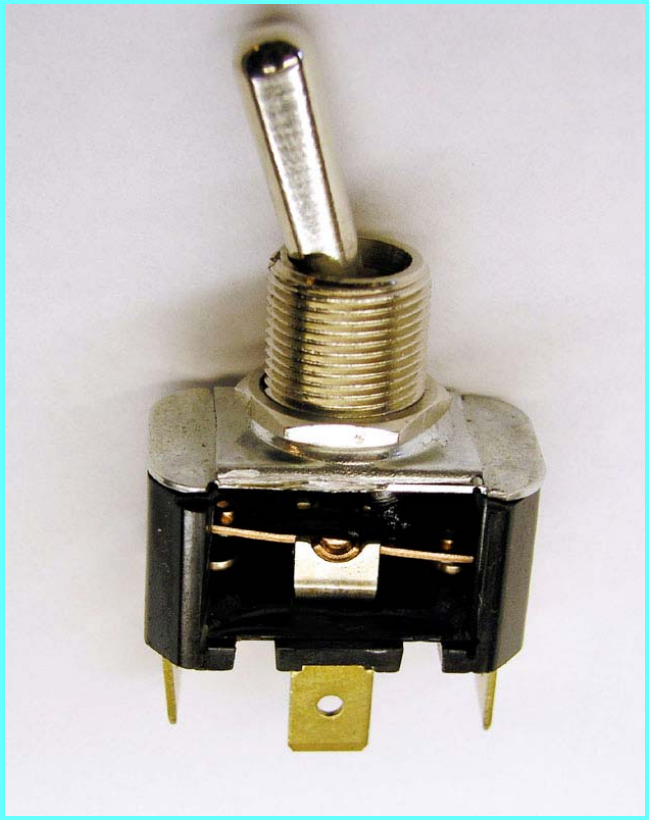
# Anatomy of a Switch Failure



**Anatomy of a Switch Failure:**

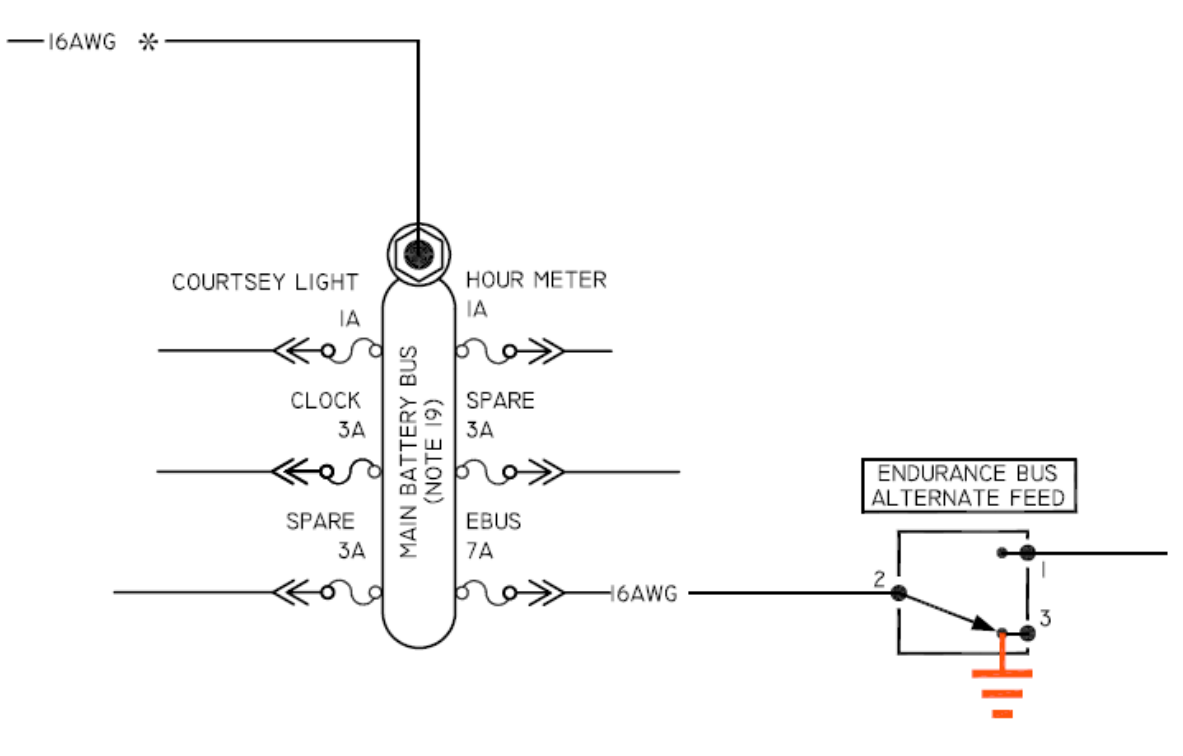
**Typical “teeter-totter” switch mechanism. Operating the toggle presses down on either side of the central pivot to rock the contact assembly**

**Anatomy of a Switch Failure:**

- **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 . . .

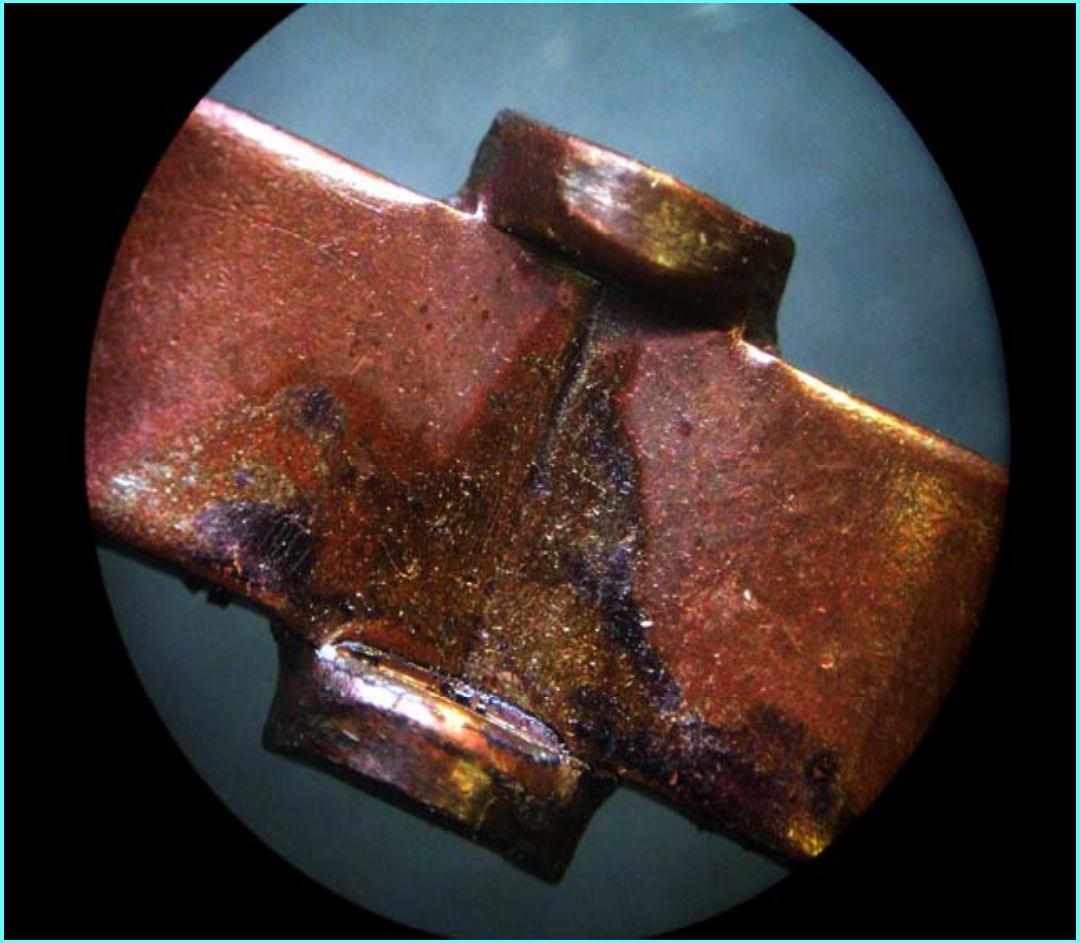


**Signs of overheating and loose terminals . . .**

**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 . . .**

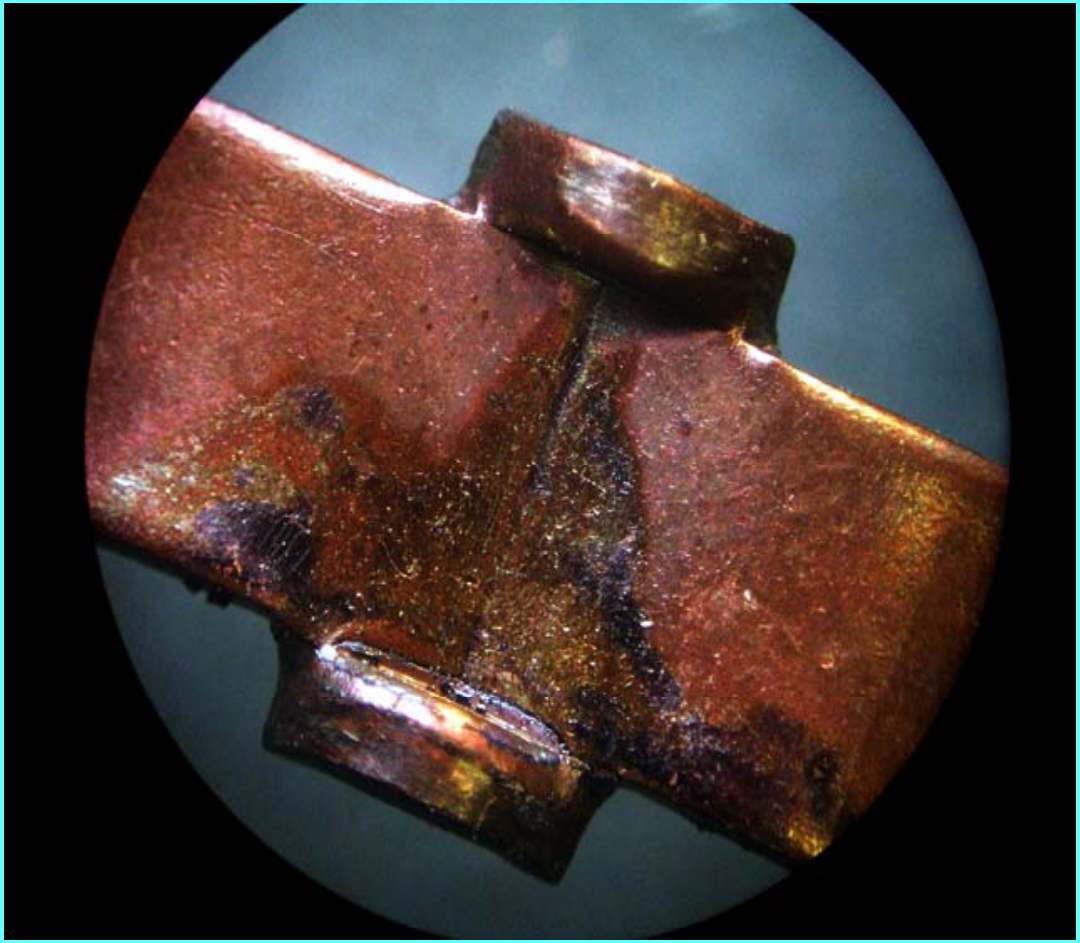


**The results of heating at the pivot point of the teeter-totter is evident.**

**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.**

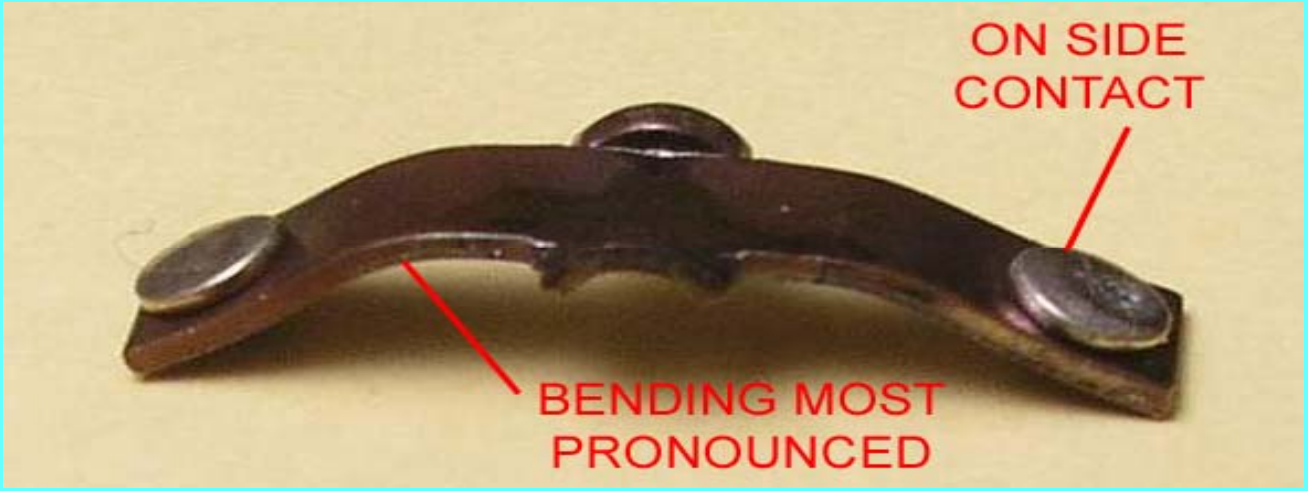
**While the lower point was better able to shoulder the loads, localized heating provided the energy to soften the “teeter-totter” and allow the failure to progress forward with time.**

**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 t he 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.**