

File No. 119-42

Docket No. SA-58

Adopted: July 16, 1942

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REPORT OF THE CIVIL AERONAUTICS BOARD

Of the investigation of an accident involving aircraft of United States registry NC 1946 which occurred near Las Vegas, Nevada, on January 16, 1942.

I.

CONDUCT OF INVESTIGATION

An accident involving aircraft NC 1946 occurred in the vicinity of Las Vegas, Nevada, on January 16, 1942, about 7:20 p.m. (PST). The aircraft was being operated at the time in scheduled air carrier service between New York, New York, and Los Angeles, California, as Flight 3 of Transcontinental & Western Air, Inc., (hereinafter referred to as "TWA"). The accident resulted in fatal injuries to all of the 19 passengers and the crew of three and in destruction of the airplane.

The Washington office of the Civil Aeronautics Board (hereinafter referred to as the "Board") received notice of the accident about 11:15 p.m. The Board immediately initiated an investigation in accordance with the provisions of Section 702(a)(2) of the Civil Aeronautics Act of 1938, as amended (hereinafter referred to as the "Act"). An Air Safety Investigator of the Board arrived at Las Vegas, Nevada, about 1:30 a.m., January 18, 1942, and immediately proceeded to the scene of the accident. <sup>1/</sup> In the meantime, searching parties, including United States Army personnel and Deputy Sheriffs of Clark County, Nevada, commenced a search for the airplane. Because of the inaccessibility of the point at which the accident occurred, the wreckage was not reached until about 9:00 o'clock on the morning following the accident. The wreckage was placed under guard by deputy sheriffs until the following morning when a military guard was

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<sup>1/</sup> This investigator was contacted, early on the morning following the accident, at Amarillo, Texas, where he was enroute from Washington, D. C., to Los Angeles, California. He proceeded to Las Vegas by the most expeditious transportation available and reached the scene of the accident with the second party to arrive, consisting of Civil Aeronautics Administration inspectors, postal inspectors, TWA officials, civil officers and a military detachment.

established. This guard was maintained until the wreckage was officially released to the company on January 31, 1942.

A public hearing was held at Los Angeles, California, on January 23, and 24, 1942. Robert W. Chrisp, an attorney for the Board, acting as presiding examiner, and the following personnel of the Safety Bureau of the Board participated in the hearing: R. D. Hoyt, Assistant Director; Frank E. Caldwell, Chief, Investigation Division; and Warren E. Carey, Senior Air Safety Investigator.

Since 15 members of the United States Army Air Corps were passengers on the airplane, the Board invited the Air Corps to participate in the investigation of the accident. Major George W. Haskins attended the proceedings as representative of the Air Corps.

All the evidence available to the Board at the time was presented at the hearing. Testimony was given by 12 witnesses, including experts in various technical subjects involved in the investigation, and 17 exhibits were received in evidence. Depositions of other witnesses were taken and have been made a part of the record. While the examiner and other representatives of the Board and the Air Corps were the only ones designated to ask questions directly of the witnesses, the examiner, acting under instructions of the Board, announced at the opening of the hearing that any person who had any evidence, questions, or suggestions to present for consideration in the proceedings might submit them in writing to the examiner. Nineteen questions were submitted and were asked of the appropriate witnesses.

Upon the basis of all the evidence disclosed by the investigation, the Board now makes its report in accordance with the provisions of the Act.

II.

SUMMARY AND ANALYSIS OF EVIDENCE

Air Carrier

At the time of the accident, TWA was an air carrier operating under currently effective certificates of public convenience and necessity and air carrier operating certificates. These certificates authorized it to engage in air transportation with respect to persons, property and mail over various routes, including route No. 2 between the co-terminal points New York, New York, and Newark, New Jersey, and the terminal point Los Angeles, California, via certain intermediate points, including Albuquerque, New Mexico, Winslow, Arizona, and Boulder City, Nevada.

Flight Personnel

The crew of the flight in question consisted of Captain Wayne C. Williams, First Officer M. A. Gillette, and Air Hostess Alice Frances Getz.

Captain Williams, aged 41, held an airline transport pilot certificate. He had a total of 12,024 hours flying time, of which approximately 3500 hours had been in DC-3 airplanes. His night flying time between August 1, 1941, and the date of the accident was approximately 293 hours. His last physical examination, required by the Civil Air Regulations, was taken on December 19, 1941, and showed him to be in satisfactory physical condition.

Captain Williams was employed by TWA on September 7, 1931. The Board examined the facts relating to the discharge of Captain Wayne Williams and his subsequent reinstatement by TWA after a proceeding held before

the then National Labor Board, and considered their relationship to the accident. A request for a rehearing had been granted but no further proceedings were taken. Since his reinstatement and until the time of the accident, Captain Williams' conduct and procedure were considered satisfactory by the management of TWA. We therefore conclude that the dispute between Captain Williams and TWA in 1933 has no causal relation to the accident.

Captain Williams originally qualified on all routes <sup>2/</sup> of the Albuquerque-Burbank <sup>3/</sup> Division in 1938. As he was assigned as pilot on another division, however, this route qualification expired. He was requalified on all routes between Albuquerque and Burbank, including the Las Vegas-Burbank route, on January 7, 1941, after having complied with the requirements of the company and of the Civil Air Regulations. He was assigned to the Albuquerque-Burbank Division on November 16, 1941. Since then he had made 39 trips on this division, seven of which included trips between Burbank and Foulmer City, and two of which included trips between Burbank and Las Vegas. His rest period prior to departure from Albuquerque on January 16th was 22 hours, 40 minutes.

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2/ See appendix for a sketch showing TWA's routes, approved in TWA's air carrier operating certificate, between Albuquerque and Burbank.

3/ Burbank, California, is TWA's terminal airport serving Los Angeles.

First Officer Gillette, aged 25, held a commercial pilot certificate and had a total flying time of 1330 hours, 650 of which had been in DC-3 airplanes. He was employed by TWA on August 1, 1940, and was assigned to the Albuquerque-Burbank Division on February 22, 1941. Since then he had made six trips which included landing at, or passing over, Las Vegas, and 37 trips which included landing at, or passing over, Boulder City. He was also qualified as a reserve first officer on TWA's Boeing S307-B's. His rest period prior to departure from Albuquerque on the day of the accident was 15 hours, 24 minutes.

It appears from the evidence that both Captain Williams and First Officer Gillette were physically qualified, and held proper certificates of competency for the flight involved.

#### Airplane and Equipment

Aircraft NC 1946 was a DC-3, manufactured by Douglas Aircraft Company, Inc., of Santa Monica, California. It was completed February 24, 1941, and was delivered to TWA March 3, 1941. The airplane was powered with two Wright Cyclone G202A engines, each rated at 1200 horsepower for take-off, and was equipped with Hamilton Standard constant speed, hydro-matic, full-feathering propellers. This model airplane had been approved by the Civil Aeronautics Administration for air carrier operation over the routes flown by TWA with 24 passengers and a crew of four. The evidence indicates that the airplane and its equipment had received the overhauls, periodic inspections, and checks which are required by company practice and approved by the Civil Aeronautics Administration, and that the airplane was in an airworthy condition on departure from Las Vegas on the day of the accident.

It is not possible to arrive at a precise determination of the actual gross weight and c.g. location of the airplane at the time it took off

from Las Vegas. As we shall explain later, we can determine only that the gross weight of the airplane probably exceeded 25,200 pounds, which is the permissible weight, by not more than 500 pounds, and that the c.g. location probably was within the prescribed limits.

#### History of the Flight

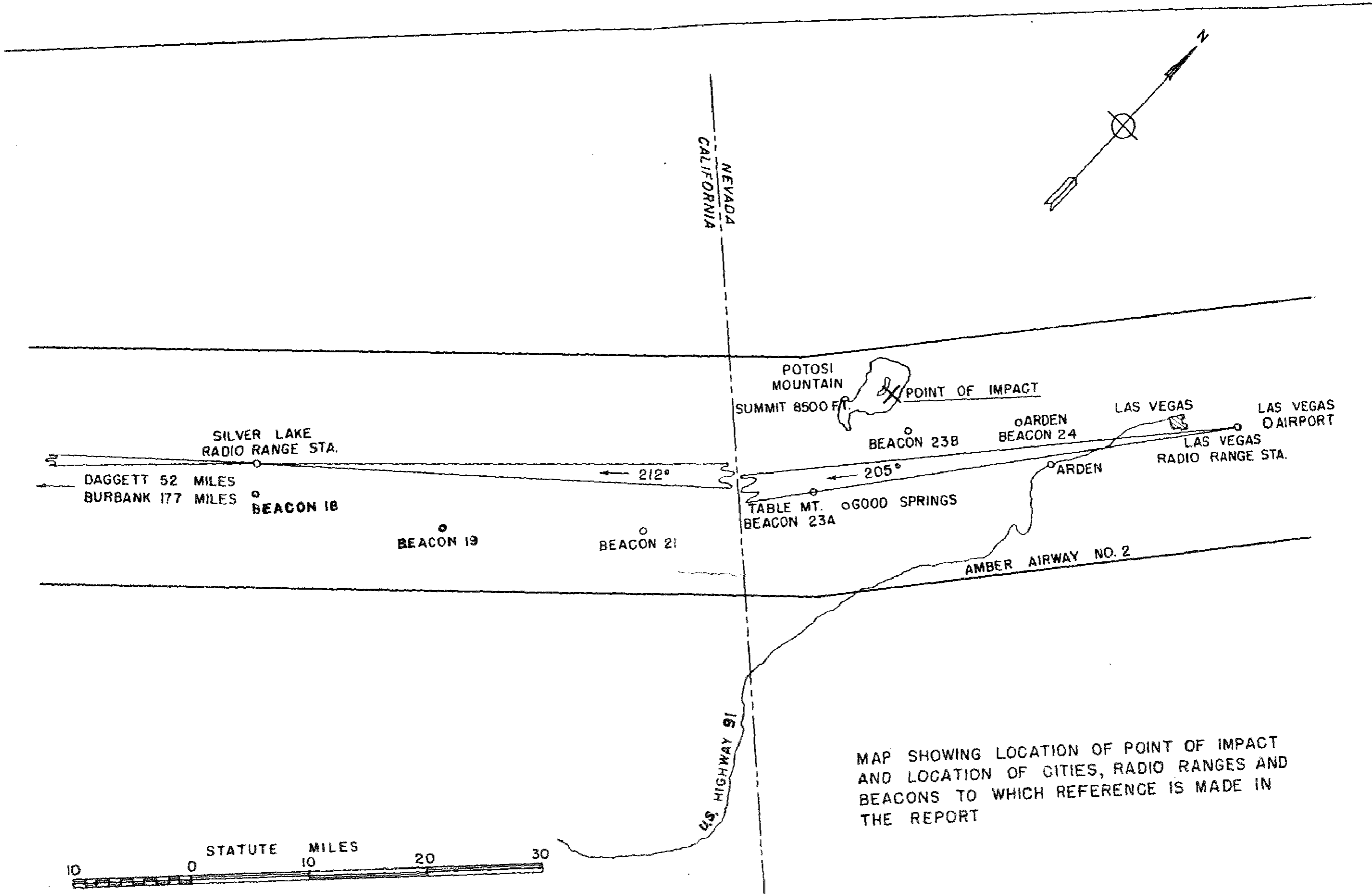
TWA's Flight 3 of January 15, 1942, enroute from New York, New York, to Los Angeles, California, departed from Las Vegas, Nevada, at 7:07 p.m. (PST), January 16, 1942. Approximately 15 minutes later it collided with an almost vertical rock cliff, near the top of Potosi Mountain in the Spring Mountain Range. The point of impact was at an elevation of approximately 7,770 feet above sea level, about 20 feet below the top of the cliff, and about 730 feet below the crest of the mountain, which has an elevation of about 8,500 feet above sea level. The point where the accident occurred is about 33 miles southwest of the Las Vegas airport and 6.7 miles (in a northwesterly direction) from the center line of the southwest leg of the Las Vegas radio range. (See map opposite this page.)

The flight had arrived at Albuquerque, New Mexico, at 4:06 p.m. (MST), approximately three hours late as a result of delays at several stations along the route. Most of these delays had been of 10 or 15 minutes duration and were occasioned by handling cargo. The longest delay, 1 hour 56 minutes, occurred at St. Louis, Missouri, due to weather. In accordance with usual procedure, the crew which had been in charge was replaced by the crew previously named.

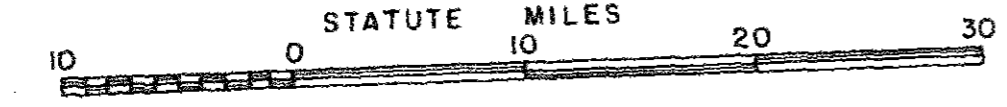
Flight 3 is regularly scheduled to operate between Albuquerque, New Mexico, and Burbank, California, without any intermediate stops. It was planned, however, that this flight should make intermediate stops at Winslow, Arizona, and Las Vegas, Nevada, <sup>W</sup> because of reduced fuel

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<sup>W</sup> When operating over this route, daylight landings are made at Boulder City rather than Las Vegas, but night landings are made at Las Vegas because there are no lights at the Boulder City Airport.



MAP SHOWING LOCATION OF POINT OF IMPACT AND LOCATION OF CITIES, RADIO RANGES AND BEACONS TO WHICH REFERENCE IS MADE IN THE REPORT



RADIO RANGE BEARINGS ARE MAGNETIC AT THE STATION



5/ load and reported head winds over the airways. Provision for these stops was included in the flight plan filed at Albuquerque.

The flight was cleared from Albuquerque to Winslow, the standard TWA clearance form having been completed at Albuquerque upon receipt of a radio message from TWA's flight superintendent at Burbank releasing the flight to Winslow. The airplane departed from Albuquerque at 4:40 p.m.(MST). At 5:38 Captain Williams transmitted the following radio message to Burbank:

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5/ Due to the heavy passenger and cargo load, the airplane was fueled to depart from Albuquerque with only 350 gallons of gasoline. It appears that the weight of the airplane, on departure from Albuquerque and also on departure from Las Vegas, was not within the permissible gross weight according to the regular method of computation. It is not possible to determine precisely the amount of the excess, but in all probability it was less than 500 pounds. The excess was due principally to the method which was used to assign passenger weights in computing the load at Albuquerque. The regular method of computation calls for the use of an average weight of 170 pounds per passenger, exclusive of baggage. TWA's passenger agent at Albuquerque testified that since computation on this basis resulted in a weight which was greater than the permissible weight, he requested the officer in charge of the 12 Army men getting on at Albuquerque to state the weights of these men. An average weight of 150 pounds was assigned to each of the 12 men. Finding that the total weight was still too heavy, the agent contacted the three women passengers and obtained and used their actual weights. Since the computation then indicated that the gross weight of the airplane precisely equaled the provisional weight permissible for take-off, the remaining passengers were figured at 170 pounds each without inquiry as to their actual weights. Army records show that the Army personnel actually weighed substantially more than the amount assigned for them. The overweight would not seem to have had any bearing on the accident. The method used for computing the load, and, therefore, of ascertaining the location of the c.g., however, is an example of loose practice, and of a ready acceptance (where such acceptance served to avoid interference with the handling of traffic) of an intrinsically improbable statement (that a considerable group of adult men would have an average weight as low as 150 lbs. each).

"DEEP LAKE 5:36 8000. WINSLOW 6:04 LAS VEGAS 6:45 PMP WITH  
100 TOTAL. REQUEST RELEASE IN FLIGHT TO LAS VEGAS."

The following message was then transmitted to the flight, over the signature of the flight superintendent at Burbank, the time of the communication being indicated on the radio log as 4:38 p.m. (PST):

"PROCEED LAS VEGAS SUBJECT CAPTAIN'S DISCRETION ROUTE AC."<sup>6/</sup>

In explanation of this modification of the original plans, TWA's chief pilot testified that after Captain Williams reached cruising altitude and had an opportunity to establish ground speed and fuel consumption, he apparently found that he could continue to Las Vegas, without landing at Winslow, with a sufficient reserve supply of fuel remaining in the tanks, thus obviating the necessity of an extra landing and consequent loss of time.

Flight 3 arrived at Las Vegas at 6:36 (PST) and the airplane was serviced with fuel. It departed from Las Vegas at 7:07 p.m., having been cleared to Burbank pursuant to a release transmitted by radio from the Burbank flight superintendent.

After its departure from Las Vegas the airplane was observed by several witnesses who stated that it was farther to the northwest than they were accustomed to seeing the airline planes flying in that vicinity. About 7:22 p.m., 15 minutes after the flight left the ground at Las Vegas, witnesses observed a fire in the vicinity of Potosi Mountain, later identified as the fire which occurred in and about the airplane following impact, and the wreckage was subsequently found at the location previously described.

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<sup>6/</sup> "AC" is TWA's designation of the Winslow-Kingman-Las Vegas route.

### Weather Conditions

It is apparent from the evidence that weather conditions in the area involved were entirely satisfactory for the flight. United States Weather Bureau records indicate that the ceiling and visibility were unlimited, with high cloudiness, <sup>7/</sup> before, during and after the flight. These reports were fully substantiated by the testimony of two Western Air Lines captains who operated flights in the vicinity of the accident about 1-1/2 hours after the accident occurred.

### Examination of the Wreckage

The examination of the wreckage did not reveal any evidence of failure of any part of the airplane or its equipment prior to impact.

It appears probable that the airplane struck the face of the cliff while approximately level longitudinally and laterally, and while proceeding straight ahead under cruising power. The first contact was apparently made by the left wing with a protruding ledge. The marks or scars on the cliff, apparently made by the wings, were in approximately level alignment. The position of the wreckage can be most reasonably explained on the hypothesis that the impact occurred while the airplane was in a level attitude. Portions of the airplane and of its contents were found on the top ledge of the cliff, some 80 feet above, and 400 or 500 feet distant from, the point of impact, a result which tends to negate the possibility that the airplane was in a diving attitude. On the other hand, the tops of trees immediately below the point of impact showed no

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<sup>7/</sup> High cloudiness is not inconsistent with the existence of unlimited ceiling and visibility. Ceiling is considered unlimited when clouds cover less than one-half of the sky or when the base of the clouds is more than 9,750 feet above the point of observation. Visibility is the mean greatest distance toward the horizon that prominent objects can be seen and identified by the normal eye. Visibility is considered unlimited when its extent is 10 miles or more.

signs of contact with the airplane, definitely indicating that the airplane was not climbing steeply, although it could have been in a gradual climb.

#### Conduct of the Flight

The flight was cleared to fly contact from Las Vegas to Burbank, having filed a flight plan which designated 8000 feet above sea level as the altitude to be used. Because of the emergency conditions resulting from the war, nearly all of the beacons between Las Vegas and Silver Lake were inoperative.<sup>8/</sup> Section 61.7108 of the Civil Air Regulations provides, and at the time of the accident provided in part, as follows:

"The following rules relating to weather conditions will govern the dispatching of air carrier aircraft in visual-contact operation. No scheduled air carrier aircraft shall be dispatched unless: \* \* \* (c) During night operation at least one beacon on the course shall be visible from the aircraft at all times, unless otherwise specifically authorized by the Administrator."

It is impossible to determine whether, on the night of the accident, there would not have been at least one beacon on the course visible at all times from an airplane flying the route at an altitude of 8000 feet above sea level. It is not possible to tell, therefore, whether the dispatching of the flight under contact rules, rather than under instrument rules which would have required a higher cruising altitude, constituted a violation of the literal reading of the regulation hereinbefore mentioned. The fact that most of the beacons were extinguished, however, required extra care in the conduct of the flight, both on the part of the pilot and with respect to others having to do with the clearance and flight plan. The

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<sup>8/</sup> Beacon Nos. 19, 21, 23<sup>A</sup> and 23<sup>B</sup>, or the Francis Spring, Kingston Pass, Table Mountain, and Wilson Pass beacons, were unlighted. See map opposite page 6.

question of the use of requisite care by the pilot will be discussed later. It was incumbent upon the ground personnel particularly to make sure that the pilot was apprised of the condition of the beacons. The information in this regard should have been entered on, or attached to, the clearance which was issued at Las Vegas.<sup>9/</sup> Moreover, the proximity of the proper course to high terrain might well have suggested to the flight superintendent and other responsible officials of TWA that night contact flights over the portion of the route involved should be operated at a higher altitude than 8000 feet during the period that these beacons should continue to be inoperative.

We shall now consider the propriety of the course used by the flight. As may be seen from the map opposite page 6, the center line of the southwest leg of the Las Vegas radio range has a true bearing of 221 degrees, or a magnetic bearing of 205 degrees, from the range station. The evidence indicates that a course following this center line, or varying from it by no more than a few degrees, is the only course considered proper for flight out of Las Vegas, on the route toward Burbank, until arrival at a point in the vicinity of the Table Mountain beacon, at which point it becomes necessary to assume a magnetic course of approximately 212 degrees in order to proceed to Silver Lake and on to Daggett.

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<sup>9/</sup> Section 61.71042 of the Civil Air Regulations provides in part as follows: "(c) The dispatcher or duly authorized station personnel shall attach or enter all current reports or information pertaining to weather and irregularities of navigational aids and facilities . . . . affecting the flight."

As a result of restrictions necessitated by military activities in areas adjacent to the airway, the Civil Aeronautics Administration, on July 15, 1941, directed a written notice to TWA, as well as to other carriers, advising them that it was necessary to confine all operations between Palmdale, California, and Las Vegas, Nevada, strictly to the airway, and suggesting that pilots be instructed to confine their flight movements, day or night, contact or instrument, to the actual on-course signal of the radio ranges serving the airway involved. A communication directed to TWA flight personnel by TWA's acting chief pilot, dated July 17, 1941, incorporated this notice verbatim and requested pilots to be guided accordingly. Copies were posted on pilot bulletin boards at Kansas City, Albuquerque, Burbank, and San Francisco.

The highest terrain along the correct course between Las Vegas and Silver Lake appears to be at an elevation of less than 6000 feet. The highest point within 15 miles on either side of the course line is Potosi Mountain, which, as previously indicated, rises to an elevation of approximately 8500 feet, and, while it is located on the airway, it is off the on-course signal.

There was received in evidence at the hearing a TWA flight log sheet form covering the route from Albuquerque to Burbank, via Winslow, Arizona, Boulder City, Nevada, and Newhall, California. This flight log sheet is a part of the pilot's navigation kit, and indicates proper courses for the various sectors of the route. It also contains a profile chart of the highest terrain along the course line and, in addition, the highest terrain within a strip, 30 miles in width, which extends 15 miles on either side of the course line. The highest terrain indicated for the course line between Boulder City and Silver Lake is approximately 5800 feet, and the highest point indicated within the 30-mile strip for this section is 9000 feet.

The route between Las Vegas and Silver Lake is also shown on the log sheet,

and the proper magnetic courses are indicated. Although no separate profile is provided for this route, it is apparent from what we have said that no substantially higher terrain exists on this route, either on the course line or within 15 miles on either side thereof, than is indicated on the log sheet for the course between Boulder City and Silver Lake.

With respect to the altitude to be used for contact flight between Las Vegas and Burbank, there appears to have been, at the time of the accident, no definite rule prescribed by TWA. TWA's chief pilot testified that it was the established practice never to operate at less than 1000 feet above the terrain along the course, and that normally a pilot would not fly from Las Vegas toward Silver Lake at less than 8000 feet above sea level, unless some weather condition in the area required flying at a lower altitude.

The point at which the accident occurred has a bearing of approximately 215 degrees, magnetic, from the Las Vegas airport, and, as previously indicated, is at an elevation of about 7,770 feet. In view of the fact that witnesses who observed the airplane as it was flying between Las Vegas and Potosi Mountain testified that its flight path appeared to be in a straight line northwest of the general line of flight on which the airline planes usually travel in that vicinity, it appears probable that the airplane proceeded directly from the airport to the point of impact. This conclusion is substantiated by the fact that the elapsed time between departure from Las Vegas and the time at which the fire was observed was determined to be a normal amount of time for direct flight between the two points.

The impact actually occurred at an altitude of 7,770 feet above sea-level approximately 15 minutes after take-off from a field at an elevation of 1900 feet. It would appear probable, therefore, that the airplane had

been climbing steadily from the time of take-off, and had not quite reached its intended operating altitude at the time of the accident.

Although the airplane, at the time of the accident, was within the limits of the airway, it was 6.7 miles from the center line of the Las Vegas radio range log. Furthermore, the course being flown, if it were continued, would place the airplane outside the limits of the airway.

It is obvious that, in view of the topography of the area involved, adherence to the course flown, at least at the altitude involved, was not only entirely improper but inevitably led to disaster.

There remains to be determined the reason or reasons for use of the improper course. The flight plan, which covered all portions of the flight from Albuquerque to Burbank, was prepared on the standard TWA form and was filed at Albuquerque. TWA's Operations Manual directs that the flight plan be prepared by the first officer under the supervision of the captain, and that it be approved and signed by the captain. The only name appearing on the flight plan in this instance, however, is that of the first officer which was printed, by hand, in the space provided for the name of the person who prepares the plan. For the first portion of the flight between Las Vegas and Burbank, namely, the sector from Las Vegas to Daggett, the flight plan designated a true course of 234 degrees and a magnetic course of 218 degrees. Since the magnetic bearing of the point of impact from the Las Vegas airport was about 215 degrees, it is apparent that the course flown was substantially the same as the course designated in the flight plan. It would be rather remarkable if the fact that the accident occurred so close to the course designated in the flight plan and at a considerable distance from the proper course were merely a coincidence.



The evidence indicates that in preparing a flight plan the practice is to divide the flight into several portions, each of which may include a number of sectors or legs having separate courses, and to enter on the flight plan for each portion a course which represents the average of the courses of the individual sectors. The result is that a course designated on the flight plan is approximately equivalent to a straight line between the extremities of the portion of the flight for which it is entered.<sup>10/</sup>

The average magnetic course between Las Vegas and Daggett is about 210 degrees, rather than 218 degrees which was the course designated in the flight plan. The average magnetic course between Boulder City and Daggett, on the other hand, is 218 degrees. In view of the

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<sup>10/</sup> It was explained that the principal function of the courses so entered on the flight plan is to serve as base lines from which the anticipated effect of the reported winds upon the flight may be calculated. The testimony indicates that it is not the practice to refer to the flight plan, while in flight, for the purpose of ascertaining the course to be flown over any given portion of the route. According to the evidence, the courses indicated on the flight log sheet are referred to for that purpose, and the flight plan is referred to principally to ascertain the previously calculated drift corrections in order to apply them to the courses shown on the flight log sheet. However, it also appears that in some cases the course indicated on the flight plan for a given portion of the flight is the course which the pilot expects to fly after reaching cruising altitude.

fact that both the captain and the first officer, and particularly the latter (who apparently prepared the flight plan), had made a substantially larger percentage of flights via Boulder City than via Las Vegas,<sup>11/</sup> it seems likely that the average course out of Boulder City was inadvertently designated in the flight plan in place of the correct average course out of Las Vegas.<sup>12/</sup>

The evidence shows that in some instances flights proceed in approximately a straight line between the extremities of a given portion of the route without following the courses of the individual sectors. Apparently such practice is customary, under certain conditions, when the result is to keep the airplane on the right side of the airway. In any instance in which a direct course is used, it is apparent that the course flown will be approximately equivalent to the average course indicated on the flight plan (if the correct average course is entered).

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<sup>11/</sup> Captain Williams had made 7 trips between Burbank and Boulder City and 2 trips between Burbank and Las Vegas. First Officer Gillette had made 37 trips via Boulder City and 6 trips via Las Vegas.

<sup>12/</sup> During the investigation other flight plans prepared by TWA pilots for flights over the route involved were examined. One was discovered in which the course designated for the Las Vegas-Daggett portion was 218 degrees, i.e., the same as the course designated in the instant case. TWA's chief pilot testified that this was obviously a mistake.

A flight proceeding from Las Vegas to Daggett by direct air line, following a magnetic course of about 210 degrees, would remain on the right side of the airway. While flight on that course, at the altitude involved, would place the airplane closer to the higher terrain of Potosi Mountain than would be the case if the on-course signal were strictly adhered to, the flight path would avoid the 8,000-foot level of the higher terrain by a distance of about 3-1/2 miles. Aside from the suggestion that flights remain within the confines of the on-course signal in the area, which obviously seems to have been ignored, there was no company regulation or instruction at the time of the accident which would prevent the use of such course. It may well be that the crew of the flight involved in the accident intended to fly that course, or a course between it and the on-course signal. If so, it is quite possible that the average course of 218 degrees, applicable to the Boulder City-Daggett route, was erroneously utilized, in assuming a heading out of Las Vegas, in the belief that it was the average or direct line course between Las Vegas and Daggett.

Except in those cases where one of TWA's flight superintendents is stationed at the point at which the flight plan is prepared, the flight plan is not checked by anyone other than the flight crew. Since there was no flight superintendent at Albuquerque, the flight plan in this case was not checked. The fact that the flight plan involved here contained such a substantial error and the fact that it was not signed by the captain indicate an urgent need for a closer watch over such irregularities.

Whatever may have been the fact with respect to the use of the flight plan course, it seems obvious that Captain Williams and First Officer Gillette were paying no more than slight attention to the position of the airplane by visual reference to objects on the ground.

Although, as previously mentioned, certain beacons on the route were inoperative due to the emergency conditions resulting from the war, one of the five beacons between Las Vegas and Silver Lake was lighted on the night of the accident. Beacon 24, also referred to as the Arden Beacon, which is located along the route about 20 miles from the Las Vegas airport, was operating. As may be seen from the map opposite page 6, this beacon is about 2-1/2 miles to the right of the center line of the Las Vegas radio range leg. Flights southwest bound out of Las Vegas should pass to the left of the beacon, but the flight involved in the accident apparently flew past on the right. In this connection it may be noted that Captain Williams' last preceding flight from Las Vegas to Burbank was made on the night of December 21, 1941, at which time Beacon 24, as well as the other beacons in the area, was unlighted. It may be that he erroneously assumed that the beacon was located directly on course and therefore assumed that he was approximately on course as he flew to the right of it. In addition to this lighted beacon, however, the lights of the town of Arden and of automobiles on U. S. Highway No. 91, and farther on, the lights of the town of Goodsprings, afforded reliable reference points. Moreover, under contact conditions such as existed on the night of the accident, if the cockpit lights are kept dimmed, it is possible to see the outline of the mountains especially when the peaks are snow-covered as they were on January 16.

Furthermore, it appears from the radio range monitor reports that the available radio range facilities were operating properly at the time of the accident. Had the captain and first officer been listening to the Las Vegas radio range, a moderate "A" signal would have been heard, which would have definitely indicated that the airplane was off course. Despite the suggestion hereinbefore mentioned that flights remain within the limits

the on-course signal in the area involved, it seems obvious that the pilots were not using the radio range for navigational purposes.

### III

#### CONCLUSION

##### Findings

We find, upon all of the evidence available to the Board at this time, that the facts relating to the accident involving aircraft NC 1946, which occurred near Las Vegas, Nevada, on January 16, 1942, are as follows:

1. The accident, which occurred at approximately 7:20 p.m. (PST) to Flight 3 of Transcontinental & Western Air, Inc., resulted in fatal injuries to the 19 passengers and crew of 3 and in destruction of the airplane.
2. At the time of the accident Transcontinental & Western Air, Inc. held a currently effective certificate of public convenience and necessity and an air carrier operating certificate authorizing it to conduct the flight.
3. Captain Williams and First Officer Gillette were physically qualified and held proper certificates of competency to perform their duties on the flight in question.
4. Aircraft NC 1946 was currently certificated as airworthy at the time of the accident.
5. The flight plan for Flight 3, filed at Albuquerque, New Mexico, designated a magnetic course of 218 degrees for the portion of the route between Las Vegas, Nevada, and Daggett, California. The average of the courses of the sectors comprising the route between Las Vegas and Daggett is about 210 degrees. 8000 feet above sea level was the altitude designated in the flight plan.

6. Flight 3 departed from Las Vegas, Nevada, at 7:07 p.m. having been cleared to fly in accordance with contact flight rules to Burbank, California.

7. About 15 minutes after departure from Las Vegas, Nevada, the airplane collided with Potosi Mountain, in the Spring Mountain Range of Nevada, at an elevation of 7,770 feet above sea level, while approximately level longitudinally and laterally and while proceeding straight ahead approximately at cruising speed. The point of impact has a magnetic bearing of approximately 215 degrees from the Las Vegas airport.

8. The airplane was flown between Las Vegas, Nevada, and the point of impact on a course which was improper for the route involved.

9. Weather conditions in the area at the time were entirely satisfactory for the flight.

10. The available radio range facilities were operating normally at the time of the accident.

11. Due to emergency conditions resulting from the war, only one beacon between Las Vegas, Nevada, and Silver Lake, California, was operating.

12. There was no evidence of structural, control system, or power plant failure prior to the accident, and the engines and propellers were functioning normally at the time the aircraft struck the mountain.

#### PROBABLE CAUSE

Upon the basis of the foregoing findings and of the entire record available at this time, we find that the probable cause of the accident to aircraft NC 1946 on January 16, 1942, was the failure of the captain after departure from Las Vegas to follow the proper course by making use of the navigational facilities available to him.

CONTRIBUTING FACTORS

1. The use of an erroneous compass course.
2. Blackout of most of the beacons in the neighborhood of the accident made necessary by the war emergency.
3. Failure of the pilot to comply with TWA's directive of July 17, 1941, issued in accordance with a suggestion from the Administrator of Civil Aeronautics requesting pilots to confine their flight movements to the actual on-course signals.

COMMENT AND RECOMMENDATIONS

The investigation of this accident has indicated the need for more precise and specific operational procedures and regulatory standards with respect to contact night flight. Accordingly, the Board has submitted the following recommendation to the Administrator:

"It is therefore recommended that the Administrator of Civil Aeronautics establish, for inclusion in the operations' manual of air carriers, such contact flight procedures at each airport as will insure that the climb to, and descent from, cruising altitude be conducted at a safe distance from all obstructions."

As further remedial measures in this regard, the Board is now considering proposed regulations which would require night contact flights to (1) remain within the confines of the proper twilight zone of the on-course signal, and (2) fly at an altitude not less than 1000 feet above the highest obstacle located within a horizontal distance of 10 miles from the center of the course intended to be flown.

The preparation of flight plans obviously should be regarded as more than mere routine. The possibility of irregularities such as the

which occurred in connection with the preparation of the flight plan involved in this instance should be eliminated. All airlines which do not now have procedures which call for an adequate check of flight plans should establish them. The company's operation manual required the captain to approve and sign the flight plan; nevertheless, the Board is considering the promulgation of a regulation which would make it a violation not to do so.

Every airline should also maintain a closer control on the determination of the gross weight and c.g. location of an airplane. If an average weight is used, either for all the passengers or for any group of passengers, it ought to be taken seriously enough to prevent the casual acceptance, on indirect information, of an intrinsically improbable figure. If the weight of the passengers is computed on an actual weight basis, it is obviously necessary that reasonable diligence be exercised by the station personnel to ascertain from the passengers their correct weights.

Approved:

/s/ L. Welch Pogue  
L. Welch Pogue

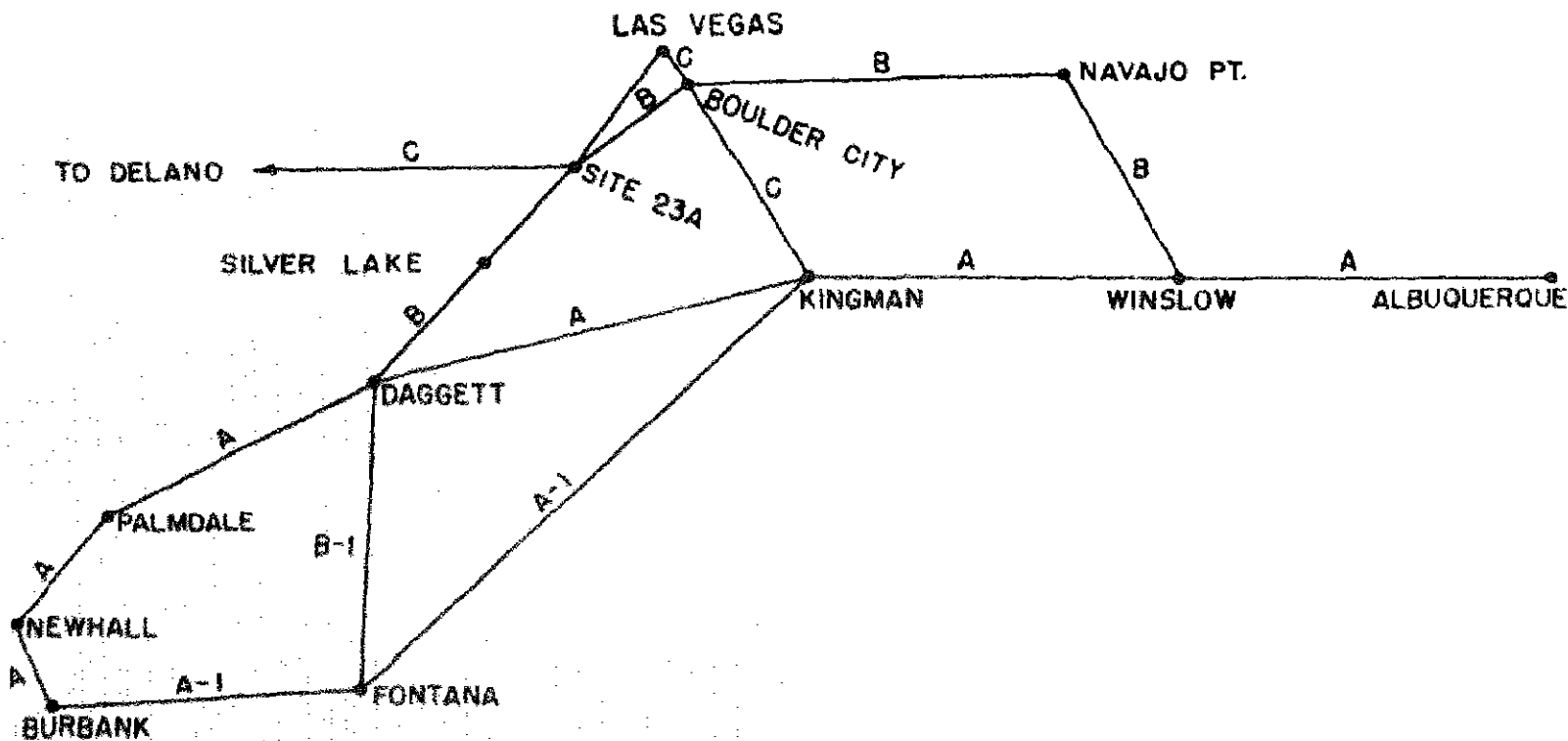
/s/ Harllee Branch  
Harllee Branch

/s/ Oswald Ryan  
Oswald Ryan

/s/ Edward Warner  
Edward Warner

Baker, Member, did not take part in the decision.





SKETCH SHOWING TWA'S ROUTES BETWEEN  
ALBUQUERQUE, NEW MEXICO AND BURBANK, CALIFORNIA

APPENDIX