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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

METEOROLOGY GROUP CHAIRMAN'S FACTUAL REPORT

By: James Skeen
(18 pages)

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

December 10, 1997

Meteorology

Meteorological Factual Report
by James T. Skeen, Jr.

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 - (1542 UTC August 5, 1997)
Airplane:	Boeing B747-300 (3B5B) - Registration HL-7468, S/N 22489
NTSB Number:	DCA97MA058

B. GROUP

Chairman: James T. Skeen, Jr.
Senior Meteorologist
National Transportation Safety Board
Washington, D.C.

Member: J. K. Bae
Assistant General Manager
Flight Dispatch Team
Korean Air
Seoul, Korea

C. SUMMARY

On August 6, 1997, at approximately 0142 Guam Local Time, a Boeing Aircraft Corporation B-747-300 (3B5B), operated by Korean Air Co. Ltd. As Korean Air flight 801, enroute from Seoul, Korea (RKSS) to Agana Guam, crashed on approach to runway 6 Left at 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 only" approach to the runway when the airplane contacted high terrain approximately 3 nautical miles southwest of the airport.

The 0132 reported weather at Guam International indicated that the wind was from 090° at 6 knots; visibility was 7 statue miles with showers vicinity 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.

The flight was operated as a scheduled 14 Code of Federal Regulations (CFR) Part 129 passenger flight. There were two pilots, one flight engineer, one purser, nineteen flight attendants (including six deadheading flight attendants) and 231 passengers on board 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. However, during the 30 days following the accident, two passengers and one deadheading flight attendant succumbed to their injuries.

D. DETAILS OF INVESTIGATION

The Meteorological Group was convened on August 7, 1997. The Group was tasked with defining the environment flight 801 was operating in prior to and up to the time of the accident and documenting the pertinent meteorological products, services, and actions of agencies and individuals involved in the accident. National Weather Service (NWS) personnel and individuals located near the accident site were interviewed. Data and products were obtained from the NWS office at Guam International and from NWS Headquarters in Silver Spring, Maryland. A Doppler weather radar tape provided by weather personnel at Anderson Air Force Base was reviewed at the NWS Headquarters.

Note: In the report all times are Guam Local Time based on the 24-hour clock unless noted. All heights are above mean sea level (msl) unless noted. Heights in surface weather observations and terminal aerodrome forecasts are above ground level

(agl). All directions refer to true north unless noted. All distances are in statue miles unless noted. Coordinated Universal Time (UTC) = local time -10 hours. UTC = Z.

1. Synoptic Situation

A Surface Analysis chart prepared by the Guam National Weather Service Office (NWSO) for 2200 August 5 generally revealed a weak easterly flow through the area. The chart also showed a weak trough of low pressure located a little southeast of the island. The chart indicated that Typhoon Tina was situated about 1,000 nautical miles northwest of Guam. See attachment one.

A weather synopsis prepared by the Guam NWSO and issued at 1700 August 5 as part of the Guam Zone Forecast stated, in part:

> .Synopsis...A weak low pressure trough is moving slowly through the Marianas Islands...resulting in gentle to moderate easterly winds and widely scattered showers. The effects of the upper level low far to the northeast have diminished during the past 12 hours or so. Light to moderate showers should be expected except for isolated afternoon thunderstorms due to solar heating.
>
> See attachment two.

2. Surface Aviation Weather Observations

The NWSO was located on the ground floor of the Control Tower at Guam International.

Selected surface weather observations for Guam International taken from the Surface Weather Observations form, in part, follow:

> **Agana-Guam International Airport (PGUM), Guam**
> field elevation 297 feet msl, manual observation
>
> Time—0050; type—METAR; wind—calm; visibility—7 miles; present weather—none; sky condition—scattered 1,600 scattered 2,500 feet; temperature—27 degrees C; dew point—24 degrees C; altimeter setting—29.86 inches hg; remarks—rain shower began 0016 ended 0033.
>
> Time—0132; type—SPECI; wind—090 degrees at 6 knots; visibility—7 miles; present weather—shower vicinity; sky condition—scattered 1,600 feet broken 2,500 feet overcast 5,000 feet; temperature—27 degrees C; dew point—25 degrees C; altimeter setting—29.85 inches hg; remarks—showers vicinity northwest-northeast.

Time—0147; type—SPECI; wind—variable 4 knots; visibility—5 miles; present weather—light rain shower; sky condition—few 1,500 feet scattered 2,500 feet overcast 4,000 feet; temperature—26 degrees C; dew point—24 degrees C; altimeter setting—29.85 inches hg.

Time—0150; type—METAR; wind—variable at 4 knots; visibility—3 miles; present weather—light rain mist; sky condition—partial obscuration scattered 1,500 broken 3,500 feet overcast 6,000 feet; temperature—26 degrees C; dew point—24 degrees C; altimeter setting—29.85 inches hg; remarks—rain shower began 0106 ended 0148 rain began 0148 rain partial obscuration.

Time—0154; type—SPECI; wind—variable at 5 knots; visibility—1 mile; present weather—heavy rain shower; sky condition—partial obscuration broken 1,900 feet overcast 3,500 feet; temperature—26 degrees C; dew point—24 degrees C; altimeter setting—29.85 inches hg; remarks—rain partial obscuration.

The Surface Weather Observation Form indicated that heavy rain showers occurred at PGUM between 0020 and 0029, between 0114 and 0116, and between 0153 and 0158. The form showed that light rain showers occurred at the airport between 0016 and 0020, between 0029 and 0033, between 0106 and 0114, between 0116 and 0128, and between 0138 and 0148. The form indicated light rain and mist occurred between 0148 and 0153. In addition, the form showed that 0.42 inch of rain fell between midnight and 0350.

See attachment three for the PGUM Surface Weather Observation forms for August 5 and 6.

The Gust Recorder chart indicated that the maximum wind speed between 0130 and 0150 was about 10 knots.

Attachment four is a copy of the PGUM Gust Recorder chart for the period from approximately midnight until around 0330.

An uncommissioned Automated Surface Observing System (ASOS) was located near the PGUM Air Traffic Control Tower. Following are unofficial weather observations accomplished by the system:

Uncommissioned PGUM ASOS

Time—0056; type—Test; wind—calm; visibility—10 miles; present weather—none; sky condition—few 1,700 feet scattered 2,500 feet scattered 4,000 feet; temperature—27 degrees C; dew point—25 degrees

C; altimeter setting—29.87 inches hg; remarks—rain began 0023 ended 0042.

Time—0156; type—Test; wind—050 degrees at 6 knots; visibility—9 miles; present weather—heavy rain; sky condition—scattered 800 feet broken 2,000 feet overcast 5,500 feet; temperature—26 degrees C; dew point—25 degrees C; altimeter setting—29.87 inches hg; remarks—rain began 0113.

See attachment five for the ASOS printout between 2256 August 5 and 0556 August 6.

Note: No high density weather data were available from the ASOS.

Weather observations taken at Anderson Air Force Base around the accident time, in part, follow:

Anderson Air Force Base (PGUA), Guam
field elevation 607 feet msl, located about 10 nautical miles northeast of the accident site

Time—0055; type—METAR; wind—090 degrees at 5 knots; visibility—7 miles; present weather—shower vicinity; sky condition—scattered 1,500 feet broken 8,000 feet broken 30,000 feet; temperature—27 degrees C; dew point—25 degrees C; altimeter setting—29.87 inches hg.

Time—0109; type—SPECI; wind—100 degrees at 5 knots; visibility—3 miles; present weather—light rain shower; sky condition—broken 1,200 feet overcast 8,000 feet; temperature—27 degrees C; dew point—25 degrees C; altimeter setting—29.88 inches hg.

Time—0132; type—SPECI; wind—210 degrees at 5 knots; visibility—7 miles; present weather—shower vicinity; sky condition—few 500 feet scattered 1,200 feet broken 5,000 feet broken 30,000 feet; temperature—25 degrees C; dew point—24 degrees C; altimeter setting—29.88 inches hg.

Time—0155; type—METAR; wind—variable at 2 knots; visibility—7 miles; present weather—shower vicinity; sky condition—scattered 1,200 feet scattered 5,000 feet broken 30,000 feet; temperature—25 degrees C; dew point—24 degrees C; altimeter setting—29.87 inches hg; remarks—moderate cumulus all quadrants.

See attachment six for PGUA observations between 1855 August 5 and 0231 August 6.

3. Non Aviation Surface Weather Reports

COMNAVMAR[1], Nimitz Hill - Limited non-official weather data were obtained from personnel at the COMNAVMAR building located on Nimitz Hill, Guam. The COMNAVMAR building was located approximately ¾ nautical mile northwest of the accident location.

An anemometer was located on top of the building (approximately 650 feet msl). A recorder chart showing the anemometer's wind speed and direction was provided by station personnel. The chart showed a time interval from 1:40 PM to 5:10 PM. However, the actual time period was from 2340 August 5 until 0310 August 6. The chart indicated that between 0140 and 0150 the wind direction was variable between around 140 degrees and 190 degrees. In addition, the chart showed that during the same period the wind speed ranged between 2 knots and 10 knots. The maximum wind speed of 9-10 knots was indicated about 0140-0142. See attachment seven.

A barogram located in the building indicated that the station pressure was approximately 991 millibars around the accident time. See attachment eight for the barogram trace around the accident time.

National Weather Service Automated Reports - The NWS provided weather data from three automatic weather observing sites on Guam. The stations provided, in part, average wind speed and direction, sea level pressure, temperature, and maximum wind speed during the previous hour.

The Apra Harbor Station (approximately 3.6 nautical miles west northwest of accident site) indicated the following for 0154: wind speed—5 knots, wind direction—086 degrees, sea level pressure—1008.6 millibars, temperature—26.8 degrees C, and maximum wind speed during last hour—12 knots.

The Inarajan Station (about 8.5 nautical miles south southeast of accident site) indicated the following for 0154: wind speed—3 knots, wind direction—030 degrees, sea level pressure—1001.8 millibars, temperature—26.2 degrees C, and maximum wind speed during last hour—5 knots.

The Mangilao Station (about 4.7 nautical miles east southeast) indicated the following for 0154: wind speed—3 knots, wind direction—045 degrees, sea level pressure—1001.3 millibars, temperature—26.0 degrees C, and maximum wind speed during last hour—17 knots.

[1] Commander, U. S. Naval Forces, Marianas

See attachment nine for the Apra Harbor, Inarajan, and Mangilao data around the accident time.

4. Winds Aloft Data

On August 5 the PGUM NWSO staff launched a radiosonde balloon at 2126. The nominal time of the data was 2200 local time (1200 UTC[2]).

The following wind data were extracted from the 1200 UTC data.

Height (msl-ft)	Wind Direction (degrees true)	Wind Speed (knots)
295	110	4.0
1242	089	4.5
2168	073	5.5
3161	063	6.8
4114	077	10.4
5067	080	11.3
5926	084	12.7
6816	078	14.4
7741	086	15.6
8665	082	14.1
9590	077	13.8

See attachment ten for the complete Guam 1200 UTC sounding data.

5. Weather Radar Information

A Weather Surveillance Radar-1988, Doppler (WSR-88D) was located on Guam. The WSR-88D was maintained by personnel at Anderson AFB. Principal User Processors (PUPs) were located at the Anderson AFB Weather Station, at the PGUM NWSO, and at the Joint Typhoon Weather Center located in the COMNAVMAR building on Nimitz Hill. According to the Commander of the Anderson AFB Weather Station, radar time checks were performed daily.

The Doppler radar antenna was located approximately five nautical miles east of the accident site and approximately two miles southeast of PGUM. Neither archive level II (digital data) nor archive level III (products) were available. The NWSO provided the Meteorology Group selected WSR-88D products which office personnel had copied from the office's PUP after notification of the accident. Air Force personnel provided the Meteorology Group the Anderson AFB archive level IV (local products) tape.

[2] Coordinated Universal Time (UTC)

The Group Chairman reviewed the radar tape on August 25 at NWS Headquarters in Silver Spring, Maryland. Selected products were printed and are described below. In addition, looping of the reflectivity products revealed a general east to west echo movement.

Following are descriptions of WSR-88D radar products attached to the Meteorology Group Chairman's Factual Report:

Base and Composite Reflectivity Products

Base reflectivity is a display of echo intensity measured in dBZ.

Attachments eleven and twelve - Attachments eleven and twelve depict Plan-Position Indicator (PPI) base reflectivity (8X magnification) radar products obtained from the Anderson AFB level IV archive tape. The nominal times of the products are 1537 and 1543 UTC, respectively. The antenna elevation angle is 0.5 degree[3]. The resolution of the base reflectivity data is 0.54 nautical mile x 1 degree. An overlay showing the ground track of flight 801 is superimposed on the images. A color scale is found on each image which depicts a range of reflectivity from ND (no data) to 75 dBZ.

Composite reflectivity displays the maximum reflectivity observed above that area. Therefore, the value displayed for a given location of the product may come from any of the adjacent elevations scans.

Attachments thirteen and fourteen - Attachments thirteen and fourteen depict PPI composite reflectivity (8X magnification) radar products obtained from the Anderson AFB level IV archive tape. The nominal times of the products are 1537 and 1543 UTC, respectively. The resolution of the composite reflectivity data is 0.54 x 0.54 nautical mile. An overlay showing the ground track of flight 801 is superimposed on the images. A color scale is found on each image which depicts a range of reflectivity from ND (no data) to 75 dBZ.

Base Spectrum Width Products

Spectrum width is a measure of dispersion of velocities within the radar sample volume.

Attachments fifteen and sixteen - Attachments fifteen and sixteen depict PPI spectrum width (8X magnification) radar products obtained from the Anderson AFB level IV archive tape. The nominal times of the products are 1537 and 1548 UTC, respectively. The antenna elevation angle is 0.5 degree. The resolution of the

[3] Assuming standard refraction, for an antenna elevation of 0.5 degree the radar beam was centered over the accident area at around 660 feet. The beam width was approximately 530 feet.

spectrum width data is 0.54 nautical mile x 1 degree. An overlay showing the ground track of flight 801 is superimposed on the images. A color scale is found on each image which depicts a range of spectrum width from ND (no data) to 20 knots.

Base Velocity Products

Base velocity is a measure of the radial component of the wind either toward the radar (negative values) or away from the radar (positive values).

Attachments seventeen and eighteen - Attachments seventeen and eighteen depict PPI base velocity (4X magnification) radar products obtained from the Anderson AFB level IV archive tape. The nominal times of the products are 1537 and 1543 UTC, respectively. The antenna elevation angle is 0.5 degree. The resolution of the base velocity data is 0.13 nautical mile x 1 degree. An overlay showing the ground track of flight 801 is superimposed on the images. A color scale is found on each image which depicts a range of base velocity from ND (no data) to 64 knots.

Velocity Azimuth Display (VAD) Wind Profile Product

VAD Wind Profile Product displays the latest wind profile and the 10 most recent wind/height profiles.

Attachment nineteen - Attachment nineteen shows VAD wind profiles obtained from the NWSO during the period between 1525 and 1623 UTC. A color bar indicating root mean square (RMS) errors is located on the right side of the image. Full barb and half barb symbols indicate approximately 10 knots and 5 knots, respectively. The x-axis denotes the altitude (msl) in one thousand foot intervals, and the y-axis shows the nominal time (UTC) of the radar scan.

6. Satellite Data

GMS-5 (Geostationary Meteorological Satellite-5) images centered on Guam for 1532 UTC were obtained from the NWSO. The resolution of the images was 1.3 kilometers. See attachment twenty for a GMS-5 infrared image centered on Guam (zoomed). Note: The image is dated August 6 at 1532Z. However, NWSO personnel stated that the date was incorrect and that the actual date and time of the image was August 5 at 1532Z.

The NWS Headquarters provided a National Oceanic and Atmospheric Administration (NOAA)-14 polar orbiting satellite image. The infrared image was dated 1543 UTC August 5. Nominal resolution of the image was 1.1 kilometers. See attachment twenty-one.

7. NWS Forecasts and Advisories

Terminal Aerodrome Forecast (TAF)

Following are TAF and amendment for PGUM issued by the Guam NWSO valid during the periods beginning 2200 August 5 and 0100 August 6:

PGUM TAF
Issued August 5, 2130
Valid August 5, 2200 to August 6, 2200
Wind 120 degrees at 7 knots, visibility greater than 6 miles, scattered 1,600 feet scattered 4,000 feet broken 8,000 feet overcast 30,000 feet; Temporary August 5, 2200 to August 6, 1500 visibility 5 miles, moderate rain shower, broken 1,500 feet broken 4,000 feet overcast 8,000 feet.
Becoming August 6, 0800 to August 6, 1000 wind 080 degrees at 12 knots. Temporary August 6, 1500 to August 6, 1900 wind 080 degrees at 12 knots gusting 20 knots visibility 3 miles, thunderstorm heavy rain shower thunderstorm vicinity, broken 1,200 feet cumulonimbus overcast 4,000 feet; Temporary August 6, 1900 to August 6, 2200 visibility 5 miles, moderate rain shower, broken 1,500 feet broken 4,000 feet overcast 8,000 feet.

PGUM TAF
Issued August 6,0030 Amendment
Valid August 6, 0100 to August 6, 2200
Wind 120 degrees at 7 knots, visibility greater than 6 miles, scattered 1,600 feet scattered 4,000 feet scattered 8,000 feet overcast 30,000 feet; Temporary August 6, 0100 to August 6, 0600 wind 130 degrees at 12 knots gusting 20 knots, visibility 3 miles, heavy rain shower, broken 1,500 feet cumulonimbus overcast.
Temporary August 6, 0600 to August 6, 1500 visibility 5 miles, moderate rain shower, broken 1,500 feet broken 4,000 feet overcast 8,000 feet.
Becoming August 6, 0800 to August 6, 1000 wind 080 degrees at 12 knots. Temporary August 6, 1500 to August 6, 1900 wind 080 degrees at 12 knots gusting 20 knots visibility 3 miles, thunderstorm heavy rain shower thunderstorm vicinity, broken 1,200 feet cumulonimbus overcast 4,000 feet; Temporary August 6, 1900 to August 6, 2200 visibility 5 miles, moderate rain shower, broken 1,500 feet broken 4,000 feet overcast 8,000 feet.

See attachment twenty-two for the above TAFs.

In-Flight Advisories

The Guam NWSO has responsibility for issuing SIGMETs (Significant Meteorological Information) for the Guam area.

According to the meteorologist on duty around the accident time, no SIGMETs were issued and valid for Guam at the accident time.

Thunderstorm Advisory

The Guam NWSO issued a Thunderstorm Advisory for Guam valid during the period from 0100 to 0700 on August 6. According to the Advisory form, this meant that thunderstorms were possible or were occurring within 20 nautical miles of Guam International Airport. See attachment twenty-three.

The meteorologist on duty at the accident time stated that a Thunderstorm Warning would have been issued in the event that thunderstorms had occurred within 5 nautical miles of the airport.

No Thunderstorm Warnings were issued around the accident time.

Marianas Public Zone Forecast

The Guam Zone Forecast issued by the Guam NWSO at 1700 on August 5 stated, in part:

.Tonight...Mostly cloudy with widely scattered showers. Winds east at 10 miles per hour. Low in the upper 70s.

.

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See attachment two for the complete text of the Zone Forecast.

Significant Weather Prognosis Charts

See attachment twenty-four for High Level Significant Weather Prognosis charts prepared by the NWS National Center for Environmental Prediction (NCEP) valid for 2200 August 5 and 0400 August 6.

9. Meteorology Group Interviews

Weather Forecaster

The weather forecaster at the Guam NWSO was interviewed on August 8. The following is a summary of that interview.

The forecaster obtained a Bachelor of Science degree at Lyndon State College graduating in 1989. He joined the National Weather at Huntsville, Alabama, and spent 4 ½ years there. He took weather observations and radar observations and

had warning and forecasting responsibilities while at Huntsville. On October 1, 1994, he transferred to the Guam office.

The forecaster stated that he came on shift on August 5 at 2300. It was his first shift back after his regular scheduled days off. He said he got an initial shift briefing from the departing meteorologist and familiarized himself with current weather conditions. He also stated that he accomplished some routine administrative duties.

He stated that a heavy shower occurred at the airport around 0030 and he amended the TAF to reflect heavier showers and slightly stronger winds. He stated that the observer told him that some strong cells were developing on the radar. He accomplished some radar cross-sections and decided that based on the radar, he should issue a Thunderstorm Advisory. The forecaster said that the station guideline was to issue an advisory if 40-45 dBZ reflectivities were observed up to the freezing level. He stated that he issued a Thunderstorm Advisory at 0100. He said that he was analyzing a surface chart from about 0130 to 0215. The forecaster stated that the tower advised the weather office of the accident at about 0225. He said he immediately called the Meteorologist in Charge, the Regional Office In Honolulu, Hawaii, and the Joint Typhoon Warning Center.

He said that the office has responsibility for issuing SIGMETs, but that the criteria for issuing a SIGMET were not met. No SIGMETs were issued during his shift. He said that the evening was "pretty routine." He didn't see any unusual signatures on the radar. He didn't observe any lightning, but thought he remembered the lightning detector going off and indicating lightning between 8 and 20 miles from the airport. He said that the lightning detector was not an official National Weather Service instrument.

Concerning the Thunderstorm Advisory, the tower was notified by a telephone hotline.

Present during the interview:
Skeen
Bae
Yoshita

Weather Observer (Hydrometeorological Technician)

The weather observer at the Guam Weather Service Office was interviewed on August 9. The following is a summary of that interview.

The weather observer began his weather observing career in 1974 and completed the Air Force Weather Forecaster School in 1978. He separated from the military in 1982 and became an instructor at the Weather Observer School in Chanute, Illinois. In 1984 he began working for the National Weather Service in Guam. He

began taking weather observations at the airport in late 1984. In 1995 his job title changed to Hydrometeorolgical Technician (HMT).

He stated that he came on duty on August 5 at 2300. He received a briefing, checked the equipment, and accomplished routine administrative tasks required at midnight. The HMT said that it was a busy night with the visibility going up and down with rain showers. He said that he checked often for lightning and if he had seen it, he would have listed the occurrence on the weather observing form. He stated that there was a lightning detector at the station which would beep if lightning was detected, but said that it was not used operationally. He recalled hearing the detector go off during the shift but was unable to recall when it occurred. He stated that all weather equipment was operating correctly on the evening of the accident. The airport did not have transmissometers so no runway visual range (RVR) reports were available.

The HMT stated that the tower notified him of the accident at about 0215. He did not recall any contacts with the tower prior to the accident notification.

Concerning weather observations, he said that the cloud ceiling is estimated using the ASOS laser beam ceilometer. Visibility is estimated using visibility charts. The wind was determined from the centerfield anemometer. There is also an anemometer with the ASOS but that its data is not currently used. He said that he input his weather observation into a computer device called MAPSO which transmits the observation longline. A local transmission device called AWIS was used to transmit the observation to the tower. He said that time checks were accomplished every six hours using WWV. The HMT stated that tower personnel were not qualified to take official visibility observations. He said that the remark VCSH meant that showers were within 5 miles of the airport but not on the airport.

He said that he monitored the WSR-88D during the course of his duties. He remembered seeing very heavy rain showers close to the RDA. He said that he had received radar training in the Air Force but was not certified by the NWS to interpret the radar. The HMT said that the intensity of the rain may have been a little heavier than normal.

Concerning weather observations around the accident, he stated that the 0147 SPECI was taken because the ceiling went up. He said that one of the visibility markers was the TACAN which was located about 3 ¾ miles from the observatory. He said that he lost that marker and decreased the prevailing visibility to 3 miles on the 0150 observation. This was due to increased rain in that direction. He stated that the rain increased, and by 0154, could barely see the terminal lights across the runway which was about 1 mile away. He said he estimated the intensity of the rain by rate of fall, not by a reduction of visibility. He stated that there is no precipitation graph in the office.

Present at the interview:
Skeen
Bae

Telecommunications Specialist, Nimitz Hill

A civilian telecommunications specialist working for the Navy was interviewed on August 11. The following is a summary of that interview.

The individual has lived on Guam for 30 years. He has no formal weather training. He said that because of his interest in wind surfing he is very interested in the weather. He said that he lives about 1-1 ¼ miles west of the crash site and has been at that location since 1982.

On the night of the accident, he said that the rain woke him up. He said that he got up because he had been working on the roof of his house and was checking for leaks. He also said he checked windows on both side of the house to make sure that they were closed. He said that it was raining heavily and that it was coming straight down. He estimated the visibility was ½ mile but said that it was not based on viewing anything. He estimated the wind speed to be about 5 knots. He did not hear or see thunder or lightning.

He said that he lay back down and heard an airplane. He said that the plane seemed to be low from the muffled sound because he hears planes all the time from his house. He said that there was a hill that may have blocked the sound because the airplane was so low. He said a few seconds later he heard the crash and saw a red flash. He said that he smelled smoke about 0215, and speculated that the wind must have been from the east northeast. He said that he called the Navy Duty Officer at about 0215.

Present at Interview:
Skeen
Bae

Petty Officer, US Navy

A Petty Officer was interviewed by telephone on August 11. The following is a summary of that interview.

He was on duty at Nimitz Hill on the night of the accident. He is a certified weather observer for the US Navy. Just before the accident, he stepped outside of the back entrance of the Naval Annex, Nimitz Hill. He said it was raining "real hard." He noted a quick orange glow over the building. He saw a second glow about five seconds later. The second glow lasted about 15-20 seconds. He did not hear an explosion. The Petty Officer stated that he never saw the lights of the plane.

Concerning the weather, he said that the visibility was maybe 200-300 meters in a heavy rain shower, and estimated the ceiling to be 700-800 feet above ground level. The Petty Officer said that the wind was slightly gusty during the rain, but not real high. He estimated that the wind was not higher than 10 knots. He said that he had been checking periodically for lightning and thunderstorm activity since the National Weather Service had issued a thunderstorm advisory. He stated that he did not see or hear lightning or thunder around that time. He said that the cell was fast moving. He thought that it was not a very large cell because the rain soon ended.

Present at Interview:
Skeen
Bae

Meteorologist in Charge, Guam NWSO

Discussions with the Meteorologist in Charge (MIC) of the Guam NWSO were held on August 9, 11, and 12. The following is a summary of those discussions.

He stated that the office is currently staffed with 18 personnel. There are three work shifts per day at the office. The shift schedules are: 11:00 pm - 7 am, 7:00 am - 3:00 pm, and 3:00 pm - 11:00 pm. He said that the normal schedule includes one forecaster and one observer per shift. However, additional personnel are available during the day.

The MIC said that the Navy originally took the weather observations at the airport. He said that the National Weather Service continued to use the 8 inch rain gauge the Navy left to measure precipitation amount. He stated that the ASOS will be commissioned during the next several months.

Concerning the lightning detector, the MIC confirmed that it was not standard National Weather Service equipment. He said that a student volunteer had brought a small lightning detector to the office last summer, and the staff found it a useful tool in alerting the staff to the presence of possible lightning in the area. Before, he said that the staff used static from a radio to assist in lightning detection. After the student left, the office purchased a detector since it was better than listening for radio static, but that it occasionally gave false alerts.

The MIC gave an office tour to the Meteorology Group. Instrumentation in the NWSO included a display showing GMS-5 satellite imagery, a WSR-88D PUP (radar display), a MAPSO (communication device for taking and disseminating weather observations), an AWIS (communication device for disseminating weather observations to the tower), a communication device for receiving weather data from around the world, and a portable lightning detector sitting in the window. In addition, he pointed out the ASOS unit located outside the building that will be taking official weather

observations after it is certified. He said the staff used the laser beam ceilometer from the ASOS to assist in cloud base determination. Other standard weather sensors in the office include temperature and dew point sensors and barometers. He said that the office used wind information from the centerfield anemometer. In addition, he said that the office launched radiosonde balloons twice daily. He provided the group copies of the visibility charts used by the office. The MIC said that the airport did not have a low level wind shear alert system (LLWS).

The MIC stated that until April 1995 the NWS gave tower controllers visibility tests in order for them to be certified to take tower visibility observations. However, he said that in April 1995 the FAA began to administer the tests and that the NWS no longer had the responsibility for that duty. He stated that in the event a tower observer called the NWS office with a visibility report, the weather observer would take a visibility observation and would use the lower visibility of the two reports for the official prevailing visibility.

Finally, he said that there were no additional test ASOS observations around the accident time.

Present during discussions:
Skeen
Bae

10. Synopsis of Other Interviews

Passenger Interviews

A review of Federal Bureau of Investigations (FBI) and Survival Factors Group interview summaries revealed a lack of significant remarks concerning weather conditions around the accident time.

The majority of those interviewed failed to mention weather conditions at all. Two passengers seated in window seats mentioned seeing city lights during the approach to the airport. Two passengers seated either by or one seat in from a window stated that is was raining or raining lightly prior to the accident. Others seated in similar locations made no comment. However, a passenger sitting in the aft cabin, center section, aisle seat stated that it was raining heavily with a strong wind.

Air Traffic Control (ATC) Interview

The following was excerpted from the ATC Group Chairman's Preliminary Factual Report's Local Controller interview summary:

He said that when the inbound was given it was not raining at the airport, but he did note that it had rained earlier and that the runways were

starting to dry. He estimated the visibility to be 7 miles and that it was a moonless night. There were no visible low lying clouds and he believes that ground light sources would have enabled him to determine their presence. He did not observe any lightning in any quadrants around the airport. He said that there was a shower that was "pushing" in from the northeast over the airport and that it was moving right down the runway to the southwest. He was not exactly sure when it started to rain on the airport because he was using the tower binoculars to see if he could observe the Korean 747.

Operations Group Interviews

The following information concerning weather conditions in the accident area was obtained from the Operations Group Chairman Preliminary Field Notes.

Continental Micronesia flight 960
(landed about 30 minutes before accident)

The First Officer commented that there were isolated thunderstorms over the water north of the VOR. He said that below 2,600 feet there was pretty much unlimited visibility, but at 2,600 feet the visibility was not so good. Further, he stated that the airplane radar painted some weather over the Nimitz VOR which had a red echo on the color radar.

The Flight Engineer said that there was rain in the vicinity of the VOR but there was no rain between the VOR and the field. He stated that there was no turbulence and the ride was pretty smooth. In addition, he said that he was able to see the airport from about 2,000 feet all the way in.

The Captain stated that there was weather over Tumon but there was no convective activity and no lightning.

Ryan International
(landed about 15 minutes after the accident)

The First Officer said that the visibility was good enough to see the lights of Guam from about 150 miles away. He said there was some weather on the radar northeast of the airport, but it was not painting red. He stated that it was harder to see the island by the time they were 100 miles from the VOR. He said that they asked for a visual approach at about 15 miles from the VOR because they could see the airport. However, the First Officer stated that they were soon back in the clouds. He said that ATC asked if they could see the missing airplane, and near the VOR, they broke out of the clouds and saw flames on the ground. He said that the only place they were not in clouds was over the crash site. During their vectors to the runway 24 visual, they encountered light rain during which time they could still see the airport. He said that

there were clouds and rain and maybe some patches of heavy rain on approach to runway 6. He said it was hard to tell the intensity of the rain because it wasn't very heavy.

The Captain said that there were some clouds over the shore line with light rain. He stated that he observed some lightning about 50-80 miles away. He said that as they turned southwest of the airport they were in and out of the clouds but were never in any heavy rain. He stated that the air around the airport when they were flying over the crash site was smooth.

Unidentified Hunter
(on Nimitiz Hill)

The hunter stated that he was standing approximately 200 feet from where the airplane came to rest. He said the night was starry right when the crash occurred but earlier there had been some intermittent rain showers. He stated that there was no rain when the airplane crashed.

11. Written Statements

Written statements prepared by the on-duty weather forecaster and weather observer are contained in attachment twenty-five.

James T. Skeen, Jr.
Senior Meteorologist

AS-30
12-11-97

Attachments: