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16. Abstract

Golden West Airlines, Inc., Flight 261, a De Havilland Twin Otter, and a CessnAir Aviation, Inc., Cessna 150 collided in flight near Whittier, California. The accident occurred during daylight hours, at approximately 4:07 p.m., P.s.t., January 9, 1975. Both aircraft were destroyed by the collision and subsequent ground impact. The 10 passengers and 2 crewmembers on the Twin Otter, and the instructor pilot and student pilot of the Cessna 150 were killed. Falling wreckage inflicted substantial damage to houses and lawns in the area of the collision, but there were no reported injuries to persons on the ground.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of both flightcrews to see the other aircraft in sufficient time to initiate evasive action. The Board is unable to determine why each crew failed to see and avoid the other aircraft; however, the Board believes that the ability of both crews to detect the other aircraft in time to avoid a collision was reduced because of the position of the sun, the closure angle of the aircraft, and the necessity for the Twin Otter's flightcrew to acquire visual contact with radar-reported traffic directly in front of them.

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File No. 3-1941

NATIONAL TRANSPORTATION *SAFETY* BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: August 7, 1975

GOLDEN WEST AIRLINES, INC.
DE HAVILLAND DHC-6, N6383
CESSNAIR AVIATION, INC.
CESSNA 150, N11421
WHITTIER, CALIFORNIA
JANUARY 9, 1975

SYNOPSIS

Golden West Airlines, Inc., Flight 261, a De Havilland Twin Otter, and a CessnAir Aviation, Inc., Cessna 150 collided in flight near Whittier, California. The accident occurred during daylight hours, at approximately 4:07 p.m., P.s.t., January 9, 1975. Both aircraft were destroyed by the collision and subsequent ground impact. The 10 passengers and 2 crewmembers of the Twin Otter, and the instructor pilot and student pilot of the Cessna 150 were killed. Falling wreckage inflicted substantial damage to houses and lawns in the area of the collision, but there were no reported injuries to persons on the ground.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of both flightcrews to see the other aircraft in sufficient time to initiate evasive action. The Board is unable to determine why each crew failed to see and avoid the other aircraft; however, the Board believes that the ability of both crews to detect the other aircraft in time to avoid a collision was reduced because of the position of the sun, the closure angle of the aircraft, and the necessity for the Twin Otter's flightcrew to acquire visual contact with radar-reported traffic directly in front of them.

1. INVESTIGATION

1.1 History of the Flight

Golden West Airlines, Inc., Flight 261 (GLW 261), a De Havilland Twin Otter, was a regularly scheduled passenger flight between Ontario, California, and Los Angeles International Airport, California (LAX). The flight departed from Ontario Airport at 1556 P.s.t., 1/ January 9, 1975, on a visual flight rules (VFR) flight plan to LAX with 10 passengers and 2 crewmembers aboard.

1/ All times herein are Pacific standard time, based on the 24-hour clock.

At 1604:45, GLW 261 contacted the LAX arrival radar controller and reported that they were over Rose Hills, a local landmark. The arrival controller acknowledged the transmission, stated that the flight was in radar contact 23 nmi east of the airport, assigned the flight a new transponder code, and cleared GLW 261 for a terminal control area (TCA) No. 2 arrival to runway 24 left. The flightcrew acknowledged, and 21 seconds later the flight was acquired automatically by the air traffic control's computer equipment. GLW 261's transponder showed that the altitude at computer acquisition was 2,800 ft 2/ mean sea level.

At 1605:45, the arrival controller verified that GLW 261 was leaving 2,600 ft. The controller then advised the crew that they had traffic approximately 5.5 nmi in front of them, climbing from 1,500 to 3,000 ft. The reported traffic was a police helicopter on a VFR flight. The controller stated that he would "point him [the helicopter] out again when he's a little closer, let me know when you have him in sight." At 1605:55, GLW 261 replied, "Two sixty one, we'll do it." This was the last known transmission from the flight.

At 1607:35, the arrival controller transmitted another advisory to GLW 261 stating that the helicopter was now at their 1130 position, 3 miles northbound, and 20 seconds later, repeated the same advisory.. There was no response to either transmission. About that time the controller noted the loss of the automatic radar terminal service (ARTS III) data block and track data. Repeated attempts to contact the flight were unsuccessful. Subsequent investigation revealed that GLW 261 had crashed about 17.1 nmi east of the LAX airport:

CessnAir Aviation, Inc., Cessna 150, N11421, was based at Long Beach Airport, California. The aircraft departed from the Long Beach Airport on a local training flight at 1546. An instructor and a student pilot were on board. The takeoff was made from runway 25 right, and in accordance with the Cessna pilot's request, the flight was cleared to maintain runway heading after takeoff, with a left turn after passing the Los Angeles River, about 2 nmi west of the airport. There were no further radio contacts with the crew after N11421's departure. The crew did not file a flight plan with air traffic control, nor was one required.

The exact route flown by N11421 between the Long Beach Airport and the point of collision is unknown. According to ground witnesses, the Cessna was on a northerly heading at the time of the collision.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	4	10	0
Nonfatal	0	0	0
None	0	0	

2/ All altitudes herein are mean sea level unless otherwise indicated.

1.3 Damage to Aircraft

Both aircraft were destroyed by the collision and subsequent ground impact.

1.4 Other Damage

Houses and lawns beneath and adjacent to the collision site were sprinkled with debris. The right wing and engine of the De Havilland fell on the roof of one house and caused substantial damage. Damage to other houses was not as severe.

1.5 Crew Information

The flightcrews of both aircraft were qualified for the operations which were intended. (See Appendix B.)

According to witnesses at Long Beach Airport, the student pilot was in the left seat and the instructor pilot was in the right seat of the Cessna on departure. The instructor pilot had noted on the schedule board that this was to be a No. 3 check. The No. 3 check is the final check for a student before his Federal Aviation Administration (FAA) flight check.

Witnesses reported that the instructor pilot had flown in the LAX area for many years.

1.6 Aircraft Information

The GLW 261 aircraft was a De Havilland 'Ruin Otter, N6383. It was registered, certificated, equipped, and maintained in accordance with FAA requirements (See Appendix C.) The aircraft was white, with a gold band and a red band running the length of the fuselage and encompassing the passenger windows.

CessnAir's Cessna 150, N11421, was registered, certificated, and maintained in accordance with FAA requirements. (See Appendix C.) The aircraft was painted white with a green cowl, and had green striping along the fuselage. It was not equipped with a transponder.

1.7 Meteorological Information

The 1555 surface weather observation was as follows: high, thin overcast at 25,000 ft, visibility 40 miles, temperature 60°F., dew point 19°F., wind from 320° at 7 kn, gusting to 17 kn. There were no reports of turbulence.

At the time of the accident, the position of the sun with respect to the accident site was approximately 9° above the horizon, azimuth 34° south of west (236° true).

1.8 Aids to Navigation

Postaccident ground checks of the pertinent navigational aids in use at the time of the accident disclosed that all equipment was operating properly.

The radar used to control arriving traffic was an airport surveillance radar 4 (ASR 4) located on the north side of the airport.

The radar display used by the arrival controllers was set on a 40-nmi east range. The moving target indicator (MTI) gate control was set at the 50-nmi range. ARTS III equipment was in use and functioning normally.

The ARTS III system processes the transponder beacon return from all aircraft within a specified range of the applicable radar site. The data from the beacon return consists of azimuth and range referenced to the antenna location, as well aa an encoded pressure altitude for aircraft equipped with a Mode C transponder. The azimuth and range raw data are converted into coordinates which are differentiated with respect to data receipt time to derive a groundspeed for a target. These data are presented selectively on the controller's video display. In addition, the raw data and calculated parameters for all received beacon targets are stored on a computer-generated magnetic tape.

The primary coverage (skin paints of nontransponder-equipped aircraft) capability of the radar is not affected by the ARTS III. These targets are displayed; however, they have no accompanying data block, and information concerning them cannot be stored by the computer.

A computer printout of the ARTS III data pertaining to GUJ 261 was obtained. In addition, an "Untracked Target" search was made of the computer for beacon returns received at the time of the accident both by the ASR 4 and ASR 7 radars (the ASR 7 is located on the south side of the airport and is used to control departing traffic). Since the ARTS III equipment stores only transponder data, this search could only disclose untracked transponder returns. The ASR 4 search was limited to an area 20° of either side of a 070° magnetic azimuth, and 5 nmi of either side of GLW 261's reported range. The same area was used for the ASR 7 search except that the azimuth was changed to 065° magnetic. No transponder targets were located in the search areas.

The computer printout of GLW 261's data disclosed that the elapsed time from target acquisition to the last reliable return was 1 minute 52 seconds. During that time period, GW 261 remained steady on a magnetic azimuth of 070° from the radar antenna, and descended from 2,800 ft to 2,200 ft. The flight was acquired at a range of 21.63 nmi, and the last reliable return was at 17.13 nmi. GLW 261's computed groundspeed was 150 kn.

1.9 Communications

There were no reported or known difficulties between air traffic control facilities and the aircraft involved in the accident.

The postaccident inspection of N11421's very high frequency (VHF) radio transmitter disclosed that it was tuned to the El Monte Airport tower frequency, 121.2 Mhz. The El Monte tower tapes were audited for the period of 1540 to 1611. During this period the El Monte tower received no radio transmissions from N11421.

1.10 Aerodrome and Ground Facilities

None were involved in this accident.

1.11 Flight Recorders

Neither aircraft was equipped nor required to be equipped with a flight data or a cockpit voice recorder.

1.12 Aircraft Wreckage

The wreckage of both aircraft was scattered over an 8- to 10-city block area. The fuselage of the Twin Otter fell into a schoolyard, and its wings fell to the ground two blocks from the fuselage. The fuselage of the Cessna fell into the front yard of a residence about a block and a half away from, and on a bearing of 60° from the Twin Otter's fuselage.

1.12.1 De Havilland Twin Otter, N6383

Both wings and the empennage of the Twin Otter had separated from the fuselage. The left wing leading edge sustained crushing damage from station 197 to station 222. The indentation was about 6 inches in depth, and the wing skin was both bent and torn. There was a substantial amount of green paint, matching the paint of the Cessna, in the indentation. The left wing strut was broken 76 inches below the upper pickup bolt, and the upper portion remained attached to the wing. A tire print was found on the strut; this print matched the tire tread found on the right main wheel of the Cessna. The Twin Otter's right wing damage included deep gashes near the wing root, but no paint transfer was noted at that location.

The Twin Otter's left engine nacelle, along with the engine, had been driven inboard. The engine had separated from its mounts, the nacelle structure had failed at the 42.2 station, and the engine with the engine mount still attached fell into the schoolyard about 75 ft from the fuselage. Portions of the Cessna's right side door frame were lodged between the propeller and spinner of the Twin Otter's left engine. The propeller had heavy scoring across the blades. Two blades were broken and one was bent almost 90°. A portion of one of the blades was not recovered, and

one blade tip was found lodged in the right main gear tire of the Cessna. The spinner was crushed, 'distorted, and had deposits of green paint adhering to it. The right engine remained attached to the right wing. This engine did not appear to be damaged badly. The rotor could still be turned. The propeller was scored but all the blades were intact.

The left side of the-Twin Otter's fuselage was crushed from station 111 to station 162, and some pieces from this area were not recovered. The Cessna's fire wall, instruments, and pieces of the cowl were found within the wreckage of the Twin Otter between fuselage stations 150 and 165. There was some paint transfer aft of fuselage station 165 on the left side of the Twin Otter's fuselage. The entire left side of the fuselage sustained crushing damage. The left main gear strut assembly was broken and the fuselage attach point was torn and distorted. The right main gear and strut assembly did not appear to have been damaged. The Twin Otter's altimeter read 2,240 ft with a barometric setting of 29.96 inHg.

1.12.2 Cessna 150, N11421

The Cessna 150's right wing showed evidence of propeller slash marks which cut through the wing three times. These slashes were at an angle of 88° with the leading edge of the wing. The left wing failed at the fuselage attach point. Both wings separated from the aircraft prior to ground impact. The cabin structure also bore evidence of propeller slashes.

A portion of one of the control cables from the De Havilland's overhead panel was found wrapped around the Cessna's engine and propeller.

The Cessna's instrument panel was found within the left side of the De Havilland's fuselage. The altimeter was damaged, but the setting was readable and indicated 29.95 inHg.

1.13 Medical and Pathological Information

Post-mortem examinations of the flightcrews of both aircraft disclosed no evidence of incapacitating diseases., Toxicological examinations disclosed no evidence of harmful drugs or substances.

1.14 Fire

There was no fire involved in the crash of the Twin Otter. The left wing of the Cessna caught fire in flight after the collision and burned.

1.15 Survival Aspects

This was a nonsurvivable accident.

1.16 Tests and Research

Two flight checks of the LAX ASR 4 radar were conducted on the evening of the accident. The radar was configured as it had been at the time of the accident and the MTI gate control was extended to 50 nmi. The purpose of the check was to investigate the radar's primary coverage capability. The flight check report concluded,. "The flight check results indicate there was no primary coverage in the area between LAX ILS runways 24 and 25 at 17 nmi east of the airport when the flight check aircraft was flown north to south and south to north (the presumed flight[path] of the Cessna 150) at 1,600', 2,600', and 3,000' m.s.l. It is suspected that this lack of coverage is due to tangential effect."

Tangential effect is one of the inherent limitations of the radar system when MTI gate is used. The MTI circuitry electronically cancels primary target returns that are stationary or appear to be stationary with respect to their distance from the antenna. Gating, therefore, provides the advantage of clearing an area of clutter (i.e. ground returns in heavily built-up areas) and provides better definition of moving targets, though the intensity of desired replies is reduced. A negative characteristic of the MTI is that a nontransponder-equipped aircraft flying a course within the MTI area that is tangential to the radar antenna produces an apparently stationary target return that is coincidentalwith the canceling signal of the MTI; therefore, its return may not be displayed to the controller. This phenomenon is called the tangential effect.

1.17 Other Information

1.17.1 LAX Arrival Procedures

All traffic which enters, departs, or operates within a certain area of the Los Angeles International Airport must either operate within or circumnavigate the Los Angeles TCA. The Los Angeles TCA is a Group I TCA. It is generally rectilinear in shape, extending 20 nmi west, 25 nmi east, about 10 nmi north, and about 12 nmi south of the Los Angeles International Airport. The top of the TCA is 7,000 ft, and the base varies with distance from the airport. (See Appendix E.)

At the time of the accident, arriving aircraft were landing on runways 24 and 25 left. The base of the TCA along the extended centerlines of runways 24 and 25 left was as follows: from 25 nmi to 20 nmi the base is 4,000 ft, from 20 nmi to 15 nmi it is 2,500 ft, from 15 nmi to 10 nmi it is 2,000 ft, and at 10 nmi the base drops to the surface.

Long Beach Airport lies outside the southern boundary of the TCA, and El Monte Airport is north of the TCA.

1.17.2 Letter of Agreement

Arriving IFR traffic at LAX is restricted to the TCA. VFR arrivals use three designated TCA arrival routes with designated TCA entry points

at specified altitudes. These routes are designed to permit an efficient flow of VFR traffic and to provide separation of traffic. They are used primarily by operators of small aircraft who wish to conduct VFR operations into LAX.

To accommodate the many operators in the Los Angeles area who conduct VFR operations into LAX on a routine basis, LAX tower has a Letter of Agreement (See Appendix F) which establishes routes and procedures for VFR arrivals and departures at LAX, The letter is entitled, "Abbreviated Visual Flight Rules (VFR) Arrivals and Departure Clearances Procedures." The responsibilities of all parties are outlined in the letter. The current Letter of Agreement is dated November 11, 1974, and about 17 local operators have forwarded letters of compliance to it. Golden West Airline's most recent letter of compliance is dated November 11, 1974.

On the day of the accident, GLW 261 had received a clearance for a TCA No. 2 arrival to runway 24 left. Paragraph 3(b) of the November 11, 1974, Letter of Agreement describes the TCA No. 2 arrival and states, in part: "Enter TCA at the runway 24 right localizer 10 DME fix at and maintain 1,500 feet until advised by the Los Angeles Tower." At the time of the accident, runway 24 right was closed for construction. The ILS localizer course was moved from 24 right to serve runway 24 left, so the entry point for TCA No. 2 arrival at the time of the accident was on the localizer course to runway 24 left.

1.17.3 Witnesses

Twelve witnesses who were at or near the collision site at the time of the accident were interviewed. Only two of these witnesses saw the collision. The witnesses generally agreed that both aircraft broke up in the air after the collision, that GLW 261 was onawestbound track towards LAX, and that the Cessna was on a northerly heading.

One witness stated that the large aircraft was flying "westerly along the regular flightpath which I have often observed similar type aircraft flying on previous occasions." He noted a smaller aircraft on the left side of the larger aircraft proceeding in a northerly direction. He stated that neither aircraft made any abrupt evasive maneuvers prior to the collision. He said that "the Cess? struck the left side of the Twin Otter, just back of the large plane's cockpit, and under the large aircraft's wing. The smaller plane hit it nose first." This witness also described a midair breakup, and specifically, a separation of a wing from the fuselage of the Twin Otter.

1.17.4 Aircraft Performance

The applicable Cessna 150 Owner's manual disclosed that in level flight at 2,500 ft, a power setting of 2,500 revolutions per minute

(r/min), or 68% power, would produce a true airspeed of 73.5 kn; a power setting of 2,600 r/min, or 7% power, would produce a true airspeed of 99 kn.

A GLW spokesman stated that the indicated airspeed for the Twin Otter during the descent from 2,800 ft would range from 135 to 140 KIAS.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The pilots of both aircraft were qualified for the operation involved. The investigation did not disclose any aircraft, navigational aid, or communications malfunction. Weather was not a factor.

The ARTS III computer was tracking GLW 261. The elapsed time between the automatic acquisition of GLW 261's transponder return and the last reliable target return was 1 minute 52 seconds. Automatic acquisition occurred 21 seconds after radar contact was established with the flight at 1604:45; therefore, the transponder return was lost at about 1606:58, when GLW 261 was about 17 nmi from the antenna and at 2,200 ft. The collision, therefore, occurred at about 1607 and at 2,200 ft. This altitude is confirmed by the Twin Otter's postaccident altimeter indication of 2,240 ft.

GLW 261's flightpath for the last 2 minutes of the flight was established conclusively by the *ARTS* III readout. These data disclosed that the flight was descending at about 300 ft per minute, on a magnetic course of 250°, with a groundspeed of about 150 kn. The direction of the aircraft's flight was further corroborated by witnesses.

The pattern of damage sustained by the Twin Otter supports the conclusion that the major in-flight impact forces were on its left side. The damage to the Twin Otter's left engine and propeller, and the propeller slashes found in the Cessna's right wing, indicate that the Cessna was on a crossing path, almost 90° to the Twin Otter, and slightly in front of it. Further substantiation of this analysis can be derived from the following: (1) the Cessna's firewall and instrument panel were imbedded in the Twin Otter's fuselage forward of the wing; (2) the propeller slashes in the Cessna's right wing formed an angle of about 88° with the wing leading edge; and (3) the Twin Otter's left engine nacelle and engine were driven inboard by the collision. Since the Twin Otter was on a magnetic course of 250°, its collision damage and the angle of impact support the conclusion that the Cessna was on a northerly track at and just prior to impact. The point of impact and direction of flight of both aircraft at and prior to impact were further corroborated by one of the witnesses at the accident.

The exact route of the Cessna was not established, but based upon the physical evidence of the wreckage, the testimony of witnesses, the departure point, and the location of El Monte Airport, the Safety Board concludes that the Cessna 150 was proceeding in a northerly direction beneath the TCA, and probably towards El Monte Airport.

The arrival controller stated that he did not observe any nontransponder or primary returns on his display. Since the controller had reported other traffic to GLW 261 it was obvious that he was attentive and that his attention was directed toward the display area where the Cessna's return would have appeared. One possible reason that the return did not show is that the Cessna's track was tangential to the radar antenna, and remained tangential to it during this critical time period. Since the controllers were using the MTI gate, the Cessna's tangential course could have produced a return which was cancelled out by the MTI circuitry, so that there was no video return on the controller's display. The flight tests conducted the night of the accident showed that an aircraft which followed the presumed track of the Cessna 150 in the area of the collision did not produce a primary return on the controller's display. Therefore, it seems logical to conclude that the Cessna's return did not appear on the controller's display because of the tangential effect.

Since the crew of GLW 261 could not be advised of the Cessna's presence, and the Cessna was not in contact with approach control, both aircraft were operating under the see-and-avoid concept. There were no restrictions to visibility in the Los Angeles area that afternoon.

A collision geometry study was made of this accident. Approximate sighting angles and distances were computed based upon a 90° impact angle and the estimated true airspeeds of the aircraft. True airspeeds of 94 kn for the Cessna and 146 kn for the Win Otter were used. Since only the last 2 minutes of the flight were on the ARTS III printout, only this time period was examined. Two minutes prior to the collision the aircraft were 5.73 nmi apart. The Cessna was to the left of GLW 261 at an angle of about 33°, and the Win Otter was to the right of the Cessna at an angle of about 57°. The aircraft were closing at a speed of about 174 kn, or about 294 ft per second. Because they were on a collision course there would have been no appreciable change in the relative sighting angles as the aircraft approached the collision point. The altitude differential between was about 600 ft 2 minutes prior to the collision and the Win Otter was descending at about 300 ft per minute; therefore, the Otter was about 1° above the Cessna's horizon until just prior to impact.

There was no evidence to indicate that the Cessna was in radio contact with the ground; therefore, both pilots should have been relatively free of cockpit duties and able to maintain a normal traffic scan. The Golden West Company's color scheme is basically white and red, two colors which, depending on background, can have a high degree of conspicuity.

However, the closure angle placed, and kept, GLW 261 in a position that was 57° to the right of the Cessna. A pilot's scan for traffic normally will range about 45° either side of the intended track; thus, in the absence of a specific advisory, it is doubtful if either of the Cessna pilot's scan patterns would have included that part of the sky where GLW 261 was to be found. Also, the Twin Otter would have been masked by the Cessna's right wing; therefore, its pilots would not be looking in that area unless they had been alerted to the presence of traffic at that location.

The ability of the flightcrew of GLW 261 to see and avoid the Cessna was lessened by two factors. First, the Cessna, considering the elevation and azimuth of the sun, would have been positioned between GLW 261 and the sun. Thus, during the first minute of the 2-minute period under analysis, it would have been difficult if not impossible to see the Cessna against the backdrop of the setting sun.

——Second, about 1 minute 15 seconds before the collision, the controller advised GLW 261 of helicopter traffic directly in front of them and climbing past the altitudes through which they were descending. The controller also told them he would point out the traffic again when it was closer, and asked them to let him know when they had it in sight. The next advisory from the controller did not occur until after the collision. There can be no doubt that an advisory of traffic directly in front of them and climbing through their altitude would have commanded the flightcrew's attention. An advisory of this nature constituted such a clear and apparent threat to their safety that the pilots could be expected to channel their visual scan to a narrow sector directly in front of their aircraft until the traffic had been acquired visually, until they were informed the traffic was no longer a factor, or until they were satisfied that a sufficient time interval had passed to insure that they had passed the traffic. They knew that the first two eventualities had not occurred, and it does not seem logical to infer that they assumed that the latter eventuality had occurred.' The Safety Board believes that the pilots of GLW 261 had limited their visual search in an area straight ahead of them in an effort to acquire a known target that constituted a definite threat, and therefore either did not see the Cessna, or did not see it in sufficient time to institute timely evasive action.

The statement of one witness indicated that neither aircraft made any abrupt evasive maneuvers prior to the collision; therefore, the Safety Board concludes that neither flightcrew saw the other's aircraft prior to impact, or in sufficient time to attempt an evasive maneuver.

2.2 Conclusions

a. Findings

1. The pilotsofboth aircraft were properly certificated and qualified.

2. Both aircraft were properly equipped and certificated for the flight.

3. Both aircraft were outside the TCA and operating in accordance with VFR.

4. GLW 261 was on a magnetic course of 250° at 2,200 ft when the collision occurred. The time of impact was approximately 1607.

5. The Cessna was on a northerly heading at and prior to the impact, and the impact angle was about 90°.

6. The Cessna was not observed on the approach control radar, probably because of the tangential effect.

7. The angle of closure between the aircraft was such that the Twin Otter was masked by the Cessna's wing and was outside the normal scan pattern of the Cessna pilots.

8. The Cessna was between the sun and the pilots of GLW 261.

9. At the time of the accident, the pilots of GLW 261 were attempting to sight the helicopter which had been reported to them by approach control.

b. Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of both flightcrews to see the other aircraft in sufficient time to initiate evasive action. The Board is unable to determine why each crew failed to see and avoid the other aircraft; however, the Board believes that the ability of both crews to detect the other aircraft in time to avoid a collision was reduced because of the position of the sun, the closure angle of the aircraft, and the necessity for the Twin Otter's flightcrew to acquire visual contact with radar-reported traffic directly in front of them.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

John H. Reed, Chairman, and Francis H. McAdams, Member, did not participate in the adoption of this report

August 7, 1975

APPENDIX A

Investigation and Hearing

1. Investigation

The National Transportation Safety Board was notified of the midair collision by the Western Region duty officer of the Federal Aviation Administration at about 1615 P.s.t. on January 9, 1975. Several members of the Safety Board's Los Angeles office proceeded immediately to the scene of the accident.

After on-scene documentation was completed, the wreckage of both aircraft was taken to the FAA hangar at the Los Angeles International Airport for more complete documentation.

The FAA, Golden West Airlines, Inc., CessnAir Aviation, Inc., De Havilland Aircraft of Canada, Ltd., Cessna Aircraft Company, and the Aircraft Owners and Pilots Association were parties to the investigation. On-scene investigation and damage documentation was completed on January 21, 1975.

2. Hearing

There was no public hearing.

APPENDIX B

Crew Information

Golden West Airlines, Inc.

Captain S. L. Rivlin

Captain S. L. Rivlin, aged 47, held Airline Transport Pilot Certificate No. 1524842 with a multiengine land rating and commercial privileges in aircraft single engine land. He had a first class medical certificate with no limitations dated December 12, 1974. He had been employed by Golden West Airlines, Inc., since 1969. His last 6 months' proficiency check was completed satisfactorily on August 10, 1974. He had a total of 9,366 hours with 2,774 hours in the De Havilland Otter DHC-6 aircraft.

First Officer Jon S. Teicher

First Officer Jon S. Teicher, aged 27, was employed as a first officer. He held commercial pilot certificate No. 1758596 with airplane single and multiengine land and instrument ratings. He had a first-class medical certificate, dated May 13, 1974, with no limitations. He had 2,065 hours in the De Havilland Otter as first officer. He had a total of 2,555 hours. He had been in the employ of Golden West Airlines, Inc., since July 1971, as copilot. His last 12-month check was satisfactorily completed on July 3, 1974.

CessnAir Aviation, Inc.

Mr. William Vander Linden

Mr. William Vander Linden, aged 47, was chief pilot for CessnAir Aviation, Inc. He also flew as an instructor pilot in the company's flight school. He held airline transport pilot certificate No. 1301310. He also held commercial privileges with an instructor rating in both single and multiengine land aircraft. At the time of the accident he had a total of 22,010 hours. He held a first class medical certificate dated July 1, 1974, with no limitations.

Mr. Michael J. Gordon

Mr. Michael J. Gordon, aged 25, was a student pilot. He held a student pilot certificate No. AA-4376783. He had been endorsed for student solo and solo cross-country flight. His total flying time was 42.8 hours, of which 6.6 hours were day solo time. He had no solo night time. His medical certificate was third class and dated August 7, 1974. Contact lenses were required to exercise his airman's certificate.

APPENDIX C

Aircraft Information

The Golden West Airlines, Inc., aircraft was a De Havilland DHC-6, a high-wing, 20-place twin engine aircraft. It was powered by two Pratt and Whitney PT6A-20 turbopropeller engines. It was used for air taxi operations.

The total airframe time since new was 10,092 hours. The total engine time was not reported. The time since engine overhaul for the left engine was 5,641 hours. The time since engine overhaul for the right engine was 2,117 hours. According to the operator's progressive maintenance records, 60 hours had elapsed since the last aircraft inspection. The airframe had 10,032 total hours at its last inspection, which took place on December 30, 1974.

There were no discrepancy writeups against the aircraft which would have contributed to this accident.

The CessnAir Aviation, Inc., aircraft was a Cessna 150L, a high-wing, 2-place, single engine aircraft. It was powered by a Continental O-200A engine. The aircraft was used as a VFR primary trainer by the CessnAir Aviation school.

The engine and the airframe had accumulated 780 flight hours. Neither the airframe nor the engine had been overhauled. The last inspection of N11421 was a 50-hour inspection on December 16, 1974. Total aircraft flight time at that time was 740 hours.

There were no discrepancy writeups against the aircraft which would have contributed to this accident.

APPENDIX D

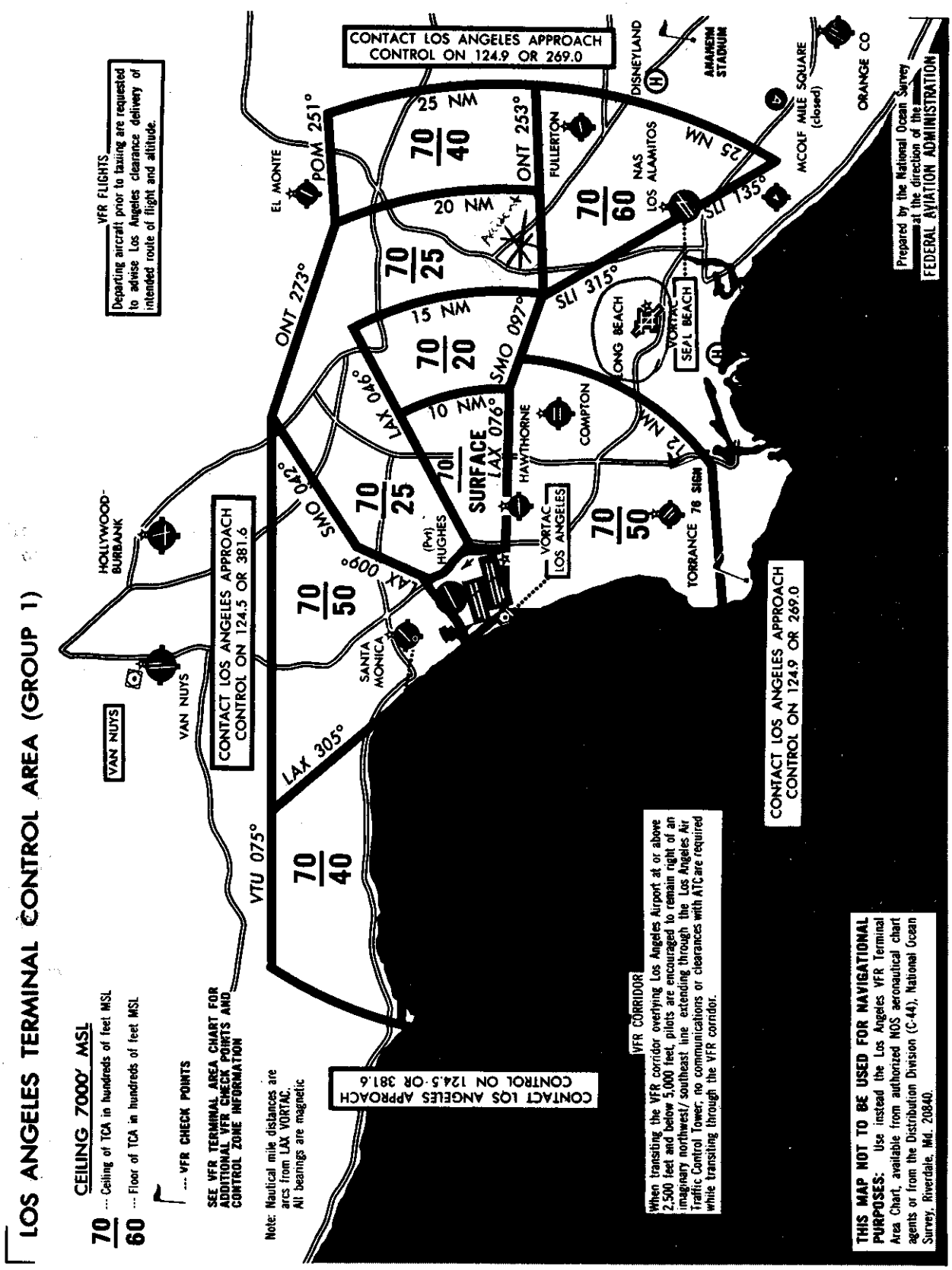
CHRONOLOGY OF COMMUNICATIONS
GOLDEN WEST COMMUTER FLIGHT 261

1604:45	GW 261	Golden West 261 - Rose Hills with Delta.
1604:50	AR-1	Golden West 261 souawk 0722 and ident. Radar contact 23 miles east of the airport. TCA number two to Runway 24 left.
1604:55	GW 261	Two four left it is - 261.
1605:45	AR-1	Golden West 261 verify leaving 2,600.
	GW 261	Right on six.
1605:50	AR-1	Roger, at ah twelve o'clock and five and a half miles is a police helicopter climbing out of 1,500 (unintelligible) three thousand VFR. I'll point him out again when he's a little closer. Let me know when you have him in sight.
1605:55	GW 261	261 we'll do it.
1607:35	AR-1	Golden West 261 that helicopter is at eleven-thirty and three miles now. Looks like he's northbound at the moment.
1607:55	AR-1	Golden West 261 that helicopter is now at eleven thirty and three miles, northbound. He's level at three thousand, VFR.
1608:05	AR-1	Golden West 261.
1608:10	AR-1	Golden West 261 Los Angeles. If you hear me ident.
1608:25	AR-1	Golden West 261 Los Angeles Approach Control how do you hear. One, two, three - three, two, one.
1608:35	AR-1	Golden West 261 radar control lost, last position observed one seven miles east of the Los Angeles Airport. If you hear me attempt contact the tower on 120.8.

APPENDIX E

TCA-12

TERMINAL CONTROL AREAS



APPENDIX F

LOS ANGELES TOWER/TRACON

LETTER OF AGREEMENT

EFFECTIVE: November 11, 1974

SUBJECT: ABBREVIATED VISUAL FLIGHT RULES (VFR) ARRIVALS AND DEPARTURE CLEARANCE PROCEDURES

1. PURPOSE. This letter of agreement establishes procedures and routes for VFR flights arriving and departing Los Angeles International Airport.

2. RESPONSIBILITY.

a. Organizations who wish to abide by the provisions of this letter, and have not already done so, may do so by forwarding a letter of compliance to the Federal Aviation Administration (FAA), Los Angeles Tower/TRACON, Los Angeles International Airport.

b. Coded VFR arrivals will be assigned by Los Angeles approach control and coded VFR departures will be assigned by Los Angeles Tower, to those VFR flights requesting the routes outlined below. Acknowledgment by a pilot will signify acceptance and compliance of a specific VFR arrival or departure including the altitude restrictions contained therein. Individual VFR arrivals or departures may be amended by Los Angeles Tower/TRACON as circumstances require. Any revision will be issued in detail.

c. The following coded VFR arrival and departures procedures are authorized for use at Los Angeles International Airport. They shall be assigned/approved by Los Angeles Tower/TRACON on a traffic permitting basis.

d. Pilots utilizing these VFR arrivals and departures shall maintain VFR conditions at all times. It shall be the pilot's responsibility to inform the Los Angeles Tower/TRACON controller exercising control jurisdiction anytime weather conditions preclude VFR flight during the entire approach of departure, whichever is applicable.

3. ROUTES.

a. TCA #1 Arrival: (Aircraft inbound to Los Angeles, south of runway 25 ILS). Cross runway 25 ILS at 1,500 feet and intercept runway 24 ILS east of the 8 DME fix direct Romeo. Enter TCA at

and maintain 1,500 feet until advised by Los Angeles Tower. Contact Los Angeles Tower 120.8 MHz. at Romeo outer marker (if assigned runways 24) or 118.9 MHz. at Lima outer marker (if assigned runways 25).

b. TCA #2 Arrival: (Aircraft inbound to Los Angeles on the runway 24 ILS or in the vicinity of El Monte). Enter TCA at the runway 24 right localizer 10 DME fix at and maintain 1,500 feet until advised by the Los Angeles Tower. Contact Los Angeles Tower 120.8 MHz. at Romeo outer marker (if assigned runway 24) or 118.9 MHz at Lima outer marker (if assigned runway 25).

c. TCA #3 Arrival: (Aircraft inbound to Los Angeles from the north or west). Enter TCA downwind north of the Marina at and maintain 2,000 feet until advised by Los Angeles Tower. Contact Los Angeles Tower as instructed by approach control. Expect right traffic for runways 25 or 24.

d. TCA #1 Departure: (Aircraft departing Los Angeles to the south), Turn left immediately after the shoreline and exit TCA one-half mile south of Los Angeles Airport unless otherwise instructed by Los Angeles Tower. Remain clear of TCA unless authorized by Los Angeles approach control or departure control.

e. TCA #2 Departure: (Aircraft departing Los Angeles to the north). Turn right immediately after the shoreline, climb and maintain 1,500 feet until exiting TCA north of Hughes Airport unless otherwise instructed by Los Angeles Tower. Remain clear of TCA unless authorized by Los Angeles approach control or departure control.

/s/ James A. Hobeger

JAMES A. HOLWEGER
Chief, Los Angeles Tower/TRACON
Federal Aviation Administration

Mr. James A. Holweger
Chief, Los Angeles Tower/TRACON
Federal Aviation Administration
5885 West Imperial Highway
Los Angeles, California 90045

Dear Mr. Holweger:

This is to inform you that pilots Golden West Airlines, Inc. (Organization) will comply with the provisions of the Letter of Agreement, subject: "Abbreviated Visual Flight Rules (VFR) Arrivals and Departure Clearance Procedures", effective November 11, 1974.

All Pilots in Golden West Airlines, Inc. (Organization) have approved and are familiar with the procedures contained in the Letter of Agreement.

Sincerely

/s/ Dennis J. Crabtree
Dennis J. Crabtree-Vice President
(Name/Title)

November 22, 1974
(Date)

Golden West Airlines, Inc.
(Organization)

APPENDIX G

PAST SAFETY BOARD RECOMMENDATIONS CONCERNING MIDAIR COLLISIONS

The Board continues to be concerned with the overall midair collision problem. The fact that this collision occurred when the visibility was virtually unlimited reemphasizes the Board's contention that the midair collision hazard is one of the most urgent and serious problems confronting civil aviation.

While the Board recognizes and commends the continuing emphasis that the FAA and other aviation organizations are providing through various programs to reduce the risk of midair collisions, the recurrence of this type of accident further illustrates the necessity to continue and to expand current efforts.

The Board, in the course of its investigations of previous midair collision accidents and special studies, has forwarded numerous recommendations to the FAA and to the aviation community designed to reduce the risk of midair collisions. These recommendations have been acted upon, in part, by the responsible agencies. However, the recurrence of midair collisions, such as this, demonstrate that many of these proposals continue to be relevant, and could provide not only added impetus to the ongoing prevention programs, but also subject matter for pilot education programs. In view of this, the Safety Board has listed certain of its earlier recommendations concerning midair collisions which seem particularly relevant and worthy of restatement at this time.

1. Undertake an educational program to make both pilots and controllers more aware of the midair collision problems, and to make pilots aware that most midair collisions occur at or near airports in clear weather and in daylight hours.

2. Establish a continuing program to assure indoctrination and continuing awareness on the part of all pilots to the midair collision potential and avoidance techniques (i.e., "see and be seen" concept, descent, turn, and climb maneuvering techniques, etc.).

3. Examine more stringently all pilot applicants for their external cockpit vigilance, with particular attention to pilots who are tested for flight instructor ratings.

4. Provide special warning and guidance to pilots who are required by the nature of their operations to fly in pairs.

5. Inform all certificated flight instructors of the high statistical significance of their involvement in midair collisions.

6. Consider the establishment of requirements for the installation and day and night operation of high-intensity white flashing lights on all civil aircraft.

7. Support the expeditious development of low-cost collision avoidance systems for all civil aircraft.

8. Develop a total midair collision prevention system approach to include training, education, procedures, ATC equipment and practices, and the development of collision avoidance systems and proximity warning instruments that are cost feasible to the general aviation community.

9. Require general aviation aircraft, when equipped, to utilize at all times both landing lights and anticollision lights during the approach and takeoff phases of operation and while operating in terminal or other high density areas.

10. After a designated date, require the daytime use of high-intensity white lights on all air carrier aircraft.

11. Develop and publish standards for visual search techniques to be used by instructors and check pilots on all training and certification check flights when pilots are operating in VMC.

12. Establish a requirement for pilots to be trained in the techniques of time sharing between visual scanning for airborne targets and cockpit duties.

13. Require that all pilots and flightcrew members be graded in scanning and time sharing techniques when training, certification, and proficiency flight checks are conducted under VMC.

14. Require that all pilots' and flightcrew members' training, certification, and proficiency check forms contain a specific item on scanning and time sharing.