49		Well, watch more carefully. Its location is east of Terpenie, 200-230 km east, so, tracking 240, toward your location.

Time	From	Transmission
		Roger. I see. So, I have 805 in zone 405 at the moment on economical cruising. The commander and chief of staff are arriving. Communications equipment ... engaged, everything else on readiness
		Reinforcements?
		Reinforcements are arriving
		Good
		Listen, please run over, to those b..... plotters, and tell them I'll kill them if they are not here in [one] minute. Well, what did I just say?
		Hello
		Kozlov, second pilot, 121 into the air. Area 404
		Roger, wilco
		Same altitude 8000
		Roger
17:50		Hello, Senior Lieutenant Pavlov
17:51		
17:52		
17:53		Hello, hello, hello, hello
		Senior Lieutenant Pavlov, hello
		Hello, hello
17:54		Roger, okay
17:55		
17:56		
		[Should we] seat two [pilots] or one for the moment?
		Seat two
		..., seat one for the moment, no need for the second
		808 is at readiness
		Good
17:57		Mastak, Mastak, Mastak
		Hello, Senior Lieutenant Kozlov

Time	From	Transmission
		Senior Lieutenant Pavlov
		Pavlov, Kozlov. Put the regimental commanders on the phone
		Roger
		Gerasimenko, hello. Stay on the line
		Hello
		Yuri Alekseevich!
		Hello
17:58		Well, what, hello, answer, who is speaking
		Lieutenant Colonel ..., hello
		Kornukov, 21.58 are you both observing the target
		We see it
		The intruder violated the State border in the area of Kamchatka. Upon entering the area of responsibility and ... violation of the State border, destroy the target. It is a real target. I anticipate real use of weapons, act with an understanding of the situation. Sokol, Gerasimenko, do you see the target on your screen? Do you see it or not? Bring Osipovich in to follow the target and identify it. Hold at a distance that will ensure engagement and immediate strike.
17:59		..., draw yours up into that area as well, hold off at a distance behind article 37 operating out of Sokol, at a distance of 10-11 km from the target, no more. Gerasimenko, you are 5-6 km in the aft hemisphere. If necessary, the target will be destroyed. For the moment it is beyond the 100-km waters. Do you understand the task?
		Lieutenant Colonel ... task understood
		Execute. If necessary, Gerasimenko, bring in the second fighter as well and act until [the target is] destroyed. Get to it, please
18:00 18:01		The are now guiding [him] up in the aft hemisphere for identification
		Does the target have no identification?

Time	From	Transmission
		They are coming in for identification, coming in I say
		Bring him up, bring Osipovich in to the established distance. You do not engage a target from the aft hemisphere, you do not engage him right on his tail, keep the angle of approach.
		Roger, executing
		Don't forget he has cannons in the rear, there
		Roger, executing
		But faster, the fighter, or rather the target is entering the zone above the one-hundred-kilometer waters
		Executing
18:02		Mastak, Mastak
18:03		
		Senior Lieutenant Kozlov
		Senior Lieutenant Pavlov
		Put Gerasimenko on [the phone]. Where is your fighter?
18:04		I am afraid he went to zone 406. Where is Osipovich?
		Hello
		Where is Osipovich, I said?
		I think you at Smirnykh ended up with ...
		Mastak, Mastak
		Hello
		805 is beside the target at a range of 8 km
		Can he see the target?
		At the approach angle, at two-fourths
		Can he see the target?
		We are bringing him into attack position
		... I said, can the fighter see the target or not?
		So we are still bringing him in ... Comrade Major. He cannot see the target for the moment

Time	From	Transmission
		Roger, bring him closer for identification
		Roger
		Hello
		Senior Lieutenant Kozlov
		Senior Lieutenant Pavlov
		Pavlov, Kozlov, keep that receiver to your ear and don't put it down
		Roger
		Operate without calling
		Let [him] call identify and so on
18:05		I did not understand
		... straight ... warned
		Hello
		Senior Lieutenant Kozlov
		You understood me, Kozlov, ... put down the phone ...
		I am not putting [it] down, I am holding [it]
		Don't put it down, that's all
		So, where is 121, Kozlov
		121 is in that area, his bearing now, bearing 75 degrees, range 130. Don't forget ... if anything happens
		Bring [it] up, hello, Mastak, Kozlov
		Hello
		Give the phone to Gerasimenko
		Comrade Lieutenant Colonel, take the phone
		Lieutenant Colonel Gerasimenko
		Kornukov, so, follow Osipovich at launch range if necessary, ... Comrade Tarasov

Time	From	Transmission
		And not to the north, no need to go near the target, hold nearby four hundred, south of zone 404, if necessary we can come in from there, do you understand the orders?
		Roger
		So everyone to the north
		Roger
		Good, report following
		Roger
		... in zone 404, so he will not get in the way. He is following in our area, right? Give me bearing and range
		Hello
		Yes
		Bearing 55, range 160. 805 following
18:07		Hello, Kozlov
		805's [fuel] remaining
		808 at readiness
		Find out how much [fuel] Osipovich has left
		[Fuel] remaining ... 805?
		Pavlov
		Yes
		I don't need Pavlov. Kozlov
		He answered
		Well, are you observing by phase on your screen?
		Affirmative, I am observing, there, and the command [...] is engaged and ...
		Well, then, bring Osipovich immediately to a range of 3 km, I authorize bringing him in at the angle of approach
		Roger, 3 kilometres at the angle of approach
		What is his distance [by your reading]?

Time	From	Transmission
		How much?
18:08		Well, between them, give [it to me]
		4 kilometers between them now
		Can the fighter see the target?
		He is observing it, isn't he?
		So, he is not observing it visually, he has not turned on the emissions yet?
		Roger, bring to a range of 4 kilometers, are there any clouds in the way?
		Yes we see ...
		Well we cannot see ... [we] must ask the fighter that
		Hello
		Yes
		He has the target in sight
		He can see it? How many jet trails are coming from it?
		Say again
		How many jet trails are there, if there are four jet trails, then it's an RS-135
		Roger
		Well, find out, hurry
18:09		Well, understood
		Mastak
		Hello
		Who?
		He has it in sight, four and a half to five between them, he cannot determine the type
		He cannot determine the type?
		No way ... it is dark, dark

Time	From	Transmission
		Turn on high [setting?], prepare weapons for firing. Give the order to fire on our command
		Roger
		Turn on high, lock-on
		Lock-on?
		Gerasimenko
		Here
		So, give the order, I say again engage high [setting], lock on the target and maintain lock-on
		Roger, executing
		Match speed, if necessary use afterburners and destroy [the target]. That is an order
		Roger
18:10		I did not understand
18:11		Gerasimenko
		Here
		Well where is that Osipovich? Is he flying alongside?
		He is 10 km from it
		Well why 10, e....., I said ... I don't understand, do you think he can identify the target at 10 km?
		It is at an altitude of 11 thousand according to reports ...
		So what?
		Gerasimenko!
		Yes
		Well, what, don't you understand? I said: bring [him] up to a range of 4 kilometers
18:12		4-5 kilometers, identify the target. You understand, that weapons are going to have to be used now and you are holding [him] at a range of 10. Give [the pilot] his orders
		Is he observing through the sights?

Time	From	Transmission
		He is observing through the sights.
		[He] is answering ... Interrogate the target
		Lock on target
		I do not understand
		Lock-on target
		Lock-on. Follow locked on
18:13		Target ...
		No response, Roger, be ready to fire the target is 45-50 km from the State border
		Roger
		Hello
18:14		Mastak
		Hello, Kozlov
		Put Gerasimenko on
		Hello
		Gerasimenko
		Hello
		Be ready to fire, bring everything to ready status, I will give Osipovich the order in two minutes or even less, in a minute and a half I will give the order to open fire, bring Tarasov into the same area
		Roger
		Watch more closely 163 is also there at point one
		Roger
18:15		Yes
		So ... target and interceptor have disappeared, they are entering the near zone, interception radar is getting a steady reading at the moment
		Good, take control, guide [him] from interception radar, issue the commands from interception radar

Time	From	Transmission
		Roger, interception radar ...
		Be careful: behind the target and our fighter we still have the MiG-23 from Smirnykh
		Yes
		Kornukov, have the tanks been jettisoned?
		Jettisoned, everything normal
		Comrade Commander, [they are] approaching my limit of visibility, who shall I hand over control to
		Sokol will now take control, transfer control to Sokol, we will now open fire, order Litvin to ... his weapons
		I have given the order, he is all ready
		Good
		Roger, we are handing over to Sokol
18:16		Transfer [control]
		Mastak
		Kozlov
		Gerasimenko, the commander orders you to take control of 163 from Smirnykh. Do you see him?
		Mastak, Mastak
		Gerasimenko
		Yes
		Well, then, ask Osipovich whether there are any navigation lights? Are there any navigation lights?
		Say again
		Are the enemy's navigation lights on or not?
18:17		Well, what, are the target's navigation lights on or not?
		Gerasimenko
		Attention, Gerasimenko
		Yes

Time	From	Transmission
		So at 18.31 target sixty five violated the State border of the USSR. I order you to destroy the target
		Roger
		Are there nav lights or not? Are there nav lights or not?
		Gerasimenko! Are there nav lights or not?
		Gerasimenko ...
		... I am asking, well, ask the pilot, does the target have nav lights or not?
18:18		Gerasimenko
		Yes
		There are nav lights, Comrade General
		There are nav lights?
		Yes, sir
		Flash lights at it, interrogate it, interrogate it, flash navigation lights as a warning signal. Does it answer or not?
		Well, tell Osipovich to flash his nav lights, order him to flash his nav lights
		I issued the order, I ordered him to flash his lights
		Gerasimenko
18:19		Order him to approach the fighter, or rather the target, rock [wings] at it and force it to land at Sokol
		Roger
		And bring the second in
		Hello, hello
		Yes
		... for some reason we cannot see them from Sokol
		Range of target is 20 kilometers
		Well, they have entered the blind spot
		Ah, the blind spot

Time	From	Transmission
		Gerasimenko, with cannons or not?
		Well, of course with cannons and with missiles
		It's ... don't bother [me]
		Gerasimenko
		Yes
		Fire a warning burst
		Yes, sir
		Fire a warning burst with cannons and rock wings to show the direction to Sokol. Bring Tarasov in for the attack as well
18:20		Kozlov
		Hello, Kozlov
		Objective monitoring
		Roger
		Do not forget objective monitoring
		Roger
		Well, you heard the radio transmissions, did the pilot fire the warning burst?
		I cannot hear the radio transmissions
		Well, tune to channel 3 and listen
		Tune to channel 3 there and listen and stop that horsing around at the command post, only you, I and the controller are to talk, no one else
		Yes, sir
		Has Osipovich opened fire or not?
		He fired the warning burst
		He fired the warning burst?
		Affirmative, he did
		Ask for reaction of target 60-65, turning south

Time	From	Transmission
18:21		Target tracking 240, about 240
		And now ... it has turned south
		Gerasimenko!
		Gerasimenko!
		Gerasimenko here
		Comply and get Tarasov here. Take control of the
18:22		MiG-23 from Smirnykh, call sign 163, call sign 163, he is behind the target at the moment. Destroy the target!
		Order received. Destroy target 60-65 with missile fire accept control of fighter from Smirnykh
		Carry out the task, destroy [it]!
		Attention, Mastak!
		Mastak
		Hello, Kozlov
		Kozlov, Put Gerasimenko on the phone and tell him to stay on
18:23		Gerasimenko
		Here
		Well, what [is happening]? Get Osipovich to fire, and soon
		He is assuming attack position, he is at [an angle of] 70 degrees to the target
		Good. Engage afterburners and destroy the target if he does not have enough altitude
		Have [they] taken control of the MiG-23 from Smirnykh?
		Gerasimenko
		... Comrade General ... to attack position
		Oh, e....., [how long does it take him] to go to attack position, he is already getting out into neutral waters

Time	From	Transmission
18:24		Engage afterburner immediately. Bring in the MiG-23 as well as a guarantee, while you are wasting time it will fly right out
		Gerasimenko
		Here
		So, 23 is going behind, his sights are engaged, draw yours off to the right immediately after the attack. Has he fired or not?
		Not yet, not at all
		Why?
		He is closing in, going on the attack
		163 is coming in, observing both
		Okay, Roger, understood, so bring 163 in behind Osipovich to guarantee destruction
18:25		Well, what? Gerasimenko
		Yes?
		Well what [is happening] there?
		Afterburner ordered, he is closing in, closing in ..... dicator
		E....., well how long does it take him to close in from a range of 5 kilometers, I do not understand
		Gerasimenko
		Yes
		Well what do you hear there?
18:26		He has launched [missiles]
		I did not understand
		He has launched [missiles]
		He has launched [missiles], follow the target, follow the target, withdraw yours from the attack and bring the MiG-23 in there
		Do you see the target on the screen?

Time	From	Transmission
		We can see [it] for the moment
		Did he fire both missiles or one?
		Both missiles ...
		Bring in the MiG-23
		Gerasimenko
		Yes
		This is the task: 22:27 bring the MiG-23 in to destroy [the target]
18:27		Yes, sir
		Gerasimenko
		163 has been ordered to engage afterburner, we are bringing him to attack position
		Roger. Did Osipovich see the missles explode? Hello?
		Ask him, ask him yourself, get on channel three and ask Osipovich, did he or did he not see the explosions?
		Right away ...
18:28		Kozlov
		Gerasimenko or Pavlov, or rather Kozlov
		Mastak, Mastak, Mastak
		Gerasimenko
		Do not leave communications at all, you must put someone on communications. Did Osipovich fire both missiles or one?
		He fired both missiles, and saw the explosions
		What, near the target, what?
		The target, the target turned north
		Say again
		The target turned to the north
		The target turned to the north?

Time	From	Transmission
		Affirmative
		Bring the 23 in to destroy [it]
		Yes, sir
		[Fuel] remaining, what [fuel] does 805 have left?
		...
		Roger, understood, bring 23 in to the target
18:29		Gerasimenko
		Well, roger, bring in 23, has Osipovich reported the result of his fire or not?
		Comrade General, the target is in a right turn ...
		[The missile] was fired ...
		Well, I understand, I do not understand the result, why is the target flying, missiles were fired, why is the target flying e.....? Well, what [is happening]?
		Yes
		Well, I am asking, give the order to the controller, what is [wrong] with you there, have you lost your tongues?
		Comrade General, [I] gave the order to the chief of staff, the chief of staff to the controller, and the controller is giving the order to ...
		Well how long does it take this information to get through, well what, [you] cannot ask the result of
18:30		firing the missiles, where, what, did [he] not understand, or what?
		805 has reported that the target has been destroyed, ... it is in a left right turn
		Bring up the 23
		Executing
		And bring him in, have him open fire
		Draw Osipovich off the attack, there is nothing he can do there now

Time	From	Transmission
		We have already drawn him off, Comrade General
		Good, how far out is the 23?
		The 23? There is 10 between them
		How much? Engage afterburners. After the operation, the MiG-23 will be landing at your location
18:31		Roger
		Call ... or rather his supervisor. Have him be at the runway control for the landing
		Gerasimenko, Gerasimenko
		Yes
		Report to me fully on the actions of 23, listen to radio transmissions and report range, locking on, firing, report everything
		Radio transmissions, Comrade General ...
		I did not understand
		Radio reception is intermittent
		Understood. [It is] intermittent here, too, well, ask the controller, Kostroma must be involved. Eh ... tell the 23
18:32		afterburner, open fire, destroy target then land at home base
		Roger
		Altitude, what is the altitude of our fighter and the altitude of the target?
		Quickly, the altitude of the target and the altitude of the fighter!
		Why don't you say anything? Gerasimenko!
		I am asking ...
		Hurry up, fellows, that's a real target
18:33		Hello
		Mastak, Mastak ...

Time	From	Transmission
		Comrade General, Gerasimenko, altitude of target is 5000
		5000 already?
		Affirmative. In a right turn. Apparently he hit it. It is descending
18:34		Destroy it! I said [have the] 23 destroy it!
		Roger, destroy it
		Well where is the fighter, how far from the target?
		Comrade General, they cannot see the target
		They cannot see the target?
		They cannot see the target. Order Kostroma to ... order,
		Understood
		Broadcast the order to the 23. He [is to] follow. Be there the whole time and fire. Is that understood or not?
		Understood
		Execute
		Executing
		Gerasimenko
		Yes, I am giving the order, Comrade General
		Well hurry up, I gave you that order a long time ago
18:35		Can a MiG-23 really close in like that, a fighter moving at a speed like that?
		Comrade General
		Yes
		Area cannot see the target
		And Kostroma?
		Neither can they
18:36		And Kostroma, ask Kostroma, does Kostroma see the target?

Time	From	Transmission
		Comrade Lieutenant General, Kostroma does not see it either
		They do not see the target either?
		Gerasimenko?
		Here
		And what does the pilot report, the 23 [pilot]?
		He cannot see the target either
		He cannot see [it]?
		He cannot see [it]
		Well you know the range, where the target is, it is over Moneron. Well go on, send him there to that area, tell Kostroma, they must have the 23 descend, he must descend. At what altitude are you holding the MiG 23?
		Gerasimenko
		Yes
		What is the altitude of the MiG-23?
18:37		... 5000 ...
		I said ... the altitude of the fighter
		5000
		5000, well, it is somewhere in the area of the target, it must be at 4000-4500. You are real slowpokes at carrying out orders e....., Even back when I gave the order to bring in the 23. He has no tanks, he can maintain any speed, to destroy the target
		Where is your SU-15 Osipovich?
		He is on approach, ...
		Roger
18:38		Gerasimenko
		Yes
		Can Kostroma see it or not, ask them again

Time	From	Transmission
		Ah, exactly ... speaking with Kostroma
		So
		Comrade General, Kostroma reports: the target has been observed: the enemy was in a descending right turn and then disappeared. Kostroma can now see the 23
		Comrade General!
		Yes
		I report, Kostroma reported: the enemy was observed in a descending right turn, then the target disappeared
		Well, roger, understood
18:39		Hello, Kozlov
18:40		
		Gerasimenko
		Gerasimenko, so send Tarasov up from reinforcements, send him up
18:41		Tarasov is in the air
		Ah, from reinforcements
		Well, what [is happening] there, has that 23 reported something, does he see [it] or not? Bring him down to 4000, have him look visually and through the sight
		Comrade General, 23 reported tops 10/10 cloud cover 2000 metres. He cannot ... go any lower
		What is the cloud cover?
		10/10, tops 2000
		Tops 2000, well, understood, well no need to go below two thousand, but he can descend to three thousand, ask him how much [fuel] he has left and depending on the reserve to hold in the area of Moneron, then you will land him at your location
		Roger. Send Tarasov up on readiness one?
		Yes, send Tarasov up, to the region of zone 412
		Roger to Moneron, to Moneron

Time	From	Transmission
		Yes, yes, no Moneron
		Ask the 23 what his reserve is
		1700 remaining
		Hello
		Hello, well what [is happening], Gerasimenko
18:42		1700 remaining
		1700?
		Affirmative
		Maintain until the reserve is one and a half tonnes, with 1.5 tonnes remaining [he is to go] back to the aerodrome, landing at your location
		Roger, Comrade General ... base 110 metres ... visibility more than 5
		Is that what Osipovich reported?
		That is what they are reporting from interception radar from ...
		I did not understand
		The meteorologist is reporting [that]
		Who?
		The meteorologist, the meteorologist
		Understood, and where is Osipovich now?
		Osipovich is on approach
		Roger, good, the 23, then, until one and one-half tonnes,
18:43		then use the homing system to guide it home for landing. Bring Tarasov in there as well, Major
		Roger
		Hello Kozlov, Kozlov
		Gerasimenko, 805 landing
		Good

Time	From	Transmission
		Roger, what weather has he reported?
		...
		Gerasimenko
		Yes
		Tarasov has been sent up from the reinforcements?
		Affirmative, I gave the order
18:44		Give him zone 412, 412. Assign, then, southern Moneron to cover the departure
		Roger
		Hello
		Yes
		Who?
		Gerasimenko
		Are you sending Tarasov up? No?
		He is taxiing out
		Who is that, Tarasov, chief of PDS?
18:45		Affirmative
		Roger, he is taxiing out, I understand
		What is his armament, Gerasimenko
		Just a moment
		Hello
		Yes
		The commander has ordered Osipovich to come to the telephone immediately after landing
		Roger
18:46		Well, what [about it], have you found out about Tarasov's armament?
		Cannons, cannons

Time	From	Transmission
		Tarasov has cannons, right?
		Affirmative
		Understood
		Hello, hello, Gerasimenko
		Gerasimenko here
		Gerasimenko, Kornukov, so, guide the MiG-23 in for landing, [send] your Tarasov to that area, have him stay awhile and [bring] the first Tarasov in for landing
		Roger
		Get Osipovich on the line to me immediately
		[I have] transmitted [the order]
18:47		Hello, Gerasimenko
		Put Kislyakov readiness one
		It has already been done
		It has been done, right?
		Affirmative
		[He is] at readiness?
		He has not reported yet
18:48		Gerasimenko!
		Yes
		Is the 23 returning?
		Affirmative, distance 70
		Where is your Tarasov, the second?
		Approaching the point [base?]
		No, that is the first Tarasov, what about the second Tarasov?
		He took off at 46 [minutes]
		Hello, he took off at 46 [minutes], at 47 [minutes] 464 assumed readiness one

Time	From	Transmission
		Good, off at 47 [minutes], zone 412, altitude 7000, transfer control to ... he and Kostroma, to monitor as well, to be in the air alert zone, understood?
18:49		464?
		Yes, yes
		What is his call sign?
		... that to 608 ...
18:50		Gerasimenko
		Here
		So, they have sent up a MiG-21 from Postovaya, stand by the line, I am taking the call sign now
		Roger, Tarasov ...
		731, 731 from Postovaya, MiG-21, we will land him at Sokol. Understood?
		MiG-21 from Postovaya, 631 we will land him at Sokol
		731, so, we are taking over control, obviously we will be here, he went there it seems, there and back, but be ready to accept control and land him at your location. Is that clear?
		It's clear
		Transmit to runway control there. Who is in your runway control?
		Rudenko and the regimental commander
		... and who?
		And who?
		Rudenko
		Rudenko, did you understand?
18:51		Osipovich, Comrade General
		Comrade General
		Hello, hello

Time	From	Transmission
		Osipovich on the line
		Gerasimenko
		Osipovich ...
		Osipovich, Osipovich
		Ah
		And which articles were you carrying?
		Gerasimenko! I am confirming the order: The MiG-21, 731 is to land here at Sokol
		Roger
		Hello
		Hello Osipovich
		Yes
		What articles were you carrying, "pencils"
		Hello, Gennadi Nikolaevich
		Yes
		Kornukov, hello
		Hello
		Report, what did you see with your own eyes, what did you see through the sights, how you used the cannons and which you fired, well, did you launch the heat-seeker separately, or both?
		Affirmative, I launched both
		Roger, you fired the cannons?
18:52		I did, I gave him two bursts
		So, no reaction?
		No reaction, it continued on as before
		Understood. And tell me, wait, I will ask questions, you answer them. Now, from the outline, from the outline, could you more or less determine the type?

Time	From	Transmission
		[I could] see a large aeroplane, because it was descending ... the navigation lights were on
		It was descending and the navigation lights were on, right?
		Yes
		Understood. You launched the radar-seekers and the heat-seekers?
		Affirmative, I launched both
		You saw explosions, where?
		I did
		In the area of the target
		Right in the area of the target, the lights went out immediately
		So, you ... did not see the descent or anything after the explosion of the missiles
		I, the [missiles] exploded, the lights went out, I reported and turned away to the right
		Understood, and its lights went out?
		Yes, its [lights]
		Roger
		What [happened}, was it not destroyed?
18:53		The target disappeared, but it was somehow descending slowly ... either it was put out of action or it was damaged it disappeared in the area of Moneron, no one can see it at the moment
		Well, it looks as if it was put out of action
		Roger, good, well we'll sort it out
		Uh-huh, Roger

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ATTACHMENT D to State letter 93/68

ANALYSIS AND CONCLUSIONS SUBMITTED BY THE RUSSIAN FEDERATION

Attachment D reproduces the Analysis and Conclusions received, in English, from the Russian Federation.

ANALYSIS

The KAL schedule in effect, listed Flight 007 to depart at 1220 (here and hereinafter UTC time is used). The total scheduled time was set as 8 hours 40 minutes, flying time 8 hours 20 minutes and arrival at the destination Seoul at 2100 (0600, Korean time). The computer flight plan for 31 August 1983, computed taking into account the en-route wind forecast, provided for a reduced flying time of 7 hours 53 minutes. KAL's practice is such that when the estimated flying time differs from the average scheduled time, the departure time is corrected so that the aeroplane arrives at Seoul no earlier than 2100 (scheduled time). Such a correction was made and the departure time for Flight 007 was set at 1250.

Note.- A statistical analysis of the departure times of KAL-007 flights out of Anchorage for August 1983 showed that in fact such a correction to the departure time was often made and that the average departure time was 1310.

At 1130 the flight crew of the aircraft pilot-in-command, Chun Byung-In, arrived at Anchorage Airport from the hostel and started preparing for the flight in the KAL operations room.

The crew briefing was performed by the airline's flight dispatcher and it covered the aeroplane ramp position, the departure time, the ATS flight plan, the flight route and levels on the segments thereof, en-route meteorological data, fuel required and on board, loading, the maintenance status of the aeroplane, as well as detailed study of the computer flight plan which provided for flying on airway J501 and then on route R20 on the following segments:

1. ANCHORAGE - CAIRN MOUNTAIN

   Airway J501. Distance 162 NM. Magnetic heading 243°. Flying time 28 minutes.

2. CAIRN MOUNTAIN - BETHEL

   Airway J501. Distance 184 NM. Magnetic heading 242°. Flying time 25 minutes.

3. BETHEL - NABIE

   Airway R20. Distance 312 NM. Magnetic heading 237°. Flying time 40 minutes.

4. NABIE - NUKKS

   Distance 296 NM. Magnetic heading 235°. Flying time 38 minutes.

5. NUKKS - NEEVA

   Distance 297 NM. Magnetic heading 235°. Flying time 39 minutes.

6. NEEVA - NINNO

   Distance 281 NM. Magnetic heading 243°. Flying time 36 minutes.

7. NINNO - NIPPI

   Distance 279 NM. Magnetic heading 242°. Flying time 35 minutes.

8. NIPPI - NYTIM

   Distance 330 NM. Magnetic heading 237°. Flying time 39 minutes.

9. NYTIM - NOKKA

   Distance 330 NM. Magnetic heading 236°. Flying time 40 minutes.

10. NOKKA - NOHO

Distance 163 NM. Magnetic heading 238°. Flying time 21 minutes.

Note.- The rest of the flight plan is not given here, since the planned time of passing the subsequent points (segments) overlaps with the time at which the flight was terminated.

The computer flight plan, copies of which were handed to each crew member, was checked during the briefing against the Jeppesen navigation chart so that the co-ordinates of waypoints entered into the inertial navigation system (INS) would agree with the co-ordinates shown on the chart. At the end of the briefing, the pilot-in-command of the aircraft approved the computer flight plan, the ATS flight plan, the Flight Release Sheet and the Weight and Balance Manifest of the aeroplane. The ATS flight plan provided for the following compulsory reporting points for the crew to report the aeroplane's position: BETHEL, NABIE, NEEVA, NIPPI, NOKKA, NOHO. Up until the point NIPPI, air traffic control was performed by the United States ATS, with subsequent transfer of the aeroplane to the control of Japan's ATS.

After completing preparations, the crew of the KAL B-747 (registration HL-7442) started to perform passenger flight KAL-007 on the route Anchorage-Seoul. On board the aeroplane were 240 passengers, 3 crew members, 20 flight attendants and 6 members of the airline's flight personnel.

At 1249:54 the crew first contacted Anchorage Tower/Approach Control on radio VHF-2[1] and requested ATC clearance and information. The controller cleared the departure to Seoul via Departure No. 8, gave flight level 310, radio communications frequency 118.6 and the SSR transponder code 6072. The crew correctly acknowledged receipt of the clearance and the information given and at 1250:21 the crew requested clearance for pushback from Gate No. 2. The controller cleared pushback from the gate at the crew's discretion and proposed Runway 32 for take-off (the magnetic heading of the runway for take-off is 320°). The crew acknowledged the information received and at 1255:38 requested clearance to taxi. The controller cleared taxiing to Runway 32. After lining up on Runway 32, at 1258:32 the crew reported ready for take-off and 3 seconds later the crew received clearance for take-off. After acknowledging the clearance received, the crew applied take-off power and started the run along Runway 32. Lift-off from the runway took place at 1300:57. This is indicated by the nature of the recording of normal acceleration and the change in the angle of pitch.

After take-off, the Anchorage approach controller gave the crew clearance to climb to level 310 and a manoeuvre onto track by making a left turn onto heading 220°. Twenty-four seconds after lift-off at 1301:21 the crew acknowledged the instructions received and began to reduce the flight heading from 320° to the assigned 220°. In the course of reducing the heading, the crew began to retract the flaps (in stages).

At 1302:40, when the crew had practically reached heading 220°, the Anchorage approach controller gave new instructions "proceed direct BETHEL when able". At 1302:44 the crew acknowledged the instructions received to proceed directly to BETHEL. Twenty-three seconds later, on heading 220°, the crew switched on autopilot A in the command mode and began under autopilot a right turn to proceed directly to BETHEL. Approximately 50 seconds after switching on the autopilot (or 3 minutes after the aeroplane lifted off from the runway) the aeroplane reached a heading of

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[1]Here and hereinafter VHF and HF means communications on ultrashort wave and short wave channels respectively.

approximately 246° which then did not change for the next 5 hours and 22 minutes of the flight right up until the time the flight was terminated by the interceptor fighter, in spite of the fact that according to the flight plan many changes in the magnetic heading were required. Most probably, when the autopilot was switched on in the magnetic heading hold mode, a magnetic heading of 242°-243° was set on the heading selector (this corresponds to proceeding in accordance with the flight plan along airway J501). During the right turn the crew, having clearance to proceed to BETHEL outside the airway J501, set a new magnetic heading of approximately 246° on the selector. Such an assumption is explained by the nature of the transition process (see the recording of the deviations of the control wheel, heading and bank) in the period of time 1304:37 - 1303:57. After reaching a heading of approximately 246°, one notes external communications by the crew on channel VHF-3 in the period 1304:37 - 1304:52, which were not recorded on the Anchorage approach control recording.[2]

Note.- If a magnetic heading of 242° - 243° was set on the heading selector, then in order to proceed "direct BETHEL" there was no need to increase the heading on the selector to 246°, since the crew had to understand that it was approaching the assigned track from the right.

At 1305:13 the Anchorage approach controller gave the KAL-007 crew instructions to contact the Anchorage ARTCC on frequency 125.7. The crew acknowledged at 1305:17 the information received and 5 seconds later the crew contacted Sector RD 5/6 of the Anchorage ARTCC and reported that it was climbing to level 310. At 1328 the Sector RD 5/6 controller informed the crew that the radar service was terminated and suggested contacting Sector D 2/3 on frequency 125.2. At this time the aircraft was in the area of coverage of the CAIRN MOUNTAIN NDB, 6 miles to the north of the track on ATS route J501.

The crew was not advised of this minor deviation, since it had received clearance to proceed directly to BETHEL. In view of this fact, the inertial navigation system was not used in the Nav (navigation) mode. This is indicated on the recording of deviations of the control wheel and angle of bank by the absence of any variations associated with making the transition process of automatic track hold along route J501. At 1328:20 the crew of Flight KAL-007 contacted the Sector D 2/3 controller of the Anchorage ARTCC and reported that it was climbing, leaving level 300 for 310. The controller acknowledged the information received and gave instructions to report passing BETHEL, which the KAL-007 crew acknowledged at 1328:30.

Note.- Thirty-two seconds after this, at 1329:02 - 1329:12, communications by the KAL-007 crew on VHF-3 are recorded (apparently with 015).

At 1350:34 the KAL-007 crew reported that it passed BETHEL at 1349 at level 310 and that it estimated passing NABIE at 1430. Actually the aeroplane passed BETHEL 12 miles to the north. This is shown by the radar data of the military radar at King Salmon (not certified for civil aircraft ATC) and by the computation of the flight path on the basis of the DFDR data. After passing BETHEL, the crew had to reduce the magnetic heading at least to 237° in accordance with the flight plan in order to get onto airway R20. However, the crew did not take any actions in this regard and continued to deviate further to the north of airway R20.

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[2]As further analysis on channel VHF-3 showed, the KAL-007 crew had many conversations with the crew of Flight KAL-015, which flew out of Anchorage after KAL-007 and proceeded along airway R20.

The controller acknowledged the information received and gave instructions to report passing NABIE to the Anchorage ARTCC on frequency 127.8. The crew acknowledged these instructions at 1350:53. It should be noted that after this, stable communications on VHF between the KAL-007 crew and the Anchorage ARTCC are not noted. As the information recorded on the DFDR shows, in the period 1353:27 - 1353:37 there were communications on VHF-3, apparently with 015.

Approximately 40 minutes later the Anchorage ARTCC controller (Sector D 10/11) attempted to contact the KAL-007 crew (1432:21 - 1433:47). At approximately the same time (1433:30 - 1434:15) many attempts at communications on VHF-2 were recorded on the DFDR recording, apparently in order to respond to the controller's inquiries. Similar attempts on VHF-2 were also recorded in the period 1435:00 - 1435:20. It is quite probable that the crew of the B-747 on Flight KAL-015 heard the dialogue, which did not take place, between the controller and KAL-007, contacted the crew of KAL-007, received information from them about passing NABIE and at 1435:25 transmitted the information to the Anchorage ARTCC:

> "... KAL-015, forwarding report of KAL-007, position NABIE at 1432, flight level 310, estimated time NEEVA 1549, fuel remaining 200.0, temperature -49°, wind 250/60."

The controller acknowledged the receipt of this information from KAL-015 and requested it to transmit to 007 instructions to report passing NEEVA on frequency 118.2.

Note.- In the period 1439:30 - 1441 many communications by 007 on HF-2 are recorded on the DFDR recording, which are not heard on the ATC recording. Apparently this was a report on passing NABIE sent through the Anchorage AFTN communication centre to Korean Air Lines operations.

At 1444:32 the crew of Flight KAL-007 using radio HF-2, having established contact with the international flight service station at Anchorage (Anchorage Radio) duplicated the report of passing NABIE at 1432 at level 310, giving a more precise estimated time of passing NEEVA at 1553, fuel remaining 200.0, wind data 250/65 and the SELCAL code GKFH, and requested the possibility of climbing to level 330. The controller acknowledged the information received, suggested that the crew check the selective calling system (SELCAL) and transferred the crew to communications with the Anchorage ARTCC on frequency 127.8 to obtain clearance to change level.

At 1446:20 the KAL-007 crew tried to contact the Anchorage ARTCC on VHF-2, but did not receive a response. Eight minutes later the crew communicated on VHF-3, apparently with 105.

Note.- An analysis of the areas of overlap of air-ground VHF communications in the areas of NABIE and NEEVA along airway R20 shows that 150 NM after passing NABIE communications on the VHF channel stop (20 minutes after passing NABIE, an aeroplane of the B-747 type goes beyond the area of stable VHF communications) and are re-established upon entry into an area at a distance of approximately 150 NM from NEEVA. Thus on the leg NABIE - NEEVA, which is approximately 600 NM long, a segment of approximately 300 NM (NUKKS ± 150 NM) is not provided with VHF communications. This fact was not reflected in the corresponding instructions and regulations for communications on airway R20.

007's report on position NABIE at 1432 requires further comments.

As the computations and modelling of Flight KAL-007 showed, when passing abeam of NABIE at 1432 the aeroplane had deviated to the right of the airway by approximately 60 NM. The INS which was in good working order indicated this lateral deviation to the crew.

In accordance with the instructions of Korean Air Lines, the crew also had to check their position using airborne radio navigation systems, with reference to the NDB and DME on St. Paul Island. The crew did not take any corrective actions and the aeroplane continued thereafter to deviate more and more to the north of airway R20.

In the period 1455 - 1550 the crew of Flight KAL-007 did not communicate with any party. According to the DFDR data VHF-1, VHF-2, VHF-3, HF-1 and HF-2, that is, all 5 aeroplane radios, did not operate in the transmission mode. At 1551 the radio technical services of the USSR Air Defence first detected a target which, in accordance with this analysis, refers to 007.

At 1551:15 there is information on the DFDR about an approximately one minute dialogue on VHF-3. A similar dialogue also took place at 1559. Given that this information is not recorded on the ground recording, it may be assumed that 007 was conducting a dialogue with 015 concerning its position, since at 1600:39 the crew of Flight KAL-015 contacted the Anchorage ARTCC (Sector D 10/11) and reported information on 007 passing NEEVA at 1558, flight level 310 and estimated time of passing NIPPI at 1708. It also reported 007's fuel remaining as 161.0 and wind data 270/55. The controller acknowledged receipt of this information and requested 015 to transmit to 007 instructions to report passing NIPPI to Anchorage en-route radio. 015 informed 007 about these instructions and at 1604:58 received 007's acknowledgement. Thus, the 007 crew reported through 015 the time of passing NEEVA as 1558. The aeroplane actually passed abeam of NEEVA at this time, but had a deviation to the right of airway R20 of approximately 200 NM. By this time, the aeroplane had gone beyond the area of coverage of the ground radar and radio navigation aids located on Shemya Island, as well as the area of VHF communications coverage.

In the period 1603 - 1605:30 the KAL-007 crew made many attempts to contact Anchorage Radio on HF channels. Very weak calls were recorded and given the fact that at this time the Anchorage Radio operator was in communication with another aircraft, Flight UA-18, the radio exchange between KAL-007 and the controller did not take place.

If one assumes that the 007 crew did not know their real position and believed that at 1558 they were on airway R20 in the area of NEEVA, then there is absolutely no explanation for the following facts:

1. The crew did not make any attempts to contact the Anchorage ARTCC on the VHF-2 channel, on which it had had earlier communications.

2. The crew did not ask for information about the serviceability of the VOR/DME/TACAN on Shemya Island. At the same time, in accordance with the airline's instructions the crew, prior to reporting position NEEVA, had to check its position using these radio navigation aids. If such a check were performed by the crew, then they would have been convinced of the absence of information from these aids.

3. The INS, which was in good working order, indicated the actual deviations from the assigned airway to the crew.

All these circumstances should have alerted the crew, even more so as the reported time of passing NEEVA differed considerably from the estimated time (by 5 minutes) and the scheduled time (by 8 minutes). Thus, the crew had fairly serious grounds for doubting the correctness of the determination of their position, but there is no evidence that they expressed these doubts.

At 1606:31 the Anchorage ARTCC (Sector D 10/11) controller requested the crew of Flight 015 to transmit to 007 information about the possibility of increasing flight altitude before the approach to NIPPI. 015's crew confirmed 007's wish to increase altitude, since at 1605:50 007 was in communication with 015. The controller gave a clearance for 007 to change level, 015 relayed this information and at 1607:27 KAL-007 began to change level and up to 1607:52 it had exchanges with 015 on VHF-3.

After changing level, at 1610:20 the KAL-007 crew communicated on VHF-3, probably with 015, and had many exchanges with it in the period 1612-1618, as well as at 1625:30, which were not recorded on the ground recordings. Similar exchanges took place on VHF-3 in the period 1620:40-1621:40. At 1612 transfer of control of Flight KAL-007 took place from the Anchorage ARTCC to the Tokyo ACC and there was a corresponding exchange of data for the co-ordination of control.

At 1622:15 the crew of Flight KAL-007 contacted the Anchorage Radio station on HF-2 for a radio check, after which at 1622:50-1623:30 on HF-1 and at 1624:00-1624:40 on HF-2 communications were recorded with undetermined parties. It is not ruled out that these communications were reports of the KAL-007 crew to Korean Air Lines operations sent through the Anchorage AFTN communication centre about their position with respect to NEEVA.

As was indicated above, at 1551 the USSR Air Defence radio technical services located on Kamchatka Peninsula detected an air target which was assigned the number 6065. The target did not respond to interrogation and moved in the direction of the USSR State border.

It should be noted that earlier from 1345 on on 31 August 1983 the Air Defence radio technical services on Kamchatka Peninsula detected and tracked air target 6064 which manoeuvred north-east of Karaginsky Island and did not respond to interrogations. According to data from the corresponding Air Defence services, this target was identified as a US reconnaissance aeroplane, an RC-135. According to available data from the US Defense Department, this RC-135 aeroplane was conducting surveillance of Soviet missile tests and the activities of the Air Defence Forces near the Kamchatka coast under the programme "Cobra Dane". The second target, 6065, because of the nature of the flight and the situation which was developing, was originally identified by the Air Defence services on duty as a refuelling aeroplane KC-135, and then as a reconnaissance aeroplane RC-135.

In response to the Air Defence's request the Main Centre, the Kamchatka Area Centre and the Khabarovsk Area Centre[3] of the unified ATC system reported that in the area in which air target 6065 was flying there were no civil aircraft monitored by these services. These reports, the lack of a response to the interrogation of target 6065, and the night time darkness, which did not make it possible for a visual identification of the target to be made by the fighters which were subsequently sent up, gave the combat units on duty and the Air Defence Command grounds to draw the definitive conclusion that air target 6065 was a United States military aeroplane, an RC-135 reconnaissance aeroplane.

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[3]These are air traffic control units of the USSR.

An analysis of the relative positions of targets 6064 and 6065, performed using data from radar measurements of these targets by the USSR Air Defence Forces, the materials on the track of the RC-135 aeroplane presented by the United States and the materials from the computation and modelling of the flight path of Flight KAL-007 using DFDR information made it possible to establish that the minimum lateral intervals between the RC-135 and the B-747 of Flight KAL-007 were approximately 150 km. This does not contradict the statement of the United States authorities (ICAO C-WP/7764, paragraph 2.11.3). It should be noted that such a conclusion could have been drawn in September 1983 on the basis alone of the objective data obtained from an analysis of information from the radar surveillance systems of the United States military services.

At 1636 air target 6065 violated the USSR State border and continued to fly over Kamchatka Peninsula. The target's flight was accompanied by the interceptor fighters, but it was not terminated by them. At 1708 the air target entered the airspace over the water area of the Sea of Okhotsk and 20 minutes later it left the area of coverage of the Air Defense radio technical services on Kamchatka Peninsula. Given the fact that the target was proceeding in the direction of Sakhalin Island, the Air Defence services of that island were informed in a timely manner.

During the flight of the KAL-007 B-747 over the territory of Kamchatka Peninsula, the lateral deviation to the north of the airway was of the order of 200-215 NM. Together with the readings of the INS, which was in good working order and which indicated this deviation, the crew had the real possibility of assessing their position by the weather radar, if they had used the terrain mapping mode. At the same time, it should be noted that the airline's instructions did not provide for this as a mandatory operation. This is its drawback. Obviously, when using the terrain mapping technique, the crew would have immediately detected the basic differences in the features of the actual terrain (Kamchatka Peninsula) as opposed to the planned terrain along the airway on the segment NINNO - NIPPI (a water expanse).

At 1708:54 the KAL-007 crew contacted the Tokyo aeronautical station (Tokyo Radio) and at 1708:59 the crew reported passing NIPPI at 1707 at level 330 and gave an estimated time of passing NOKKA at 1826. The crew transmitted a wind value of 320/45 and requested a SELCAL check GKFH, which went normally.

It should be noted that the 007 crew did not report passing NIPPI to the Anchorage ATS service. At the time of passing NIPPI, the aeroplane had a lateral deviation of approximately 230 NM to the right of airway R20.

In the period 1710 - 1711 the DFDR recording indicates communications on HF-1 and HF-2, apparently to transmit the report of passing NIPPI through the Anchorage AFTN communication centre to Korean Air Lines operations, as well as on VHF-1, apparently with 015.

Note.- Starting from 1754:00, the recording of the airborne tape recorder, the CVR, was kept. This provides the possibility of identifying all parties in the subsequent exchanges.

At 1745 air target 6065 was again detected by the USSR Air Defence radio technical services, those stationed on Sakhalin Island. At that time the aeroplane was at a point with the co-ordinates 49°45'N/148°23'E and had deviated from airway R20 by 275 NM.

By this time, the Air Defence services on Sakhalin Island had reliable information about the movement of the intruder aeroplane over Kamchatka Peninsula and they sent up the first interceptor fighter from the Air Force Air Division of the Far East Military District (a SU-15, call sign "805"). The

whole of the rest of the aeroplane's flight was monitored by the USSR Air Defence services and in the period 1812-1829 also by those of Japan.

In order to identify target 6065, the Air Defence service asked the services on duty at the ATC Unified System Main Centre, the Air Force and the Navy whether they were monitoring any aircraft and it received a negative response. At 1746 a second interceptor took off, a MiG-23 (call sign "163"), and at 1754, a third, a SU-15 (call sign "121"). The interceptor aeroplanes were vectored in the direction of the probable flight of the target.

The following analysis is given with respect to the actions of the aeroplane with the call sign "805", which made the direct interception of KAL-007.

In the period 1754:16-1802:48 conversations among the KAL-007 crew are recorded on the CVR. These do not relate directly to the performance of the flight ("... We have an interesting conversation. Mr. Kim entertains us ...").

At that time, the interceptor fighter was at an altitude of 8 000 m and was proceeding towards the intruder aeroplane. At 1756-1757 the distance between the two aeroplanes was 120-130 km.

By 1800, when the aeroplanes had practically closed on each other, the interceptor had received a command from the vectoring controller to turn left with a 45° bank onto heading 240°, on which KAL-007 was moving according to the controller's report.

By 1803 the pilot of the interceptor aeroplane had assumed the same heading as KAL-007 and reported the detection of the target with the radar sight.

In the period 1758-1802 the pilot of the interceptor fighter many times received instructions to identify the target which was approaching the USSR border. As was stated above, when violating the USSR State border in the area of Kamchatka Peninsula, air target 6065 was identified as a United States RC-135 reconnaissance aeroplane. Therefore, the Air Defence services on Sakhalin Island had sufficient grounds to believe that the intruder aeroplane was a military target. This also predetermined the corresponding instructions (actions). Analyzing the radio exchange between the ground services and the interceptor fighters, the conclusion can be drawn that on the one hand the Air Defence Services did not apply to the intruder aeroplane the rules of interception for civil aircraft published in the USSR AIP (1980), while on the other hand they used methods, widespread in practice, to provide a warning of the violation of the State border and unauthorized flight (flashing of lights by the interceptor, warning bursts from the cannons of the interceptor along the path of the intruder aeroplane, etc.). These actions correspond to the requirements of the Order of the USSR Minister of Defence of 1961 with respect to military intruder aeroplanes.

For reference: Extracts from the text of the Order of the USSR Minister of Defence of 1961.

Art. 1 "One is not to open fire on passenger and transport intruder aeroplanes, but force them by the actions of fighters to land at one of the nearest aerodromes."

Art. 2 "Using fighter aircraft, one is to force military intruder aeroplanes to land using warning fire and in the event of refusal to comply, one is to use weapons for effect. Anti-aircraft missile forces and anti-aircraft artillery are to open fire on military intruder aeroplanes for effect."

At 1803 the KAL-015 crew contacted the crew of Flight KAL-007 on VHF-3. For a minute they had conversations unrelated to the flight. Then the crew exchanged data on the estimated time of passing NOKKA (007 at 1825, 015 at 1829). The exchange of views confirmed that 015 was gradually catching up with 007, in the light of which the 015 crew reported that they had "an unexpectedly strong tail wind ... thirty to forty degrees, 35 knots".

Such information surprised the KAL-007 crew, since they had "still a head wind, direction 215°, 15 knots". Despite the fact that this data significantly differed from the flight plan data (320°, 26 knots) and from the airborne data of Flight 015, this information did not alert the KAL-007 crew ("well, these things happen"). It should be borne in mind that at this time the distance between the 015 aeroplane on airway R20 and the 007 aeroplane to the north of the airway was 310 NM. This naturally was the reason for the difference in wind conditions. By this time the interceptor, 12-15 km behind the target and observing KAL-007 from the left at an angle of 20°, had received information that the target was military and instructions to destroy the target upon violation of the border.

At 1808:30 the KAL-015 crew contacted KAL-007 on VHF-3 and suggested that it assume level 350 after 015 moved to level 370 in the event of clearance by the ATC controller. After this, for three minutes the KAL-007 crew had conversations within the cockpit, unrelated to the flight.

At this time (1809:00) the vectoring controller informed the interceptor pilot that the target was left of him at 10° and at a distance of 12 km. At 1810:35 the interceptor pilot reported that the target was flying with a flasher. At 1811:09, according to the interceptor's report, the target was in front on the same heading at a distance of 12 km. At 1813, upon a command from the vectoring controller, the fighter pilot carried out an interrogation of the target and reported that the target was not responding to the interrogation.

Note.- The interrogation was carried out using the "friend-foe" system and there could be no response from KAL-007, since only USSR aeroplanes are equipped with such systems. The fighter pilot did not use the changeover to the use of the distress frequency 121.5, since there was no provision for this in the regulations in effect in the USSR.

At 1812 KAL-007 was detected by the radar services of Japan's Self Defence Forces (Wakkanai) at an altitude of 32 000 ft with a secondary transponder code of 1300. The aeroplane's co-ordinates at this time were 47°40'N/143°45'E. The reason for the KAL-007 crew using the code 1300 is unknown. In accordance with Japan's AIP, when entering radar monitored airspace, including entering from airway R20, aircraft are as a rule assigned SSR code 2000. The code 1300 is assigned upon exit from this air zone. It is namely this circumstance which did not make it possible for Japan's air defence units to identify the KAL-007 aeroplane in a timely manner. It may be assumed that if KAL-007 had performed the flight with a correctly set SSR code, then Japan's air defence radar tracking services could have identified in a timely manner the aeroplane which had deviated from the airway and reported this to Japan's ATC units which would have given the corresponding instructions to KAL-007 and would have informed the USSR ATC units that the passenger aeroplane had deviated from airway R20 and was proceeding over Sakhalin Island. In that case the tragic outcome of the flight would have been prevented.

At 1814:26 the KAL-015 crew contacted the Tokyo Radio controller, requested clearance to change level (from 350 to 370) and received this clearance, after which KAL-007, at 1814:57 on HF-1, requested clearance to level 350. The controller gave the clearance to climb and at 1820:11 the KAL-007 crew acknowledged the information received: "Roger, KAL-007, climb, maintain 350, leaving 330 this time".

At 1816:40 KAL-007 violated the USSR State border in the area of Sakhalin Island and at 1818 the command came from the vectoring controller: "805, target has violated State border, destroy target". After this the controller again asked to clarify whether the target's air navigation light was on. The fighter pilot replied: "The air navigation light is on, the flasher is on".

The change of level was started at 1820:37 and was accompanied by an increase in the power settings of the engines, a reduction in flight speed from 310 to 290 knots and an increase in the angle of pitch of approximately 2°. Practically at the same time, the pilot of the interceptor fighter received the command from the vectoring controller to fire a warning burst from his cannons in front of the aeroplane and he reported: "Lock-on disengaged, giving a burst from the cannons".

Note.- The KAL-007 crew, being in front of and above the fighter and climbing to a new level with an angle of pitch of approximately 2°, may not have seen this warning.

At 1821:00 the fighter pilot reported that he had executed the firing, after which he reported that he had approached the target to a distance of 2 km and repeated that the target was flying with a flasher.

While the KAL-007 aeroplane was climbing, at 1821:45 the fighter pilot reported that the target was reducing speed and at 1822:00 he reported: "Am already moving in front of the target". Actually, at this time, the fighter aeroplane was in the process of catching up with the target and moving abeam of it.

Note.- In carrying out the interception of a military aeroplane, the interceptor fighter does not use manoeuvres to move ahead of the target, since in this case it is faced with the real danger of being hit by the weapons of the intercepted aircraft.

At 1823:19, having received instructions to open fire on the target, the fighter began to fall back from it. At 1824:56 the fighter reported: "Target in lock-on, distance to target 8". At 1825:30 the fighter pilot launched two missiles at the target and at 1826:01 he reported: "Executed launch, target destroyed". Judging by the time of these reports and the speed of the missile, the hit could have occurred in the time interval not earlier than 1825:50 and not later than 1826:00. According to the DFDR data the target was hit at 1825:54. At that time KAL-007 was 350 NM to the right of the assigned airway R20. The co-ordinates of the point where the aeroplane was hit are 46°46'27"N/141°32'48"E.

The time at which the aeroplane was hit is identified with sufficient certainty on the DFDR parameter recording (20627 s) by the change in parameters characterizing the acceleration of the aeroplane and on the recording of the stabilizer, and also on the CVR recording by the sharp change in the acoustic signal from the open microphones in the cockpit. These recorders (DFDR and CVR) recorded the flight parameters and acoustic information for 104 seconds after the aeroplane was hit. The stopping of the tape transport mechanisms of both recorders occurred practically simultaneously. This shows that they became completely de-energized.

An analysis of the radar information on the flight of the B-747 and the radio exchange between the ground tracking units, the interception control and the interceptor fighters of the USSR makes it possible to assume that the aeroplane collided with the surface of the water no earlier than 1834 (8 minutes after it was hit). Information available on the flight in the time interval 1827:30-1833:00, when the aeroplane descended from 10 500 m to 5 000 m, makes it possible to assume that the nature of the motion corresponded to a flat spiral with average values of the angle of bank of approximately 50° and

a flight path angle of approximately -3.5°/-4°. The vertical rate of descent was 15-20 m/s. It should be noted that these conditions in terms of intensity of descent are considerably "softer" than the emergency descent, which the crew intended to perform (announcements in the aeroplane cabins at 1826:24 and later on and the crew's report to the Tokyo control centre at 1827).

Modelling the final phase of the flight under conditions where the engine power settings are close to "idling" showed that the process of descent was accompanied by a smooth reduction in flight speed and that by 1833 when the aeroplane reaches 5 000 m the calibrated airspeed has been reduced to approximately 350-400 km/h. Taking into account turning with a bank of approximately 50°, this corresponds to coming to conditions close to a stall.

Thus, it is not ruled out that the last segment after 1833 corresponded to a flight under stall conditions. In this case, collision with the surface of the water does not cause considerable scattering of aeroplane wreckage. This is in fact what occurred. The co-ordinates where the bulk of the wreckage was found are 46°33'32"N/141°19'41"E.

CONCLUSIONS

1. The considerable lateral deviation of the B-747 aeroplane on Flight KAL-007 from the assigned airway R20 was a result of the crew using an air navigation method based on maintaining a constant magnetic heading immediately after take-off (three minutes after the aeroplane lifted off) and throughout the whole of the subsequent flight. This basically contradicts the generally accepted standards and rules of air navigation, including the regulated documents of Korean Air Lines. Disregarding the need for multiple corrections of the magnetic heading, which were prescribed by the computer flight plan, as well as the resulting current information from the aeroplane's navigation systems when reaching the intermediate waypoints, cannot be explained by an insufficient professional level of crew training, inattention or even negligence, since in this case what one is talking about is the complete refusal of the crew to comply with all the rules and procedures for the performance of the flight prescribed by the airline's instructions, including those in the event of possible abnormalities in the operation of the equipment.

A probable explanation for the situation which developed may be the intentional following of the route which was actually taken. The following facts attest to this:

- in accordance with the ATS plan, the crew informed the Anchorage and Tokyo ATC units of their position with respect to the compulsory reporting points. However, the information did not correspond to the actual position of the aeroplane indicated by the airborne navigation systems;

- when reporting with respect to NABIE and NEEVA, the crew did not ask the ATS units about the serviceability of the NDB and DME on St. Paul Island and that of the VOR and elements of the DME/TACAN on Shemya Island, despite the absence of signals from these radio navigation aids, since, possibly, they knew that they were out of coverage;

- having determined their position with respect to NEEVA, the crew, according to the DFDR data, did not make any attempts to contact the Anchorage ARTCC on communications channel VHF-2;

- the recording of the radio exchanges (CVR) of the crew of Flight KAL-007 with the crew of Flight KAL-015, which was following it at an interval of approximately 4 minutes, indicates the complete lack of alertness on the part of the crew of KAL-007 with regard to the basic differences in wind force and direction according to the data of these two aeroplanes;

- long before entering Japan's ATS radar area, the crew set on the SSR code selector the code 1300, which refers to the phase of exit from this area prior to entry into the Korean area TAEGU, instead of the prescribed code 2000.

The flight path of Flight KAL-007, obtained on the basis of the results of modelling taking into account the data from the radar tracking stations of the United States, the USSR and Japan, essentially coincides over a considerable extent (Anchorage-abeam NIPPI) with a great circle flight path Anchorage - FIR Seoul (the deviations do not exceed $\pm$ 15 NM. This is determined by the accuracy of the calculations made). If one assumes that a route along the great circle VOR Anchorage - FIR Seoul was programmed on one of the three INS and that the flight was performed according to this programme, then in this case the crew's actions can be logically explained. However, the investigation materials do not contain exhaustive evidence confirming this assumption.

Thus, the Commission could not determine the reasons which prompted the crew to decide to follow from Anchorage to Seoul the route which was actually taken and which was close to the great circle.

2. The actions of the USSR Air Defence Forces on the territory of Kamchatka Peninsula and Sakhalin Island were based on the conviction that a military intruder aeroplane had entered USSR airspace. The absence of civil aircraft, according to the reports of the USSR ATC units, in the airspace monitored by them and the impossibility of visual recognition of the intruder aeroplane type as a civil aircraft under night flying conditions confirmed the certainty of its military affiliation. Given these circumstances, the rules of interception for civil aircraft, recommended by ICAO and established in the USSR AIP, were not applied by the USSR Air Defence Forces. The USSR Air Defence units were guided by the rules regulating the actions of the Air Defence Forces in the event of violation of the USSR State border by military aeroplanes. This led to the stopping of the flight at 1826 hours.

As was shown by an analysis of the objective information on the actions of the Air Defence units in intercepting the intruder aeroplane, all available measures were taken to identify and determine the type and State affiliation of this aeroplane. Further evidence of this is the fact that the flight was stopped not when it flew over Kamchatka Peninsula and not when it again violated the USSR State border in the area of Sakhalin Island, but immediately before the intruder aeroplane exited USSR airspace.

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