



# Aviation Investigation Final Report

<b>Location:</b>	Prescott, Arizona	<b>Accident Number:</b>	WPR18FA245
<b>Date &amp; Time:</b>	August 29, 2018, 20:35 Local	<b>Registration:</b>	N6500W
<b>Aircraft:</b>	Cessna P210	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Controlled flight into terr/obj (CFIT)	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The purpose of the flight was for the pilot to acquire night currency by performing practice takeoffs and landings. He initially requested to takeoff and fly the traffic pattern for the longer, 150-ft wide runway (21L), but the ground controller replied that the traffic pattern was full and offered that the pilot could use the parallel, shorter 60-ft wide runway (21R). Once airborne, the pilot did not fly a traffic pattern that paralleled runway 21R on downwind and he overshot the final approach course on his base-to-final turn. The pilot subsequently corrected his track and became aligned for runway 21R, but airplane collided with desert terrain about 1,900 ft short of the destination runway, impacting in a near level-pitch attitude with the landing gear down. The airplane impacted a berm and shortly thereafter, was destroyed by a postcrash fire.

Although visual meteorological conditions prevailed, no natural horizon and few external visual references were available during the visual approach in dark night conditions to judge height above terrain. The pilot's tasks during the approach included maintaining visual separation from the traffic on runway 21L and aligning with the much narrower runway 21R. The pilot's collision with terrain short of the runway suggests that he was experiencing the runway width illusion in which the sight picture to a narrow runway during a nighttime approach can lead pilots to believe their approach path is too high and they descend in an attempt to correct. The runway had a precision approach path indicator (PAPI) system to help pilots maintain a safe glidepath at night. The pilot's competing visual task demands including traffic and runway alignment and recency of nighttime experience may have contributed to his failure to heed this information.

Examination of the recovered wreckage did not reveal evidence of any preexisting mechanical anomalies that would have precluded normal operation of the airplane. Examination of the airplane's exhaust revealed a crack that would have likely been present during the most recent maintenance. However, although the heat exchanger contained voids, that was likely not an entry for the exhaust gases because the higher pressure of the ram air that is directed into the exchanger.

Postmortem toxicology tests identified 35% carboxyhemoglobin (carbon monoxide) in the pilot's blood. The soot deposits in his airways suggests the elevated carbon monoxide was a postcrash effect rather than occurring before the airplane collided with the ground. Therefore, it is unlikely that the effects of carbon monoxide contributed to the accident. The circumstances of the accident suggest the pilot was actively flying the airplane, indicating he was not incapacitated at the time.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's misjudgment of distance and altitude from the runway and his subsequent failure to maintain an approach path that provided clearance from the terrain due to a visual illusion in dark night conditions.

### Findings

Personnel issues	Identification/recognition - Pilot
Personnel issues	Visual illusion/disorientation - Pilot
Environmental issues	Dark - Effect on personnel
Aircraft	Altitude - Not attained/maintained

# Factual Information

## History of Flight

Approach-VFR pattern final	Controlled flight into terr/obj (CFIT) (Defining event)
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On August 29, 2018, about 2035 mountain standard time, a Cessna P210, N6500W, was destroyed when it was involved in an accident in Prescott, Arizona. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The purpose of the flight was for the pilot to acquire night currency by performing practice takeoffs and landings at the Prescott Regional Airport (PRC). He initially requested clearance from the ground controller to takeoff from runway 21L and stay in the pattern, but the controller told the pilot that the traffic pattern was full. The controller then told the pilot he could depart from and stay in the traffic pattern for 21R, which the pilot accepted.

A review of the radar track data indicated that after departure, the airplane joined a right traffic pattern for runway 21R (see figure 1). On the downwind leg, the track was not parallel to the runway and neared the approach end. The track then progressed into a long teardrop-shaped 180° turn; about 2.8 nautical miles (nm) from the approach end of runway 21R, the airplane's heading turned right toward the runway. At 2032:59 the tower controller stated to the pilot, "just verifying you're lining up for runway 21R." Four seconds later the pilot replied, "roger that, 21R, 6500W." At 2033:19 the controller told the pilot to go around.

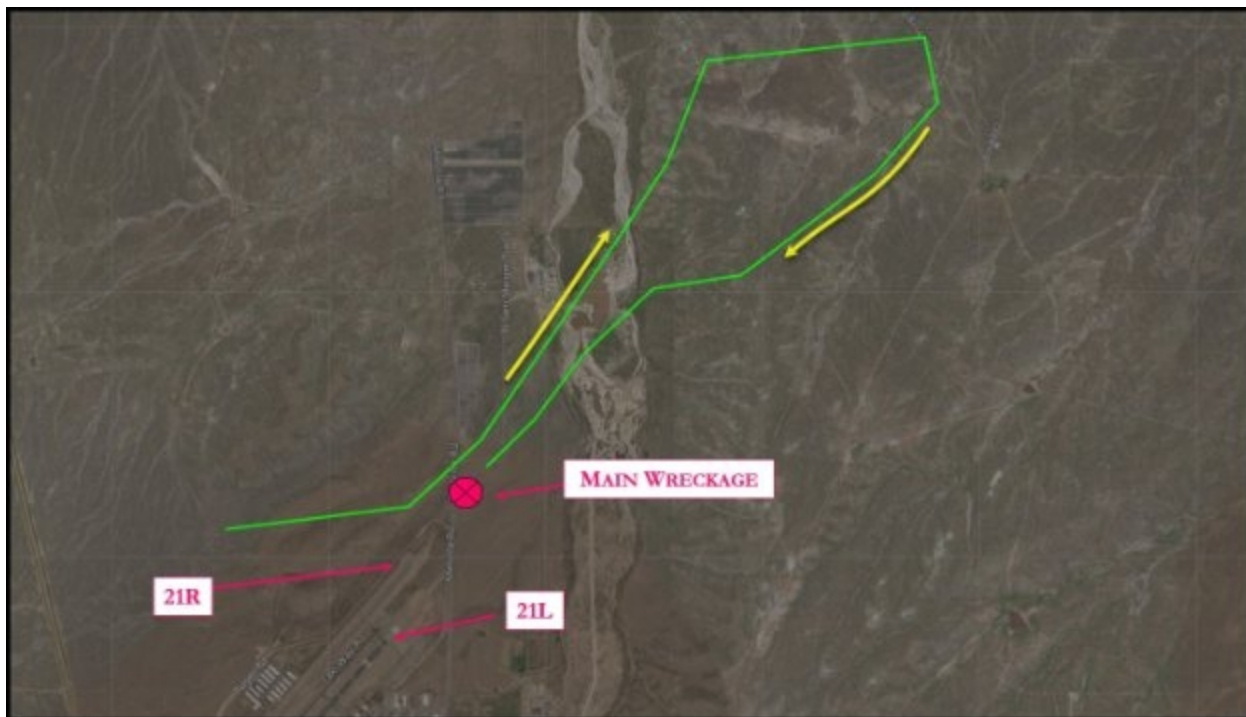


Figure 1: Radar Track

The last recorded data point was at 2034:17 and about 740 ft northeast of the accident site. At that time, the airplane was about 5,050 ft mean sea level (msl), which was about 145 ft above ground level (agl), at a ground speed of 99 kts. At 2034:24, the controller again told the pilot to go around, to which another pilot in the pattern responded that the airplane was on fire.

## Pilot Information

<b>Certificate:</b>	Airline transport; Commercial; Flight instructor	<b>Age:</b>	71, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	Unknown
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	September 18, 2017
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 2480 hours (Total, all aircraft), 32 hours (Total, this make and model), 2337 hours (Pilot In Command, all aircraft)		

The pilot had flown 32.1 hours in the accident airplane over the course of 12 flights. The pilot was based out of Prescott and recorded performing 10 landings at the airport in the accident airplane. The pilot's personal logbooks revealed that the last time he flew in nighttime conditions was in November 2017. The logbook entry indicated that the flight occurred at PRC in a Cessna 172; the total duration of the flight was 1.8 hours, of which 0.9 hours was at night.

#### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N6500W
<b>Model/Series:</b>	P210 N	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1981	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	P21000788
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	Annual	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	2211.5 Hrs at time of accident	<b>Engine Manufacturer:</b>	Teledyne Continental Motors
<b>ELT:</b>	Installed, activated, did not aid in locating accident	<b>Engine Model/Series:</b>	TSIO-520AF
<b>Registered Owner:</b>		<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

A review of the maintenance records revealed that, on July 24, 2018, the airplane underwent maintenance for the air conditioning system and the vacuum pumps at a tachometer time of 2,210.8 hours.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Night/dark
<b>Observation Facility, Elevation:</b>	KPRC, 5052 ft msl	<b>Distance from Accident Site:</b>	1 Nautical Miles
<b>Observation Time:</b>	03:53 Local	<b>Direction from Accident Site:</b>	215°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	190°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.17 inches Hg	<b>Temperature/Dew Point:</b>	20°C / 7°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Prescott, AZ (PRC )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Prescott, AZ (PRC )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	20:30 Local	<b>Type of Airspace:</b>	

According to the U.S. Naval Observatory, Department of Astronomical Applications, the phase of the moon was waning gibbous (just past full) with 87% of the moons visible disk illuminated. Sunset was at 1859 and civil twilight was at 1925. Moonrise was at 2105 and at the time of the accident the moon was about 7.4° below the horizon (including refraction) on an azimuth (heading) of 82°.

## Airport Information

<b>Airport:</b>	Ernest A Love Field PRC	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	5045 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	21R	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	4846 ft / 60 ft	<b>VFR Approach/Landing:</b>	Traffic pattern

Runway 21R was 4,846 ft long by 60 ft wide, and runway 21L was 7,619 ft long by 150 ft wide. The threshold for runway 21L was 1,500 ft beyond the threshold for runway 21R (see figure 2). Further, a lighted taxiway was between the two runways.





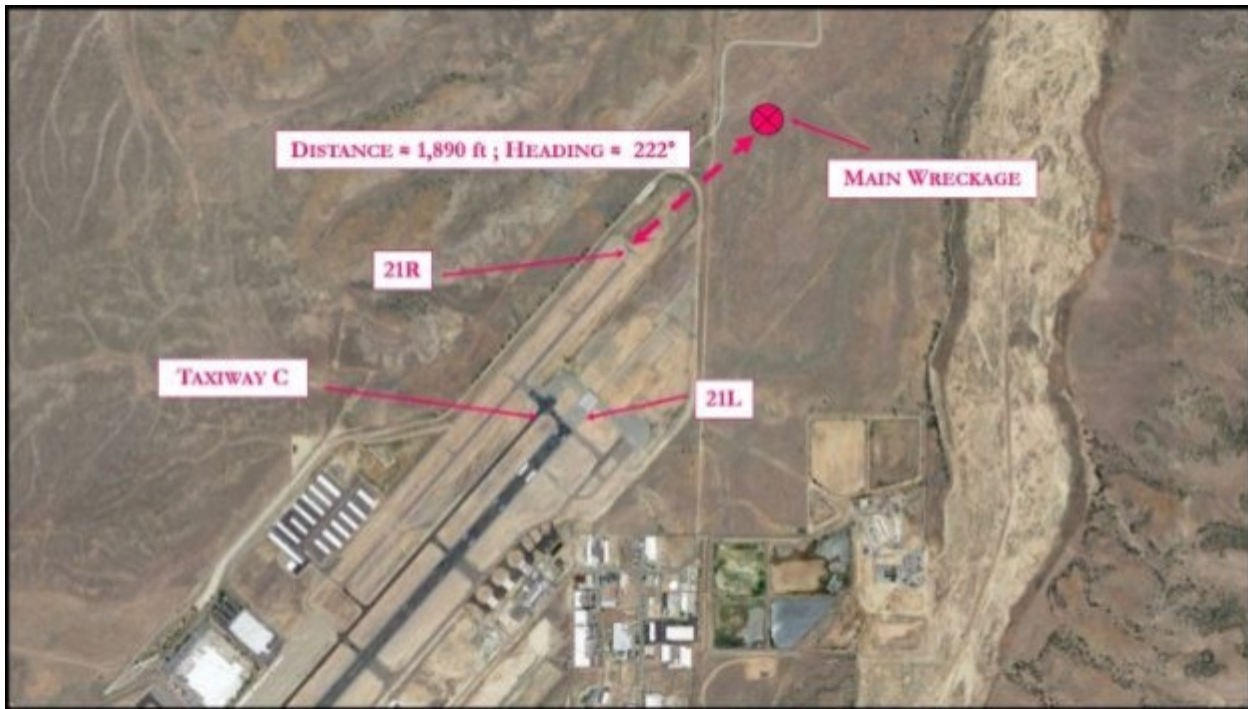
Figure 2: Airport

Runway 21R was equipped with a 2-light precision approach path indicator (PAPI) system with an approach angle of 3.00° located to the left of the runway that provided a threshold crossing height of 48 ft. The runway was equipped with medium intensity edge lights. The runway 21R threshold was at an elevation of 4,938 ft and it sloped up at 0.8% to 4,975 ft at the runway end.

### Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	34.669998,-112.40583

The accident site was located in desert terrain about 1,890 ft from the runway 21R threshold (see figure 3). The wreckage was found distributed over a 240-ft distance on a median magnetic track of about 222°.



*Figure 3: Accident Site in Reference to the Airport*

The main wreckage consisted of a majority of the airframe and engine, which came to rest on a heading of about 270°. The remaining wreckage was found adjacent to the main wreckage; it principally consisted of the outboard left wing, the nose landing gear doors, a propeller blade, and nose cowling pieces.

The first identified points of contact consisted of disrupted dirt and grass on the flat desert terrain. The markings started as two nearly parallel indentations in the vegetation and dirt, spaced about 110 inches apart continued southwest toward the main wreckage. A center indentation appeared about 96 inches down the debris field and was spaced equally between the right and left craters. The craters were consistent in size and orientation to that of the landing gear wheels.

Numerous parallel ground scars that were located perpendicular to the direction of the center indentation, consistent with propeller slashes.

The fuselage came to rest upright and was partially consumed by fire. The inboard section of the left wing still had the partially consumed aileron and wing flap control surfaces attached. The outboard section was about 10 ft from the main wreckage and consumed by fire. Flap cable continuity was established from the control surface to the cockpit area; the flap handle was in the 10° position. The flap actuator jackscrew was examined, and the exposed threads was consistent with the flaps being extended between 5° and 10°. Flap cable continuity was established from the control surface to the cockpit area. The aileron cable continuity was established from the control surfaces to the control yoke assembly.

The right wing remained affixed to the fuselage with the aileron and wing flap control surfaces still attached at their respective hinges. The outboard section had less burn than the main wreckage and fuel was found in the right-wing fuel tank. Fuel system continuity could not be established due to the amount of impact and thermal damage that the airplane sustained. Fuel was present in the left outboard



wing tank. The fuel selector valve was found in the "LEFT" position. Trace amounts of fuel were recovered from the fuel manifold.

The main landing gear up lock mechanism is in the main gear wheel well; however, the boots were burned so the condition could not be determined. The nose gear steering boots' condition could also not be determined.

The engine was intact. Investigators achieved manual rotation of the crankshaft by rotation of the crankshaft propeller flange. Thumb compression was established in all cylinders. Valve train continuity was observed, with equal lift action at each rocker assembly; oil was found in the rocker box areas on all cylinders.

Investigators removed the upper spark plugs of all cylinders; they were light gray in color. According to the Champion Aviation Check-A-Plug AV-27 Chart, these spark plug signatures corresponded to lean to normal engine operation. A borescope examination of the cylinders revealed no foreign object damage, no evidence of detonation, and no indication of excessive oil consumption. Lack of combustion deposits was consistent with low hours since overhaul and/or a lean operation.

The upper spark plugs were reattached to their respective leads and rotation of the crankshaft resulted in a visible spark at each plug; the impulse couplings were audible during rotations.

Disassembly of the fuel manifold revealed trace amounts of liquid consistent in odor to that of 100LL Avgas; there was no evidence of debris and the diaphragm was pliable. Inlet screen for the fuel metering unit was clear. The throttle body was thermally damaged. The mechanical fuel pump was intact as was the sheer shaft of the drive coupling.

The turbocharger exhibited no apparent damage and the impeller rotated freely by hand. The controller was thermally destroyed, the wastegate actuator was intact, and the respective oil lines were still attached. The vacuum pumps were removed; the vanes were all intact. Light scoring could be seen on the outside housing of both. The sheer shaft was intact.

Two of the propeller blades were in the hub, one of which was partially consumed by fire. The remaining blade was found in the debris field. The two blades that were not thermally consumed exhibited leading-edge polishing and gouges, with the tips curled aft.

The engine examination revealed that the flange on the exhaust manifold was cracked at the front crossover tube. The fracture features were consistent with reverse bending fatigue. This is a fatigue crack propagation mechanism whereby cracks initiate on opposite surfaces of a component that is being bent back and forth. The cracks propagated inward from opposite surfaces until the remaining material cross-section could no longer bear the stress, resulting in the material fracturing from overstress.

A computerized tomography (CT) scan of the heat exchanger revealed that there were several areas with significant voids. It could not be determined if these voids would create a complete gas path from one side to the other. The Cessna representative stated that even if there was a complete gas path, the pressure on the pressurization side of the heat exchanger is higher than the ram air pressure and, therefore, would leak into the side going overboard rather than being introduced into the cabin air.

## **Additional Information**

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The Federal Aviation Administration's (FAA) Airman Information Manual (AIM) addresses illusions encountered on approaches to landing in chapter 8-1-5. It states that a "narrower-than-usual runway can create the illusion that the aircraft is at a higher altitude than it actually is." It further states that a pilot who fails to recognize this illusion will "fly a lower approach, with the risk of striking objects along the approach path or landing short."

The AIM chapter additionally addresses runway and terrain slopes illusions, stating that an, "upsloping runway, upsloping terrain, or both, can create the illusion that the aircraft is at a higher altitude than it actually is." Again, it warns that pilots who fail to recognize this illusion will fly a lower approach.

## **Injuries to Persons**

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Narrative injuries to persons place holder

## **Damage to Aircraft**

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Narrative damage to aircraft place holder

## **Other Damage**

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Narrative other damage place holder

## Communications

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Narrative communications place holder

## Flight recorders

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Narrative flight recorders place holder

## Medical and Pathological Information

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According to the autopsy performed by the Yavapai County Medical Examiner, the cause of death was smoke inhalation and thermal injuries.

Toxicology testing performed by the Federal Aviation Administration's Forensic Sciences Laboratory identified 35% carboxyhemoglobin in blood and ibuprofen in urine. There was no ethanol or cyanide detected in the blood samples.

Carbon monoxide (CO) is an odorless, tasteless, colorless, nonirritating gas formed by hydrocarbon combustion. In the body, CO binds to hemoglobin with much greater affinity than oxygen, forming carboxyhemoglobin; elevated levels result in impaired oxygen transport and utilization. Nonsmokers may normally have up to 3% carboxyhemoglobin in their blood; heavy smokers may have levels of 10 to 15%. Acutely low levels of CO may cause vague symptoms like headache and nausea but increased levels (40% and above) lead to confusion, seizures, loss of consciousness, and death.

## Fire

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Narrative fire place holder

### **Survival Aspects**

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Narrative survival aspects place holder

### **Tests and Research**

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Narrative tests and research place holder

### **Organizational and Management Information**

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Narrative organizational and management information place holder

### **Useful or Effective Investigation Techniques**

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Narrative useful or effective investigation techniques place holder

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Keliher, Zoe		
<b>Additional Participating Persons:</b>	Jeffrey Larson; Federal Aviation Administration; Scottsdale, AZ Nicole Charnon; Teledyne Continental Motors; Mobile, AL Andrew Hall; Textron Aviation; Wichita, KS		
<b>Original Publish Date:</b>	November 19, 2020	<b>Investigation Class:</b>	2
<b>Note:</b>	The NTSB traveled to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=98190">https://data.nts.gov/Docket?ProjectID=98190</a>		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).