National Transportation Safety Board
Aviation Accident Final Report

Location:	BYERS, KS	**Accident Number:**	CHI93MA276
Date & Time:	07/26/1993, 1352 CDT	**Registration:**	CFCRJ
Aircraft:	CANADAIR CL-600-2B19	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General Aviation - Flight Test		

Analysis

THE CREW WAS PERFORMING A LATERAL & DIRECTIONAL STABILITY TEST. CHANGES FROM EARLIER TESTS COMBINED NEW LEADING EDGE FAIRING, NEW FLAP SETTING, LOWER REFERENCE AIRSPEED, AND TRIAL SETTINGS FOR THE STALL PROTECTION SYSTEM (SHAKER & PUSHER). ENGINEERS HAD BRIEFED THE CREW DATA WOULD BE SUFFICIENT IF THE STEADY HEADING SIDESLIP (SHSS) MANEUVER ENDED AT A 15 DEG SIDESLIP, OR AT ONSET OF STALL WARNING; CREW AGREED TO END AT STALL WARNING. DURING THE TEST THE CAPT CONTINUED PAST STALL WARNING TO 21 DEG SIDESLIP AT FULL RUDDER. THE AIRPLANE ROLLED RAPIDLY THROUGH 360 DEG & ENTERED A DEEP STALL. THE COPILOT ATTEMPTED TO DEPLOY THE ANTI-SPIN CHUTE. HOWEVER, ALL THE CHUTE SYSTEM COCKPIT SWITCHES WERE NOT PROPERLY PRESET; INSTEAD OF ASSISTING RECOVERY, THE CHUTE PARTED FROM THE AIRPLANE. FULL CONTROL WAS NOT REGAINED BEFORE IMPACT. THE CHUTE SYSTEM DESIGN ALLOWED DEPLOYMENT OF THE CHUTE EVEN WHEN THE HYD LOCK SWITCH WAS IN THE UNLOCKED POSITION & THE HOOKS CLASPING THE CHUTE SHACKLE TO THE AIRFRAME WERE OPEN. SYSTEM TESTED OK BEFORE FLIGHT.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE CAPTAIN'S FAILURE TO ADHERE TO THE AGREED UPON FLIGHT TEST PLAN FOR ENDING THE TEST MANEUVER AT THE ONSET OF PRESTALL STICK SHAKER, AND THE FLIGHTCREW'S FAILURE TO ASSURE THAT ALL REQUIRED SWITCHES WERE PROPERLY POSITIONED FOR ANTI-SPIN CHUTE DEPLOYMENT. A FACTOR WHICH CONTRIBUTED TO THE ACCIDENT WAS THE INADEQUATE DESIGN OF THE ANTI-SPIN CHUTE SYSTEM WHICH ALLOWED DEPLOYMENT OF THE CHUTE WITH THE HYDRAULIC LOCK SWITCH IN THE UNLOCKED POSITION. (WHEN IN THE UNLOCKED POSITION, THE HOOKS CLASPING THE CHUTE SHACKLE TO THE AIRFRAME ARE OPEN.)

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. (C) PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND
2. STALL/SPIN - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. (F) SAFETY SYSTEM(OTHER) - INADEQUATE
4. (F) ACFT/EQUIP,INADEQUATE DESIGN - MANUFACTURER
5. (C) SAFETY SYSTEM(OTHER) - UNLOCKED
6. (C) MISCELLANEOUS EQUIPMENT - IMPROPER USE OF - PILOT IN COMMAND
7. (C) MISCELLANEOUS EQUIPMENT - IMPROPER USE OF - COPILOT/SECOND PILOT
8. (C) SAFETY SYSTEM(OTHER) - SEPARATION

Factual Information

HISTORY OF FLIGHT

On July 26, 1993, at 1352 central daylight time, a Canadair CL-600-2B19 airplane, Canadian registry C-FCRJ, departed controlled flight while maneuvering, and descended to ground collision near Byers, Kansas. The two test pilots and flight test engineer aboard were fatally injured. The airplane was destroyed by impact and postcrash fire. Visual meteorological conditions existed. The airplane was operated by the manufacturer on a performance improvement test, designated as flight 388. The flight originated at 1331 from Wichita, Kansas and operated VFR under 14 CFR 91; a flight plan had not been filed with the FAA.

The test flight was part of the Regional Jet Performance Improvement Flight Test Program (Canadair report number RAG-601R-106). The program was to repeat all portions of certification testing which pertained to configuration changes or expanded capabilities. At its conclusion, Canadair would apply to Transport Canada (TC) and present the test data for amendment to the airplane's type certificate. On the accident flight, tests encompassed a new flap setting, a leading edge fairing to smooth the sweep transition at wing station (WS) 148, and a lower reference operating speed (1.13 Vs) allowed by TC and the FAA.

Before flight, an engineering brief convened among flight crew, engineers, technicians and aerodynamicists. The captain chaired the briefing; the chief test pilot attended to observe. Topics included airplane configuration, load, maintenance status, and instrumentation. The flight test engineer briefed an outline he had written, called the flight plan. The flight plan bundled tests from RAG-601R-106 and was conditioned on preceding accomplishment of other tests. The flight plan listed tests to be conducted, their sequence, conditions, and data to be obtained.

Flight 388 was the first on which any of the operator's pilots attempted a steady heading sideslip (SHSS) maneuver at 1.13 Vs with flaps 8 degrees and WS148 fairing. The SHSS is a trial of lateral and directional stability in a configuration. It is performed at constant speed with aft center-of-gravity (CG), by deflecting rudder while opposing with aileron to hold heading. In the maneuver, increasing rudder deflection should generate proportionate sideslip (beta), and control force should not drop off. The maneuver concludes with releasing control deflections. The low wing's rising at aileron release indicates positive static lateral stability; nose movement toward center at rudder release indicates positive static directional stability.

The stall protection system (SPS) shaker and pusher activation points for flaps zero, 20, 30 and 45 degrees were based on natural stalls without sideslip in an airplane without the WS148 fairing. Activation points for flaps-8 were based on engineering estimates of lift improvement from the WS148 fairing, and were at higher angles-of-attack than would be interpolated from points for other flap settings. Sideslip influence on angle-of-attack sensors for the SPS had not been established at the new flap setting and was to be refined with data from the flight.

Aerodynamicists told the crew data would be sufficient if the SHSS terminated at onset of the stall warning or 15 degrees beta.

The latter is a minimum criterion for certification. The pilots' practice in SHSS had been to proceed to full rudder deflection if performance during the maneuver appeared predictable. The aerodynamicists explained that while reviewing data from flight 386 they observed shaker initiation during SHSS. They stated they had never encountered pusher activation during

SHSS and did not want one. It was agreed among crew and aerodynamicists to cut off the maneuver at stall warning shaker.

Before taxi, the captain electrically powered and armed the anti-spin parachute system and cycled the hooks which clasp the parachute shackle to the airframe. He cycled them from unlocked to locked and unlocked again. Before takeoff, he briefed the copilot about aborting takeoff, "if I ask for it, you'll lock, deploy the chute."

The flight took off, and the crew completed a longitudinal trim test while flying west to the test area. In the setup for the first SHSS, the test engineer read from the flight plan the conditions: 146 knots (calculated 1.13 Vs), flaps-8, gear up, "to the shaker." The captain and copilot acknowledged.

Commencing about 12,500 feet MSL with idle power, the captain gradually increased right rudder, and the copilot read beta. The captain remarked "buffet starts" after the copilot read 12 beta. The chief test pilot later explained this was random airframe buffet from sideslip, and stated the airplane exhibits little or no aerodynamic buffet before stall.

Shaker onset occurred at 17 beta. The captain remarked shaker and continued without pause. The copilot began reading alpha (angle-of-attack) with beta. At 11 alpha and 19 beta, the captain remarked, "a little bit of pitch instability," then reported, "on the stop" (full rudder). The copilot read 21 beta.

As the captain reported releasing aileron, a tone similar to the stall identification horn sounded. The airplane rolled rapidly right toward inverted. Recorded data show the roll began near time 1351:25.

The copilot told the captain, "just keep going." The roll continued toward upright. Altitude was about 11,500 feet MSL. Angle-of-attack after the roll was at least 35 units (recording limit), and remained there from 1351:32 to :52.

The copilot asked, "want me to release the chute?" The captain's response was unclear on the cockpit voice recorder, "stop (at)" The copilot asked, "at eight?" The captain commanded, "chute out." Five seconds later, the captain asked if the chute were out; the copilot answered, "yeah."

Angle-of-attack decreased below stall angle at 1351:56, with the airplane rolling beyond 60 degrees right wing down, and pitched 60 degrees nose down. Altitude was about 6800 feet MSL, airspeed about 190 knots.

A witness described the airplane heading slowly north before rolling 1 1/2 or 2 1/2 times, during which the nose came down. The airplane changed heading through west, and roll abated near a south heading. The airplane was slightly left wing down, and vapor trailed the wingtips as the nose appeared to rise. The airplane descended from view, and a fireball erupted.

Another witness recounted a parachute issuing from the tail and continuing away from the airplane.

The Pratt County Sheriff department first received telephone notification of the accident from a witness at 1356 CDT.

OTHER DAMAGE

Several acres of grain stubble and standing corn were fuel-soaked and scorched.

PERSONNEL INFORMATION

The first pilot, as captain, occupied the left pilot seat. He joined Canadair in 1978 as an engineer. He joined the flight test section around 1980 as flight test engineer. At intervals of about 5 years, he advanced to copilot, then to captain. He flew various jet and propeller airplanes in the manufacturer's inventory, lately the CL-600 Challenger and the accident model. The current program was the first for which he had been assigned lead test pilot. He held a Canadian air transport pilot certificate, and FAA commercial pilot certificate with instrument rating. No record was found of flight background in aerobatics or formation, nor formal training in swept wing or jet aircraft. His jet aircraft experience was obtained in the course of flight test involvement. He had 875 total hours in model, about 200 hours as pilot-in-command.

The copilot joined Canadair in 1991 as a test pilot after 9 years in the Royal Canadian Air Force. He had flown Grumman S-2 and Lockheed T-33 airplanes, and had been an instructor and check pilot in the military. He held a degree in mechanical engineering. He held a Canadian air transport certificate. Since joining Canadair, he had flown the Challenger and the accident model. He had 756 total hours in model, about 65 hours as pilot-in-command.

The third crewman, a British emigre to Canada, joined Canadair in 1979 as an aeronautical engineer. He was the senior flight test engineer for this model's certification program. He held no airman credential, nor was any required. As a flight test engineer, he had been aboard airplanes about 2600 flight hours, 600 in the accident model. His flight task was to monitor tests' setup and conduct, note observations and assure data were adequate to the test purpose. His task involved extensive preparation and coordinating with engineering and support personnel, and included writing a plan for the test flight.

Both pilots were Canadian citizens. Both applied to TC in 1992 for type rating in model, with recommendation from the chief test pilot, who is not an instructor or examiner. The ratings were issued without examination or flight check, there being no examiner designated by TC at the time. Neither pilot attended a training course in model which the manufacturer began offering customers' pilots after type certification. Neither attended a test pilot course. The pilots had flown together 165 hours, usually with the first pilot commanding and occupying the left seat. They flew together twice Friday, July 23, with another flight test engineer.

The 3 crewmen moved to Wichita in 1991 to conduct flight tests in model from a facility owned by Learjet, a subsidiary of Bombardier as is Canadair. All were off duty over the weekend before the Monday flight.

AIRCRAFT INFORMATION

The airplane was completed in 1991 and was the first of its model. Its U.S. model designator is CL-600-2B19. An equivalent airplane in commercial service is a 50-passenger transport airplane called Regional Jet. The airplane was powered by 2 General Electric CF34-3A1 turbofan engines, each with 8730 pounds takeoff thrust.

Transport Canada issued annual flight permits for experimental use. The airplane was moved in 1991 to Wichita for continuing tests and development. FAA issued Special Flight Authorizations annually for flights in U.S. airspace.

Transport Canada issued type approval for the model July 31, 1992. The FAA issued type

certification January 21, 1993.

The manufacturer used the airplane and two like it for flight tests. The usual crew compliment was two pilots in the cockpit and a flight test engineer at an instrumented console in the cabin.

The accident airplane was extensively instrumented. Flight control displacement and force were measured at the left column and pedals, necessitating most tests be flown by the left seat pilot. Controls at both pilot stations were functional.

Among custom instrumentation were indicators for alpha and beta sensed at a noseboom. The sensors' remote mounting permitted readings less subject to airflow disturbance over the fuselage. The standard instrument suite's angle-of-attack sensors on either side of the fuselage drive the stall protection computer. Test sensors and instruments provided no input to the SPS.

Airplane records were examined at the test facility. The maintenance program, called preventive maintenance schedule, was unique to the airplane's test use, involving extensive preparation for each flight. Before the accident flight, the airplane operated 770.5 flight hours since new. Recent maintenance inspections had been performed as follows: 12 and 24-month inspections at 750 flight hours, a 400-hour check at 700 flight hours, and a 100-hour check at 689 flight hours. The quality control manager likened the airplane's daily inspection to a 100-hour inspection for a commercial airliner. A daily inspection involved 80 man-hours by a detail of 4 mechanics and 3 avionics technicians.

Airframe and system modifications effecting configuration, maintenance or operating procedure were documented in serialized bulletins called RSIs (restrictions and/or special instructions).

The airplane's flight permit, amended March 12, 1993, authorized 53,000 pounds maximum takeoff weight. The load on the accident flight consisted of 12,500 pounds of fuel, 5,500 pounds of lead bricks fixed in trays under the cabin floor, and 1,200 pounds of water-glycol solution. The flight test engineer adjusted CG in flight by redistributing solution between tanks at the cabin front and rear. The airplane weighed 52,032 pounds at takeoff, with CG at 23.1 per cent MAC (mean aerodynamic chord). Weight at control departure was 51,030 pounds, with CG at 35.6 percent MAC.

An anti-spin parachute was mounted under the vertical tail to induce nosedown pitch should the airplane enter a spin or deep stall. It also served as a drag chute for takeoff abort or landing. Switches and indicator lamps were located either side of alpha and beta indicators on the glareshield. The chute system was tested once after installation by deploying it during high speed taxi; there was no flight test. There had been no occasion requiring its use since installation. Maintenance personnel checked the system weekly and when directed by the flight test section before a hazardous flight. A weekly check was performed on the accident date.

RSI F-0085R, Anti-Spin Chute Operation, states the POWER switch remains ON continuously for flight. The ARM switch is OFF for normal flight, but is selected ON during a pre-stall check. The HYDLOCK switch is selected to UNLOCK for normal flight, and to LOCK in a prestall check. Chute deployment from the normal flight switch positions required 3 switch movements: HYDLOCK switch down to LOCK, ARM switch up to ON, then lift guards and move the ganged DEPLOY switches up to FIRE. System design permitted chute deployment when electrical power was available, regardless of hook position about the shackle. The

appended Systems Group Chairman's Report discusses the chute and controls.

The chief test pilot stated the chute system design and their practice were based on concern for uncommanded chute deployment at low altitude or high true airspeed. He emphasized a captain's discretion to configure and use the system as deemed fit. He stated when he was pilot-in-command only he exercised system controls, calling it a critical aspect which he did not delegate.

METEOROLOGICAL INFORMATION

Surface weather observations at 3 facilities surrounding the accident site gave like reports of winds from the southeast 10 to 15 knots and clear skies.

COMMUNICATIONS

The flight called Wichita ground control for taxi for VFR departure to the west. The flight notified Wichita tower when clear of the airport traffic area.

The flight test location was in uncontrolled airspace about 70 miles west of Wichita. The airspace was not designated for special use. Communication with air traffic control was not required and was not established.

Telemetry was not in use, and communication was not established with the base radio at the test facility.

FLIGHT RECORDERS

A Loral airborne data acquisition system (ADAS) recorder lay among cabin wreckage. The recorder was destroyed, but substantial magnetic tape remained at the spindle for the shattered takeup reel. The unit recorded GMT-indexed output of various instruments and sensors; an audio channel recorded the crew's intercom; radio reception was not recorded. Unless remarked otherwise, data presented herein was derived from this recorder. Data indicated no system discrepancies, no uncommanded flight control displacement, and engine operation as commanded. In proximity to the stall, landing gear were up, auxiliary power unit on, flaps 8 degrees, and water ballast did not shift. Data ended at a tear in the tape; the remainder was not recovered. The last altitude recorded was about 5700 feet MSL.

A Loral solid-state flight data recorder (FDR), model F1000, scattered as 3 pieces. Its Crash Survivable Memory Unit lay 715 feet from impact; lack of identifying marks on the unit delayed its recovery by one day. Data recovered from the storage unit indicated the recorder operated, however, more than 20 recording parameters were inactive. Inactive parameters included altitude, airspeed, angle-of-attack, vertical speed and Greenwich mean time. FDR data were correlated with the ADAS recording and extended 8 seconds beyond available ADAS data. Approaching the end of FDR data, engines operated at high rpm, pitch changed from more than 62 degrees nose low to 38 degrees nose low, and acceleration increased to more than 4.5 G. Component examination and data are discussed in the appended Flight Data Recorder Factual Report.

A Fairchild cockpit voice recorder (CVR), model A100A, was recovered with slight impact damage. The 30-minute recording spanned checks before takeoff and the descent following control departure. Sound of a ground impact was not audible on the CVR. The recorder circuit incorporated an acceleration-sensing switch.

A partial transcript of the recording is in the appended Group Chairman's Report of

Investigation, Cockpit Voice Recorder.

The FDR and CVR were typical of installations on airplanes in revenue service. Neither was required for flight under FAR 91.

WRECKAGE AND IMPACT INFORMATION

The airplane struck the ground in a flat, cultivated field. Site elevation was 1960 feet MSL. Wreckage cast about 750 feet, heading 200 degrees from impact. The cockpit and tail with engines cast 650 to 700 feet. The most distant pieces were engine subassemblies and auxiliary power unit.

Imprints of the left wing and rear fuselage were discernable at the north end of the wreckage field; portions of wing flap hinge faring and of fiberglass tail cone lay in the respective ground scars. Parallel on either side of the fuselage imprint were linear engine imprints, with puffed dust settled over the first 10 feet. The fuselage imprint aligned 183/003 degrees. All flight control surfaces and airplane extremities were accounted for at the crash site. There was no appearance of breakup, bird strike or collision in flight.

The cockpit was extensively damaged by impact and fire. The fuselage broke into sections.

Flap actuating jackscrews in the wreckage were extended to a length consistent with 8 degrees flap extension. Control surfaces on the severed tail moved freely. Control continuity could not be established. Stabilizer trim was about 1 degree nosedown. Ground spoilers were stowed; flight spoilers were damaged beyond impact position determination.

The anti-spin parachute lock/unlock hooks and actuator were damaged by airframe breakup and fire. Hydraulic lines were severed and the actuator held no fluid. The actuator rod extended 1.5 inches, placing the hooks near the locked position. The parachute control box was battered and burned; ARM and POWER switches were found ON, and DEPLOY switches in FIRE. The HYDLOCK switch was damaged beyond determination. Hydraulic pumps which power the hooks had apparent crash damage.

Fan blades on both engines bent opposite their rotation direction. Thrust reversers were closed. Compressor guide vane actuators from both engines were removed and disassembled: one from the left engine bore a piston imprint consistent with compressor speed of 82 per cent rpm. Separation of subassemblies was symmetrical between engines and occurred across flange fasteners.

The parachute fell 3 miles, 025 degrees from the site. The risers extended full length from a lunchbox-size metal shackle to the canopy. The parachute lay with shackle southeast and canopy northwest. The risers were intact and retained distinctive packing folds. The canopy was intact without fabric tear. The chute and risers appeared pristine and unstressed. A canister lid which separates at chute deployment fell 2.3 miles, 040 degrees from the site.

Components are further described in reports of the powerplants and systems groups. Wreckage distribution is described in the structures group report. The reports are appended.

MEDICAL AND PATHOLOGICAL INFORMATION

The first pilot held an FAA first class medical certificate issued May 20, 1993 with limitation for eyeglasses. The certificate application declared no medications were being taken.

The FAA airman medical record showed no remarkable medical history. The report of autopsy

remarked minimal atherosclerosis and death due to multiple impact injuries with vertical and right frontal aspect. Toxicological testing showed 7.5 ug/ml acetaminophen and 6.8 ug/ml salicylate in the blood; both are nonprescription pain relievers.

The second pilot held a Canadian category 1 medical certificate issued July 9, 1992 with notation for eyeglasses; the certificate remained valid through July 1993. The certificate application stated no medications were being taken, and remarked no previous medical condition. The report of autopsy remarked no preexisting disease and death due to multiple blunt force injuries with right and frontal aspect. Toxicological testing showed 29 mg/dl ethanol and 24 mg/dl acetaldehyde in the blood, and 14 mg/dl ethanol in lung fluid. Sec-butanol, 5 mg/dl, and 1 mg/dl of 1-butanol were detected in the blood. The report stated the majority of blood ethanol was likely postmortem formation.

The test engineer was 48 years of age. No record was found of his holding an airman medical certificate, nor was one required. He had no vision in his right eye. The report of autopsy remarked death due to multiple impact injuries, largely frontal aspect. No preexisting disease was remarked. No toxicological test was requested.

FIRE

The aircraft held about 11,000 pounds of fuel at accident. Tanks ruptured during the crash. Fuel ignited, and fire flashed over the debris field from 100 feet south of impact to 700 feet south of impact. Portions of the wreckage were consumed. Fire burned along crop furrows well outside the area wetted by fuel. No witness reported fire on the airplane in flight, nor did the crew remark fire or smoke. The witness who recounted vapor trailing the wingtips construed it as fuel dumping.

TESTS AND RESEARCH

Data from ADAS recordings for flights 386 and 388 were examined at length. Results of the study are cited throughout this report. The Group Chairman's Airplane Performance Study is appended.

A test was conducted using a like airplane with identical parachute system. Hydraulic lines to its hook actuator were disconnected and fluid drained to simulate a system breach: the hooks moved easily by hand. The accident airplane's actuator was hydraulically powered, selected to the unlocked position and hook contact with a position-sensing microswitch affirmed. Details are in the systems group report.

The control box for the anti-spin chute was examined by the engineering branch of Transportation Safety Board of Canada to determine status of 8 indicator lamps; the report is appended. Four lamps were damaged beyond determination, including both for the HYDLOCK switch. Filaments of 3, variously damaged, appeared distended consistent with illumination at impact: one for the ARM switch and 2 for the POWER switch. Another for the POWER switch, labeled DEP(loy), was intact and its filament was not distended. Lamps for the ARM switch light only in the ON position. The POWER switch operates similarly: the 4 lamps light only in the ON position.

ADDITIONAL DATA/INFORMATION

In interviews with the operator's personnel, the terms "hazardous" and "critical" recurred to describe flights or maneuvers which invoked additional preparation or procedure for support personnel or flight crew: telemetry, anti-spin parachute check and arming, ad hoc checklist,

personal parachutes. Planned stalls were unanimously characterized as hazardous or critical. Others variously mentioned were initial flights in model, flutter tests, and unspecified maneuvers which might precipitate stall departure. The SHSS with 1.13 Vs was characterized as delicate for the slow airspeed, but not hazardous. No document was obtained which named discrete tests or maneuvers as hazardous.

FAR 21.35(d) states each applicant for an aircraft type certificate must show for each test flight that adequate provision is made for the crew for emergency egress and the use of parachutes. The preceding was not listed among other FARs cited for operator compliance in the most recent Special Flight Authorization from FAA, dated April 1, 1993. Personal parachutes were not carried on the airplane; the test section's practice was to don parachutes and helmets for flights deemed hazardous.

There is no U.S. or Canadian certificate or endorsement for a test airman. The chief test pilot described training for a company test pilot as an apprenticeship. A typical pilot had both engineering background and airman credentials when hired, entered the production flight test section as copilot, and might later be designated captain. The chief pilot selected a pilot for engineering flight test from production test airmen he assessed had aptitude, attention to detail and disposition for demanding work. Pilots learned maneuvers and procedure by observing from a jumpseat or second pilot seat. Acquaintance with an airplane could be obtained from an engineer, technician or pilot familiar with the model; the accident copilot's introduction consisted of briefings by system engineers. The pilots obtained no external training, and did not use the company's simulator. There were no recurrent checks or training, and no company pilot was yet designated check airman for the model. The pilots observed TC licensure requirements and intervals for airmen not involved in revenue flight operations.

The pilots did not use the certificated airplane's flight manual, and none existed for the experimental airplane. The chief pilot explained changing configurations and varying test sequences could make fixed procedures impracticable and required deliberate action by pilots. For selected flights, a checklist might be drafted and posted in the cockpit. Single-engine trials were cited as example: the engine relight procedure would be posted for ready reference. No checklist was created for flight 388.

Aircraft wreckage was released to Canadair July 30, 1993. The CVR was returned November 18, 1993. Canadair consented to NTSB's request to retain the FDR for study.

Parties to the investigation participated in a review of findings before adjournment of the field portion of the investigation.

Pilot Information

Certificate:	Commercial; Foreign	**Age:**	48, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	05/20/1993
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	3836 hours (Total, all aircraft), 875 hours (Total, this make and model), 2699 hours (Pilot In Command, all aircraft), 91 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CANADAIR	**Registration:**	CFCRJ
Model/Series:	CL-600-2B19 CL-600-2B1	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Experimental	**Serial Number:**	7001
Landing Gear Type:	Retractable - Tricycle	**Seats:**	5
Date/Type of Last Inspection:	06/01/1993, Continuous Airworthiness	**Certified Max Gross Wt.:**	53000 lbs
Time Since Last Inspection:	17 Hours	**Engines:**	2 Turbo Fan
Airframe Total Time:	771 Hours	**Engine Manufacturer:**	GE
ELT:	Installed, not activated	**Engine Model/Series:**	CF-34-3A1
Registered Owner:	CANADAIR	**Rated Power:**	8730 lbs
Operator:	CANADAIR	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	GBD, 1887 ft msl	**Distance from Accident Site:**	40 Nautical Miles
Observation Time:	1356 CDT	**Direction from Accident Site:**	360°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	15 knots / 19 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	34°C / 22°C
Precipitation and Obscuration:			
Departure Point:	WICHITA, KS (ICT)	**Type of Flight Plan Filed:**	None
Destination:	WICHITA, KS (ICT)	**Type of Clearance:**	VFR
Departure Time:	1331 CDT	**Type of Airspace:**	Class G

Wreckage and Impact Information

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

Administrative Information

Investigator In Charge (IIC):	J R VALLASTER	**Report Date:**	04/29/1994
Additional Participating Persons:			
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.ntsb.gov/pubdms/.		