



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Cleveland, OH	<b>Accident Number:</b>	NYC02FA059
<b>Date &amp; Time:</b>	02/10/2002, 2302 EST	<b>Registration:</b>	N541CW
<b>Aircraft:</b>	Mitsubishi MU-300	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	2 None

**Flight Conducted Under:** Part 91: General Aviation - Positioning

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## Analysis

As the airplane was descending to the airport, the pilot-in-command (PIC) calculated that the required distance to land on a dry runway would be 2,720 feet. The second-in-command (SIC) stated to the PIC, "all right if I touch down and there's no brakes I'm going around." The ILS Runway 23 approach was in use, and the braking action was reported "poor" by a Hawker Jet, which had landed prior to the accident flight. All runway surfaces were covered with a thin layer of snow. The airplane touched down with about 2,233 feet of runway remaining, of the 5,101-foot long runway. The airplane departed the end of the runway, and proceeded into an overrun grassy area, where the nose landing gear assembly collapsed. The tower controller advised the flightcrew prior to landing that the wind conditions were from 330 degrees at 18 knots. According to the airplane's Pilot's Operating Manual, the estimated landing distance on a dry runway, for the conditions at the time of the accident, was about 2,750 feet. No charts were available in the FAA approved Airplane Flight Manual, to compute a landing distance incorporating a contaminated runway. Review of 14 CFR Part 25.1, which prescribed airworthiness standards for the issue of type certificates, and changes to those certificates, for transport category airplanes, revealed, "For landplanes and amphibians, the landing distance on land must be determined on a level, smooth, dry, hard-surfaced runway." There were no requirements for the applicant to determine landing distances on a wet or contaminated runway. The latest weather recorded at the airport, included winds from 330 degrees at 12 knots, gusts to 22 knots; visibility 3/4 statute mile, light snow; and overcast clouds at 300 feet.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to obtain the proper touch down point on the runway, and the pilot-in-commands failure to initiate a go-round. Factors in the accident were the tailwind condition, the snow-covered runway.

## Findings

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Occurrence #1: OVERRUN

Phase of Operation: LANDING - ROLL

### Findings

1. (F) WEATHER CONDITION - TAILWIND
2. (C) PROPER TOUCHDOWN POINT - NOT OBTAINED - COPILOT/SECOND PILOT
3. ACFT/EQUIP,INADEQUATE AIRCRAFT MANUALS
4. INADEQUATE CERTIFICATION/APPROVAL - FAA(ORGANIZATION)
5. (F) AIRPORT FACILITIES,RUNWAY/LANDING AREA CONDITION - SNOW COVERED
6. (C) GO-AROUND - NOT PERFORMED - PILOT IN COMMAND
7. (F) PERFORMANCE DATA - NOT AVAILABLE - MANUFACTURER

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Occurrence #2: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER

Phase of Operation: LANDING - ROLL

### Findings

8. TERRAIN CONDITION - SOFT

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Occurrence #3: GEAR COLLAPSED

Phase of Operation: LANDING - ROLL

## Factual Information

### HISTORY OF FLIGHT

On February 10, 2002, at 2302 eastern standard time, a Mitsubishi MU-300, N541CW, operated by Flight Options Inc., was substantially damaged during an overrun at the Cuyahoga County Airport (CGF), Cleveland, Ohio. The two certificated airline transport pilots were not injured. Night instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the positioning flight that originated from the Palwaukee Municipal Airport (PWK), Chicago, Illinois. The flight was conducted under 14 CFR Part 91.

According to the pilot-in-command (PIC), prior to the accident flight, company dispatch personnel instructed the flightcrew to fly six passengers from Marquette, Michigan, to PWK. Upon arrival at PWK, the PIC called dispatch and was instructed to reposition the airplane to CGF. The PIC proceeded to order fuel and check the current weather in the Cleveland area. The PIC also called the CGF air traffic control tower to inquire about the current weather and any braking action reports that may have been available. The tower controller stated to the PIC that a Cessna Citation had just landed and reported the braking action as fair to good.

The flight departed PWK about 2152, and proceeded eastbound, with the second-in-command (SIC) at the controls. Upon arrival in the Cleveland area, the approach controller advised the flightcrew that the current CGF weather was 300 overcast, visibility 1/2-mile in snow, winds from 320 degrees, variable to 350 degrees at 12-15 knots, gusts to 25 knots. The approach in use was the Runway 23 ILS. The PIC also recalled that he heard the controller state that the Cleveland Hopkins Airport, located about 20 miles west of CGF, was closed due to snow removal, and should reopen in approximately 30 minutes.

While being vectored for the ILS approach, the controller stated that the airplane was "number two" for the approach following a Hawker jet. While the accident airplane was being vectored, it traveled through the final approach course, and had to be re-vectored. The airplane was then given a heading to intercept the final approach course and cleared for the approach. The PIC decided at this point, if the airplane was not stabilized on the approach by 1,900 feet msl, a missed approach would be executed. The airplane was stabilized at 2,000 feet, with the landing gear extended, full flaps, and a "Vref" speed of 106 knots, plus 5 knots. The PIC contacted the tower; advising them that the airplane was on the approach, inbound. The tower controller advised the flightcrew that the runway had been plowed, and that the Hawker had just landed and reported the braking action as "poor." The accident airplane was then cleared to land. The PIC visually identified the runway at 300-400 feet above the decision height, and the landing was continued. The speed of the airplane as it passed over the threshold of the runway was about 106 knots and touchdown occurred within the first 500-600 feet of the runway. Upon touchdown the speed brakes were deployed and maximum braking was applied. The PIC recalled that although there was a firm brake pedal, he could not feel the anti-skid pulsating. Deceleration of the airplane was slow and he soon realized the airplane was not going to stop on the runway, and attempting a go-around was not an option due to the amount of runway remaining. The airplane departed the end of the runway at a speed of 20-30 mph, and proceeded onto a down sloping grass overrun area. During the overrun, the flightcrew elected to shut down the engines. As the airplane was about to come to a stop, the nose gear struck a mound, and the nose landing gear assembly collapsed. The flight crew secured the airplane and exited.

According to the SIC, who was flying the airplane from the left seat, the PIC had called the tower while they were on the ground at PWK, and stated that a Cessna Citation pilot reported the braking action at CGF as "good." As the flight arrived in the Cleveland area, the controller vectored the airplane for the ILS approach because airport personnel were plowing the runway, and that they were number two for the approach behind a Hawker. The SIC stated that the vector was poor, and that he flew through the localizer course. The airplane was then re-vectored back and became established on the approach at 2,000 feet msl. The flightcrew was then instructed to contact the tower, where they were cleared to land. To the SIC's best recollection, the flightcrew was never given the braking action by the tower controller. The airplane "broke out" about 200-300 feet above the decision height, with the runway in sight, and straight ahead. As the airplane crossed the "numbers," the speed was at "ref," and touchdown occurred about 500-600 feet down the runway. The SIC applied maximum braking and the airplane began to slide to the right. The SIC straightened out the airplane and both flightcrew members felt that there was no antiskid. At that time the SIC determined that there was insufficient remaining runway to abort the landing, and committed himself in trying to slow the airplane down. The airplane then departed the end of the runway, at 30-40 mph, and proceeded into an overrun grassy area. The SIC did recall that the nose gear collapsed prior to the airplane coming to a complete stop.

An airport employee, who was plowing snow on the airport, stated that he was advised by the control tower that two airplanes were inbound, and he was instructed to remain clear of the runway. The employee positioned the plow truck to taxiway intersection A8 and stopped. After the first airplane landed, which was the Hawker, the pilot reported to the control tower that the braking action was poor. When the second airplane arrived, which was the MU-300, the employee observed it touchdown between A5 and A6 taxiway intersections. The employee then noticed that the airplane was not slowing down, and crossed the A8 taxiway intersection at a high rate of speed. The airplane then departed the end of the runway and came to rest in the grass.

A Federal Aviation Administration (FAA) inspector interviewed the CGF tower controller on February 13, 2002. The controller stated that he visually observed the accident airplane as it flew over the threshold of runway 23, and that it "looked like a normal landing, within the first 600 feet or so." When the tower controller was re-interviewed on February 17, 2002, by the FAA inspector, he stated, "I saw the plane come over the numbers at the normal height so it looked like a normal landing." When asked if he observed the airplane touchdown on the runway, the tower controller stated, "No, I did see it next go by really fast at A-6."

Excerpts of the cockpit voice recorder (CVR) transcript revealed the following:

At 2233:19, as the airplane was descending to the CGF airport, the flightcrew began a discussion regarding the runway length available at CGF. The PIC calculated that the runway required to land would be 2,720 feet. The SIC queried if that number was for a dry runway, which the PIC confirmed.

At 2233:48, the PIC stated, "so even if you add half... thirteen... ah that's four thousand so. County's fifty one hundred feet." The SIC replied, "all right if I touch down and there's no brakes I'm going around." The PIC stated, "what's that?" which the SIC replied, "I said if I touch down and I have no brakes like we're skidding on ice and we go."

At 2257:12, the PIC advised the approach controller that the airplane had just flown though the

localizer. The approach controller replied, "Options five forty one my mistake turn right heading two seven zero intercept the localizer." About 22 seconds later, the approach controller advised the flight crew, "...you're five from KROOK. maintain three thousand 'til established on the localizer. cleared for the ILS two three at County."

At 2258:15, the PIC contacted the CGF control tower. The tower controller advised the flightcrew that the wind conditions were "variable three one zero to three six zero at 12," and cleared the flight to land.

At 2258:37, the tower controller advised the flightcrew, "...there's a thin layer of snow on the runway. the Tapley readings are fifty forty five forty five... the runway's been cleared almost full length and width... the braking by the last aircraft reported as poor" The PIC replied, "all right."

At 2259:20, the PIC stated, "'kay keep coming down we're way below a-above glideslope." The SIC responded, "well I mean I was below before the localizer even came in." The PIC replied, "...exactly. let's see if we can salvage it."

At 2300:11, the tower controller advised the flightcrew that the winds were from 330 degrees, at 18 knots.

At 2300:58, the PIC stated, "little low on glideslope," which the SIC replied, "correcting."

AT 2301:06, the SIC stated, "holy mackerel it's windy." The PIC replied, "yeah watch your speed," followed by, "'kay ref and ten...sinking five. you're a little high get her down." The SIC responded, "coming down."

At 2301:18, the PIC stated, "chop the power...get down."

At 2301:25, the CVR recorded a sound similar to touchdown, followed by varying background noises.

At 2301:26, the PIC stated, "what do you got. boards are out. straighten out." About 8 seconds later, the PIC stated, "cold cock one...powerback. The SIC responded, "it's back...we ain't going to stop."

At 2302:10, the PIC advised the tower controller, ah five forty one we rolled off the end."

The recording ended at 2302:34.

Throughout the CVR transcript, there was no mention by the flightcrew of any braking problems or anomalies. There was also no request or callout for a go-around by either flightcrew member.

The accident occurred during the hours of darkness, approximately 41 degrees, 33 minutes north latitude, and 81 degrees, 29 minutes west longitude.

#### FLIGHT CREW INFORMATION

##### Pilot-in-command

The PIC held an airline transport certificate with a rating for airplane multi-engine land, and commercial privileges for airplane single engine land. In addition, the PIC was also a single engine and multi engine, instrument, flight instructor. He was type rated in the Beechcraft BE-400, Mitsubishi MU-300, Lear Jet, Cessna CE-500, and Bombardier CL-600. The PIC reported his total flying experience in airplanes was 12,478 hours, of which about 2,000 hours

were in the Beechcraft BE-400 and Mitsubishi MU-300.

The PIC's most recent FAA first class medical certificate was issued on January 26, 2002.

#### Second-in-command

The SIC held an airline transport certificate with ratings for airplane single engine and multi-engine land. In addition, the SIC was type rated in the Beechcraft BE-400, Mitsubishi MU-300, Lear Jet, and Dassault DA-20. The SIC reported his total flying experience in airplanes was 3,899 hours. He also reported that he had accumulated a total of 326 hours in the Beechcraft BE-400 and Mitsubishi MU-300.

The first officer's most recent FAA first class medical certificate was issued on July 2, 2001.

#### METEOROLOGICAL INFORMATION

The weather recorded at CGF, at 2245 was, winds from 330 degrees at 12 knots, gusts to 22 knots; visibility 3/4 statute mile, light snow; overcast clouds at 300 feet.

#### AERODROME INFORMATION

Runway 23 at CGF was a 5,101 foot long, 100 foot wide, hard surfaced asphalt transverse grooved runway. A 500-foot long stopway was also located at the departure end of Runway 23.

The runway was equipped with a 4-light PAPI, and a 1,400-foot medium intensity approach lighting system with runway alignment indicator lights. The runway was not equipped with a runway end identifier lighting system.

Review of the CGF airport diagram revealed that A5 taxiway intersection was located about 2,868 feet from the approach end of runway 23, leaving about 2,233 feet of runway remaining. The A6 taxiway intersection was located about 3,300 feet from the approach end of runway 23, leaving about 1,801 feet of runway remaining.

At 2245, CGF personnel conducted a runway condition report, which stated that the runway 5/23 condition was "thin layer of snow." The report also stated that the friction meter measurements for runway 23 were "approach end 50, mid point 45, roll out 45." Braking action on runway 23 was, "good" at the approach end, "fair" at the mid point, and "fair" at the roll out. Comments on the report were that the runway had been plowed.

#### AIDS TO NAVIGATION

Review of the approach plate for the ILS Runway 23 approach at CGF revealed that the minimum glide slope altitude at the beginning of the final approach segment on the precision approach was 3,000 feet. The glide slope altitude at KROOK intersection, which was located about 4 miles from the approach end of the runway, was 2,262 feet.

#### WRECKAGE INFORMATION

On February 11, 2002, an FAA inspector examined the airplanes braking system. No anomalies were noted.

On February 25, 2002, Safety Board personnel, including a senior structural engineer, examined the airplane at the operator's maintenance facility. With the assistance of a photograph taken by the airport fire department after the accident, and before the recovery process, the damage exhibited on the aircraft was consistent with a nose landing gear failure during the overrun. The nose landing gear traveled aft, and to the right, where it contacted the

pressure bulkhead and caused visible substantial damage.

## FLIGHT RECORDERS

### Cockpit Voice Recorder

The airplane was equipped with a Universal CVR30-A, solid state CVR. The CVR was transported to the Safety Board, Office of Research and Engineering, where a CVR group convened on March 5, 2002, and a partial transcript was prepared for the 30-minute recording.

### Flight Data Recorder

There was no flight data recorder installed in the airplane, nor was it required.

## TOXICOLOGY INFORMATION

Post accident drug and alcohol tests were administered to the pilots after the accident.

## ADDITIONAL INFORMATION

### Wheel Brake System

According to the Mitsubishi MU-300 Diamond I Pilot's Operating Manual, "When the pilot or copilot depresses the brake pedals, the delivery pressure of the master cylinder (directly connected to the brake pedals) is transferred to the power brake valve through the mixing valves. The power brake valve amplifies the pilot's master cylinder pressure and transfers the increase of pressure to the main gear assembly."

### Performance Data

According to an FAA approved Mitsubishi MU-300 Diamond I Airplane Flight Manual, the landing field length on a dry runway for an airplane weighing 12,500 pounds, at a pressure altitude of 1,000 feet, and a temperature of 32 degrees Fahrenheit, was 2,750 feet. The manual also listed a "Factored Landing Field Length" calculation. The explanation for its use was, "Also referred to as scheduled landing field length." Using this calculation, the landing field length would be increased by 67 percent, to 4,675 feet.

No charts were available in the FAA approved Mitsubishi MU-300 Diamond I Airplane Flight Manual, to compute a landing distance incorporating a contaminated runway.

The Beechjet 400A was the successor to the MU-300, and had similar design specifications. According to a Beechcraft Beechjet 400A Airplane Flight Manual, "Landing performance on wet or contaminated runways has not been determined."

According to a Manufacturer approved Beechcraft Beechjet 400A Airplane Flight Manual Supplement, the landing distance required to land on a dry snow runway, for an airplane weighing 12,500 pounds, at a pressure altitude of 1,000 feet, and a temperature of 32 degrees Fahrenheit, was about 8,000 feet. The supplement was not approved by the FAA, and was "prepared by the manufacturer to assist operators in developing suitable guidance, recommendations or instructions for use by their flight crews when operating under adverse runway conditions."

Review of 14 CFR Part 25.1, which prescribed airworthiness standards for the issue of type certificates, and changes to those certificates, for transport category airplanes, revealed, "For landplanes and amphibians, the landing distance on land must be determined on a level,

smooth, dry, hard-surfaced runway." There were no requirements for the applicant to determine landing distances on a wet or contaminated runway.

According to a representative of the type certificate holder for the Mitsubishi MU-300 Diamond I, the United Kingdom Civil Aviation Authorities (CAA), requires that prior to certification in the United Kingdom, the manufacturer, or type certificate holder, produce data incorporating landing performance on wet and contaminated runways.

Review of an Airplane Flight Manual, published for United Kingdom registered Mitsubishi MU-300 Diamond I airplanes, revealed charts for determining the effect on landing distances for slippery runways.

#### Runway Friction Readings

According to the Aeronautical Information Manual, Section 4-3-9; Runway Friction Reports And Advisories:

"...MU (friction) values range from 0 to 100 where zero is the lowest friction value and 100 is the maximum friction value obtainable. For frozen contaminants on runway surfaces, a MU value of 40 or less is the level where the aircraft braking performance starts to deteriorate and directional control begins to be less responsive. The lower the MU value, the less effective braking performance becomes and the more difficult directional control becomes...."

"...Pilots should use MU information with other knowledge including aircraft performance characteristics, type, and weight, previous experience, wind conditions, and aircraft tire type (i.e., bias ply vs. radial constructed) to determine runway suitability...."

#### Wreckage Release

The airplane wreckage was released to a representative of the operator on February 25, 2002.

### Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Instructor; Commercial	<b>Age:</b>	50, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	01/19/2002
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	01/26/2002
<b>Flight Time:</b>	12478 hours (Total, all aircraft), 2000 hours (Total, this make and model), 11200 hours (Pilot In Command, all aircraft), 88 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Co-Pilot Information

<b>Certificate:</b>	Airline Transport	<b>Age:</b>	33, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	07/02/2001
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	05/24/2001
<b>Flight Time:</b>	3899 hours (Total, all aircraft), 326 hours (Total, this make and model), 1500 hours (Pilot In Command, all aircraft), 152 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Mitsubishi	<b>Registration:</b>	N541CW
<b>Model/Series:</b>	MU-300	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	SA-004
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	9
<b>Date/Type of Last Inspection:</b>	01/16/2002, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	15500 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo Fan
<b>Airframe Total Time:</b>	7457 Hours as of last inspection	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	JT 15D-4D
<b>Registered Owner:</b>	Flight Options Inc.	<b>Rated Power:</b>	2500 lbs
<b>Operator:</b>	Flight Options Inc.	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	CGF, 879 ft msl	Distance from Accident Site:	
Observation Time:	2245 EST	Direction from Accident Site:	
Lowest Cloud Condition:		Visibility	0.75 Miles
Lowest Ceiling:	Overcast / 300 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	12 knots / 22 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.88 inches Hg	Temperature/Dew Point:	-2° C / -2° C
Precipitation and Obscuration:			
Departure Point:	Chicago, IL (PWK)	Type of Flight Plan Filed:	IFR
Destination:	(CGF)	Type of Clearance:	IFR
Departure Time:	2152 EST	Type of Airspace:	Class D

## Airport Information

Airport:	Cuyahoga County Airport (CGF)	Runway Surface Type:	Asphalt
Airport Elevation:	879 ft	Runway Surface Condition:	Snow--dry
Runway Used:	23	IFR Approach:	ILS
Runway Length/Width:	5101 ft / 100 ft	VFR Approach/Landing:	None

## Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	41.565000, -81.486111

## Administrative Information

Investigator In Charge (IIC):	Stephen M Demko	Report Date:	02/05/2004
Additional Participating Persons:	Linda Baker; FAA; Cleveland, OH Paul Leachko; Flight Options; Cleveland, OH		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</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](#).