

NATIONAL TRANSPORTATION SAFETY BOARD

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AIRCRAFT INCIDENT REPORT

TRANS WORLD AIRLINES

Boeing 707, N6729TW and

AMERICAN AIRLINES

Boeing 707, N8432

Near Phillipsburg, Pennsylvania

June 11, 1971



NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D. C. 20591

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16. Abstract A Trans World Airlines (TWA) Boeing 707, N6729TW, and an American Airlines Boeing 707, N8432, narrowly avoided a midair collision at approximately 35,000 feet near Philipsburg, Pennsylvania, on June 11, 1971, while operating within positive control airspace under the control jurisdiction of the New York Air Route Traffic Control Center. As a result of the violent evasive maneuver executed by the captain of the TWA B-707, three passengers and the flight engineer incurred minor injuries, but did not require immediate medical attention. None of the occupants of the other aircraft, whose crew was unaware of the occurrence until some time later, was injured. There was no damage to either aircraft, both of which proceeded routinely to their respective destinations. The National Transportation Safety Board determines that the probable cause of this incident was the controller's misidentification of the radar target of TW Flight 31, N6729TW, due to a transitory diversion of attention to another portion of the radar display. This resulted in inappropriate traffic control actions with respect to the American Airlines aircraft and placed the two flights on a collision course at the same altitude.					
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TRANS WORLD AIRLINES BOEING 707, N6729W
AND
AMERICAN AIRLINES BOEING 707, N8432
NEAR PHILIPSBURG, PENNSYLVANIA, JUNE 11, 1971

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WASHINGTON, D. C. 20591
AIRCRAFT INCIDENT REPORT

Adopted: December 29, 1971

TRANS WORLD AIRLINES BOEING 707, N6729W
AND
AMERICAN AIRLINES BOEING 707, N8432
NEAR PHILIPSBURG, PENNSYLVANIA, JUNE 11, 1971

SYNOPSIS

A Trans World Airlines (TWA) Boeing 707, N6729W, and an American Airlines Boeing 707, N8432, narrowly avoided a midair collision at approximately 35,000 feet near Philipsburg, Pennsylvania, on June 11, 1971, while they were operating within positive control airspace under the control jurisdiction of the New York Air Route Traffic Control Center. As a result of the violent evasive maneuver executed by the captain of the TWA B-707, three passengers and the flight engineer incurred minor injuries. None of the occupants of the other aircraft, whose crew was unaware of the occurrence until some time later, was injured. There was no damage to either aircraft, both of which proceeded routinely to their respective destinations.

The National Transportation Safety Board determines that the probable cause of this incident was misidentification by a New York Center controller of the radar target of TW Flight 31, which resulted in inappropriate control action in respect to AA Flight 151 and which placed the two flights on a collision course at the same altitude.

The Safety Board recommends that:

The Federal Aviation Administration take appropriate action to assure that all air traffic control personnel are made aware of this misidentification incident so that increased vigilance may result and serve to preclude the recurrence of similar incidents.

INVESTIGATION

Trans World Airlines N6729W, Flight 31, (TW31) was a regularly scheduled passenger flight between Philadelphia, Pennsylvania, and San Francisco, California. The aircraft departed the gate at 0930, 1/ on an instrument flight rules (IFR) clearance "as filed, 2/ Limerick four departure, flight plan route, maintain 8,000, expect Flight Level (FL) 350 after Pottstown." Takeoff was at 1002, and the flight was subsequently cleared to climb to 17,000 feet, then FL230, then FL260 on a heading of 330 degrees, then direct to Philipsburg (PSB) and on up to FL350.

As flight neared PSB it was instructed by the New York Air Route Traffic Control Center (NY CNTR) to contact Cleveland Center. At this point the first officer was flying the aircraft, and when they were about 9.5 nautical miles east of PSB in level cruise at FL350, the captain saw the first officer's windshield "fill" with an American Airlines B-707 approximately 500 feet away and slightly above, flying approximately 90° to the left of TW31's course. The captain reacted instantly by pushing forward on the yoke. He estimated that the closest point of approach of the two aircraft was 50 feet.

As a result of the evasive maneuver, three passengers and the flight engineer of TW31 incurred minor injuries.

American Airlines N8432, Flight 151 (AA151), was a regularly scheduled passenger flight between Boston, Massachusetts, and Honolulu, Hawaii, with an intermediate stop in St. Louis, Missouri. The flight departed at 0937 and was proceeding at FL350 along J49 between Hancock, N.Y., and Philipsburg (PSB) when the NY CNTR directed the flight to turn left to a heading of 190° and to change to another NY CNTR frequency. Communications were established on the new frequency at 1024 and the captain (who was handling communications while the first officer was flying the aircraft) reported turning to the new heading at FL350. He then asked whether the vector was for spacing behind traffic and, after receiving an affirmative reply, requested a clearance to climb to FL390. The controller was unable to authorize the requested altitude because of traffic "at (FL) 370 right with you."

AA151 was then cleared to proceed direct to PSB (at 1025:35) and at 1026:45 was instructed to maintain a 270° heading to intercept J78 (the planned route of flight after PSB).

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

2/ Filed flight plan route was via Limerick Four Standard Instrument Departure (SID), Penn Valley transition, direct Philipsburg, Jet Route (J) 60 Cleveland, J34 Carleton, Michigan, J584 Northbrook, Illinois, J34 Stockton, California, direct San Francisco.

At 1028, TW31 reported NY CNTR that they had nearly hit AA151. This report was the first knowledge that any of AA151's crew had of the occurrence. The flights subsequently communicated with one another on 129.5MHz., after they had changed to the Cleveland Center frequency for traffic control purposes. Both flights proceeded to their destinations without further incident.

Sector 3 of the New York Air Route Traffic Control Center was responsible for traffic control in the airspace within which this incident occurred. The personnel assigned to Sector on June 11, 1971, were: a developmental radar controller (R3T) ^{3/}, a monitor controller responsible for the actions of the developmental controller (R3M), a radar handoff controller (H3), and a sector coordinator.

ATC HANDLING OF TW31

The Cleveland Center Sector which adjoins NY CNTR Sector 3 is stratified into three layers, with each Subsector having its own set of controllers physically displaced from each of the other Subsectors. The altitudes which they control and the appropriate beacon code assignments for their traffic are:

<u>Name of Subsector</u>	<u>Altitudes</u>	<u>Code</u>
Lorain	FL350 - FL600	2300
Brecksville	FL240 - FL330	2100
Clarion	Up to and including FL230	1300

On the NY CNTR side of the boundary, the airspace from FL180 up to FL600 is all contained within Sector 3 and there are no Subsectors. The three aforementioned beacon codes are employed on the same altitude basis. Aircraft operating between FL180 and FL230 use code 1300; between FL240 to FL330, code 2100; and traffic above that level, code 2300.

At 1024:25 the NY radar handoff controller attempted a handoff of TW31 to the Cleveland Center. At that time the aircraft's target was 20 miles east of PSB. The receiving controller in Cleveland stated that he did not see the target. The radar handoff controller in NY replied that TW31 was right on the airway and his Cleveland counterpart responded: "Wait a minute, there's a guy coming on now" At that point the Cleveland Center established radar contact with TW31. At 1026:05, the NY developmental radar controller instructed TW31 to contact Cleveland Center on 133.3MHz.

^{3/} A controller in training status as far as the position to which he is assigned is concerned.

At 1026:15 TW31 contacted Cleveland's Lorain Subsector radar controller and reported at FL350. The captain then reported the near midair collision and was advised of the flight identification of the American Airlines B-707. The occurrence was reported by the Cleveland Sector coordinator to the NY CNTR radar handoff controller, who, in turn, asked that TW31 be returned to NY CNTR frequency for a minute. This was approved and the Cleveland radar controller instructed TW31, "change back to the NY CNTR on 127.95 and tell them about the evasive action you had to take. They had both airplanes."

TW31 contacted NY CNTR again at 1028:35 and, after activating the identification feature on their transponder, inquired whether AA151 had been displayed on the NY CNTR's radar. The NY CNTR replied in the affirmative. TW31 recited the events surrounding the incident and its location. The monitor controller's response was: "Yes sir, I see what happened here" At this point, he instructed AA151 to change to Cleveland Center on 133.3MHz. However, before AA151 left 127.95-MHz., TW31 asked AA151 to converse on 129.5MHz. A transcription of the ensuing conversation appears in Appendix A to this report.

ATC HANDLING OF AA151

At 1023:20, AA151 was proceeding southwestward on J49 toward PSB at FL350. Four seconds earlier TW31 had reported level at FL350 headed for PSB. The NY CNTR Sector 29 handoff controller called the NY Sector 3 controller and advised him of AA151's location and flight level, since the aircraft was approaching the inter-sector boundary. The Sector 3 controller responded that there was another aircraft at FL350 25 miles east of PSB (purportedly the position of TW31's target). The Sector 29 ^{4/} controller advised that he had no means of resolving the impending traffic conflict because of other traffic at FL310 and FL390. The Sector 3 controller suggested placing AA151 on a 190° heading (in order that the flight might be vectored to a point about 10 miles or so in trail behind TW31). He stated further that Cleveland Center would not accept aircraft at "the wrong altitude" (FL330 or FL370, utilized primarily by opposite direction traffic). This resolution of the problem was accepted by the H29 controller and an appropriate vector and frequency change was issued to AA151.

When AA151's target was at a suitable distance behind that which was believed to be TW31, AA151 was instructed to proceed direct to PSB. During the early stages of the right turn to this direct course, the two aircraft nearly collided.

^{4/} Sector 29 is adjacent to and northeast of Sector 3-PSB.

ATC HANDLING OF N940BS

N940BS was a Gulfstream II en route from Allentown, Pennsylvania, to Detroit, Michigan. At 1012:25, the New York Center Sector 3 radar handoff controller accepted a handoff of N940BS when the aircraft was 9 miles west of Allentown heading direct to Philipsburg and climbing to its flight planned cruising level of 22,000 feet (FL220). At 1015:25, N940BS contacted the Sector 3 developmental radar controller and reported leaving FL190 for FL220. During this same time period, the Sector 3 controllers were handling another westbound aircraft headed toward Philipsburg. That aircraft was TW31.

Meteorological conditions are not considered pertinent to this incident.

All radio aids to navigation utilized by the aircraft discussed in this report were operating without reported difficulty, with one exception. The Keating, Pennsylvania, VORTAC was scheduled to be shut down for maintenance from 1000 to 1600. Appropriate coordination had been effected prior to the issuance of a Notice to Airmen concerning this shutdown. The information was furnished to the assistant chief on watch at the Cleveland Center; however, he failed to pass it on to the sectors concerned with traffic destined to utilize that VORTAC.

The flight data recorder from AA151 showed no erratic or sudden deviations during the period of time in which this incident occurred. All parameter traces were recording legibly and the foil was undamaged.

TW31's flight data recorder was likewise found to be operating properly during this time period. The heading trace showed a value of $288 \pm 1^\circ$ for 1 minute prior to the commencement of the evasive maneuver. This maneuver was evidenced by a change in the vertical acceleration (g) value from a normal $\pm 1.00g$, in the negative direction to $\pm 0.02g$, then positively to TW31 $\pm 1.74g$, and subsequently back to $\pm 1.00g$. There was no change in heading value during this "push-over" maneuver.

The cockpit voice recorder (CVR) from TW31 was not examined, since it was allowed to continue to operate subsequent to the incident for the remainder of the flight to San Francisco, thereby causing all recording prior to 30 minutes before engine shutdown to be erased.

The crew of AA151, after having been made aware of the near collision as a result of conversation with TW31, pulled the circuit breaker on their CVR in order to preserve the data recorded thereon for later retrieval and examination. The CVR was removed from the aircraft at St. Louis and shipped to the Board in Washington, D. C., for examination and tape readout.

ANALYSIS

This incident is not typical of most in that the causal factors do not involve the interrelationship of man, machine, and environment. On the contrary, the sequence of events which led to a near collision was dependent upon the acts of commission and omission by men.

All of the controllers involved in the handling of the aircraft discussed herein characterized their workload as moderate. None of them had been on duty for longer than 3½ hours on June 11, 1971, and their rest periods since their last duty tour had been adequate.

The flightcrew participants in this dynamic situation had acted on the instructions or clearances issued by the controllers, which resulted in the near miss.

The failure of the Cleveland Center supervisor to relay to the cognizant sectors the data concerning the impending maintenance shutdown of the Keating VORTAC compounded the control problems. Had the controller involved been aware of this shutdown, he could have issued alternative routings to aircraft overflying Keating, or, at least, would have been aware of the reason for aircraft course deviations and inquiries in the vicinity of Keating.

There is no doubt that the NY CNTR developmental radar controller established positive identity in an appropriate manner in respect to the radar targets of TW31 and another westbound aircraft (N940BS) when they entered the east end of his Sector 3 airspace. At this point the aircraft were separated from one another geographically, with the target of closer to PSB. Their appearances on the sector frequency were within 40 seconds of one another, with both aircraft climbing, TW31 initially to FL230 and N940BS to FL220, his final altitude.

About 2 minutes thereafter, a problem arose at the western end of the sector with respect to two other aircraft. While the three Sector Controllers focused their attention on this near confliction, the "shrimboats" 5/ on TW31 and N940BS were reversed. The identity reversal can be attributed to the fact that N940BS had reached cruising altitude while TW31 was still climbing, thus creating a marked difference in ground speeds which caused N940BS to pass TW31. When the controller resumed surveillance of that portion of his display the relative positions of the targets were reversed.

He now mistakenly considered the lead target to be TW31 and the following target to be N940BS, about 12 miles in trail. Consequently, when the necessity arose to vector AA151 about 10 miles in trail behind

5/ A plastic marker used to indicate the location and identity of a radar target on a horizontal radar display.

TW31, what actually occurred was that AA151 was vectored about 10 miles behind N940BS and right across the flight path of TW31 at the same altitude.

Apart from the obvious means of preventing a recurrence of this type of hazardous situation, that is, by the constant retention of radar target identity, one is compelled to ponder what other means might be employed to avoid such mistakes in the future. Phrased differently, what might others have done to assist the Sector 3 controllers in recognizing their error? In this context, it should be borne in mind that once the identities had been reversed, with the targets more than 10 miles apart on an east-west line, the data regarding TW31's purported location which was provided to the Cleveland Center in the course of the handoff could not possibly have corresponded to the Cleveland controller's observed position of the target. Furthermore, because of the Cleveland Center's stratification and concomitant radar beacon code assignments only the targets of TW31 and AA151 would have been displayed on the CLE Lorain Subsector. The target of N940BS would have been visible only to the Clarion Subsector controller. The Lorain Subsector handoff controller should have recognized the discrepancy between the stated and observed positions of the target being pointed out as TW31, and should have refused to accept the handoff until a more accurate assessment of TW31's position was accomplished. This action, if taken, would have prevented the near miss. The ultimate responsibility for maintaining appropriate radar target identity in this instance, however, reposed with the monitor controller at the NY CNTR.

The Board has not emphasized in this report the application of the principle of "see-and-avoid," since this incident occurred at FL350, within positive control airspace. In this environment, a pilot cannot, because of operational and physiological limitations, depend on visual detection of other aircraft, albeit this case does illustrate that visual alertness helped to avoid an accident. The rationale used by the Federal Aviation Administration for the establishment of positive control airspace was based on the fact that because of these limitations to flightcrews' capabilities to "see-and-avoid," an environment must be created in which all flight operations are known to, and under the control of, air traffic control.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this incident was the misidentification by a New York Center controller of the radar target of TW Flight 31, which resulted in inappropriate control action in respect to AA Flight 151 and which placed the two flights on a collision course at the same altitude.

Recommendation

The Safety Board recommends that:

The Federal Aviation Administration take appropriate action to assure that all air traffic control personnel are made aware of this misidentification incident so that increased vigilance may result and serve to preclude the recurrence of similar incidents.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman.

/s/ OSCAR M. LAURIEL
Member

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

December 29, 1971

TRANSCRIPTION OF CVR RECORD OF VOICE COMMUNICATION BETWEEN A TRANS WORLD AIRLINES BOEING 707 (FLIGHT TW31) AND AN AMERICAN AIRLINES BOEING 707 (FLIGHT AA 151) ON ARTIC CHANNEL 129.5 MHz., FOLLOWING A NEAR MISS ON JUNE 11, 1971, NEAR PHILIPSBURG, PENNSYLVANIA, (OAK 71-I-0052)

LEGEND

AA 151 Radio transmission made by the captain of American Airlines Flight 151.
TW 31 Radio transmission made by the captain of Trans World Airlines Flight 31
() Not clearly understood

SOURCE

CONTENT

AA 151 Cleveland Center, American one five one
TW 31 This is TW thirty-one, are you on the frequency?
AA 151 Roger, TWA thirty-one, American one fifty-one
TW 31 Ok, did you, ah, did you see us, ah, by Philipsburg there?
AA 151 Negative, we didn't see you at all
TW 31 Oh man ! Ah, we had to take evasive action to avoid colliding with you---were---I guess you went right over Philipsburg didn't you.
AA 151 No we didn't. We went to the south of it
TW 31 Yeah that's ah, you were at thirty five. You see us out to ah, your right. I think we're at three o'clock to you
AA 151 Okay, we have you over at the right
TW 31 Man, if we didn't see you, ah, we'd both be down there on the, ah, -- ah terrain down below. It was ah--- pretty hairy
AA 151 Oh, that's why I couldn't understand the heading that he gave us in the first place. He turned us to one nine zero on the heading
TW 31 Yeah, okay I'm ah, I am going to make a file a near miss and you do the same, if you will. I've had one midair collision and I don't like to have another one
AA 151 Okay, this is TWA thirty-one?
TW 31 Affirmative, and it happened at, ah, ah, at, ah, let's say, ah fourteen, ah, fourteen twenty eight and we were eleven miles east of Philipsburg at flight level three five zero

Transcription (2)

SOURCE

CONTENT

AA 151 Correct

TW 31 Okay, where you guy going?

AA 151 We're going to St. Louis

TW 31 Where you based?

AA 151 Chicago

TW 31 Okay, ah, ah, I think it's the fault of the radar controllers down below and this shouldn't be. We're both transponder equipped and, ah, we've had too many midair collisions as it is

AA 151 Right

TW 31 And the (animal Hiber) says hello

AA 151 Okay

TW 31 We're based in IA

AA 151 Okay

End of conversation