



National Transportation Safety Board Aviation Accident Final Report

Location:	DENVER, CO	Accident Number:	FTW98FA001
Date & Time:	10/01/1997, 0436 MDT	Registration:	N414EX
Aircraft:	Boeing 727-51C	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Serious, 2 Minor, 1 None
Flight Conducted Under:	Part 121: Air Carrier - Non-scheduled		

Analysis

As the cargo jet was taxiing for takeoff in a nonmovement area, it was struck by an airport employee shuttle bus. The airplane captain was seriously injured. Visual meteorological conditions prevailed, and the collision occurred during predawn hours. The bus driver said he stopped at the stop sign, turned on the 4-way flasher lights, and looked both ways. He saw one inbound aircraft to the right that had stopped. He did not see the airplane approaching from the left as he started across the cargo ramp. The airplane crew stated they did not see the bus until seconds before impact. Airplane skid marks, measuring 22 and 24 feet in length, were noted on the taxiway. No bus skid marks were noted on the roadway.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Failure of the bus driver to yield the right of way to oncoming traffic due to his inadequate visual lookout. Factors were visibility restrictions, inadequate driver training by management, and the flight crew's inadequate visual lookout due to their attention being diverted by performing the pretakeoff checklist.

Findings

Occurrence #1: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: TAXI - TO TAKEOFF

Findings

1. OBJECT - VEHICLE
2. (C) VISUAL LOOKOUT - INADEQUATE - DRIVER OF VEHICLE
3. (F) FACILITY INADEQUATE, VISUAL RESTRICTION
4. (F) INADEQUATE INITIAL TRAINING - COMPANY/OPERATOR MANAGEMENT
5. (F) VISUAL LOOKOUT - INADEQUATE - FLIGHTCREW
6. (F) DIVERTED ATTENTION - FLIGHTCREW

Factual Information

HISTORY OF FLIGHT

On October 1, 1997, at 0436 mountain daylight time, a Boeing 727-51C, N414EX, operated by Ryan International Airlines, Inc., as Flight 607, collided with a 1988 Gillig Phantom bus, operated by Republic Parking Co., while taxiing for takeoff in a non-movement area at Denver, Colorado, International Airport (DIA). The airline transport rated captain sustained serious injuries, the airline transport rated first officer received minor injuries, and the airline transport rated flight engineer was not injured. The airplane was destroyed. The shuttle bus driver received minor injuries. Two passengers aboard the bus were not injured. The bus was destroyed. Visual meteorological conditions prevailed, and an IFR flight plan had been filed for the domestic cargo flight to San Francisco, California, operating under Title 14 CFR Part 121.

The investigative team interviewed the shuttle bus driver, Thomas P. Armstrong, on October 3, 1997, and the following is based on that interview. Mr. Armstrong said he reported for work at 0400. After a morning briefing with company personnel, he made a walk-around inspection of his bus. Two passengers (Mike Weston and Roberta Welling) boarded the bus, and he departed the employees' south parking lot at 0436, en route to "C" concourse. Because of a bus ahead, he drove at a "moderate speed" for spacing. The bus traveled north on Vandriver Street. The road crosses the south cargo ramp at Taxiway Sierra Charlie. He did not observe any activity on the cargo ramp as he approached the intersection, and came to a complete stop at the stop sign. He looked both ways and turned on the 4-way flasher lights. He said his headlights and running lights were on, and the interior lights were off. He observed the nose taxi light of an aircraft off to his right. He "inched" the bus forward, stopped, looked both ways again, and proceeded across the cargo ramp. The bus's radio, tuned to the bus channel (800 mHz), was on but he paid no attention to it. In the background, he heard a voice yell "Hold, hold, HOLD!" He thought he was referring to the aircraft on his right. Suddenly, he saw a bright light through the left window and he was thrown to the floor. He estimated his speed to be less than 5 mph at impact.

One of the bus passengers, Mike Weston was interviewed by telephone by FAA personnel and the following is based on that interview. He was seated in the rear of the bus, on the right side facing left. The bus came to a complete stop at the stop sign before proceeding across the cargo ramp. He saw the approaching airplane clearly and he yelled, "Whoa," five times before the collision, but the driver did not respond.

This investigator interviewed the captain of the Boeing 727, Joseph B. Jordan, by telephone from his hospital bed at Denver Health Medical Center on October 10, 1997, and the following is based on that interview. After push-back, engine start, and "A" system hydraulics pressurization, the first officer received clearance from ramp control to taxi to the Alpha hold bars, located about halfway between the cargo ramp and runway 35L. At that point they were to contact ground control. The captain said the taxiway makes a 40 degree right turn and goes up a small hill. He had just made the right turn when he heard his first officer yell "Bus!" He said he caught a glimpse of the bus, "stood on the brakes," and may have yelled, "Brace yourself!" He did not remember seeing any lights on the bus. The bus did not stop, but kept coming and collided with the airplane. The captain was trapped in the crushed cockpit.

This investigator interviewed the first and second officers at their motel on October 2, 1997,

and the following is based on those interviews. The first officer said the airplane departed Newark, New Jersey, and arrived in Denver via Indianapolis, Indiana, at 0414. Its destination was San Francisco, California. After push-back, they were cleared to taxi "right side out," contact ground control and hold short of taxiway Sierra Charlie. An inbound airplane was holding short of the cargo ramp and yielding to their exit. The navigation lights, rotating beacon, and runway turnoff lights were on. The airplane was not equipped with taxi lights. He saw "something dark" off to the right and yelled a warning to the captain. He did not see the bus' headlights. He had just completed the checklist when "something dark caught my eye off to the right." He did not see any lights. He yelled and "hit the brakes." There was the impact and he felt pain. He immediately shut down all three engines and the cockpit became dark. He was able to extricate himself from the collapsed cockpit and went aft and opened the cabin door. He felt the airplane rolling backwards. He returned to the cockpit and tried to activate the pneumatic brakes but to no avail. Several Federal Express employees tried to chock the wheels, but the airplane backed into an embankment before coming to a halt.

The second officer said that after completing the checklist, she turned her seat to the forward position. (The first officer) "looked right, looked again, and said something about a 'problem.'" She looked out the window and saw the bus, "hazy, gray, not very discernible." It was about 30 feet away, "going fast, steady speed, and he made no attempt to stop. I don't think he saw us." There were no lights inside the bus, and she did not see its headlights. (The captain) looked and yelled, "Brace yourself!" He applied full brakes and (the first officer) pulled the start levers to cutoff. This killed the engines and all the electrics. The impact drove the instrument panel and power console into the captain's lap. He yelled his leg and kneecap were broken. The cockpit was completely dark. She got up and assisted the first officer from his seat, and then extricated the captain. She then went aft, opened the cabin door, and told people below to call an ambulance and to get some stairs. The airplane started rolling backwards. The first officer returned to his seat and first tried the parking brake then the pneumatic brake. Nothing worked.

PERSONNEL INFORMATION

Captain Joseph B. Jordan, age 52, was employed by Ryan International Airlines on January 28, 1991. He holds Airline Transport Pilot Certificate No. 1844837, dated February 17, 1995, with an airplane multiengine land rating, and type ratings in the Convair 340/440 and Boeing 727. He has commercial privileges in single engine land/sea airplanes and gliders, and also holds a glider instructor rating. His first class airman medical certificate, dated May 9, 1997, contains the restriction, "must wear corrective lenses." His last proficiency check was accomplished on June 19, 1997, in the Boeing 727.

First Officer Edward J. Del Monico, age 35, was employed by Ryan International Airlines on January 10, 1995. He holds Airline Transport Pilot Certificate No. 155669449, dated June 2, 1993, with an airplane multiengine land rating, and type ratings in the Boeing 737 and SA-227. He has commercial privileges in single engine land airplanes, and also holds single engine airplane instructor rating and flight engineer-turbojet ratings. His first class airman medical certificate, dated March 5, 1997, contains no restrictions or limitations. His last proficiency check was accomplished on June 10, 1997, in the Boeing 727.

Second Officer Kathryn A. Schindelar, age 56, was employed by Ryan International Airlines on September 15, 1995. She holds Airlines Transport Pilot Certificate No. 1830525, dated April 25, 1991, with an airplane multiengine land rating, and a type rating in the Boeing 737. She

also has commercial pilot privileges in single engine land airplanes. Her first class airman medical certificate, dated July 21, 1997, contains the restriction, "must wear corrective lenses." Her last proficiency check was accomplished on June 10, 1997, in the Boeing 727.

Thomas P. Armstrong, age 47, was hired by Republic Parking Co., as a bus driver on April 25, 1997. He holds a Colorado commercial driver's license (CDL) no. 920086878 that expires May 24, 2001. Mr. Armstrong said that he had 36 years' driving experience, and had held the CDL for five months. He is employed as a ramp serviceman for United Airlines, and works for Republic Parking Company on a part-time basis. He had been off for two days, and he considered himself well rested before the accident.

AIRCRAFT INFORMATION

N414EX, a Boeing 727-51C (s/n 18899), owned by Emery Worldwide Airlines, Inc., and operated Ryan International Airlines, was manufactured in 1981. It is powered by three Pratt & Whitney JT8D-7B turbofan engines, each rated at 14,000 pounds of thrust. According to the operator, the airframe has accumulated 47,098 hours and 45,215 cycles at the time of the accident. The last continuous airworthiness inspection was performed on September 30, 1997. The airplane's dispatch weight was 151,358 pounds. The first officer said the airplane was not equipped with taxi lights, but that its runway turnoff lights were illuminated.

The employee shuttle bus, license plate number 880A09, was a 1988 Gillig Phantom (VIN 15GCA091XJ1081969).

METEOROLOGICAL INFORMATION

Visual meteorological conditions existed at Denver International Airport. At 0453, 17 minutes after the accident, the following METAR (Aviation Routine Weather Report) was recorded:

WIND 230 DEGREES AT 6 KNOTS; VISIBILITY 10 STATUTE MILES; SKY CLEAR;
TEMPERATURE 12 DEGREES C.; DEW POINT 4 DEGREES C.; ALTIMETER 30.18 INCHES
OF MERCURY; REMARKS: AUTOMATED OBSERVATION WITH PRECIPITATION
DISCRIMINATOR (RAIN/SNOW), SEA LEVEL PRESSURE 1015.2 MILLIBARS,
TEMPERATURE +11.5 DEGREES C., DEW POINT +4.4 DEGREES C.

FLIGHT RECORDERS

The Collins cockpit voice recorder (m/n 624C-1, s/n 2035) and Sundstrand flight data recorder (m/n UFDR, s/n 6305) were removed from the aircraft and shipped to NTSB headquarters for readout.

According to the flight data recorder specialist's factual report, data begins at Subframe Reference Number (SRN) 1973, and ends at SRN 2101. "The aircraft begins taxiing on a heading of 069 degrees and eventually establishes on a heading of approximately 077 degrees. Between SRN 2086 and 2096, the aircraft changes to a 101 degree headings and remains on this heading until the end of the data. At SRN 2095, an increase in negative longitudinal acceleration begins. From the initial zero value, it reached a maximum value of -.66 g's at SRN 2096."

According to the Cockpit Voice Recorder Group Chairman's Factual Report, the written transcript "started at 0433:06 mdt and continued uninterrupted until 0436:08 mdt when electrical power was removed from the CVR." At 0433:52, the flight was cleared to "taxi right side up to Alpha hold." Between this time and the time of the collision, the crew was

completing pre-takeoff checklist items. At 0435:58, the first officer said, "Watch it, watch it." At 0436:00, a loud crashing and rustling sound is recorded. At 0436:06, the captain said, "Oh, my leg."

WRECKAGE AND IMPACT INFORMATION

Three heavy skid marks, aligned on a magnetic heading of approximately 108 degrees, were noted on the taxiway. The left pair of skid marks were 22 feet in length, and the right pair of skid marks were 24 feet in length. The center skid mark was consistent with sideways scuffing and measured 16 feet in length. The airplane was located approximately 200 feet in back of these skid marks, and was resting against an embankment, completely off the cargo ramp. The front portion of the cockpit and nose section of the airplane were destroyed. Standing inside the cockpit and looking down at the rudder pedals, the pavement could be seen through the opening in the nose section.

The left front portion of the bus was damaged and the windshield was knocked out. The bus was located across the taxiway, in a grassy area, completely off the ramp. The magnetic heading of the service road, at the point where it crosses the nonmovement area, is approximately 335 degrees. No skid marks were noted on this heading.

MEDICAL AND PATHOLOGICAL INFORMATION

Due to the severity of the Captain Jordan's injuries, he was treated and stabilized by paramedics, then transported by ambulance to the Denver Health Medical Center for treatment. According to Captain Jordan, both lower legs, the right kneecap and right ankle were fractured. He told attending physicians that specimens had to be drawn for toxicological screening. This was done and, according to their toxicological report (#22660039), Captain Jordan tested positive for barbiturates and opiates. This report was reviewed by the Office of Research and Engineering's staff physician. According to NTSB's staff physician, these readings were due to the medications administered by the paramedics.

First Officer Del Monico said his injuries were limited to bruises and soreness. Second Officer Schindelar was not injured. Their toxicological tests were performed by Roche Biomedical Laboratories. According to the reports (#071297769 and #071297770), both crewmen were negative for THC, cocaine, PCP, opiates and amphetamines.

Mr. Armstrong said his injuries consisted of facial cuts and bruises. A toxicological screen on Mr. Armstrong was performed by Chem Review, Ltd., in Bismarck, North Dakota. According to the report (75668), the results were negative for drugs and alcohol.

TESTS AND RESEARCH

A human performance specialist was dispatched from NTSB headquarters to assist in the investigation. According to the report, two problem areas were identified: (1) numerous obstructions to vision in the accident area, and (2) a deficient bus driver training program.

The report noted that when positioned at the intersection and looking west towards the cargo ramp, a small hill with a chain link fence on top blocks the view of approaching airplanes. For a period of time, only the top portion of an airplane's vertical stabilizer can be seen (according to DIA'S management, if a vehicle is positioned at the intersection and its driver looks west, he will see approximately 750 feet of the taxiway, or has approximately 45 degrees left side field of vision before the hill becomes an obstruction). Night and adverse weather conditions can further diminish the field of view. Although the cargo ramp is well illuminated on the north

side, no such lighting exists on the south side and this would be the side of an airplane closest to a vehicle stopped at the intersection (DIA management said the south side of Taxiway Sierra Charlie is not illuminated from Taxiway Sierra Alpha west for 1,300 feet because this is the defined southern edge of Taxiway Sierra Charlie, and only ramp aircraft parking areas are illuminated).

The bus driver training program consists of reading a study guide, watching a videotape on airport driving, and taking an airport familiarization ride with a company trainer (DIA recommends that each company conduct their "familiarization tours" for its employees during the shift that the employee works. The driving video was filmed during daylight hours to educate the drivers on airfield markings and signs). No provisions are made for driver training in night or low visibility conditions.

ADDITIONAL INFORMATION

According to 14 CFR Part 91.113(b), if aircraft are converging, the aircraft on the right has the right-of-way.

The Denver Police Department also investigated this accident. The bus driver was cited for violating section 54-180, "Taking right of way (at the) stop sign." Section 54-180, contained in the Denver Police Department handbook, states: "The driver of a vehicle shall stop or yield at the entrance to a through highway and shall yield the right-of-way to other vehicles which have entered the intersection from the through highway or which are approaching so closely on the through highway as to constitute an immediate hazard. The driver of a vehicle shall likewise stop in obedience to a stop sign or yield in compliance with a yield sign as required herein at an intersection where a stop sign or a yield sign is erected at one (1) or more entrances thereto although not a part of a through highway and shall proceed cautiously, yielding to vehicles not so obligated to stop or yield and which are within the intersection or approaching so closely as to constitute an immediate hazard, during the time such driver is moving across or within the intersection; provided, that if such a driver is involved in a collision with a vehicle in the intersection, after driving past a yield sign, such collision shall be deemed prima facie evidence of failure to yield right-of-way."

According to Denver Municipal Airport System Rules and Regulations, however, section 130.03-1 states: "Aircraft shall have the right of way over all other vehicles."

With the exception of withholding the cockpit voice and flight data recorders, N414EX was released to Ryan International Airlines on October 1, 1997. The two recorders were released to the company on October 20, 1997. The wreckage of the shuttle bus was verbally released to Republic Parking Co., on October 1, 1997.

In addition to the Federal Aviation Administration, parties to the investigation were Ryan International Airlines and Denver International Airport.

Pilot Information

Certificate:	Airline Transport; Commercial	Age:	52, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Glider	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	Last Medical Exam:	05/09/1997
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	15020 hours (Total, all aircraft), 7305 hours (Total, this make and model), 7920 hours (Pilot In Command, all aircraft), 136 hours (Last 90 days, all aircraft), 47 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Boeing	Registration:	N414EX
Model/Series:	727-51C 727-51C	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	18899
Landing Gear Type:	Retractable - Tricycle	Seats:	5
Date/Type of Last Inspection:	09/30/1997, Continuous Airworthiness	Certified Max Gross Wt.:	170000 lbs
Time Since Last Inspection:	14 Hours	Engines:	3 Turbo Fan
Airframe Total Time:	47098 Hours	Engine Manufacturer:	P&W
ELT:	Not installed	Engine Model/Series:	JT8D-7B
Registered Owner:	EMERY WORLDWIDE AIRLINES, INC	Rated Power:	14000 lbs
Operator:	RYAN INT'L AIRLINES, INC.	Air Carrier Operating Certificate:	Flag carrier (121)
Operator Does Business As:		Operator Designator Code:	RYNA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	DEN, 5431 ft msl	Observation Time:	0453 MDT
Distance from Accident Site:	0 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Clear / 0 ft agl	Temperature/Dew Point:	12° C / 4° C
Lowest Ceiling:	None / 0 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	6 knots, 230°	Visibility (RVR):	0 ft
Altimeter Setting:	30 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	(DEN)	Type of Flight Plan Filed:	IFR
Destination:	SAN FRANCISCO, CA (SFO)	Type of Clearance:	IFR
Departure Time:	0000	Type of Airspace:	Class B

Airport Information

Airport:	DENVER INTERNATIONAL (DEN)	Runway Surface Type:	
Airport Elevation:	5431 ft	Runway Surface Condition:	
Runway Used:	0	IFR Approach:	
Runway Length/Width:		VFR Approach/Landing:	

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 Minor, 1 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	1 Minor	Aircraft Explosion:	None
Total Injuries:	1 Serious, 2 Minor, 1 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	ARNOLD W SCOTT	Adopted Date:	05/04/1998
Additional Participating Persons:	GLEN T WHITEFIELD; DENVER, CO THOMAS V DEWITTY; DENVER, CO		
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 pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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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.