



# Aviation Investigation Final Report

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<b>Location:</b>	Seattle, Washington	<b>Incident Number:</b>	SEA07IA019
<b>Date &amp; Time:</b>	November 16, 2006, 14:20 Local	<b>Registration:</b>	N9522S
<b>Aircraft:</b>	Cessna 172	<b>Aircraft Damage:</b>	None
<b>Defining Event:</b>		<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Instructional		

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## Analysis

While on a VFR straight-in approach in a Cessna 172, the flight instructor and her student were advised by the tower that a heavy Boeing 747, which was behind and above the 172, was executing a visual approach to an upwind parallel runway. Although the 747 crew did not have the 172 in sight, the flight instructor in the 172 spotted the 747 soon after being advised of its presence by the tower. The instructor maintained visual contact with the descending 747, and as the 747 neared a point where it would pass the 172, the instructor elected to continue the VFR approach at about the same altitude and on the same course as before. The instructor then watched as the still-descending 747 passed upwind of the 172 at a slightly higher altitude than the 172 was at. When the 747 reached a point about one-quarter mile in front of the 172, the 172 encountered the wake vortices from the 747, and immediately departed controlled flight. Recovery was completed about 150 feet above the terrain. At the time that the 747 passed the 172, the instructor was aware that there was a nine knot wind blowing almost directly across the parallel flight paths of the two aircraft, and although the instructor had requested a low approach at the runway, the instructor did not take evasive action when the 747 passed the 172 while on approach.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The instructor pilot's improper in-flight decision not to take evasive action as a heavy aircraft passed by while on an upwind parallel approach path to an adjacent runway, leading to a wake vortices encounter. Factors include a nearly direct crosswind blowing from the heavy aircraft toward the incident aircraft.

## Findings

Occurrence #1: VORTEX TURBULENCE ENCOUNTERED

Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

### Findings

1. (C) IN-FLIGHT PLANNING/DECISION - IMPROPER - PILOT IN COMMAND(CFI)
2. (C) WAKE TURBULENCE - ENCOUNTERED - PILOT IN COMMAND(CFI)
3. (F) WEATHER CONDITION - CROSSWIND

## Factual Information

On November 16, 2006, at 1422 Pacific standard time, a Cessna 172, N9522S, encountered wake vortices from an experimental Boeing 747-400 LCF (Large Cargo Freighter), while on a straight-in final approach to a visual approach for landing at Boeing-King County International Airport, Seattle, Washington. The certified flight instructor and her student were not injured, and the aircraft, which is owned and operated by Galvin Flying Service, did not sustain any damage.

According to the flight instructor, who's student was established at 1,000 feet mean sea level (msl) on a straight-in approach to Runway 13 left, about five seconds after being passed by the 747, which had been cleared for a visual approach to runway 13 right, the Cessna 172 rolled almost instantly to a 90 degree right bank, and descended in a nearly straight nose-down attitude. The flight instructor took control of the aircraft, and was able to complete a recovery approximately 150 feet above the channel of water that runs along the east side of Terminal Island. The recovery was completed below the level of the booms of the cranes that were unloading the nearby container ships.

According to Boeing Aircraft Company, the 747 LCF, which at the time of the event was configured for overweight landing tests, weighed approximately 633,700 pounds at the time it passed the Cessna 172 on final approach.

At the time of the incident there was a nine knot crosswind blowing approximately 80 degrees from the right of the path of both aircraft.

A review of the recorded radio transmissions revealed that the Cessna first contacted the tower controller at 1419:22, which was approximately three and one-half minutes prior to the upset. At that time, the flight instructor advised the tower that they were inbound over Ballard Locks, which is approximately seven nautical miles north of the end of the runway, and about a mile and one-half to two miles east of the extended centerline of runway 13 left. The instructor also advised the tower that they had ATIS information X-ray. The controller then advised the Cessna that they had traffic "behind and to your right," and that the traffic was a "seven forty seven heavy jet approaching Shilshole on the localizer," and then cleared them to make a "straight in approach" to runway 13 left. The instructor responded with "Traffic in sight." At 1419:56, the 747 contacted the tower and reported "Ten miles, for landing on the visual." The controller advised the 747 to follow a T-33 that was south of Elliott Bay, and cleared its crew to land on runway 13 right. About fifteen seconds after it checked in, the 747 was advised that in addition to a banner towing aircraft over downtown Seattle, the Cessna was north of Elliott Bay at 1,400 feet, inbound from Ballard. The 747 crew advised the tower that they had the banner tower in sight, but that they were still looking for the Cessna. About 20 seconds after advising the 747 of the banner-tow and Cessna traffic, the tower advised the Cessna that the "heavy

747" was two miles off to their right, that it was "outside the shoreline," that it was landing on the right runway, and that it "does not have you in sight." The flight instructor responded to that transmission by advising the tower that they had the heavy traffic in sight, and then requested that the tower let the 747 know that they (the 172) were about one mile to the northwest of the Space Needle. The tower passed that information on to the 747, and the 747 crew advised the tower that they were still looking for the 172. Then about 10 seconds later, the tower asked the 172 to verify that they had sight of the "heavy jet" off to their right. The instructor pilot responded that they did have "the heavy jet off our right in sight," and then requested a "low approach on runway 13 left." The tower then cleared the 172 for a low approach, and advised the pilot to "...maintain visual separation with the 747 off to your right." The controller also advised the 172 that the 747 did not have them in sight, and then stated "caution wake turbulence." The instructor pilot continued to keep the descending 747 in sight, and the 747 eventually passed the 172 while at an altitude slightly above it. This temporarily created the situation where the 172 was slightly lower than the 747, behind the 747, and downwind of the 747's ground track. At 14:22:45, with the 747 approximately one-quarter mile in front and to the right of the 172, the 172 encountered the vortices generated by the heavy 747.

### Flight instructor Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	22, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	April 1, 2005
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	May 1, 2006
<b>Flight Time:</b>	629 hours (Total, all aircraft), 59 hours (Total, this make and model), 542 hours (Pilot In Command, all aircraft), 70 hours (Last 90 days, all aircraft), 17 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Student pilot Information

<b>Certificate:</b>	Student	<b>Age:</b>	24, Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	October 1, 2006
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	10 hours (Total, all aircraft), 10 hours (Total, this make and model), 6 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N9522S
<b>Model/Series:</b>	172	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	17280432
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	October 1, 2006 100 hour	<b>Certified Max Gross Wt.:</b>	2550 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	4077 Hrs at time of accident	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	IO-360-L2A
<b>Registered Owner:</b>		<b>Rated Power:</b>	180 Horsepower
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KBFI, 21 ft msl	<b>Distance from Accident Site:</b>	3 Nautical Miles
<b>Observation Time:</b>	13:53 Local	<b>Direction from Accident Site:</b>	130°
<b>Lowest Cloud Condition:</b>	Scattered / 3000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>		<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	210°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.01 inches Hg	<b>Temperature/Dew Point:</b>	11°C / 1°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Seattle, WA (KBFI)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	(KBFI)	<b>Type of Clearance:</b>	VFR
<b>Departure Time:</b>	13:20 Local	<b>Type of Airspace:</b>	

## Airport Information

<b>Airport:</b>	Boeing Field/King County Int. KBFI	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	21 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	13L	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	3709 ft / 100 ft	<b>VFR Approach/Landing:</b>	Full stop; Straight-in

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 None	<b>Aircraft Damage:</b>	None
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 None	<b>Latitude, Longitude:</b>	47.587223, -122.333335

## Administrative Information

**Investigator In Charge (IIC):** Anderson, Orrin

**Additional Participating Persons:** Ove Larson; Seattle, WA

**Original Publish Date:** December 20, 2007

**Note:**

**Investigation Docket:** <https://data.nts.gov/Docket?ProjectID=64909>

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](#).