Testimony of
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FAA Aircraft Certification: Alleged Regulatory Lapses in the Certification and Manufacture of the Eclipse EQ-500
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Good morning Chairman Costello, Ranking Member Petri, and Members of the Committee. Thank you for allowing me the opportunity to present testimony on behalf of the National Transportation Safety Board regarding the Eclipse 500 airplane. It is a privilege to represent an agency that is dedicated to the safety of the traveling public.

Although the Safety Board is not directly involved in aircraft certification and manufacturing processes, the Board strives to improve aviation safety through detailed accident and incident investigations and subsequent recommendations. To date, the Board has conducted five investigations involving Eclipse 500 airplanes. One of these events occurred 3 years ago, and the investigation is complete. The other four events have occurred since April 2008, and the investigations are still ongoing. I would like to provide you with a brief description of the circumstances of each of these events.

- On September 3, 2005, an Eclipse 500 was substantially damaged when it landed with its landing gear up at Albuquerque, New Mexico. The two commercial pilots were not injured. The Safety Board's investigation found that the pilot did not complete the before-landing checklist and failed to extend the landing gear before landing.

- On April 17, 2008, an Eclipse 500 experienced a stuck rudder trim during a simulated single-engine instrument approach to Flint, Michigan. The pilots landed the airplane without incident at Pontiac, Michigan.

- On June 5, 2008, an Eclipse 500 sustained minor damage when its flight crew experienced a loss of thrust control at Chicago Midway International Airport. I will discuss this event in more detail momentarily because it resulted in the Safety Board's urgent recommendations to the Federal Aviation Administration (FAA).

- On July 17, 2008, an Eclipse 500 sustained minor damage during an in-flight separation of the aft lower left side wing-to-body fairing during cruise flight near Rockford, Illinois.

- On July 30, 2008, an Eclipse 500 departed the runway while landing at West Chester, Pennsylvania. The airplane was substantially damaged, and the two persons on board were not injured.

Regarding the June 2008 incident at Chicago Midway International Airport, the flying pilot reported that, while crossing the runway threshold for a landing attempt, the airplane encountered a 10- to 15-knot windshear and developed a high sink rate, which the pilot arrested by applying power. The airplane's touchdown was normal, and the pilot retarded both thrust levers to idle. However, shortly afterward, the pilot found that the airplane was accelerating rapidly through 100 knots. The pilot confirmed that the thrust levers were at idle, but he noted that the engines were at maximum power and that the airplane was continuing to accelerate. Because the airplane was rapidly approaching the end of the runway and could not be slowed, the pilot decided to abort the landing.

As the airplane was climbing out, the pilots found that the thrust lever position had no effect on power from either engine. The flying pilot lowered the flaps and landing gear to control the airplane's speed. However, the pilots found that, to remain below 200 knots, which is the maximum operating speed for the flaps and landing gear, the airplane needed to maintain a shallow climb. The pilots declared an emergency and were cleared by the air traffic control tower to land on any runway.

The pilots noted that the airplane's engine indicating and crew alerting system displayed that the left and right engine full authority digital electronic controls, or FADECs, had failed. The pilots referenced the quick reference handbook's emergency procedures section for engine control failure, which contained instructions for a single engine control failure but not for a dual engine control failure. The procedures advised that, when one engine control failed, its respective engine should be shut down. Thus, the pilots shut down the right engine and began to maneuver the airplane toward the runway. However, shortly afterward, they noted that the left engine was at idle and would not respond to the thrust lever commands. Fortunately, the airplane had sufficient altitude to reach the runway for a successful landing. Without the resourcefulness of the pilots, the visual meteorological conditions that prevailed at the time, and the airplane's proximity to the airport, the successful completion of this flight would have been unlikely.

The Eclipse 500 airplane does not have any mechanical linkage or cables between the thrust levers and the engines. Instead, the airplane's thrust levers are connected to potentiometers that convert the movement of the levers to an electrical signal that is transmitted to the engines' FADECs by electrical wiring. Each FADEC continuously checks itself and the opposite engine's FADEC to ensure that all of the components are working correctly. Each engine control has two separate channels: one is in control, and the other stands by to become active if a component in the active channel fails. If both channels fail, the FADEC software will continue to control its engine by reading data from the opposite engine. If both channels fail on both engines' thrust levers, the FADEC software is programmed to ignore the thrust levers' positions and maintain the requested thrust level of the last valid thrust lever position.

Tests have found that, when the thrust levers on the Eclipse 500 were pushed against the maximum power stops using a normal application of force -- that is, a force that a pilot might

normally use during flight -- it was possible to cause the control system to detect an out-of-range setting that would result in an engine control failure. These faults could be cleared by cycling the electrical power to the FADECs.

The findings of the investigation to date indicate that it is likely that the pilot advanced the thrust levers up to the maximum power stops when reacting to the windshear to arrest the sudden increase in the sink rate. This action likely caused the dual channel failures in both thrust levers. Then, because of the programming logic of the FADEC software, the engines maintained the thrust level of the last valid thrust lever position. In this case, that position was at, or nearly at, maximum power, so the engines remained at that high power setting.

During this incident, the fault in the right engine was cleared when the flight crew shut down that engine. However, because the FADEC software was programmed so that the left engine would mirror the thrust lever position of the no-fault right engine, which was positioned at idle after shutdown, the power in the left engine was reduced to idle. After the pilots shut down the right engine to attempt to regain engine control, it is likely that the left engine rolled back to idle immediately. Thus, the pilots were flying with one engine that was shut down and another engine that would not advance past idle, and they had no emergency procedures to address the situation.

This dual channel failure of both thrust levers occurred after the airplane had accumulated only 238 hours and 192 cycles since new. The thrust levers are part of the throttle quadrant assembly. The Safety Board's investigation found that other throttle quadrant assemblies failed in a similar manner during testing, which suggested that there might be a design or quality problem in the Eclipse 500's throttle quadrant assembly.

On June 12, 2008, one week after the incident at Chicago Midway International Airport, the Safety Board issued two urgent recommendations to the FAA. The first recommendation, A-08-46, asked the FAA to require an immediate inspection of all Eclipse 500 airplane throttle quadrants to ensure that pushing the throttle levers against the maximum power stops would not result in an engine control failure and to require that any units that fail the inspection be replaced and that the replacement parts be similarly inspected. On the same day, the FAA issued an airworthiness directive to require pilots of Eclipse 500 airplane to evaluate the throttle quadrants to see if a control fault would occur.

Eclipse has since developed an FAA-approved test procedure and issued an alert service bulletin that provided standardized procedures for testing and, if necessary, modifying the thrust lever. In August 2008, the FAA superseded its original airworthiness directive to mandate the Eclipse alert service bulletin, which is to be accomplished by a person who is authorized to perform maintenance.

The Safety Board's second urgent recommendation, A-08-47, asked the FAA to require Eclipse to immediately develop an emergency procedure for a dual engine control failure on the Eclipse 500 airplane and then to incorporate the procedure into the airplane flight manual and quick reference handbook via an airworthiness directive.

Eclipse developed emergency procedures for a dual engine control failure, and the FAA issued an airworthiness directive stating that these procedures were to be incorporated into the airplane flight manual and the quick reference handbook. Eclipse also reprogrammed the FADEC logic to limit the thrust lever out-of-range angle and not make it a hard fault so that, when the thrust lever was retarded to below the out-of-range angle, the FADECs would resume reading the thrust lever position. These FADEC logic changes were to be incorporated into Eclipse 500 airplanes while they are at service centers for maintenance.

This concludes my prepared statement. I will be happy to answer any questions you may have.