



National Transportation Safety Board Aviation Accident Final Report

Location:	IRVINE, CA	Accident Number:	LAX97FA059
Date & Time:	11/30/1996, 1307 PST	Registration:	N2TE
Aircraft:	Morane-Saulnier MS760 II	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	3 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

Shortly after takeoff, the pilot radioed the air traffic control tower declaring an emergency and stating his intent to return for landing. He stated that he had taken off with an external boarding ladder attached to the aircraft. Several witnesses reported that the aircraft's downwind leg was too close to the airport causing the aircraft to overshoot the turn to the final approach course, and that the pilot increased the aircraft's bank angle as he tried to align the aircraft with the landing runway. As the aircraft was intercepting the final approach course, it abruptly rolled inverted, the nose dropped, and the aircraft spiraled onto the roof of an industrial building. A Boeing 757 aircraft, landing on the same runway, had passed over the accident site 2 minutes and 17 seconds earlier. The B-757 was cleared to land before the accident aircraft received a takeoff clearance and was on the runway when the pilot declared the emergency and turned downwind. The local controller did not issue a wake turbulence advisory. Experienced MS760 pilots reported that the aircraft will exhibit no adverse performance or safety affects with the boarding ladder attached.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain an adequate airspeed margin while maneuvering in a steep banked turn to the landing runway, which resulted in an inadvertent stall/spin. Factors in the accident were: the pilot's inadequate preflight inspection of the aircraft in that he departed with the boarding ladder attached to the aircraft's exterior; the pilot's inadequate in-flight planning in that he flew a traffic pattern so close to the runway that it required excessive bank angles to align the aircraft with the landing runway; and the aircraft's probable encounter with the periphery of a weakened B-757 wake turbulence, which increased the wing's angle of attack beyond the stall point at a critical point during a steep banked turn.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: APPROACH - VFR PATTERN - BASE LEG/BASE TO FINAL

Findings

1. (F) AIRCRAFT PREFLIGHT - INADEQUATE - PILOT IN COMMAND
2. (F) IN-FLIGHT PLANNING/DECISION - INADEQUATE - PILOT IN COMMAND
3. (C) MANEUVER - EXCESSIVE - PILOT IN COMMAND
4. (C) AIRSPEED(VS) - NOT MAINTAINED - PILOT IN COMMAND
5. (F) WAKE TURBULENCE - ENCOUNTERED - PILOT IN COMMAND
6. STALL/SPIN - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On November 30, 1996, at 1307 hours Pacific standard time, a Morane-Saulnier MS760 II, N2TE, rolled inverted and crashed into an industrial building from approximately 500 feet agl during an emergency landing approach at John Wayne Airport, Santa Ana, California. The aircraft was destroyed and the commercial pilot and two passengers were fatally injured. Visual meteorological conditions prevailed for the local area personal flight.

Shortly after takeoff from runway 19R, the pilot radioed the John Wayne Air Traffic Control Tower declaring an emergency and stating his intent to return for landing. He stated that he had taken off with an external boarding ladder attached to the aircraft. The controller cleared the aircraft to land on the same runway it had just departed; however, a Boeing 757 aircraft, on 2-mile final approach from the north when the accident aircraft departed, landed on the same runway in the interim.

There were several witnesses to the 4-minute flight. One reported observing the aircraft taxi out with the ladder on the right-hand side of the aircraft. Other witnesses reported that the aircraft's downwind leg was too close to the airport causing the aircraft to widely overshoot the turn to final approach, and that the pilot increased the bank angle as he tried to align the aircraft with the landing runway. Several non-pilot witnesses at various locations under the aircraft's flight path reported being attracted to the aircraft by its low altitude, slow speed, loud engine noise, and unusual proximity to the airport.

According to the witnesses, as the aircraft was intercepting the final approach in a 30- to 45-degree right bank about 1 mile from the landing threshold, the aircraft suddenly rolled to the right until it was inverted. It spiraled downward and completed approximately 1.5 turns before impacting the building. Two airline pilots who observed the accident stated that they saw no pitching or wing rocking before the roll commenced.

A witness located at the MacArthur Avenue Golf Course, approximately 1/4 mile west of the accident site, reported that his attention was attracted to the aircraft because jet aircraft do not usually make their traffic patterns so close in to the airport and so low. He reported that, while facing north, the aircraft approached from his left rear and flew over his position about 300 feet agl. The aircraft banked to the right until the wings were in a near vertical bank angle and then the aircraft "corkscrewed" to the ground. The engine thrust sound was "normal" when it flew over him, then became a "high pitch whine" and became silent during the spin.

The flight on which the accident occurred was the pilot's third flight of the day in the accident aircraft. Another pilot flew in the left seat of the aircraft on the first flight of the day and was receiving instruction from the accident pilot who sat in the right seat. He stated that there were no mechanical irregularities with the aircraft and reported that the pilot made no comment to him about any discrepancies with the aircraft. This flight was an aerial photo mission to photograph the aircraft for an upcoming magazine article. The left seated pilot held a private certificate with type ratings in two jet aircraft types but was not type rated in the accident aircraft..

Prior to the third (accident) flight the aircraft was refueled with 174 gallons of Jet A fuel. According to the refueler, 60 gallons was pumped into each tip tank and the remainder was added to the fuselage tank, which brought it to about 2/3 full.

Witnesses stated that when the aircraft taxied for departure, the pilot was in the right front seat and a passenger, who was writing a magazine article on the aircraft, was in the left front seat.

PERSONNEL INFORMATION

The pilot was a USAF Master Sergeant stationed at Vandenburg AFB, California. He was an administrative aide in the 30th Communications Squadron. He learned to fly as a civilian in 1987, and was active as a flight instructor in the Vandenburg Aero Club. Between 1992 and October, 1994, he was the Chief Flight Instructor for the club. In 1994, when the club became an FAA Approved Part 141 school, a full-time chief flight instructor was hired and the pilot became the Assistant Chief Flight Instructor, a position he held at the time of the accident.

The pilot owned his own MS760 aircraft. A pilot who had flown with him in that aircraft reported that his aircraft's flight controls were a conventional control wheel arrangement as opposed to the accident aircraft, which had a control stick. This pilot also reported that it was the accident pilot's usual practice to fly landing approaches by reference to the "diamond speed" on the angle of attack indicator, and that the angle of attack indicator was virtually impossible to see from the right seat. When the accident pilot flew his aircraft from the right seat, it was his practice to have the pilot in the left seat call out his approach angle of attack relative to the "diamond."

The pilot's activities in the last 72 hours was compiled by the Safety Adviser to the Vandenburg Aero Club and is attached.

According to the pilot's logbook, in the 90 day period before the accident, he had given dual instruction in the accident aircraft on 6 flights totaling 7.8 hours, 18 landings, and 7 instrument approaches; exclusive of the two prior flights on the day of the accident.

The passenger in the left front seat held a private pilot certificate with an airplane single engine land rating. The passenger had no known experience in jet aircraft and had accrued a total flight time of 220 hours.

AIRCRAFT INFORMATION

The MS760 aircraft has a canopy over the passenger compartment, which is normally opened and closed (for boarding) by an electric motor; however, there is also a manual crank located on the right-hand cabin side wall by the right front passenger's right knee. There is an interlock microswitch on the boarding ladder receptacle which prevents the canopy from being electrically closed when the ladder is on the aircraft. However, the manual crank can open or close the canopy regardless of whether or not the ladder is attached. There is no cockpit annunciation of the ladder being attached to the exterior, nor is the ladder visible from the cockpit with the canopy closed. According to a pilot familiar with the aircraft type, it is not uncommon for the electrical canopy system to malfunction due to sensitive rigging of the interlock microswitch, and many pilots routinely crank the canopy closed rather than use the electric system. The pilot who flew aboard the aircraft on the first flight of the day thought he recalled that the pilot had closed the canopy using the manual crank.

It was noted in examining the wreckage that one of the two wires attached to the interlock microswitch at the right-hand ladder attachment point had a loose wire at the crimp of the ring terminal. Another MS760 aircraft was examined and the same wire was purposely disconnected from the canopy interlock microswitch to duplicate this condition. With the wire disconnected from the microswitch, the otherwise operational canopy would not close

electrically. It was noted, however, that the inhibiting function of the microswitch was sensitive to placement of the ladder in the fuselage receptacle and to the rigging of the switch mechanism.

The flight instructor who trained the pilot for his type rating in the aircraft has about 1,000 hours in the MS760. He described the aircraft as "docile, fun and easy to fly." The stall is docile and straight ahead, although it will snap if cross controlled "like any other airplane" and "you'd have to do it deliberate." The flight instructor also said that the airplane flies "fine" with the ladder on the outside. He said that anyone who has much time in the airplane has done it once and "the ladder won't effect anything." This instructor also said that what happens is that air loads cause the ladder to twist and the rear latch will come loose. This causes the front latch to jam and hold the ladder securely. There is "a little burble but it's no big deal." He further noted that it doesn't effect the engine operation and people have flown 2-hour cross-country flights with the ladder attached. He also said that he briefs all his students about flying with the ladder out, and he is certain that he briefed the pilot of the accident aircraft during training for his type rating. Regarding an airline pilot's report of the airplane yawing to the right at liftoff, he said that it was just coincidence, "you wouldn't even notice the ladder." He added that the airplane is "pretty lethargic" on one engine so if the initial climb was good, as reported by an airline pilot/witness, then both engines were operating.

According to pilots familiar with the aircraft type, the Safe Flight Angle of Attack indicator is hard to see from the right seat and the spoiler, which is normally modulated on final approach to control glide path, is on the left throttle so that it is hard for the pilot in the right seat to use.

METEOROLOGICAL CONDITIONS

Visual meteorological conditions prevailed with scattered clouds at 20,000 feet and visibility of 30 statute miles. The surface wind was from 210 degrees at 8 knots.

WRECKAGE AND IMPACT INFORMATION

The aircraft impacted and penetrated the roof of a single-story industrial building located in Irvine. Witnesses reported that the aircraft impacted in a nose-down attitude in a vertical flight path. From the accident site, the John Wayne Airport runway 19R threshold is 194 degrees at 1.13 nautical miles as determined with a GPS unit. All of the aircraft was present at the accident site and there was a postcrash fire.

The fuselage of the aircraft with the inboard wing sections, minus the empennage, came to rest in an interior file room approximately 25 feet square. The axis of the fuselage was oriented on an approximate magnetic bearing of east. The right wing tip fuel tank and outer wing section was located on the opposite side of the east wall of the file room which separates the file room from an adjacent warehouse. The outer left-hand wing section and tip tank were located in an adjacent conference room. The empennage of the aircraft, together with an inboard section of the right aileron, was on the roof of the building about 75 feet southwest of the remainder of the aircraft.

The empennage assembly exhibited crushing damage on the lower surface, and the fuselage cross-section was horizontally elliptical. There was no fire or smoke markings on the empennage section.

Both tip fuel tanks exhibited crushing damage to the nose of the tank. The fuel jettison doors were open on each tank; however, that area of each tank was substantially damaged.

In the file room, the fuselage came to rest at a 30-degree nose down angle, wings level with respect to the concrete floor. The cockpit area forward of the rear cabin bulkhead was destroyed, except for certain lower fuselage skins and stringers that were crushed flush with the floor. The crushing damage to the cockpit was concentrated more on the left side than the right side. The aft fuselage, from the tailpipe exit to where the fuselage was severed forward of the empennage, was bent upward an additional 30 degrees with respect to the fuselage center section. Approximately 5 feet of each inboard wing panel remained attached to the fuselage. The belly skins of the aft fuselage exhibited scraping and crushing damage.

The aircraft forward fuselage was destroyed up to the bulkhead behind the rear seat and the instrument panel was destroyed. The throttle quadrant was located and was found with a large size watchband imbedded on it. The wing leading edge exhibited spanwise crushing damage. The landing gear was extended, the flap actuator was in the fully extended position, and the speed brakes/spoiler actuator was in the retracted position. The aileron trim tab and the trimable horizontal stabilizer were in the neutral position.

The boarding ladder was located in a corner of the file room near the cabin area wreckage. A fireman/rescuer recalled tossing it aside from the cockpit area during the recovery operation. The left-hand mounting lug of the ladder was intact and the right-hand lug was separated. There was no paint transfer from the ladder to the right-hand engine inlet, and the fuselage skin on the right-hand side near the attachment fittings was fire damaged.

The micro switch at the boarding ladder attachment, which enables electrical closing the canopy when the external steps are removed, was substantially damaged mechanically but did not exhibit fire exposure damage. The switch was separated from the operating plunger and the mounting bracket. One of the two wires which attach to the switch was separated from the crimp type ring terminal and the wire ends were frayed and gray in color.

The rotating sections of both engines were seized against the cases; however, both engines rotated after removal from the aircraft. The throttle arms on both fuel control units were at midrange of their travel; however, each engine had moved forward about 1 inch off their mounts. The firewall fuel shutoff valves were open and the fuel lines were destroyed by impact and fire. Approximately 1/8 cup of fuel was present in the fuel control of each engine when the fuel line was disconnected adjacent to the engine inlet.

The engines were examined on January 15, 1997. Both engines were intact and were mechanically continuous through the accessory sections, although the blade tips of the left engine turbine wheel rubbed the case when rotated by hand. The mounts of both engines exhibited deformation toward the rear of the engine. Both engines exhibited fire/smoke damage in the inlet area and a lesser amount of smoke and heat damage to the accessories on the engine. A soot trail was also present down the external sides of the engines.

The tailpipe assemblies and the turbine wheels were removed from both engines. The turbine of the right engine was visibly undamaged and the turbine of the left engine exhibited modest damage to the leading edge of several blades within 1/8 to 1/4 inch of the blade tips. In the tailpipe of each engine was a powdery foam-like material resembling that used in the roof insulation of the building into which the aircraft impacted.

The combustion section of the engines was examined using a borescope tool. In the bottom of the turbine housing (casing) of the engines was more of the same foam-like material, but in irregular "pea size" round shapes with most exhibiting burn damage (singeing). There was

more of the foam debris in the right engine turbine housing than there was in the left engine, and there were several small pieces of partially burned foam inside the combustor assembly of the right engine.

The aft power shaft bearing was removed to access the turbine wheel and each engine's bearing was clean and rotated freely. The oil supply lines to the bearings contained clean oil and the oil filter and fuel filter elements were clean. The compressor impellers were examined through the engine inlets and appeared to be undamaged.

TESTS AND RESEARCH

A Boeing 757 aircraft, N5019, operated by United Airlines as flight number 471 from San Francisco to John Wayne airport, flew in proximity of the accident site while on landing final approach in the minutes before the accident. The accident aircraft, holding in position on runway 19R, was cleared for takeoff at 1302:58 when the tower transmitted "paris jet two tango echo one niner right cleared for takeoff traffic two miles out." The pilot of the accident aircraft declared the emergency at 1304:00 while on right crosswind leg and was cleared by the tower to return to land on the departure runway at 1304:13. The accident aircraft flew downwind leg west of the airport. It subsequently crashed 1.13 miles north of the airport, on the extended centerline of runway 19R, at approximately 1305:50 when there was an unintelligible transmission. At 1306:01 an unidentified voice reported "you just lost an airplane out here."

A printout of the digital flight data recorder from flight 471 was obtained from United Airlines and excerpts are attached. The DFDR system clock was synchronized to within plus or minus two seconds of the ATC clock based upon the microphone key signal as the Boeing exited the runway after landing. The DFDR data shows the Boeing landing (touching down) on runway 19R at 1304:07. Its ground speed in the 60 seconds before touchdown is between 119 and 123 knots, and the aircraft was approximately centered on the localizer and glideslope. Assuming an average ground speed of 121 knots, the Boeing aircraft passed over the accident site at 1303:33 at an altitude of 367 feet agl (approximately 413 msl).

No FAA ATC radar data is available for the accident because, although Southern California TRACON's ARTS 3 radar system was operational at the time, the CDR radar recording capability was inoperative. According to the TRACON, the CDR had been malfunctioning since 0215 on the day of the accident and it was determined that a "cold start" would be required. The "cold start" was delayed until 1930 in order to minimize operational impact. The Los Angeles Air Route Traffic Control Center's radar coverage in the area does not extend below 2,500 feet msl.

Limited radar data was available from the Noise Abatement Office at the John Wayne Airport. In support of its noise abatement program, the Noise Abatement Office operates a PASSEUR system (Passive Secondary Surveillance Radar) which "listens" to radar replies from aircraft being interrogated by ATC radar and records position and mode C altitude. The PASSEUR data ends as the two aircraft descend below about 700 feet msl on their landing approaches. On the attached PASSEUR data, the accident site is north of noise monitor M-9. The UAL 471 profile shows the Boeing 757 approaching on downwind west of the airport and turning right-hand base leg and final until radar contact is lost slightly north of the accident site. Similarly the MS-760 Paris jet is shown on its profile until it begins descent while still on downwind leg.

The accident aircraft was in communication with John Wayne Air Traffic Control Tower. Following the pilot's declaration of emergency, the tower controller cleared the aircraft to land

and redirected local traffic to accommodate the emergency. Forty-five seconds later, the tower asked the pilot the nature of the emergency and was told of the "airstair" attached outside the aircraft. The tower repeated the clearance to land, but did not issue a wake turbulence advisory referencing the UAL Boeing 757 which had landed 1 minute prior.

The Air Traffic Control Handbook, FAA Order 71170.65(J), states in Chapter 2, General Control, Section 2-1-1, "Provide air traffic control service in accordance with the procedures and minima in this order except when: (c.) Deviation is necessary to assist an aircraft when an emergency has been declared." In Section 10-1-1 (d), the same order states: "Because of the infinite variety of possible emergency situations, specific procedures cannot be prescribed. However, when you believe an emergency exists or is imminent, select and pursue a course of action which appears to be most appropriate under the circumstances and which most nearly conforms to the instructions in this manual."

In Section 2-1-19, the same order states: "Apply wake turbulence procedures to aircraft operating behind heavy jets and, where indicated, to small aircraft behind large aircraft." In Section 2-1-20 (a), it says: "Issue wake turbulence cautionary advisories and the position, altitude if known, and direction of flight of the heavy jets or B-757's to: 1. TERMINAL: VFR aircraft not being radar vectored but are behind heavy jets or B-757's."

In the same FAA Order, Chapter 3, Airport Traffic Control - Terminal, Section 3-10-3 (b) states: "Issue wake turbulence cautionary advisories and the position, altitude if known, and direction of flight of the heavy jets or B-757's to aircraft landing behind a departing/arriving heavy jet or B-757 on the same or parallel runways separated by less than 2,500 feet."

MEDICAL AND PATHOLOGICAL INFORMATION An autopsy was performed on the pilot and second pilot by the Orange County Sheriff-Coroner and toxicological analysis was performed by the FAA's Civil Aeromedical Institute in Oklahoma City, Oklahoma. The toxicological studies were negative for alcohol and all screened drug substances.

ADDITIONAL INFORMATION

The aircraft wreckage was released to Mr. Jerry Prince, Aircraft Recovery Services, on February 18, 1997.

Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	48, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	Last Medical Exam:	07/29/1996
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	2169 hours (Total, all aircraft), 201 hours (Total, this make and model), 1868 hours (Pilot In Command, all aircraft), 48 hours (Last 90 days, all aircraft), 22 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Morane-Saulnier	Registration:	N2TE
Model/Series:	MS760 II MS760 II	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Utility	Serial Number:	005
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	04/05/1996, Annual	Certified Max Gross Wt.:	8650 lbs
Time Since Last Inspection:	11 Hours	Engines:	2 Turbo Jet
Airframe Total Time:	3334 Hours	Engine Manufacturer:	Turbomeca
ELT:	Installed, not activated	Engine Model/Series:	MARBORE VI
Registered Owner:	ROBERT E. J. MORRIS	Rated Power:	1060 lbs
Operator:	ROBERT E. J. MORRIS	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	SNA, 54 ft msl	Observation Time:	1320 PST
Distance from Accident Site:	1 Nautical Miles	Direction from Accident Site:	194°
Lowest Cloud Condition:	Scattered / 20000 ft agl	Temperature/Dew Point:	17° C / 4° C
Lowest Ceiling:	None / 0 ft agl	Visibility	30 Miles
Wind Speed/Gusts, Direction:	8 knots, 210°	Visibility (RVR):	0 ft
Altimeter Setting:	30 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	SANTA ANA, CA (SNA)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	VFR
Departure Time:	1303 PST	Type of Airspace:	Class C

Airport Information

Airport:	JOHN WAYNE (SNA)	Runway Surface Type:	Asphalt
Airport Elevation:	54 ft	Runway Surface Condition:	Dry
Runway Used:	19R	IFR Approach:	None
Runway Length/Width:	5700 ft / 150 ft	VFR Approach/Landing:	Full Stop; Traffic Pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	RICHARD B PARKER	Adopted Date:	04/10/1998
Additional Participating Persons:	DONALD GORDON; LONG BEACH, CA		
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/ .		

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.