



## Flight Information File 2008-02

**SUBJECT:** Cirrus Transient Voltage Suppressor Failures  
**DATE:** January 17, 2008

On January 16, two WMU students returning from a cross country flight experienced the failure of a transient voltage suppressor (TVS) in the Cirrus SR20 they were flying.

The transient voltage suppressor is an electrical component that is designed to protect sensitive electrical circuitry from voltage spikes. Cirrus has four TVS in the models of aircraft WMU has and this is the third time that WMU has experienced such a failure.

During the failure of the TVS, the plastic housing of the component melts. Crews have reported they have experienced an acrid smell in the cockpit along with seeing sparks and small flames in the center console viewed through the throttle (power) and mixture lever slots.

The following two pages is an advisory from Cirrus on the topic of TVS failures. It is recommended that every pilot become familiar with the information contained in this advisory. The second page of this advisory contains pilot actions. A copy of the pilot action checklist has been laminated and should reside in the center console of each Cirrus aircraft. Please notify dispatch if you cannot find a copy aboard the aircraft you have been dispatched.

Be advised, smelling smoke in the cockpit does not necessarily mean you have a TVS failure. The situation could easily be an electrical fire which requires an alternative course of action. Make sure to review not only the attached procedures for TVS failure but also stay proficient in all emergency and abnormal procedures.



# Service Advisory

SA 07-17

Issued: 11 Sep 2007

Models SR20 and SR22

**TO:** Owners, Operators, and Service Centers

**SUBJECT:** Transient Voltage Suppressor Failure

**EFFECTIVITY:** SR20 Serials 1268 and subsequent  
SR22 Serials 0002 and subsequent

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## Description of Condition:

Cirrus Design has received multiple reports of failed Transient Voltage Suppressors (TVS) in SR20 and SR22 aircraft. Recently, these reports have increased in frequency.

These devices are installed to protect the PFD, GPS 1, COM 1 and the standby attitude gyro from lightning strikes. This Service Advisory is being issued to advise operators of the possibility and mode of TVS failure, provide guidance for handling the failure, and inform operators of the efforts Cirrus is making to correct this condition.

*Serials SR20-1268 thru 1422 w/o PFD, Serials SR22-0002 thru 0820 w/o PFD:* There are two TVS in each aircraft. One is installed in the circuit breaker panel and one behind the instrument panel.

*Serials SR20-1337 & subs w/ PFD, Serials SR22-0435 & subs w/ PFD:* There are four TVS in each aircraft equipped with a PFD. Three are installed in the circuit breaker panel and one behind the instrument panel.

## What TVS do:

Transient Voltage Suppressors are a major component of the lightning protection system on Cirrus SR20 and SR22 aircraft. During lightning strikes, enormous energy spikes can be induced within the aircraft electrical system. In the absence of any transient protection, this unwanted energy would typically be dissipated in the form of high-voltage discharge across the avionics and electrical systems of the aircraft. By adding a high-power TVS at key power entry points on the electrical busses, unwanted energy from electrical transients is allowed to dissipate through a semi-conducting pathway to ground. Acting much like a lightning rod, the TVS (under high-voltage conditions) protects the pilot and aircraft by channeling damaging voltage away from the aircraft electronics and into the localized grounding point.

## What happens when they fail:

Cirrus has not been able to duplicate a TVS failure on our aircraft and must rely upon field reports of these failures. Listed below are characteristics of TVS failures that have been noted by operators:

- Flashing, sparking, or flame in the console. Typically, this event has been of short duration. The TVS in the circuit breaker panel cannot be viewed from the pilot or passenger seats and it is unlikely that fire can be directly determined by observation through the power and mixture lever slots in the console. The interior materials used in Cirrus aircraft are fire resistant and will not sustain a fire. Photographs of failed TVS and local interior panels revealed one instance where an interior panel seems to be slightly scorched. Further, Cirrus has examined several components and wiring that appeared to be scorched but were actually covered with soot from the epoxy potting compound.
- Smoke and acrid fumes emanating from the console. Reports of smoke have been varied. Some operators reported no smoke, some reported "cigarette-like" smoke, and others reported moderate to heavy smoke. In all cases, operators reported acrid fumes, like electronics or plastic burning. The Material Safety Data Sheet (MSDS) for the epoxy potting compound used for the TVS indicates that the fumes

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can cause acute eye, skin, and respiratory irritation and have been classed by OSHA as a hazardous substance.

- Many operators have reported the loss of GPS 1 and COM 1. The TVS protecting this equipment is attached to the avionics essential bus and failure of the associated TVS will cause the AVIONICS ESSENTIAL BUS circuit breaker to open, interrupting power to GPS 1 and COM 1. Because the TVS typically fails in a shorted condition, the circuit breaker will not reset. Failure of this TVS has been, by far, the most common.
- Failure of either of the other two TVS in the circuit breaker panel has not caused an equipment loss. Both of these protect the PFD power sources and are connected to the bus through a fuse so that a TVS failure would fail the fuse and PFD power will be maintained.
- Cirrus has not recorded any event where the TVS protecting the standby attitude gyro (behind the instrument panel) failed.

**What the operator should do:**

Cirrus has determined that failure of a TVS, in itself, does not create a hazardous condition. In all the instances where a TVS failure occurred on a Cirrus airplane, the operator was able to continue the flight to a safe landing. Whenever making an instrument approach, it is always wise to plan for a possible missed approach and go-around.

If smoke and/or fumes are detected in the cabin and it is suspected that this event was caused by a TVS failure, the operator should confirm that there is no fire and that the likely cause of the smoke and/or fumes is a TVS failure:

1. AVIONICS ESSENTIAL BUS Circuit Breaker.....Check  
If open, do not reset. Continue flight using Nav receiver 2 and COM 2.
2. Heater .....OFF
3. Air Vents .....OPEN, FULL COLD
4. Prepare to land as soon as possible.

*If airflow is not sufficient to clear smoke or fumes from cabin:*

5. Cabin Doors..... PARTIALLY OPEN
6. Airspeed may need to be reduced to partially open door in flight.

Make repairs before further flight. Cirrus should be notified with the circuit the TVS was protecting, aircraft Hobbs hours, and TVS lot numbers. Affected parts must be returned to Cirrus.

**What Cirrus is doing:**

- Cirrus has been studying the condition and has been consulting our avionics vendors and other experts in this field and has been unable to determine a root cause for these failures. However, Cirrus has carefully measured airplane bus voltage under a number of flight conditions and does not note any conditions that could lead to these failures. Additionally, Cirrus surveyed the airplane electrical system for the effects of P-static and did not note any adverse affects. Further, Cirrus is aware that other airplane and avionics manufacturers have also noted an abnormally high failure rate of TVS. It is our assessment that the failed units were defective at installation and that screening of the units was not effective in identifying units with potential defects.
- Cirrus is consulting with the vendor and other experts attempting to identify a screening protocol that will reliably detect defective TVS prior to installation.
- As a backup, Cirrus has contacted other vendors of TVS and is collecting availability information.
- When Cirrus has determined a course of action that will correct the potential failure condition and will cause the least disruption to customer operations, a Service Bulletin may be issued.