CIVIL AERONAUTICS BOARD

# ACCIDENT INVESTIGATION REPORT

**Adopted:** June 18, 1952 **Released:** June 23, 1952

TRANSOCEAN AIR LINES - NEAR FAIRBANKS, ALASKA, DECEMBER 30, 1951

## The Accident

At approximately 2207 [1] on December 30, 1951, Transocean Air Lines' Flight 501 South, a Curtiss C-46F, N-68963, en route Point Barrow, Alaska, to Fairbanks, Alaska, struck Chena Dome, which is on a true bearing of 59 degrees and 35 miles from the Fairbanks radio range station. The accident occurred during an attempted orientation on the Fairbanks radio range, preparatory to landing at Ladd Field. All occupants - two pilots and two passengers - were killed, and the aircraft was demolished upon impact.

## History of the Flight

Transocean Air Lines, an irregular carrier, is currently engaged in Alaskan air transport for the United States Navy as part of its operations. Flight 501 South was made in connection with this contract. Upon departure from Point Barrow at 1655, December 30, 1951, the aircraft carried six passengers, 9,243 pounds of cargo, 275 pounds of baggage, 900 gallons of gasoline, and the two crew members, Captain R. R. Warren and First Officer R. V. Irwin. This loading resulted in a gross takeoff weight of 47,646 pounds (allowable 48,000 pounds), and the disposable load was properly distributed with relation to the center of gravity.

The following IFR (Instrument Flight Rules) flight plan was filed with ARTC (Air Route Traffic Control) at Point Barrow: Point Barrow to Umiat via Amber Airway 2 at 4,000 feet mean sea level; Umiat to Bettles via Amber 2 at 10,000 feet; Bettles to Nenabank intersection [2] via Amber 2 at 8,000 feet; and Nenabank intersection to Fairbanks via Green 7 at 5,000 feet. Big Delta, 70 miles southeast of Fairbanks, was the alternate airport. Weather forecasts indicated instrument and on-top flight conditions en route; an instrument approach was anticipated at Fairbanks.

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1/ All times referred to herein are Alaskan Standard and based on the 24-hour clock.

2/ Nenabank is the intersection of the west leg of Fairbanks radio range and the northwest leg of Nenana radio range.

The flight arrived at Umiat at 1754, remaining there for one hour and 56 minutes. The captain and first officer were advised by the CAA communications station employee of a recent repositioning of the north leg of the Bettles radio range, with a resultant change in quadrant signals. Both pilots, while in the CAA INSAC (Interstate Airways Communications) station, received the 1928 weather information. The 1810 weather, which included route and terminal forecasts and winds aloft, was also available to the crew. Winds from 240 degrees at 40-60 knots were forecast for cruising altitude to Nenabank intersection; thence to Fairbanks the forecast was 240 degrees at 30-40 knots. Upon departing Umiat at 1950, the takeoff gross weight of the aircraft was 36,373 pounds. The only passengers aboard were two employees of Wien Alaska Airlines who were carried nonrevenue through a mutual assistance agreement between the two companies. Their names were entered on the flight plan as additional crew members.

The flight reported over Bettles at 2053. At 2144 it reported 25 miles northwest of Nenabank intersection, estimating there at 2150. An ARTC clearance was delivered to the flight at 2144, clearing it to the Fairbanks radio range station, to cruise and maintain 8,000 feet to the Nenabank intersection, and then maintain 5,000 feet to Fairbanks.

At 2148, the flight reported over Nenabank intersection at 8,000 feet, descending to 5,000 feet IFR, and estimating Fairbanks at 2200. At 2155, it reported reaching 5,000 feet. At 2157, the flight was cleared for a standard range approach to Fairbanks, to cross Fairbanks at 4,000 feet. The flight again contacted Fairbanks at 2205 and advised as follows: "ADF OUT HAVE MISSED CONE PROCEEDING OUT WEST LEG WILL CALL WHEN OVER STATION."

At 2206 Fairbanks requested confirmation that the flight was proceeding out the west leg, and at 2207 this confirmation was received from the pilot. This was the last message received and it is believed that the aircraft crashed immediately thereafter.

## The Investigation

Severe cold weather with temperatures as low as 70 degrees below zero delayed search and rescue activities for several days. The wreckage was sighted from an aircraft of the USAF 10th Rescue Squadron, Ladd Air Force Base, Fairbanks, on January 3, 1952. Attempts were made to reach the crash site by search parties in "Weasels," a USAF multi-place helicopter, and by dog team, but sub-zero temperatures, heavy snow, and lack of trails made such efforts unsuccessful until January 5, 1952. On that date, a USAF multi-place helicopter landed near Chena Dome. The four bodies were removed from the scene and such examination of the wreckage as was possible was accomplished by the three USAF officers who landed in the helicopter. Due to the extreme cold, further efforts to reach the scene were abandoned, since such activities might well have resulted in more loss of life.

Distribution of wreckage indicated that the aircraft struck the snow-covered area in the immediate vicinity of Chena Dome at approximately 4,550 feet mean sea level, and on a heading of approximately 240 degrees magnetic; it appeared to have been in a left turn at impact. The left wing and nose

sustained most of the initial shock, and the wreckage spread over the upslope of the hill. The left wing panel, which apparently contacted the hill approximately 100 feet below the crest, was torn from the fuselage at the wing root. The fuselage, fairly intact, was found in an inverted position at the crest of the mountain. The right wing panel remained attached to the fuselage and was relatively intact. The tail group was broken from the fuselage. The cockpit and nose section disintegrated upon impact, scattering instruments and control assemblies over a wide area.

One engine and its propeller could not be located because of deep snow. Examination of the propeller on the other engine indicated that this engine was developing power at impact. Rudder and elevator tabs were found in the neutral position, and the right aileron tab a few degrees up. Instruments and radios were shattered. A recovered wrist watch had stopped at 1007:07 (2207:07); also, efforts by the Fairbanks radio operator to contact the aircraft, beginning at 2209, were unanswered. A few papers which were obtained from the wreckage yielded no pertinent information.

On June 2, 1952, when weather conditions first permitted, an investigator of the Civil Aeronautics Board was flown to the scene of the accident by USAF helicopter. He determined that at the time of impact, the aircraft was flying straight and level. First contact with the steep slope of Chena Dome was with the left wing panel. Both engines and their propellers were located and bore evidence indicating that power was being developed by both engines at the time of impact. The control systems, although badly mutilated, revealed no evidence of malfunction prior to the accident. The ADF (Automatic Direction Finder) tuning dial indicated that the unit had been tuned to the Fairbanks radio range frequency. The radio equipment was destroyed. The wreckage bore no evidence of fire. On June 4, 1952, the helicopter again flew to the scene and returned the investigator to Fairbanks.

Weather conditions along the route were substantially as forecast. An occluded front, curving from northwest to south near the west coast of Alaska, moved northeast; however, it did not reach the flight path until after the accident. Meteorological data indicate that light turbulence and possibly light rime ice were encountered, and the flight probably encountered high wind velocities as it progressed southward. Post study of weather indicated that the maximum velocity was 60 knots from the southwest. There was considerable lowering of ceilings ahead of the front, and the clouds were low over the higher terrain to the north and east of Fairbanks. The ceiling in the Fairbanks area at the time of the accident was 4,000 feet, with possibly a lower ceiling in the Chena Dome area.

Another Transocean Air Lines' flight preceding Flight 501 South over the same route terminated at Fairbanks 50 minutes before the accident. Captain E. N. Thomson stated that radio reception became very poor due to precipitation static and St. Elmo's fire at a point about 50 miles past Bettles on the southeast leg. Atmospheric conditions made it impossible to

receive the Nenana radio range station, making it necessary to dead reckon in an effort to reach the Nenabank intersection. Further, high west winds became apparent on the Bettles-Nenabank intersection segment of his flight. As a result, he intercepted the west leg of the Fairbanks range several miles to the east of the Nenabank intersection. The Fairbanks range was found reliable and the flight was completed without incident.

Radar plots were obtained of Flight 501 South in the Fairbanks area.3/ The first plot placed the aircraft in the N quadrant approximately 35 miles northwest of the Fairbanks radio range station. Upon intercepting the west leg of the range at 2142, the flight was plotted on or near the east and west legs for 12 minutes; the aircraft circled near the commercial broadcasting station KFAR, located five miles west-northwest of Fairbanks, between 2145 and 2147, and passed over the Fairbanks radio range station between 2148 and 2149. At 2157 the target faded from the radar scope. Examination of this flight path indicates that the aircraft turned to the left into the mountainous area. There was no instrument procedure specified for the Fairbanks range which authorized such a left turn, nor has the procedure been modified since the accident.

Investigation revealed that the Fairbanks and Bettles radio ranges, both Adcock type stations, are satisfactory navigational facilities, although multiples are known to exist on the west leg of the Fairbanks range, and such information has been published. The Nenana radio range station is a MRL loop type station and the limitations inherent in this type have also been published. Prior to this accident, however, CAA records failed to reveal any written complaints on the Nenana installation. Monitoring reports on these facilities revealed that all were operating normally throughout the pertinent period. A flight check of the Fairbanks radio range on December 31, 1951, showed the station to be operating satisfactorily with all on-course signals in correct alignment.

The CAA communicator at Fairbanks advised that all radio contacts with the flight were normal, and at no time did the pilot express any concern about the safety of the flight.

The aircraft was airworthy upon departure from Point Barrow, and no malfunctions of any nature were subsequently reported by Captain Warren except his reported failure of the ADF. The aircraft had been given a No. 2 inspection at the company's Seattle maintenance base and was released for Alaskan service on December 14, 1951. A review of maintenance records revealed no evidence that the aircraft was not airworthy.

The Alaska Division of Transocean Air Lines was formed in July 1950. Equipment and facilities to institute a training program comparable to the standards maintained by the company in their training school at Oakland, California, have been of limited availability due to the remote location.

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3/ See attachments for both radar and reported position reports.

The company has stated that it recognizes the importance of continuous training for all personnel, and will continue to improve this aspect of its operations as equipment, facilities, and personnel become available to the Alaska Division. In this connection, a mobile training unit, initiated for just such remote operations, was scheduled (prior to the accident) to visit the Division, and training by this unit has since been accomplished in Alaska. Currently, there is no formal training program in force in the Alaska Division for the foregoing reasons. Pilot training consists principally of en route training by captains giving individual instruction and flight checks by the Chief Pilot of the Division, who is a designated CAA examiner. The manager of the Alaska Division stated that pilot training in force prior to the accident was considered adequate, for all pilots are initially employed as copilots, the experience level required is generally higher than that of most carriers, and they are trained in all items associated with their duties. He stated that pilot applicants are considered only if they possess instrument and multi-engine ratings, have a minimum flight experience of about 2,000 hours, and pass a check ride. The company considers experience in Arctic flying highly desirable, and most pilot applicants possess such experience. The applicant is given individual instruction on equipment and routes prior to flight duty assignment, and shortly thereafter must pass an instrument flight check. Prior to up-grading to captain status, a pilot must have an airline transport rating, a minimum of 5,000 flying hours, and pass route checks.

CAA airman records for Captain Warren reflected that he first took the written examination for an airline transport pilot rating in October 1945. He passed three sections of this examination but failed that section dealing with radio navigation. Captain Warren failed two additional written examinations, but obtained a passing grade on the fourth trial in February 1946. In November and December, 1946, he failed the flight portion of the examination for the rating. These two flight tests indicated that at that time, Captain Warren displayed below-average ability in certain phases of instrument work. He was engaged in flying at Fairbanks from April 1948 until July 1950, and should have been thoroughly familiar with the area. In November 1951, he successfully met the requirements for an ATR, demonstrating above-average ability on cone identification, but below-average on ADF tracking and intersecting a predetermined bearing. He satisfactorily accomplished a flight check over the route involved on December 11, 1951. He had made at least one actual instrument approach at Fairbanks following his employment by Transocean Air Lines.

Similar records for First Officer Irwin revealed that he passed the written examination for ATR in September 1951, and the flight test in November 1951. Most of the items applicable to instrument work were graded average. Mr. Irwin received instrument and airline transport ratings in August and November, 1951, respectively, following two flight courses completed at the carrier's flight school at Oakland, California.

Analysis

At no time during the flight was the aircraft reported unairworthy. Shortly before the accident, the only ADF was reported "out." It is possible that the unit was not inoperative but the pilot rejected the indication of the needle as incorrect because he thought the flight was still west of the station. Had the ADF actually been inoperative, the loss of this receiver would not have precluded a successful orientation and approach at Fairbanks since the aircraft was equipped with two additional low frequency receivers. One of these receivers was a manually operated direction finding loop. In addition, a marker beacon receiver was installed in the aircraft.

The ground speed between Umiat and Bettles (1950 to 2053) was 170 miles per hour. After passing Bettles, the flight plan called for cruising altitude of 10,000 feet to Nenabank intersection, necessitating a climb of 6,000 feet. Following the report over Bettles, the next message from the flight gave its position as 25 miles northwest of Nenabank intersection (2144), IFR, and estimating the intersection at 2150. The ground speed over this segment of the flight, taking the climb into account, was in conformity with that made good since departure from Umiat. However, the estimate of 2150 over Nenabank intersection is an increase of 80 miles per hour over the 170 miles per hour made good thus far.

According to the radar plots, at 2144 the flight was only 12 miles west of Fairbanks, or about 60 miles southeast of the 2144 estimated position. It is apparent that the pilot was estimating his position when he reported at 2144 that he was 25 miles northwest of Nenabank intersection. At 2136, radar plotted the flight's position approximately 38 miles east of the 2144 reported position.

Flight 501 reported over Nenabank intersection at 2148 and estimating Fairbanks at 2200. This position report (2148) further strengthens the theory that the pilot was estimating his progress very inaccurately since the ground speed of 375 miles per hour (25 miles in 4 minutes) is unrealistic. Furthermore, the radar plots indicated that at about 2148 the flight was over or very near the Fairbanks range station rather than over Nenabank intersection, and thereafter continued east of the station. It is difficult to understand why the pilots so confused their actual position with reported position, for determination of the Nenabank intersection and the Fairbanks station involve totally different interpretations and usage of receiving equipment.

Failure to contact the flight after 2209 indicates that the crash occurred very shortly before this time. The time of the crash is further confirmed by the wrist watch, which was stopped at 2207:07.

The almost complete lack of adherence to the flight plan following departure from Bettles, and the wide discrepancies between the position reports and radar plots indicate that this accident was the result of errors in navigation. Several theories have been advanced in an effort to verify

the track made good, the cause of the pilot's confusion regarding his position, and suggested methods of utilization of the radio navigational equipment aboard the aircraft. No detailed discussion of these points is deemed feasible, since pure conjecture would become the dominant factor. It is apparent, however, that intelligent and proper use of the radio equipment was not accomplished after the flight's passage over Bettles, resulting in increasing confusion which culminated in the accident.

## Findings

Upon consideration of available evidence, the Board finds that:

1. The carrier, the aircraft, and the crew were properly certificated.
2. The gross weight of the aircraft was within approved limits, and the load was properly distributed with relation to the center of gravity.
3. The flight was being conducted under instrument flight rules.
4. Weather conditions were substantially the same as forecast and would not have precluded a successful approach and landing at the terminal point.
5. The flight was considerably off course when initially positioned by radar, and was shortly thereafter plotted on the west and east legs of the Fairbanks range for 12 minutes.
6. All ground radio facilities functioned normally, and all radio contacts with the flight were normal.
7. The flight made an unauthorized left turn while outbound on the east leg of the Fairbanks radio range and subsequently struck a mountain northeast of the station while on a westerly heading.

## Probable Cause

The Board determines that the probable cause of this accident was the failure of the pilot to follow procedures and utilize properly the radio facilities for approach and letdown at Fairbanks, with the result that the flight became lost.

BY THE CIVIL AERONAUTICS BOARD:

/s/ DONALD W. NYROP

/s/ OSWALD RYAN

/s/ JOSEPH P. ADAMS

/s/ JOSH LEE

/s/ CHAN GURNEY

# SUPPLEMENTAL DATA

## Investigation and Hearing

The Civil Aeronautics Board was notified of this accident through facilities of CAA Communications at 2320 AST, December 30, 1951. An investigation was immediately initiated in accordance with the provisions of Section 702 (a)(2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was ordered by the Board, and was held in the Alameda Hotel, Central Street and Broadway Avenue, Alameda, California, on February 6 and 7, 1952.

## Air Carrier

Transocean Air Lines, a large irregular air carrier, is a California corporation, with its principal offices at the Oakland Municipal Airport, Oakland, California. The company possesses a letter of registration issued by the Civil Aeronautics Board, and an air carrier operating certificate issued by the Civil Aeronautics Administration for operations over the route described in this report.

## Flight Personnel

Captain Robert R. Warren, age 32, was employed by Transocean Air Lines on July 26, 1950. He was the holder of a valid airman certificate with an air transport rating for multi-engine land, and both single-engine land and sea aircraft. Captain Warren had a total of 7,034 flying hours, of which 150 were in company C-46 equipment, and 116 hours of instrument flying time. Records reflect that he had 150 hours of Link instrument training. His last instrument check was accomplished on December 11, 1951, and his last en route check was made on December 11, 1951. Captain Warren received a Class "A" CAA physical examination on October 13, 1951.

First Officer Richard V. Irwin, age 33, was employed by Transocean Air Lines on September 7, 1951, and transferred to the Alaska Division on December 1, 1951. He was the holder of a valid airman certificate with an air transport rating. He had a total of 2,552 flying hours, of which 196 were in C-46 aircraft. His last CAA physical examination was accomplished on November 26, 1951.

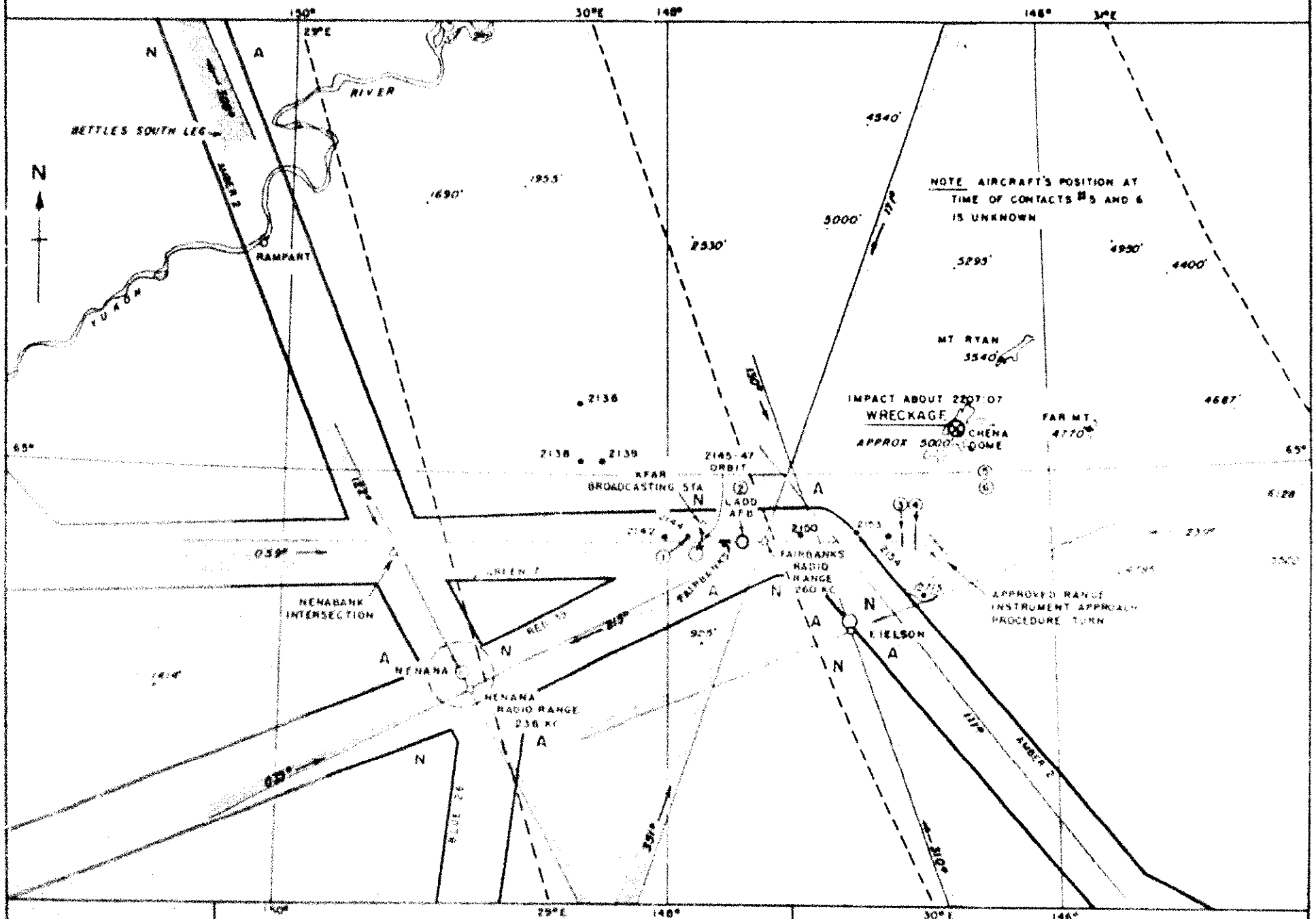
## The Aircraft

N-68963, a Curtiss C-46F, serial number 22485, was owned by the U. S. Air Force and operated under lease by Transocean Air Lines. It had a total of 1,937 flying hours and was currently certificated by the Civil Aeronautics Administration. The aircraft was equipped with two Pratt and Whitney R-2800-75 engines, and Hamilton Standard 23E50-(287-6491A-0) propellers. The aircraft underwent a No. 2 (125 hour) check at Seattle, Washington, on December 14, 1951.

# ATTACHMENT I

## SHOWING AIRCRAFT RADIO CONTACTS AND RADAR PLOTS RELATIVE TO ACCIDENT

### TRANSOCEAN AIR LINES C-46F; N68963 NEAR FAIRBANKS, ALASKA - DEC. 30, 1951




RADAR PLOTS

- • FIX
- ) ORBIT
- || FADE OUT

### RADIO CONTACTS

TIME (All times in Alaska Standard)

(1) 2144 - At 8,000 feet, IFR, estimated time over Nenabank (intersection) 2150. Request clearance. (N-68963 cleared to Nenabank intersection, cruise and maintain 8,000 feet, thence 5,000 feet to Fairbanks.)

(2) 2148 - Over Nenabank (intersection), descending to 5,000 feet IFR, estimating Fairbanks at 2200.

(3) 2155 - Reached cruising altitude 5,000 feet at 2155.

(4) 2157 - (ARTC cleared N-68963 for standard range approach, to cross Fairbanks at 4,000 feet.)

(5) 2205 - ADF out. Have missed cone. Proceeding out west leg. Will call when over station.

(6) 2207 - (Flight requested to confirm proceeding out west leg.) Confirming proceeding out west leg. (Lost contact with the flight.)

NOTE: Above contacts are not verbatim, but were obtained from abbreviated CAA flight contact records.

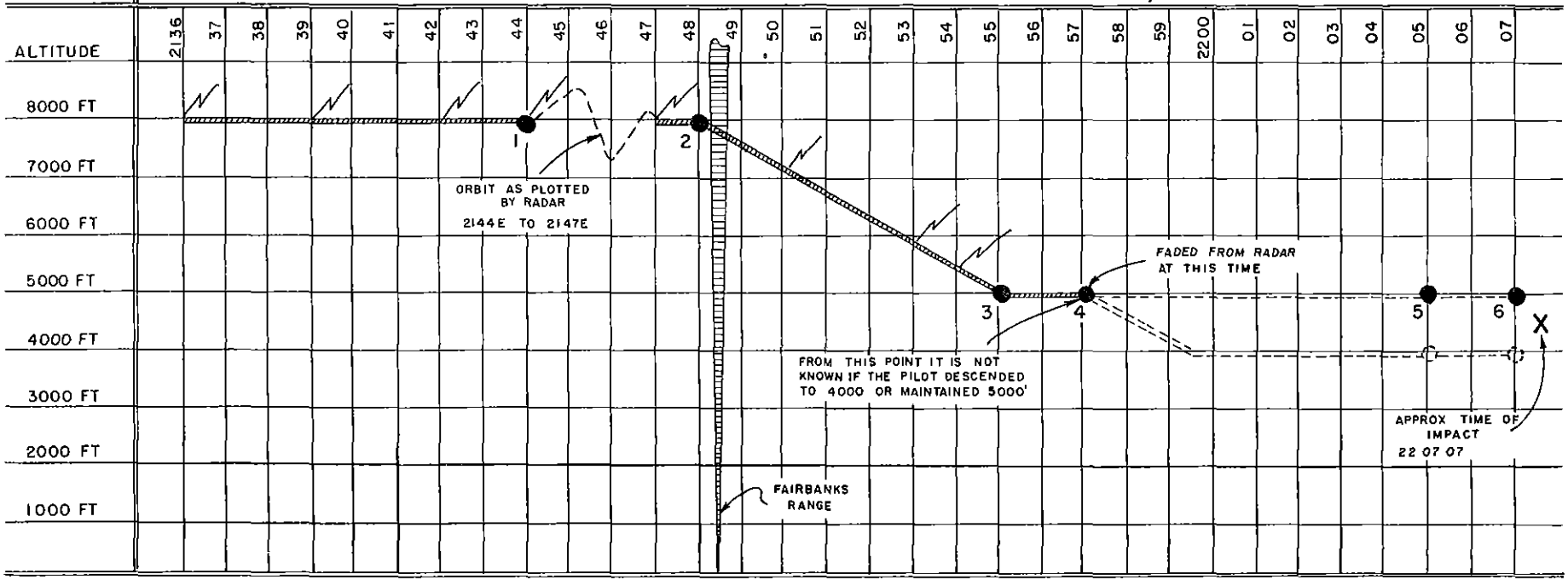
PREPARED UNDER THE SUPERVISION OF
FRED G. POWELL
Bureau of Safety Investigation, CAB.

SOURCE: World Aeronautical Chart #77

10 5 0 10 20 30 40 50
STATUTE MILES

# ATTACHMENT II

## VERTICAL FLIGHT PATH OF TRANSOCEAN C-46F N68963 - DEC 30, 1951




FLIGHT PATH OF AIRCRAFT

RADIO CONTACTS (REFER TO ATTACHMENT I)

RADAR PLOTS

(NOTE RADAR PLOTS DO NOT INDICATE ALTITUDE)

PREPARED BY J H WAGGONER
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BUREAU OF SAFETY INVESTIGATION, C.A.B.