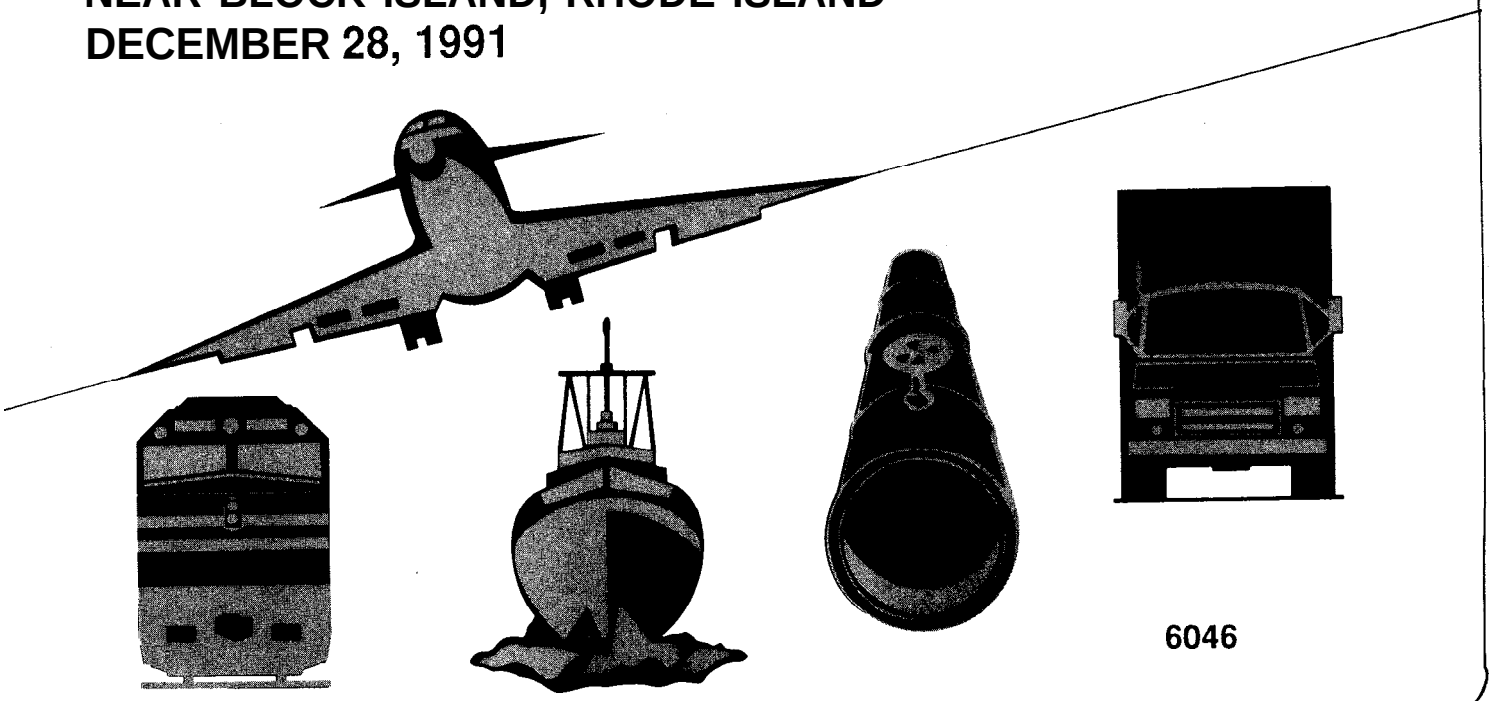
PB93-910405
NTSB/AAR-93/01/SUM

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY REPORT

LOSS OF CONTROL
BUSINESS EXPRESS, INC.,
BEECHCRAFT 1900C N811 BE
NEAR BLOCK ISLAND, RHODE ISLAND
DECEMBER 28, 1991



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National
Transportation
Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

Accident No. :	NYC-92-FA-053
Airplane Owner/Operator:	Business Express, Inc.
Airplane Type:	Beechcraft 1900C, N811BE
Location:	near Block Island, Rhode Island
Date and Time:	December 28, 1991, 2147 est
Injuries:	3 Fatal
Type of Occurrence:	Loss of Control

1. THE FLIGHT

On December 28, 1991, about 1845 eastern standard time, a Beech Aircraft Corporation Beechcraft 1900C, operated by Business Express, Inc. (BEX), departed the Igor I. Sikorsky Memorial Airport, Bridgeport, Connecticut. The flight was operated under the provisions of 14 Code of Federal Regulations (CFR) Part 91 and visual flight rules (VFR). A flight plan was not filed, nor was one required. An instructor pilot (IP) and two other pilots were aboard the airplane to conduct training.

The location of the flight was essentially unknown until it was observed in the traffic pattern at the Block Island Airport about 2000. According to the airport manager, the flight landed about 2000, and the flightcrew deplaned. The three pilots discussed the technical aspects of the airplane and seemed in good spirits. They boarded the airplane and took off from runway 28 sometime between 2045 and 2100. Sometime later, the flight landed again at the Block Island Airport and remained on the ground for a few minutes with its engines running; the flight then departed for the second time, but the airport manager did not observe the direction of flight.

N811BE had been scheduled for a passenger flight from Bridgeport at 1000 on December 29, 1991. About 0930, company station personnel reported the airplane missing to the central dispatch department. A search of all company stations disclosed that N811BE was not at any of the airports serviced by the stations.

About 0740, on December 29, 1991, persons aboard a fishing vessel located part of a wing of an airplane floating in the ocean northeast of Block Island. The part was later identified as belonging to N811BE. The U.S. Coast Guard initiated an air and surface search of the area, which located other small pieces of floating debris, but no survivors or bodies.

Air traffic control (ATC) radar data recorded at the Boston Air Route Traffic Control Center (ARTCC) was reviewed for possible identification of N811BE. The December 28 data disclosed aircraft activity in the vicinity of the Block Island Airport between 2113 and 2147. The data reflected an airplane at various altitudes between 300 feet mean sea level (msl) and 2,500 feet msl with its transponder providing a code 1200 (VFR code) return. The activity ceased at 2146:07 at an altitude of 1,800 feet msl at coordinates latitude 41°14'7"N and longitude 71°21'58"W.

Based on the ATC radar data and the location of the right wing section, an underwater search-and-survey firm performed a drift analysis of the wing section. The analysis was performed to determine where the wing section entered the water based on the elapsed time between the disappearance of the ATC radar target assumed to have been N811BE and the time and location of the wing section's discovery. The analysis used surface wind speed and direction for each 20-minute period during the elapsed time along with oceanographic data on wind-driven and tidal currents for the area. The analysis provided a 12 square mile search area with the highest probability of wreckage location within a 1.5 square mile area.

Wreckage location efforts began in the 1.5 square mile area on January 1, 1992. First activation of the underwater receivers for a cockpit voice recorder (CVR) beacon transmission disclosed faint beacon signals. A sonar search pattern established along the last ATC radar ground track of the assumed target of N811BE disclosed a debris field west of the track. Further search placed the CVR transmitter at the southwestern end of the debris field. On January 2, underwater video from a remotely-operated vehicle confirmed the wreckage of N811BE. Poor weather conditions precluded recovery of the CVR until January 11, 1992.

Over about 30 days, salvage efforts resulted in the recovery of 40 to 50 percent of the airplane. The bodies of the three pilots aboard were not recovered, and they remain missing. The accident occurred about 2147 at latitude 41°13'34"N and longitude 71°22'48"W.

On December 28, the weather at Providence, Rhode Island, was reported at 2100 as clear with 20 miles of visibility. The winds were from 280" at 12 knots, and the altimeter was 30.19 inches of mercury. Providence is about 60 miles north-northeast of the Block Island Airport. Sunset occurred at 1624 and twilight ended at 1655 on December 28, 1991. No moon was visible when the accident occurred at the accident location'.

2. FLIGHT RECORDERS

N811BE was not equipped with a flight data recorder (FDR), and none was required as per the provisions of 14 CFR 135.152. N811BE was equipped with a B&D Instrument CVR, Serial No. A01 165. The recorder case had minor impact damage. The interior electronic circuits showed signs of corrosion, and a minor amount of marine life infestation was present. The recording tape was wet but otherwise undamaged. The underwater beacon operated properly.

The tape contained three channels of excellent quality audio information, and a transcript was made of the 32 1/2 minutes of recorded information. No ATC communications were on the tape to provide a correlation of CVR times with actual times. As noted in the succeeding section, correlation of the radar data and CVR comments indicates that 49 seconds should be added to the originally selected CVR times to obtain actual times. A corrected CVR transcript is contained in Appendix A. All of the comments on the tape related to training activities with a captain-trainee occupying the left seat and the IP occupying the right seat. The IP also performed first officer duties at the request of the captain-trainee.

The CVR discussions disclosed that the captain-trainee was practicing instrument approaches to the Block Island Airport, during which the IP disabled the trainee's attitude indicator several times by opening a circuit breaker through which electrical power was supplied to the indicator. The discussions also disclosed that the IP simulated a failure of the landing gear extension indicators and a failure of the flap extension system by opening appropriate circuit breakers. The first approach was a nondirectional radio beacon approach to runway 10 with a circle to land on runway 28. The airplane landed at 2132:00, and the pilots took

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[1] According to astronomical data, the moon was about 37° below the eastern horizon.

off at 2134:48. About 2135:02, a failure of the left engine was simulated. At 2135:34, power was restored to the left engine.

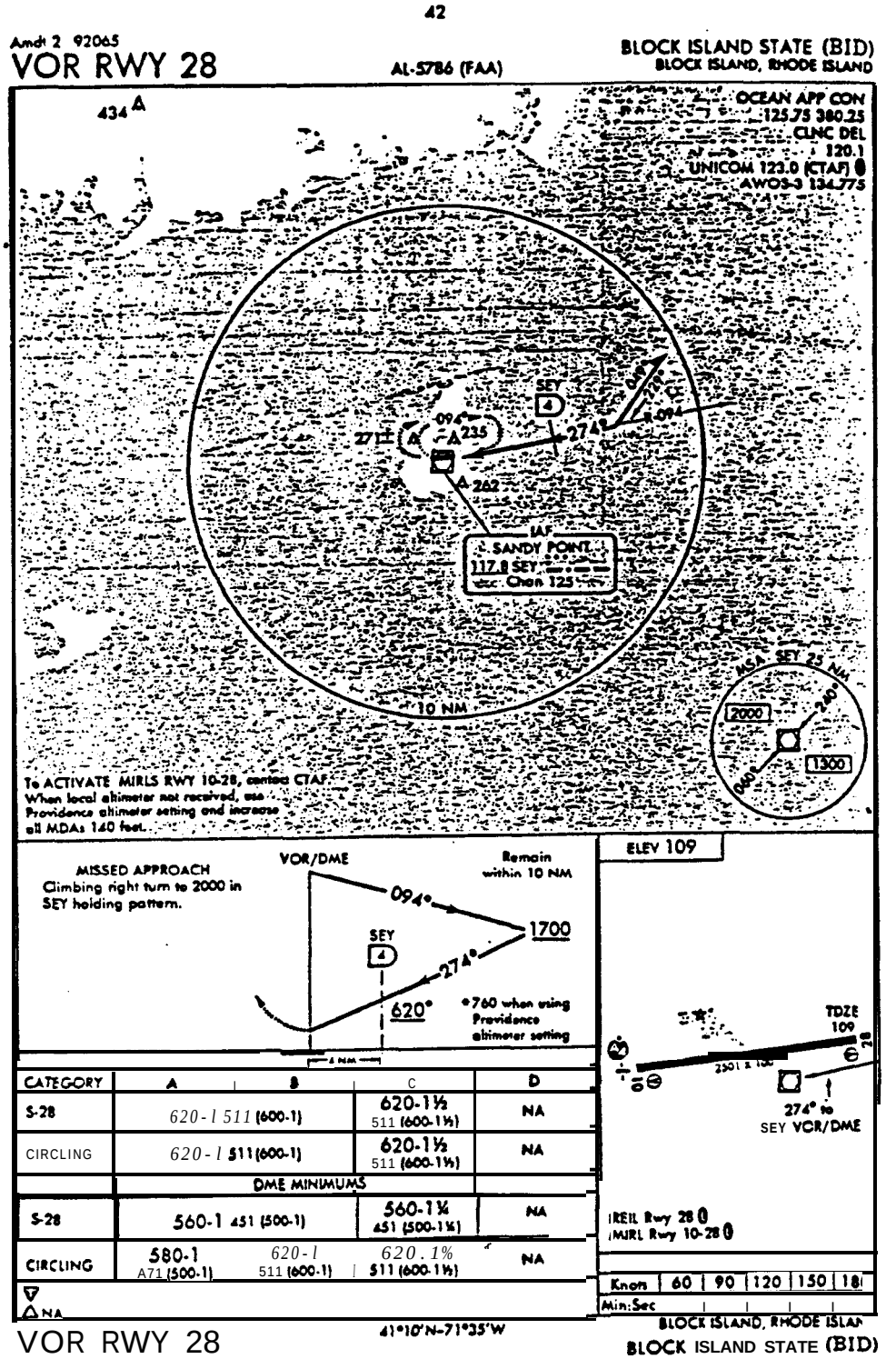
At 2136:27, the IP specified a very high frequency omnidirectional radio (VOR) approach to runway 28 (see Figure 1) and, at 2136:46, the trainee stated, "have a failure on the attitude indicator." At 2139:04, the descent check was accomplished, and the approach check was begun. At 2144:22, a failure of the right engine was simulated by retardation of the power lever to the flight idle position; at 2144:38, the IP confirmed that the right power lever was in flight idle. At 2145: 15, the trainee said, "it'll be a single-engine landing...ref gonna be one oh three...that'll be one twenty-three as it stands now."

At 2146:35, the IP said, "stop one thing at a time. You're in a bad situation, so correct one thing first. " At 2 146:39, the IP said "nope," and at 2146:40, the trainee said, "Whoa" followed by, "your aircraft?" At 2146:42, the IP replied, "no take it" followed by the statements "get the bank" and "power to idle. " At 2146:46, the IP said, "What are you doing that for?" accompanied by the sound of the landing gear warning, which continued until the recording ended. At 2146:47, the IP said "all right." The recording ended at 2146:49. All of the above statements were made without 'indications of distress or distortion related to physical exertion.

3. RECORDED RADAR STUDY

Recorded ATC radar data were obtained from Boston Center and the Ocean Terminal Radar Approach Control (TRACON) facility near Providence, Rhode Island. The TRACON data were processed by the continuous data recording (CDR) editor program. The data from the two facilities were plotted into ground tracks and altitude profiles for the 1200 mode C target that represented N811BE. A time difference error of 4 seconds, as determined by comparing altitude profiles of the two sets of data, was corrected by adding 4 seconds to the TRACON data. The Boston Center data were recorded at 12-second intervals, while the TRACON data were recorded at 4.5- to 4.7-second intervals.

The radar data were correlated with CVR information to determine actual times for CVR comments. Because the CVR information contained no communications with ATC to provide actual times, the correlation was general in



CATEGORY	A	B	C	D
S-28	620-1 511 (600-1)		620-1½ 511 (600-1½)	NA
CIRCLING	620-1 511 (600-1)		620-1½ 511 (600-1½)	NA
	DME MINIMUMS			
S-28	560-1 451 (500-1)		560-1¼ 451 (500-1¼)	NA
CIRCLING	580-1 A71 (500-1)	620-1 511 (600-1)	620-1¼ 511 (600-1½)	NA

▽ △NA

Figure 1--VOR Instrument Approach Procedure

nature. The correlation indicates that 49 seconds should be added to. CVR times to obtain actual times.

The ground track of N811BE was established by aligning both sets of radar data. Figure 2 shows the airplane's ground track as identified by both sets of radar data. The ground track is related to a grid south of the Ocean TRACON antenna site and east and west of a true north-south line through the site. The small open circles represent N811BE's mode C returns recorded at Boston Center and the cross marks represent returns recorded at Ocean TRACON. The final portions of the track are shown in Figure 3. The black dots in Figure 3 show the position of N811BE with respect to the Ocean TRACON antenna site. The dots represent every other transponder-reported position, with the related altitude above each dot, as the airplane was flown into the procedure turn for the VOR approach to runway 28 at Block Island. The last recorded transponder return occurred at 2146:24; the reported altitude was 1,900 feet. The actual times are related to each dot with the hour digits omitted; e.g., 43:47.2 equals 2143:47.2 eastern standard time. Part of the CVR comments are included with "CT" identifying the captain-trainee's comments and "IP" identifying the instructor pilot's comments.

Radar data from the Ocean TRACON and local atmospheric conditions were used in a computer program (FLIGHT) to calculate airplane performance parameters such as ground speed, indicated airspeed, roll angles, and acceleration loads. This program can calculate the long-term motions of the airplane, but the short-term motion calculations are not reliable. Also, the calculated values of parameters, such as roll angle, should be used with caution.

According to the FLIGHT calculations, N811BE was in level flight between 160 and 180 knots indicated airspeed (KIAS) when the last radar return was recorded. It was also in a right bank of about 26°, at a magnetic heading of about 236°, and at an altitude of 1,900 feet.

Further calculations with a limited-degree-of-freedom program involving the wreckage location, N811BE's last recorded altitude and location, an assumed wings-level trim airspeed of 170 KIAS, and an assumed crash time coincident with the end of the CVR recording indicate that during the 15 seconds from the time of the last altitude alert until the end of the CVR recording, the airplane could have reached the wreckage location intact. This could have been accomplished from a continuous right turn with the roll angle decreasing from about 75" right

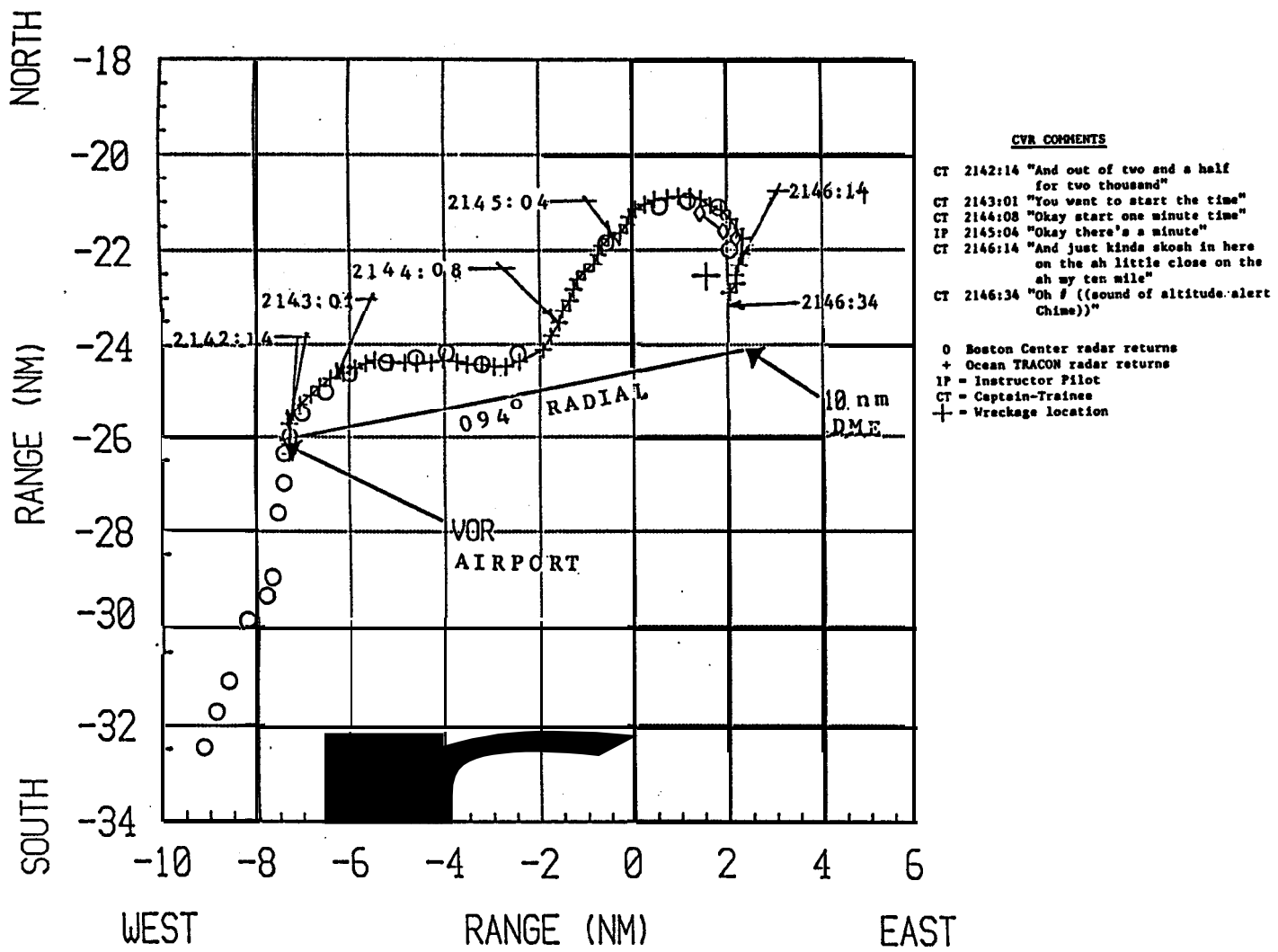
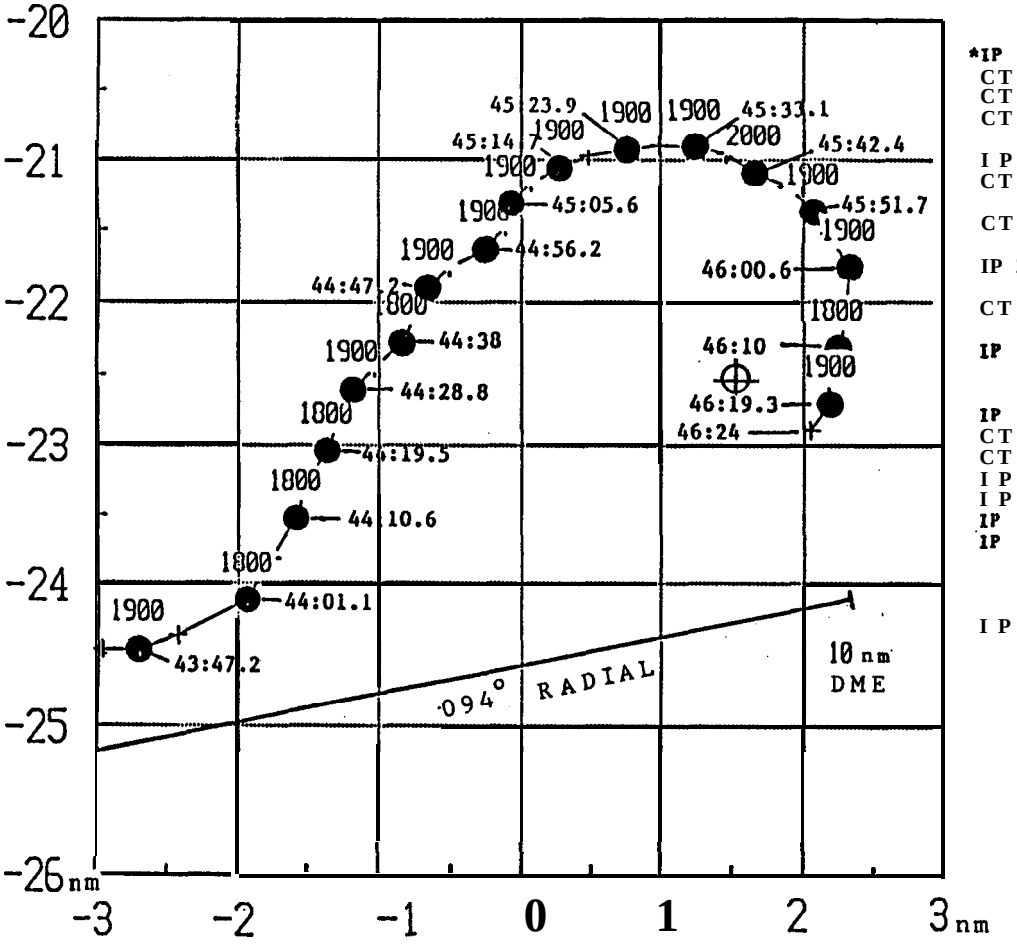


Figure 2--Ground Track of N811BE



CVRCOMMENTS

*IP	2145:04	"Okay there's a minute"
CT	2145:05	"Okay end in a right turn"
CT	2146:06	"Course looks to be alive"
CT	2146:14	"...close on the ah my ten mile"
I P	2146:17	"Yeah"
CT	2146:19	"I probably ehould be wary of that"
CT	2146:27	"Whet altitude am I good down to?"
IP	2146129	"Ah once you're established inbound you're good to what?"
CT	2146:34	"Oh # ((sound of altitude alert chime))
IP	2146:35	"Stop one thing at a time you're in a bed • ituetion so correct one thing first"
IP	2146:39	"Nope"
CT	2146:40	"Whoa"
CT	2146:42	"Your aircraft?"
I P	2146:42	"No take it"
I P	2146:44	"Get the bank"
IP	2146:45	"Power to idle"
IP	2146:46	"What are you doing that for?"
	2146:46	Sound of landing gear warning horn ctarts and continues to the end of the recording
I P	2146:47	"All right"
	2146:49	End of Recording

*IP = Instructor Pilot
CT = Captain - Trainee

⊕ Wreckage Location

Figure 3--Ground Track of N811BE (expanded continuation)

wing down to about 40° right wing down and with acceleration loads near 1.7 G increasing to about 2.15 G at impact. The airplane's rate of descent would have averaged about 6,800 feet per minute (fpm) in the process, and its airspeed would have increased to about 240 KIAS. Also, assuming the airplane began the descent while entering an unusual attitude, small variations of roll angles and acceleration load time histories would produce similar results.

4. AIRPLANE AND RELATED INFORMATION

N811BE was owned by the Concord Commercial Corporation of Park Ridge, New Jersey, and was operated by Business Express, Inc., (BEX). It had 19 passenger seats and 2 pilot seats. N811BE was equipped with 2 Pratt & Whitney PT-6A-65B engines, each with a Hartzell 4-bladed propeller. Each powerplant was rated at 1100 horsepower, The airplane had accumulated 11,265 hours in service and 13 hours since its last inspection on December 24, 1991. The gas generator and the power section of the left engine had 1,296 hours and 3,286 hours, respectively, since the last inspection. The gas generator and power section of the right engine had 1,093 hours and 9,600 hours, respectively, since the last inspection, which was an overhaul for the power section.

The maintenance records for N8 11BE for the year preceding the accident were reviewed. No discrepancies were noted that might indicate a chronic problem with the airplane's systems, flight controls, or powerplants. Also, there were no discrepancies that might indicate a potential problem in the airplane's structure.

In April 1987, N811BE was damaged during a collision with a ground service truck. According to a damage assessment by the Beech Aircraft Corporation, the truck struck the right propeller and the right side of the fuselage near the floor level just aft of the copilot's side window. The fuselage and right propeller sustained extensive damage.

According to further assessments of the damage to N811BE by the repair station, the airplane was aerodynamically and structurally straight and undistorted. Repair costs to the airframe and replacement of the right propeller were estimated at $720,000. The repair/inspection costs of the right engine were about $141,000. The airplane was repaired and returned to service in late 1987.

The maximum certificated gross takeoff weight for the airplane was 16,600 pounds, and its maximum landing weight was 16,100 pounds. N811BE weighed about 12,830 pounds on departure from Bridgeport with an estimated full load of fuel. Under the circumstances, the airplane's weight and balance would have been within limits when the accident occurred.

The wreckage of N811BE was located on the ocean floor in water about 120 feet deep. The wreckage pattern, as established by sonar, was about 300 feet wide by 600 feet long, and it was oriented on a heading of about 020° magnetic. The approximate center of the wreckage area was at latitude 41°13'34" N and longitude 71°22'48" W, about 10 miles from the Block Island Airport on a magnetic bearing of about 077°.

Both wings had separated from the airplane just outboard of the engine nacelles. The right wing appeared to have failed in downward bending as evidenced by a tension fracture in the upper cap of the main spar and compression buckling in the lower cap. The trailing edge flaps were extended about 8°. The upper panel of the right wing between the fuselage and the engine nacelle was separated; it and the outboard section of the right wing were found floating on the ocean surface about 4 miles from the wreckage area.

The outboard section of the left wing had failed in two pieces, and its leading edge was crushed. The lower cap of the main spar was separated at the outer splice. The inboard portion of the lower cap had separated completely in an approximate 30-foot section that extended to the main spar separation in the right wing. The main spar upper cap appeared to have failed in tension.

The nose and cockpit section of the fuselage was separated from the cabin section. The skin of the upper left quadrant of the nose was dimpled and wrinkled. The 'nose gear was attached and in the extended position. The windshields were in place, but the inner and outer glass panels were shattered; they were held together by the center plastic laminate. The upper left portion of the cabin displayed evidence of water impact damage. The passenger door on the left side was separated from its lower lug attachment fittings. The door handle was in the locked position, and the alignment markings for the three aft locking pins indicated a locked position. The alignment markings for the three forward pins were displaced. The cockpit instruments were destroyed. The wing flap selector was in the approach position. The copilot's flight instrument light rheostat

was in the dim position.

The vertical stabilizer displayed evidence of water damage on its right side, and the left horizontal stabilizer was bent upward. The right horizontal stabilizer was missing; its attachment structure to the vertical stabilizer indicated a failure in aft bending.

Both engines had separated from their nacelles. The right main landing gear strut was in the extended position; the wheels and tires were separated from the strut. The left gear strut was bent forward into the nacelle box structure.

The airplane apparently crashed into the water left wing first. All observed structural failures were from overstress with no evidence of fatigue in the fractures of critical components.

The left engine with propeller hub and four stub blades was recovered. The right engine was similarly recovered, but during the transfer form the water to the salvage barge, the forward part of the right engine including propeller hub, reduction gears, and exhaust casing separated and sank back into the ocean. These latter components were not recovered. The four blades on the left propeller had separated within about 1 foot of the hub. The engines displayed minimal impact damage but were severely corroded from exposure to ocean water.

Both engines displayed scoring from internal rotating parts indicating that the engines were developing power when the airplane struck the water. The scoring was not extensive, and no estimate could be made about the amount of power the engines were developing. However, since one of the last comments on the CVR was "power to idle," followed by sounds of the landing gear warning horn, it appears that the power lever on the left engine was reduced to match the power from the right engine, which was at a flight idle power setting to simulate its failure. Nothing in the engines indicated preimpact distress or anomalies that would have prevented normal operation.

The pilot's attitude indicator was operated by inverters powered by the electrical system. The power to the attitude indicator could be interrupted by opening a circuit breaker located on a panel on the right side of the cockpit. The copilot's attitude indicator was vacuum operated through ejectors in the airplane's bleed air pneumatic system. The landing gear warning horn would sound

whenever the landing gear is not extended and locked, and one or both power levers was retarded to or below the 84 percent to 86 percent N, (gas generator rated speed) power position. The warning horn could be silenced by pressing the gear warning horn silence button adjacent to the landing gear control handle (except when the flaps were in the landing position) or by extending the landing gear into the down and locked position.

5. FLIGHTCREW

Instructor Pilot (IP)

The IP, age 28, had an airline transport pilot (ATP) certificate and an IP certificate with ratings for airplane single-engine and multiengine land. He had type ratings in the BE 300, BE 1900, and Saab 340 airplanes. His first-class medical certificate was issued without limitation or waiver on December 1, 1991. According to company records, the IP had about 5,630 hours of flying time, including 1,128 hours in the BE 1900. During the 24 hours, 30 days, and 90 days preceding the accident, the IP flew 3, 64, and 203 hours, respectively, all in the BE 1900.

The IP was hired by BEX on September 17, 1986. He was designated a company line check pilot for captains and first officers in BE 1900 airplanes on August 18, 1989, and a company proficiency check pilot in the BE 1900 on March 28, 1991. According to pilots who had received instruction from the IP, he was a good pilot and a good instructor. He frequently simulated failures of various systems, such as the landing gear, wing flaps, attitude indicator, or horizontal situation indicator by opening circuit breakers or by not moving the appropriate control handle when requested. On occasion, he would simulate successive failures, such as an engine failure, followed by a failure in one or more systems.

Several pilots stated that at night, the IP would lower the intensity of the flight instrument lights on the IP's instrument panel so that the trainee could not refer to those flight instruments following a simulated failure of one or more of the trainee's flight instruments. In response to one trainee's query about why they

practiced partial panel[2] instrument flight when redundant systems were available, the IP responded that he did not like to practice with partial panel flying, but that it was required by the training manual.

Caotain-Trainee

The captain-trainee, age 28, was occupying the left pilot seat. He was hired by BEX on October 10, 1990. He had an ATP certificate with ratings for airplane single-engine and multiengine land. He was issued a first-class medical certificate without limitations or waivers on April 10, 1991. The trainee had about 2,500 hours of flying time, including about 1,200 hours in the BE 1900. During the 24 hours, 30 days, and 90 days preceding the accident, the trainee flew 0 (excluding time in the accident airplane), 66, and 112.5 hours, respectively, all in the BE 1900. He was receiving training for an upgrade check to captain status when the accident occurred.

6. THE COMPANY

BEX began operations in November 1984 with five 8-seat Piper PA-31 airplanes. From 1984 through 1989, the company expanded and purchased several small commuter airlines in the process. In 1986, the company became one of Delta Airline's "Delta Connection" carriers. By July 1989, the company was operating 18 BE 1900, 5 Fokker 27, 7 Saab 340, and 8 Shorts 360 airplanes with about 266 pilots employed. It was conducting operations under 14 CFR Parts 121 and 135. When the accident occurred, BEX was operating 20 BE 1900, 11 Shorts 360, and 25 Saab 340 airplanes with over 400 pilots employed. On March 2, 1992, BEX added 5 BAC 146-200 airplanes, and by July 1992, the company was operating 19 BE 1900, 37 Saab 340, and 5 BAC 146-200 airplanes with 483 pilots employed.

During the above years, BEX expanded its routes significantly in the northeastern United States; its routes included two cities in Canada--Ontario and Ottawa. In 1991, BEX carried more than 1.3 million passengers, an increase of

[2]Refers to less than a full complement of flight instruments. Typical instruments that might fail in flight are gyro-controlled instruments such as the attitude indicator, turn and bank indicator, or heading indicator.

more than 18 percent from 1990. The company had no fatal accidents before this accident.

A review of the company's operations specifications disclosed that the management officials required by 14 CFR 121.59 and 14 CFR 135.37 were named in the specifications. The same officials were named for the regulatory designations of director of operations, director of maintenance, and chief pilot for both Part 121 and Part 135 requirements. The specifications were issued by the Federal Aviation Administration (FAA) and were signed by the principal operations inspector (POI). Nothing in the operations specifications precluded the operation of company training flights under Part 91 of the Federal Aviation Regulations (FARs) or the operation of those flights under VFR. According to the specifications, the company's principal base of operations was Bradley International Airport, Windsor Locks, Connecticut.

The company operations manual required by 14 CFR 121.151 and 135.21 provided guidance for company personnel. The manual contained a table of organization for the flight department personnel, which included an assistant chief pilot position for the Bridgeport domicile. The organizational table showed a director of training position under the vice president of operations; the latter was the named director of operations in the operations specifications. The table also listed a director of system control under the senior vice president of operations. The latter was responsible for operations, maintenance, and system control functions. The table of organization did not include individual names; the names were provided at the request of Safety Board investigators. The assistant chief pilot position at the principal base was vacant.

According to the manual, the vice president of operations was responsible for the following:

(1) Determination of training programs;

(2) Supervision of training records;

(3) Evaluation and analysis of pilot training and testing;

(4) Evaluation and development of operational procedures and standards;

(5) Continuous observance of safety practices; and

(6) Service as the Sr. V.P. of Operations in his absence.

The vice president of operations joined BEX in 1986; he had previously flown as a pilot with a commuter airline for 9 years. He indicated that he was responsible for the flight training programs and that he had established the standards for the programs. He stated that control of the training programs was the responsibility of the director of training. He indicated that three to four of the BE 1900 IPs operated the ground and flight training programs. Before the accident, he was not aware that flight plans were not filed for training flights or that multiple simulated emergencies were flown. He stated that opening circuit breakers to simulate a failure of a system was common practice. He stated that no system had been established to monitor or to standardize instructional practices.

The director of training joined BEX in 1989, He was a qualified pilot in the Saab 340 but not in BE 1900. After joining BEX, he taught airplane systems ground school for the Saab 340 pilots, but he did not know who was responsible for ground or flight instruction in the BE 1900. He said that BEX formerly had program managers for each type of airplane but that the managers were eliminated in late 1990. In April 1991, he requested that the program managers be returned, but the request was denied. He said that no one was specifically in charge of monitoring the BE 1900 training program, and no one was assigned to monitor and standardize instructional methods. According to the BEX operations manual, the director of training was responsible to the vice president of operations for the following:

(1) Departmental production of safe and efficient operation of Company fleet;

(2) Construction and revision of aircraft operating manuals, pilot training manuals, and technical publications and bulletins required of the flight department;

(3) Determination and coordination of pilot training and qualification requirements and schedules to support line flying activities;

(4) Management of the quality of pilot training programs, activities, and records, and training department personnel;

(5) Administration of training of proficiency check airmen and instructors to assure competency, currency, and standardization;

(6) Performance of special projects and other functions as assigned; and

(7) Representation of the Company with government, industry, and communities in activities related to flying training.

BEX had a training manual that provided policy and guidance on ground and flight training for flight crewmembers. According to the manual, the training coordinator, who reported directly to the vice president of operations, scheduled all flightcrew training. The coordinator was to maintain a daily check of the pilot training files to ensure that the records were current and in compliance with FAR requirements. He or she was to coordinate with the director of training, chief pilot, maintenance department, and crew scheduling to establish the necessary training schedules.

The individual flight instructors maintained the trainee's file until the assigned training was completed. The IP involved in this accident had the training files of the two captain-trainees who were on board the airplane; the files were not recovered. The training coordinator knew of no difficulties that the two trainees might have been having with the upgrade training.

According to a parent of one of the trainees, his son had told him that the other trainee was having difficulty with the upgrade training and that the other trainee might not complete the training successfully. His son had spent the evening preceding the accident with the other trainee to help him with the training requirements. The other trainee was in the left seat of N811BE when the accident occurred.

BEX published the training manual "to provide each Instructor, Flight

Crewmember.. . with the proper procedures and guidelines necessary to perform their duties in a standardized, safe and efficient manner." According to the manual, "Flight training may be originated at any airport where an aircraft may be based, provided an appropriate Flight Instructor conducts such training in accordance with company procedures and policies. " BEX also used a BE 1900 flight simulator located at Flight Safety International (FSI), La Guardia Airport, New York, for some of its flight training. The simulator was evaluated in 1989 by the FAA to the level C (Phase II) standards of Part 121, Appendix H. As such, it could be used for type rating checks and ATP certificate checks subject to the flight examiner's discretion concerning certain maneuvers.

When the accident occurred, the FSI flight simulator was the only Phase II BE 1900 simulator in domestic operation. Also, at that time, there were about 150 BE 1900 airplanes in domestic airline operations out of a total fleet of about 220 airplanes.

The training manual also included a flight training form that listed the items and maneuvers in which training was required for initial, transition, recurrent, and upgrade flight checks. Two of the 39 items and maneuvers listed on the form were: (1) normal/abnormal/emergency operation of the flight instruments, and (2) unusual attitudes.

BEX also had a company operating manual for the BE 1900 that included a chapter on training. This chapter contained explanations of normal procedures and techniques to be used in flying the airplane. For instance, the chapter outlined the procedures and techniques to be used for single-engine precision and nonprecision approaches, including a circle-to-land procedure. Nothing in the training chapter addressed partial panel instrument flying directly, but the chapter did mention flight training on the abnormal operation of systems. Under some basic rules for training flights, page 13:5:2:2(8) of the manual stated, "During training, no multiple emergencies, and in the event of an actual emergency, the simulated emergency will be restored to normal if possible before correcting the actual emergency. "

7. FAA SURVEILLANCE

The POI for BEX was located at the FAA's Flight Standards District Office

(FSDO) at Bradley International Airport. The POI had been at the same FSDO for his approximate 20-year career with the FAA. The POI indicated that he had been the POI for BEX for several years and that he had previously served as POI for BEX earlier in his career.

The POI was qualified in the Saab 340 airplanes but not in the BE 1900. He indicated that he had visited BEX training sessions for BE 1900 pilots, had performed en route checks in BE 1900 airplanes, and had visited the BE 1900 flight simulator at La Guardia Airport, but he could not recall when he had performed these activities or any of the details related to the activities. The POI indicated that he had not assigned any of his inspectors to specifically monitor the BEX pilot training programs. He also stated that following the accident of December 28, 1991, BEX had contracted with FSI to conduct the majority of its BE 1900 flight training in the BE 1900 flight simulator.

Safety Board investigators also interviewed two FAA Aviation Safety Inspectors (Operations) who had given many of the ATP rating and type rating check flights for BEX pilots in the BE 1900 airplane. When interviewed in May 1992, each inspector had given 15 to 20 ATP or type rating checks to BEX pilots; the majority were given after the accident. Neither inspector had required partial panel instrument flying of any of the ATP or type rating applicants, but one inspector indicated that if an applicant had lost his attitude indicator during flight, he would have expected the applicant to be able to fly partial panel without referring to the other attitude indicator. Both inspectors indicated that they had not reviewed BEX's pilot training programs nor had they been directed to do so. Neither inspector was aware that circuit breakers were used to fail various systems during flight training nor were they aware that the Block Island Airport was used by BEX pilots for training.

A review of the Program Tracking and Reporting Subsystem (PTRS) records for operational surveillance of BEX from January 1, 1991, through January 1, 1992, disclosed about 430 reports. Of these, four were labelled with the activity code for training and one was labelled with the activity code for simulator. The latter related to the Saab 340 simulator, which was a part of BEX's 14 CFR Part 121 operation. The majority of the surveillance reports revealed activity related to ramp, en route cockpit, and en route cabin inspections.

All four of the reports related to the surveillance of training identified the

POI as having conducted the surveillance. Of the four reports, two pertained to Part 135 operations at BEX and involved only the BE 1900 airplanes. The two PTRS reports contained no comments about the type of training observed or the inspector's opinion of the training.

In January 1992, based on discussions with Safety Board investigators about the operation of training flights without the knowledge of BEX system control, the company established a policy that training flight schedules would be coordinated with system control and that the IP would report to system control shortly before takeoff and shortly after termination of the training flight. Based on similar discussions, the company adopted a policy in April 1992 that prohibited the opening of circuit breakers during training flights to simulate the failure of an associated system. Further, in April 1992, BEX established program managers for each model of airplane in its fleet. The program managers are responsible for maintaining pilot qualifications in their respective airplanes and standardizing the training activities related to that model of airplane.

8. ANALYSIS

The pilots of N811BE were qualified in the airplane in accordance with FARs and company policies. Although neither autopsies nor post mortem toxicological tests could be performed because the bodies of the pilots were not recovered, there was no independent evidence of medical or physiological problems that might have adversely affected their performance. Further, the CVR conversations between the pilots suggest that neither had any physical problems that might have affected their control of the airplane.

The Safety Board concludes that there is no evidence to indicate that the airplane was not airworthy or that structural failures, or systems defects or malfunctions, precipitated control difficulties. All critical structural failures observed were caused by overloads associated with forceful impact with the surface of the ocean.

Although the evidence was not conclusive with regard to when the outboard section of the right wing separated from the airplane, the Safety Board believes that the wing was intact when the airplane crashed into the ocean. The postaccident drift analysis placed the wing section in the wreckage area when the

accident occurred. Metallurgical examination disclosed that there were no defects in the structural components of the wing in the area of separation and that separation occurred from overstress.

Based on the airplane's last transponder-reported position and altitude, the airplane performance study disclosed that the airplane could have descended to the wreckage location within the 15 seconds that elapsed between the last altitude alert recorded on the CVR and the end of the recording. Further, the descent could have occurred without exceeding performance limitations in terms of airspeed and acceleration loads that could have caused major structural failures. Moreover, the descent could have occurred without acceleration loads that would have made intra cockpit conversation difficult--as noted before, the pilots' conversation was not abnormal throughout the descent and the IP continued to discuss unusual attitude recovery actions with the captain-trainee almost until the end of the recording.

The Safety Board cannot conclusively exclude the possibility of an event that caused premature termination of CVR operation before the airplane struck the water because the CVR events could not be precisely coordinated with the position and altitude as recorded by ATC radar, nor was there any FDR information available to establish the airplane's actual performance during its final descent. However, throughout the approximate 32-minute CVR transcript there was no mention by any of the pilots of any airplane systems problems, engine problems, or instrument problems, other than those created by the IP. Therefore, considering all of the evidence, the Board believes that any event that would have caused termination of the CVR must have been sudden and probably catastrophic, which leads to the conclusion that the event was a high speed collision with the surface of the ocean.

The Safety Board notes that the ATC radar data show no returns from N811BE's transponder after 2146:24 when an altitude of 1,900 feet was recorded by the Ocean TRACON. Since altitudes as low as 300 feet in the vicinity of Block Island were reported previously, efforts were made to determine why there were no further transponder reports as the airplane descended below 1,900 feet and into the ocean.

The transponder antenna on N811BE was located on the underside of its fuselage. Therefore, steeply banked attitudes in a right descending turn probably would have prevented interrogation of N811BE's transponder by the Ocean

TRACON, which would have precluded mode A and C reports of the airplane's position and altitude, respectively, to that facility after 2146:24. Although the Safety Board could not determine with precision the airplane's attitude when it struck the water, the airplane may have been nearly inverted with the outboard section of the left wing striking the water first and with the longitudinal axis at a fairly substantial angle with respect to the surface of the water. This attitude probably would have been consistent with a loss of control occurring in a right turn under conditions of thrust asymmetry; that is, with the left engine/propeller producing relatively high thrust and the right engine/propeller producing little or no thrust to simulate its failure. Therefore, the Safety Board concludes that the loss of mode A and C reports from N8 11BE's transponder after 2146:24 was related to the airplane's unusual attitude as it descended below 1,900 feet and crashed into the ocean about 2 146:49.

The evidence indicates that the trainee's attitude indicator was intentionally disabled, about 6 minutes after which a failure of the right engine was simulated by retarding the right power lever to flight idle. Further, the evidence indicates that as the trainee maneuvered the airplane to align it for a VOR approach to runway 28 at Block Island Airport, he became spatially disoriented" and asked the IP to take control of the airplane. The IP declined the request, apparently because he failed to recognize the trainee's severe disorientation, and attempted to coach the trainee through a recovery from an unusual attitude. In the process, the IP lost awareness of the airplane's altitude and rate of descent and may have become spatially disoriented. As a consequence, the airplane entered an uncontrolled descent and crashed into the ocean in less than 15 seconds.

The spatial disorientation of the captain-trainee occurred in large part because the IP exercised poor judgment in exposing the captain-trainee to a failure of his attitude indicator followed by the simulated failure of the right engine while the trainee was maneuvering the airplane at relatively low speeds and a low altitude on a nonprecision instrument approach on a dark night. The disablement of the trainee's attitude indicator without a means of covering the indicator, despite the trainee's specific request, was in itself a significant hazard to the trainee's spatial orientation because it is difficult to completely ignore the instrument unless it is covered. As a result, the false indications of airplane attitude as the speed of the indicator's operating gyro slowed would have tended to distract and confuse

[3] See Appendix B for a discussion of spatial disorientation.

the pilot. Also, the lapse of almost 6 minutes between disablement of the attitude indicator and simulated failure of the right engine would have introduced significant errors in the indicator's display of the airplane's pitch and bank attitudes. Since there was no mention on the CVR of covering the attitude indicator, the Board believes that the IP used poor judgment in subjecting the trainee to such conditions.

Almost 6 minutes after disabling the trainee's attitude indicator, the IP compounded the trainee's problems with spatial orientation by simulating the failure of the right engine, which would have introduced significant lateral and directional control problems. Failure of an attitude indicator in the BE 1900 did not constitute an emergency as defined in the pilot's operating handbook, because of the airplane's two independently-powered attitude indicators. Therefore, when he simulated a failure of the right engine, the IP technically did not introduce multiple emergencies. However, by not permitting control of the airplane by reference to the IP's operable attitude indicator, he effectively created multiple emergencies for the captain-trainee, which again reflected poor judgment on the part of the IP.

Although it appears that none of the company's operations specifications or its operating policies and procedures were disregarded by the IP who was involved in the accident, the Safety Board believes that considerable more attention and communication from management was needed to assure adherence to standard instructional methods and to flight safety. Instead, company management officials relied on the judgment of the IPs.

The evidence indicates that company management officials were not well informed about the flight training activities within the company, at least with respect to the BE 1900 airplane and Part 135 training. This probably occurred, in part, because of the lack of a subordinate program manager for the BE 1900 airplane and the lack of an assistant chief pilot at the principal base. Further, management deficiencies probably were related to the company's rapid expansion during the 2 to 3 years that preceded the accident. In any event, the result was that all BE 1900 pilot training activities were apparently delegated to relatively junior IPs, who were relatively new to the company training procedures and who were inexperienced as air carrier check pilots.

The Safety Board believes that company managers failed to adequately

monitor the BE 1900 flight training program and failed to recognize that no one was specifically in charge of the training program. Also, the managers and the POI were not aware that, in effect, multiple simulated emergencies were flown in training and that at least this IP was exercising judgment that seriously jeopardized flight safety by conducting partial panel instrument training at low altitude at night.

The Safety Board is aware that many commuter and regional air carriers have had flight training problems similar to BEX's problems. Because of the lack of airplanes available during daytime revenue operations and the lack of sophisticated flight simulators, much of the flight training is conducted in airplanes at night. In 1986, following three fatal commuter airline crashes in which the pilots were flying instrument approaches in instrument meteorological conditions on regularly scheduled flights, the Safety Board discovered similar problems related to the training of commuter air carrier pilots. As a result, the Safety Board issued Safety Recommendation A-86-103, which asked the FAA to:

> Expedite the program which proposes standards for the use and evaluation of aircraft flight simulator devices to be used in training programs of 14 CFR Part 135 operators and in cooperation with the Regional Airlines Association [RAA], encourage and assist operators to acquire simulator devices.

The Safety Board also issued Safety Recommendation A-86-120, which asked the RAA to:

> Work with its membership to encourage the use of flight simulators and Advanced Training Devices in the pilot training programs of commuter airlines.

Safety Recommendation A-86-l 03 was classified "Closed--Acceptable Action" on February 23, 1989, based on the FAA's December 5, 1988, response, which stated:

> The Federal Aviation Administration (FAA) has granted the petition for exemption from the Regional Airline Association to allow the use of advanced training devices in crew training and checking under 14 CFR Part 135. Any Regional Airline Association member who is a 14 CFR Part 135 certificate holder can apply under this exemption for

> approval to use FAA-approved advanced training devices for training and checking. The exemption, along with the advisory circular which addresses advanced training devices, establishes the basis to encourage and assist 14 CFR Part 135 operators to incorporate flight simulator devices into their training programs. Individual principal operations inspectors will cooperate fully with operators to utilize these devices in their training programs.

The Safety Board, in its February 23, 1989, reply that closed Safety Recommendation A-86-103, stated:

> We note that the Federal Aviation Administration has granted the petition for exemption from the Regional Airline Association to allow the use of advanced training devices in crew training and checking under 14 CFR Part 135. This exemption, along with advisory circulars 120-45 and 120-46, establishes the basis to encourage and assist 14 CFR Part 135 operators to incorporate flight simulator devices into their training programs. We appreciate the actions taken. Safety Recommendation 'A-86- 103 is now classified as "Closed--Acceptable Action. "

Safety Recommendation A-86- 120 was classified "Closed--Acceptable Action" on June 7, 1988, based on the RAA's response on March 2, 1988, which stated:

> The RAA has, since 1983, been working on Advanced Training Devices (ATD) for use by commuter air carriers. The FAA, responding to an RAA proposal, issued AC 120-45 and 120-46, which recognize the ATD and establish training and checking authorizations. Those ACs have been distributed to all member airlines and members are continually being encouraged to purchase ATDs for use in training programs. Additionally, more motion base/visual simulators are being installed for commuter use in training centers and member airlines are using them.

The Safety Board is aware that since the above safety recommendations were closed, the FAA, in October 1990, adopted Special Federal Aviation Regulation (SFAR) No. 58, Advanced Qualification Program (AQP). The AQP provides an

alternative method for qualifying, training, certifying, and otherwise ensuring the competency of crewmembers and others who are required to be trained and qualified under the provisions of 14 CFR Parts 121 and 135. The AQP provides for increased use of approved flight simulators and training devices in air carrier training programs and for the establishment of training centers with which carriers can contract for the complete training, qualification, and evaluation of air carrier personnel or for services that are less comprehensive.

The Safety Board is also aware that the FAA has proposed to establish certification and operating rules for training centers. The proposal would also provide additional credits for the use of aircraft flight simulators in formal training, testing, and checking programs. The Safety Board responded to the FAA's related notice of proposed rule making (NPRM)[4] in December 1992, and agrees with the intent of the NPRM to permit a wider variety of training, testing, and checking to be accomplished in approved flight simulators and training devices. The Safety Board cautioned, however, that care must be exercised to prevent excessive use of flight simulators to meet specified qualification requirements at the expense of operating experience in the actual flight environment.

The Safety Board believes that, although no air carrier yet has an approved AQP, the FAA and RAA have focused well on the crewmember training problems faced by commuter and regional air carriers, and the availability of flight simulators and advanced training devices for most types of airplanes used by commuter and regional air carriers has increased significantly in the past 8 years. However, as this accident demonstrates, the availability of only one Phase II BE 1900 simulator apparently has not been sufficient for BEX to cope with its rapid expansion and its increased number of pilots. As a result, hazardous training maneuvers continued to be conducted in the company's airplanes. However, to BEX's credit, it has recognized the risks and, according to the POI, has made plans to conduct most of its BE 1900 training in flight simulators. The Safety Board believes, however, that similar needs probably continue to exist in the commuter and regional air carrier industry and, therefore, encourages the RAA again to assist its membership in obtaining access to appropriate flight simulators for use in their pilot training programs.

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[4] Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking at Training Centers, Docket No. 26933, Federal Register (page 35888), Vol. 57, No. 155, August 11, 1992.

The Safety Board also notes that with the significant improvements made in flight simulators in the last decade, and with the increased size, complexity, and performance of typical commuter air carrier airplanes, it may be time to consider the confinement of certain hazardous training maneuvers to flight simulators for Part 135 commuter operators. In 1972, the Safety Board made safety recommendations to the FAA to this effect for Part 121 operators, and currently, virtually all training, testing, and checking for pilots of Part 121 operators are conducted in flight simulators. Therefore, the Safety Board believes that the FAA should consider appropriate amendments to 14 CFR Part 135 to require that training, testing, and checking in the performance of certain hazardous flight maneuvers, such as engine-out operations and recovery from unusual attitude maneuvers, be conducted to the maximum extent feasible in approved flight simulators for Part 135 commuter operators.

The Safety Board believes that the FAA surveillance devoted to BEX's flight training programs was inadequate in view of the company's rapid expansion and the commensurate increase in the number of pilots. When increases of this type occur, the quality of the company's training programs becomes more important. Transitional training is needed as more pilots are brought into the company and its current pilots upgrade to different positions and different airplanes. The Board believes that only two surveillance visits to BEX's BE 1900 training program over a year were not sufficient to adequately assess the quality of the program or management's involvement in the program. In this case, management oversight of the BE 1900 training program was minimal, particularly after elimination of the program manager position in late 1990. Appropriate surveillance could have identified these management deficiencies.

In view of the 430 or so surveillance activities devoted to BEX's operations between January 1, 1991, and January 1, 1992, of which only 4 were devoted to BEX's operational training programs, the Board believes that the POI's resources for surveillance were probably adequate but not distributed properly. The Safety Board realizes that judgments in this respect are not easy to make and does not regard the lack of such surveillance as a causal factor in the accident. However, the Board believes that the company's steady expansion in terms of airplanes, pilots, and routes should have suggested to the FAA a need for increased surveillance of the company's pilot training programs and its management of the programs.

9. FINDINGS

1. The flightcrew was qualified and current in accordance with FARs and company policies.

2. There was no evidence of airframe or powerplant failures prior to impact with the water.

3. There were no airplane system malfunctions or failures before impact with the water except when electrical power to the captain-trainee's attitude indicator was deliberately removed.

4. The captain-trainee was flying the airplane in simulated night instrument conditions on a dark moonless night over the ocean about 10 miles east-northeast of Block Island, Rhode Island, when the accident occurred.

5. The IP disabled the captain-trainee's attitude indicator, and about 6 minutes later, he simulated a failure of the right engine by retarding the power level to the flight idle position, which, in effect, introduced multiple emergencies contrary to the provisions of the company's BE 1900 operating manual.

6. The IP used poor judgment by encouraging the captain-trainee to fly the airplane with his attitude indicator disabled and uncovered, followed about 6 minutes later by a simulated failure of the right engine under simulated instrument conditions on a dark night.

7. The IP failed to recognize in a timely manner that the captain-trainee was spatially disoriented when the captain-trainee asked the IP to take control of the airplane ("Your aircraft?"); instead, the IP attempted to coach the captain-trainee into a recovery from an unusual attitude.

a. The attempted recovery from an unusual attitude was not successful, apparently because the IP lost awareness of the airplane's altitude and rates of descent and may have become spatially disoriented at an altitude too low for recovery.

9. The airplane probably crashed into the ocean in a near-inverted attitude with the outboard section of the left wing striking the water first and with the longitudinal axis at a substantial angle with respect to the surface of the ocean.

10. Company management personnel did not adequately supervise the BE 1900 flight training program to ensure that training objectives were met without exposing its pilots to conditions potentially hazardous to flight safety.

11. The FAA failed to adequately monitor the company's flight training programs and failed to recognize that management's oversight of and involvement in the BE 1900 training program were minimal.

10. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable causes of this accident were the instructor pilot's loss of altitude awareness and possible spatial disorientation, which resulted in the loss of control of the airplane at an altitude too low for recovery; and company management's lack of involvement in and oversight of its Beechcraft 1900 flight training program. Contributing to the accident was the instructor pilot's exercise of poor judgment in establishing a flight situation and airplane configuration conducive to spatial disorientation that afforded the pilots little or no margin for error.

11. SAFETY RECOMMENDATIONS

As the result of the investigation of this accident, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require principal operations inspectors of commuter airlines to verify that appropriate and qualified levels of airline management are actively involved in the airline's flight training programs. (Class II, Priority Action) (A-93-70)

Encourage commuter airline managers to use approved flight simulators for pilot training, qualification, and competency and instrument check purposes to the maximum extent feasible. (Class II, Priority Action) (A-93-71)

Consider an amendment to 14 CFR Part 135 to require that commuter air carriers perform certain hazardous training, testing, and checking maneuvers, such as engine-out operations and recovery from unusual flight attitudes, in approved flight simulators to the maximum extent feasible. (Class III, Longer Term Action) (A-93-72)

The Safety Board also recommends that the Regional Airline Association:

Encourage its members to use approved flight simulators for required pilot training, qualification, and competency and instrument check purposes to the maximum extent feasible. (Class II, Priority Action) (A-93-73)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

Carl Vogt
Chairman

Susan Coughlin
Vice Chairman

John K. Lauber
Member

Christonher A Hart
Member

John Hammerschmidt
Member

April 27, 1993

APPENDIX A

Transcript of a B +D Instruments cockpit voice recorder S/N A01 165 removed from a Business Express, Inc., Beech 1900C, N81 1BE, which was involved in an accident on December 28, 1991, off the coast of Block Island, Rhode Island.

RDO	Radio transmission from accident aircraft
CAM	Cockpit Area Microphone sound or source
INT	Cockpit intercom sound or source
-1	Voice identified as student pilot (left seat)
-2	Voice identified as instructor pilot (right seat)
-3	Voice identified as seconde student pilot seated in cabin
-?	Voice unidentified
UNK	Unknown source
*	Unintelligible word
@	Nonpertinent word
#	Expletive deleted
%	Break in continuity
( )	‘Questionable text
(( ))	Editorial insertion
	Pause

Notes: All times are expressed in eastern standard time.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2114:19	Start of recording		
2114:21 INT-1	confirm right engine failure?		
2114:22 INT-2	correct.		
2114:24 INT-1	check fire check feather?		
2114:26 INT-2	feathered, no fire. - not feathered, no fire.		
2114:27 INT-1	not feathered no fire. confirm right ah right power lever?		
2114:36 INT-2	okay, fly the airplane first.		
2114:37 INT-2	okay right power lever confirmed.		
2114:38 INT-1	and flight idle.		
2114:38 INT-2	idle.		
2114:39 INT-1	confirm right prop lever?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2114:40 INT-2	right prop lever confirmed.		
2114:41 INT-1	feather.		
2114:42 INT-2	feather.		
2114:43 INT-1	okay wait 'till four hundred feet.		
2114:55 INT-2	okay don't climb.		
2114:58 INT-1	okay I'm lowerin' the nose.		
2115:01 INT-1	and you said no fire is that right?		
2115:03 INT-2	you're you're already at four hundred feet when we ah doin' the drill.		
2115:06 INT-1	okay and ah'wait for ah thousand feet to call for clean up checks .		
2115:11 INT-2	okay what do you want to do first though. four hundred feet you said that you are waitin' for four hundred feet.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2115:15 INT-1	yeah and waitin' for blue line which I got now. flaps up.		
2115:17 INT-2	all right.		
2115:18 INT-2	don't climb to eight hundred feet. level off at four hundred feet. you got blue line. flaps up.		
2115:22 INT-1	and pitch back up .		
2115:24 INT-2	that's it – just like on the profile it shows you. level off.		
2115:27 INT-1	that's correct.		
2115:33 INT-?	*.		
2115:36 INT-2	alright auto-feather off.		
2115:37 INT-1	and the auto-feather is off.		
2115:38 INT-2	taxi light out.		
2115:39 INT-1	got it out:		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2115:57 CAM	((sound of altitude alert tone))		
2115:57 INT-2	okay NDB one zero. circle to land two eight.		
2116:00 INT-1	okay.		
2116:03 INT-1	okay here at Block Island. okay NDB one zero Block Island rhode Island and the NDB is two sixteen. it's in there you'll need to monitor it throughout the approach please. airport elevation is ah hundred and nine feet and ah it's ah NDB is on the field. there's no final approach fix on this approach there fore there is no time and the inbound bearing for the approach is ah one fifteen.		
		2116:39 RDO-	((sound of BID morse code identifier starts))

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2117:54 INT-2	okay all right direct to the NDB maintain two point five 'till established cleared for the approach.		
2117:59 INT-1	okay I got an off flag here.		
2118:00 INT-2	okay.		
2118:02 INT-1	ah should I tell you that?		
2118:02 INT-2	yeah.		
2118:03 INT-1	okay I have an off flag. apparently it's a failure of my attitude indicator.		
2118:07 INT-2	okay maintain two point five 'till established.		
2118:08 INT-1	um could you sinc the props.		
2118:11 INT-1	maintain two point five okay.		
2118:14 INT-1	and cleared direct beacon till' ah –.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2118:17 INT-2	right you're eight miles from the beacon maintain two point five 'till established cleared for the approach.		
2118:21 INT-1	okay.		
2118:25 CAM	((sound of altitude alert chime))		
2118:28 INT-2	make things easy on yourself, right. your eight miles from the beacon.		
2118:32 INT-1	ah.		
2118:33 INT-2	ah.		
2118:34 INT-1	let's go with the descent check and ah approach check.		
2118:35 CAM	((sound of landing gear warning horn starts))		
2118:38 INT-2	okay pressurization?		
2118:39 INT-1	pressurization set for ah landing.		
2118:41 INT-2	altimeters?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2118:42 CAM	((sound of landing gear warning horn stops))		
2118:44 INT-1	and the ah altimeters are ah set.		
2118:47 INT-2	ice protection?		
2118:48 INT-1	as required.		
2118:49 INT-2	descent check's complete. ah approach check. cabin lights and signs?		
2118:52 INT-1	they're up.		
2118:53 INT-2	lights?		
2118:53 INT-1	they're up.		
2118:54 INT-2	auto-feather?		
2118:55 INT-1	auto-feather is armed.		
2118:56 INT-2	PA?		
2118:57 INT-1	as required.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2118:58 INT-2	approach crew brief?		
2118:59 INT-1	and be as previously briefed. give me a Ref.		
2119:01 INT-2	one oh three.		
2119:02 INT-1	okay.		
2119: 18 INT-1	takeoff flaps please.		
2119:19 INT-2	got 'em.		
2119:23 INT-1	okay I'll be goin' to the beacon then it'll be ah right hand turns.		
2119:31 INT-1	parallel entry. let you know what I'm doin.		
2119:35 INT-2	okay what's this parallel entry stuff.		
2119:39 INT-1	um yeah it's ah oh I'm sorry it's ah after the missed ah I'm thinkin' it's a it's procedure turn so.		
2119:43 INT-2	okay yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2119:46 INT-1	and we're direct to the beacon two point five. checklist's complete and we're just lovin' life. all right.		
2120:04 INT-1	yeah it'd be easier if you'd just cover that thing up.		
2120:06 INT-2	I know.		
2120:07 INT-1	just ignore it though you know. I guess I gotta'.		
2120:09 INT-2	yup.		
2120:10 INT-1	force myself to ignore it.		
2120:16 INT-1	and just confirm that was the ah barb is on the ah left side.		
2120: 19 INT-2	correct.		
2120:20 INT-1	okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2120:23 INT-1	and since there's no final approach fix I'll go ahead and configure as I turn inbound on to the portion of the approach.		
2120:28 INT-2	okay - well when can you go down to your MDA?		
2120:31 INT-1	established inbound.		
2120:32 INT-2	right.		
2120:34 INT-1	and ah confirm MDA again.		
2120:37 INT-2	ah what'd you put in there.		
2120:39 INT-1	I didn't that's just it huh.		
2120:41 INT-2	alright circlin' to land -- six forty.		
2120:49 INT-1	(got) it thank you.		
2121:20 INT-1	okay left-to ah time one minute.		
2121:23 INT-2	okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2121:32 INT-1	I can use the DME off of ah seventeen eight.		
2121:36 INT-2	okay well I ah haven't you not have it.		
2121:39 INT-1	all right so stay within ten I would use it if it was available just to let you know.		
2121:42 INT-2	okay so you'd cross the NDB right.		
2121:43 INT-1	right.		
2121:45 INT-2	so what do you want to do?		
2121:46 INT-1	so I just start a time for one minute.		
2121:48 INT-2	okay what is that going to do for you?		
2121:50 INT-1	and then ah go outbound.		
2121:54 INT-2	outbound you just gunna' come out here and go outbound a minute this way.		
2121:54 INT-1	no and then I'm ah * okay right okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2121:58 INT-2	okay don't space out on me.		
2121:59 INT-1	okay.		
2122:04 INT-2	just be one step ahead of the game. know I'm gunna' get to the VOR I'm gunna' turn left I'm gunna' intercept the two ninety five outbound.		
2122:07 CAM	((sound of altitude alert chime))		
2122:09 INT-1	yep yep.		
2122:10 INT-2	right on top of every thing.		
2122:36 INT-1	I'm going to go to about a two seventy heading.		
2123:17 INT-1	I'm gunna start my time now.		
2123:18 INT-2	okay.		
2123:19 INT-1	one minute.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2123:59 INT-1	and I probably need a little bigger of a cut here.		
2124:19 INT-2	and there's a minute.		
2124:20 INT-1	okay.		
2124:29 INT-1	and you can start the time for ah one more minute.		
2124:31 INT-2	okay watch what your doin'.		
2124:42 INT-1	whoa.		
2124:44 INT-2	now see your DG is your primary bank and your ah altitude is your primary pitch.		
2124:47 INT-1	okay thanks for reminding me of that.		
2124:49 INT-2	all right.		
2125:40 INT-2	okay there's a minute.		
2125:41 INT-1	okay and ah it's a right turn.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2125:43 INT-2	clear.		
2126:01 INT-1	now you were sayin' about judging your bank angle and all.		
2126:03 INT-2	right like three er well three degrees a second is standard. so don't go any more than five degrees in one second.		
2126:10 INT-1	okay I might want to slow down.		
2126:13 INT-2	and watch your speed too.		
2126:25 INT-1	there's my course and ah I'm within ten degrees here now you suggest is rollin' wings level to see what you get first.		
2126:33 INT-2	well you're maybe you're on course now you're sayin' right.		
2126:36 INT-1	yeah.		
2126:37 INT-2	okay so that means you're probably going to be way off course by the time you turn inbound aren't ya.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2126:40 INT-1	yeah.		
2126:42 INT-2	so established inbound is when you go down.		
2126:49 INT-2	never start your descent like this unless your established inbound don't –.		
2126:52 INT-1	okay.		
2126:53 INT-2	you know if you're established but ninety degrees to the course and you know.		
2127:07 INT-1	okay and I'm startin' down now.		
2127:09 CAM	((sound of landing gear warning horn starts))		
2127:15 INT-1	gear down prop sync's off props forward.		
2127:20 INT-1	and flaps to approach landing check.		
2127:21 CAM	((sound of landing gear warning horn stops))		
2127:23 INT-1	start time I say. that any way even though I know.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2127:25 INT-2	okay that's good no problem.		
2127:28 INT-2	and landing gear?		
2127:29 INT-1	they're no three green. bring the power lever up and back.		
2127:32 INT-2	up and back no light no horn.		
2127:34 INT-1	okay check the circuit beaker.		
2127:36 INT-2	okay your circuit breaker's over there right.		
2127:37 INT-1	yeah mine's in how about yours on your side?		
2127:38 CAM	((sound of altitude alert tone))		
2127:39 INT-2	yup.		
2127:41 INT-1	and how about the flaps beyond approach momentarily.		
2127: 43 INT-2	okay no light no horn.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2127:46 INT-1	okay and ah no light no horn so I've got three green I'll land.		
2127:50 INT-2	right.		
2127:53 INT-1	and ah comin' up on MDA here.		
2128:07 INT-1	whoa okay.		
2128:10 INT-2	okay remember remember I just finished tellin' you right before you went down. don't go down until you're established inbound like going inbound -.		
2128:17 INT-1	all right.		
2128:17 INT-2	you were still in the turn you were like sixty degrees off the inbound course.		
2128:22 INT-1	oh #. I'm all # up here.		
2128:26 INT-2	yeah watch altitude.		
2128:31 INT-1	I'm gettin' all disoriented here-.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2128:33 INT-1	okay I'm lookin' for my altitude. there's my course. course is alright got a correction in there.		
2128:42 INT-2	watch altitude.		
2128:53 INT-1	okay let me go missed.		
2128:54 INT-2	all right we'll just stick with it for now.		
2128:56 INT-1	okay I think I can get it back so ah.		
2128:57 INT-2	okay.		
2128:59 INT-1	I just gotta' find a little pitch attitude. .		
2129:10 INT-1	and a little more.		
2129:24 INT-1	okay it's startin' to come - a little better here on the course about ten degrees off.		
		2129:29 RDO-	((sound of six microphone keys))
2129:50 INT-2	all right there's the airport.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2129: 53 INT-1	okay ought ta' be a circle to land.		
2130:00 INT-2	now what speed do you want ta' be at?		
2130:03 INT-1	ah it's a circle be fifteen one eighteen. I'm single engine so one twenty eight.		
2130:06 INT-2	okay well you're not single engine are you?		
2130:08 INT-1	ah no okay one eighteen okay and now it's ny down wind.		
2130:16 INT-1	I'll have you time for twenty seconds a point abeam..		
2130:26 INT-1	start time please twenty seconds.		
2130:28 INT-2	okay.		
2130:46 INT-2	all right there's twenty seconds.		
2130:47 INT-1	okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2130:49 INT-2	what's your speed's suppose to be?		
2130:51 INT-1	ah slow speed -.		
2130:53 INT-1	all right what did I just say ah one oh em eighteen-.		
2130:56 INT-2	watch your altitude. altitude. altitude.		
2130:58 INT-1	*.		
2131:00 INT-2	six forty right or it's a bust .		
2131:02 INT-1	#.		
2131:13 INT-2	now think you know we're doin'. one fifty one forty you should be at one twenty.		
2131:20 INT-1	okay I'm within thirty degrees I'm leavin' my MEA.		
2131:27 INT-1	landing flaps.		
2131:28 INT-2	landing flaps three green cleared to land.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		2131:47 RDO-2	and Beech oh two final two eight Block
2132:00 CAM	((sound of touchdown))		
2132: 09 INT-2	all right we'll do a one eighty and go back.		
2132:11 INT-1	okay a one eighty and go back.		
2132:13 INT-2	all right think about it. remember.		
2132:15 INT-1	yeah.		
2132:16 INT-2	you're spacin' out little bit. the first thing I don't know what you were thinkin' when you went outbound.		
2132:21 INT-1	yeah I just forgot to turn to my heading that all I mean I knew I was goin' to the beacon and I just forgot to turn outbound.		
2132:25 INT-2	yeah.		
2132:26 INT-1	I knew where I was and-.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2132:29 INT-2	okay.		
2132:30 INT-1	and on the partial panel. all I can say is that it's been years and it's ah.		
2132:33 INT-2	yeah well that's okay.		
2132:34 INT-1	but I I appreciate just lettin' me stick with it and workin' with me on it..		
2132:38 INT-2	all right and the other thing was ah remember wait 'till you're established inbound.		
2132:43 INT-1	yeah I thought I had I mean I was confused.		
2132:45 INT-2	well it's it's like this if you were ah like fifty degrees off a localizer inbound heading -.		
2132:51 INT-1	right.		
2132:52 INT-2	like intercepting.		
2132:53 INT-1	uh huh.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2132:54 INT-2	and you're doin' a localizer approach or what ever the case was. once you're established you were good down as the needle centered would you start goin' down boom or would you wait till you turned inbound or was established inbound?		
2133:04 INT-1	so ah don't be leavin' that altitude sure until I'm turned inbound on course.		
2133:08 INT-2	right.		
2133:09 INT-1	okay.		
2133:09 INT-2	right.		
2133:10 INT-2	it says you're on course but if your head- if you're heading sixty degrees different than the course -.		
2133:14 INT-1	what the #.		
2133:15 INT-2	how long are you going to stay on course for.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2133:16 INT-1	not a whole lotta of time okay but your point is well taken yeah.		
2133:21 INT-2	all right so wait until you're established inbound and then ah just fly the airplane first. altitude you know stop the problem first and then correct to get back. so if you're too low first stop from getting any lower and then then climb back up.		
2133:34 INT-1	okay.		
2133:34 INT-2	it's better than tryin' to do everything at once. like tryin' to get on course do this do this do that –.		
2133:38 INT-1	this that.		
2133:39 INT-2	if you're too low. that takes priority over every thing doesn't it?		
2133:42 INT-1	without a doubt.		
2133:43 INT-2	so it's like stop that. get it back where it should be and then worry about the course and stuff. you can always miss the approach but if you go too low you might not be able to.		

TIME & SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME 6 SOURCE	AIR-GROUND COMMUNICATION CONTENT
2133:54 INT-2	alright where's my cushion again?		
2133:56 CAM-3	it's in the back.		
2133:59 INT-2	all right just erect your attitude indicator.		
2134:06 INT-1	yeah.		
2134:07 INT-2	yeah go ahead and pull it again okay.		
2134:08 INT-2	all right line yourself up.		
2134:11 INT-1	okay flaps are at takeoff. I'll just make sure it's reset here okay.		
2134:22 INT-2	all right cleared to go. I'd use your heading bug yeah.		
2134:31 CAM	((sound of increasing engine sound))		
2134:39 INT-2	auto-feather's not armed, torque set, engine instruments green, airspeed's alive both sides.		
2134:47 INT-2	Vee one.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2134:48 INT-2	Vee R.		
2134:49 INT-2	Vee two.		
2134:53 INT-1	max power.		
2134:54 INT-2	yup.		
2134:55 INT-1	positive rate.		
2134:55 CAM	((sound of landing gear warning horn starts))		
2134:56 INT-1	gear up Vee two.		
2134:58 CAM	((sound of landing gear warning horn stops))		
2135:02 INT-1	and confirm left engine failure?		
2135:04 INT-2	that's correct.		
2135:06 INT-1	check fire check feather?		
2135:07 INT-2	feathered, no fire.		

INTRA-COCKPIT COMMUNICATION

TIME & SOURCE	CONTENT
2135:08 INT-1	feathered, no fire okay.
2135:13 INT-1	wait until four hundred feet. which we're at already. lower the nose.
2135:22 INT-1	flaps up.
2135:22 INT-2	flaps up.
2135:26 INT-1	and let's go through. you said there is a fire right?
2135:28 INT-2	no.
2135:29 INT-1	no fire. we're going to a thousand feet for cleanup checks.
2135:30 INT-2	okay.
2135:31 INT-1	at blue line.
2135:34 INT-2	alright here it comes back.
2135:36 INT-1	okay.

AIR-GROUND COMMUNICATION

TIME & SOURCE	CONTENT

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2135:45 CAM-3	need your book?		
2135:46 INT-2	yeah right.		
2135:49 INT-2	all right.		
2136:03 INT-1	and ah clean up checks. climb check.		
2136:04 INT-2	okay.		
2136:05 INT-1	when you get a chance.		
2136:07 INT-2	where the # is my ah -.		
2136:27 INT-2	okay VOR two eight Block Island.		
2136:29 INT-1	okay, and you have the aircraft.		
2136:34 INT-1	VOR two eight -.		
2136:45 CAM	((sound of altitude alert chime))		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2136:45 INT-1	Block island is ah Rhode Island. Block Island state Rhode Island VOR two eight seventeen eight is in the NAV aid. you can have that in your side needs to be identified please. airport elevation is a hundred and nine feet. it's a procedure turn in lieu of ah procedure turn ah and a procedure turn altitude is ah seventeen hundred feet. outbound from the VOR for the procedure turn and ah let's see I got zero nine four for the ah two seventy four is the inbound and seven seventeen hundred feet is the procedure turn. said that all ready ah once established inbound you're good down to ah six hundred and twenty till four miles then the note says with the Providence altimeter setting you got to bump that up. so we'll have the local altimeter setting and we'll be good down to ah six twenty. ah at DME of four miles and you can back me up and call that if you would and ah out of six twenty we'll descend down to a straight in. ah you said straight in is that correct?		
2137:45 INT-2	ah correct.		
2137:45 INT-1	yeah straight in minimum with local altimeter setting of ah five sixty.		
2137:54 INT-1	and ah let's see -.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2138:11 INT-1	okay.		
2138:26 INT-1	okay.		
2138:27 INT-2	all right you got the plane. left turn direct to the ND- VOR maintain two point five till established, cleared for the approach.		
2138:32 INT-1	okay.		
2138:37 CAM	((sound of landing gear warning horn starts))		
2138:42 INT-1	let's go descent check. approach check.		
2138:43 CAM	((sound of landing gear warning horn stops))		
2138:44 INT-2	okay pressurization?		
2138:46 INT-1	have a failure on the attitude indicator.		
2138:47 INT-2	okay.		
2138:50 INT-1	yeah I'd just ah might want ta check the invertor or anything no.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2138:52 INT-2	ah well you would but it's dead.		
2138:55 INT-1	okay.		
2138:56 INT-2	altimeters?		
2138:58 INT-1	and the ah altimeters are set for landing.		
2139:01 INT-2	ice protection?		
2139:03 INT-1	ice protection is as required.		
2139:04 INT-2	and the descent check is complete.		
2139:06 INT-2	approach check. cabin lights and signs?		
2139:09 INT-1	are up. as required.		
2139:10 INT-2	lights?		
2139:11 INT-1	lights as required.		
2139:11 INT-2	auto-feather?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2139:13 INT-1	ah auto-feather is armed.		
2139:15 INT-2	PA?		
2139: 16 INT-1	as required.		
2139:17 INT-2	and captain approach brief?		
2139:19 INT-1	that'11 be the ah VOR ah to two eight at Block Island as previously briefed. and I'll need a Vee ref.		
2139:27 INT-2	one oh three.		
2139:29 INT-1	okay one oh three it is.		
2140:05 INT-1	and once I hit the VOR it'll be a right turn and fly outbound and do my procedure turn.		
2140:14 INT-1	right turn about zero nine.		
2140:16 INT-2	okay.		
2140:17 INT-1	to let you know.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2140:19 INT-1	talkin' to myself as probably as much as I'm talkin' to you.		
2140:22 INT-2	yeah that's fine.		
2140:22 INT-1	okay.		
2140:23 INT-2	that's good.		
2140:39 INT-2	yeah with the gear thing make it easy on yourself. check that circuit breaker power lever up and back flaps beyond approach boom boom boom that's it.		
2141:10 INT-1	and confirm crosin' the VOR after that I'm good down to ah seventeen two thousand.		
2141:15 INT-2	ah correct.		
2141:16 INT-1	two thousand after I cross the VOR.		
2141:21 INT-1	takeoff flaps please.		
2141:22 INT-2	comin' up.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2141:24 INT-1	okay and ah they don't seem to be workin' check the breaker on your side.		
2141:26 INT-2	okay.		
2141:29 INT-1	oh they are workin' now.		
2141:30 INT-2	okay.		
2141:44 CAM	((sound of altitude alert chime))		
2142:14 INT-1	and out of two and a half for two thousand.		
2142:17 INT-2	okay.		
2142:26 INT-1	and just confirm ah the procedure turn is within ten nautical miles of the VOR. is that what they want?		
2142:30 INT-2	ah correct.		
2142:32 INT-1	okay.		
2142:47 INT-2	okay now think about it you want to be relatively aggressive to get on that course outbound now.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2142:51 INT-1	okay I'll whip it around here.		
2142:53 INT-2	yeah.		
2143:01 INT-1	you want to start the time.		
2143:03 INT-1	ah I got DME ah just confirm that the four mile point is where the barb starts from.		
2143:08 INT-2	right.		
2143:09 INT-1	okay.		
2143:10 INT-2	okay don't now don't we want to re-intercept this course?		
2143:13 INT-1	yeah so we're goin ah -.		
2143:15 INT-2	well five degrees won't do it. we'll never intercept it well like four hundred miles.		
2143:18 INT-1	it'll take for ever right that's ridiculous.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TINE & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2143:19 INT-2	yeah usually after a VOR thirty degrees is pretty standard. right.		
2143:24 INT-1	okay.		
2143:31 INT-1	my RMI shows it's comin in alright here. it's close to it okay two thousand and'* course is alive.		
2143: 39 INT-1	let's ah go ahead and go right on over to ah confirm that the barb is on the left side or the ah.		
2143:44 INT-2	it's on the left.		
2143:46 INT-1	okay that's where I'm goin now.		
2143:50 INT-1	I should have initially been like you said been more aggressive.		
2143:53 INT-2	yeah you wanta' get right on that course outbound.		
2144:02 INT-2	you don't have to go far but even at the slow rate of turn that you were doin' you were slowin' down when you got around the heading outbound.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	**TIME & SOURCE**	**CONTENT**
2144:08 INT-1	okay start one minute time.		
2144:09 INT-2	okay.		
2144:22 CAM	((sound of landing gear warning horn))		
2144:24 INT-1	okay confirm max power.		
2144:26 INT-2	okay.		
2144:28 INT-1	confirm right engine failure.		
2144:29 INT-2	that's correct.		
2144:31 INT-1	check fire check feather.		
2144:32 INT-2	not feathered no fire.		
2144:34 INT-1	okay confirm right prop lever.		
2144:35 INT-2	right prop lever confirmed.		
2144:38 INT-1	**con-** ah flight idle.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME! & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2145:22 INT-2	right.		
2145:27 INT-1	and ah oops.		
2145:30 INT-1	and just confirm what altitude I'm still good to ah down to now.		
2145:32 INT-2	ah two thousand still.		
2146:06 INT-1	course looks to be alive.		
2146:14 INT-1	and just kinda' skosh in here on the ah little close on the ah my ten mile.		
2146:17 INT-2	yeah.		
2146:19 INT-1	I probably should be wary of that.		
2146:27 INT-1	what altitude am I good down to?		
2146:29 INT-2	ah once your established inbound right you're good to what?		
2146:34 INT-1	oh #.		

TIME & SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME & SOURCE	AIR-GROUND COMMUNICATION CONTENT
2146:34 CAM	((sound of altitude alert chime))		
2146:35 INT-2	stop one thing at a time. you're in a bad situation so correct one thing first.		
2146:39 INT-2	nope.		
2146:40 INT-1	whoa.		
2146:42 INT-1	your aircraft?		
2146:42 INT-2	no take it.		
2146:44 INT-2	get the bank.		
2146:45 INT-2	power to idle.		
2146:46 INT-2	what are you doin' that for?		
2146:46 CAM	((sound of landing gear warning horn starts and continues until the end of the recording))		
2146:47 INT-2	all right.		
2146:49	End of recording		

APPENDIX B

Spatial Disorientation

An individual's orientation in space, that is, the recognition of whether an individual is upright, supine, etc., is dependent upon visual and vestibular information. Visual information, provided by the eyes and processed by the brain, gives information on the position being maintained. Vestibular information, provided by the organs and fluid in the inner ears, indicates the position or orientation that the body perceives is maintained. An individual who correctly determines his or her position relative to the earth is said to have proper spatial orientation.

To an individual inside an aircraft, however, vestibular information can be misleading because the body no longer has a fixed reference with which to orient against, as the individual moves when the aircraft moves. Further, steady aircraft motion, or an accelerating or decelerating aircraft, can produce vestibular sensations that are at odds with the reality of the body's orientation. Generally, visual information in an aircraft can counter misleading vestibular information since either the horizon or aircraft instruments can tell the individual the aircraft's, and thus the individual's, orientation relative to the earth. However, when such visual information is lacking or is not perceived, the individual can be misled by incorrect vestibular information. That individual is spatially disoriented, or is perceiving an orientation in space that is incorrect. A spatially disoriented pilot can believe that a straight and level aircraft is in a turn, or is climbing or descending.

Spatial disorientation is likely to occur when external visual cues are absent. This can occur during instrument meteorological conditions or during nighttime when visual cues are absent, such as on moonless nights over unpopulated areas. Pilots are trained to rely on aircraft instruments to provide correct spatial references when visual cues external to the aircraft are absent.