National Transportation Safety Board
Aviation Accident Final Report

Location:	SAN ANTONIO, TX	**Accident Number:**	FTW99FA223
Date & Time:	08/16/1999, 1733 CDT	**Registration:**	N2671V
Aircraft:	Swearingen SA-227-AC	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The airplane landed wheels up after the instructor pilot failed to lower the landing gear. The instructor told the student to execute 'a no flap landing due to a simulated hydraulic pump failure.' The student established the airplane on the approach and called for the 'Emergency Gear Extension Checklist.' The instructor delayed extending the gear in accordance with the operator's flight standards manual, which stated that the landing gear should not be extended until the landing was assured. Later in the approach, when the gear warning horn stopped sounding, due to the student's movement of the power levers forward, the instructor removed his hand from the gear handle without extending the gear. The instructor stated that 'because [the student] had already called for the [Emergency Gear Extension] checklist once before, in a split second thought process, [he] mistakenly thought it had been completed.' Following the accident, the landing gear system was tested and found to operate normally. Review of the maintenance records revealed no uncorrected discrepancies. At the time of the accident, the instructor pilot was completing a 9-hour work day, and did not have a lunch break.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The instructor pilot's failure to complete the Emergency Gear Extension Checklist, resulting in the inadvertent wheels-up landing. A factor was the instructor pilot's fatigued condition.

Findings

Occurrence #1: WHEELS UP LANDING
Phase of Operation: LANDING

Findings
1. (C) CHECKLIST - NOT PERFORMED - PILOT IN COMMAND(CFI)
2. (F) FATIGUE - PILOT IN COMMAND(CFI)
3. (C) WHEELS UP LANDING - INADVERTENT - PILOT IN COMMAND(CFI)

Factual Information

HISTORY OF FLIGHT

On August 16, 1999, at 1733 central daylight time, a Swearingen SA-227-AC multi-engine airplane, N2671V, was substantially damaged when it landed gear-up at the San Antonio International Airport, San Antonio, Texas. The airline transport rated instructor pilot and the instrument-rated commercial pilot, who was receiving instruction, were not injured. The airplane was registered to General Interquip Inc., of Upland, California, and operated by Merlin Express of San Antonio, Texas. Visual meteorological conditions prevailed for the 14 Code of Federal Regulations Part 91 instructional flight and a company VFR flight plan was filed. The local flight originated from the San Antonio International Airport at 1530.

According to the instructor pilot and the pilot receiving instruction (student), the student was undergoing first officer training for the Swearingen SA-227-AC. The pilots stated that they were completing the last approach and landing for the flight. The instructor told the student to execute "a no flap landing due to a simulated hydraulic pump failure."

The student pilot maneuvered the airplane to intercept the ILS (instrument landing system) 12R approach at the San Antonio International Airport. The student established the airplane on the approach and called for the "Emergency Gear Extension Checklist." The instructor stated that the landing gear could not be extended until landing was assured. The landing gear was not extended. The student continued flying the approach and retarded the power levers to idle to reduce the airspeed, and the landing gear warning horn sounded. The instructor placed his right hand on the landing gear extension lever. As the airplane reached the target airspeed, the student moved the power levers forward to increase power, and the landing gear warning horn ceased. The instructor reported that "because [the student] had already called for the [Emergency Gear Extension] checklist once before, in a split second thought process, [he] mistakenly thought it had been completed." He removed his hand from the landing gear lever without extending the landing gear. Subsequently, the airplane landed on the runway with the landing gear in the up position.

PERSONNEL INFORMATION

The instructor pilot held an airline transport pilot certificate in multi-engine land airplanes, and a commercial certificate in single-engine airplanes and helicopters. The instructor pilot also held type ratings in the Lear Jet and the SA-227. According to Merlin Express company flight records, the instructor pilot was endorsed to operate as second-in-command (SIC) of the SA-227 on June 16, 1998. He was given his endorsement to act as pilot-in-command (PIC) in the SA-227 on July 16, 1998. On October 9, 1998, the pilot was endorsed by the chief of training for Merlin Express as a ground, simulator, and flight instructor for the SA-226 and SA-227 aircraft. On March 2, 1999, he completed an FAR 121/135 Airman Competency/Proficiency Check. According to the enclosed Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1/2), the instructor pilot had accumulated a total of 3,400 flight hours, of which 490 hours were in the same make and model as the accident airplane. He had also accumulated 110 hours of instruction in the SA-227. The instructor pilot was issued a first class medical certificate, with no limitations, on February 22, 1999.

Discussions with the instructor pilot revealed that he started his work day at 0830 with two hours of ground instruction, followed by an instructional flight with a student initiating at

1100, and returning at 1330. The instructor debriefed the first student until 1430, and then briefed the next student (who was the student involved in the accident) prior to the accident flight. The second flight originated at 1530 and was supposed to finish with the accident approach (at 1730). Additionally, the instructor stated that he had not eaten lunch prior to the second flight.

The pilot receiving instruction was issued a commercial pilot certificate, with single and multi-engine land airplane, and instrument ratings on January 4, 1995. On March 24, 1999, he was issued a flight instructor certificate. At the time of the accident, he was receiving instruction to operate as SIC of the SA-227. According to company records, he had completed the aircraft ground training on July 9, 1999. According to the enclosed NTSB Form 6120.1/2, he had accumulated a total of 2,050 flight hours, of which 9 hours were in the SA-227. He was issued a first class medical certificate, with no limitations, on March 5, 1999.

AIRCRAFT INFORMATION

The airplane was manufactured in 1981 and had accumulated a total airframe time of 19,317 hours. According to the enclosed NTSB Form 6120.1/2, the last maintenance inspection was completed on August 4, 1999. According to Merlin Express maintenance records, the last "light" inspection of the landing gear was completed on April 11, 1999. The last "heavy" inspection of the landing gear was completed on December 12 and 13, 1999. Review of the maintenance records did not reveal any uncorrected maintenance discrepancies during those inspections. (See the enclosed excerpts from the maintenance records for more details.)

According to the SA-227 pilot training manual, the landing gear is "normally controlled electrically and actuated by the two hydraulic actuators attached to the gear." All of the landing gear doors are mechanically attached to and operated by movement of the landing gear. The landing gear position indication is provided by six lights (two for each gear) mounted on the instrument panel. Additionally, there is a landing gear warning horn, which sounds intermittently if all three landing gear are not down and locked when the flaps are extended more that half way, or either engine power lever is moved to flight idle. There is an emergency extension system provided in the event of an electrical and/or hydraulic failure. The system, when utilized mechanically releases the landing gear uplocks and positions the landing gear selector valve to allow the landing gear to free-fall to the down position, with the aid of the airstream.

At the time of the accident, the Merlin Express flight standards and training manuals for the SA-227 stated that when the airplane experiences a loss of hydraulic power, the landing gear should only be extended when landing on the runway is assured. A recommendation for a manual revision was submitted (by the instructor pilot prior to the accident) to the Director of Flight Standards for Merlin Express. The recommendation was to allow for the extension of the landing gear at the final approach fix to ensure a stabilized approach. The revision has since been approved by Merlin Express' Flight Standards and the FAA.

MEDICAL AND PATHOLOGICAL INFORMATION

Toxicological tests for drugs and alcohol were ordered by Merlin Express, and were performed on the flight crew. The results of the tests were negative.

WRECKAGE INFORMATION

Examination of the airplane and the runway revealed that the airplane traveled 1,827.7 feet

from the approach end of the runway, and came to rest upright on a measured magnetic heading of 124 degrees. The airplanes resting position was 22 feet to the left of the runway centerline. A few of the propeller blade tips were separated, and all of the propeller blades displayed severe curling with chordwise scraping and leading edge gouges. The airplane was lifted off of the runway with the aid of a crane. As the airplane was lifted, the landing gear emergency extension was activated, allowing the landing gear to extend. The landing gear was locked in the extended position, and the airplane was towed to a hangar located on the airport for further examination.

Examination of the airplane revealed that the main spar was structurally damaged and a three-foot, by two-inch section of the bottom of the fuselage was damaged. The vertical fin was buckled. The engine firewall, for the left engine, was damaged. External power was connected to the airplane and the NTSB investigator-in-charge extended and retracted the landing gear system using the cockpit controls. The landing gear, landing gear warning system, and gear transit and gear down indicator lights operated normally.

ADDITIONAL INFORMATION

The airplane was released to Merlin Express' director of maintenance on August 17, 1999.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	40, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	02/22/1999
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	3400 hours (Total, all aircraft), 490 hours (Total, this make and model), 2400 hours (Pilot In Command, all aircraft), 40 hours (Last 90 days, all aircraft), 27 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Swearingen	**Registration:**	N2671V
Model/Series:	SA-227-AC SA-227-AC	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	AC-437
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	08/04/1999, Continuous Airworthiness	**Certified Max Gross Wt.:**	14500 lbs
Time Since Last Inspection:	24 Hours	**Engines:**	2 Turbo Prop
Airframe Total Time:	19317 Hours	**Engine Manufacturer:**	Garrett
ELT:	Installed, not activated	**Engine Model/Series:**	TPE331-11U
Registered Owner:	GENERAL INTERQUIP INC.	**Rated Power:**	1000 hp
Operator:	MERLIN EXPRESS	**Operating Certificate(s) Held:**	Commuter Air Carrier (135); Flag carrier (121); On-demand Air Taxi (135)
Operator Does Business As:	N/A	**Operator Designator Code:**	MEJA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	, 0 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	0000	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	36°C / 16°C
Precipitation and Obscuration:			
Departure Point:	SAN ANTONIO, TX (SAT)	**Type of Flight Plan Filed:**	Company VFR
Destination:		**Type of Clearance:**	VFR; VFR on top
Departure Time:	1430 CDT	**Type of Airspace:**	Class C

Airport Information

Airport:	SAN ANTONIO INTERNATIONAL (SAT)	**Runway Surface Type:**	Concrete
Airport Elevation:	809 ft	**Runway Surface Condition:**	Dry
Runway Used:	12R	**IFR Approach:**	ILS
Runway Length/Width:	8502 ft / 150 ft	**VFR Approach/Landing:**	Full Stop

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	NICOLE LUPINO	**Report Date:**	08/18/2000
Additional Participating Persons:	STEPHEN D HOMER; SAN ANTONIO, TX		
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/.		