

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

SURVIVAL FACTORS

SPECIALIST'S FACTUAL REPORT

July 11, 2017

I. ACCIDENT

Airplane : Piper PA28 [N7031R]
Location : Homestead, FL
Date : May 16, 2016
Time : 1646 eastern daylight time (EDT)¹
NTSB # : ERA16FA186

II. SURVIVAL FACTORS SPECIALIST

Specialist : Jason T. Fedok
National Transportation Safety Board
Washington, DC

III. SUMMARY

On May 16, 2016 about 1646 eastern daylight time, a Piper, PA-28-140, N7031R was substantially damaged when it impacted terrain during landing at Miami Homestead General Aviation Airport (X51), Homestead, Florida. The private pilot was seriously injured and the passenger received minor injuries. The airplane departed from Miami Executive Airport (TMB), Miami, Florida. Visual meteorological conditions prevailed and no flight plan was filed for the planned flight to X51. The airplane was registered to and operated by a private individual as a personal flight conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

IV. DETAILS OF THE INVESTIGATION

The NTSB investigator-in-charge (IIC) noted that the pilot's shoulder harness restraint had separated at the shoulder level during the accident and requested a survival factors examination of both the pilot and copilot restraints. Both the lapbelt and shoulder harness portions of both restraints were removed and shipped to NTSB headquarters for visual examination. According to the IIC, the pilot was 70 inches in height and weighed

¹ All times are reported in local time unless otherwise noted.

151 pounds. The passenger seated in the copilot's seat was 68 inches in height and weighed 147 pounds. The IIC also provided photographs of the accident site for review.



Photo 1. Front view of N7031R.



Photo 2. The left side of N7031R.



Photo 3. The right side of N7031R.



Photo 4. Interior of N7031R.



Photo 5. Instrument panel of N7031R.



Photo 6. Upper portion of pilot's shoulder harness.



Photo 7. Close-up of frayed end of pilot's shoulder harness.



Photo 8. Lapbelts and shoulder harnesses of both restraints.

Pilot's Restraint System

The pilot's seat was equipped with a three-point restraint system. The pilot's shoulder harness was manufactured by Pacific Scientific (P/N 1107447-05, rated strength 2000 lbs.). Equipped with an inertia reel and an end fitting designed to secure to a standoff button on the separate lapbelt, the belt webbing's total extended length was approximately 53 inches. The webbing retracted normally into the inertia reel. The distal 24 inches (the portion which did not retract into the inertia reel under normal conditions) of the shoulder harness webbing showed significant discoloration and fading. (see figure 8) The yellowed material in the discolored areas was noticeably stiffer and less pliable than that which retracted into the inertia reel, which appeared to be black in color. Some minor wear was noted on the edges of the belt that retracted into the inertia reel; however, there was a 6-inch section of significant abrasive wear approximately 15-21 inches from the distal end fitting. This section of wear involved the compromise of approximately 6 longitudinally woven threads (or 1/8 inch) at its deepest intrusion into the webbing. A complete transverse, frayed separation of the webbing was also noted at the point of deepest intrusion, approximately 20 inches from the distal end fitting. (see figure 9)

The pilot's lapbelt was manufactured in August 1988 by Davis Aircraft Products Inc. (model number FDC-6400-120-5, TSO C22f, rated strength 2000 lbs.) The 13-inch fixed-length buckle portion was in good condition and the buckle functioned as designed. It was appropriately supple and showed no evidence of fading or damage. The adjustable, insert tab portion of the belt was in similarly good condition. It was adjusted to a length of approximately 34 inches.



Photo 9. Area of fraying and separation of the pilot's shoulder harness.

Copilot's Restraint System

The copilot's seat was equipped with a three-point restraint system. The copilot's shoulder harness was manufactured by Pacific Scientific (P/N 1107447-05, rated strength 2000 lbs). Equipped with an inertia reel and an end fitting designed to secure to a standoff button on the separate lapbelt, the belt webbing's total extended length was approximately 53 inches. The webbing did not retract normally into the inertia reel and approximately 48 inches of webbing remained exposed. The distal 44 inches of the webbing showed discoloration and fading and appeared an orangish color. The discolored material was slightly stiffer and less pliable than the pilot's and copilot's lapbelts, but less so than the pilot's shoulder harness. The most significant area of discoloration appeared between 14 and 42 inches from the distal end fitting. There was very minor abrasive wear on the edges of a small portion of the webbing that would have retracted into the inertia reel under normal conditions, but no thread integrity was compromised. There was no noted wear to the edges of the remainder of the webbing.

The copilot's lapbelt was manufactured in August 1988 by Davis Aircraft Products Inc. (model number FDC-6400-120-5, TSO C22f, rated strength 2000 lbs.) The 13-inch fixed-length buckle portion was in good condition and the buckle functioned as designed. It was appropriately supple and showed no evidence of fading or damage. The adjustable, insert tab portion of the belt was in similarly good condition. It was adjusted to a length of approximately 35 inches.

Consultation with Manufacturer

On April 20, 2011, Pacific Scientific was acquired by Meggitt PLC. A senior project engineer at Meggitt Control Systems was consulted via telephone and email about the condition of the belt webbings. High resolution photographs were provided for his review. The engineer responded via email stating:

The pilot shoulder belt shown in the picture was definitely past due to be serviced due to the extreme fading condition. I suspect the faded section of the webbing is stiffer than the other sections. Also, I a [sic] suspect the fray on the top edge across the tear was a pre-existing condition before that accident.

The Co-pilot shoulder belt would also qualify for needing service based on the photo.

The Meggitt engineer also provided a copy of the restraint system's Component Maintenance Manual (CMM) which contained a table showing the company's acceptable qualitative limits for fraying, damage, and stiffening of belt webbing (see figure 1).

CHECK

1. General

- A. Procedures to check restraint system components are given in Table 501. Use bright light and magnification of 5 power or greater to aid visual inspections.

Table 501. General Inspection Guidelines (Minimum Criteria)

Inspection	Check For	Acceptable Limits	Corrective Action
Stitching	Broken or missing stitches.	No more than three or more broken or missing stitches per pattern.	Return restraint to Pacific Scientific Customer Support for repair.
Webbing	Excessive fraying.	Fraying cannot exceed a six inch area.	Return restraint to Pacific Scientific Customer Support for repair.
	Cuts deeper than 1/16 inch.	Cuts less than 1/16 inch deep.	Return restraint to Pacific Scientific Customer Support for repair.
	Linear curvature due to wear or hardware interface (including aircraft seat).	No linear curvature is allowed.	Return restraint to Pacific Scientific Customer Support for repair.
	Excessive stiffening or soiling.	No excessive stiffening or soiling is permitted.	Return restraint to Pacific Scientific Customer Support for repair.

Figure 1. Pacific Scientific's CMM guidance on acceptable limits of fraying, stiffening, and soiling.

Jason Fedok
 Survival Factors Investigator