Anatomy of a Switch Failure
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Typical “teeter-totter” switch mechanism. Operating the toggle presses down on either side of the central pivot to rock the contact assembly.
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• The “teeter-totter” pivots on a cradle that is connected to the switch’s center terminal.

• The need for good electrical connection here is obvious.
The switch in this case study would pop the supply fuse when the switch was turned OFF . . .
Signs of overheating and loose terminals . . .
Teeter-totter is sufficiently curved to allow OFF end of switch to rise against the grounded frame . . .
Note bowed teeter-totter and burn mark on inside surface of frame . . .
The failed and a new teeter-totter . . .
The results of heating at the pivot point of the teeter-totter is evident.

The contacts for this switch were in excellent shape.

This switch was NOT overloaded. I was powering a strobe system with an average current draw under 5A.

Failure began at the upper pivot point which transferred all the load to the lower pivot and precipitated the heat-induced failure.
A “high resistance” joint at the upper pivot pushed loads to the lower pivot point.

The lower pivot may have been suffering from the same elevated resistance phenomenon as the upper point. This exacerbated the failure event.

While the lower point was better able to shoulder the loads, localized heating provided the energy to soften the “teeter-totter” and allow the failure to progress forward with time.
The teeter-totter was bent more on the OFF (non-current carrying) side of the part.

This means that the part was being hammered more strongly in the transition from ON to OFF (hot) than during OFF to ON (cool).

This switch wasn’t very old (a few hundred flight hours).

Failure started due to corrosion/poor fit at one pivot point. Heating at the over-loaded pivot caused precipitous increase in resistance that ultimately took the temper out of the material thus allowing it to change shape.
This is an excellent example of a “high resistance” joint participating in a relatively slow degradation toward complete failure.

Had the terminals of the switch been reversed, ground in the OFF condition would not have blown the fuse. The contact degradation would have continued until the switch really “smoked”.

In this interesting but rare instance, the secondary failure of the teeter-totter coming to ground raised some flags that caused the switch to be replaced before it reach a catastrophic, smoke-generating failure.