



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

April 25, 2023

Specialist's Report

SURVIVAL FACTORS

ERA22LA395

A. ACCIDENT

Location: Orlando, FL
Date: September 1, 2022
Time: 1700 eastern daylight time (EDT)
2200 universal time coordinated (UTC)
Airplane: Diamond Aircraft Industries DA 42 NG, N43RG

B. SURVIVAL FACTORS SPECIALIST

Specialist Amanda Taylor
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

On October 27, 2022, a survival factors specialist, investigator in charge (IIC), and representatives from the FAA and Diamond Aircraft Industries convened at Florida Air Recovery located in Jacksonville, FL to conduct a wreckage examination of seats, restraints, and aspects of the airplane related to survival factors. Prior to that an interview with the surviving pilot was conducted by the IIC.

D. FACTUAL INFORMATION

1.0 Airplane Configuration

The airplane was a Diamond 42NG, tail number N43RG (see figure 1), non-pressurized, twin engine piston airplane. It was configured with four seats, two pilot seats in the front and two passenger seats in the rear (see figure 2). The front seats were accessed via a forward-hinged canopy, and the rear seats through a left side door located above the wing.



Figure 1. Photograph from flightaware.com of the accident airplane.

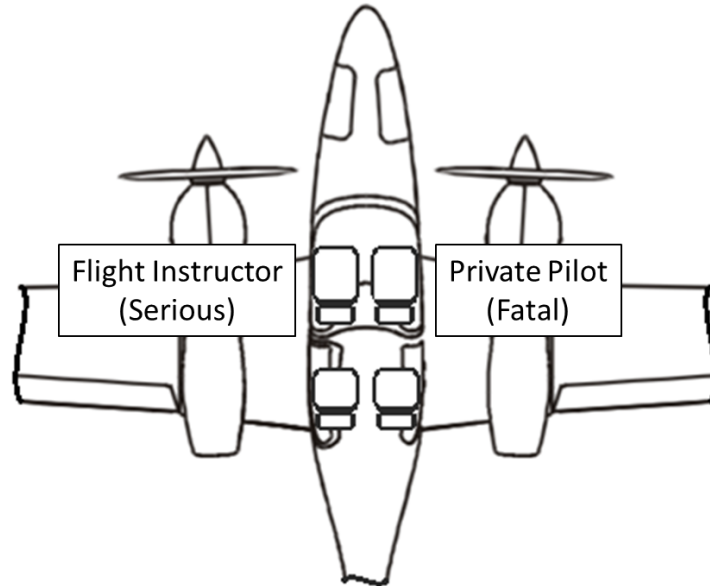


Figure 2. Diagram of N43RG showing the occupant seating locations.

2.0 Airplane Documentation

2.1 Airplane exterior

The airplane was found upside down by emergency responders and the FAA inspectors at the accident site. The tail had separated aft of the cabin, and there was crushing along the canopy (see figure 3). The airplane was recovered and transported to Florida Air Recovery. The canopy was not attached to the airplane at the salvage yard (see figure 4) but was in the associated debris that was transported with it.



Figure 3. N43RG post-crash. (Courtesy of the FAA)



Figure 4. N43RG at Florida Air Recovery.

2.2 Cabin interior

The front seats were accessed by the pilots using a canopy which hinged just forward of the instrument panel. The rear seats, which were unoccupied, were accessed by a top-hinged door located on the left side. The cabin was deformed downward at the overroll bar (see figure 5). Measurements were taken from the middle tunnel cover at the trim wheel to the overroll bar and measured 29.1 inches.



Figure 5. Front view of N43RG at Florida Air Recovery.

Exemplar measurements were provided by Diamond to compare with the accident airplane. Table 1 details these measurements figures 6 and 7 show where these measurements were taken.

Table 1. Measurements from an exemplar airplane compared with the accident airplane.

Measurement Letter	Measurement Starting point	Measurement ending point	Dimension in Exemplar Airplane (inches)	Dimension in Accident Airplane (inches)	Difference (inches)
A	Left-hand sidewall	Trimwheel	21.1	21.1	0
B	Right-hand sidewall	Trimwheel	20.7	21.9	1.2
C	Center of left-hand pilot seat back	Instrument panel cover	32.3	30.1	2.2
D	Center of right-hand pilot seat back	Instrument panel cover	32.3	31.1	1.2
E	Left-hand pilot seat cushion center	Overroll bar	36.6	32.5	4.1
F	Right-hand pilot seat cushion center	Overroll bar	36.6	32.1	4.5

G	Middle tunnel cover at trimwheel	Overroll bar	33.5	29.1	4.4
H	Floor in front of passenger seat	Door frame at fuselage	47.0	42.6	4.4
I	Left-hand passenger seat cushion center	Door frame at fuselage	35.4	32.3	3.1
J	Forward bottom of left-side door	Aft bottom of left-side door	40.4	39.8	0.6
K	Forward top edge of left-side door	Aft top edge of left-side door	39.3	40.0	0.7
L	Cargo area	Door frame at fuselage	25.3	22.5	2.8

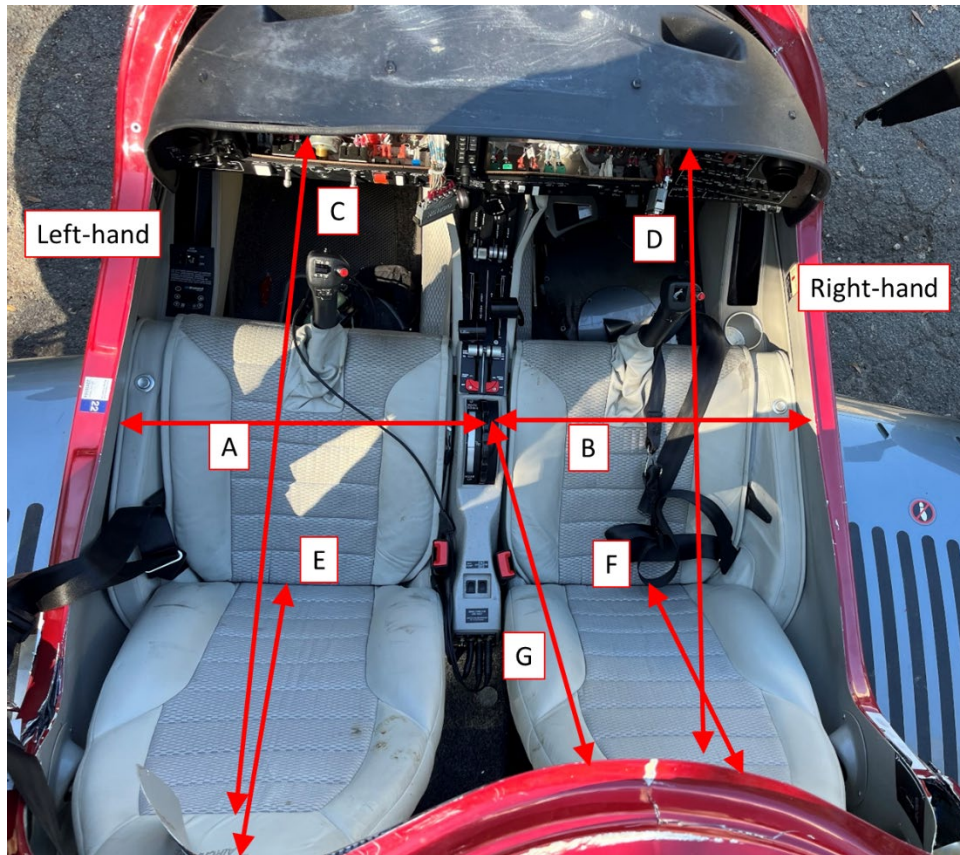


Figure 6. Overhead view of pilot seat measurements.

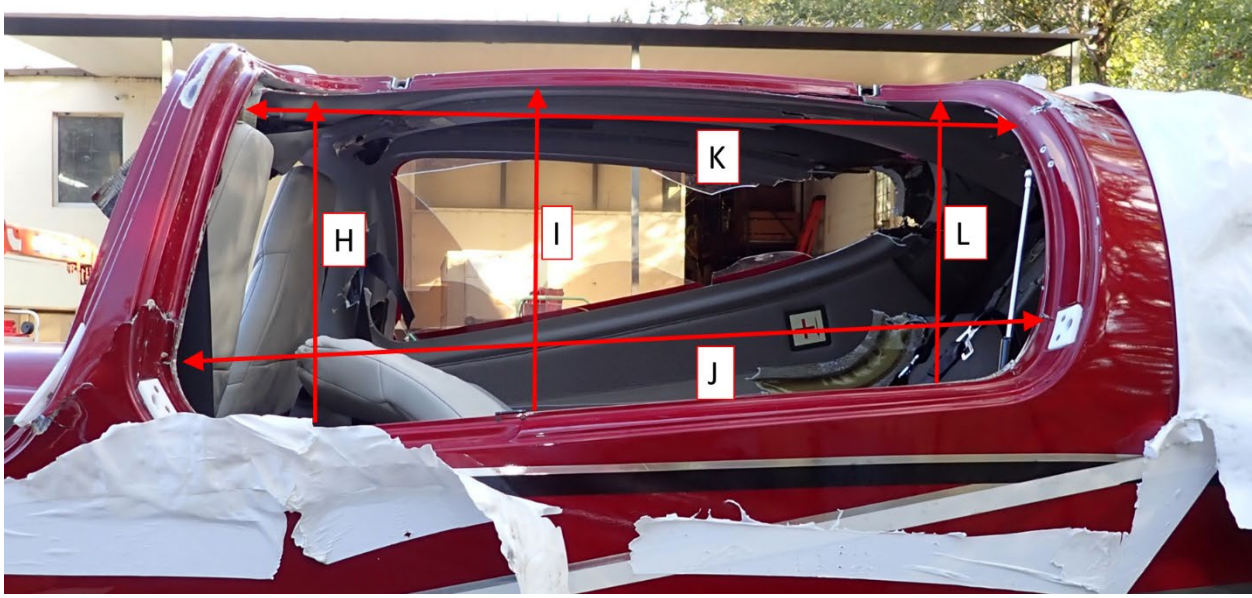


Figure 7. Measurements of left side door frame.

2.3 Restraints

All seats had a three-point restraint with a push button buckle manufactured by Schroth.¹ The front seat restraints had a lap belt portion, which was manually adjusted, anchored to the outboard sidewall, and secured to a push button buckle affixed to the inboard middle tunnel cover aft of the trim wheel. The upper torso webbing was permanently secured to the buckle tang on the lap belt and was then routed over the occupant's outboard shoulder to a guide attached to the overroll bar, then down to an inertia reel which was secured to the lower sidewall of the cabin aft of the seats.

The rear seat restraints had a lap belt portion, which was manually adjusted, anchored to the outboard sidewall, and secured to a push button buckle affixed to the sidewall. The upper torso webbing was permanently secured to the buckle tang of the lap belt and was then routed over the occupant's inboard shoulder to an inertia reel located aft of the occupants secured to the center of the aft bulkhead.

All restraints were still attached to their attachment points and the webbing appeared in good condition. The inertia reels and push button buckles functioned normally. The right-hand front seat upper torso strap was noted to have a clean, linear separation.²

The lap belts were measured from the sidewall anchor point to the end of the webbing at the buckle tang. The right-hand lap belt was adjusted to a length of 20.1 inches. The left-hand lap belt was adjusted to a length of 24.2 inches.

¹ The only data label found on the restraints were the name Schroth on the manual lap belt adjuster. No part number, serial number, or TSO information was identified.

² According to the FAA FSDO inspector who responded to the accident this webbing was cut by first responders to remove the occupant from the airplane.

2.4 Front Seats

The seats were composed of a seat back and pan made of composite material. The cushions were an OEM monolithic foam with a leather and fabric cover. There were no data labels found on the seat or cushions. After recovery to the salvage yard, all seats remained attached to the interior structure. The seat back was in the most upright adjustment position at the salvage yard. The seat was not adjustable fore and aft, instead the rudder pedals were adjusted to fit the occupant. The rudder pedals were in the forward most position.

2.4.1 Right Hand Seat

There was no damage noted to the seat cushions or structure (see figure 8).



Figure 8. Right-hand pilot seat at salvage yard with cut upper torso webbing laying in the seat.

2.4.2 Left-Hand Seat

There was no damage noted to the seat cushions or structure (See figure 9).



Figure 9. Left-hand pilot seat at salvage yard.

3.0 Emergency Equipment

A fire extinguisher was normally secured to the sidewall just aft of the right-hand pilot seat. The cradle was still attached to the sidewall in the airplane; however, the extinguisher was not in it and not located in the debris collected and brought to the salvage yard.

A 406 MHz Emergency Locator Transmitter (ELT) was found in the tail section of the airplane and was still secured in its cradle (see figure 10). It was manufactured by Kannad Integra ER and had a data label affixed to the aft end. The battery had an expiration date of 03/2028. The ELT was not easily accessible to determine if the switch was in the ARMED position because of significant damage in the area.



Figure 10. ELT still secured in the tail section of the airplane.

4.0 Airport information

Orlando Executive Airport (ORL) was located about three miles east of central Orlando, Florida at an elevation of 112.6 feet. The airport was served by two runways (7/25 and 13/31). ORL was a publicly owned commercial service airport. The accident flight had planned to take off on runway 7 after conducting a pre-takeoff check on taxiway A7.

5.0 Accident summary³

According to the surviving flight instructor, while sitting at the runup pad a quartering, left headwind picked up, at some points gusting to 60 knots (the last call he recalled from tower). The airplane was pointed approximately 130 deg, for runway 7, and was perpendicular to the runway. The weather system seemed to be moving out of the south. He applied down elevator control and left aileron into the wind. He felt the left wing bouncing around a little more than the right wing.

The wind then lifted the left wing and it felt like it was pushing them over to the right. The left main gear was off the ground, but he could not say if the right main gear was on the ground at that point or not. He thought it may have been off the ground as well. They tried to shut down the engines, not knowing how severe it would get. He grabbed for the engine masters but did not remember anything else.

The next thing he recalled was waking up inverted. His feet were in the left-hand pilot's seat (his seat) and his head was over the center pedestal, toward the

³ The surviving pilot was interviewed by the IIC. A summary produced from the interview is included in attachment 1. The information obtained was used to create this narrative.

right-hand seat. The right-hand seat pilot's head was near the primary flight display. He never saw where his legs were. He tried to talk to him but received no response.

The surviving flight instructor's three-point lap belt and harness was fastened prior to the event, set as if ready for flight (not relaxed or loosened). It was tight across his shoulder and lap. The seat belt was not around him when he woke up, but he did not recall why he was not strapped in. He stated that he must have "slipped out somehow."

He stated there was a placard on the sidewall with three seat positions - full upright, full aft, and a centered red position. There was a red mark, and you were to line up the seat back with that position. He stated his seat was slightly aft of the full upright position. He believed that the right seat pilot's seat back was a little more upright than his position.

The first responders arrived and put an air cushion under the right engine nacelle and lifted the wreckage. They helped pull him out by his feet as he tried to crawl out. According to the flight instructor's statement to his attending physician, and ATC records⁴, it took about 15 minutes to extricate him. The right seat pilot remained inside.



Figure 11. Google Earth image showing the airport and accident location.

⁴ A timeline of events is in attachment 3 of this report.

6.0 Medical And Pathological Information

6.1 Injury Table

Type of injury ⁵	Crew	Passengers	Total
Fatal	1	0	1
Serious	1	0	1
Minor	0	0	0
None	0	0	0
TOTAL	2	0	2

6.2 Injury Information

The flight instructor was seriously injured sustaining a broken clavicle and multiple lacerations. The private pilot was fatally injured after receiving numerous blunt force trauma injuries to the head and cervical spine according to the autopsy. For more details about their injuries see attachment 2.

E. List of attachments

Attachment 1: Pilot record of conversation

Attachment 2: Injury chart

Attachment 3: Timeline

Submitted by:

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⁵ 49 CFR Part 830.2 classified the injuries.