Turbulence injuries, Air France, Boeing 707-B-328B, F-BLCA, Near O-Neill, Nebraska, May 13, 1974

Micro-summary: **This Boeing 703-328B experienced severe turbulence in cruise, injuring several people, two seriously.**

Event Date: **1974-05-13 at 0236 CDT**

Investigative Body: **National Transportation Safety Board (NTSB), USA**

Investigative Body's Web Site: **http://www.ntsb.gov/**

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FILE NO. A-0003

AIRCRAFT ACCIDENT REPORT

AIR FRANCE

BOEING 707-B-328B

FBLCA

NEAR O'NEILL, NEBRASKA

MAY 13, 1974

ADOPTED: JANUARY 15, 1975

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

REPORT NUMBER: NTSB-AAR-75-4

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594
AIRCRAFT ACCIDENT REPORT

Adopted: January 15, 1975

AIR FRANCE
BOEING 707-B-328B
FBLCA
NEAR O'NEILL, NEBRASKA
MAY 13, 1974

SYNOPSIS

About 2:36 a.m. c.d.t. on May 13, 1974, Air France Flight 004, a Boeing 707-B-328B, entered an area of light turbulence near O'Neill, Nebraska. About 3 to 5 minutes later, the flight encountered moderate to severe turbulence, which lasted about 4 1/2 minutes. During the turbulence, 2 passengers were injured seriously and 11 were injured slightly. Two flight attendants were injured, one seriously.

The captain went to the cabin to see the injured passengers and discussed the injuries with a passenger who was a doctor. The captain decided to continue to Paris, France, and landed the aircraft at Orly Airport, Paris, almost 7 hours after the in-flight turbulence encounter.

The National Transportation Safety Board determines that the probable cause of the accident was the operation of the aircraft in an area of very strong thunderstorm activity which should have been easily detectable and which resulted in serious injuries to passengers because of the failure of the captain to warn the passengers and to turn on the "fasten seatbelt" sign.

1. INVESTIGATION

1.1 History of the Flight

Air France Flight 004, a Boeing 707-B-328B, was a regularly scheduled passenger flight between Los Angeles, California, and Paris, France.

The flight departed Los Angeles International Airport on May 12, 1974, at 10:20 p.m. P.d.t. 1/ Ninety-nine passengers and a crew of twelve were on board. The flight proceeded to the vicinity of O'Neill, Nebraska, at 33,000 feet without incident.

In the area of the O'Neill VORTAC 2/, the aircraft encountered light turbulence. At that time according to the captain, the autopilot altitude hold was disconnected and the "fasten seatbelt" sign was turned on. Approximately 3 to 5 minutes later, at 0236, severe turbulence was encountered. The captain said that he started to request that the passengers return to their seats. He could not recall if he completed the announcement, because he had to drop the microphone and fly the aircraft because of turbulence.

The captain said that there was no lightning at any time and that when the severe turbulence ceased, the flight was in and out of tops of cumulus-type clouds. He said that, "No indication of turbulence was observed on the aircraft radar nor did we receive a warning from the National Weather Service or Denver Center." After the severe turbulence encounter, Denver Air Route Traffic Control Center vectored the flight to avoid further turbulence.

The flight continued to Orly Field, Paris, without further incident. About 3 hours from Orly, the captain contacted Orly and advised them that there were injured passengers on board and requested doctors and ambulances to stand by.

Investigation disclosed that when the aircraft encountered the turbulence, 12 passengers were standing in the rear of the aircraft. They were either making duty-free purchases or waiting to use the lavatories. The standing passengers were thrown about the aircraft, and struck the aircraft and its equipment. As a result, 13 passengers and 2 flight attendants were injured. Loose equipment, bottles, containers, and other articles were strewn about the aircraft. About 45 minutes after the turbulence encounter, one of the passengers, who was a doctor, asked if he could be of assistance. The flight attendant asked him to look at the injured passengers.

1/ Unless otherwise specified, all times hereafter are central daylight time based on the 24-hour clock.

2/ VORTAC - A collocated VOR and tactical air navigation aid. The facilities are capable of providing distance information and azimuth to aircraft with distance measuring equipment (DME) on board.

According to the doctor, about 2 hours after the turbulence encounter, the captain asked if he had examined the injured passengers and the extent of their injuries. The doctor stated that he was a cardiologist and had no expertise in trauma or bone injuries. He stated that: "To the best of my knowledge, there were two serious injuries ...." An elderly lady had a fractured ankle and an elderly man had a dislocated knee, a possible fracture, and other injuries. The doctor said the fractures would need treatment as soon as the aircraft landed. The captain asked if there were any life-threatening injuries that needed immediate treatment. The doctor replied that he did not think so.

The captain said, "A Chef de Cabine flight steward came to the cockpit as soon as possible and advised me that several passengers had been injured. I went into the cabin to see the people and talked to the doctor. Two of the people wanted to return to Los Angeles. The doctor said there were slight injuries and bruises; one woman had a nose bleed, but they could continue to Paris, France. The doctor gave the injured a sedative to help them sleep. The doctor was not positive, but from his superficial examination he could see no reason for the flight not to continue. This influenced my decision to proceed to our destination."

An Airline Transport Instructor Pilot, employed by the Boeing Company, was among the passengers seated in the first-class section. During an interview, he stated that at least 30 minutes before the "extreme turbulence," he observed intense cloud-to-cloud lightning and vertical lightning toward the ground. The flashes were brilliant and rapid enough for him to observe "towering cumulus clouds in all areas that could be seen from aft right to forward right to approximately 30° off the nose." At the time of the observation, he became concerned and fastened his seatbelt tightly, although he noted at the time that the "fasten seatbelt" and "no smoking" signs were not lighted. The aircraft entered the turbulence and he heard screams from the rear of the aircraft. Approximately 3 to 4 minutes later, the "fasten seatbelt" sign came on and a brief announcement was made in French over the public address system.

Eighteen passengers gave statements, and most of them were interviewed. Ten passengers recalled seeing lightning outside the aircraft. The remainder did not mention any observations regarding the weather. Four passengers stated that the "fasten seatbelt" sign came on after the severe turbulence started.

The accident occurred during hours of darkness.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	0	0	0
Nonfatal	2	13	0
None	10	86	

1.3 Damage to Aircraft

None

1.4 Other Damage

None

1.5 Crew Information

The flightcrew was certificated for the flight. (See Appendix B.)

1.6 Aircraft Information

The aircraft was certificated in accordance with United States and French national requirements. (See Appendix C.)

1.7 Meteorological Information

Surface weather charts showed a deep, complex low-pressure center moving eastward across nothern Wyoming, while an associated trough of low-pressure, extending southward from the low, moved into the Texas-Oklahoma Panhandle area. A cold front extended southward and southwestward from the Wyoming low, and a warm front extended southeastward, and had moved into western Nebraska by the time of the accident.

The Grand Island, Nebraska, 0235 radar weather observation (as well as the radarscope photographs taken about 0235 and 0242) showed, in part, an arch-shaped line of echoes 15 miles wide and extending from about 60 miles southwest of Ainsworth, Nebraska, to Mitchell, South Dakota, to 40 miles southeast of Sioux City, Iowa. That line was described as having 9/10 echo coverage, with the strongest cells just north of Ainsworth, near Mitchell, and north of Sioux City.

Additionally, this observation (and the photographs) showed a thunderstorm cell, 20 miles in diameter, near O'Neill. The thunderstorm cell was characterized as: Very strong, hail indicated, top 42,000 feet, moving from 260° at 50 kn. (See Appendices D and E.)

At 0215, the Kansas City Forecast Office issued SIGMET 3/ ALPHA 1 as follows:

> "Flight Precaution. Line thunderstorms near Pierre, Valentine, east of Sydney moving eastward 25 kn. Ceilings 2,000 visibility 2 miles in thundershowers, tops 45,000. Conditions continuing beyond 0800."

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no reported communications difficulties between the flight and the air traffic control facilities.

1.10 Aerodrome and Ground Facilities

Not applicable.

1.11 Flight Recorders

A cockpit voice recorder (CVR) and a flight data recorder (FDR) were installed in the aircraft.

Since this aircraft flew for about 7 hours after the turbulence encounter, all recordings on the CVR tape pertinent to the accident were erased. The aircraft was equipped with a SFIM FDR. The readout was made from a copy of the original recording medium which was supplied by Air France.

3/ A SIGMET is an advisory warning of weather severe enough to be potentially hazardous to all aircraft. It is broadcast on navigational aid voice frequencies and by Flight Service Stations. It is also transmitted on Service-A weather teletype circuits.

The FDR readout disclosed that the aircraft encountered the turbulence at an altitude of 33,000 feet at an airspeed varying between 277 and 286 kn., and while on a magnetic heading of 052°. The vertical acceleration trace recorded a maximum "g" load of +2.02 and a minimum load of +0.16. The duration of the turbulence was 4 1/2 minutes.

1.12 Wreckage

Not applicable.

1.13 Medical and Pathological Information

Thirteen passengers and two flight attendants were injured. These injuries ranged from hip, kneecap, and ankle fractures to severe cuts and skin abrasions. All injuries were sustained by persons who were not secured by seatbelts. All of the injuries were caused when those persons were thrown around the aircraft during the turbulence.

1.14 Fire

Not applicable.

1.15 Survival Aspects

The accident was survivable.

1.16 Tests and Research

None.

1.17 Other Information

An examination of the aircraft's airborne weather radar was conducted by the air carrier subsequent to the accident. According to the carrier, this examination revealed that the broadcast - receiver support was deformed which caused an intermittent modification of the unit's impedance. The carrier reported that this modification reduced the sensitivity of the radar to a level which was insufficient to provide radar depiction of weather echoes.

The National Transportation Safety Board was not notified of the occurrence of this accident.

As a result of information received from sources other than the operator, the Safety Board initiated its investigation 3 1/2 weeks after the accident.

14 CFR 430.5, requires that: "The operator of an aircraft shall immediately, by the most expeditious means available, notify the nearest National Transportation Safety Board Field Office when:

(a) An aircraft accident or any of the following listed incidents occur...."

Article 11 of the International Civil Aviation Organization (ICAO) Convention requires that the aircraft of one contracting state when operating into, out of, or within the territory of another contracting state, adhere to all applicable laws and regulations of the latter state.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The flight of Air France Flight 004 was routine until it encountered turbulence near O'Neill, Nebraska, at 33,000 feet.

Ground-based radar weather observations and radarscope photographs, showed a large thunderstorm cell in the vicinity of O'Neill at the time of the accident. There were indications of hail associated with the radar echoes. The radar meteorologist characterized the cell as being strong and reported the radar tops (tops of detectable moisture) at 42,000 feet. The actual cloud tops were probably several thousand feet higher. The cell was moving from the west-southwest at 50 kn.

In view of the extent and intensity of the thunderstorm activity shown by the radar weather observations and the radarscope photographs, the Safety Board believes that a properly operating and properly operated airborne weather radar would have detected such activity.

The captain stated that the aircraft's radar did not indicate turbulence-producing weather in the vicinity of the flight path. The examination of the radar equipment by the air carrier subsequent to the accident indicated that the sensitivity level was insufficient to produce weather echoes which, most probably, explains the lack of these indications on the captain's radarscope.

The flight data recorder disclosed that at the time of the turbulence encounter, the flight was at 33,000 feet and on a heading of 052° magnetic. Considering the magnetic variation (about 10° E) and applying a true track to the radarscope photographs, it is evident that no other echoes could have masked the one near O'Neill. On such a heading and at the aircraft's altitude, the frequent and intense lightning from the cell should have been visible for many miles. Therefore, even if the radar were inoperative, the thunderstorm activity near O'Neill should have been easily visible and could have been circumnavigated without difficulty.

The captain stated that there was no lightning at any time. The Boeing instructor pilot passenger stated that he observed the lightning for about 30 minutes before the turbulence encounter. He describes the flashes as brilliant and rapid enough for him to observe cumulus clouds in all of the areas that he could see from the right of the aircraft. Additionally, 10 of 18 passengers recalled having seen lightning outside the aircraft. The Safety Board concludes, therefore, that lightning was visible from the aircraft before the severe turbulence was encountered. The upper level significant weather prognostic chart, which was examined by the captain before departure, did not show any thunderstorm activity for the central part of the country. There is no evidence to indicate that the flight received SIGMET ALPHA 1 issued at 0215. Even though the flightcrew had no earlier forecast and may not have received Sigmet Alpha 1, the thunderstorm activity was easily detectable and circumnavigable. There is no doubt that the aircraft either penetrated the thunderstorm or was in its immediate vicinity, and as a result, encountered moderate to severe turbulence.

The interview with and statements by the captain and doctor aboard the aircraft differ as to the reported degree of injury sustained by the passengers and flight attendants. These differences have not been reconciled. The pilot-in-command is responsible for the safety of the passengers, crewmembers, and the airplane. The Safety Board believes his decision to continue his flight rather than to land at a suitable airport was not prudent. The decision extended the time which the injured had to endure pain and could have complicated the injuries. The seriously injured could not be seated properly and secured in their seats and thus were not protected in the event of further in-flight turbulence.

The "fasten seatbelt" sign was off before the aircraft entered the area of turbulence. With the amount of thunderstorm activity in the area, the sale of tax-free items should have been suspended, and

the seatbelt sign should have been turned on before the aircraft entered the turbulent area.

2.2 Conclusions

(a) Findings

1. The aircraft and flightcrew was certificated for the flight.

2. The flight was routine at 33,000 feet until it reached the vicinity of O'Neill, Nebraska.

3. There was very strong thunderstorm activity in the vicinity of O'Neill, Nebraska.

4. Radar tops of the thunderstorm activity were at 42,000 feet and hail was indicated on ground-based weather radar.

5. The thunderstorm activity was not masked by other cloud systems.

6. The thunderstorm activity was easily detectable both visually and by airborne weather radar, and accordingly was circumnavigable. At least 10 passengers saw the lightning.

7. The aircraft encountered moderate to severe turbulence associated with the very strong thunderstorm activity.

8. When the turbulence was encountered, the "fasten seatbelt" sign was not illuminated.

9. Fifteen persons, who were not secured by seatbelts, sustained injuries during the turbulence encounter.

10. Prognostic charts examined by the captain before departure did not indicate anticipated thunderstorm activity. However, that should not have influenced the accident since the thunderstorms were easily detectable and avoidable.

11. During discussions with a doctor who was a passenger, the captain became aware of the seriousness of the injuries.

12. A number of the injured passengers requested that a landing be made so that hospital services could be provided. However, the captain elected to continue the nonstop flight to Paris.

13. The accident was not reported to the Safety Board by the operator.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the operation of the aircraft in an area of very strong thunderstorm activity which should have been easily detectable and which resulted in serious injuries to passengers because of the failure of the captain to warn the passengers and to turn on the "fasten seatbelt" sign.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

January 15, 1975

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board initiated its investigation on June 7, 1974. Investigators from the Safety Board's New York, Los Angeles, Oakland, Denver, and Washington Offices conducted the investigation.

The field phase of the accident investigation was completed August 8, 1974.

2. Hearing

There was no public hearing.

APPENDIX B

CREW INFORMATION

Captain Robert Espes

Captain Robert Espes, 51, held French Airline Transport Pilot Certificate No. PL-0576, dated January 5, 1956. At the time of the accident, he had accumulated about 22,508 flight-hours, of which 4,935 had been in the Boeing 707. His first proficiency check in the B-707 was March 25, 1967; his latest proficiency check was March 24, 1974; and his latest line check July 15, 1973. He possessed a current first-class medical certificate without limitations, dated April 4, 1974. The captain had not flown during the previous 24 hours.

First Officer J. Dournier

First Officer J. Dournier, 32, held French Commercial Pilot Certificate No. 1659, dated August 6, 1970. At the time of the accident, he had accumulated 4,864 flight-hours, of which 3,090 had been in the Boeing 707. His first proficiency check as first officer in the B-707 was April 25, 1971; his latest proficiency check was March 16, 1974; and his latest line check was May 22, 1973. He possessed a current first-class medical certificate, dated April 25, 1974, without limitations. The first officer had not flown during the previous 24 hours.

Second Officer Georges Mear

Second Officer Georges Mear, 33, held French Commerical Pilot Certificate No. 1466, dated June 20, 1968. At the time of the accident, he had accumulated 4,826 flight-hours, of which 2,034 had been in the Boeing 707. His first proficiency check as second officer in the B-707 was on March 25, 1971; his latest proficiency check was April 8, 1974; and his latest line check was on December 5, 1973. He possessed a current first-class medical certificate without limitations, dated December 20, 1973. The second officer had not flown during the previous 24 hours.

Flight Engineer Auguste Figeac

Flight Engineer Auguste Figeac, 52, held French Flight Engineer's Certificate No. 1124, dated March 18, 1957. At the time of the accident,

he had accumulated 13, 585 flight-hours, of which 4, 320 had been in the Boeing 707. His latest proficiency check was on May 1, 1974, and his latest line check was on September 29, 1973. He possessed a current flight engineer's medical certificate without limitations, dated March 5, 1974. The flight engineer had not flown during the previous 24 hours.

Flight Engineer Louis Caron

Flight Engineer Louis Caron, 53, held French Flight Engineer Certificate No. 0587, dated July 7, 1955. At the time of the accident, he had accumulated 22, 800 flight-hours, of which 9, 509 had been in the Boeing 707. His latest proficiency check was April 4, 1973, and his latest line check was on February 27, 1974. He possessed a current flight engineer's medical certificate without limitations, dated June 21, 1973. The flight engineer had not flown during the previous 24 hours.

Flight Attendants

The seven flight attendants were qualified.

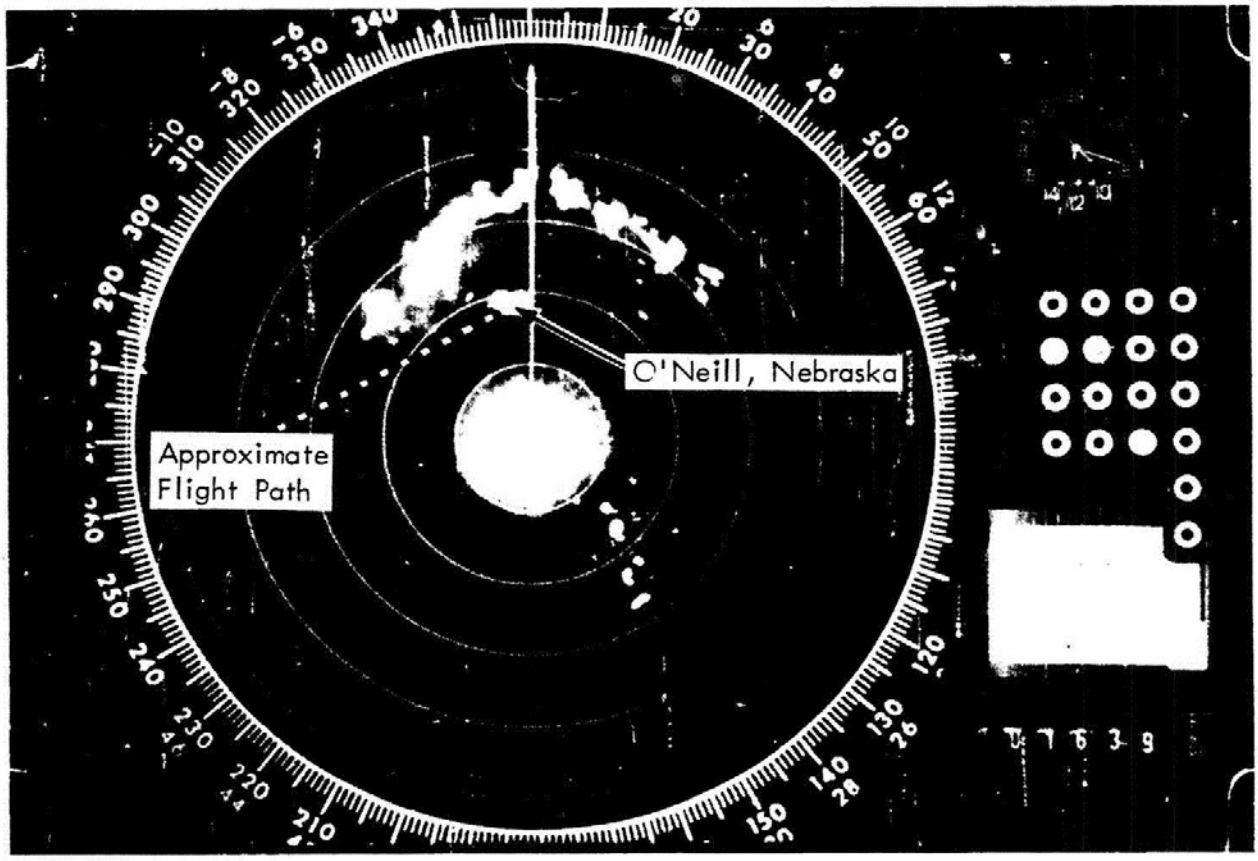
APPENDIX C

AIRCRAFT INFORMATION

Make and Model	Boeing 707-B-328B
Registration	FBLCA
Serial No.	18685
Date of Manufacture	Unknown
Total Flight-Hours	37, 020
Engines	Pratt & Whitney JT3-D3B

APPENDIX D

Grand Island, Nebraska, Weather Radarscope Photograph



Frame No. : 1639

Date : May 13, 1974

Time : 0732Z (0232 c.d.t.)

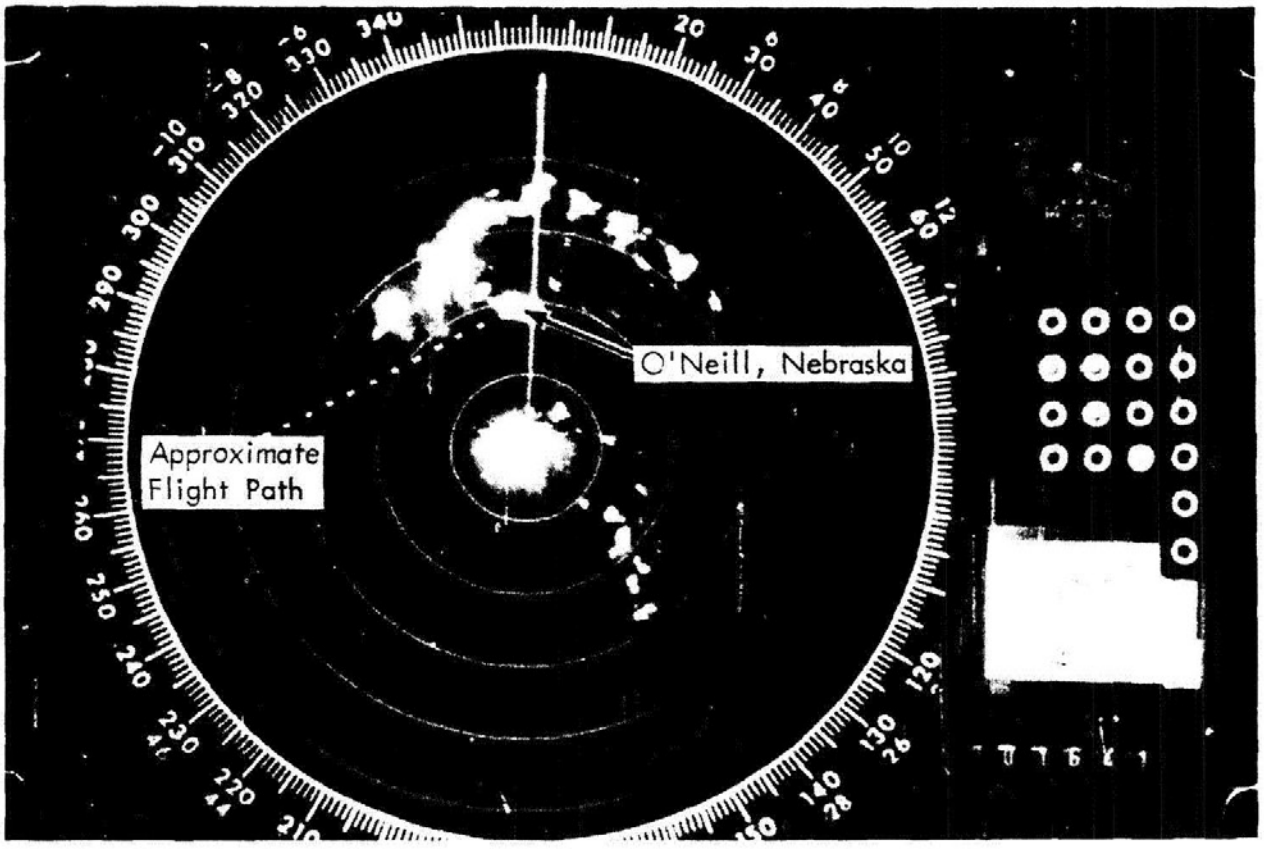
Range : 250 n mi

Range Markers: 50 n mi

Directions : °True

APPENDIX E

Grand Island, Nebraska, Weather Radarscope Photograph



Frame No. : 1641

Date : May 13, 1974

Time : 0742Z (0242 c.d.t.)

Range : 250 n mi

Range Markers: 50 n mi

Directions : ^{o}True