FLIGHT SAFETY FOUNDATION
Accident Prevention
Vol. 51 No. 12 *For Everyone Concerned with the Safety of Flight* December 1994

Moving Power Levers Below Flight Idle During Descent Results in Dual Engine Flameout and Power-off Emergency Landing Of Commuter Airplane

The official U.S. report expressed concern that pilots may be routinely moving the power levers below the flight-idle stop during flight to slow their aircraft or increase descent rates.

Russell Lawton
Aviation Safety Consultant

The emergency landing of a Saab 340B (a twin-engine turboprop) operated by Simmons Airlines Inc. has resulted in a recommendation by the U.S. National Transportation Safety Board (NTSB) that the U.S. Federal Aviation Administration (FAA) revise the Federal Aviation Regulations (FARs) to prevent operation of the propellers in the beta mode while in flight. [The beta mode is usually engaged to change propeller pitch on the ground for braking and manuevering.] The 23 passengers and two pilots aboard the airplane were not injured in the February 1, 1994, accident. The one flight attendant received a minor injury during evacuation.

While cruising at flight level (FL) 220 (22,000 feet [6,706 meters]) in visual meteorological conditions (VMC) at night, the crew was instructed by air traffic control to descend to 11,000 feet (3,355 meters), in preparation for an approach to Baton Rouge Airport (BTR), Louisiana, U.S. (Twenty-two minutes after the accident, weather was reported as visibility 10 miles [16 kilometers], measured ceiling 12,000 feet [3,658 meters], ceiling 7,500 feet [2,286 meters] and winds 220 degrees at four knots.) The captain (the pilot flying) moved the power levers to flight idle for the descent. As the airplane descended, the airspeed overspeed warning sounded for about 13 seconds. The power levers had moved over the flight idle gates, into the beta range. An extreme overspeed of both engines and propellers occurred, substantially damaging both engines and resulting in a dual engine flameout. The flight was over an airport when the engine failure occurred. The crew then declared an emergency and made a power-off emergency landing at that airport. During the landing, the airplane ran off the runway end and came to a stop in a field.

"The probable causes of this accident were the captain's movement of the power levers below flight idle in flight, the inadequate certification requirements and consequent design of the airplane's power levers that permitted them to be moved below the flight idle position into the beta range, either intentionally or inadvertently, while in flight, and the

inadequate action taken to require a positive means to prevent beta operation on airplanes for which such operation is prohibited," the report said.

The Saab 340B (owned by Simmons Airlines Inc. and operated as American Eagle Flight 3641) was a scheduled passenger flight from Dallas/Fort Worth International Airport (DFW), Texas, U.S. to BTR. While en route at FL 220, the flight was cleared by the Houston FAA air route traffic control center (ARTCC) to descend at the pilot's discretion to maintain 11,000 feet, in preparation for an approach to BTR. The captain was the pilot flying. At 2120:09, the airspeed overspeed warning sounded for about 13 seconds. The cockpit voice recorder (CVR) transcript indicated that neither pilot commented on the overspeed warning.

The first officer then briefed the captain on the most recent automated terminal information service (ATIS) for BTR, and indicated that visual approaches were being conducted to Runways 31 and 22R. "When told by the first officer that the wind speed at BTR was 'light and variable,' the captain said, 'well what the heck's wrong with the instrument landing system [ILS] to runway one three?' The first officer responded, '… nothing, they'll probably give it to us,'" the report said. A landing on Runway 13 would have resulted in a straight-in approach from their position.

The cockpit voice recorder (CVR) transcript indicated that neither pilot commented on the overspeed warning.

"At 2122:10, the captain stated, 'Man, we're almost the speed of heat here … two sixty-four … or two-sixty two … three sixty-two.' At 2124:32, he said, 'gosh, we gotta come down,'" the report said. The flight crew was then told by Houston ARTCC to contact BTR approach control. When the first officer called BTR approach, he reported descending through 15,500 feet (4,725 meters) for 11,000 feet. The controller asked the crew what approach they wanted to which the first officer responded that they wanted a straight-in approach to Runway 13. The controller then gave the crew a vector to the localizer, told them to expect a visual approach, and to descend to 2,000 feet (610 meters).

"At 2127:19, the captain said, 'A little bouncy bouncy here. I wonder what's causing that?' The first officer replied, 'I don't know … with calm winds down there you got something right in that this cloud layer or something.' The captain replied, 'Yeah.' The captain then said … , 'Yeah, we'll just … kinda slow this baby up a little bit,'" the report said. About five seconds later, the autopilot disconnect chime sounded. About six seconds later, the sound of an increase in propeller/engine revolutions per minute (rpm) frequency and amplitude could be heard on the CVR.

"… [Four] seconds after the onset of the sound of an increase in propeller/engine rpm frequency and amplitude, and after the sound of the master caution warning chime, the first officer said, 'What happened?' The captain replied, 'What the (expletive).' The first officer stated, 'Your both engines flamed out,' and 'Both engines flamed out … you've got an airport underneath you," the report said.

"At 2128:43, the first officer broadcast a 'MAYDAY,' to BTR, stating that they had lost both engines and asking, '… is there an airport underneath us?' The BTR controller replied, '… yes sir, the False River Airport and ah it should be lit, and ah believe five thousand feet [1,525 meters] [runway length], stand by.'"

The report said,"The captain flew a circling, power-out descent to a landing to the south, on the 5,000-foot by 75-foot [22.8-meter] runway (18/36) at False River Air Park. The first officer lowered the landing gear, using the hydraulic pump-override, shortly before touchdown. Following initial touchdown, the airplane became airborne again, with about 1,600 feet [488 meters] of runway remaining, then touched back down on the runway about 606 feet [185 meters] from the departure end, leaving intermittent tire braking or skid marks until the airplane departed the end of the runway."

The report continued: "After departing the end of the runway, the airplane traversed soft, grass-covered soil and a 25-foot [7.6-meter]-wide by 6-foot [1.8-meter]-deep ditch, then went through a combination steel post, chain link and barbed wire fence. It came to rest, upright, in a sugar cane field, approximately on runway heading, about 1,425 feet [434.6 meters] from the departure end of the runway.

"After the airplane came to a stop, the first officer exited the cockpit. After he observed fencing materials wrapped around the landing gear, he lowered the airstair door to assist passengers exiting the cabin so that they would not jump into the fencing. Simultaneously, the flight attendant, using her flashlight, attempted to direct passengers out the forward right emergency exit. Seeing the fencing material under the right front door, she directed the passengers toward the left door, which the first officer opened. Passengers characterized the evacuation as rapid, calm and efficient. None of the passengers was injured during the impact or evacuation. The flight attendant later reported a back injury (an inflamed disc) sustained while she opened a door during the evacuation."

The airplane was substantially damaged, and the cost of repairs was US$1.75 million. The damage to property was valued at $10,000.

Investigators reviewed the maintenance records of the accident airplane, which was acquired by Simmons Airlines in 1993 as a new airplane. There were no minimum equipment list (MEL) discrepancies or other discrepancies with the airplane the day of the accident flight. Following an examination at the accident

site, the airplane's engines and propellers were shipped to their respective manufacturers for further examination. "The examinations, under Safety Board supervision, revealed no preexisting faults that would have precipitated the in-flight engine/propeller overspeed and subsequent loss of power," the report said.

Investigators reviewed the flight data recorder (FDR) readout to determine the position of the power levers during the descent. The FDR onboard the accident flight was a Fairchild Model F800 that recorded 128 data parameters. In the descent, the FDR showed that "the engine parameters remained steady for about one minute prior to the first indication of the movement of the power levers (at 2127:43) associated with an overspeed event. The power levers remained near the flight idle stops after 2126:39. The captain stated that at the time the engine roar and overspeed incident began, he had the power levers at the flight idle stops where he had set them after the airplane had passed through about 12,000 feet [3,660 meters]," the report said.

". . . one propeller reached about 1,965 rpm and the other propeller reached about 2,190 rpm, or about 142 percent and 158 percent of red line rpm, respectively," the report said.

The report continued: "At 2127:43, the data showed the power levers beginning to move aft of the flight idle stop position. The airspeed was recorded as 226 knots indicated airspeed (KIAS), and the airplane was descending through about 9,232 feet [2,816 meters] msl [mean sea level]. About 9 seconds later … as Flight 3641 was descending through about 9,040 feet [2,757 meters] at 217 KIAS, the FDR showed a rapid rise of both propeller rpms from the steady reading of about 1,225 rpm to an rpm value at or above the maximum recordable FDR reading of 1,500 rpm. At this time, the engine power levers had moved about 4 inches [10 centimeters] aft of the flight idle gate to positions aft of the ground idle detents."

There were two interruptions of FDR data during the descent and landing because of the loss of electrical power. "The first power loss was for 40 seconds … during the time the engines were shut down. The recording then resumed and the FDR operated for another 2 minutes and 51 seconds. … Because of the second power interruption to the recorder, the airplane's touchdown on the runway and subsequent events in the accident sequence were not recorded on the FDR," the report said.

The NTSB conducted a sound spectrum analysis of the CVR engine/propeller frequencies. The analysis showed "that both propellers had been operating steadily at about 1,200 rpm for several seconds before the overspeed event. After the power levers were moved into the beta range, the spectrum showed that one propeller reached about 1,965 rpm and the other propeller reached about 2,190 rpm, or about 142 percent and 158 percent of red line rpm, respectively," the report said.

The Saab 340B airplane flight manual (AFM) prohibits movement of the power levers aft of the flight idle stop while in flight, the report said.

Investigators reviewed the power-lever design on the Saab 340B for the possibility of inadvertent movement into the beta range. They found that the design "met the regulatory provisions by the incorporation of spring-loaded latches to prevent inadvertent movement of the power levers aft of the flight idle stops and into the beta range. To move the power levers aft of the flight idle stops and into the beta range, the latches on the power levers must first be lifted about 1/2 inch [1.27 centimeters] using two fingers in order to overcome the combined spring force of 12 pounds [5.4 kilograms]. In the beta range, a tactile detent is provided to distinguish the threshold between ground idle and propeller reverse pitch," the report said.

When they were interviewed following the accident, "both the captain and first officer stated that they did not intentionally move the power levers below the flight idle stop into the beta range. Further, neither indicated that they were aware of unintentionally raising the triggers on the levers to permit movement into the beta range. The first officer was performing the [nonflying] pilot duties, and the Board believes it unlikely that he touched the power levers. The captain recalled moving the power levers to flight idle a few minutes before the engine overspeed event, but he could not recall where his hand was when the overspeed occurred," the report said.

The report explained: "When the propeller overspeed occurred, the airplane was in a [high-speed] descent and was encountering turbulence. Because the power levers were already at flight idle, to slow the airplane to make the ride more comfortable for the passengers, the captain would have to reduce the descent rate and slow the airspeed using airplane pitch. The only other option was to increase propeller drag by using beta range. The disengagement of the autopilot a few seconds after he made the comment about slowing the airplane suggests that he intended to fly the airplane manually and decrease the airspeed."

The report said: "The FDR data confirmed the captain's awareness that both power levers were at the flight idle gate (about 43 degrees) for about 1 minute before they were moved past the gate. The rate of movement of the levers in the beta range averaged 3 degrees per second, and the Board believes that this is consistent with a deliberate action, rather than an inadvertent or sudden action. … To prevent inadvertent movement of the power levers below the flight idle position, the lever mechanism is designed so that a distinct movement of the hand and finger is required to raise the triggers and

release the flight idle stop. The mechanism functioned normally during postaccident tests. The Safety Board therefore concludes that the captain manipulated the triggers and moved the power levers into the beta range."

The background and qualifications of the flight crew were reviewed. The captain, age 52, had been employed by Simmons Airlines since 1986. He held a U.S. airline transport pilot (ATP) certificate, with a type rating for the Saab 340B. At the time of the accident, he had more than 20,000 hours total flight time, and about 300 hours in the Saab 340 (almost all as captain). He held a current FAA first class medical with a limitation to wear correcting lenses while flying.

The first officer, age 43, had been employed by Simmons Airlines since 1987. He held a U.S. ATP certificate, with a type rating for the Saab 340B. At the time of the accident, he had 6,500 total flying hours, with about 1,700 hours in the Saab 340B. He held a current FAA first class medical with no limitations.

The flight attendant had completed flight attendant training eight months before the accident. Before entering flight attendant training, she had been employed by Simmons Airlines in a nonflying position.

The NTSB reviewed the actions of the flight crew and the flight attendant regarding passenger safety during the emergency landing. About 10 minutes prior to the intended arrival at BTR and prior to the in-flight emergency, the flight attendant had instructed passengers to fasten their seat belts and stow their tray tables.

"Although the pilots were extremely busy during the emergency landing, the first officer instructed the flight attendant to prepare the cabin for an emergency landing. However, the instruction was broadcast to BTR on the air traffic control frequency instead of the public address system. Although the flight attendant entered the cockpit, she did not obtain instructions from the pilots. Nevertheless, she certainly should have had enough cues to determine [that] an emergency landing was in progress," the report said.

Investigators interviewed all of the passengers about the accident. "Passengers stated that there were no announcements from the cockpit about the emergency. … Some passengers stated that after the flight attendant returned from the cockpit, she did not instruct the passengers to fasten their seatbelts and that she neither warned them of an emergency landing nor told them to assume the brace position. Some passengers noted that an emergency landing or crash was apparent after the roar, and that vibrations and flames at the rear of the engines had stopped," the report said.

The NTSB commented that the flight attendant "should have instructed the passengers to prepare for an emergency landing. The lack of coordination left the passengers ill prepared for the potential crash landing. However, the performance of the flight crew and flight attendant was excellent after the airplane came to a stop. Under other circumstances, the lack of proper preparation of the passengers for the emergency landing could have led to serious injuries or death," the report said.

The NTSB developed nine findings as a result of its investigation:

- "The flightcrew and flight attendant were properly trained and qualified to conduct the flight;
- "Weather and air traffic control handling were not factors in the accident;
- "The airplane had been maintained in accordance with its approved maintenance program, and there were no preexisting defects that contributed to the accident;
- "The captain actively moved the power levers from the flight idle gate into the beta range for undetermined reasons. Operation of the propellers in the beta range while in flight is prohibited by the airplane flight manual;
- "There were no mechanical failures of the power lever systems that could have permitted the movement of the power levers into the beta range without positive action by the pilot;
- "The propellers and engines experienced extreme overspeed when propeller and engine governing was lost while operating in the beta range. The engines were substantially damaged during the overspeed and necessitated a power-off emergency landing;
- "Although the design and certification of the power levers met existing requirements, those requirements were inadequate because they permitted a design that did not prevent movement into the beta range in flight;
- "The airframe and engine manufacturing industry, the FAA, and the certification authorities from other countries were slow in reacting to several previous in-flight beta occurrences that led to serious incidents and accidents; [and,]
- "The flightcrew and flight attendant failed to prepare the passengers for the emergency landing, although they performed a timely and effective evacuation once the airplane came to a stop."

As a result of its findings, the NTSB made the following recommendations:

- "Issue an airworthiness directive [AD] applicable to Saab 340 airplanes that would require installation of a system that prevents the power levers from moving aft of the

flight idle stops into the beta range in flight regardless of pilot action. Until the system is installed, cockpit placards should be installed in Saab 340 airplanes to warn pilots not to move the power levers into the beta range while in flight;

- "Revise Title 14 Code of Federal Regulations [CFRs] Parts 25.1155 and 23.1155 to require a positive means to prevent operation of the propeller in the beta mode while in flight, unless the airplane is certificated for such use; [and,]

- "Review all other turbopropeller airplane designs to determine whether in-flight engine operation in the beta range should be prohibited. Issue appropriate airworthiness directives applicable to those airplanes to install a system to prevent movement of the power levers into the beta range, and require appropriate warnings in airplane operating manuals and on cockpit placards to warn pilots not to move power levers into the beta range in flight, unless the airplane is certificated for such use."

In March 1994, Saab issued a service bulletin that outlined procedures to install a placard in the cockpit of SF-340 airplanes. "The placard warns the flight crew about not moving the power levers below 'flight idle' (beta mode) when the airplane is airborne," the report said. In April 1994, the FAA issued an AD that made the Saab service bulletin mandatory.

In response to the NTSB's three recommendations, the FAA stated:

- "Saab is currently developing a design to preclude the power levers from moving aft of the flight idle stops while the airplane is airborne. Saab will present that design to the FAA for review and comment. Once the FAA accepts the design, Saab will issue a service bulletin to provide instructions to install the in-flight beta lockout system. The FAA will consider the issuance of a notice of proposed rulemaking proposing to require the installation of an in-flight beta lockout system in accordance with the new service bulletin;

- "The FAA has initiated rulemaking action proposing to amend 14 CFR 23.1155 and 14 CFR 25.1155 to require a means to preclude inadvertent or intentional selection of the beta range in flight. The FAA considers any design that allows the selection of the beta mode in flight to be unsafe unless the airplane is certificated for such use. The FAA will use the provisions of 14 CFR 21.21(b)(2) to prevent this practice on new design and approvals until 14 CFR 23.1155 and 14 CFR 25.2255 are amended; [and,]

- "The FAA agrees that for existing turbopropeller airplanes there should be a system to prevent movement of power levers into the beta range and such systems should be proposed for retrofit through an AD. Airplanes properly certificated for in-flight beta operation will be excluded from the AD process. The FAA is reviewing all turbopropeller airplane designs to determine whether in-flight operation in the beta range should be prohibited. The FAA is also working with the aircraft manufacturers and other civil airworthiness authorities to evaluate existing designs and develop new beta lockout systems. When this effort is completed, the FAA will propose appropriate ADs to install these systems." ♦

Editorial note: This article was adapted from *Aircraft Accident Report: Overspeed and Loss of Power on Both Engines During Descent and Power-off Emergency Landing, Simmons Airlines, Inc., d/b/a American Eagle Flight 3641, N349SB, False River Air Park, New Roads, Louisiana, February 1, 1994*, Report No. NTSB/AAR-94/06, prepared by the U.S. National Transportation Safety Board. The 74-page report includes figures and appendices.

About the Author

Russell Lawton is an aviation safety consultant, a U.S. Federal Aviation Administration accident prevention counselor and editor of IFR Refresher *magazine. Lawton is the former vice president of operations for the Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation and served on the International Civil Aviation Organization (ICAO) Personnel Licensing and Training panel. Lawton holds an airline transport pilot certificate and a flight instructor certificate, and has logged more than 5,000 flight hours.*

Flight Safety Foundation

presents the

European Aviation Safety Seminar (EASS)

[formerly the European Corporate and Regional Aircraft Operators Safety Seminar]

"Safe Flight — The Enduring Challenge"

February 28–March 2, 1995
Amsterdam, Netherlands

For more information contact J. Edward Peery, FSF.

ACCIDENT PREVENTION

Staff: Roger Rozelle, director of publications; Girard Steichen, assistant director of publications; Kate Achelpohl, editorial assistant; Rick Darby, editorial consultant; and Jean H. Zephir, production consultant.

Subscriptions: US$80 (U.S.-Canada-Mexico), US$85 Air Mail (all other countries), twelve issues yearly. • Include old and new addresses when requesting address change. • Flight Safety Foundation, 2200 Wilson Boulevard, Suite 500, Arlington, VA 22201-3306 U.S. • telephone: (703) 522-8300 • fax: (703) 525-6047

What's Your Input?

In keeping with FSF's independent and nonpartisan mission to disseminate objective safety information, Foundation publications solicit credible contributions that foster thought-provoking discussion of aviation safety issues. If you have an article proposal, a completed manuscript or a technical paper that may be appropriate for *Accident Prevention,* please contact the director of publications. Reasonable care will be taken in handling a manuscript, but Flight Safety Foundation assumes no responsibility for material submitted. The publications staff reserves the right to edit all published submissions. Payment is made to author upon publication. Contact the Publications Department for more information.