



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Baltimore, MD	<b>Accident Number:</b>	IAD02FA047
<b>Date &amp; Time:</b>	05/01/2002, 1653 EDT	<b>Registration:</b>	N498CW
<b>Aircraft:</b>	Beech 400A	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	6 None
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Executive/Corporate		

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## Analysis

While on a visual approach, the captain had difficulty with the flight management system. He and the first officer exchanged words about it, and argued as to whether they were cleared for the approach. During that timeframe, with the airplane about 5 miles from the airport, 238 knots and 3,000 feet, the controller also asked the crew if they were "going to be able to get down," to which the first officer responded, "ah, we're looking." About 30 seconds later, the first officer confirmed that the airport was in sight, and, "we'll be able to get down." After switching over to the tower frequency, the airplane was cleared to land, and about 20 seconds later, the first officer asked the captain, "You gonna be able to make it?" The captain did not respond, but 20 seconds later asked about the runway length, which the first officer gave him. The first officer then told the captain that the airplane was Vref plus forty, and twice said, "There's no way." He then said twice, "Go around." The airplane crossed the landing threshold about 150 feet agl, 166 knots, and the captain landed. The airplane subsequently overran the end of the runway, and went through some lights and antennas. A review of company standard operating procedures revealed that the crew missed numerous required callouts and checklist items, that the captain was trying to program the FMS when the first officer should have been doing it, that the captain should have initiated a go-around when advised that the airplane was not within the "visual approach window," and that after the captain did not respond to the first officer's calls, the first officer should have announced that he was assuming control, and "taken the necessary actions to return the aircraft to a safe flight condition."

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The captain's failure to go around. Factors included the captain's preoccupation with the flight management system, the crew's failure to adhere to company standard operating procedures, and the lack of proper crew coordination.

## Findings

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Occurrence #1: OVERRUN

Phase of Operation: LANDING

### Findings

1. (C) GO-AROUND - NOT PERFORMED - PILOT IN COMMAND
2. (F) IMPROPER USE OF EQUIPMENT/AIRCRAFT - PILOT IN COMMAND
3. AIRSPEED(VREF) - EXCEEDED - PILOT IN COMMAND
4. PROPER TOUCHDOWN POINT - NOT ATTAINED - PILOT IN COMMAND
5. (F) PROCEDURES/DIRECTIVES - NOT FOLLOWED - FLIGHTCREW
6. (F) CREW/GROUP COORDINATION - INADEQUATE - FLIGHTCREW

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Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT

Phase of Operation: LANDING - ROLL

### Findings

7. OBJECT - APPROACH LIGHT/NAVAID
8. OBJECT - ANTENNA

## Factual Information

### HISTORY OF FLIGHT

On May 1, 2002, at 1653 eastern daylight time, a Beechjet 400A, N498CW, a fractionally-owned and operated airplane managed by Flight Options, Incorporated, was substantially damaged during a landing overrun at Baltimore-Washington International Airport (BWI), Baltimore, Maryland. The two certificated airline transport pilots and the four passengers were not injured. Visual meteorological conditions prevailed, and the airplane was operating on an instrument flight rules flight plan. The executive transport flight originated at Reading Regional/Carl A. Spaatz Field (RDG), Reading, Pennsylvania, and was operated under 14 CFR Part 91.

When interviewed at the scene, the captain stated that the flight from Reading was routine, and that he was at the flight controls during the approach and landing. When the airplane was 6 miles from the airport, he didn't hear that they were cleared for the visual approach. "The FMS [Flight Management System] locked up on me, so I was distracted."

The airplane was on an assigned heading, at an altitude that the captain thought "was higher than...we should be." The captain asked the first officer, "Are we cleared for the visual?" and the first officer reported that they were. The captain then "turned down the runway," but was "fast and...high." The captain lowered the flaps and the landing gear, and said, "We're high and we're fast, but we'll be okay." The first officer responded, "Hey man, we need to go around," but the airplane was over the threshold and the captain thought they were "okay."

The captain landed the airplane, but didn't know how far down the runway it touched down. The first officer said, "We're not going to make it," but the captain thought they would, and also thought that it was too late to abort the landing, even with full throttle. The airplane subsequently departed the end of the runway, and the captain "just tried to keep it straight."

When asked what the airspeed was when the airplane crossed the runway threshold, the captain responded, "Vref plus 25. Vref was 113 knots, and we were doing about 140."

The captain also noted that when the FMS system malfunctioned, he was "locked out" because both pilots were attempting to program the system simultaneously. He first had to clear his inputs for the first officer to be able to program his side.

When asked about the airplane's performance and handling, the captain stated, "The airplane was fine." The captain also stated that there weren't any mechanical anomalies, but noted that during the system checks prior to the takeoff from Reading, the anti-skid feature of the braking system initially did not test properly, "then there was a delay in the responses on the second test, but it worked satisfactorily." The captain also noted that even if the anti-skid hadn't worked properly, it wouldn't have grounded the airplane. "If it doesn't work, you consult the checklist and increase your landing distances."

The first officer was also interviewed at the scene, and asked to describe the events prior to and during the flight. He concurred that the flight from Reading was uneventful until the approach for landing. According to the first officer, they were assigned a heading of "210 or 220 at 4,000 feet and we were given direct to the airport. At that time, I was putting the ILS into the FMS at the same time [the captain] was putting in the frequencies."

The crew was also cleared for the visual approach during that same time. The captain

continued on the assigned heading and asked, "Are we cleared for the visual?" The first officer responded that they were, and as the airplane turned onto the final approach, he thought they were too high. In addition, the tower controller called and asked if they "could make it." The first officer responded that they could, but it subsequently appeared to him that they couldn't. At 1/4 mile from the runway, he said, "I think we should go around." When the airplane was 1,000 feet down the runway and hadn't touched down yet, he said, "We need to go around."

A couple of seconds later the airplane touched down and the first officer said, "We're not going to make it." At that point, the first officer felt "there was no chance." The thrust reversers were already deployed, and he "popped the speed brakes."

When asked what the airspeed was as the airplane crossed the landing threshold, the first officer responded that he thought it was "Vref (113 knots) plus 40, and coming down at 1,700 feet per minute." When asked where the airplane touched down, he stated, "maybe 50 to 60 percent of the runway remained."

The first officer also stated that he had flown the airplane earlier in the day, and when he landed it on a 5,000-foot runway, it seemed to operate "just fine" and "normally." The first officer further stated that he had flown other Beechjets, and noticed the braking on the accident airplane wasn't as good as others, "but nothing major." On the last leg of flight, "we didn't have any problems at all."

The passengers were interviewed briefly at the scene, and later submitted written statements that were consistent with their original interviews. According to one passenger, the flight was uneventful; however, approaching the airport, he was thinking that the descent was "fairly steep," but since he was usually on large commercial jetliners, he may have been "unused to the normal takeoff and landing patterns of small jets."

The airplane landed "fairly hard, but again not anything unusual." As soon as the airplane touched down, the pilot applied the brakes "at what seemed to be full force." The airplane began to slow, but as the passenger looked forward, through the cockpit window, it was clear that they were going to run out of runway. The passenger told his fellow passengers "we aren't going to make it," and they all braced for an impact.

The airplane then departed the end of the runway, onto the grass, went through some "modest" barriers and a couple of light poles, then over an embankment, and slid down a gentle slope, before finally coming to rest at the bottom of the slope. The passengers and crew then quickly but calmly exited the airplane through the exit door, and moved away from the airplane.

The passenger also noted that the airplane had landed with "maybe 1,000 feet or less to go" and had "little chance to stop due to a lack of rolling space." The amount of time that braking occurred "seemed quite short before we hit the end of the runway, and I estimate we hit the barrier doing maybe 60 mph."

The passenger was not aware of any problems of a mechanical, weather or traffic nature prior to the landing. After the accident, crewmembers were "clearly shaken up (as were we all) but they did not visibly panic, and they got the exit hatch open quickly, and urged us out of the plane. Their behavior after the accident was, in my view, proper and satisfactory." In addition, the cushioned seats and three point lap/shoulder harness system was a safety feature that "worked as designed, and allowed us all to walk away shaken but without visible injury."

A review of air traffic control (ATC) transcripts and radar data revealed that a radar target

identified as the accident airplane, callsign Options 498, was 5 miles from the airport, at 3,000 feet above mean sea level (msl), with a groundspeed of 238 knots, when the approach controller asked, "Are you going to be able to get down?"

Forty seconds later, at 16:51:55, the airplane was still at 3,000 feet msl, with a groundspeed of 207 knots, and had closed to within 3 miles of the airport, when the crew received clearance for the visual approach to runway 15L. At 16:52:13, when the airplane was at 2,300 feet, about 2 miles from the airport, with a groundspeed of 190 knots, the crew was cleared to land.

A Safety Board air traffic specialist plotted the last five radar returns for the airplane. The radar track was superimposed over a diagram of the airport. The track depicted the target as it aligned with the runway. At 16:52:56, the airplane was over the runway threshold, at 300 feet msl, with a groundspeed of 166 knots.

The cockpit voice recorder was transported to the Safety Board for review. According to the group chairman's factual report:

At 1641, approaching Baltimore, the first officer received information Sierra, which advised calm winds and an altimeter setting of 29.84, and to expect a visual approach to runway 33 right. The first officer subsequently relayed the information to the captain.

At 1642, the center controller advised the crew that the airplane was cleared direct to Baltimore, and requested that they reduce to 250 knots, which the first officer acknowledged.

At 1643, while the first officer was on radio #2 with a fixed based operator, the captain received and acknowledged a descent to 8,000 feet on radio #1. Shortly thereafter, the crew proceeded through the descent checklist, and determined the reference speeds to be 113, 121 and 135 knots.

At 1644:21, Baltimore Approach Control advised that Baltimore Airport was changing to runway 15, and asked if runway 15 Left (15L) would be acceptable. The winds were then from 180 degrees at 8 knots. The first officer, after asking the captain, responded that 15L would be fine. The controller then advised the crew to expect vectors for the visual approach to runway 15L, and to fly heading 220.

At 1645:13, the captain stated, "crew briefing do visual for one five left backed up by an i-l-s."

At 1645:27, the controller advised the crew to descend to 4,000 feet, which the first officer acknowledged.

At 1646:26, the captain asked, "one fifty seven on the course?" and the first officer responded, "that is correct."

At 1646:41, there was a sound similar to an autopilot disconnect tone, and the captain stated, "what the [expletive, unknown] flying to?" The first responded, "i don't know."

At 1648:03, the controller requested the crew to contact another Baltimore sector controller, which the first officer acknowledged.

Shortly thereafter, the captain noted that the heading bug had moved from 220 to 210, and after a brief discussion with the first officer, told him to just contact Baltimore and see what they wanted them to do.

At 1649:19, the first officer reported that the airplane was at 4,000 feet. The controller then responded, " 'kay great proceed direct to baltimore descend maintain two thousand five

hundred report the airport in sight," which the first officer acknowledged.

At 1649:39, the captain stated, "eh how about you give me direct baltimore here first," and the first officer responded, "didn't i?"

At 1649:47, the first officer stated, "you are direct baltimore."

At 1649:58, the captain stated, "i can't you can't give me direct baltimore when you're using yours you have to give me direct baltimore on yours."

At 1650:03, the first officer asked, "okay you want me to just turn it?" and the captain responded, "using (baltimore/both of them) at the same time."

At 1650:09, the first officer stated, "okay well I was giving you the visual," and the captain responded, "cancel yours go to baltimore."

At 1650:16, the first officer asked, "you want direct?" then stated, "baltimore. there you go," and the captain responded, "thanks."

At 1650:27, the controller advised the crew, "there's ah traffic a couple of helicopters ah about four and six miles respectively south of your position they're gonna cross the final for fifteen left south of you two helicopters," which the first officer acknowledged.

At 1650:58, the first officer asked the captain, "okay you got one five left?" and the captain responded, "well did you give me runway on here?"

At 1651:02, the first officer responded, "yeah it's all on there," and the captain stated, "all- all right give me that."

At 1651:06, the captain stated, "give me that runway."

At 1651:11, the captain stated, "wait what's going on here?" and the first officer asked, "did you want your [unintelligible]?"

At 1651:18, the captain asked, "we're cleared for the visual?"

At 1651:19, the controller stated, "... let me know if you have the airport you going to be able to get down?" and at 1651:21, the first officer responded, "ahh we're looking."

At 1651:25, the captain stated, "[expletive]. just don't talk anymore for me for a second let me. are we cleared for the approach?"

At 1651:29, the first officer responded, "yes you are."

At 1651:30, the captain stated, "oh say something about that then..." and the first officer responded, "i did it..."

At 1651:32, the captain stated, "...i asked you three times," and the first officer stated, "...cleared for the visual."

At 1651:33, the first officer stated, "it's," and the captain responded at 1651:34, "just don't say anything. don't tell me what the runway. just tell me if we're cleared for the approach or not."

At 1651:38, the first officer stated, "okay."

At 1651:51, the controller asked, "options four ninety eight you have the airport?" and the first officer responded, "that's affirmative we'll be able to get down."

At 1651:54, the controller stated, "all right cleared visual approach one five left tower nineteen

four," and the first officer acknowledged. The controller then advised the crew to switch over to the tower radio frequency.

At 1652:09, the first officer reported to Baltimore Tower, "with you on the visual one nine left...er five left."

At 1652:13, the tower controller cleared the airplane to land, and the first officer acknowledged.

At 1652:30, the first officer asked the captain, "you gonna be able to make it?" and there was no response.

At 1652:50, the captain asked, "how much runway we have here?" and the first officer responded, "five thousand...feet."

At 1653:00, the first officer stated, "you're ref plus forty...there's no way."

At 1653:09, the first officer stated, "there's no way."

At 1653:10, the first officer stated, "go around."

At 1653:15, the first officer again stated, "go around."

At 1653:16, there was a sound similar to touchdown, followed by clicks and increasing background noise.

Beginning at 1653:22, there were a series of expletives by the captain, interrupted at 1653:25, by a "thump" and at 1653:28, by a sound similar to impact.

At 1653:40, there was a sound similar to decreasing engine rpm.

The accident occurred during daylight hours, in the vicinity of 39 degrees, 10.6 minutes north latitude, 76 degrees, 39.2 minutes west longitude.

## PILOT INFORMATION

The captain held an airline transport pilot certificate with a rating for airplane multi-engine land and BE-400/MU-300 type ratings. He reported 3,000 hours of flight experience, of which, 1,100 hours were in the Beechjet. His most recent Federal Aviation Administration (FAA) first class medical certificate was issued on December 9, 2001.

A review of FAA records revealed that the captain had been a pilot for about 10 years. In 1992 he obtained his private pilot certificate after passing his second practical test attempt. In 1994, he obtained his instrument rating - airplane after passing his third practical test attempt. The captain also obtained his commercial pilot certificate in 1994, having passed the practical test on his first attempt. In 1996, the captain obtained his flight instructor certificate after passing his second practical test attempt. The captain subsequently had no more test failures.

In 1996, the captain began his first professional flying employment, with Cleveland Airports. In 1998, the captain obtained his airplane multi-engine rating. He subsequently worked as a pilot for A.L.S., Inc. and Grand Aire, Inc.

The captain was hired by Flight Options on June 5, 2000. He completed his operator and aircraft initial training the same month, and satisfactorily completed all 14 CFR Part 135 proficiency checks at Flight Safety International. On June 30, 2000, he obtained his airline transport pilot certificate and BE-400/MU-300 type ratings.

The captain completed his initial operating experience (IOE) check ride with Flight Options on February 2, 2001, in a Beech 400A. He was graded "proficient" on all tasks and maneuvers, and was upgraded to pilot in command (PIC). The evaluating pilot noted:

"[The captain] does a great job in executing all of the duties required by a pilot in command. His knowledge and determination far exceed the level that Flight Options Requires of a PIC. However, there is one area that [he] needs to concentrate on in the future: communication. [He] needs to 'slow down' whenever he is excited or encounters a busy situation. While this is by no means a deficiency, it is however an area that he needs to work harder on in the future. It is the only area that needs improvement, but, it is at a level that I consider to be proficient in terms of acting as a PIC."

The captain satisfactorily completed his latest company proficiency check in June 2001, and completed non-aircraft-specific recurrent training in September 2001.

The first officer held an airline transport pilot certificate with a rating for airplane multi-engine land and BE-400/MU-300 type ratings. The first officer's most recent FAA first class medical certificate was issued on February 4, 2002.

The first officer had been a pilot for about 8 years. FAA certification records revealed no evidence of prior performance difficulties associated with written or practical tests.

In an interview shortly after the accident, the first officer reported 3,000 hours of flight experience, with 280 hours of experience in the Beechjet. On his most recent annual company resume, dated October 30, 2001, he reported 2,750 hours total time, with 349 hours of turbine time.

The first officer obtained his airline transport pilot certificate in August 2000. FAA medical certificate application forms indicated that he was employed as a pilot by Sabena Airlines in July 2000 and by Aerojet in July 2001. The first officer was hired by Flight Options in October, 2001. He completed his operator and aircraft initial training in November 2001, satisfactorily completing all 14 CFR Part 135 proficiency checks, and receiving BE-400/MU-300 type ratings.

#### AIRCRAFT INFORMATION

The airplane was a 1996 Beech 400A. It was powered by two Pratt and Whitney JT15D5 turbo-jet engines, and had accrued 2,410 aircraft hours. The airplane was on a continuous airworthiness program, and its most recent (Phase 12) inspection was completed on April 12, 2002, at 2,349 aircraft hours.

#### AIRPORT INFORMATION

Baltimore-Washington International Airport runway 15L was 5,000 feet long and 100 feet wide, and the approach end elevation was 142 feet.

#### WRECKAGE INFORMATION

The airplane was examined at the site about 2 hours after the accident, and all major components were accounted for at the scene.

Continuous skid marks extended back from the main wreckage, to a point where they could no longer be segregated from the other skid marks on the runway. Facing the direction of travel,

the skid marks began abeam the 1,000-foot remaining marker. They continued through the runway lights, which were 190 feet beyond the departure end of the runway, then through the localizer antennas, which were 380 feet beyond the departure end of the runway.

The airplane came to rest upright; about 680 feet beyond the departure end of runway 15L, headed about 110 degrees magnetic. The nose of the airplane was crushed up and aft, and the nose landing gear was collapsed under the airframe. Both sides of the divided windscreen were broken. The right windscreen displayed impact damage, and the left windscreen did not.

The leading edge of the left wing displayed impact damage 3 feet and 12 feet outboard of the wing root. The left main landing gear was partially buried, but appeared intact.

The leading edge of the right wing displayed impact damage 6, 9, 12, 18, and 21 feet outboard of the wing root. The right main landing gear was buried up to the bottom surface of the right wing, but also appeared intact.

The inlet cowlings and the first stage fan blades of both engines displayed impact damage.

There was no evidence of pre-accident mechanical anomaly.

The anti-skid feature of the airplane's braking system was subsequently tested at the airport under the supervision of an FAA inspector (Airworthiness), on May 8, 2002. In a written statement, the inspector described the procedures used for the test, and the results of the test. According to the inspector:

"[The] system operated as per instructions and is considered to be in a normal operating condition. Warning system operates as required. Results of testing shows that the anti-skid system is in proper working order."

#### TESTS AND RESEARCH

A Safety Board Human Performance study was conducted, which examined a number of areas of an operational nature. According to the investigator's factual report:

##### -- Crew Flight and Duty Time --

The two crew members flew together exclusively for eight consecutive days, from April 24, 2002, to May 1, 2002. Flight and duty times for the 3 days preceding the accident were: On April 28, 2002, crew duty started at 1300, and ended at 2055, with 3.9 hours of flight time. On April 29, 2002, crew duty started at 0800 and ended at 1535, with 3.2 hours of flight time. On April 30, 2002, crew duty started at 0930 and ended at 2030, with 3.3 hours of flight time. On May 1, 2002, crew duty started at 1130, and the crew flew 1.8 hours of flight time.

##### -- Use of Checklists --

Required landing distance was part of a composite item on the Flight Options Beechjet 400A checklist, which included, "VREF, VAC, N1, AOA, Lng Dist." During the flight, the first officer read only the first four parts of this item. The captain later asked the first officer to tell him the length of the runway just before crossing the runway threshold.

##### -- Callouts --

The crew made standard callouts during the early and middle phases of the flight, with a few exceptions. No standard callouts (e.g., flaps, gear, altitude) were made during the approach or landing phases of flight. The first officer made one standard deviation callout, 16 seconds prior

to touchdown, informing the captain that the airplane was traveling too fast.

-- Crew Use of Flight Automation --

During the climb, descent, and approach phases of flight, the captain repeatedly complained of difficulties with the autopilot and FMS. The nature of the difficulties was not always clear from the CVR recording. The captain sometimes expressed confusion regarding the actions of the autopilot. At other times, he appeared to have difficulty programming the FMS. At times he appeared to be arguing with the first officer regarding who should program the FMS. In a written statement submitted to Flight Options after the flight, the captain and first officer stated that the captain was unable to select a direct course to BWI on the FMS after the crew receiving a direct clearance because the first officer was entering waypoints for the approach. Statements on the CVR revealed that the crew did not resolve this problem until 3 minutes before touchdown.

-- Organizational Information --

The Flight Options General Operating Manual (GOM) stated that Flight Options was a certified Air Carrier under Part 135 of the Federal Aviation Regulations (certificate number DJFA206D), and that the company's training, operations manuals, standard operating procedures, methods, and policies complied with 14 CFR Part 135. However, the manual also stated that all flights were being operated under Part 91 of the Federal Aviation Regulations.

-- Company Standard Operating Procedures --

Company standard operating procedures (SOPs) were contained in the company's General Operating Manual (GOM). Flight crews were familiarized with these procedures during training.

-- Use of Checklists --

All checklists were to be executed utilizing a challenge-response method. The pilot flying (PF) was to initiate the checklist, and the pilot not flying (PNF) would challenge by reading each checklist item out loud. The PF was to accomplish the item or direct the PNF to accomplish it, verify its completion, then state the appropriate response.

Some response-only checklist items, indicated by dark shading, were to be performed and called out by the PNF without an initial challenge. Any doubt about the status of an item was to be resolved before continuing with the checklist. After all checklist items were completed, the PNF was to state "\_\_\_\_\_ checklist complete."

If the PNF believed that a checklist had been overlooked, he was supposed to prompt the PF by asking whether the checklist should be started.

-- Callouts --

Required visual approach callouts were:

PF: (1500 feet above airport surface) "Flaps 10."

PNF: (after selecting flaps 10) "Flaps selected 10."

PNF: (when flaps indicate 10) "Flaps indicate 10."

PF: "Flaps 20."

PNF: (after selecting flaps 20) "Flaps selected 20."

PNF: (when flaps indicate 20) "Flaps indicate 20."

PF: "Gear down. Before Landing checklist."

PNF: (after selecting gear down) "Gear selected down."

PNF: (after gear indicates down) "Gear indicates down."

PNF: (complete Before Landing checklist)

PNF: (upon reaching 1,000 feet above airport surface) "1,000 feet."

PF: "Continue."

PF: (on final approach) "Flaps 30."

PNF: (after selecting flaps 30) "Flaps selected 30."

PNF: (when flaps indicate 30) "Flaps indicate 30."

PNF: "500 feet."

PNF: "50 feet."

Landing:

PF: (at touchdown) "Extend speed brakes."

PNF: (after extending speedbrakes) "Speedbrakes extended."

PNF: (at thrust reverser deploy) "6 lights."

PNF: (at thrust reverser idle speed) "60 knots."

The airplane must be in the "visual approach window" when less than 500 feet above the touchdown point. If the airplane was not within the window, a go around must be executed. The GOM defined the approach window as:

- An indicated vertical speed of less than 1,000 feet per minute
- An indicated airspeed within  $V_{ref} + 20$  (no less)
- No flight instrument flags with the runway or visual references not in sight
- Landing configuration, except full flaps (single engine visual approaches)

The PF was required to respond immediately to any PNF callout regarding an observed flight path deviation. If the PF did not positively respond by oral communication or action to two consecutive challenges from the PNF, the PNF was to "announce that he is assuming control, and take the necessary actions to return the aircraft to a safe flight condition."

-- Advising of Aircraft Configuration Change --

The PF was to alert the PNF to any aircraft control or configuration changes he planned to make, including changes to the aircraft's landing gear, speed brake, or flap settings.

-- Radio Tuning and Communication --

The PNF had primary responsibility for tuning the navigation and communications radios, identifying NAVAIDs, and performing other radio communication tasks. When tuning the VHF radios, the PNF was required to tune the newly assigned frequencies in the radio not in use, select the new radio, and retain the old frequency on the radio not in use for a "reasonable

time period" after the contact has been established on the new frequency. When tuning the PF's radios for navigation, the PNF was required to announce the NAVAID to be set, "coordinate with the PF to ensure proper selection sequencing within the autopilot mode," and announce "(Facility) tuned and identified."

-- FMS/Flight Director Programming or Changes --

On the ground, both crewmembers were to confirm the proper routing programmed in the FMS. In flight, the PF would request that the PNF to program changes in the FMS or flight director when required. The PNF would then announce that the changes were entered, and both pilots would confirm the changes.

ADDITIONAL INFORMATION

Interpolation of the Beech 400A Landing Distance chart using the aircraft landing weight provided by the flight crew, the atmospheric conditions at the time of the accident, and the flight crew's calculated Vref speed of 113 knots, revealed that with the anti-skid feature of the braking system enabled, the airplane would have required approximately 3,300 feet of landing distance. With the anti-skid feature disabled, the landing distance required was 3,800 feet.

On May 9, 2002, the airplane was released to an agent of the operator.

**Pilot Information**

<b>Certificate:</b>	Airline Transport; Commercial	<b>Age:</b>	32, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	12/19/2001
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	06/01/2001
<b>Flight Time:</b>	3000 hours (Total, all aircraft), 600 hours (Total, this make and model), 32 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

## Co-Pilot Information

<b>Certificate:</b>	Airline Transport; Commercial	<b>Age:</b>	33, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	02/04/2002
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	3000 hours (Total, all aircraft), 280 hours (Total, this make and model), 32 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Beech	<b>Registration:</b>	N498CW
<b>Model/Series:</b>	400A	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	RK-108
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	9
<b>Date/Type of Last Inspection:</b>	04/12/2002, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	16100 lbs
<b>Time Since Last Inspection:</b>	61 Hours	<b>Engines:</b>	2 Turbo Fan
<b>Airframe Total Time:</b>	2410 Hours at time of accident	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	JT15D-5
<b>Registered Owner:</b>	Steven E. Cauley	<b>Rated Power:</b>	2965 lbs
<b>Operator:</b>	Flight Options, Inc.	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BWI, 146 ft msl	Distance from Accident Site:	
Observation Time:	1654 EDT	Direction from Accident Site:	
Lowest Cloud Condition:	Few / 25000 ft agl	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	120°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.84 inches Hg	Temperature/Dew Point:	21 °C / 8 °C
Precipitation and Obscuration:			
Departure Point:	Reading, PA (RDG)	Type of Flight Plan Filed:	IFR
Destination:	Baltimore, MD (BWI)	Type of Clearance:	IFR
Departure Time:	1625 EDT	Type of Airspace:	Class B

## Airport Information

Airport:	Baltimore Washington Intl (BWI)	Runway Surface Type:	Asphalt
Airport Elevation:	146 ft	Runway Surface Condition:	Dry
Runway Used:	15L	IFR Approach:	ILS
Runway Length/Width:	5000 ft / 100 ft	VFR Approach/Landing:	Full Stop

## Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	4 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	6 None	Latitude, Longitude:	39.175278, -76.668333

## Administrative Information

Investigator In Charge (IIC):	Brian C Rayner	Report Date:	09/01/2004
Additional Participating Persons:	Raymond Stinchcomb; FAA/FSDO; Baltimore, MD Paul Yoos; Ratheon Aircraft Company; Wichita, KS Gerald Nash; Flight Options, Inc.; Cleveland, OH		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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

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