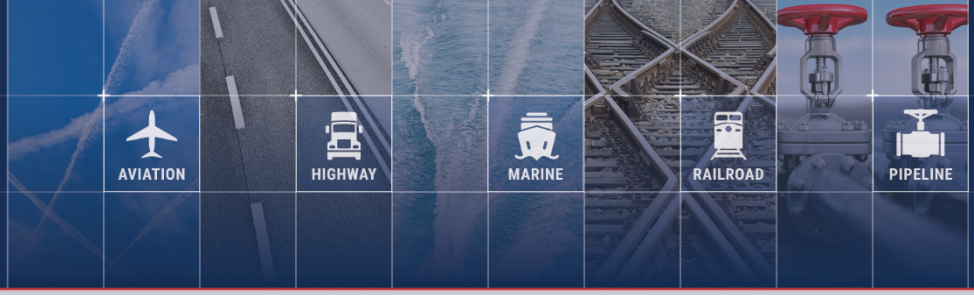

Aviation Investigation Final Report

Location:	SANTA ANA, California	**Accident Number:**	LAX93LA199
Date & Time:	May 2, 1993, 13:43 Local	**Registration:**	N3842J
Aircraft:	CANADAIR F-86E MK.6	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

A PREPLANNED ROUTINE INVOLVING AN F-86 AND A MIG-15 HAD BEEN SCHEDULED FOR THE AIRSHOW. WHEN THE MIG-15 PILOT WAS UNABLE TO PARTICIPATE, THE F-86 PILOT ELECTED TO CONDUCT A SOLO AEROBATIC ROUTINE THAT HAD NOT BEEN PRACTICED FOR THE SHOW. AFTER TAKEOFF, HE BEGAN A LOOP WITH AN AILERON ROLL AT THE TOP OF THE MANEUVER. DURING DESCENT FROM THE TOP OF THE LOOP, THE AIRPLANE DEVELOPED A HIGH RATE OF DESCENT AND CONTACTED THE RUNWAY IN A NEAR NOSE AND WING LEVEL ATTITUDE. THE PILOT WAS NOT WEARING A 'G' SUIT, AND THE CALCULATED 'G'S' SUSTAINED DURING THE PULL-OUT (BEFORE IMPACT) WERE 6.4 G'S. NO SPECTATORS WERE INJURED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE PILOT'S INADEQUATE PLANNING/DECISION CONCERNING PERFORMANCE OF AN AEROBATIC MANEUVER, AND HIS FAILURE TO MAINTAIN ADEQUATE ALTITUDE/CLEARANCE ABOVE THE RUNWAY DURING RECOVERY FROM THE MANEUVER. A FACTOR RELATED TO THE ACCIDENT WAS: THE PILOT'S LOWER TOLERANCE TO 'G'S' (PHYSIOLOGICAL CONDITION) BY NOT WEARING A 'G' SUIT (MISCELLANEOUS EQUIPMENT).

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: MANEUVERING

Findings
1. AEROBATICS - PERFORMED - PILOT IN COMMAND
2. (C) IN-FLIGHT PLANNING/DECISION - INADEQUATE - PILOT IN COMMAND
3. (C) ALTITUDE - INADEQUATE - PILOT IN COMMAND
4. (F) MISCELLANEOUS EQUIPMENT - NOT USED - PILOT IN COMMAND
5. (F) PHYSIOLOGICAL CONDITION - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On May 2, 1993, about 1343 hours Pacific daylight time, a Canadair F- 86E Mark 6, N3842J, crashed during an aerial demonstration at the El Toro Marine Corps Air Station, Santa Ana, California. The airplane was being operated as part of an annual air show when the accident occurred. The airplane, operated by the pilot in partnership with National Airshows Inc., was destroyed by impact and post-impact fire. The certificated commercial pilot, the sole occupant, received fatal injuries. Visual meteorological conditions prevailed. The flight originated from El Toro at 1341 hours.

An Operations Inspector, Federal Aviation Administration, Long Beach Flight Standards District Office, was present at the airshow. He reported that the pilot was to participate in a mock dog-fighting routine with the pilot's partner/operator flying another aircraft as a portion of the normally planned demonstration. The pilot of the second airplane did not feel well and canceled his participation in the demonstration. The pilot of the accident aircraft then planned to perform a solo aerobatic routine. The routine that the pilot began was not one that had been practiced.

At 1318 hours, Air Traffic Control personnel cleared the accident airplane to taxi to the runway in preparation for the aerial show. Ground personnel working with the pilot reported that as the airplane taxied out from parking, the pilot's shoulder harness was observed lying back behind the seat back and unsecured. At 1324 hours, while waiting for takeoff, the pilot made a radio request for assistance with the airplane's canopy from his ground crew. A witness reported observing the pilot leaning far forward in the seat of the airplane on the right side of the airplane. At 1325 hours, the pilot canceled any assistance from his ground crew. At 1341 hours, the pilot was cleared for takeoff on runway 34L.

After departure, the pilot performed a right 90 degree climbing turn, followed by a left 270 degree descending turn. This positioned the airplane over runway 16R at about 75 feet above ground level (AGL). The pilot then began a loop with an aileron roll at the top of the maneuver. Following the descent at the bottom portion of the loop maneuver, the airplane descended in a near nose and wing level attitude until striking runway 16R about mid-field. An intense explosion occurred. Wreckage was scattered along the runway for about 1/4 mile. No spectators were injured.

The operator reported that the loop maneuver in the accident airplane required a minimum of 275 knots at the entry point, and a minimum altitude of 4,000 feet above ground level (AGL) at 125 knots at the top of the maneuver. The operator indicated to FAA personnel that he observed the accident airplane's maneuver. He reported that it appeared to him that the

accident airplane did not have the minimum entry speed. The operator estimated that the maximum altitude gained at the top of the maneuver was about 2,500 feet and the airplane appeared to experience an accelerated stall at 100 to 200 feet AGL just prior to impact. Additionally, the operator indicated that it was normal for the pilot to wear a "G" suit during his aerobatic routine.

CREW INFORMATION

The pilot held a commercial pilot certificate with airplane single engine land and sea, airplane multiengine land (limited to VFR only), and instrument-airplane ratings. The most recent second class medical certificate was issued to the pilot on April 9, 1993, and contained no limitations. The pilot's airman records, maintained in the FAA's Airman and Records Center located in Oklahoma City, were reviewed by Safety Board investigators. The review noted that pilot was first issued a student pilot certificate on May 18, 1976, followed by a private pilot certificate on May 25, 1976. The pilot then received a commercial pilot certificate on July 21, 1976. The pilot held a letter of authorization (LOA) to act as pilot-in-command of North American F-86 Sabre Jets (All Models).

The operator reported that the pilot's formal aerobatic training was unknown. The pilot had owned and flown aerobatic aircraft in aerobatic flight in the past. The pilot received a checkout in the accident airplane on January 10, 1992, and the pilot completed all approved maneuvers by January 15, 1992. During 1992, the pilot did not fly any aerial demonstrations; however, he did practice the F-86 solo routine several times, down to ground level. In 1993, the pilot prepared for solo and dual air show routines by practicing in a Pitts S-2 and the accident airplane. The operator indicated that practice sessions exceeded 25 sequences.

The operator reported that the pilot portrayed himself as an ex-naval aviator and A-4 pilot. U.S. Naval Investigative Service (NIS) personnel assisted Safety Board investigators in an inquiry of the pilot's military experience. According to the NIS, the pilot was terminated from the U.S. Navy advanced jet training curriculum, Pensacola, Florida, on May 19, 1976.

Review of pilot logbook entries submitted by the operator revealed that the pilot's total aeronautical experience consisted of about 5,596.4 hours, of which 47 were accrued in the accident airplane. In the preceding 90 and 30 days prior to the accident, the logbook lists a total of 26.8 and 24.5 hours, respectively, flown in the accident airplane. On the last application for medical certificate, dated April 9, 1993, the pilot listed a total time of 6,200 hours, with 150 hours accrued in the preceding 6 months. The application did not have any entry for military experience.

Pilots participating in aerial demonstrations are required to demonstrate to the FAA their competency. The FAA utilizes air show professionals as Airshow Certification Evaluators (ACE) to evaluate other air show performers for the purpose of recommending a performer for aerobatic flight. The ACE program is administered by the International Council of Air Shows Inc. (ICAS). Evaluations and recommendations are forwarded to the FAA for review. The FAA

is has the final authority to issue a Certificate of Acrobatic Competency, Form 8710-7. An FAA statement of acrobatic competency is valid for 1 year. An ACE has evaluation authority through ICAS Inc. that is valid for 2 years.

Safety Board investigators examined the evaluation records of the pilot and those of his last evaluator that are maintained by ICAS Inc. The pilot received an initial evaluation of acrobatic competency on September 19, 1991, by an ACE. The FAA issued a Form 8710-7 for solo and formation maneuvers in Pitts S-2 aircraft, with a level 2 (250 feet) altitude limitation to the pilot, with an expiration date of September 30, 1992. The evaluator indicated that the pilot's initial qualification at level 2 was based on the pilot's prior military low level and air-to-ground experience.

On October 19, 1992, the pilot applied for a statement of acrobatic competency with a level 1 (no restriction) altitude. The pilot was evaluated again by the same evaluator on January 4, January 18, and January 19, 1993, in a Pitts S-2 airplane. Additionally, the evaluator observed the pilot in formation flight in the F-86 with a MIG-15 on February 9, 1993. A review of the pilot's logbook indicated that the pilot logged flights in the Pitts on January 12 and January 18, 1993.

On February 24, 1993, the pilot was given an ACE acrobatic competency recommendation to the FAA with the following limitations: Maneuver limitations - solo/formation; Altitude limitations - Level 1, surface; Authorized aircraft - Pitts S-2, F-86 Sabre. A Level 1 authorization means that a performer may conduct aerobatic maneuvers down to the surface, not having any other altitude restriction for termination of a maneuver. On February 26, 1993, the FAA issued a statement of acrobatic competency (FAA Form 8710-7) to the pilot.

The pilot's evaluator submitted an application for designation as an evaluator on March 1, 1991, and listed 8 years of airshow performance experience. He was again evaluated on October 17, 1992, by the operator of the accident airplane for an ACE renewal. The evaluator has held and currently holds an FAA Form 8710-7 that expires on March 31, 1994.

FAA personnel interviewed the pilot's evaluator who recommended him for his aerobatic competency. The evaluator, a member of an aerobatic team and an employee of National Airshows Inc., indicated that on the preceding two days before the accident, the pilot exhibited poor control or judgement when he utilized an unusually low altitude to terminate maneuvers during his airshow performances. The evaluator indicated that he counselled the pilot about his performance and thought the issue resolved.

AIRCRAFT INFORMATION

The airplane had accumulated a total time in service of 1,666.8 flight hours. Examination of the maintenance records revealed that the most recent airframe and engine inspection was accomplished on February 3, 1993, 24.8 flight hours before the accident. The engine had accrued a total time in service of 132.9 hours of operation since being overhauled on August 1,

1977. Examination of the maintenance records revealed no unresolved maintenance discrepancies against the aircraft prior to departure.

METEOROLOGICAL INFORMATION

The closest official weather observation station is located at the El Toro Marine Corps Air Station. At 1345 hours, a surface observation was reporting in part:

Sky condition and ceiling, 20,000 feet scattered; visibility, unrestricted; temperature, 77 degrees F; dew point, 55 degrees F; wind, 150 degrees at 3 knots; altimeter, 29.88 inHg.

COMMUNICATIONS

Review of the air-ground radio communications tapes maintained by the El Toro Marine Corps Air Station facility revealed that the aircraft successfully communicated with the ground and local control positions. A transcript of the air to ground communications between the aircraft and all involved ATC positions appears as Item 11 of this report.

WRECKAGE

Examination of the airplane by FAA personnel revealed that the seat belt attachment fittings were both securely fastened to the seat; however, both halves of the seat belt were consumed by fire. The seat belt buckle was found in the fastened position; however, the seat belt material was consumed by fire. The shoulder harness was consumed by fire with the exception of about 4 inches of harness material remaining in the inertial reel mechanism. The shoulder harness inertial reel mechanism was in the unlocked position and when tested, the reel functioned properly. The aircraft canopy was found in the closed position.

MEDICAL AND PATHOLOGICAL INFORMATION

A post mortem examination of the pilot was conducted by the Orange County Coroner's Office on May 3, 1993. According to the report, the cause of death was attributed to exsanguination (excessive loss of blood due to internal or external hemorrhage). No pre-existing conditions were noted during the post mortem examination which would have adversely affected the pilot's abilities to pilot the airplane. An external examination of the pilot by FAA personnel at the accident site revealed that the pilot was not wearing a "G" suit.

Toxicological examinations were conducted by the FAA Civil Aeromedical Institute (CAMI) on May 12, 1993, and revealed the presence of 14.4 ug/ml Salicylate in the urine. CAMI personnel reported that Salicylate is the main ingredient of aspirin.

TESTS AND RESEARCH

The airplane's altimeter was examined by the National Transportation Safety Board's Materials

Laboratory Division. An external examination revealed that the outer case was covered by black sooting and the glass face of the instrument was broken and missing. Detailed visual examination of the dial face under the bottom portion of the 100 foot and 1,000 foot pointers revealed impressions (witness marks) directly beneath the pointers. With the pointers aligned over the witness marks, the altimeter indicated an altitude reading between a minus 20 and minus 30 feet. The Kollsman window barometric scale could be rotated by the adjustment knob. Examination of the internal components revealed that the pivot screw was displaced from the center of the jewel bearing of the rocker shaft. The face of the rocker shaft contained an impact mark adjacent to the position of the pivot screw. The Materials Division Laboratory report appears as Item 13 of this report.

A video tape recording of the accident was submitted to the National Transportation Safety Board's Engineering Services Division. Safety Board investigators reported that at the start of the final maneuver, the airplane passed the viewing stand at an altitude of 75 feet AGL and at 350 knots ground speed. At the top of the loop, the airplane reached an altitude of about 3,650 feet. The speed at the top of the loop was not determined.

As the airplane approached the ground, the speed had increased to 380 knots and then slowed to about 360 knots at ground impact. The airplane descended to about 75 feet and then pitched down. The angle of attack at 75 feet was about 16 degrees and then dropped to 8 degrees at ground contact. The pitch angle at 75 feet was about -3 degrees and then dropped to about -5 degrees at ground contact.

Calculation of acceleration loads during the last 1/4 of the loop indicated that the pitch change rate was about 20 degrees per second, which equates to about 6.4 Gs. During the last second before impact, the pitch angle changed from -25 degrees at 350 knots, to -6 degrees at 370 knots. The total flight load for the last second was about 7.3 G. The report by the Safety Board's Office of Research and Engineering is included as Item 12 of this report.

ADDITIONAL INFORMATION

CAMI personnel reported that human tolerance to high "G" maneuvers varies with each individual. The rate of induced "G" and duration of exposure to excessive "G" are the usual contributing factors. Military experience has shown that an average "G" tolerance without any extra means of tolerance enhancement is about 4.5 "G" that begins to effect the pilot (primarily initial loss of visual acuity) in about 5 seconds. The pilot's tolerance to excessive "G" (both amount and time) can be extended, among others, primarily by the use of an abdominal straining maneuver and a "G" suit. Excessive exposure to high "G" (both amount and time) can lead to "GLOC" ("G" induced loss of consciousness).

Military experience has defined that a "G" suit can provide about 1 additional "G" protection. A properly performed straining maneuver can provide about 2 "G" of protection. In combination, and without any further tolerance enhancement, an experienced pilot could tolerate about 7.5 "G" before beginning to loose visual acuity. The factors that may affect the pilot's ability to

tolerate excessive "G" are: Individual difference in physiological responses; physical fitness; dehydration (lowers "G" tolerance); nutrition (missing meals reduces "G" tolerance); recency of "G" exposure (tolerance declines rapidly if frequent exposure to "G" doesn't occur); and most illnesses reduce "G" tolerance.

The wreckage was initially released to representatives of the owner on May 5, 1993. The altimeter was released on October 5, 1993. No wreckage or parts were retained by the Safety Board.

Pilot Information

Certificate:	Commercial	**Age:**	40,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Center
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	April 9, 1993
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	5596 hours (Total, all aircraft), 47 hours (Total, this make and model), 27 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CANADAIR	**Registration:**	N3842J
Model/Series:	F-86E MK.6 F-86E MK.6	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	1480
Landing Gear Type:	Retractable - Tricycle	**Seats:**	1
Date/Type of Last Inspection:	February 3, 1993 Annual	**Certified Max Gross Wt.:**	18000 lbs
Time Since Last Inspection:	25 Hrs	**Engines:**	1 Turbo jet
Airframe Total Time:	1667 Hrs	**Engine Manufacturer:**	ORENDA
ELT:	Not installed	**Engine Model/Series:**	10
Registered Owner:	NATIONAL AIRSHOWS INC.	**Rated Power:**	6000 Lbs thrust
Operator:	JAMES A. GREGORY	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	NZJ ,383 ft msl	**Distance from Accident Site:**	
Observation Time:	13:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 20000 ft AGL	**Visibility**	30 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	25°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(NZJ)	**Type of Flight Plan Filed:**	None
Destination:	(NZJ)	**Type of Clearance:**	VFR
Departure Time:	13:41 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	MCAS EL TORO NZJ	**Runway Surface Type:**	Concrete
Airport Elevation:	383 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	16R	**IFR Approach:**	None
Runway Length/Width:	6311 ft / 250 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	1 Fatal	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	Erickson, Scott
Additional Participating Persons:	GARY MUCHO; GARDENA , CA JOHN GOLDFLUSS; LONG BEACH , CA
Original Publish Date:	August 31, 1994
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=28372