National Transportation Safety Board
Investigative Update
ERA18FA120

On April 4, 2018, at 0953 eastern daylight time, a Piper PA-28R-201, N106ER, collided with terrain following the in-flight separation of its left wing shortly after takeoff from Daytona Beach International Airport (DAB), Daytona Beach, Florida. The airline transport pilot and private pilot were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Embry-Riddle Aeronautical University and operated under the provisions of Title 14 *Code of Federal Regulations* Part 91 as an instructional flight. Day visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed for the local flight, which departed DAB at 0927.

An NTSB Structures Group was formed. Parties to the investigation include the Federal Aviation Administration (FAA), Piper Aircraft, and Embry-Riddle Aeronautical University.

As discussed in the NTSB Preliminary Report for the investigation, the airplane's left wing separated from the fuselage near the wing root. Initial examination of the left wing main spar at the NTSB Materials Laboratory revealed that more than 80% of the lower spar cap and portions of the forward and aft spar web doublers exhibited fracture features consistent with metal fatigue (see figure 1). The fatigue features originated at or near the outboard forward wing spar attachment bolt hole (see figure 2). None of the surfaces exhibited visible evidence of corrosion or other preexisting damage. The right wing also exhibited fatigue cracks in the lower spar cap at the same hole location extending up to 0.047-inch deep. The remainder of the lower spar cap, spar web doublers, and upper spar cap displayed fracture features consistent with overstress.

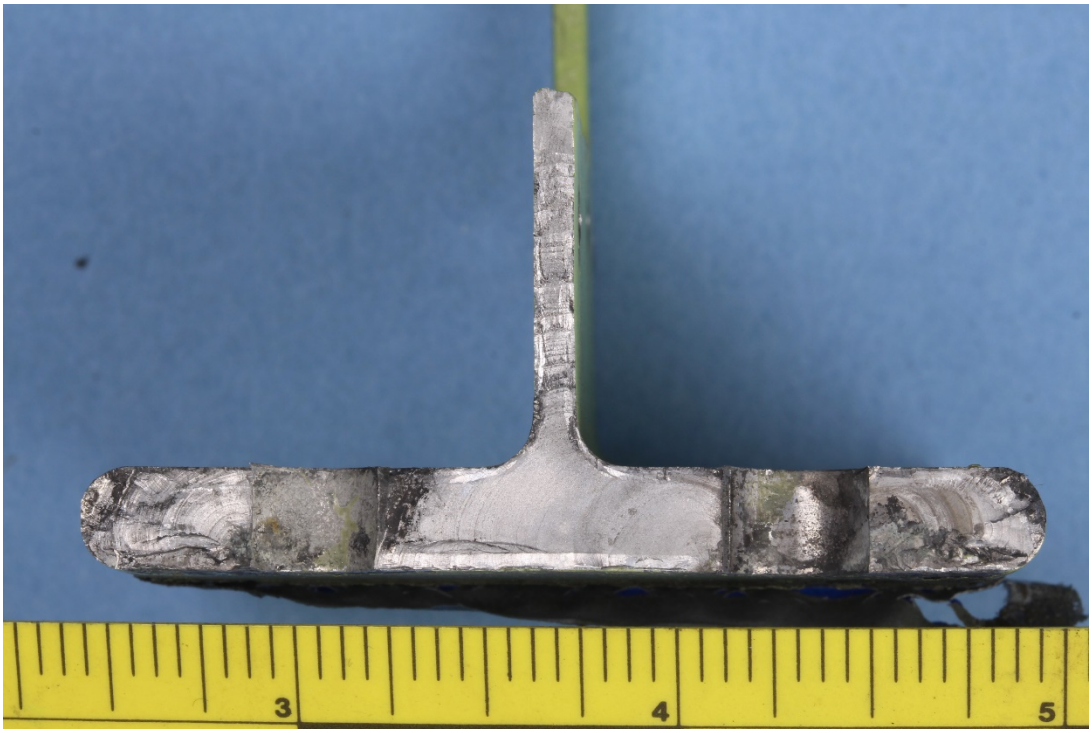

Figure 1 – Left wing main spar lower cap fracture surface.

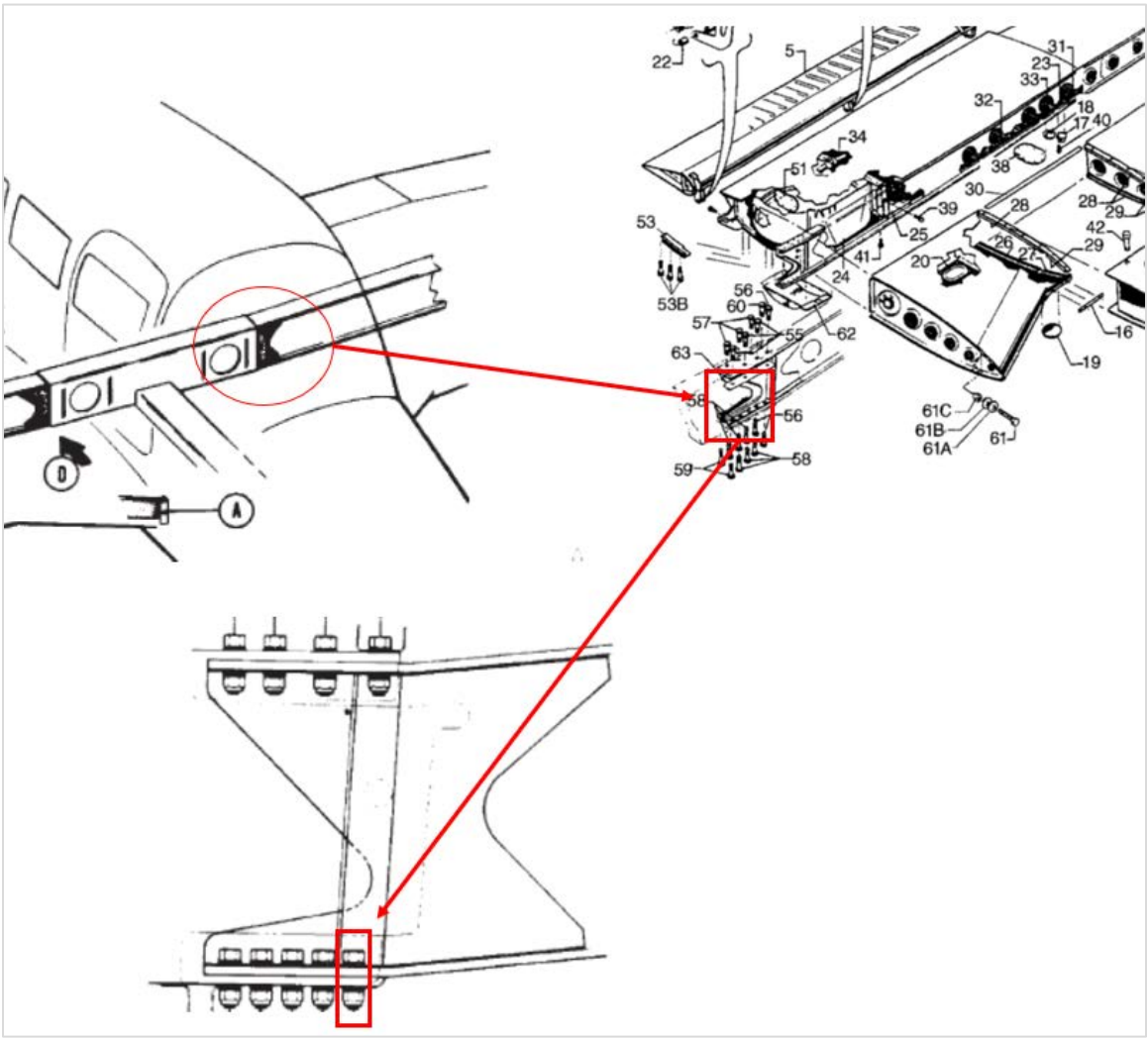

Figure 2 – Exploded view of left wing spar assembly and attachment bolt

At the time of the accident, the airplane, serial number 2844137, had accumulated about 7,690 total airframe hours and 33,276 cycles (1 cycle = 1 takeoff and 1 landing). According to the operator, the accident airplane had been used exclusively for flight training of students working toward commercial pilot and flight instructor certificates and for experience in the operation of complex airplanes.

On April 18-19, 2018, the Structures Group conducted an inspection of a second Piper PA-28R-201, serial number 2844135, which had accumulated about 7,661 total airframe hours and 32,228 cycles. The airplane's wings were removed, and an eddy current inspection (ECI) was performed by representatives from Piper Aircraft. The inspection revealed a crack indication at the left lower outboard forward wing spar attachment bolt hole (the location previously illustrated in

figure 2). The crack measured about 0.040-inch long and 0.040-inch deep. The airplane's wings were subsequently reinstalled and examined using new inspection procedures developed by Piper Aircraft. A bolt-hole ECI probe was used to successfully confirm the location and size of the previously identified crack.

To assess the condition of the wing spars on other similarly operated PA-28Rs of similar vintage, the NTSB requested information from other flight schools, Piper Aircraft, and the FAA.

At the time of this update, the outboard lower spar cap bolt holes in nine additional PA-28R-201 airplanes have been inspected using ECI techniques under the supervision of the NTSB Structures Group, and no crack indications were detected. The inspected airplanes include:

- Two airplanes with similar operational backgrounds at another Florida-based flight school.
- Five retired airplanes with total airframe hours ranging from 8,667 to 10,301 hours at a third Florida-based flight school. The flight school did not track cycles; however, assuming 1 cycle per hour for airplanes operated for private use and 4 cycles per hour for airplanes operated in a training environment, yielded estimated cycles on each airplane that ranged from 30,578 to 36,953.
- Two airplanes with about 2,765 and 3,910 total airframe hours (about 9,500 and 15,600 cycles, respectively) that were operated by a Texas-based flight school and manufactured about the same time as the accident airplane.

The investigative team is also examining the corrective actions taken in response to a March 30, 1987, Piper PA-28-181 in-flight wing separation, which resulted in three recommendations to the FAA and a subsequent Airworthiness Directive, which has since been rescinded. In addition, Piper Aircraft published three service bulletins.

The investigation is ongoing. Additional information will be released as warranted.