

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



August 12, 2021

MATERIALS LABORATORY FACTUAL REPORT

Report No. 21-052

A. ACCIDENT INFORMATION

Place : Minneola, Florida
Date : January 21, 2021
Vehicle : Plante Quad City Challenger II, N4469Z
NTSB No. : ERA21LA109
Investigator : Leah Read, AS-ERA

B. COMPONENTS EXAMINED

Synchronous drive belt.

C. DETAILS OF THE EXAMINATION

An overall view of the submitted synchronous drive belt is shown in figure 1. The belt had a transverse fracture that intersected a tooth root at the interior side and had a more jagged transverse path through the glass reinforcement core strands as shown in the right image in figure 1, features consistent with a tensile overload failure.

The edges of the belt appeared rubbed with exposed core strands in several areas consistent with lateral travel or tracking. On the side shown in the overall image in figure 1, rub with exposed core strands was observed between area B and the fracture surface (a length encompassing 19 teeth). On the opposite side of the belt, rubbed edges with exposed core strands were observed on either side of the fracture along a length encompassing 71 teeth (25 teeth on one side of the fracture and 46 teeth on the other). The belt had a total of 120 teeth.

Damage was observed on the sides of several teeth in two areas arbitrarily denoted "A" and "B" in figure 1. In these areas, the sides of the teeth appeared gouged consistent with sliding contact with another object. The sides of three teeth were damaged in area A as shown in figure 2, and the sides of 5 teeth were damaged in area B shown in figure 3.

The interior surfaces of the drive belt generally appeared free of significant wear. However, discrete fiber damage was observed on the interior surface as shown in figure 4. The tooth peaks were damaged on approximately a dozen teeth near area B. The damage was greatest near area B, and two lines of damage appeared to angle across the width of the belt from area B.

Markings on the exterior surface of the belt indicated the belt was a PowerGrip GT3 960-8MGT-50 synchronous belt manufactured by the Gates Corporation.¹ The belt had been installed to connect the engine output sprocket to the propeller drive sprocket on the accident engine. However, the Gates PowerGrip GT3 Drive Design Manual includes a “Safety Policy” for primary in-flight aircraft systems that states, “Do not use Gates belts, pulleys or sprockets on aircraft, propeller or rotor drive systems or in-flight accessory drives. Gates belt drive systems are not intended for aircraft use.”

Matthew R. Fox, Ph.D.
Senior Materials Engineer

¹ Gates Corporation, Denver, Colorado (<https://www.gates.com/us/en.html>).

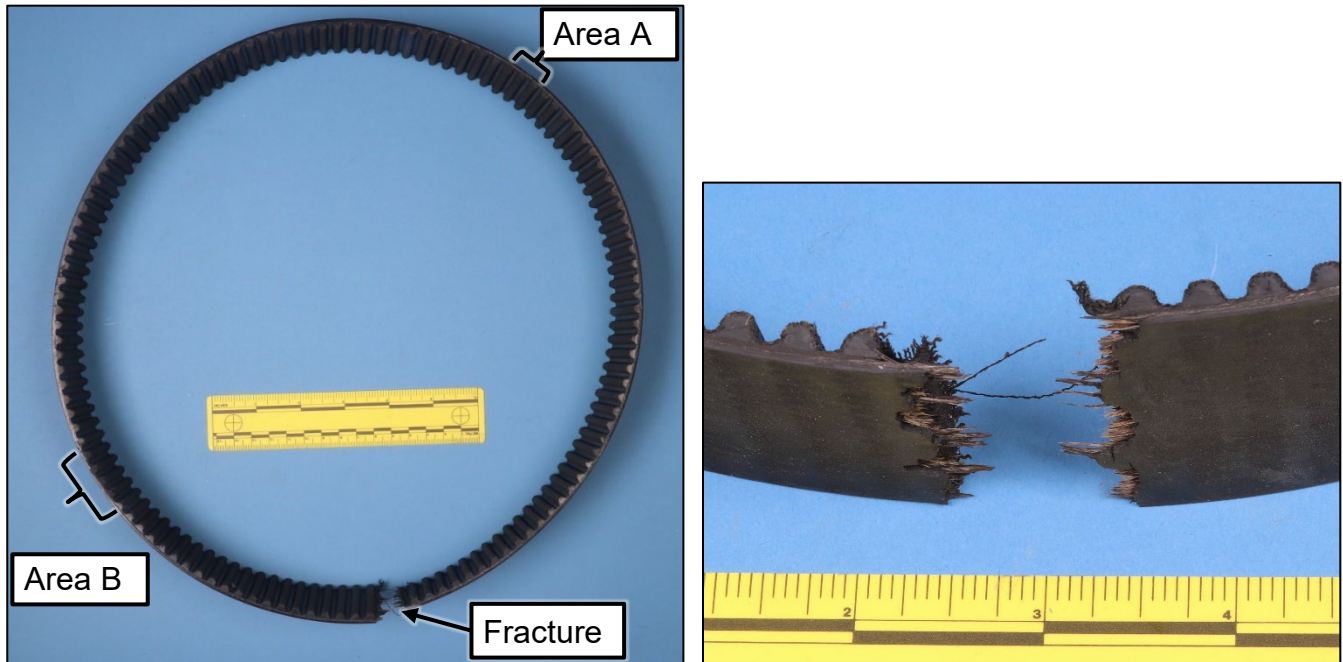


Figure 1. Overall view of the submitted synchronous drive belt (left) with a closer view of the fracture (right).

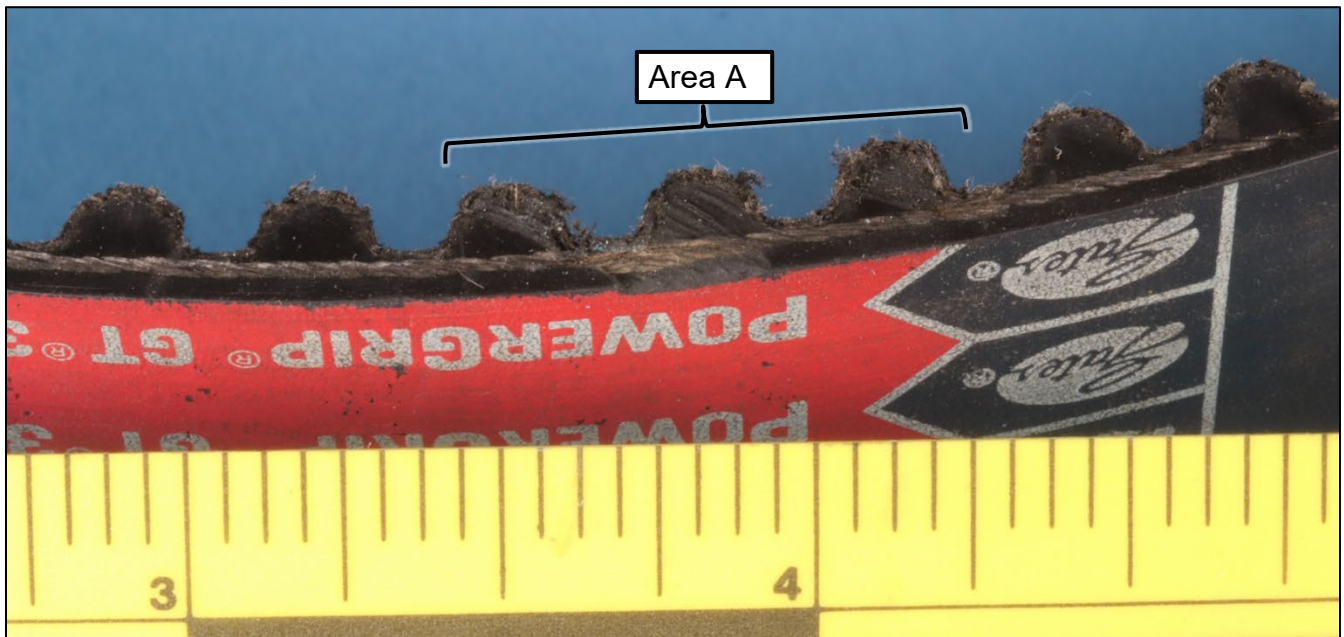


Figure 2. Tooth damage at the edge of the synchronous drive belt in area A.

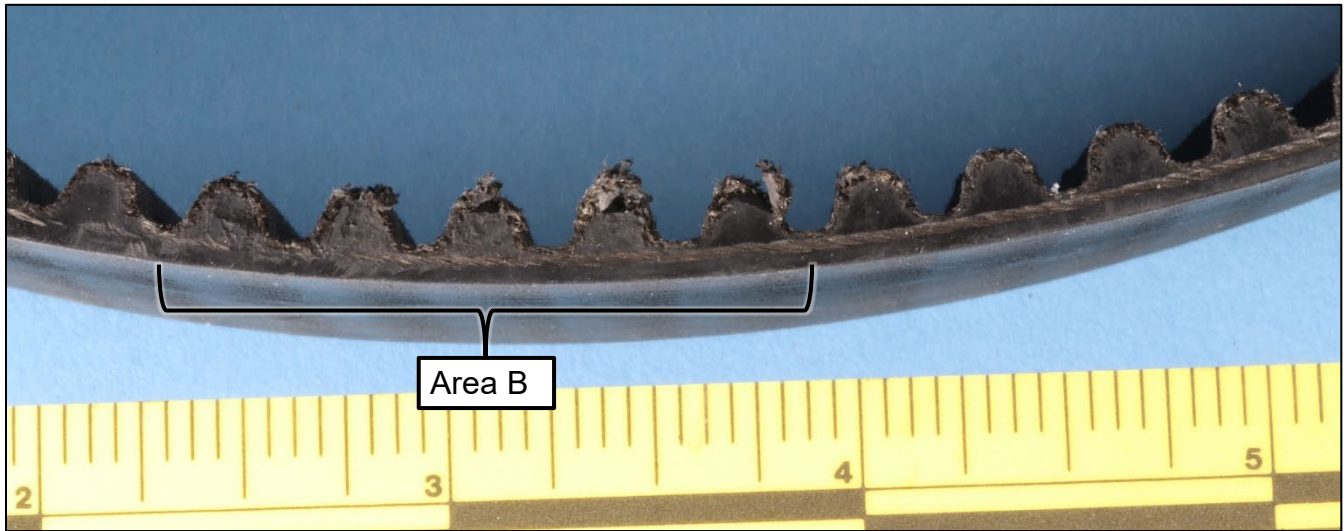


Figure 3. Tooth damage at the edge of the synchronous drive belt in area B.

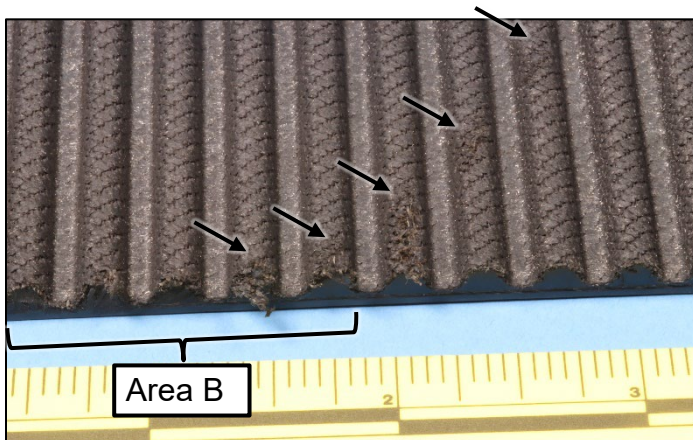
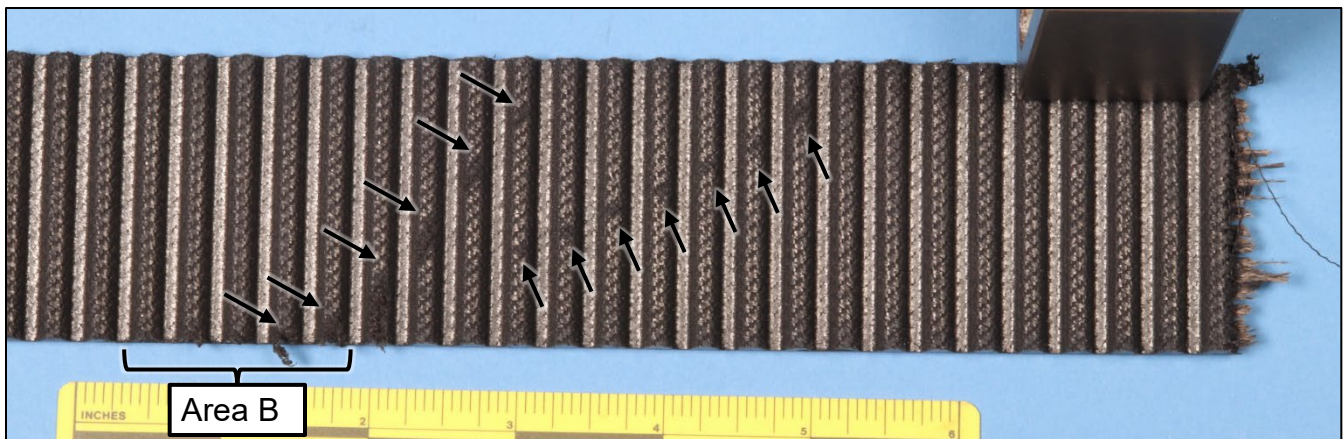


Figure 4. Views of discrete tooth peak damage (indicated with unlabeled arrows) on the interior surface at area B and on adjacent teeth.