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WASHINGTON, D.C.

OPERATIONS / HUMAN PERFORMANCE GROUP
CHAIRMAN'S FACTUAL REPORT

By: Paul R. Misencik
(35 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

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Operations / Human Performance Group Chairman's Factual Report

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AVIATION SAFETY INVESTIGATOR
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FEBRUARY 24, 1998

TABLE OF CONTENTS

A. Accident	Page 5
B. Operations Group	Page 5
C. Summary	Page 6
D. Details of the Investigation	Page 6
E. History of Flight	Page 7
F. Personnel Information	Page 9
1. The Captain	Page 9
2. The First Officer	Page 10
3. The Flight Engineer	Page 11
G. Toxicology	Page 12
H. Flight Crew Histories	Page 13
1. Medical factors	Page 13
2. Interviews of Flight Crew Family Members	Page 14
3. Accident Crewmember's Flight Schedules	Page 18
I. Korean Air Procedures	Page 18
1. Self Briefing	Page 18
2. Supervisor of Flying Briefing	Page 18
3. Full Crew Briefing	Page 19
4. Audio Visual Airport Familiarization	Page 19
5. Briefing of Unfamiliar Airport	Page 20
J. Local Conditions - Guam Area	Page 20
1. General	Page 20
2. Witness Observations	Page 21
(a.) Continental Air Micronesia	Page 21
(b.) Ryan International	Page 22
K. Training	Page 23
1. Pilot Recruitment	Page 23
2. Ground School and Flight Training Facilities	Page 24
3. Crew Resource Management (CRM)	Page 24

4. English Language Competency Page 25
5. Basic and Advanced Course in Instrument Flying Page 26
6. Flight Crew Training Curriculum Page 26
(a.) Ground School Page 26
(b.) Cockpit Procedures Training (CPT) Page 27
(c.) Simulator Flight Training Page 27

L. Korean Air Approach Procedures Page 29
1. Checklist Usage Page 29
2. Landing Briefing Page 29
3. Descent and Approach Procedures Page 29

M. Airport Information Page 30
1. Location Page 30
2. Airport Overview Page 30
3. Guam Weather Overview Page 30
4. Airport Operations Page 30
5. Airport Communications Page 31
6. Navigational Aids to Airport Page 31
7. Runway 6L/24R Page 31
8. NOTAM Information - Guam International Airport Page 32
9. Airport rescue and Fire Fighting (ARFF) Page 32

N. Airplane Information Page 32
1. Weight and Balance Page 33

O. Company History Page 33

P. Additional Information Page 34

Signature Block Page 35

Attachments Page 36

Flight Papers 18 Pages

Interview Summaries (Guam - Seoul Korea, August 1997) 29 Pages

English Text of Guam Audio Visual Presentation 5 Pages

Korean Text of Guam Audio Visual Presentation 5 Pages

Letter - Level 3 Pilot English Test 1 Page

Forensic Toxicology Report	5 Pages
Outline of B-747 Initial and Transition Training	7 Pages
Copy of B-747-200 Simulator Training Guide	18 Pages
Copy of Checklists	6 Pages
Copy of Landing Briefing Card	1 Page
Airport Diagram	1 Page
Copies of Approach Plates from Accident Airplane	5 Pages
Copies of August 2, 1996 ILS 6L Approach Plate	1 Page
Accident Crewmember's Flight Schedule (June, July, August-1997)	6 Pages
Summary of United States D.O.D. Capability Survey of Korean Air.	1 Page
Captains Flight Activity Record - (Aug. 3-4, 1997)	2 Pages
Interview Summaries (Guam, January 13, 1998)	3 Pages

A. ACCIDENT

Operator:	Korean Air Co. Ltd.
Flight Number:	Korean Air 801
Location:	Nimitz Hill, Guam, Mariana Islands
Date:	August 6, 1997
Time:	0142 Guam Local Time[1] - (1542 UTC[2] August 5, 1997)
Airplane:	Boeing 747-300 (3B5B), Registration HL-7468, S/N 22489
NTSB Number:	DCA97MA056

B. OPERATIONS GROUP

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[1] All times are Guam Local Time (LCL) based on a 24-hour clock unless otherwise noted.
[2] Coordinated Universal Time (UTC) - Formerly Greenwich Mean Time (GMT) or (Z).

C. SUMMARY

On August 6, 1997 at approximately 0142, a Boeing 747-300 (3B5B), operated by Korean Air Co. Ltd. as Korean Air flight 801 from Seoul, Korea (RKSS) to Agana, Guam, crashed on approach to runway 6 Left at the Guam International Airport (PGUM).

At the time of the accident the glide slope associated with the instrument landing system (ILS) to runway 6L was out of service, and the crew was conducting a localizer approach to the runway when the airplane contacted high terrain approximately 3 nautical miles southwest of the airport.

The 0132 reported weather at PGUM indicated that the wind was from 090° at 6 knots; visibility was 7 statute miles with showers and there was a scattered layer of clouds at 1,600 feet, a broken layer at 2,500 feet and an overcast cloud layer at 5,000 feet.

While in U.S. airspace the flight was operated as a scheduled passenger flight under 14 Code of Federal Regulations (CFR) Part 129. There were two pilots, one flight engineer, one purser, nineteen flight attendants (including six deadheading flight attendants) and 231 passengers aboard the airplane at the time of the accident. The airplane was destroyed by impact forces and a post-accident fire. Of the 254 occupants on board, 225 were fatally injured, and 25 passengers and four flight attendants survived the accident with minor to serious injuries. During the 30 days following the accident, two passengers and one deadheading flight attendant who initially survived the accident succumbed to their injuries.

D. DETAILS OF THE INVESTIGATION

Phase I of the operations group investigation began on August 7, 1997 when the operations group convened at the Parc Hotel in Tumon, Guam. The Korean Ministry of Construction and Transportation (M.O.C.T.) assigned Mr. Kim, Jae-Young as their representative for this phase of the investigation. While in Guam, members of the operations group examined the accident site and interviewed crewmembers of other airline companies who were operating in the vicinity of Guam International prior to and after the accident of Korean Air 801. During Phase I, materials, manuals and data were requested from Korean Air and the FAA.

Phase II of the investigation began on August 11, 1997 when the operations group convened in Seoul, Korea. Captain Lee, Kwang-Suk represented the Korean M.O.C.T. for this phase of the investigation. The operations group toured the Korean Air headquarters facilities in Seoul and the training facilities at Inchon. Interviews were conducted with Korean Air pilots, instructors, supervisory pilots, check-airmen and management personnel. Members of the Korean M.O.C.T. were also interviewed. Additional materials and data were requested from the Korean M.O.C.T. and Korean Air.

E. HISTORY OF FLIGHT

According to Korean Air records the accident crew arrived at the Dispatch Center in the Korean Air Headquarters building at least two hours prior to the scheduled departure time of Korean Air 801.[3] Proposed departure time from Kimpo Airport was 2105.

The flight plan for Korean Air 801 listed a different captain's name. The accident captain had originally been scheduled to fly to Dubai, United Arab Emirates, but when it became apparent that he would not have had adequate crew rest, he was assigned the shorter trip to Guam and replaced the original captain. The original captain's name was crossed out and the accident captain's name was added. The accident captain's previous trip had been a flight from Seoul to Hong Kong on August 3, 1997, with a return to Seoul on August 4, 1997.[4]

Korean Air personnel stated that the accident flight crew met in the Dispatch Center area and collected the necessary trip paperwork. They conducted a self-briefing and then proceeded to their assigned supervisor of flying for the supervisor briefing.[5] The supervisor of flying who briefed the accident crew was a retired Korean Air B-747 captain with approximately 23,330 hours total flying time. He had been a supervisor of flying since December 26, 1996.

The supervisor of flying said he reviewed the flight data and asked about the weather enroute and at Guam. He said there was some discussion about *Typhoon Tina* and the possibility of enroute turbulence. The supervisor of flying said he recommended maximum use of the weather radar to the flight crew.

He said he checked their ratings, licenses, passports and company identification. He said that he did not check whether the crewmembers carried the proper manuals or whether their manual revisions were up to date. He said that he frequently checks those items.

The supervisor of flying said he discussed company notices with the accident crew. He stated that they did not discuss the NOTAMS[6] at Guam nor did they discuss the out-of-service glideslope associated with the 6L ILS at Guam because the crew did not mention them. He said his main concern was to confirm that crews had closely studied their trip paperwork.

The supervisor of flying said he had never flown with the accident captain and did not know him personally. However, he said the accident captain seemed absolutely normal and not at all fatigued. He said he had flown with the accident flight engineer and had known him from the military when they had served together during the Viet Nam War.

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[3] The Korean Air Operations Manual requires B-747 crewmembers to show up at the Dispatch Center (or other designated place) no later than 1 hour 20 minutes prior to the scheduled departure time for a domestic flight and no later than 1 hour 30 minutes prior to the scheduled departure time for an international flight.
[4] Captain's Flight Activity Record included in attachments.
[5] Supervisor briefing explained in Korean Air Procedures section.
[6] Notices To Airmen (NOTAMS)

According to Korean Air records and witness interviews, the accident crew followed company pre-departure check-in, trip planning and dispatching requirements. The weight and balance manifest for the flight was approved by the captain at 2108. Korean Air flight 801 blocked out from the gate at 2127 and took-off at 2153.

According to ATC transcripts[7] Korean Air 801 contacted Guam Center and Radar Approach Control (CERAP) at approximately 0103 Korean Air 801 was at FL410[8] and over MIXSS intersection which is approximately 240 nautical miles northwest of the Nimitz VOR.

ATC transcripts indicate that Guam CERAP told Korean Air 801 to expect runway 6L which they acknowledged. At approximately 1522 UTC, Guam CERAP informed Korean Air 801 that ATIS[9] information "Uniform" was current and the altimeter setting was 29.86" hg. Korean Air 801 answered that they were "checking Uniform" but they did not acknowledge the altimeter setting. Two minutes later Korean Air 801 began deviating around weather.

At approximately 0131 Korean Air 801 stated they were clear of "Charlie Bravo"[10] and requested radar vectoring for runway 6L. Korean Air 801 was given radar vector headings by Guam CERAP and at approximately 0139 was cleared to intercept the localizer[11] which was acknowledged by Korean Air 801.

At approximately 0140, Guam CERAP cleared Korean Air 801 "for ILS 6L approach, glideslope unusable." Korean Air 801 acknowledged they were cleared for the ILS approach. The flight did not acknowledge that the glideslope was unusable.

At approximately 15:41 UTC, Korean Air 801 was told to contact Agana Tower, which they acknowledged.

Korean Air 801 crashed near the summit of Nimitz Hill at approximately 0142.

At the approximate time of the crash a Ryan International B-727 was approximately 125 nautical miles to the southeast of Guam. The Ryan first officer said he noticed a red glow illuminate the clouds surrounding Guam which flared up and quickly died out. By the time he could bring it to the attention of the other crewmembers the flare up was no longer discernible.

When ATC was unable to reestablish contact with Korean Air 801, they requested that the Ryan crew assist them in locating the missing flight. They were given radar vectors over Nimitz Hill where they spotted what they described as "a big fire on the hill."

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[7] Excerpts from ATC transcripts included in ATC Group Factual
[8] Flight Level 410 (FL410) - 41,000 feet above sea level based on an altimeter setting of 29.92" hg, (QNE).
[9] Automated Terminal Information Service (ATIS).
[10] "Charlie Bravo" (CB) - cumulonimbus clouds
[11] the component of an instrument landing system (ILS) which provides lateral guidance.

F. PERSONNEL INFORMATION

All three crewmembers were certified in compliance with existing Korean Air and M.O.C.T. regulations.

1. THE CAPTAIN

Captain Park, Yong-Chul According to Korean Air records, the following information pertains to Captain Park, Yong-Chul:

The captain was born on [redacted], 1954 and was hired by Korean Air on November 2, 1987. Prior to his employment with Korean Air, the captain was a pilot in the Korean Air Force.

He flew as first officer on the Boeing 727 and on the B-747. He received a type rating on the B-727 on November 15, 1988, and a type rating on the B-747 on November 17, 1990. Company records indicate the captain had approximately 8,932 hours total flying time, including 2,884 hours as a military pilot and 6,048 hours as a civilian pilot.

A synopsis of his flight experience with Korean Air follows:

Qualified as B-727 first officer:	December 19, 1988
Total flight time, B-727 first officer:	1,209 hours
Qualified as B-747 first officer:	February 13, 1991
Total flight time as B-747 first officer:	1,474 hours
Qualified as B-727 captain:	December 27, 1992
Total flight time as B-727 captain:	701 hours
Qualified as B-747 captain:	August 20, 1995
Total flight time as B-747 captain:	1,718 hours

The captain's recency of flight experience follows:

Previous 7 days flight time (including accident flight):	17:20 hours
Previous 30 days flight time (including accident flight):	90:06 hours
Previous 60 days flight time (including accident flight):	179:29 hours
Previous 90 days flight time (including accident flight):	281:43 hours

The captain's experience and training pertaining to Guam operations were as follows:

Guam airport familiarization audio-visual presentation:	July 4, 1997
Seoul to Guam (Captain B-747)	July 4, 1997
Seoul to Guam (Captain B-727)	August 27, 1993
Seoul to Guam (Captain B-727)	October 3, 1993
Seoul to Guam (Captain B-727)	September 19, 1993
Seoul to Guam (Captain B-727)	September 8, 1993
Seoul to Guam (Captain B-727)	July 11, 1993
Seoul to Guam (Captain B-727)	June 21, 1993
Seoul to Guam (Captain B-727)	May 3, 1993
Seoul to Guam (Captain B-727)	December 9, 1992

The captain's latest pertinent training:

Route Check (SEL-NRT-SEL) July 19, 1997

The captain's last route check prior to the accident was a route check from Seoul to Narita and return on July 19, 1997. The total elapsed time was 4:42 hours. Weather at Narita and Seoul was well above minimums and the winds were less than 10 knots. Both approaches were full ILS. The Captain was given an "above standard" evaluation on that check.

Proficiency Check (Simulator) June 11, 1997

The captain's last proficiency check prior to the accident was a simulator proficiency check on June 11, 1997. The total elapsed time was 2:00 hours. During the check ride the captain executed a VOR / DME approach to runway 32L at Kimpo. The weather for the approach was 900 feet overcast, wind 290/11 kts. The captain was given an "excellent" evaluation for that check.

A Korean Air spokesperson stated that the captain had taken and passed the Level 3 Pilot English Test[12] and had attended Crew Resource Management (CRM) training. However, the dates of attendance could not be determined from available records.

2. THE FIRST OFFICER

First Officer Song, Kyung-Ho According to Korean Air records, The following information pertains to First Officer Song, Kyung-Ho:

The first officer was born on [redacted] 1956, and was hired by Korean Air January 10, 1994. He was a graduate of the Korean Air Force Academy and prior to his employment with Korean Air, the first officer was a pilot in the Korean Air Force.

He received a type rating on the B-747 March 11, 1995. Company records indicate the first officer had approximately 4,066 hours total flying time, including 2,276 hours as a military pilot and 1,790 hours as a civilian pilot.

A synopsis of his flight experience with Korean Air follows:

Qualified as B-747 first officer:	July 23, 1995
Total flight time, B-747 first officer:	1,560 hours

The first officer's recency of flight experience follows:

Previous 7 days flight time (including accident flight):	20:23 hours
Previous 30 days flight time (including accident flight):	67:36 hours
Previous 60 days flight time (including accident flight):	129:05 hours
Previous 90 days flight time (including accident flight):	196:37 hours

The first officer's experience and training pertaining to Guam operations are as follows:

Guam airport familiarization audio-visual presentation:	July 8, 1997
Seoul to Guam (First Officer B-747)	September 27, 1995
Seoul to Guam (First Officer B-747)	August 2, 1995

[12] Letter included in attachments.

The first officer's latest pertinent training:

Proficiency Check (Simulator)	March 28, 1997

The first officer's last proficiency check prior to the accident was a simulator proficiency check on March 28, 1997. The total elapsed time was 2:00 hours. During the check ride the first officer executed a VOR / DME approach to runway 32L at Kimpo. The weather for the approach was 900 feet broken, wind 260/11 kts. The first officer was given an "above standard" with instructor comments which stated, "control skills and knowledge are above standard" as a total evaluation for the checkride. He was given an evaluation of "standard" for non-precision VOR approaches but the instructor's comment for the non-precision VOR approach stated: "altitude management on non precision approach somewhat less than desirable. Another instructor commented relative to an evaluation criteria titled, Adherence to Law & Regulation, "Somewhat slow to carry out directions."

According to Korean Air records, the first officer was not observed during a route check since July, 1995.

A Korean Air spokesperson stated that the first officer had taken and passed the Level 3 Pilot English Test[13] and had attended Crew Resource Management (CRM) training. However, the dates of attendance could not be determined from available records.

3. THE FLIGHT ENGINEER

Flight Engineer Nam, Suk-Hoon According to Korean Air records, The following information pertains to Flight Engineer Nam, Suk-Hoon:

The flight engineer was born on [redacted] 1939, and was hired by Korean Air May 7, 1979. He was a graduate of the Korean Air Force Academy and prior to his employment with Korean Air, the flight Engineer was a navigator in the Korean Air Force.

With Korean Air, he flew as a flight engineer on Boeing B-727, Airbus A-300, and Boeing B-747 airplanes. Company records indicate the flight engineer had approximately 13,065 hours total flying time, including 1,977 hours with the military and 11,088 hours as a civilian flight engineer.

Korean Air records indicate the flight engineer received a medical certificate on June 17, 1997.

A synopsis of his flight experience with Korean Air follows:

Qualified as Boeing B-727 flight engineer:	October 10, 1980
Total flight time, B-727 flight engineer:	996 hours
Qualified as Airbus A-300 flight engineer:	March 1, 1982
Total flight time, A-300 flight engineer:	8,150 hours
Qualified as Boeing B-747 flight engineer:	March 17, 1990
Total flight time, B-747 flight engineer:	1,573 hours

[13] Letter included in attachments.

The flight engineer's recency of flight experience follows:

Previous 7 days flight time (including accident flight):	28:23 hours
Previous 30 days flight time (including accident flight):	101:17 hours
Previous 60 days flight time (including accident flight):	154:04 hours
Previous 90 days flight time (including accident flight):	206:33 hours

The flight engineer's latest pertinent training:

Proficiency Check (Simulator) March 7, 1997

The flight engineer's last proficiency check prior to the accident was a simulator proficiency check on March 7, 1997. The total elapsed time was 2:00 hours. The flight engineer was given a "above standard" total evaluation and the instructor comments for the total evaluation were, "control skills and knowledge are above standard." Crew coordination was rated "above standard."

Route Check (SEL-NRT-SEL) April 21, 1997
Route Check (SEL-ANC) April 18. 1997

The flight engineer was observed on two route checks in April 1997. On April 18, 1997 his overall evaluation was "above standard" and the instructor's overall comment stated, "control skills and knowledge are above standard."

On the April 18, 1997, route check he was given an overall evaluation of "excellent" and the instructor's overall comment stated, 'control skills and knowledge are excellent."

The flight engineer's CRM skills for the two route checks were rated "above standard" and "excellent".

A Korean Air spokesperson stated that the flight engineer had taken and passed the Level 3 Pilot English Test[14] and had attended Crew Resource Management (CRM) training. However, the dates of attendance could not be determined from available records.

G. TOXICOLOGY

The forensic toxicology report is included in the attachments.

[14] Letter included in attachments.

H. FLIGHT CREW HISTORIES

1. MEDICAL FACTORS

According to his brother, the captain was very healthy and there had been no changes in his health in the past 12 months. The brother stated that the captain drank alcohol, but never more than 2 or 3 drinks, did not smoke, and did not take prescription medicine. The captain held a valid First Class Korean airman's medical certificate dated March 13, 1997. He also held a valid FAA First Class Airman's Medical Certificate dated March 13, 1997, with no restrictions. His height was 69 inches and weight as 168 pounds. His distant vision was 20/20 without correction, and near vision as 20/30 in the right eye and 20/20 in the left eye without correction.

According to his brother, the first officer's health was very good and had not changed in the past 12 months. The brother stated that the first officer did not drink alcohol because of religious beliefs, did not smoke, and did not take prescription medicine although he used herbal medicines. The first officer held a valid First Class Korean airman's medical certificate dated June 13, 1997. He also held a valid FAA First Class Airman's Medical Certificate dated June 13, 1997, with no restrictions. The examination noted prior history of tuberculosis, treated from January to June, 1980. No change was noted in history since the last examination. His height was 64.3 inches and weight as 137 pounds. His distant and near vision were both 20/20 without correction.

According to his family, the health of the flight engineer was very good and had not changed in the past 12 months. He used glasses for close work. He drank alcohol sparingly and smoked tobacco. He did not use prescription medicine, but took herbal medicine. The flight engineer held a valid First Class Korean airman's medical certificate dated June 5, 1997

The crewmember's bodies were not refrigerated for the first 2 days following the accident, and were in states of moderate to severe postmortem decomposition. Fluid and tissue specimens were obtained from the bodies of all three crewmembers at autopsy and were used for toxicological testing at the FAA Civil Aeromedical Institute Toxicology Laboratory. The toxicological test results are attached to this report. For the captain, blood and urine samples tested positive for alcohol and acetaldehyde, and a vitreous fluid sample tested negative for alcohol. The laboratory noted that the alcohol "found in this case is most likely from postmortem ethanol production." For the first officer, blood, muscle, and brain samples tested positive for alcohol and acetaldehyde, and blood tested positive for n-butanol. For the flight engineer, , blood, muscle, and brain samples tested positive for alcohol and acetaldehyde, and blood tested positive for n-propanol and n-butanol. The laboratory noted that the alcohol "found in this case may be the result of postmortem production." Urine samples from all three crewmembers tested negative on a screen for abused drugs.

In autopsy examination, identifiable fragments of food material were found in the stomach contents of all three crewmembers.

Among personal effects found in the wreckage, in a crew bag, investigators found a plastic pill container labeled "Cartilex, shark cartilage" containing 25 capsules of varied shapes

and colors. Toxicology testing detected melatonin in one tablet, and no drugs in the remaining tablets.

The medical examiner found a packet of tablets, with the name of a Korean physician at an internal medicine center in Seoul, among the personal effects of the captain. The physician was contacted by investigators, and he confirmed that the captain was a patient of his. The physician's records provided the following information: the physician examined the captain on July 27, 1997, and diagnosed bronchitis. He prescribed three medications: Copan (clenbuterol), a medication which opens up the upper airways; Sentil (clobazam), an anti-anxiety medication in the benzodiazepine class of drugs occasionally used as a sleep aid; and Vibramycin (doxycycline), an antibiotic. The physician prescribed the Sentil at half its usual dosage because of the captain's occupation as an airline pilot. (Note: a portion of the toxicology evaluation at the FAA Civil Aeromedical Institute Toxicology Laboratory was a screen for benzodiazepines, including clobazam, in the captain's blood: no indications were found of its presence.)

Company records indicate that on July 28, 1997, at 0535 (UTC), the captain departed on a 10 hour 36 minutes trip from Seoul to San Francisco. He returned from San Francisco the following day, arriving in Seoul at 0748 (UTC) on July 30. The captain did not advise the company prior to this trip that he had been diagnosed with bronchitis and treated with prescription medications, and did not receive medical approval from the company to conduct this trip

The Korean Air Operations Manual (5/21/97, Chapter 4-12-4) requires that a crewmember who "must be on duty under influence of medication, shall follow the direction of an Aeromedical Specialist." The Korean Ministry of Transportation Aviation Regulations (12/14/91, Provision 47) indicates that a pilot shall not be on flight duty under the influence of alcoholic beverages, anesthetics or any other drugs that will jeopardize the safe operation of an aircraft. The ICAO Standards Annex 1 (11/16/89, Section 1.2.6.) specifies that license holders shall not exercise the privileges of their licenses and related ratings at any time when they are aware of any decrease in their medical fitness which might render them unable to safely exercise these privileges.

2. INTERVIEWS OF FLIGHT CREW FAMILY MEMBERS

The Human Performance investigator conducted interviews of family members for each of the three flight crewmembers. Interview summaries are attached.

Mr. Park, Yung-Kil
Brother of the Captain

On August 8, 1997, the Human Performance investigator interviewed Mr. Park at the Pacific Star Hotel, Guam. Questions were asked in English and answered in Korean, with Mr. Han Char Ki, of the Korean Senior Youth Association, Guam, serving as the interpreter. Mr. Park provided the following information:

Mr. Park's last contact with his brother, Captain Park, was in a telephone conversation around 1300-1400 on Tuesday, August 5. They discussed the captain's plans the next day to bring his wife and two children on a visit to his relatives living in the countryside (including his mother and Mr. Park). The captain lived in Seoul. On the evening of August 6, following his return from the trip to Guam, the captain, his wife, and their children planned to take a commercial flight to Sachon Airport, Kyeongnam, Korea. They would arrive around 2000, and he asked Mr. Park to pick them up at the airport. The captain sounded bright and excited. He was in a very good mood.

The captain and his wife had been married for 20 years. Within the past 12 months, there had been no major changes in his personal or financial conditions. He owned two houses (renting out one), earned a good income and lived comfortably. He had very good relations with his whole family. Mr. Park usually received telephone calls from the captain 3 or 4 times per month. He had great respect for the captain, and described him as very industrious and pleasant. He said the captain was a simple man.

Mr. Park did not know the captain's specific activities in the days before the accident. The captain usually spent his days off duty with his family, and enjoyed activities such as picnics. The captain ate his meals with his family in the days before the accident, and nobody in the family reported being sick from the food.

The captain wanted to be a pilot when he was young. He was one of 9 children, and the only one to enter aviation (although a sister married a pilot). He was admitted to the Korean Air Force school, was an excellent student, and flew jets in the Korean military prior to his employment with Korean Air. He did not have any previous aviation accidents. He was supposed to become a flight instructor with the company. Several times, he received safety recognition. The captain often flew at night, including long trips to Europe. He never complained about anything involved in flying. He kept aviation study materials at home.

The captain was very healthy and there had been no changes in his health in the past 12 months. He hiked in the mountains and always took care of himself. He did not wear corrective lenses. He drank alcohol, but never more than 2 or 3 drinks. He did not smoke tobacco, and did not take prescription medicine.

Mr. Park, Yung-Kil
Brother of the Captain

On August 9, 1997, the Human Performance investigator had a second interview with Mr. Park at the Pacific Star Hotel, Guam. Questions were asked in English and answered in Korean, with Mr. Han Char Ki, of the Korean Senior Youth Association, Guam, serving as the interpreter. To assist the NTSB, Mr. Park had telephoned the wife of the captain to obtain further information concerning the captain's activities before the accident. Based on his conversation with Mrs. Park, he provided the following information:

When he was off duty, the captain normally went to bed between 2200-2300, and awoke between 0600-0630. On Friday, August 1, the captain was off duty. He went to bed between 2200-2300. On Saturday, August 2, he awoke between 0600-0630 . He flew a trip to Cheju Island and returned home about 1700. He went to bed between 2200-2300. On Sunday, August 3, he awoke between 0600-0630. He flew a trip to Hong Kong and overnighted there. On Monday, August 4, he returned home around noon. He followed routine activities

around the house, including reading the newspaper and watching television, and went to bed at his normal time. On Tuesday, August 5, he awoke at 0600. He went to the gym for 1 hour, then returned home and ate breakfast. He studied the flight schedule for his upcoming trip to Guam. He took a nap from 1100 to 1340, then arose and ate lunch. It consisted of vegetables, his usual lunch. He departed for the airport, a 20 minute drive, at 1500. The flight was scheduled at 2000, but he left home early, his usual practice, to allow time to prepare for the flight.

Mr. Song, Seung-Ho
Brother of the First Officer

On August 8, 1997, the Human Performance investigator interviewed Mr. Song at the Pacific Star Hotel, Guam. Questions were asked in English and answered in Korean, with Mr. Han Char Ki, of the Korean Senior Youth Association, Guam, serving as the interpreter. Mr. Song provided the following information:

Mr. Song's last spoke with his brother, First Officer Song, in a telephone conversation on Tuesday, July 29. The first officer was the oldest of 5 brothers and, as the eldest son, was responsible to take care of the parents. He missed visiting them at the last holiday because of his work, and he asked Mr. Song to take good care of the parents in his absence.

The first officer spoke by telephone with his mother about 1700 on Tuesday, August 5. It was a brief call. He had not expected to fly to Guam, but, since he would receive time off duty after the trip, indicated that he would visit the mother and brother in the countryside. The first officer lived in Seoul. It was a normal call, and everything seemed routine.

Many people travel between Korean and Guam now which is a common vacation time, so there was a change of schedule to send a larger airplane on the flight to Guam. The first officer learned of this change about 2 days before the trip, or at least was advised then that this trip was possible. The first officer had flown to Guam many times before.

The first officer lived alone and Mr. Song did not know the specifics of his activities before the accident. The first officer married in 1981, and was the father of two teenage sons. Since March, 1997, the wife and sons lived in New Zealand to further the education of the boys. The first officer visited them in New Zealand and did not mind living alone. He enjoyed outdoor sports and attended church on Sunday.

The first officer was the only member of the family to enter aviation. He dreamed of flying when he was a boy, and he passed a competitive test to enter the Air Force flying school. He really enjoyed flying. As an Air Force pilot, in 1984, he received a Presidential Award for escorting a defecting pilot from North Korea to a landing. The first officer was doing a training flight when the pilot entered South Korean airspace in a MIG airplane and announced his intentions to defect. Within Korean Air, the first officer sometimes taught pilot classes and was recognized. The first officer did not have previous aviation accidents or emergencies.

The first officer's financial situation was very good, and there had been no major changes in it in the past 12 months. There had been no major changes in his personal life during this period other than his wife and children moving to New Zealand. He always had energy to fly demanding flight schedules and always was ready for any trip.

Mrs. Nam, Pae-Malhee
Wife of the Flight Engineer

Mr. Nam, Gun-Woo
Son of the Flight Engineer

Mr. Ko, Sung-Yong
Friend of the Flight Engineer

On August 8, 1997, the Human Performance investigator interviewed Mrs. Nam at the Pacific Star Hotel, Guam. Mr. Nam and Mr. Ko were present and also contributed information. Questions were asked in English and answered in Korean, with Mr. Han Char Ki, of the Korean Senior Youth Association, Guam, serving as the interpreter. Mrs. Nam provided the following information:

Mrs. Nam's last contact with her husband was on Tuesday morning, August 5, around 0900-0930, when he departed the house for his upcoming trip. He said he would be home about 0900 the next day, and Mrs. Nam thought he might be returning from Guam as a passenger. Nothing was unusual; his mood was normal.

On Sunday, August 3, the flight engineer returned in the morning from a trip to New York and Alaska. He stayed at home doing routine activities. He was off duty on Monday and did routine activities at home. She thinks that he had flown to Guam before, but was not sure. He had been flying the A-300 for 10 years, so he probably flew into Guam many times. [No further information could be obtained regarding the activities or sleeping history of the flight engineer before the accident.]

Mr. Nam is in the military and does not live at home. He last talked with his father by telephone on Wednesday evening, July 30, and the father advised him to take care of himself in the Army. The father was doing well.

Mr. Ko, who is a flightcrew member with Korean Air, last saw the flight engineer at the company two days before the accident around 0900. The flight engineer was happy and smiling. He had just returned from Moscow, and was going to Cheongju Island.

The flight engineer married in 1970 and was the father of 3 children. According to Mr. Ko, he graduated from the pilot academy in 1963 and received military training as a pilot but did not succeed in the program. He became an air traffic controller and then, in 1965, received navigator training from the United States Air Force. He flew combat missions in the Vietnam war as a navigator for the Korean military. Following this, he began employment with Korean Air. He was not a pilot. He had not experienced any previous aviation accidents or emergencies. About 3 years ago, he received recognition from the company. Mr. Ko thought

that the accident trip was the first time he flew with Captain Park and First Officer Song. He trained as a B-747 flight engineer two years ago, but only begin flying this position in the past several months.

According to Mrs. Nam, the financial situation of the flight engineer was stable. His financial and personal situations had not changed in the past 12 months. His health was very good and had not changed in the past 12 months. He was slim and light but strong, very healthy. He was very industrious, a golf player, and took good care of himself. He liked things to be done perfectly, and never had any small mistakes.

3. ACCIDENT CREWMEMBER'S FLIGHT SCHEDULES

The accident crewmembers flight schedules for June, July, and August 1997, are included in the attachments.

I. KOREAN AIR PROCEDURES

1. SELF BRIEFING

The Korean Air Operations Manual (page 4-36) states that crewmembers are required to show up at the Dispatch Center or any other place designated, 1 hour 30 minutes prior to scheduled departure time for international flights. However, a company spokesperson said that pilots are required to arrive 2 hours prior to their trip.

Company procedures at the time of the accident directed flight crewmembers to receive their trip paperwork at the Dispatch Center then gather as a group at one of the tables in the self briefing area to study the paperwork. This was referred to as the self-brief phase of preflight operations.

Approximately 15 minutes was allocated for this phase since the supervisor-brief was scheduled to begin 1 hour 45 minutes before departure time.

2. SUPERVISOR OF FLYING BRIEFING

The supervisor of flying system is a program which had been in place at Korean Air approximately one year prior to the accident. Korean Air officials described the supervisors of flying as retired captains and instructors who had been among the most experienced pilots and who had no previous record of disciplinary action. After crewmembers review their flight paperwork during the self-brief phase of preflight preparations they report as a group to the assigned supervisor of flying 1 hour and 45 minutes prior to scheduled departure time.

A company spokesperson said that the function of supervisors of flying is to insure that pilots have reviewed all materials for the trip including the NOTAMS. Supervisors of flying also

periodically spot check Jeppesen and other required manuals including the revision dates. They also spot check licenses, ratings, passports and identification badges.

15 minutes was allocated for the supervisor-brief but, it averaged about 10 minutes. The company spokesperson also stated that crews did not like the supervisor-brief at first because they considered it a cumbersome procedure, but by the time of the accident they had accepted it.

3. FULL CREW BRIEFING

Following the supervisor-brief, the pilots went to the flight attendant area to meet with the cabin crew. The captain provided a briefing to the entire crew which lasted approximately 5 minutes. After the full crew briefing the entire crew boarded company buses for the ride to the airplane.

4. AUDIO VISUAL AIRPORT FAMILIARIZATION

Since June 1, 1997, Korean Air had incorporated an audio-visual presentation for airport familiarization. The program was purchased from Japan Airlines and was used to satisfy pilot requirements for operations into designated special airports.

Guam International was not classified as a designated special airport and viewing the Guam video was not required. However, a Korean Air spokesperson said it was recommended to pilots that they view the video if they had not been into Guam within the preceding 3 months.

The audio visual system was available for pilots to view on their own, 6 days a week. It was not available for viewing on Sunday. After viewing the audio-visual presentation, pilots recorded their name and other pertinent data on a sign-in sheet in the audio-visual room.

Company records indicate that Captain Park, Y.C. viewed the Guam audio-visual presentation on July 4, 1997. First Officer Song, K.H. viewed the Guam audio visual presentation on July 8, 1997.

The script narration for the Guam audio-visual airport familiarization is included in the attachments.

The accident captain had last flown into PGUM on July 4, 1997, which was the same trip sequence as the accident flight. The first officer from the July 4, 1997, flight stated the accident captain telephoned him the day before and asked him to report to the Dispatch Center earlier than normal in order to get a familiarization briefing for PGUM. The first officer said he met the captain approximately 1 hour prior to the normal check-in time and watched the PGUM audio-visual presentation and received a unfamiliar airport briefing.

The first officer who flew with the accident captain on July 4, 1997, said the accident captain reminded him that the Nimitz VOR was located in a mountainous area which called for

care. He said the accident captain used the term "black hole" which was a term the first officer was not familiar with.

5. BRIEFING OF UNFAMILIAR AIRPORT

The Korean Air Operations Manual stated unfamiliar airport briefings should be implemented for unscheduled or charter operations to unfamiliar airports. The Operations Manual indicated that that unfamiliar airports refers to an airport to which Korean Air had no experience of flight operations within one year.

The Operations Manual recommended that a MOCT-commissioned Checker Captain be included on the crew being dispatched to an unfamiliar airport. If the MOCT-commissioned Checker Captain was not available then the pilot-in-command should have at least one of the following:

- 1500 flight hours as PIC on the aircraft type.
- 1000 flight hours as PIC on the aircraft type and certified as a flight instructor on the aircraft type.
- 1000 flight hours including 500 or more as PIC on the aircraft type and experience of one round trip to concerned airport within last 6 months and obtained approval of Team manager of Flight Crew Evaluation and Analysis Team.

In addition, the Operations Manual recommends that if a captain has not flown the type of airplane to the unfamiliar airport within the preceding year, the crew shall be briefed by the Team manager of the Flight Operations Standards Team.

J. LOCAL CONDITIONS - GUAM AREA

1. GENERAL

Members of the operations group interviewed the crew of a B-747 which preceded Korean Air 801 to Guam. Members of the operations group also interviewed the crew of a B-727 which landed at Guam International just after the accident. Other pilots based on the island of Guam were also interviewed[15].

The airline pilots interviewed agreed that runway 6L is the preferred runway. None could recall ever landing in the opposite direction on runway 24. In visual conditions the B-747 and B-727 pilots stated that it was standard procedure to turn base leg inside Nimitz Hill when landing on runway 6L.

The pilots agreed that most approaches into Guam were made in visual conditions and a check airman stated that there is a tendency for crewmembers to press on, hoping to regain

[15] Interview summaries included in attachments.

visual contact once it is lost. A training check-airman stated his biggest worry about crews flying into Guam was complacency.

The pilots all stated that rain showers throughout the area are very common. Generally they are small, very localized and usually isolated. It is not unusual for pilots to fly in and out of clouds while maneuvering and losing ground or airport contact for only short periods of time. The Continental Air Micronesia chief pilot stated that a person unfamiliar with the airport making the descent may have a sense of complacency if he had the field in sight.

A check-airman stated that there are usually build-ups in the vicinity of Guam as is typical in the South Pacific. He said the trade winds tend to move the weather toward Nimitz Hill. The Continental Air Micronesia Chief Pilot/Guam Operations said in his experience he has run into a lot of "heavy weather" over the VOR[16]. He also stated that an approach to runway 6L without a glide slope had to be well briefed and the pilots had to pay close attention to the approach to make it successful

A Continental Air Micronesia check-airman said he briefs crews that it is possible to get a GPWS[17] warning on approach over Nimitz Hill if the airplane is not in the landing configuration. He also stated that in his experience the DME[18] associated with Nimitz VOR is never intermittent or unreliable. It has always worked normally or has not worked at all.

2. WITNESS OBSERVATIONS

(a.) CONTINENTAL AIR MICRONESIA

A Continental Air Micronesia B-747 arrived at Guam from over PAYEE intersection, 240 nautical miles north of the Nimitz VOR. They were approximately 30 minutes ahead of Korean Air 801. A synopsis of their observations regarding their arrival at Guam are as follow[19]:

- Visibility was excellent from Payee intersection. There were scattered thunderstorms between Payee and the Nimitz VOR. There was "weather" over the Tumon area but no convective activity and no lightning.

- Their weather radar indicated "weather" over the Nimitz VOR.

- They saw there was rain over the Nimitz VOR but not from the VOR to the airport. However, after landing and taxiing to the gate it began raining and by the time the crew was getting on the crew bus there was "moderate rain" at the field.

- At 2,600' (Qnh)[20] visibility was not so good because of clouds and rain showers. Below 2,600' the visibility improved and at 2,000' they could see all the way to the airport.

[16] VHF Omni Range (VOR).
[17] Ground Proximity Warning System (GPWS)
[18] Distance Measuring Equipment (DME)
[19] Witness interview summaries included in attachments.

- The ride was smooth with no turbulence.

- The ATIS mentioned the glide slope was not functioning although they could not remember the exact terminology.

- They did not recall ATC commenting that the glide slope was inoperative during their communications.
- They stated that the glide slope was "flagged off" on their instruments.

- The DME operated normally.

- They made a visual approach and turned final inside the VOR.

(b.) RYAN INTERNATIONAL

A Ryan International B-727 arrived at Guam from Truk Island. Their flight path was from the southeast and they arrived in the vicinity of Nimitz VOR approximately 15 minutes after the accident. A synopsis of their observations regarding their arrival at Guam are as follows[21]:

- Visibility was good enough from the southeast to see the lights of Guam from approximately 150 - 250 miles away.

- The radar indicated some clouds northeast and southeast of Guam.

- Approximately 100 - 125 miles out the first officer saw a red glow illuminate the clouds surrounding Guam then die out.

- The DME was operating at the time the crew saw the red flash illuminate the clouds approximately 100-125 miles from the VOR. The last time they noticed the DME operating was when they were approximately 25 miles from the VOR.

- The ATIS mentioned the glideslope was inoperable.

- They recall ATC advised another crew the glideslope was inoperable but, were not certain which crew was being advised.

- ATC did not advise the Ryan crew that the glideslope was inoperable until they were vectored inbound on final approach.

- They did not ever recall ATC advising flight crews of high terrain on the approach path.

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[20] Current Barometric Pressure (QNH)
[21] Witness interview summaries included in attachments.

- During past flights they recalled occasionally getting GPWS[22] alerts while making visual approaches over Nimitz Hill.

- 100 miles from Guam it became more difficult to see the island because of clouds at a lower altitude.

- The radar indicated some clouds over the shoreline and some lightning flashes 50-80 miles from the island.

- Southwest of the airport, while being vectored at 2,600 feet, they were in and out of the clouds and It was difficult to keep the runway in sight without descending below 2,600 feet. They were in the rain but, they never encountered heavy rain.

- During the vectors they encountered light rain but could sometimes see the airport through the rain showers.

- In the vicinity of the VOR they were mostly in the clouds. However, over the crash site they were not in the clouds and had ground contact.

- They stated that the Nimitz Hill area is a "black hole" and sometimes at night it is difficult to distinguish the hill from clouds if any clouds are in the area. They said that if it is raining or clouds are in the area it would be almost impossible to spot the hill or tell the hill from the clouds.

- The VASI[23] would keep the flight path clear of the hill if the VASI was visible.

- The captain said in the past he noticed the runway 6L glideslope and localizer had a slight dip and bend.

- The captain said that he recalled the Guam 6L glideslope had previously been out of service at least once.

K. TRAINING

1. PILOT RECRUITMENT

According to company management personnel pilot recruitment historically was from the Korean military. However, as the airline grew the supply of available Korean military pilots could not keep up with the demand for a rapidly expanding pilot force. In 1989 an *ab-initio*[24] program was begun at Korean Air to train pilot candidates from "zero time". At the time of the

[22] Ground Proximity Warning System (GPWS).
[23] Visual Approach Slope Indicator (VASI).
[24] ab-initio - Literally: From the Beginning. A company program to select candidates who may have no prior flight experience and to train them from zero flight time.

accident 389 pilots had been trained under the *ab-initio* program. According to a company spokesman, the *ab-initio* pilots were first assigned to the smaller airplanes flying domestic routes. As they gained experience they were upgraded to the larger equipment flying international routes. Korean Air estimated that the first of the *ab-initio* pilots who began training in 1989 would be evaluated for possible upgrade to captain during 1998.

Korean Air also recruited non-Korean national pilots to supplement the pilot force. At the time of the accident there were 167 foreign pilots employed by Korean Air. There were a multitude of nationalities represented, but the majority of the foreign pilots working for Korean Air were from the United States and Canada. Foreign pilots were hired through several crew leasing companies and their employment was subject to the terms of a renewable contract.

2. GROUND SCHOOL AND FLIGHT TRAINING FACILITIES

Korean Air conducted *ab-initio* training at the Sierra Academy of Aeronautics, Livermore California.

Ground instruction was conducted at the Korean Air Flight Crew Training Center in Seoul, Korean while the simulator flight training was conducted at the Korean Air flight training facility in Inchon, Korea.

Boeing 747 airplanes were divided into two classifications. The Boeing B-747-100, B-747-200 and the B-747-300 were classified as "Classics." The Boeing B-747-400 was a separate category. Boeing B-747 pilots were classified as either "Classic" or "B-747-400" pilots. A "Classic" pilot flew all three "Classic" B-747s. Although there was no company policy of dual qualification, a company spokesman indicated that occasionally pilots were dual qualified on the Falcon Jet only. At the time of the accident Korean Air did not dual qualify B-747 pilots.

The simulator utilized by the B-747 "Classic" pilots was a B-747-200 simulator located at the flight training facility at Inchon, Korea. It utilized instrumentation and software for JT9D engines and the flight directors had "Command Bar" type presentations. The B-747-200 simulator is Level "C" with a Vital-IV 4W/3CH visual system.

3. CREW RESOURCE MANAGEMENT (CRM)

CRM training was instituted at Korean Air in December, 1986 as a result of the Korean Air flight 007 shootdown. The CRM program was purchased from United Air Lines and used as a model.

The four day CRM program is given only to pilots. CRM training was held in a campus-like setting approximately 1 hour by automobile from Seoul. The size of the class was limited to 18-24 pilots at a time.

Prior to attending the CRM program, pilots would be given manuals to study and when they arrived at the CRM location they were given additional materials.

According to the Korean Air Director of Academic Training, the purpose of the CRM program is to help pilots identify and improve their own behavior and attitude. The course emphasizes conflict and dilemma resolution. During the course, pilots are given problems and conflicts to resolve.

The Director stated the CRM course also emphasizes "advocacy." Advocacy teaches the first officers and flight engineers to intervene when necessary. At first there were some "cultural" difficulties with the curriculum and there were also difficulties teaching the first officer and flight engineer to intervene. The Director stated that those difficulties were not as prevalent as when the program first began. He said that advocacy is no longer a problem at Korean Air.

The Director also stated that captains are taught to encourage advocacy. He said most captain and first officer briefings contain a mention of advocacy and that the other crewmembers should feel free to intervene when necessary.

The Director said that there were no annual CRM recurrent classroom sessions. However, pilots were evaluated on CRM during route checks and during proficiency check rides. A pilot is given a CRM LOFT[25] simulator training period once a year. The CRM LOFT period lasts approximately 1 ½ hours and CRM principles are evaluated as crewmembers cope with various abnormalities during a simulated flight.

The initial four day CRM program was not graded, so there were no grading or pilot evaluation records from that program.

4. ENGLISH LANGUAGE COMPETENCY

The Director of Academic Training stated that Korean Air has English language training. English language training emphasizes English as used in aviation. The course is 120 hours of classroom study conducted by a teacher whose native language is English, usually an American. Pilots receive an additional 25-30 hours of ATC English.

In a letter signed by the General manager of the Korean Air Foreign Language Testing Team[26], pilots were required to pass a Level 3 Pilot English Test. The test evaluated written, listening and speaking competency in English. A minimum passing score of 80% was required and failure in any portion of the test resulted in the pilot being retrained and re-tested.

The above mentioned letter also stated that the accident captain, first officer, and flight engineer all passed the Level 3 Pilot English Test.

[25] Line Oriented Flight Training (LOFT)
[26] Copy of letter included in attachments.

5. BASIC AND ADVANCED COURSE IN INSTRUMENT FLYING

The Basic and Advanced Course in Instrument Flying is given to pilots prior to their Initial training on the airplane type concerned. The captain was initially trained on the Boeing B-727 and the first officer was initially trained on the B-747. As a result, they received the Basic and Advanced Course in Instrument Flying on those respective airplanes.

The Basic Course consisted of eight simulator periods two hours long while the Advanced Course consisted of ten simulator periods of two hours each.

The Basic Course modules included basic instrument procedures including airwork, instrument departures, instrument arrivals, and instrument approaches.

The Advanced Course modules expanded on the procedures of the Basic Course and added additional procedures including: avionics operation, SIDs[27], noise abatement procedures, STARs[28], and engine(s) out procedures.

6. FLIGHT CREW TRAINING CURICULLUM

The captain and flight engineer were trained on the B-747 under the Transition Training curriculum. The first officer was trained under the Initial Training curriculum.

The Initial and Transition flight crew training curriculum[29] for the Boeing B-747 consisted of five phases.

1. Ground School
2. Cockpit Procedures Training (CPT)
3. Simulator Flight Training
4. Airplane Local Training
5. Route Training

(a.) GROUND SCHOOL

The *B-747 Initial* ground school curriculum included general systems, normal procedures, abnormal & emergency procedures, weight & balance, performance, limitations, differences, Category II, review, and a test. 177:00 hours was allocated for the B-747 Initial ground school curriculum both for pilots and flight engineers

The *B-747 Transition* ground school curriculum included general systems, normal procedures, abnormal & emergency procedures, weight & balance, performance, limitations, differences, Category II, review, and a test. 153:00 hours was allocated for the B-747 Transition ground school curriculum both for captains and first officers with type ratings on other air-

[27] Standard Instrument Departure (SID)
[28] Standard Terminal Arrival (STAR)
[29] Outline of B-747 Initial and Transition included in attachments.

planes. The course curriculum comprised 157:00 for flight engineers who had qualified on other airplanes.

(b.) COCKPIT PROCEDURES TRAINING (CPT)

The Initial training syllabus for the CPT was 28:00 hours for pilots and flight engineers. During Transition training the CPT syllabus was 24:00 for pilots and flight engineers.

(c.) SIMULATOR FLIGHT TRAINING

24:00 hours was allocated for the simulator phase of Initial training for both pilots and flight engineers. During Transition training 20:00 - 24:00 hours was allocated for the simulator phase.

The simulator profiles listed approach modules used in flight training. The following were the approach modules listed in the Simulator Training Syllabus of the Korean Air Training Guide for captains. The first officer syllabus was similar to the captain's. The only difference was the first officer would make ILS approaches instead of 2 engine inoperative approaches.

Profile 1

Approach	Runway	Weather	Wind	Malfunction	Remarks
ILS	Kimpo 14	CAVOK[30]	150/10	none	Autoland
ILS	Kimpo 14	CAVOK	150/10	none	

Profile 2

Approach	Runway	Weather	Wind	Malfunction	Remarks
ILS	Kimpo 14	CAVOK	140/10	none	Manual CAT 1
VOR	Kimpo 32	CAVOK	320/10	FR & GB open	Miss at 200'
ILS	Kimpo 14	CAVOK	140/10	Yaw Damper	land

Profile 3

Approach	Runway	Weather	Wind	Malfunction	Remarks
VOR/DME	Kimpo 32	CAVOK	230/05	Config, warning	Land
ILS	Kimpo 14	CAVOK	230/05	Min. fuel	min. fuel G.A.
ILS	Kimpo 14	CAVOK	230/05	Raw Data	land

Profile 4

Approach	Runway	Weather	Wind	Malfunction	Remarks
NDB	Cheju 06	1,000/5,000m	330/10	Config. Warning	land
ILS	Kimpo 14	100/1mi	330/10	probe heat	windshear miss
ILS	Kimpo 14	200/1mi	330/10		land

[30] Ceiling and Visibility OK (CAVOK)

Profile 5

Approach	Runway	Weather	Wind	Malfunction	Remarks
ILS	Kimpo 14	800/3mi	140/10	2 hyd. Syst. Inop	land
ILS	Kimpo 14	300/1mi	230/10	I eng. Inop	land
ILS	Kimpo 14	300/1mi	230/10	Raw Data	land

Profile 6

Approach	Runway	Weather	Wind	Malfunction	Remarks
ILS	Kimpo 14	Clear	140/10	LE Flap(s)	wet runway land
ILS	Kimpo 14	Clear	140/10	Stabilizer	land
LOC	Kimpo 14	460/1200m	230/10	1 eng. Inop - auto-spoiler inop	land

Profile 7

Approach	Runway	Weather	Wind	Malfunction	Remarks
VOR	Kimpo 32	100/1/2mi	050/10	wing gear	missed appch.
ILS	Kimpo 14	100/R350	140/15	wing gear	CAT II - coupled
ILS	Kimpo 14	200/1mi	230/15	1 eng. Inop	rejected landing
ILS	Kimpo 14	Clear	140/10	2 eng. Inop	land

Profile 8

Approach	Runway	Weather	Wind	Malfunction	Remarks
ILS	Kimpo 14	300/1mi	050/30	TE flap asymm.	Land
NDB	unkn. 36	1000/5000m	090/15	1 eng. Inop	land
ILS	Kimpo 14	100/1/2mi	050/15	Raw Data	missed appch.
ILS	Kimpo 14	300/1mi	050/15	Raw Data	land

Profile 9

Approach	Runway	Weather	Wind	Malfunction	Remarks
VOR/DME	Kimpo 32	800/3mi	230/15	none	windshear - land
ILS	Kimpo 14	00/00	230/15	1 eng. Inop.	Missed appch.
ILS	Kimpo 14	Clear	140/10	2 eng. Inop	land

Profile 10

Approach	Runway	Weather	Wind	Malfunction	Remarks
VOR/DME	Kimpo 32	800/3mi	230/30	none	rejected landing
ILS	Kimpo 14	300/1mi	230/15	Raw Data	land
ILS	Kimpo 14	1500/3mi	140/10	2 eng. Inop.	land

Profile 11

Approach	Runway	Weather	Wind	Malfunction	Remarks
VOR/DME	Kimpo 32L	100/R350	230/15	none	missed appch.
ILS	Kimpo 14R	not depicted	230/15	Raw Data	land
ILS	Kimpo 14R	100/R350	230/15	1 eng. Inop.	missed appch.
ILS	Kimpo 14R	100/R500	230/15	manual L/D	land
ILS	Kimpo 14L	not depicted	140/10	2 eng. Inop.	land

The B-747-200 Simulator Training Guide (For Instructor)[31] describes procedures for the various approaches used in the training syllabus. The only non-precision approach described in the Training Guide is the VOR/DME approach to runway 32R at Kimpo Airport.

L. KOREAN AIR APPROACH PROCEDURES

1. CHECKLIST USAGE

The Korean Air checklist philosophy is described in the B-747 Guidebook which stated: "The normal procedures are the recommended actions necessary to operate the airplane for each phase of flight. They enable the flight crew to more readily memorize the required items, ensure that all necessary actions have been taken, and minimize the time required.

Normal procedures for each phase of flight are performed by recall, and the normal checklist is used to ascertain that all the safety items have been accomplished. Each response to the checklist challenge should be preceded by the verification of the present configurations, and the crewmembers should check for conformation. If any disagreements have been found between present configuration and checklist response, corrective actions should be taken first before any further checklist challenge."

The B-747 Guidebook stated that the descent checklist will be performed while descending through 20,000 ft. ~ 18,000 ft. (1,000 ft. above Transition level in North America.)

The Approach Checklist will be performed following speed reduction to 250 kts. Descending through 10,000 ft. with inboard landing lights on.

The Landing Checklist will be performed with landing configuration completed, (landing flaps set).

2. LANDING BRIEFING

The Landing Briefing card stated that the landing briefing should be completed prior to arrival over the Top of Descent (TOD).[32]

3. DESCENT AND APPROACH PROCEDURES

The B-747 Guide Book stated the following pertinent procedures (in part) regarding descent and approach procedures:

- Preparation for enroute descent:
  - Check NOTAMS and weather

[31] Included in attachments
[32] Included in attachments.

- Perform landing briefing.
  Review terminal charts, check them for proper revision.

M. AIRPORT INFORMATION[33]

The following data was correct regarding Guam International Airport (PGUM) on August 6, 1997:

The airport had two parallel runways oriented northeast/southwest.

1. **LOCATION:** 3 miles NE of Agana, Guam, Mariana Islands
   Lat./Long.: N13° 28.9' E144° 47.6'
   Elevation: 297 feet MSL[34] / 90.5 meters (surveyed)
   Magnetic Variation: 02E

2. **AIRPORT OVERVIEW:** Guam International Airport was owned by the United States Navy and operated under lease by A. B. Won Pat Guam International Airport Authority. The airport is located on the west central coast of the island of Guam. Obstructions rise to 785 feet MSL within 2 nm northeast, 807 feet MSL and 1,035 feet MSL both within 3 nm east, 803 feet MSL within 5 nm southwest and 1,532 feet MSL within 11 nm southwest.

3. **GUAM WEATHER OVERVIEW:** Guam's climate is influenced by its location near N13° latitude. Weather patterns are typical of a tropical island and are quite uniform throughout the year. The most significant variation in weather is the amount of precipitation. Guam averages 247 days a year with measurable amounts of rain. The sky is rarely clear. Most days begin with a scattered layer becoming broken to overcast by afternoon. However, VFR conditions prevail approximately 80% of the time year round. The rainy season lasts from July through November when precipitation averages 24 days per month. Typhoons and tropical storms are most common during this period, but they can occur at any time during the year. Average monthly rainfall averages 11.7 inches of rain with September being the wettest month with an average of 13.3 inches rainfall. IFR conditions occur approximately 13% of the time during the afternoon hours from August through October. The prevailing winds during the rainy season are from the east averaging 9 knots.

4. **AIRPORT OPERATIONS:**
   Control Tower: Contract - Full time
   ARTCC[35]: Honolulu Center
   FSS[36]: Honolulu Flight Service Station (long distance phone call)
   NOTAMs Facility: PGUM (NOTAM-D service available)
   Certification: Full FAR Part 139 certification.

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[33] Airport diagram included in attachments.
[34] Mean Sea level (MSL)
[35] Air Route Traffic Control Center (ARTCC)
[36] Flight Service Station (FSS)

Int'l Operations: Customs landing rights airport.
Last FAA Inspection: February 6, 1997 (FAA Airports Field Personnel)

5. AIRPORT COMMUNICATIONS:

ATIS:	119.0
Guam Approach:	119.8
Agana Tower:	118.1, 340.2, 126.2, 360.2
Agana Ground:	121.9, 336.4
Guam Departure:	119.8
Clearance Delivery:	121.9
Emergency:	121.5, 243.0

6. NAVIGATIONAL AIDS TO AIRPORT:

NIMITZ VORTAC[37] (UNZ)-115.30 063° Radial/ 4.0 nm
MT. MACAJNA NDB[38] (AJA)-385 060 Mag. Hdg../ 3.9 nm

7. RUNWAY 6L/24R: 6L/24R was the longest runway, 10,015 feet long and 150 feet wide. The surface was grooved asphalt/concrete and was classified in "good condition." The runway had high intensity runway edge lights. Runway 6L was the primary landing runway and the runway with the lowest approach minimums.

Runway 6R was closed to B-747 takeoffs and landings. (See NOTAMS)

Runway 6L had precision instrument markings, but at the time of the accident the markings condition were classed as "fair". Runway 6L had a medium intensity approach lighting system with runway alignment indicator lights (MALSR). The runway did not have runway end identifier lights (REILS), centerline lights or touchdown zone lights.

Runway 6L had a 4 box VASI[39] located on the left side of the runway. The VASI was calibrated for a 3.00° visual glide path angle.

The touchdown elevation of 6L was 256 feet which rose to 297 feet at the far end of the runway (.41% slope).

Instrument approaches that were available to runway 6L were:
ILS Category I
LOC (GS out)
VOR/DME
VOR

[37] VHF Omni Range with TACAN, distance measuring equipment. (VORTAC)
[38] Non-directional Beacon (NDB)
[39] Visual Approach Slope Indicator (VASI).

8. NOTAM INFORMATION - GUAM INTERNATIONAL AIRPORT:

The trip paperwork provided to the accident crew by Korean Air Dispatch contained the following NOTAM information:

AO112/97 WIE-9708080400 2200/0400 MON-FRI
RWY06L/24R CLSD,
Series A NOTAM, #112 of 1997 Effective immediately thru 1400(Lcl.) August 8, 1997 from 0800 to 1400, runway 6L/24R closed

AO109/97 9707250055-UFN
FREQ 279.5 U/S
Series A NOTAM, #109 of 1997, from 1055, July 7, 1997 until further notice, frequency 279.5 is unusable.

A0086/97 9707072200-9709120900
RWY06L G/P U/S
Series A NOTAM, #086 of 1997, from 0800, July 7, 1997 until 1900, September 12, 1997, runway 6L glidepath is unusable

A0078/97 WIE-UFN
UNLIGHTED ANTENNA 5 S PGUM 312FT AGL
Series A NOTAM, #078 of 1997, effective immediately until further notice, there is an unlighted antenna 5 miles south of PGUM 312 feet above ground level.

A0087/95 WIE-UFN
RWY06R CLSD FOR B747 LANDING AND TKOF ONLY
ALL OTHRS REMAIN THE SAME
Series A NOTAM, #087 of 1997, effective immediately until further notice, runway 6R closed for B-747 landing and takeoff only, all others remain the same.

9. AIRPORT RESCUE AND FIRE FIGHTING (ARFF):

Under Title 14 CFR Part 139 Guam International Airport (PGUM) was classified Airport Index D according to the Indices and Aircraft Rescue and Fire Fighting (ARFF) requirements.

N. AIRPLANE INFORMATION

Boeing-747 airplanes were used by Korean Air since 1974.

B-747-300 (3B5B), serial number 22487 was purchased new from the Boeing Commercial Airplane Company. The airplane order was placed on April 10, 1979. The new airplane was rolled out on November 14, 1984 and had the registration number HL7468. The first flight was

made on December 3, 1984 and Korean Air took delivery of B-747 HL7468 on December 12, 1984. HL7468 was equipped with JT9D - 7R4G2 engines.

On August 5, 1997 the Korean Air fleet included 20 B-747 "Classic" airplanes. The "Classic" fleet consisted of the following B-747 types:

Model	Number in fleet
B-747-200	15
B-747-300	3
B-747-SP	2

Of the 128 captains assigned to the "Classic" 69 were foreign nationals.

1. WEIGHT & BALANCE

The planned weight & balance form signed by the accident captain and the dispatcher indicated the following data:

Airplane dry operating weight:	172,870 kg.	
Planned passenger weight/incl. cabin baggage:	17,694 kg.	(237 passengers)
Planned cargo load in compartments:	7,333 kg.	
Planned zero fuel weight:	197,897 kg	Max. 242,630 kg.
Planned departure fuel:	51,847 kg.	
Planned trip fuel:	36,923 kg.	
Estimated landing weight:	212,821 kg.	Max. 265,306 kg.
Planned zero fuel weight C.G.:	24.2%	
Planned takeoff weight C.G.:	24.0%	
Planned takeoff stabilizer trim setting:	4.4 units	

O. COMPANY HISTORY

Korean Air's company history began in 1948 when Korean National Airlines (KNA) a government owned company initiated service from Seoul to Pusan. On March 1, 1969 the Hanjin Group took over Korean National Airlines and began privatized operations and was re-christened Korean Airlines.

On August 5, 1997 the Korean Air Fleet consisted of the following airplanes:

20	Boeing B-747 "Classic"
26	Boeing B-747-400
5	McDonnell Douglas MD-11
10	Airbus Industrie A-300
25	Airbus Industrie A-300-600
2	Boeing B-777
2	Airbus Industrie A-330
14	McDonnell Douglas MD-82
12	Fokker F-100

The company projected a growth to 175 airplanes by the year 2005. The Deputy Director of Flight Operations stated that most employees are positive about the company.

At the time of the accident the Republic of Korea was experiencing an economic recession. The Deputy Director of Flight Operations stated that 1995 was "a good year" but "the last two years were in the red." He said he did not know the financial condition of the company but, he was able to convince management to allocate additional funds to implement safety programs.

He said it was difficult to obtain qualified pilots. As a result, Korean Air initiated ab-initio training and also began recruiting foreign pilots.

In addition to their domestic route structure Korean Air routes extended to North America, Europe, The Middle East, Southeast Asia, China, Australia, and Japan.

P. ADDITIONAL INFORMATION

In the cockpit area of the accident wreckage investigators found an approximately 8½ X 11 inch clear plastic sleeve containing Jeppesen approach plates for Guam International Airport[40]. The approach plates contained in the plastic sleeve were:

11-1	(19 Jan 96)	ILS Rwy 6l
13-1	(19 Jan 96)	VOR Rwy 6L
13-2	(19 Jan 96)	VOR DME Rwy 6L
16-1	(19 Jan 96)	NDB Rwy 6L[41]
16-2	(19 Jan 96)	NDB DME Rwy 24R

Charts 11-1 and 13-2 were side by side visible through one face of the plastic sleeve and 16-1 and the blank side of an approach plate were visible through the other. Chart 11-1 had the following items highlighted with a green fluorescent tint:

Plan View:

In the ILS facilities box: 063° (inbound magnetic course), 110.3 (ILS freq.), IGUM (identifier).

FLAKE (initial approach fix).

In the VOR facilities box: 115.3 (NIMITZ VOR freq.), UNZ (identifier).

Profile View:

2500' (MSL altitude crossing FLAKE).

1900' (MSL altitude crossing the outer marker).

256' (TDZE touchdown zone elevation - Rwy 6L)

[40] Copies of these approach plates included in attachments.

[41] Deleted with August 2, 1996 re-issue.

Approach plates for Guam International had been re-issued on August 2, 1996 with an effective date of August 15, 1996. Changes to the (11-1) ILS Rwy 6L approach plate included: Location names, crossing altitudes, and the missed approach procedure. A copy of the August 15, 1996 (11-1) ILS Rwy 6L approach plate is included in the attachments.

[redacted]

Paul R. Misencik
Chairman, Operations Group