



Aviation Investigation Final Report

Location:	Addison, Texas	Accident Number:	CEN12LA220
Date & Time:	March 23, 2012, 11:00 Local	Registration:	N229TX
Aircraft:	CIRRUS DESIGN CORPORATION SR22T	Aircraft Damage:	Substantial
Defining Event:	Electrical system malf/failure	Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane experienced an electrical fire while taxiing to the departure runway. A postaccident examination revealed that a grounded shield wire was improperly attached to the alternator's auxiliary power terminal instead of the alternator's case-ground connection during recent maintenance. The mechanic who had recently removed the alternator stated that he did not identify the location of the wire harness leads during removal and that the manufacturer's documentation did not depict where the power shield wire should be attached on the alternator, so he decided to attach the shield wire to the auxiliary power terminal, which was not correct.

The manufacturer's wiring manual did not depict the optional electrical system wiring configuration, which included the incorporation of the No. 1 alternator power shield wire. As a result of the accident, the airplane manufacturer updated the wiring manual to explicitly account for the shield wires and the unused auxiliary power terminal. Caution messages were added to the maintenance manuals warning mechanics that the airplane might be equipped with cable shielding and, if so, where to connect the shielding on the alternator.

Probable Cause and Findings

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

Maintenance personnel's improper maintenance, which resulted in the incorrect wiring of the No. 1 alternator and a subsequent electrical system fire during taxi. Contributing to the accident was the airplane manufacturer's inadequate maintenance documentation that did not depict updated electrical system wiring options.

Findings

Aircraft	AC generator-alternator - Incorrect service/maintenance
Personnel issues	Installation - Maintenance personnel
Aircraft	AC generator-alternator - Related maintenance info
Organizational issues	Maintenance records - Manufacturer

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Taxi-to runway	Electrical system malf/failure (Defining event)
Taxi-to runway	Fire/smoke (non-impact)

On March 23, 2012, at 1100 central daylight time, a Cirrus Design Corporation model SR22T airplane, N229TX, was substantially damaged during an electrical fire while taxiing for departure at Addison Airport (ADS), Addison, Texas. The commercial pilot and passenger were not injured. The airplane was registered to and operated by PlaneSmart! Aviation LLC under the provisions of 14 Code of Federal Regulations Part 91 without a flight plan. Day visual meteorological conditions prevailed for the local area flight that was originating when the accident occurred.

The pilot reported that after a short taxi the primary flight display (PFD) and the multifunction display (MFD) suddenly lost all displayed information. The circuit breakers for battery No. 1 and alternator No. 2 had tripped and could not be reset. The pilot advised the tower controller that he wanted to return to the ramp. The tower controller told the pilot that the control tower was currently changing the active runways and to expect to hold his position for about 5 minutes. The pilot noted that airplane then experienced a total loss of electrical power. He decided to turn the airplane towards the control tower in order to look for light-gun signals from the control tower; however, the engine lost power as he increased power. At this time the passenger noticed smoke emanating from the lower engine compartment. The pilot and passenger exited the airplane and called the control tower via mobile phone to report the fire.

The airplane had undergone recent maintenance that required the removal of the No. 1 alternator to facilitate the removal of an adjacent engine cylinder. A postaccident examination, completed by a Federal Aviation Administration (FAA) Airworthiness Inspector, revealed that the grounded shield wire for main power-out cable had been mistakenly attached to the auxiliary power terminal on the No. 1 alternator instead of the alternator's case-ground connection. There was extensive fire and heat damage to the No. 1 alternator wire harness, and to the associated ground buss and main control unit connectors. Additionally, the stainless steel heat shield and composite firewall exhibited fire and heat damage which necessitated major repair of the affected areas.

According the FAA inspector, the aviation mechanic who had removed the No. 1 alternator did not mark or identify the location of the wire harness leads during removal. The mechanic referenced the Aircraft Wiring Manual (AWM) and Aircraft Maintenance Manual (AMM) before reinstalling the alternator, but was unable to determine the proper placement of the wire harness leads using the available documentation. The mechanic consulted with a co-worker on the placement of the grounded shield connector (which was partially obscured by shrink-wrap and not readily identifiable as being a shield wire). The decision was made to install the grounded shield wire to the auxiliary power terminal. (The auxiliary power terminal provides 1/3 of the total output capacity of the 100 ampere alternator.)

According to the airplane manufacturer, a historical review of electrical schematics, airplane build records, and supporting engineering documentation established that the No. 1 alternator power shield wire was incorporated in the SR22 and SR22T airplane fleets to address reported electromagnetic interference on those airplanes equipped with a 100 ampere No. 1 alternator, storm scope, and air-conditioning. A review of the AWM confirmed that the auxiliary power terminal, and the optional power and field shield wires were not depicted in the electrical schematic and supporting documentation. As result of the accident, the airplane manufacturer updated the AWM alternator wiring depiction to explicitly account for the grounding shield wires and the unused auxiliary power terminal. Additionally, the AWM and AMM were both updated to include a caution message concerning the unused auxiliary power terminal that stated, "Do not install cable shielding wire(s) to the AUX power terminal." The updated AMM also included a caution message that stated, "Cable shielding could be installed to the power and/or field wire harness. If installed, attach cable shielding wire(s) to ground terminal on alternator."

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	26
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	September 10, 2009
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	January 27, 2011
Flight Time:	753 hours (Total, all aircraft), 23 hours (Total, this make and model), 715 hours (Pilot In Command, all aircraft), 106 hours (Last 90 days, all aircraft), 44 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CIRRUS DESIGN CORPORATION	Registration:	N229TX
Model/Series:	SR22T	Aircraft Category:	Airplane
Year of Manufacture:	2011	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	0076
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	March 22, 2012 Annual	Certified Max Gross Wt.:	3400 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	482 Hrs as of last inspection	Engine Manufacturer:	Continental Motors
ELT:	C126 installed, not activated	Engine Model/Series:	TS10-550-K
Registered Owner:	PlaneSmart! Aviation, LLC	Rated Power:	315 Horsepower
Operator:	PlaneSmart! Aviation, LLC	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	ADS,644 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	10:47 Local	Direction from Accident Site:	
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots / None	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	240°	Turbulence Severity Forecast/Actual:	/ N/A
Altimeter Setting:	30.05 inches Hg	Temperature/Dew Point:	17°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Addison, TX (ADS)	Type of Flight Plan Filed:	None
Destination:	Addison, TX (ADS)	Type of Clearance:	VFR
Departure Time:	11:00 Local	Type of Airspace:	Class D

Airport Information

Airport:	Addison Airport ADS	Runway Surface Type:	Asphalt
Airport Elevation:	644 ft msl	Runway Surface Condition:	Dry
Runway Used:	15	IFR Approach:	None
Runway Length/Width:	7202 ft / 100 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 None	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	32.968612,-96.836387(est)

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Gavin M Hill; Federal Aviation Administration, Dallas FSDO; Irving, TX Brannon Mayer; Cirrus Aircraft Corporation; Duluth, MN
Original Publish Date:	June 11, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=83278

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