



National Transportation Safety Board Aviation Accident Final Report

Location:	Seattle, WA	Accident Number:	SEA02FA060
Date & Time:	03/28/2002, 1310 PST	Registration:	N19903
Aircraft:	Boeing S-307	Aircraft Damage:	Substantial
Defining Event:		Injuries:	4 None

Flight Conducted Under: Part 91: General Aviation - Flight Test

Analysis

The crew had originally planned to practice landings at an airport about 20 minutes away, then stop, refuel the airplane, and subsequently return to the original departure airport. Prior to the flight, the crew discussed fuel endurance, which was calculated to be 2 hours based on the captain's knowledge of the airplane's fuel consumption, and the quantity of fuel indicated on the gauges. The fuel tanks were not dipped. The flight was made at 1,500 feet msl. Upon reaching the practice airport, the crew conducted one full stop landing, then taxied back for takeoff. During takeoff, an engine had a momentary overspeed, and the crew decided to return to the original departure airport without refueling. Approaching the original departure airport, the airplane had to delay landing for about 7 minutes for a manual gear extension. Upon completion, it turned back toward the airport, and was about 6 miles from the runway when fuel pressure for one of the engines dropped. The boost pumps were turned on; however, the engine lost power. A low fuel pressure light then illuminated for another engine. The captain called for the flight engineer to switch fuel feed to another tank, but the flight engineer responded, "we're out of fuel." The remaining engines subsequently lost power, and the captain ditched the airplane into a bay. The time from first takeoff until ditching was 1 hour, 19 minutes. The airplane had flown 39 hours since restoration, and exact fuel capacities, fuel flow calculations and unusable fuel amounts had not been established. A dipping chart had been prepared, with one person in the cockpit and one person with a yardstick putting fuel in a main tank in 25-gallon increments. However, the data had not been verified, and dipping was not considered to be part of the pre-flight inspection.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Loss of all engine power due to fuel exhaustion that resulted from the flight crew's failure to accurately determine onboard fuel during the pre-flight inspection. A factor contributing to the accident was a lack of adequate crew communication regarding the fuel status.

Findings

Occurrence #1: LOSS OF ENGINE POWER

Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings

1. (C) ALL ENGINES
 2. (C) FLUID - EXHAUSTION
 3. (C) AIRCRAFT PREFLIGHT - INADEQUATE - FLIGHTCREW
 4. (F) CREW/GROUP COORDINATION - INADEQUATE - FLIGHTCREW
-

Occurrence #2: FORCED LANDING

Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: DITCHING

Phase of Operation: EMERGENCY DESCENT/LANDING

Findings

5. TERRAIN CONDITION - WATER

Factual Information

HISTORY OF FLIGHT

On March 28, 2002, about 1310 Pacific standard time, a Boeing S-307 Stratoliner, N19903, registered to the National Air & Space Museum and operated by The Boeing Company as a 14 CFR Part 91 maintenance check and proficiency flight, ditched in the waters of Elliott Bay, Seattle, Washington, following a loss of engine power on all four engines. Visual meteorological conditions prevailed at the time, and a company visual flight rules flight plan was in effect. The airplane was substantially damaged. The two airline transport pilots, and two airframe & powerplant mechanics seated at the flight engineer and avionics stations were not injured. The flight departed Snohomish County Airport (Paine Field) (PAE), Everett, Washington, and was destined for Boeing Field/King County International Airport (BFI), Seattle, Washington.

The accident flight was the second of two flights that day. The first flight was flown from Boeing Field to Paine Field, where a full stop landing was made. The crew then taxied the airplane back to the approach end of the runway, and took off on the accident flight.

On March 29, 2002, the National Transportation Safety Board Investigator-in-Charge, Federal Aviation Administration (FAA) inspectors, and representatives of Boeing interviewed the crew. All four crew members subsequently provided written statements.

According to the captain, the crew had originally planned to practice landings at Paine Field, then stop and refuel the airplane. After the refueling, the airplane would return to Boeing Field. Estimated time en route, between the two airports, was 20 minutes.

Prior to the first flight's departure, the captain spoke, via telephone, with the maintenance manager about the status of remaining maintenance jobs to be completed before the airplane was released. (Note: The maintenance manager was seated at the avionics station for the accident flight and is hereafter referred to as the observer.) The remaining maintenance consisted of pre-oiling the engines and checking the fuel quantity.

After the telephone conversation, the observer met with the captain in his office. Shortly thereafter, the first officer for the flight joined them. The three agreed that prior to the flight, they would conduct a systems and procedures review at the airplane. The three then walked over to the airplane and met with the chief mechanic. (Note: The chief mechanic was seated at the flight engineer's station for the accident flight and is hereafter referred to as the flight engineer.) The flight engineer briefed the three other crewmembers about the maintenance work that had been performed on the airplane since its last flight. See Airplane Information for details.

The captain, first officer and observer then boarded the airplane and conducted the systems and procedures review. The review was concluded by 1100. At that time, the flight engineer reported to the captain that the pre-flight inspection had been completed, and the airplane was released for flight. The captain asked the flight engineer how much fuel was onboard, and the flight engineer reported that 425 gallons of fuel were in the main fuel tanks. Flight endurance was discussed with the given fuel quantity, which was calculated to be two hours based on the captain's knowledge of B-307 fuel consumption. The amount of fuel onboard was determined to be sufficient for the planned flight.

About 1200, the engines were started and warmed-up, and a run-up was completed with no anomalies noted. The airplane was taxied to runway 13R (13 right), and at 1224, full power was applied for takeoff. The flight was flown to Paine Field at 1,500 feet, and carburetor heat was used en route.

Upon reaching Paine Field, the captain set up for a full stop landing on runway 16R. Touchdown was about 1247. The airplane was taxied back to runway 16R, and it was decided that the captain was going to make two more take-offs and landings, then stop to have the airplane refueled.

The takeoff was made at 1251. During the initial climb-out, it was noted that the tachometer for the number three engine (right side; inboard) indicated a momentary overspeed to approximately 3,000 rpm. With no crew action, it then returned to 2,500 rpm, which was normal for takeoff. Because of the overspeed, the flight crew decided to abandon the original plan, and return to Boeing Field to investigate the problem. The return flight utilized a flight profile similar to the outbound flight.

The return flight was uneventful; however, while on approach to Boeing Field, during landing gear extension, the left main landing gear did not indicate that it was down. The approach was broken off, and the manual gear extension procedure was begun.

The manual gear extension procedure required that a section of the carpet in the cabin be pulled up to open a hatch, and someone would climb into the belly of the airplane to manually crank down the gear. The observer was assigned the task. The first attempt was unsuccessful; however, during the second attempt, the gear was fully extended with a green light indication noted. The procedure took several minutes to complete.

The airplane was then turned back toward the airport to begin another approach for landing. The airplane was about 6 miles from the runway when fuel pressure for the number three engine (right side; inboard) dropped below minimum. The boost pumps were turned on; however, fuel pressure did not recover, and the engine lost power. The low fuel pressure light then illuminated for the number four engine (right side; outboard). The captain commanded the flight engineer to switch fuel feed to another tank. The flight engineer's response was, "There is no other tank. We're out of fuel."

The captain pushed the throttles forward and called for the number three engine to be feathered. When the throttles were pushed forward, multiple engine surges occurred. Then the surging stopped, and it appeared that the remaining engines had also lost power.

The airplane was rapidly losing altitude and the captain decided to ditch in Elliott Bay. The captain called a Mayday to the tower about 1309, and touchdown on the water occurred at about 1310. After landing, the airplane remained afloat while the crew evacuated. They were quickly picked up by rescue boats. The airplane was subsequently towed to shallower water by a Seattle Police Department boat before it partially sank in the water just offshore.

The first officer's statement of the events leading up to the ditching was similar to the captain's statement. The first officer reported that during the preflight discussions, he was led to believe that the fuel onboard the airplane was 400 gallons. The first officer stated that from previous flights, the airplane's fuel consumption was about 40 gal/hour/engine. Fuel consumption for the accident flight was calculated using 50 gal/hour/engine for simplification, which equaled 2 hours of flight time.

The first officer also stated that during the preflight discussion, the observer was asked by the captain about the airplane's status. The observer replied that all that remained was to "pull the airplane out, pre-oil the engines and dip the (fuel) tanks."

The first officer subsequently conducted a walk-around inspection before boarding the airplane to ensure all panels were closed and that all was secure. The crew boarded the airplane, and the normal checklist began. The first items on the checklist were fuel, oil and hydraulics, and the response from the flight engineer was "checked and set." The engines started easily, and ran at 1,000 rpm until the oil warmed up, taking about 10 minutes. When all checks were complete, the airplane took off.

After the engine overspeed condition was detected during the takeoff from Paine Field, the captain transferred control of the airplane to the first officer to fly it back to Boeing Field, and complete at least one landing. The first officer maintained control of the airplane until he noted the low fuel pressure light on the number three engine. He then turned on the fuel boost pump for that engine. The flight engineer also noted the low fuel pressure and stated the same, then subsequently reported, "We don't have any fuel." The captain then asked the flight engineer, "What do you mean we don't have any fuel?" The flight engineer replied, "The tanks are showing empty." The captain then took control of the airplane, and the emergency procedures were begun.

The number three engine was feathered shortly before the number four engine lost power. Before the number four engine was feathered, engines one and two surged, then subsided. Engines one, two and four were not feathered prior to the ditching.

During the interview, and in his subsequent written statement, the flight engineer reported that his shift started at 0600 and several volunteers arrived by 0630. Since the engines had not been run in about a month, he decided to pre-oil them, which took several hours. He also involved himself in arranging when to pull the airplane out of the hangar, as well as other airplane-related issues. Volunteers not involved in the pre-oiling process conducted the preflight inspection.

Later in the morning, the captain arrived to discuss with the flight engineer what had been done with the airplane since it last flew in late August 2001. After the briefing, the airplane was pulled out of the hangar, and the preflight inspection was completed. When the airplane was ready for flight, the fuel quantity was discussed. The flight engineer reported a "little less than half in the main tanks."

During interviews with the flight engineer, he stated that the fuel quantity was determined by looking at the main fuel tank fuel gage in the cockpit. The flight engineer also reported that the fuel tanks had not been "dipped" with a calibrated fuel stick.

The flight engineer noted that the flight to Paine Field was uneventful. After the airplane landed and taxied back to the runway, he saw that the fuel gages for the main fuel tanks were indicating 1/4 tank, but did not report it to the captain.

After takeoff, the flight engineer noted a loss of power to the number three engine. He turned his attention to the engineer's panel to try and determine the problem, when engine power came back to full, and the propeller oversped. The cause of the overspeed was discussed among the flight crew, but only the flight engineer was aware of the power loss that preceded it. The flight engineer thought that it might have been ice ingestion. At that time, it was determined to abandon the flight and return to Boeing Field.

During the process of trying to get the left main landing gear down and locked, the flight engineer left his station momentarily to help the observer. When the gear was down and he returned to his station, he noted the number three low fuel pressure light was on. He also noted that the fuel gauges were indicating "0" and reported it to the other flight crew members. The captain asked him to switch to another tank; however, there was no fuel in either the inboard or outboard auxiliary tanks.

The observer seated at the avionics station reported that during the preflight discussions about the fuel quantity, he stated that he thought there were a little less than 200 gallons in each of the two main fuel tanks. The fuel gage also read a little less than half for each main tank. He too saw that the fuel gage was indicating 1/4 tank prior to takeoff from Paine Field, but did not mention it to the captain. The observer reported that after the engines began to lose power, the captain asked if the tanks had been "dipped." After some discussion, it was determined that they had not.

Radar data depicted the flight path of the airplane from Paine Field to the Seattle area. The data indicated that the straight-in approach to Boeing Field was broken off at Alki Point, and the airplane proceeded westerly, to the eastern shore of Bainbridge Island. Two orbits were made before the flight initiated a second straight-in approach to Boeing Field. The last target before the airplane dropped off radar coverage was located over the southern end of Elliott Bay, west of the accident location.

A home video of the events leading up to, and during the ditching, revealed that the airplane made a stabilized, right descending turn to the water. The audio portion of the video revealed surging sounds from the engine(s). Water impact was made in a slightly right-wing-low attitude with the landing gear extended. The airplane initially remained upright and afloat, but subsequently sank nose-low in the shallow water.

Several witnesses also reported surging sounds from the engine(s) before the airplane ditched in Elliott Bay, about 50 feet from the shoreline, near Salty's Restaurant, at 1936 Harbor Ave. S.W., in Seattle.

PERSONNEL INFORMATION

The captain was a certificated airline transport pilot and rated in multi-engine land, single-engine land and sea, glider and instrument airplane. At the time of the accident, he reported a total flight time of approximately 15,000 hours, with 62 hours in the S-307. The captain also reported that he was type-rated, with "several thousand" hours in various older airplanes, including the B-17, DC-3 and B-247. His training for flight in the S-307 was accomplished in a B-17.

The first officer was a certificated airline transport pilot and rated in multi-engine land, single-engine land and sea, glider and instrument airplane. At the time of the accident, he reported a total flight time of approximately 7,530 hours, with 40.8 hours in the S-307. The first officer also reported that he was type-rated in several Boeing airplanes, including the B-247. His training for flight in the S-307 was accomplished in a B-17.

The captain and first officer had planned to switch crew positions after refueling at Paine Field.

The airframe and powerplant mechanic seated at the flight engineer's station also held a private pilot certificate for single-engine land airplane. He reported that he had been onboard the S-307 for the recovery flight in 1994 and all the flights since restoration. In addition, he

had been involved in the restoration of the airplane since the beginning of the project.

The airframe and powerplant mechanic seated at the avionics station also held a private pilot certificate for single-engine land airplane. He was the project manager for the restoration project, and reported approximately 40 hours of flight time in the S-307.

Both mechanics had been approved by the FAA to occupy the flight engineer's station during flight operations, and had planned to switch crew positions after refueling at Paine Field.

AIRPLANE INFORMATION

Flight log documentation indicated that the restoration of the airplane was completed in June 2001. A series of ground run tests were conducted through July, with the first flight logged on July 11, 2001. Approximately 39 hours and 30 minutes of flight time had been recorded since the first flight after restoration.

The airplane was equipped with four, 900 horsepower, Wright Cyclone R-1820-97 engines. Each engine had a carburetor installed. Maintenance records indicated that engines number one and two were overhauled in July 1996 and October 1996 respectively. Engine number three was overhauled in February 1998, and engine number four was overhauled in June 1995. Time since overhaul, to include the accident flight, totaled approximately 53 hours.

The airplane was maintained in accordance with an FAA-approved inspection program, accepted on June 26, 2001, which included "A," "B," and "C" checks, in addition to pre-flight inspections. Specific requirements included:

- (1) Preflight inspection - accomplished prior to the first flight of the day, and recorded and signed on the Maintenance Discrepancy Sheet in the airplane flight log.
- (2) A-check inspection - accomplished after 50 flight hours after a previous B check and at 50-hour intervals thereafter until the next B check.
- (3) B-check/annual inspection - accomplished over 100 flight hours or 12 calendar months, whichever came first, after the previous B check.
- (4) C-check inspection - accomplished with alternate B checks, starting with the second B check.

Provisions for Special Inspections were to be accomplished for lightning strikes, encounters with heavy in-flight turbulence, or hard landings. An A check would be accomplished for return to service if the airplane had not flown within 180 days.

Inspection items were to be accomplished, and signed off by a licensed airframe and powerplant mechanic. Any discrepancies found were to be recorded on maintenance discrepancy worksheets.

Upon completion of a preflight inspection, the mechanic would have had to verify that all inspection items and logbook discrepancies were completed, and make an entry of the inspection and sign the Maintenance Discrepancy Worksheet in the airplane flight log. A review of the Maintenance Discrepancy Worksheets verified an entry that a preflight inspection was signed off as completed on March 28, 2002. The signoff signature was that of the mechanic who was seated at the flight engineer's station during the accident flight. The Preflight Inspection Check List, used for the inspection, included: "Check fuel quantity and service if required."

The last B-check/annual inspection was completed on February 1, 2002, at 20,576.8 airplane flight hours. One engine run, totaling 50 minutes for engine number one; 40 minutes for engine number two; 38 minutes for engine number three; and 44 minutes for engine number four, was accomplished on February 14, 2002. No flight time was logged on that date, and no other engine runs or flight had been accomplished up to the accident date.

During the B-check/annual inspection, the fuel system was inspected and signed off by an airframe and powerplant mechanic. The checks included: check fuel lines and fittings for loose or leaking connections; inspect lower wing surfaces for indication of fuel leakage; check fuel shutoff valves for leaks and proper condition; check fuel transfer valves for binding, tightness of connections, security and leakage; check boost pumps for proper operation, leaks and security of mounting; inspect visible portions of all fuel cells for deterioration and shifting of mounting supports; check for fuel leakage at mounting flanges of all quantity transmitters.

Two discrepancies were recorded regarding the fuel system during the latest annual inspection. The first noted that the right wing inboard auxiliary fuel tank was not bonded properly. The bond braid and clamps were replaced. The second item identified a leak in the left wing outboard auxiliary tank sump drain. The drain valve was replaced and a leak check was okay. No other discrepancies were identified for fuel leaks in the fuel system.

A C-check inspection was completed on February 1, 2001. The accident flight was the first flight after the C check.

Fuel quantity indications were provided by three, round fuel gauges positioned on the left side of the flight engineer's panel, aligned vertically. The top gauge was for the left and right main tanks. The gauge below it was the left and right inboard auxiliary tanks, and the gauge below that was for the left and right outboard auxiliary tanks. (Each gauge had two needles, one for the right tank and one for the left tank).

A person sitting in the captain's position (left seat) could view the fuel quantity gages to the right rear; however, the needles and increments on the gages would not be accurately discernable.

There were no repeater fuel gauges on the pilots' panel. However, there was a fuel pressure gage and low fuel pressure warning light for each engine.

Fueling records indicated that the airplane's two main fuel tanks and two inboard auxiliary fuel tanks were topped off with fuel, totaling 817 gallons of fuel added, on July 31, 2001, in Great Falls, Montana. The outboard auxiliary tanks were reported as empty and were not used. The main fuel tank total fuel capacity was 425 gallons per tank. The inboard auxiliary tank fuel capacity was 212 gallons per tank.

Flight log documentation since July 31, 2001, indicated a total of 5 hours and 2 minutes of flight time, and 7 hours and 9 minutes of engine run time. Of the seven entries, including the accident flight, three included flight time, while the remaining four were strictly engine run times with no flight time. No fueling had been performed since July 31, 2001. The last flight prior to the accident was logged on August 31, 2001. Three engine ground runs only were performed from September 2001 to February 2002, totaling approximately two hours per engine.

A discrepancy on the Maintenance Discrepancy Worksheet dated August 31, 2001, noted that

the number three engine was running rich at all power settings, which was confirmed by fuel flow and torching at the exhaust during deceleration to idle upon landing. The corrective action taken included removing the carburetor, having it independently flow-checked, then reinstalled. The operations check was good; however, the mechanic noted: "Please check FF (fuel flow) on next flight."

The flight crew reported that during previous cross-country flights, fuel flow was calculated. The documentation was still ongoing at the time of the accident. No fuel flow calculations were noted for the accident flight; however, the flight crew reported that fuel flow in flight was averaging about 40 gallons per hour per engine. Fuel flow calculations were not documented for ground run times. The crew also reported that the inboard auxiliary tanks were utilized until they were run dry. The main fuel tanks were then selected. The main fuel tanks were utilized for the accident flight.

According to the Maintenance Handbook of Instructions for the S-307, "The fuel system consists primarily of four single engine systems in which the two engines on either side of the airplane are interconnected by cross feed lines for emergency operation. There are no provisions for pumping fuel from one side of the airplane to the other. Thus a pump on one side of the airplane can operate both engines on its own side, but it cannot operate an engine on the opposite side of the airplane."

Current and historical documents were reviewed in an attempt to determine unusable fuel quantities; however, the information could not be found.

COMMUNICATIONS

At 1154, on Boeing Company frequency, notification was given that the airplane was preparing for a VFR flight, with four onboard, to Paine Field and a stop for fuel. The flight was due back in about 3 hours. Security was notified that the airplane would be taxiing from spot "alpha one" in about 10 minutes.

At 1221, the flight crew contacted Boeing Tower, and reported that they were ready for departure. At 1223, the airplane was cleared for takeoff, with a left downwind departure.

At 1257, the flight crew called Boeing Tower, and informed the controller that they had the current weather (Oscar), and were 1.5 miles west of West Point.

At 1258, the controller cleared the airplane to land, with a straight-in approach to runway 13R.

At 1259, the flight crew notified the controller of a gear indication that they needed to investigate. The controller responded for the flight to proceed west of centerline, and to inform him if assistance was needed. The crew responded that they would be proceeding to Bainbridge Island to orbit.

At 1306, the flight crew informed the controller that the airplane was straight-in for runway 13R, and requested clearance to land. The controller responded that the airplane was cleared to land.

At 1307, the flight crew notified the controller that they were declaring an emergency, straight-in to runway 13R, and followed that with a Mayday call. The controller responded that emergency equipment was rolling, and inquired if they were getting a gear indication.

At 1309, the flight crew notified the tower that they were going to have a "ground impact" by Alki Point. The controller acknowledged this last transmission from the flight.

WRECKAGE AND IMPACT INFORMATION

The airplane was examined after it was recovered from the water. The main landing gear was separated from the airframe, and various amounts of wing skin were separated from the lower wing and belly area. The empennage belly section displayed extensive hydrodynamic damage and tearing of skin. The right wing trailing edge near the wing root was severely torn and deformed.

All four engines remained attached to their respective engine mounts. The number four engine (right side; outboard) was displaced downward. The propeller blades on the number four engine were bent aft and not in the feathered position. The lower cowlings to both the number three and number four engines displayed extensive hydrodynamic damage. The propeller blades for the number three engine were in the feathered position. The number one and number two engines and cowling remained intact, with neither engine's propeller blades feathered. The propeller blades on the number two engine were bent rearward slightly. The number one engine propeller blades appeared straight.

All four carburetor fuel screens (one from each engine) were removed and inspected, and found to be clear of contaminants. A strong odor of fuel was present in the fluid drained from the fuel strainers and carburetors.

A fuel/water mix was siphoned out of all six fuel tanks and pumped into a holding tank. Later, when the fluid settled and separated, it was determined that 45 gallons of it was fuel. In addition, the Washington State Department of Ecology determined that there were approximately 10 gallons of fuel spill in the bay immediately following the accident.

The fuel tanks were removed from the wings after recovery. Each tank displayed varying degrees of hydrodynamic damage, but all were intact.

A single fuel line ran across the body of the airplane, allowing fuel to be transferred by gravity from one main tank to the other. The line contained a shutoff valve at each point of entrance into the body, and the line between the valves contained a drain cock to eliminate fuel from the body after fuel transfer has taken place. The line and shutoff valves were inspected for leaks. The line was intact and the shutoff valves were in the closed position and safety-wired shut. No evidence of a fuel leak was found. Additionally, all fuel tank vents were found unobstructed.

TESTS AND RESEARCH

During the NTSB's maintenance records review, and follow-up discussions with maintenance personnel, a Main Tanks Fuel Gage Calibration chart dated June 25, 2001, was located. Maintenance personnel reported that with the aid of a standard yardstick, two volunteers, one in the cockpit and one putting fuel in the main tank in 25 gallon increments, developed the chart to compare the quantity of fuel in the tank to the reading on the fuel gage. The calculation was accomplished with the airplane in a taxi position. The chart's upper limit was 400 gallons.

Maintenance personnel reported that the chart was empirical and had not been verified. Since the data had not been verified, and was still an ongoing process, "dipping" the fuel tanks was not part of the pre-flight inspection. Fuel flow calculations were also ongoing at the time of the accident.

The main and inboard auxiliary fuel gages were removed from the cockpit for testing. Subsequently, the fuel tank sending units from the two main fuel tanks and the inboard

auxiliary tanks were also removed for inspection. Although it was believed that the right and left main fuel tank gage was dry, when power was applied, the unit short-circuited.

The main fuel tank and inboard auxiliary gages were taken to the Boeing Company's Engineering/Quality Assurance Laboratory for inspection under the NTSB's supervision. During the inspection, the tank units were functionally tested using a restored and calibrated fuel quantity test set. The right and left inboard auxiliary fuel indicators passed the functional testing, and each was also checked operationally with its respective fuel sending units. The right and left main fuel tank gage was shorted internally from the earlier test attempt. The fuel sending units for the respective tanks appeared undamaged and functional.

ADDITIONAL INFORMATION

During a telephone interview and subsequent written statement, an off-duty fire fighter for The Boeing Company stated that he observed the airplane heading northbound around 1200, and about 15 minutes after the airplane had flown over his location, a friend that was with him noticed an odor of gas. The odor "came and went" depending on the wind. The fire fighter did not notice any fuel vapor trailing from the airplane, nor did he notice any abnormal engine noise. Later in the day (time unknown), the fire fighter observed a fuel sheen on 49th Street, Seattle, which was nearby the flight path of the airplane.

The only reference to fuel quantity in all the checklists was in the "before start" section.

The airplane was released to the Stratoliner Project Manager on April 1, 2002.

Pilot Information

Certificate:	Airline Transport; Commercial	Age:	60, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	Seatbelt
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	10/01/2001
Occupational Pilot:		Last Flight Review or Equivalent:	08/29/2001
Flight Time:	15000 hours (Total, all aircraft), 62 hours (Total, this make and model), 14350 hours (Pilot In Command, all aircraft), 51 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft)		

Co-Pilot Information

Certificate:	Age:
Airplane Rating(s):	Seat Occupied:
Other Aircraft Rating(s):	Restraint Used:
Instrument Rating(s):	Second Pilot Present: Yes
Instructor Rating(s):	Toxicology Performed:
Medical Certification:	Last FAA Medical Exam:
Occupational Pilot:	Last Flight Review or Equivalent:
Flight Time:	

Flight Engineer Information

Certificate:	Age:
Airplane Rating(s):	Seat Occupied:
Other Aircraft Rating(s):	Restraint Used:
Instrument Rating(s):	Second Pilot Present: Yes
Instructor Rating(s):	Toxicology Performed:
Medical Certification:	Last FAA Medical Exam:
Occupational Pilot:	Last Flight Review or Equivalent:
Flight Time:	

Other Flight Crew Information

Certificate:	Age:
Airplane Rating(s):	Seat Occupied:
Other Aircraft Rating(s):	Restraint Used:
Instrument Rating(s):	Second Pilot Present: Yes
Instructor Rating(s):	Toxicology Performed:
Medical Certification:	Last FAA Medical Exam:
Occupational Pilot:	Last Flight Review or Equivalent:
Flight Time:	

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	Registration:	N19903
Model/Series:	S-307	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	2003
Landing Gear Type:	Retractable - Tailwheel	Seats:	39
Date/Type of Last Inspection:	02/01/2002, AAIP	Certified Max Gross Wt.:	45000 lbs
Time Since Last Inspection:	1 Hours	Engines:	4 Reciprocating
Airframe Total Time:	20577 Hours as of last inspection	Engine Manufacturer:	Wright
ELT:	Installed, not activated	Engine Model/Series:	R-1820-97
Registered Owner:	National Air & Space Museum	Rated Power:	900 hp
Operator:	The Boeing Company	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BFI, 18 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	1253 PST	Direction from Accident Site:	119°
Lowest Cloud Condition:		Visibility	9 Miles
Lowest Ceiling:	Broken / 2800 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	4 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	190°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.26 inches Hg	Temperature/Dew Point:	11° C / 5° C
Precipitation and Obscuration:			
Departure Point:	Everett, WA (PAE)	Type of Flight Plan Filed:	Company VFR
Destination:	Seattle, WA (BFI)	Type of Clearance:	None
Departure Time:	1247 PST	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	4 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC): Debra J Eckrote **Report Date:** 02/21/2003

Additional Participating Persons: David G Lehman; FAA-FSDO; Renton, WA
Simon Lie; The Boeing Company; Seattle, WA

Publish Date:

Investigation Docket: NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at <http://dms.nts.gov/pubdms/>.

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