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AIRCRAFT ACCIDENT REPORT

USAF CONVAIR VT-29D (CV-340) AND
CESSNA 150H, N50430
NEWPORT NEWS, VIRGINIA
JANUARY 9, 1975

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20594
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16. Abstract

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The Convair was executing a precision radar approach to Langley Air Force Base and was under the control of the Langley Ground Control Approach final controller. The Cessna was on a local pleasure flight; it was operating in accordance with visual flight rules, and was not on a flight plan.

The National Transportation Safety Board determines that the probable cause of this accident was the human limitation inherent in the see-and-avoid concept, which can be critical in a terminal area with a combination of controlled and uncontrolled traffic. A possible contributing factor was the reduced nighttime conspicuity of the Cessna against a background of city lights.

As a result of this accident, the National Transportation Safety Board made four recommendations.

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NATIONAL TRANSPORTATION SAFETY BOARD
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Adopted: June 18, 1975

UNITED STATES AIR FORCE CONVAIR VT-29D (CV-340)
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SYNOPSIS

About 1836 e.s.t., on January 9, 1975, a United States Air Force Convair VT-29D (CV-340) and a Cessna 150H collided in flight over the James River near Newport News, Virginia, at an altitude of 1,500 feet. The five crewmembers and two passengers aboard the Convair and the pilot and passenger aboard the Cessna were killed. Both aircraft were destroyed by the collision and subsequent impact with the water.

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1. INVESTIGATION

1.1 History of the Flight

United States Air Force (USAF) Convair VT-29D, (CV-340) Serial No. 52-5826, call sign Motel-32 (M-32), departed from Langley Air Force Base (AFB), Hampton, Virginia, at 0955 1/ on January 9, 1975. It was operating as an administrative flight to transport military personnel from Langley to Shaw AFB, Sumter, South Carolina, and Key Field, Meridian, Mississippi.

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

At 1520, the flight departed from Key Field on an instrument flight rules (IFR) flight plan to return to Langley AFB. The flightcrew consisted of a pilot, a copilot, a flight mechanic, and two flight attendants. There were two passengers aboard.

The en route portion of the flight was handled routinely by the Federal Aviation Administration (FAA) Air Traffic Control (ATC) facilities. About 5 nmi southwest of Cofield, Virginia, VORTAC, 2/ Washington Air Route Traffic Control Center handed M-32 off to Norfolk, Virginia, approach control. The Norfolk controllers instructed M-32 to descend to 1,500 ft. m.s.l., and vectored it toward Langley for a handoff to the Langley Ground Control Approach (GCA) unit in preparation for a precision radar approach and landing on runway 7.

The handoff from Norfolk approach control to the Langley GCA was delayed because the GCA controller was receiving only an intermittent return from the aircraft's transponder. However, the handoff was completed about 1832 when M-32 was approximately 12 to 14 nmi west of Langley. The GCA controllers stated that there had been no problems receiving transponder returns from other aircraft on the day of the accident.

The GCA approach controller's handling of M-32 was routine and at 1834 the aircraft was handed off to the GCA final controller. At this time, according to established USAF approach procedures, the crew should have completed the descent checklist, and the aircraft should have been stabilized at about 120 to 130 knots indicated airspeed (KIAS). The Convair's landing gear and landing lights would normally have remained retracted until glide slope interception at about 5 nmi from the runway.

The final controller established contact with M-32 when the aircraft was about 10 nmi from Langley. At 1834:20, he informed the flightcrew that further communication from them was no longer required, and he continued to vector the aircraft to intercept the final approach course. At 1835:09 and just prior to the 8 nmi range call, the final controller advised M-32, "Traffic at one o'clock, two miles, northwest bound." There was a response from M-32 about 5 seconds later, which, to the controller, sounded like the word "Roger."

The controller later stated that he first observed this traffic on his search radarscope. At the time he advised M-32 of its presence the traffic had not yet appeared on his precision scope. After advising M-32 of the traffic, he rotated the elevation antenna full right towards the unknown traffic and the target appeared on the elevation display of his precision scope. He estimated that the unknown traffic was at a range of about 5.5 nmi, moving away from the antenna, about 500 to 700 feet above the glidepath, and flying in a northwesterly direction. He then rotated

2/ A collocated very high frequency omnirange and ultrahigh frequency tactical air navigational aid.

the elevation antenna back to the published inbound course and to M-32's radar return.

According to the controller, when M-32 reached 8 nmi, the unidentified traffic appeared on his elevation display and shortly thereafter on his azimuth display. At 1835:25, he told M-32 that the traffic appeared "slightly higher than you on precision radar." M-32 acknowledged with "Roger." This was the last known radio transmission from the flight.

The final controller said that he suffered a slight coughing spell after the 7-mile call, therefore, he repeated the call. Immediately after the second 7-mile call the two radar targets merged on his precision scope and then disappeared. The controller informed the tower that he had lost contact with M-32.

The controller stated that the target that had merged with M-32's target was the same one he had observed on his search radarscope and had called to M-32's attention. He believed that the crew of M-32 had had the traffic in sight. After the other traffic had appeared on his precision scope, he had had both targets in view continuously until they merged. He further stated that M-32 had not intercepted the glidepath before the accident, and he believed that its radar return was at a normal position on his scope for 1,500 ft. m.s.l.

Cessna 150H, N50430, was a rented aircraft belonging to Cavalier Flyers Incorporated which is a business involving flight instruction, charter flights, and aircraft sales and rentals. Cavalier Flyers is located at Norfolk Regional Airport, a terminal-area airport located about 20 nmi southeast of Langley AFB.

According to the owner of Cavalier Flyers, the pilot of N50430 had rented the aircraft from him on several previous occasions. The owner stated that on the night of January 9, 1975, the pilot had planned a local flight of about 1 hour. He also said that the aircraft was *not* equipped with a transponder.

After performing a routine preflight inspection of N50430, the pilot and his passenger boarded the aircraft and prepared to depart. The pilot did not, nor was he required to, file a flight plan.

At 1802, N50430 departed from runway 5 at Norfolk Regional Airport on a local visual flight rules (VFR) flight. At 1803:22, N50430 requested, and was cleared for, a downwind departure from the airport traffic area. This was the last known contact with the aircraft.

The tower controller stated that N50430's navigation lights were on; however, he could'not recall having seen its anticollision light.

The collision occurred at approximately 1836, during hours of darkness, at an altitude of 1,500 feet m.s.l. and at a point about 7 miles west of the threshold of runway 7 at Langley AFB. Both aircraft fell into the shallow waters of the James River tidal flat just west of Newport News, Virginia. The Convair wreckage was located at 37° 02' 15" latitude and 76° 29' 41" longitude. The main portion of the recovered Cessna wreckage was at 37° 02' 14" latitude and 76° 29' 54" longitude.

The probable flightpaths of both aircraft as established by radar tracks are shown in Appendix D.

There was only one known witness who saw both aircraft immediately prior to the collision. This witness was aboard a fishing craft on the east side of the main channel of the James River. He said he saw an aircraft that was directly abeam of his boat and at an elevation of about 15° above the horizon. At the time he did not realize that he saw more than one aircraft; he believed that he was looking at a helicopter performing a training mission. He observed more than the normal number of aircraft lights, which were clustered in a small group. He described the lights as two flashing red beacons, one appearing above the other, with what appeared to be a row of cabin lights betweeen them. He saw what he thought was a flare which extinguished before reaching the water. Immediately thereafter, the aircraft descended vertically into the river and burst into flames. The witness did not hear any explosion either before or after impact with the water. He proceeded to the wreckage area and searched for survivors until relieved by a Coast Guard vessel.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	*6	x3	0
Nonfatal	0	0	0
None	0	0	

* Includes persons on both aircraft.

1.3 Damage to Aircraft

Both aircraft were destroyed as the result of the in-flight collision and impact into the water.

1.4 Other Damage

None.

1.5 Crew and Controller Information

The pilots of both aircraft and the GCA final controller were qualified for the operations involved. The Cessna pilot was properly

certificated by the FAA, and the military crewmembers and the GCA final controller possessed the necessary military ratings.

The Cessna pilot had about 12 hours of night-flying experience. Both Convair pilots had exceeded their semiannual night-flying requirement of 5 hours; the Aircraft Commander's night-flying time during the last 6 months prior to the accident amounted to 6.3 hours and that of the First Pilot amounted to 6.0 hours. (See Appendix B.)

1.6 Aircraft Information

Both aircraft were within their respective weight and balance limits.

Both aircraft were maintained in accordance with applicable regulations. The Cessna was properly certificated and the Convair was in compliance with the appropriate military specifications. (See Appendix C.)

1.7 Meteorological Information

A clear sky and unrestricted visibility prevailed at the time and place of the accident. There was no moon.

Pertinent surface weather observations for the Newport News area at the time of the accident were as follows:

1800 -- Clear, visibility 10 miles, temperature 54°F., dewpoint 39°F., wind calm, altimeter setting 30.06 inches.

1900 -- Clear, visibility 10 miles, temperature 50%. , dewpoint 40°F., wind calm, altimeter setting 30.10 inches.

1.8 Aids to Navigation

Aircraft proceeding to Langley AFB from the southwest on an instrument approach utilize the Cofield VORTAC, which is located about 39 nmi from Langley. Runway 7 is a primary instrument landing runway, with an inbound magnetic heading of 073°. This runway is provided with a TACAN 3/ approach capability, a full instrument landing system (ILS), and a Mobile Ground Control Approach Unit.

The only navigational aid involved in the accident was the GCA radar. The official nomenclature for the equipment at Langley is AN/NPN 13 Mobile GCA. The equipment and associated trailers are situated on the north side of runway 7-25.

All controller stations in the GCA trailers are equipped similarly. Each has two radarscopes -- a search scope and a precision scope. The

3/ TACAN - Ultrahigh frequency tactical air navigational aid.

search scope, located above the precision scope, has transponder interrogation capability, but the precision radar's capability is limited to primary radar return. 4/

At the time of the accident, the Moving Target Indicator (MTI) gate had been extended to the limits of the search radarscope. The search radar range was set at 20 nmi, and was detuned from its output capacity of 1,500 watts to 300 watts to avoid cluttering of the radarscopes. located at other bases in the area.

The precision radar elevation display has a logarithmic scale. This causes the target of an aircraft which is flying away from the antenna site at a constant altitude to appear to descend on the display. This situation probably applied to the Cessna. Conversely, M-32, flying towards the antenna at a constant altitude, would appear to climb.

The GCA unit was given a special postaccident inspection on the morning of January 10, 1975. The equipment was found to be operating within prescribed limits.

The equipment had been flight-checked and had been found satisfactory on August 23 and on October 30, 1974.

1.9 Communications

There was no indication that either flight had experienced any difficulties with communications. Personal acquaintances of the Convair crew audited the approach control recorder tapes of communications between the final radar controller and M-32; they determined that the transmissions from the Convair were made by the copilot.

1.10 Aerodrome and Ground Facilities

Not applicable.

1.11 Flight Recorders

Neither aircraft was equipped, or required to be equipped, with a flight data recorder or a cockpit voice recorder.

1.12 Aircraft Wreckage

The main wreckage of the Convair was located in the James River, 0.15 miles to the right of the approach path to runway 7 and 6.9 miles from the runway's threshold. Part of the wreckage protruded above the

4/ Primary Radar - A radar system in which a minute portion of a radio pulse transmitted from a site is reflected off an object and then received back at that site.

water and was visible from the shore. The main Cessna wreckage was located in deeper water, 0.1 miles to the right of the approach path to runway 7 and 7.1 miles from its threshold.

1.12.1 Convair Wreckage

The wreckage of the Convair was distributed on the river bottom in a circular area with an approximate diameter of 200 feet. The left engine and nose were located in craters, with the fuselage and tail progressively accordioned onto the lower wreckage. The tail had separated but remained attached to the fuselage by wire bundles and control cables. The main wreckage was oriented in a south-to-north direction.

The right horizontal stabilizer was bent aft and separated from the tail. The right elevator had separated from the stabilizer and its torque tube was bent aft. The right side of the vertical fin, the right horizontal stabilizer, and its elevator showed red paint smears.

Not all of the right outer wing was recovered. That which was recovered was fragmented extensively compared with the left wing.

The aircraft was equipped with two twin-bulb, red, 150-candlepower, Grimes rotating beacons. One beacon was located on the top of the vertical fin. The other beacon was located on centerline and on the bottom of the fuselage at station 530. These beacons were not recovered.

1.12.2 Cessna Wreckage

Despite an intensive search, only the following parts of the Cessna were recovered: the nose section from the propeller spinner aft to Station 18.5, a section of the left inboard wing containing the left fuel tank, and the undamaged right front seat.

The Cessna propeller had small nicks near the blade tips. One blade was bent forward in a gradual radius to approximately 80° from vertical. The blades did not contain any other damage such as gouges, scratches, or paint marks. The right side of the engine cowling was crushed against the right side of the engine. The forward cabin fuselage skin on the right side was completely torn open and depressed into the cabin. The right set of rudder pedals was bent toward the center of the cabin. The instrument panel, control wheels, and attaching parts were bent and pushed inward to the left side of the cabin.

The Cessna was equipped with a red, Aeroflash Signal Corporation, 150-candlepower flashing beacon. The beacon was not recovered.

1.13 Medical and Pathological Information

The bodies of the seven occupants of the Convair aircraft were recovered. Complete post-mortem examinations and toxicological tests were

made in coordination with the Armed Forces Institute of Pathology, the Virginia State Medical examiner, and the staff of the Langley USAF Base Hospital. Post-mortem examinations gave no evidence of preexisting disease' and toxicological tests were negative.

The body of the passenger in the Cessna was recovered on February 25. 1975. Post-mortem examination did not reveal any preexisting disease and toxicological tests were negative. The pilot of the Cessna had not been located as of the date of this report.

1.14 Fire

There was no evidence of fire damage to the Cessna wreckage. Fire damage to the Convair wreckage was limited to those portions of the aircraft that protruded above the surface of the water.

1.15 Survival Aspects

This accident was not survivable.

Initial search and rescue efforts were conducted by local residents and by witnesses to the accident. The Coast Guard was notified and responded immediately; it coordinated its search and rescue efforts with the Newport News Police and disaster units of Langley AFB.

1.16 Tests and Research

1.16.1 Flight Tests

A series of nighttime approaches to runway 7 were made in an Air Force Convair to determine the location of ground lights in front and to the right of the aircraft's flightpath. The purpose of these tests was to determine to what extent, if any, the city and shoreline ground lights of Newport News could have masked the Cessna's anticollision and position lights when viewed from the Convair's cockpit. Approaches were made on the runway 7 localizer course beginning at about 12 nmi and ending at 6 nmi from Langley. The aircraft maintained 1,500 feet altitude and a magnetic heading of about 070°. The observed ground lights had a mixture of hues from incandescent lights, sodium lights, and mercury lights, as well as hues of multicolored lights such as those used for advertising purposes.

A flight test to observe the primary radar returns produced by a Cessna 150 was conducted on January 16, 1975. The aircraft's radar return was monitored through left and right turns and two 360° turns in opposite directions on the final approach course at the 7 nmi range marker of runway 7. The radar returns were lost for a period of two antenna sweeps, while the aircraft was proceeding southeasterly on an outbound course of 115° from the 7 nmi range marker of the final approach

course. The loss of returns occurred about 3 nmi south of the final approach course in the area where the moving target indicator gain had been reduced to prevent "blooming" of the target. The quality of the radar return, with the exception of the losses noted above, was good throughout the entire test runs. The final controller on duty during the accident participated in the test.

1.16.2 Collision Geometry

The collision tracks of the two aircraft were reconstructed for the last 180 seconds of flight using radar plots developed from the recollections of USAF personnel who observed the Convair and the Cessna on their radar displays.

Based on the best available information, the following assumptions were made:

	Airspeed	Altitude	Magnetic Heading	Attitude
Convair	120 KIAS	1,500 ft.	080° to 070°	3° nose up
Cessna	80 KIAS	1,500 ft.	298°	level

At 1835:25, when the final controller informed the Convair crew that the traffic appeared slightly higher than the Convair on the precision radar, the tine to collision was about 26 seconds and the closure distance was about 1.3 nmi. At this time the visual sight angle from the Convair to the Cessna was about 19°, and from the Cessna to the Convair about 30°. (See Appendix G for the reconstructed collision angle and visual sight lines from each aircraft.)

Empirical data show that a pilot requires about 10 to 15 seconds to detect, track, assess, and to make a control input.

1.16.3 Visibility Study

A visibility study was conducted to determine the field of vision from each cockpit. 5/ Cockpit visibility diagrams (Appendixes E and F) show the position of each aircraft in the field of vision of the occupants of the different cockpit seats. Any movement from the fixed eye position from where the photographs were taken would affect the location of the other aircraft in the viewer's field of vision.

1.16.4 Analysis of Paint Specinens

A number of paint specimens, including paint samples from both aircraft and paint smears on the Convair, were collected and sent to the

5/ A duel lens camera was used to record a panoramic view from the design eye reference point from each cockpit seat. These binocular photographs show the field of vision of each seat occupant based on his fixed eye reference point.

National Aeronautics and Space Administration (NASA) and the Federal Bureau of Investigation (FBI) for examination.

NASA and FBI findings confirmed that a red smear on the right side of the vertical fin of the T-29 was similar to the Cessna red paint. Paint smear findings were limited and in most cases inconclusive because of the minute amount of material available for examination.

1.17 Other Information

1.17.1 Controller's Duties

The duties of a USAF controller regarding traffic advisories and vectors are set forth in Section 15 of the FAA Handbook 7110.8D, Terminal Air Traffic Control. Paragraph 1540 states that the provision of additional services is contingent upon the controller's capability to fit it into his performance of higher priority duties, and that the provision of such services is not mandatory.

Paragraph 1543 sets forth the controller's responsibility for issuing vectors to avoid conflicting traffic. The paragraph states, "Provide a vector to assist an aircraft receiving radar traffic information to avoid observed traffic only when the following conditions exist:

a. The pilot requests it.

b. The aircraft to be vectored is within the airspace for which you have control jurisdiction."

On the subject of safety advisories paragraph 1545 states:

"Issue an advisory to radar-identified aircraft whenever radar observation reveals a situation which, in your judgment, is likely to affect the safety of the aircraft."

Paragraph 1550 provides the following guidance in case of altitude conflict:

"Take whatever action you consider necessary to separate aircraft concerned if an aircraft not under radar control is known to be at an altitude and in the same general area as one being controlled."

14 CFR 91.67 states that when weather conditions permit, pilots shall maintain vigilance so as to see and avoid other aircraft, "regardless of whether an operation is conducted under instrument flight rules or visual flight rules."

1.17.2 Letter of Agreement

The coordination procedures between the Norfolk Tower and the Langley GCA are contained in a Letter of Agreement dated May 1. 1974. The letter delegates to the Langley GCA the authority and respbnsibility for conducting radar arrival service for precision/surveillance approaches to Langley, and delineates the controlled airspace within which these services can be offered.. The transfer point for the approach to runway 7 is 12 nmi from Langley, and the vectoring area is 2 nmi either side of the final approach course beginning at the approach end of runway 7 and extending southwest to a point 10 nmi on the final approach course. All handoffs are to be made at or prior to the transfer point. The evidence disclosed that M-32 had been handled in compliance with these procedures.

2. ANALYSIS AND CONCLUSIONS

Analysis

2.1 Analysis

Both aircraft were certificated, equipped, and maintained in accordance with applicable regulations and procedures. There was no evidence of preaccident failure of the structures, 'systems, or components of either aircraft.

The pilots of both aircraft were qualified for the flight. No evidence was discovered to suggest impairment or incapacitation of the Convair crew. Although the body of the pilot of the Cessna has not been recovered, background information indicates that he was physically fit at the time of the accident.

Weather was not considered a factor in the accident as the night was clear, with no meteorological restrictions'to visibility.

With regard to the sequence of events preceding the collision, only the actions of the GCA final controller can be reconstructed accurately. This controller observed the unidentified traffic on search radar, issued an advisory, repositioned the antenna to find the traffic on his precision display, refined his first advisory, positioned the antenna back to M-32, and then continued controlling M-32's final approach.

According to FAA Handbook 7110.8D, the USAF final controller's duty to provide ,additional services -- in this case traffic advisories -- was not mandatory, and was contingent upon his ability to fit it into his performance of higher priority tasks. In this instance the controller provided these additional services, not once, but twice. The only other service the controller could have afforded M-32 was to issue them avoidance vectors based on his judgment of the situation. Considering the absence of a request for avoidance vectors, the controller's belief that the M-32 flightcrew had the traffic in sight, the uncertainty about altitude differential, and the short time available to decide upon a course of

action that would resolve a conflict without the possibility of aggravating it, the controller acted in accordance with the intent of prescribed procedures.

The crew of the Convair probably had completed the descent checklist and was preparing for the before-landing checklist and the interception of the glide slope. Accordingly, the aircraft commander of the Convair, who apparently was flying the aircraft, would have been observing his instruments and relying on the other cockpit crewmembers to maintain outside vigilance.

The exact route of the Cessna from the point southwest of Norfolk Airport to the point of impact is not known. Interviews suggest that the pilot would have crossed over the James River Bridge near its northeast side and followed the brightly lit shoreline of Newport News.

The Cessna pilot did not request radar monitoring from Norfolk approach control even though his route of flight was within its area of surveillance and control. The pilot was not required to request this service, but it was available and there was no reason to assume that it would not have been provided upon request.

A number of factors in effect at the time of the collision, taken either individually or collectively, could have affected the ability of the pilots of either aircraft to detect the other aircraft and to take appropriate evasive action in time to prevent the collision. The most significant of these factors are:

1. Conspicuity of each aircraft

Both aircraft were equipped with red, green, and white position lights and red anticollision lights. However, neither aircraft was equipped nor required to be equipped with high-intensity anticollision lights which would have considerably enhanced each aircraft's conspicuity.

2. Background Lighting

The Convair would have been viewed against a fairly uniform dark background. The Cessna may have been viewed against a background which included the city lights of Newport News below the horizon, thereby reducing the Convair crew's ability to detect and track the Cessna. However, if the Cessna were climbing to the altitude of the Convair, the Cessna's lights would have been viewed entirely against the background of the city lights, which would have reduced drastically the detection capabilities of the Convair crew.

3. Cockpit Visibility

The following postulations in reference to cockpit obstructions to vision are based on each crewmember's visibility from the aircraft's design eyereference points. Any movement by the individual crewmembers' heads would result in the aircraft being viewed in different portions of the windshields.

(a) Visibility from the Convair

It is possible that cockpit structure and cockpit protuberances interfered with the copilot's detection and tracking of the Cessna. Binocular photographs show that the Cessna -- i.e., its visible lights -- could have been in the vicinity of the windshield post to the right of the Copilot's zero reference point for as long as 180 seconds prior to the collision. This assumes that the Cessna was at 1,500 feet and was maintaining a heading of 298 degrees.

From the pilot's position, the Cessna's lights could have been positioned in the lower-right portion of the windshield in the vicinity of the cup holder which is mounted on top of the glare shield.

When these computed locations for the Cessna were compared with color photographs of ground lights, it became apparent that even without any masking of the Cessna's target by cockpit structure, the Cessna's lights would have been difficult to detect against the ground lights. If masking due to cockpit structure did occur, causing only intermittent opportunities to detect and track the Cessna, the redetection and retracking of the Cessna would have been difficult, especially from the copilot's position.

(b) Visibility from the Cessna

From the passenger's position, the Convair's lights would not have been obstructed by any aircraft structure. They would have appeared slightly to the left of the aircraft's centerline.

From the pilot's position, the Convair's lights could have been masked by the windshield post to the left of the pilot. The Convair's dark background should have enhanced the probability of its detection.

4. Pilot Experience

The Convair pilots had flown more than the USAF-required night flight hours during 1974 while the Cessna pilot had about 12 hours

of total night-flying experience. Since virtually all USAF flight personnel receive training in the fixity-of-target principle which ascribes that an airborne target at the same altitude is on a collision course when its position, in the viewer's windshield, remains unchanged, it must be assumed that the Convair crew had knowledge of this principle. It could not be determined to what extent, if any, the Cessna pilot was aware of this phenomenon. Because of his low total flight time and his low total night flight time, he may have had a limited ability to detect another aircraft in a potential collision situation at night, to assess correctly the collision geometry, and then to initiate effective evasion action.

5. Pilot Response Considerations

When the Convair was initially advised of traffic, the 2-mile horizontal separation should have provided adequate time for the crew to detect, track, and assess the Cessna's target and to take appropriate evasive action to avoid a collision. If the pilot of either aircraft had detected the other as late as 10 to 15 seconds before the collision, either one probably would have had sufficient time to avoid the other. However, this in-flight collision, like so many others, contains too many unknowns to give a precise accounting of the factors that led to the collision.

It could not be determined whether the acknowledgement of the two traffic advisories indicated recognition, real or supposed, of the Cessna by the Convair crew. It is possible that the Convair crew mistook either ground lights or another aircraft as the reported Cessna. The possibility that the crew mistook one or more ground lights as the target cannot be ruled out; however, the theory that the crew saw an aircraft other than the Cessna is not supportable since there were no other aircraft known to be in that position at that time.

The possibility also exists that the Convair crew actually saw the Cessna and inaccurately estimated its altitude, its azimuth, and its rate of closure, thereby discounting it as a threat. Such inaccurate perceptions have occurred at night when lighted targets appeared further away and at different altitudes than was actually the case. On occasion, highly experienced pilots have taken evasive action when an in-flight collision seemed imminent to them, only to discover later that several hundred feet of separation existed between the aircraft. Conversely, there have been instances when pilots detected and tracked the lights of another aircraft at night, believing that sufficient separation existed, and only realizing at the last moment that evasive action was necessary to avoid a collision.

Although the approximate collision angle between the two aircraft was determined from the controller's recollection of the radar tracks, the

attitude of each aircraft at the time of impact and the exact point of initial contact could not be determined fromwreckage examination. Paint transfers and the unusual aft bending of the right horizontal stabilizer of the Convair confirmed in general that a collision occurred between the right side of the Cessna and the right side of the empennage of the Convair. The available information is insufficient to assess the possibility that one or both aircraft were engaged in evasive maneuvers which placed the aircraft in an unusual position at the time of collision.

The accident is another example of the problems created by a heterogenous mix of controlled and uncontrolled traffic in a high-density terminal area where the regulations place the burden on both crews to see and to avoid the other aircraft. The effectiveness of the see-and-avoid concept is governed by the capability and reliability of the human element; herein lies its inherent limitation.

2.2 Conclusions

(a) Findings

1. Both aircraft were certificated and maintained properly.

2. All crewmembers were qualified.

3. The Convair was operating in accordance with an IFR flight plan and was under GCA radar control.

4. The handling of the Convair by both ATC and GCA controllers was in accordance with prescribed procedures.

5. The Cessna was on a local VFR flight without a flight plan.

6. The accident occurred outside the airport control area of Langley AFB.

7. The Cessna pilot did not request and did not receive flight-following service from ATC.

8. There was no restriction to in-flight visibility in the area of the accident,

9. From the Convair, the Cessna would have been viewed against the multicolored ground lights of Newport News, thereby reducing the Cessna's conspicuity.

10. As viewed from the Cessna, the background of the Convair was uniformly dark.

11. Both aircraft were equipped with 150-candlepower lights.

12. The Cessna was the target that the final GCA controller saw approaching from the Convair's 1-o'clock position.

13. The final GCA controller gave the Convair crew *two* traffic advisories of the Cessna; these were acknowledged by the Convair crew.

14. The exact angle of impact is unknown.

15. Deformation and paint smears indicate that the right sides of the two aircraft were involved in the collision impact.

16. The Cessna could have been temporarily masked from the Convair's copilot by the windshield post and by the glare shield.

17. The Convair could have been temporarily masked from the viewofthe Cessna pilot by the windshield post to his left.

18. The Cessna pilot's ability to detect, track, and assess correctly the Convair's position could have been affected by his limited nighttime flying experience.

(b) Probable Cause

The National Transportation Safety Board determines that the probable causeofthis accidentwas the human limitation inherent in the see-and-avoid concept, which can be critical in a terminal area withacombination of controlled anduncontrolled traffic. Apossible contributing factor was the reduced nighttime conspicuityof the Cessna againstabackground of city lights.

3. RECOMMENDATIONS

As a result of this accident, the Safety Board made four recommendations. (Appendix H)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM A. HALEY
Member

June 18, 1975

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Board was notified of the accident at 1950 e.s.t., on January 9, 1975, and an investigation team was dispatched to the scene. A working group was established for operations/witnesses, air traffic control, structures/systems, and maintenance records. Special studies were also made of the human factors and the weather aspects.

Parties to the investigation were the Federal Aviation Administration, the Aircraft Owners and Pilots Association, the United States Air Force, and Cavalier Flying, Inc.

2. Hearing

A public hearing was not held.

APPENDIX B

CREW AND CONTROLLER INFORMATION

Aircraft Commander James S. Robinson

Aircraft Commander James S. Robinson, Lt. Col., USAF, aged 47, was a Command Pilot and a Standardization Evaluation Flight Examiner. He had accumulated 6,840 total flying hours, including 1,332 hours in the T-29. He completed his last proficiency check on July 3, 1974, and satisfactorily completed his last annual physical (Class II) on July 19, 1974, with no waivers.

First Pilot Henry T. McAlhaney

First Pilot Henry T. McAlhaney, Major, USAF, aged 33, was a Senior Pilot. He had accumulated 2,206 total flying hours, including 202 hours in the T-29. He completed his last proficiency check on June 17, 1974, and satisfactorily completed his last annual physical (Class II) on March 5, 1974, with no waivers.

Both pilots were instrument and night qualified in accordance with Air Force Regulations.

Flight Mechanic Leonard A. Giglio

Flight Mechanic Leonard A. Giglio, T/Sgt., USAF, aged 29, was qualified for duties as a flight mechanic on June 13, 1974. He satisfactorily completed his last physical examination (Class III) on April 17, 1974.

All flightcrew members had received adequate rest periods prior to reporting for duty on the day of the accident.

All cabin crewmembers had satisfactorily completed their prescribed training and were medically qualified for flying duty.

Pilot Bruce David Pollock

Pilot Bruce David Pollock, Seaman E-1, USN, aged 19, held a private pilot certificate No. 188-46-0363, with ratings in airplane single engine land aircraft. According to the operator of Cavalier Flyers, Inc., Mr. Pollock had approximately 195 total flying hours of which over 12 hours were at night. His third class medical certificate was issued on June 26, 1973, with no limitations.

Interviews with personnel associated with Mr. Pollock were conducted, and it was noted that the track of his flight route between Norfolk and Newport News would normally pass over the northeast side of the James

River Bridge adjacent to the shoreline of Newport News. No other facts that could be considered significant to the accident were found,

Controller William C. Nelson

The GCA final controller, Staff Sergeant William C. Nelson, USAF, aged 28, possessed an FAA control tower operator certificate No, 146406139, with the following limitation, "Langley AFB, Va., GCA only." Sergeant Nelson was a supervisory level controller. He had 3 years' experience as a GCA controller, of which 2 years were at Langley AFB.

Sergeant Nelson had been off duty about 48 hours prior to reporting for duty on the day of the accident.

APPENDIX C

AIRCRAFT INFORMATION

1. United States Air Force Convair VT-29D (CV-340), S/N 52-5826

Convair S/N 52-5826, was owned and operated by the U. S. Air Force. The last major inspection was performed on September 4, 1974, at 14,304.1 hours. At the time of the accident it had been flown about 14,473 hours.

The maintenance records indicated the aircraft was continuously maintained in accordance with United States Air Force rules and regulations.

The aircraft was equipped with two Pratt & Whitney Model R-2800-99W engines and two Hamilton Standard Model 43E60-53 propellers. Powerplants identification and overhaul data as of January 9, 1975, were as follows:

Engines

Position	Serial Numbers	Time Since Overhaul
1	NK510661	498.8
2	NK511014	1,218.4

Propellers

1	N191045	953.7
2	N174907	1,269.6

2. Cavalier Flyers, Inc., Cessna 150H, N50430

Cessna N50430 was owned and operated by Cavalier Flyers, Inc., Norfolk, Virginia. It had been flown about 3,224 hours at the time of the accident.

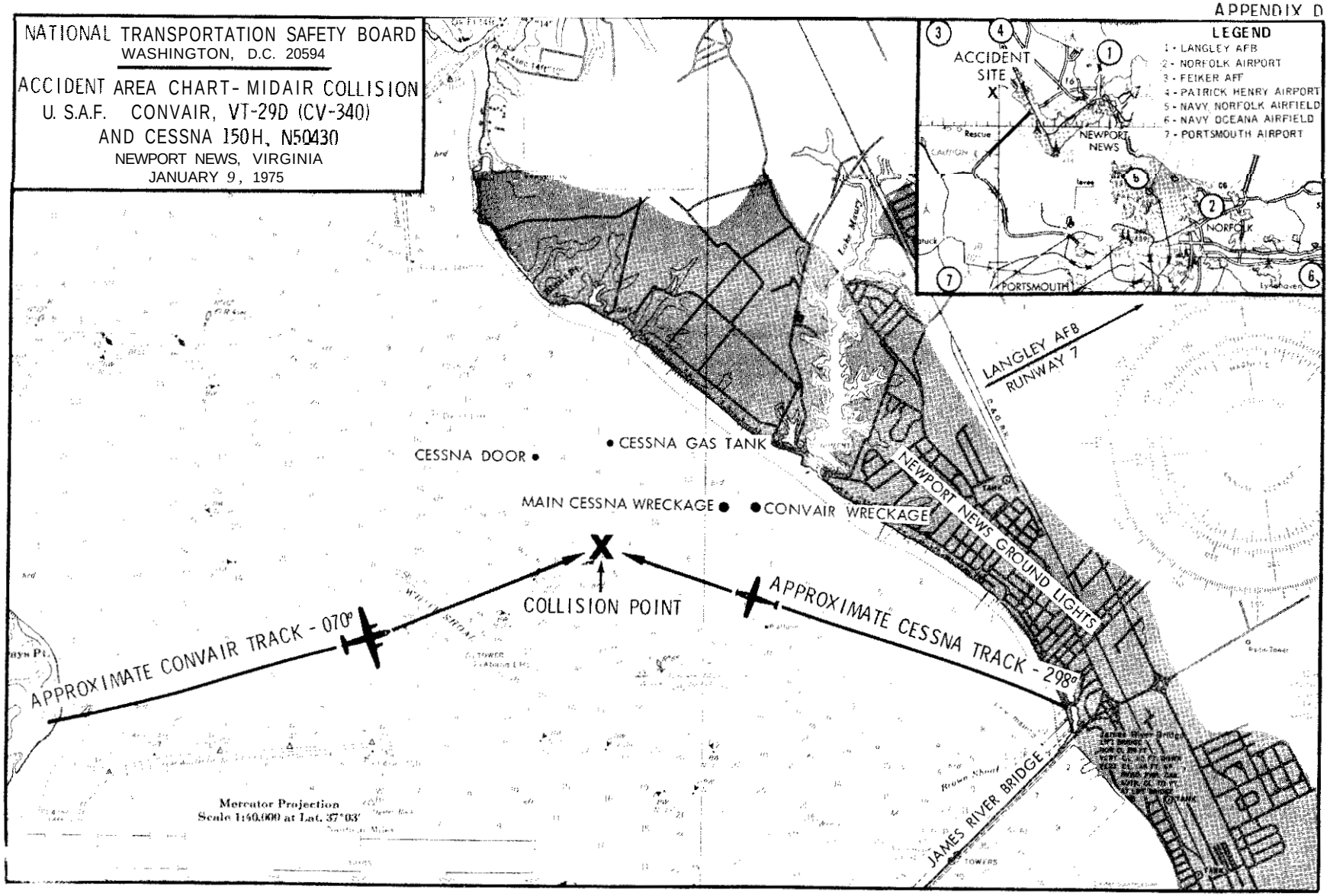
The last major inspection was a combined annual and 100-hour inspection which was performed on October 9, 1974, at 3,157.0 hours.

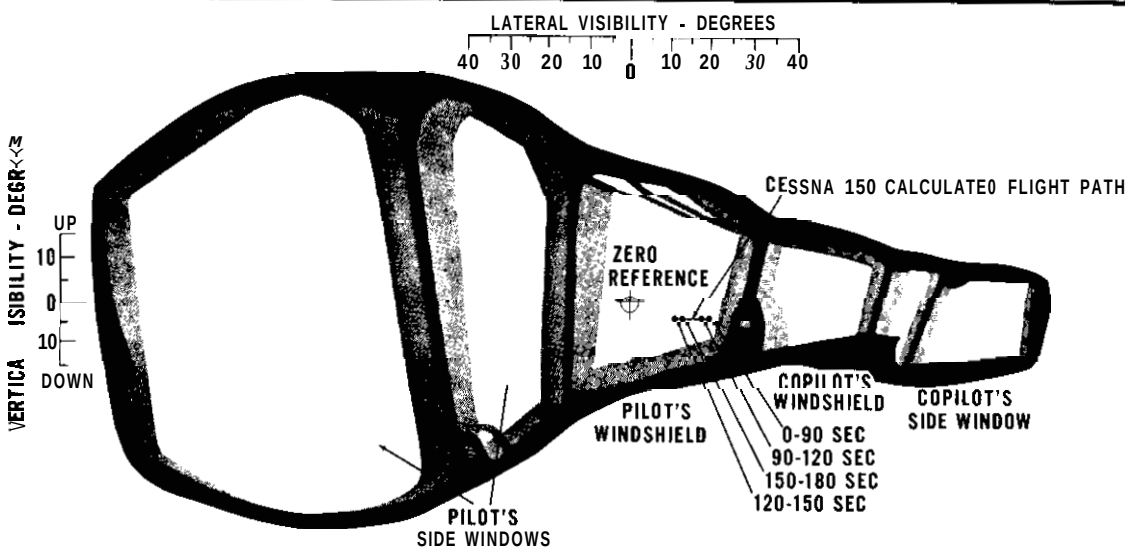
The maintenance records indicated the aircraft was continuously maintained in accordance with FAA rules and regulations. The records also indicated that the aircraft had complied with all applicable Airworthiness Directives.

The aircraft was equipped with a Continental Model 0-200-A engine, Serial No. 63741-6-A, with a total time since overhaul of 1,411.5 hours, and with a McCauley Model 1A100 propeller, Serial No. F3154, with a total time of about 3,224 hours since overhaul.

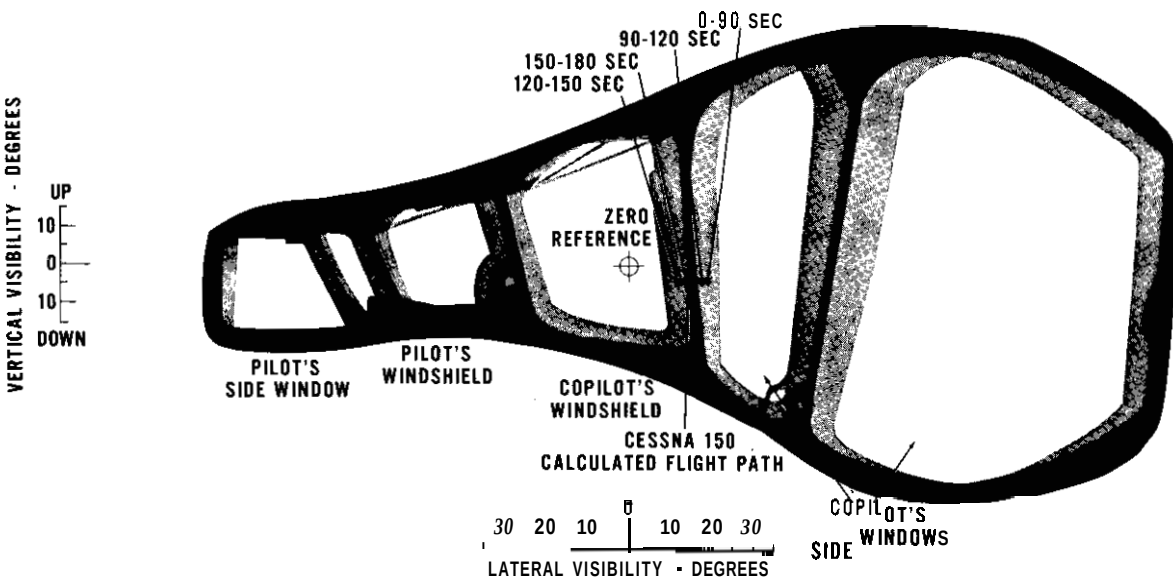
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

ACCIDENT AREA CHART - MIDAIR COLLISION
U. S.A.F. CONVAIR, VT-29D (CV-340)
AND CESSNA 150H, N50430
NEWPORT NEWS, VIRGINIA
JANUARY 9, 1975





T-29 LEFT SEAT VISIBILITY FROM PILOT'S DESIGN EYE REFERENCE POINT

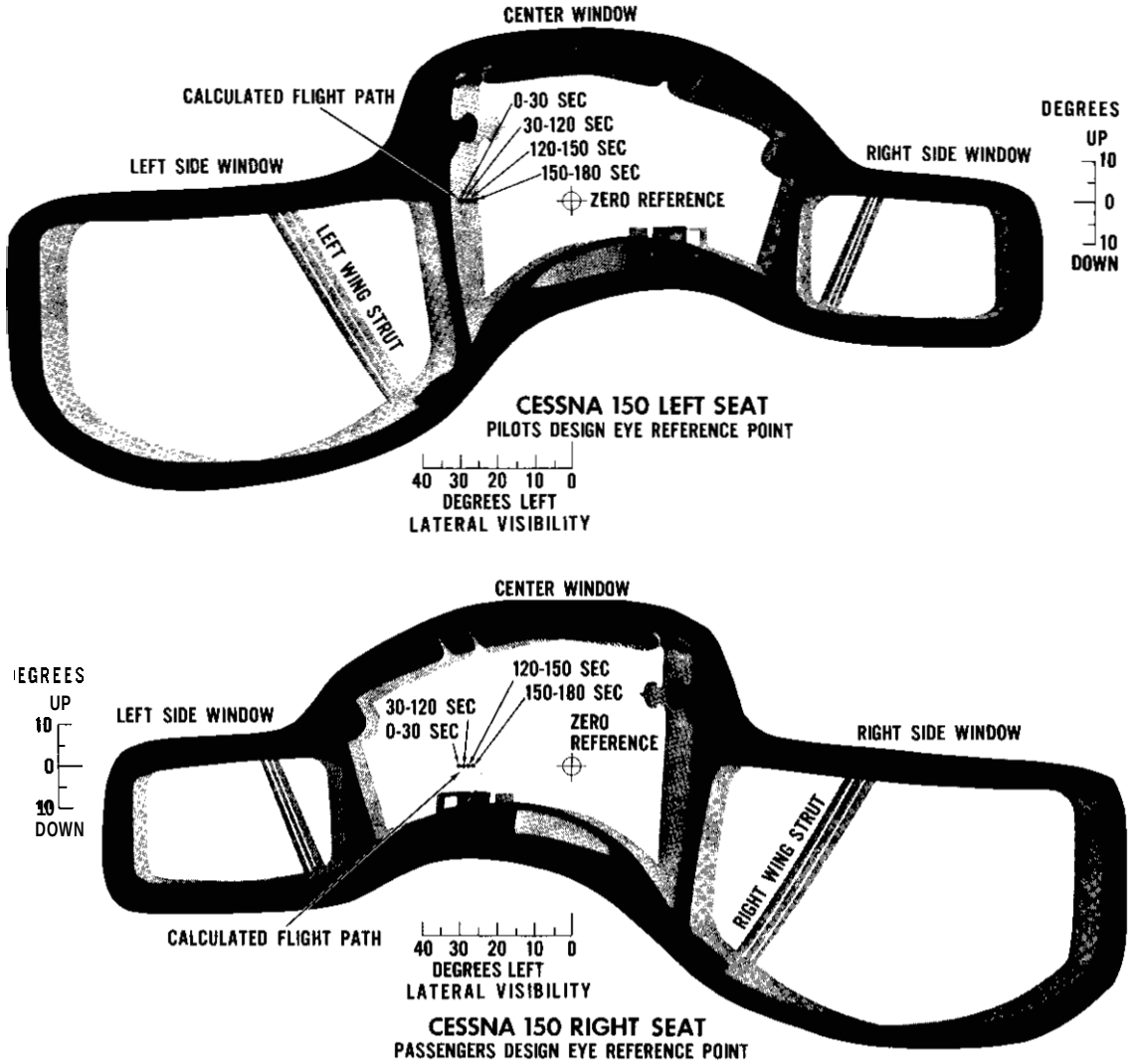


T-29 RIGHT SEAT VISIBILITY FROM COPILOT'S DESIGN EYE REFERENCE POINT

NOTE:
BLACK AREAS REPRESENT OBSTRUCTED VISION
SHADED AREAS REPRESENT MONOCULAR VISION ONLY
CLEAR AREAS REPRESENT BINOCULAR VISION

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

COCKPIT VISIBILITY - T-29
USAF T-29 AND CESSNA 150
NEWPORT NEWS, VIRGINIA
JANUARY 9, 1975

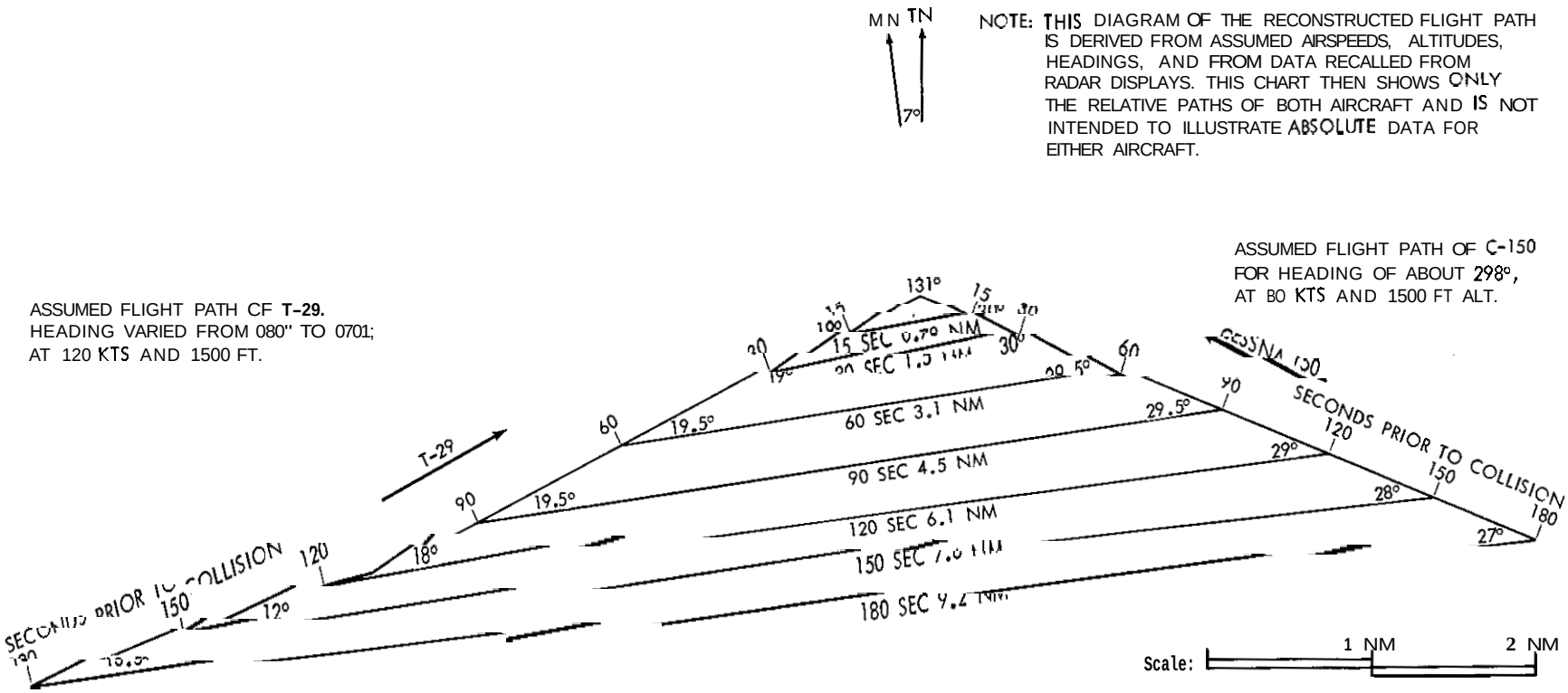


NOTE: BLACK AREAS REPRESENT OBSTRUCTED VISION
SHADED AREAS REPRESENT MONOCULAR VISION
ONLY CLEAR AREAS REPRESENT BINOCULAR VISION

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

COCKPIT VISIBILITY - CESSNA-150
USAF T-29 AND CESSNA 150
NEWPORT NEWS, VA.
JANUARY 9 1975

APPENDIX *G*



RECONSTRUCTION OF PROBABLE FLIGHT PATHS INFLIGHT COLLISION USAF T-29 AND CESSNA 150

NEWPORT NEWS, VIRGINIA

JANUARY 9.1975

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

APPENDIX H

ISSUED: April 25, 1975

Forwarded to:

Mr James E. Dow
Acting Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-75-35 thru 38

The National Transportation Safety Board is continuing its investigation of the midair .collision between a Cessna-150H and a USAF T-29D at Newport News, Virginia, on January 9, 1975. Thus far, the investigation has disclosed that the Cessna was on a local VFR flight, that the pilot had not filed a flight plan, and that he was not, at the time of the accident, in radio contact with any air traffic control (ATC) facility. The T-29 was on its final approach to Langley Air Force Base, and was under the control of the ground control approach (GCA) final controller. The final controller had issued two traffic advisories concerning the Cessna to the T-29's flightcrew. Although it was dark, the weather was clear, and the reported visibility was 7 miles. Despite these facts, there is no conclusive evidence to indicate that either pilot saw the other's aircraft.

The Safety Board believes that this accident again points out the hazards of an IFR-VFR traffic mix, and the inadequacies of the "see and avoid" concept in terminal areas, in which moderate to heavy traffic exists. The very nature of operations within a terminal area defeats the viability of the "see and avoid" doctrine since the flightcfew in at least one, or possibly both, aircraft become involved with the duties and problems of landing. Within these areas, aircraft must be protected, and the only method is the control of traffic by the air traffic control system.

The Tidewater area around Norfolk, Virginia, should have a terminal control area. There are six major civil and military airports within 35 nmi of each other: Norfolk Regional Airport, Patrick Henry Airport, Oceana Naval Air Station, Norfolk Naval Air Station, Langley Air Force Base, and Felker Army Airfield. Numerous general aviation airfields are situated throughout the Tidewater area. These fields generate a traffic mix ranging from small general aviation aircraft, helicopters, and air carrier aircraft (both prop-jet and turbine), to the various tactical aircraft of the military.

APPENDIX H

Honorable James E. Dow 2

During 1974, there were 205,600 IFR operations in the Tidewater area. Based on data compiled by the Langley Air Force Base Air Traffic Control Board, the Safety Board has estimated that the combined IFR and VFR operation in this area totaled about 709,000, and that these will increase to about 886,000 in 1975.

The Safety Board believes that the traffic situation in the Tidewater area and at Langley Air Force Base requires corrective action to avoid a recurrence of such midair collisions. We also believe that the nature of the traffic mix and the volume of the traffic within the Tidewater area warrant the establishment of a terminal control area which would encompass the area's major airfields. Therefore, the Safety Board recommends that the Federal Aviation Administration:

1. Establish a Group II traffic control area to encompass the following airports in the Tidewater area: Oceana Naval Air Station, Norfolk Naval Air Station, Norfolk Regional Airport, Langley Air Force Base, Patrick Henry Airport, and Felker Army Airfield. Should this prove impractical, we recommend that the FAA and Department of Defense (DOD) Joint Review Group coordinate and establish a Terminal Radar Service Area (TRSA), similar to the one in Sacramento Valley, California, which will encompass the Tidewater area. (Class II)

2. Extend the approach gates to runways 7-25 at Langley Air Force Base to a distance of 12 nmi. (Class II)

The Safety Board's investigation has disclosed other areas of the military-civilian aviation interface within the U. S. wherein air traffic control procedures could be instituted in a further effort to prevent midair collisions. Therefore, the Safety Board further recommends that the FAA-WD Joint Review Group:

3. Determine which other military bases or areas require the establishment of either a terminal control area or terminal radar service area and establish them, (Class III)

4. Initate action to enable DOD to establish and maintain Group I type terminal control areas around selected military facilities. (Class III)

The Safety Board believes that these recommended procedures require no new hardware, are well within present capabilities and methodologies and, if adopted, will lower the exposure rate of both military and civil aircraft to the dangers of terminal-area midair collisions.

Our Bureau of Aviation Safety staff is available for additional discussion if desired.

REED, Chairman, McADAMS, THAYER, and BURGESS, Members, concurred in the above recommendations. HALEY, Member, did not participate.

By: John H. Reed
Chairman

Embry-Riddle

University