



Aviation Investigation Final Report

Location:	Granbury, Texas	Accident Number:	CEN18LA341
Date & Time:	August 19, 2018, 20:19 Local	Registration:	N1133T
Aircraft:	Cirrus SR22	Aircraft Damage:	Substantial
Defining Event:	Runway excursion	Injuries:	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was practicing instrument flight rules approaches and was returning for a landing with a light crosswind during dusk visual meteorological conditions. He disengaged the autopilot using the panel autopilot button. All flight controls seemed to perform normally. The right turn to base and right turn to final were made normally. On final approach, the pilot made minimal rudder inputs. As the pilot started to flare the airplane, he started putting in more rudder inputs. However, he could not depress the left rudder pedal fully. The airplane touched down about 80 knots on the main landing gear while the pilot was holding all the left rudder he could. The airplane started to veer to the right and continued off the runway, where it impacted a ditch, fence, and tree; the airplane sustained substantial damage to a wing and the fuselage.

The pilot indicated that the yaw damper was on when he landed. However, the airplane was equipped with a recoverable data module that recorded the flight's configuration and navigation data, which indicated that the yaw damper was off about 1/4 mile before the landing runway threshold.

Given the available information, the pilot likely did not maintain directional control of the airplane during the crosswind landing.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to maintain directional control during a crosswind landing, which resulted in the airplane exiting the runway and impacting a ditch, tree, and fence.

Findings

Personnel issues	Aircraft control - Pilot
Environmental issues	Tree(s) - Contributed to outcome
Environmental issues	Fence/fence post - Contributed to outcome
Environmental issues	Rough terrain - Contributed to outcome

Factual Information

History of Flight

Landing-landing roll	Runway excursion (Defining event)
Landing-landing roll	Collision during takeoff/land

On August 19, 2018, about 2019 central daylight time, a Cirrus SR22 T airplane, N1133T, impacted obstructions when the airplane exited runway 14 during a landing at the Granbury Regional Airport (GDJ), near Granbury, Texas. The private pilot sustained minor injuries. The airplane sustained substantial wing and fuselage damage during the runway excursion. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Dusk visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The local flight originated from GDJ about 1949.

The purpose of the flight was to practice an instrument flight rules approach. The pilot checked all flight controls for full movement and then departed from runway 14 to the North. He set the autopilot to intercept the area navigation approach to runway 14 at its initial approach fix. The auto pilot intercepted the approach normally and the airplane made a procedure turn to intercept the approaches' glidepath. The glidepath was flown down to minimums and a go around was established. The go around button was used which suspended the landing sequence on the computer.

During the climb to 2,700 ft, a waypoint was set manually to reestablish computer sequencing. Upon arrival at the waypoint, the autopilot was disengaged using the panel autopilot button. The pilot subsequently proceeded into the downwind leg of the pattern for runway 14. All flight controls seemed to perform normally. The right-hand turn to base and right-hand turn to final were made normally. On final minimal rudder inputs were made. As the pilot started to flare, he started putting in more rudder inputs. However, he could not depress the left rudder pedal fully. The airplane touched down about 80 kts on the main landing gear while the pilot was holding all the left rudder he could. The airplane started to veer to the right and continued off the runway until impacting a ditch, fence, and tree.

Pilot Information

Certificate:	Private	Age:	60, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	May 3, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	May 26, 2018
Flight Time:	580 hours (Total, all aircraft), 20 hours (Total, this make and model)		

The pilot held a Federal Aviation Administration (FAA) private pilot certificate with airplane single-engine land, glider, and instrument ratings. He held a FAA third-class medical certificate, dated May 3, 2018, with a limitation for corrective lenses. The pilot reported that he had accumulated 580 hours of total flight time and 20 hours of flight time in the same make and model airplane as the accident airplane.

The pilot attended a Cirrus Airframe/Powerplant Differences Course and satisfactorily completed the training on May 26, 2018. The pilot also received both a high performance and flight review endorsement as part of this course.

Aircraft and Owner/Operator Information

Aircraft Make:	Cirrus	Registration:	N1133T
Model/Series:	SR22 T	Aircraft Category:	Airplane
Year of Manufacture:	2015	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	1030
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	May 1, 2018 Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	250 Hrs at time of accident	Engine Manufacturer:	Continental
ELT:	Installed, not activated	Engine Model/Series:	TSIO550K
Registered Owner:		Rated Power:	315 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

N1133T, a 2015 model Cirrus Aircraft Corporation SR22 T, serial number 1030, was a four-place, single-engine, low-wing, airplane powered by a six-cylinder, 315-horsepower, Teledyne Continental Motors model TSIO-550-K engine, with serial number 1011841. The airplane had a demonstrated crosswind of 21 kts.

The pilot, in part, posted, "There is no doubt in my mind that the yaw damper is to blame and believe me you cannot overpower it! Apparently the [autopilot] AP button turns the autopilot on including the [yaw damper] YD. For some stupid reason when pressed again it does NOT turn the yaw damper off. The AP disconnect on the yoke does turn the yaw damper off however. Why on earth would it be set up differently? ...

I also did transition training in May and no mention of this potential problem. I have over 900 landings in a Cirrus with no problem and humbly I say that I could have made that landing under normal conditions in my sleep. I normally disconnect the Autopilot with the yoke control but did not this evening because I wanted to maintain the flight director as I have done numerous times in my SR20. ...

On touchdown the plane started veering right and I couldn't stop it. So anyway, I know that the yaw damper was on when I landed because of the quirky way it is set up, but I don't know why I couldn't

overpower the rudder and land normally."

The pilot reported that the last annual inspection was completed in May of 2018. He also advised that punch list items listed in paperwork related to that annual inspection as well as another airframe logbook entry that refers to replacement of the rudder bellcrank rod bearing may have had an effect of the yaw of the airplane.

A representative from the maintenance facility that conducted that annual inspection, in part, reported that, "During the Annual, the yaw servo bridle cable tension was found to be low ... and was adjusted as needed. The Autopilot Servo Clutch Torque Check ... was also addressed during the Annual. The torque test is completed through the onboard avionics and does not require servo removal. The torque readings of all three servos were found to be within limits. No further action was taken. The aft rudder control rod end was inspected at the Annual. There is nothing in our notes of any defects."

The airplane was equipped with a Garmin GFC 700 digital Automatic Flight Control System (AFCS) Autopilot system, which was a fully digital, dual channel, fail-passive digital flight control system composed of dual GIA 63W Integrated Avionics Computers, other line-replaceable units, and servos.

The airplane was equipped with an optional yaw damper. The airplane maintenance manual, in part, stated:

The yaw damper reduces dutch roll tendencies and coordinates turns. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. A GSA 80 servo provides the control surface interface and the mode selection occurs via the GMC 705 controller. Yaw Damper operation is provided by the yaw servo and supplies:

- Yaw Damper engagement and annunciation
- Yaw axis airplane control ...

The yaw servo is an electromechanical unit that provides automatic control of the yaw flight axis. The yaw servo receives data from dual GIA 63W integrated avionics computers. ... The yaw servo consists of a GSA 80 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for yaw axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

The airplane was equipped with an aircraft data logger, which included a Recoverable Data Module (RDM). The RDM, located in the shear web of the aft vertical spar in front of the rudder, receives airplane data from the primary GIA 63W integrated avionics unit. The RDM was designed to record

airplane performance, configuration data, and navigation data to include the flight's groundspeed and global positioning system track.

The approved airplane flight manual supplement for the GFC 700 AFCS, in part, indicated an airplane limitation which stated, "Yaw Damper must be turned off for takeoff and landing." In addition, the supplement indicated, "Before Taxiing ... Autopilot Override TEST Move flight controls fore, aft, left and right to verify that the Autopilot can be overpowered."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Dusk
Observation Facility, Elevation:	KGDJ, 778 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	19:35 Local	Direction from Accident Site:	186°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	120°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.84 inches Hg	Temperature/Dew Point:	34°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Granbury, TX (KGDJ)	Type of Flight Plan Filed:	None
Destination:	Granbury, TX (KGDJ)	Type of Clearance:	None
Departure Time:	19:49 Local	Type of Airspace:	

Airport Information

Airport:	GRANBURY RGNL GDJ	Runway Surface Type:	Asphalt
Airport Elevation:	777 ft msl	Runway Surface Condition:	Dry
Runway Used:	14	IFR Approach:	None
Runway Length/Width:	3603 ft / 60 ft	VFR Approach/Landing:	Full stop

GDJ was a public, non-towered airport, owned by the City of Granbury, located 2 miles west of Granbury, Texas, at a surveyed elevation of 777.5 ft above mean sea level. The airport featured runway 14/32 which had a 3,603 ft by 60 ft asphalt surface. Runway 14 had a two-light precision approach path indicator (PAPI) on located on the left side of the runway and that PAPI provided a 3.00° glide path. Runway 14 obstruction remarks listed a 15 ft trees, located 200 ft from the runway, and 160 ft right of centerline.

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Minor	Latitude, Longitude:	32.444442,-97.816947(est)

Additional Information

Federal Aviation Regulation 23.143, in part, stated:

(a) The airplane must be safely controllable and maneuverable during all flight phases including-

...

(6) Landing (power on and power off) with the wing flaps extended and retracted.

(b) It must be possible to make a smooth transition from one flight condition to another (including turns and slips) without danger of exceeding the limit load factor, under any probable operating condition (including, for multiengine airplanes, those conditions normally encountered in the sudden failure of any engine).

(c) If marginal conditions exist with regard to required pilot strength, the control forces necessary must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) of this section exceed those prescribed in the following table:

Values in pounds force applied to the relevant control ...

(a) For temporary application: ...Rudder Pedal ... 150

(b) For prolonged application ... [Yaw] 20

A review of FAA certification paperwork revealed that the SR22 type airplane did not exceed the maximum prescribed control forces for the temporary application of the rudder pedal while the yaw damper was engaged.

Subsequent to the accident, Cirrus supplied a factory flight instructor who gave the pilot dual instruction and also see if the yaw damper met certification parameters. The instructor, in part, reported that he supplied 6.3 hours of training to the pilot on two consecutive days in a Cirrus airplane that was similarly equipped with a yaw damper. A task he noticed was that the pilot was not using checklists properly. In his ground check he did not include overriding the yaw damper on the autopilot to insure that he could properly operate the rudder pedals if there was a failure in the system.

During several approaches he noticed that the pilot was not disengaging the autopilot with the autopilot disengage (red) button. Instead, he was using the autopilot (AP) button on the autopilot control panel. This led to the yaw damper remaining engaged after the master autopilot control had been toggled off. He improved on his checklist usage and began to use the autopilot disengage button.

The instructor was specifically asked if he provided training on how to override the yaw damper and he replied that he taught the pilot to incorporate it into his before takeoff checklist autopilot override test.

The instructor was asked to verify if the pilot was able to override the yaw damper and he indicated that he could, and he was able to achieve full deflection.

The instructor was asked if the pilot was confident in overriding the yaw damper during the ground tests and indicated that he was able to do it and admitted to it when asked. However, the pilot said something to the effect of "mine was harder when I had my accident."

The instructor confirmed that the yaw damper override forces were consistent with other yaw damper equipped Cirrus aircraft that he had flown.

Flight recorders

The airplane's RDM was downloaded by a safety representative from the airplane manufacturer under the supervision of an FAA inspector. A copy was retained by the NTSB for review. The safety representative parsed the downloaded flight data and plotted configuration data to include the yaw damper. The plotted route of flight data was consistent with the pilot's reported route of flight. The data showed that the yaw damper was not on about .25 miles before the landing runway threshold.

Administrative Information

Investigator In Charge (IIC):	Malinowski, Edward
Additional Participating Persons:	Robert Bennett; Federal Aviation Administration; North Texas, TX Brad Miller; Cirrus; Duluth, MN Brannon D Mayer; Cirrus; Duluth, MN Rick Beach; Cirrus Owners & Pilots Association; Las Vegas, NV
Original Publish Date:	June 3, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98104

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).