



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: April 24, 2001

In reply refer to: A-01-11

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 7, 2000, at 1543 Coordinated Universal Time, the pilot of United Airlines flight 174 (UAL174), a Boeing 757 en route from Los Angeles International Airport (LAX), Los Angeles, California, to Boston-Logan International Airport, Boston, Massachusetts, reported a near midair collision (NMAC) with a United States Air Force (USAF) Lockheed F117A Nighthawk over LAX at approximately 11,000 feet.¹ UAL174 was operating under instrument flight rules as a scheduled passenger flight in accordance with 14 Code of Federal Regulations (CFR) Part 121 and was in contact with Federal Aviation Administration (FAA) controllers at the Los Angeles Air Route Traffic Center (ARTCC),² Palmdale, California. Subsequent investigation by the FAA identified the F117A as a USAF aircraft operating under visual flight rules on a training flight originating at Air Force Plant 42 airport, Palmdale, California. The F117A was not in contact with air traffic controllers, nor was it required to be. Neither aircraft was damaged, and no injuries were reported.

According to flight crew statements, after departing runway 24 at LAX, UAL174 was cleared to follow the Loop 2 departure procedure³ and climb to 15,000 feet. Aircraft using the Loop 2 departure procedure are initially in contact with Southern California (SCT) Terminal Radar Approach Control (TRACON), which is responsible for most of the airspace around LAX up to and including 13,000 feet. However, because of radar coverage limitations directly above LAX, control of Loop 2 departures is required to be transferred from SCT to Los Angeles

¹ All altitudes in this letter refer to feet above mean sea level.

² ARTCCs have responsibility for almost all controlled airspace in the United States. In areas where high concentrations of air traffic are found, ARTCCs delegate air traffic control (ATC) responsibility to terminal radar approach control (TRACON) facilities. TRACONs are normally responsible for airspace extending 30 to 60 miles from airports and up to 10,000 to 15,000 feet above sea level.

³ The Loop 2 departure procedure requires that aircraft depart to the west, then turn eastbound to cross over the LAX very high frequency omnirange (VOR) navigation transmitter at or above 10,000 feet.

ARTCC no later than when these aircraft are 5 miles west of the LAX VOR. This procedure ensures that these aircraft receive uninterrupted air traffic control (ATC) radar service but also results in Los Angeles ARTCC controllers being responsible for aircraft that are operating in SCT's airspace. In this incident, UAL174 contacted Los Angeles ARTCC when it was west of the LAX VOR and climbing through approximately 9,700 feet.

According to the captain's report of the incident, UAL174 was eastbound approaching the LAX VOR and had reached approximately 11,100 feet shortly before the airplane's Traffic Alert and Collision Avoidance System (TCAS)⁴ provided a traffic advisory followed by a resolution advisory, directing UAL 174's flight crew to descend to avoid the oncoming conflicting traffic. In response, the crew of UAL174 stopped the aircraft's climb and descended back to 10,800 feet. Examination of recorded radar data showed that UAL174 passed about 0.15 miles south of the F117A and 500 feet below it. Because the NMAC occurred below 13,000 feet, both aircraft were operating within SCT airspace.

Recorded radar information obtained from Los Angeles ARTCC and SCT shows that the USAF F117A was generating a normal transponder return and altitude readout throughout the relevant part of the flight. Automation support staff at Los Angeles ARTCC reported no problems with the radar or display systems that would have prevented either UAL174 or the F117A from appearing on the Los Angeles ARTCC controller's radar display. However, the Los Angeles ARTCC controller did not provide any traffic advisories and, in subsequent communications with the crew of UAL174, stated that he had not observed the F117A on radar. During a postincident interview, the controller stated that he did not see the F117A's target until the crew of UAL174 reported following the resolution advisory. He also stated that he did not receive a conflict alert from the ARTCC's mode C intruder⁵ conflict detection service.

The Safety Board's investigation determined that the proximity of UAL174 and the USAF F117A should have triggered a mode C intruder conflict alert, drawing the controller's attention to the two aircraft. Automation support staff at Los Angeles ARTCC confirmed that the mode C intruder software did, in fact, note the impending conflict and produce an alert about 1 minute before the NMAC occurred. It was found however, that because of a mode C intruder software function known as ARTS/Approach Control Suppression Logic (A/ACSL), the conflict alert was not displayed to the ARTCC controller in contact with UAL174.

According to FAA automation staff, A/ACSL is intended to minimize the number of nuisance alerts displayed at ARTCCs when conflicts occur between aircraft operating inside TRACON airspace. In such occurrences, the TRACON is generally responsible for resolving the

⁴ UAL174 was required by 14 CFR Section 121.356 to be equipped with TCAS. TCAS warns flight crews of other aircraft in their vicinity that may present a collision hazard by producing two types of alert: traffic advisories and resolution advisories. A traffic advisory is generated when another aircraft will pass nearby but does not present a collision hazard. A resolution advisory indicates that action is required to prevent a potential collision and directs the crew to climb or descend to avoid the conflicting traffic. Pilots are required to follow resolution advisory instructions.

⁵ Mode C intruder warns controllers when an aircraft receiving ATC radar service is predicted to conflict with other radar-observed traffic, even if the other aircraft is not under ATC control (as was the case with the USAF F117A).

conflict, so an alert need not be displayed at the ARTCC. However, the Safety Board notes that in certain cases, such as this incident, A/ACSL may inappropriately prevent a valid alert from being displayed to ARTCC controllers.

Under normal circumstances, FAA procedures require that the radar handoff process⁶ between a TRACON and an ARTCC be completed before a departing aircraft enters ARTCC airspace. Therefore, it is common for ARTCC controllers to be in communication with aircraft operating in TRACON airspace for some period of time. If a mode C intruder alert is generated during this period of time, A/ACSL will suppress the alerts at the ARTCC because the conflict is occurring in TRACON airspace even though the radar data processing system has been informed that the aircraft has been transferred to the ARTCC. The Safety Board notes that in such situations, it would be appropriate for A/ACSL to take into consideration the handoff status of the aircraft and present alerts to the ARTCC once the handoff has been completed. Although this modification may result in a greater number of alerts at an ARTCC, the Safety Board does not believe that these would constitute “nuisance alerts” since they would be routed to the controller responsible for the aircraft and would help to ensure that incidents like the NMAC described in this letter do not recur. If the controller involved in this incident had received a timely mode C intruder alert, he likely would have acted to resolve the conflict well before the TCAS advisory occurred, thereby avoiding this NMAC.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Modify air route traffic control center (ARTCC) mode C intruder software to ensure that all aircraft operating under ARTCC radar control receive full conflict alert and mode C intruder services regardless of whether they are in ARTCC, terminal radar approach control, or other airspace. (A-01-11)

Acting Chairman CARMODY and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Carol J. Carmody
Acting Chairman

⁶ The radar handoff process allows the ATC data processing systems at a TRACON and an ARTCC to exchange information about aircraft that are transitioning between TRACON and ARTCC control and to assign responsibility for these aircraft to a specific control position within the ARTCC. In the case of a departing flight such as UAL174, a TRACON departure controller assumes ATC handling of the aircraft and subsequently enters a keyboard command that causes the aircraft’s data block (which contains identity and altitude information) to be displayed at the first ARTCC sector that will handle the flight. When ready to accept ATC handling of the aircraft, the ARTCC controller makes another keyboard entry that causes the ARTCC system to take control of the flight and notifies the TRACON controller that the transfer is complete. The TRACON controller then instructs the pilot to contact the ARTCC controller.