Engine Heater Remote Switch

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Winter can make for some great flying, but starting an airplane engine when it is very cold can be very tough on it. Cold, thick oil doesn't flow effectively through the passages in our engines, and the resultant high oil pressures can blow out oil coolers and cause other damage. An engine pre-heater is a must in cold weather, but the idea of going out to the airplane hours early to turn it on had me searching for a way to do it remotely. Luckily, I found some readily available products that made the whole project relatively easy.

> **Note**: I am not an electrician and the described methods may not be proper, safe, or meet applicable codes. Consult a qualified electrician licensed to perform work in your location before attempting any electrical project. The 120 VAC line current used in this project is extremely dangerous. Electric heaters of all kinds pose significant risk of electrocution or fire if used improperly. I have no financial interest in any of the products mentioned. Prices and specifications were accurate as of Sep 2013, and are subject to change. This document describes how I built this project and is not intended to be a guide.

The method I settled on uses a commercially available electronic switch, the "GSM-Auto." The device works using the GSM cell phone system, so I first verified that my hangar is covered by a GSM network (coverage maps for the U.S. are available at ATT and T-Mobile web sites (http://www.att.com/maps/wireless-coverage.html#fbid=Oodr-uTkW5h and http://www.t-mobile.com/coverage.html)). The "GSM-Auto" is available through several web sites, I bought it at http://www.gsm-auto.com and it cost $149. The device is programmable; I set it to turn on my engine heater for two hours when I call it.

The next step was to get a phone number, an account, and a SIM card to put into the GSM-Auto. For this application I wanted a low/no cost plan, so I looked at the "pay as you go" options at http://www.cellguru.net/prepaid_compare.htm . I went with a company called Lycamobile that charges no monthly fee and uses the T-Mobile network in my area. The SIM card was free (there was a $7 charge for shipping). The GSM-Auto needs the "regular" SIM card, not the newer "mini-SIM" or the "micro-SIM" cards. To keep the account active I ask the GSM-Auto to place at least one outgoing call every 90 days (easy to do—the device can be programmed to send a confirmation text to the incoming number whenever it is called).

The SIM card needs to be properly configured in order to work in the GSM-Auto. For a few bucks, a local cell phone repair shop rented me an "unlocked" GSM phone for a week and I configured the SIM card according to the instructions that came with the GSM-Auto. It was important to call Lycamobile and turn off the account's voicemail feature.

The next step was to actually wire things up. The GSM-Auto comes with a separate AC transformer that provides 12VDC to operate the circuitry (see red and black wires in Fig 1). The only other connection I needed to make was the switched "hot" wire that goes to the heater (the "hot" wire is usually the black one in US 120VAC circuits).

Three-conductor 14 AWG flexible cord fits snuggly into either of the two available openings in the GSM-Auto case. I bought a three conductor 50 foot extension cord (on sale at Harbor Freight: $19.99) to use for this project. The very simplest way to wire this system would be to have a cable (from the wall plug) enter the GSM-Auto enclosure and hook the black "hot" wire to the common terminal for Relay 1 (this is location 8 on the terminal bar). Then, have the outgoing cable (to the heater) enter the enclosure through the other opening and attach the black wire to the "normally open" terminal for Relay 1 (location 7 on the terminal bar). Connect the "in" and "out" neutral wires (white) together and do the same for the green ground wires (using wire nuts). Run the small red and black 12 VDC power wires (from the transformer) alongside either of these cables through the rubber grommet in the case and connect to the appropriate spots on the terminal bar. Obviously I'd attach everything to a solid piece of wood or other surface and attach the cord to this same solid surface to prevent it from being yanked out of the GSM-Auto switch.

Because my hangar is short on receptacles (it has a total of two, and doing things as described above would require both of them), I did things a bit differently. I added a junction box and two duplex GFCI receptacles (see Fig 2). A cord from my wall receptacle provides power to two un-switched "always on" receptacles (on the right in Fig 2), and I plug the GSM-Auto transformer into one of these. The other two receptacles are switched on and off by the GSM-Auto. See Figure 2 and Figure 3.

Materials List

- One GSM-Auto electronic remote switch
- One 2-prong plug (Cooper 183DU-PT or similar). If the transformer supplied with the GSM-Auto has a jack on the AC side, cut it off and replace it with this plug.
- One three-conductor 14 AWG outdoor extension cord. Long enough to reach from the available AC power receptacle to a location where the GSM-Auto can receive a good signal. This cord was cut, remainder used to make an extension cord leading from the GSM to the heater.
- One 4" square metal junction box (deeper ones have plenty of room to store wires).
- Two receptacles (either GFCI or regular duplex)
- One metal cover for metal junction box. Chosen to accommodate choice of receptacle types (above).
- Two NM cable connectors (these hold the cables and protect them where they enter the junction box)
- Small bits: three wire nuts, one green ground screw (to fit tapped hole in junction box), one insulated staple or clamp to secure the GSM Auto-to-junction box cable to the backer board, six small wood screws or drywall screws to attach the GSM Auto, junction box, and transformer to the backer board.
- Backer board, size as needed. I used ¾" x 5 ½" x 16"

Figure 1: Wiring into terminals on Auto-GSM. The small red and black wires(terminal 1 and 2) come from the supplied transformer and provide 12VDC to power the circuits. The larger wires (terminal 8 “in” and terminal 7 “out”) control the “hot” wire to the switched receptacles that power the engine heater.

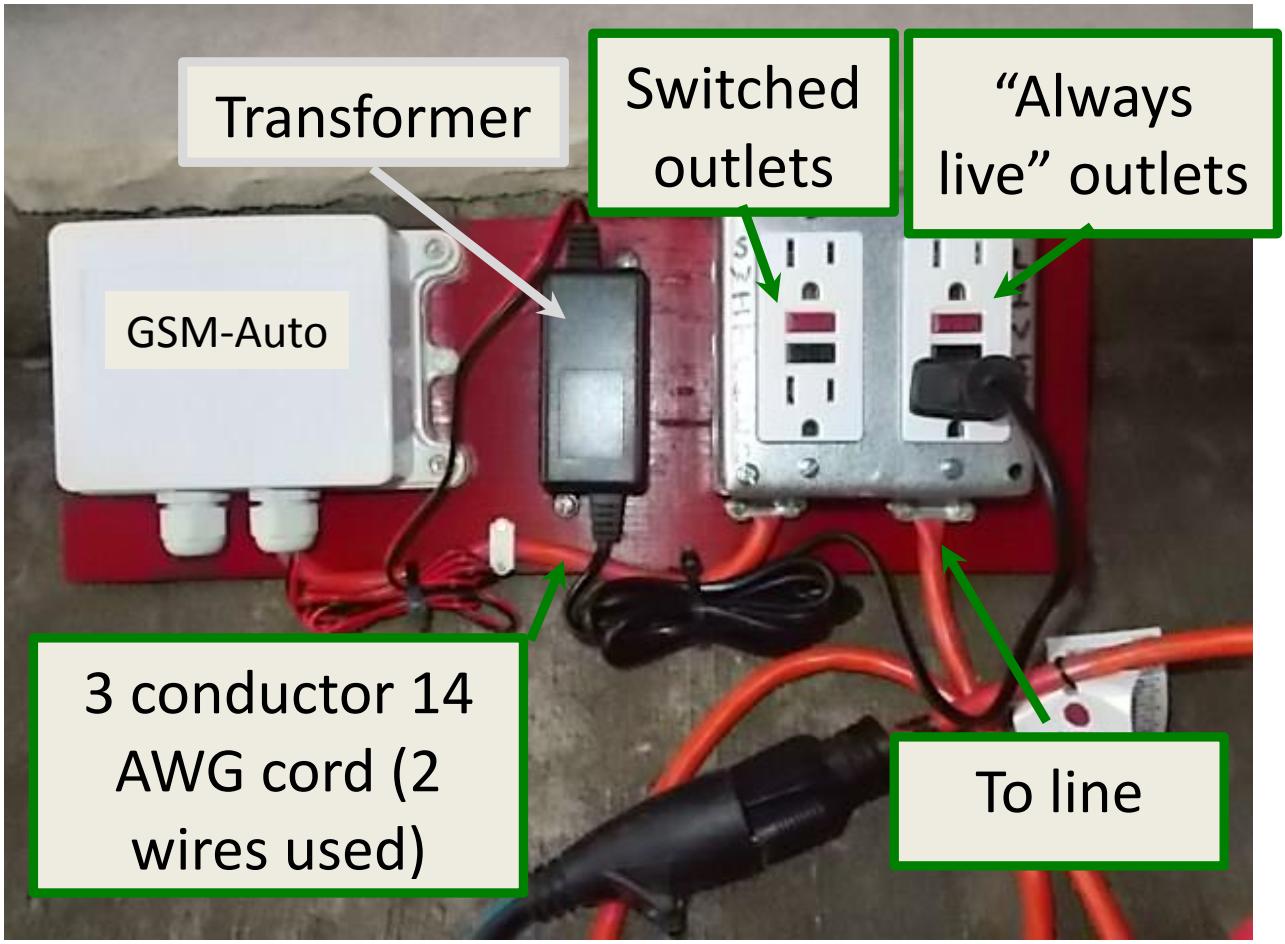

Figure 2: Overall configuration. The transformer that powers the switch is plugged into the "Always Live" receptacles. The heater plugs into the receptacles switched on and off by the GSM-Auto. The cable connecting the GSM-Auto to the junction box has three conductors: an unused green wire and two “travelers.” The black “hot” wire leads to the GSM-Auto and when the switch is “on” electricity flows through the white wire to the “switched” outlets. As is common practice, I marked the white “traveler” as potentially “hot” by blackening the ends with a marker or a wrap of black electrical tape (see Figure 3).

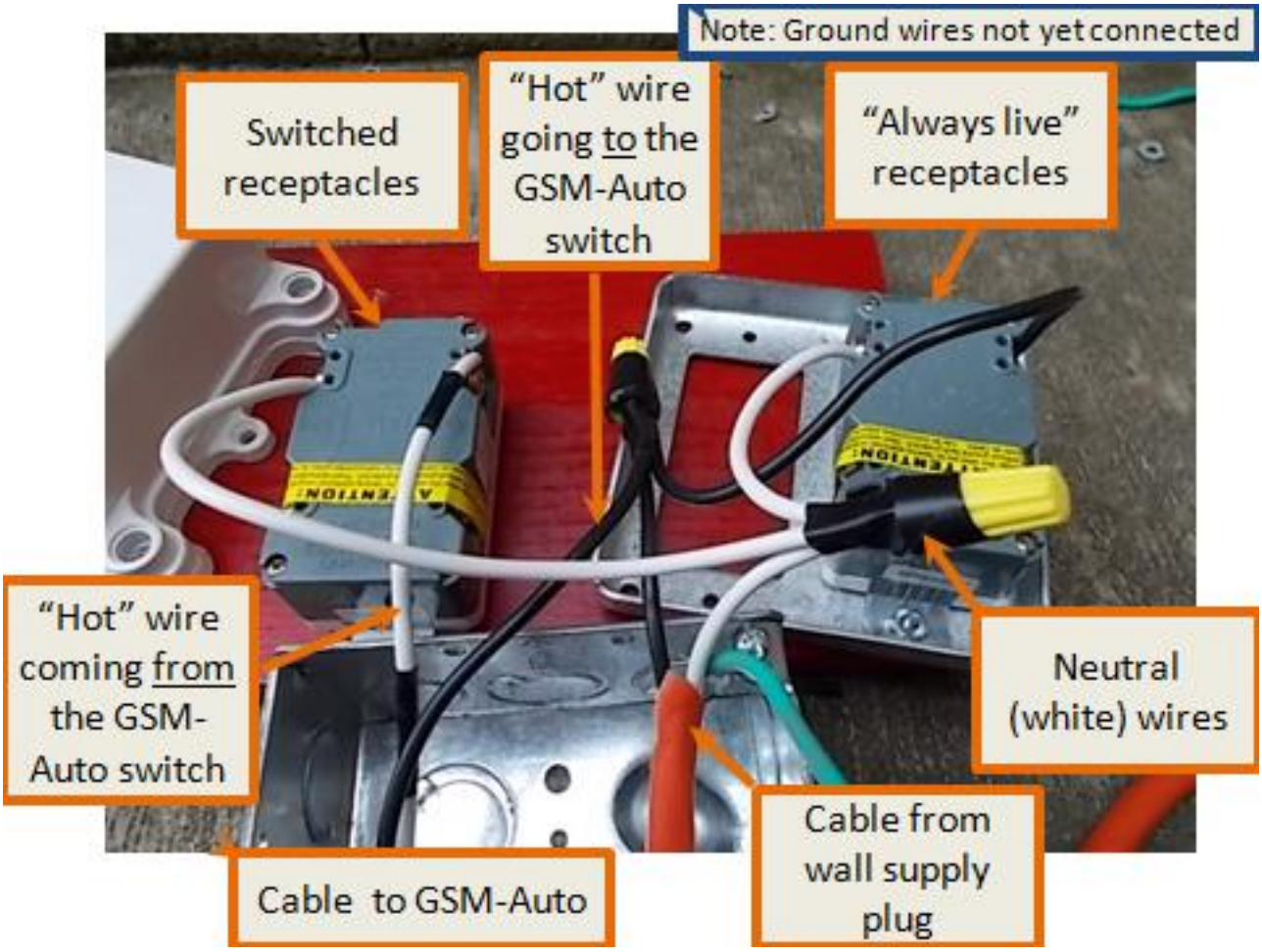

Figure 3: Wiring of the receptacles (before connecting ground wires). I used GFCI outlets due to possible dampness in the hangar. The "neutral" wires go to the silver terminal screw on the receptacles; the "hot" wires go to the gold terminal screws.

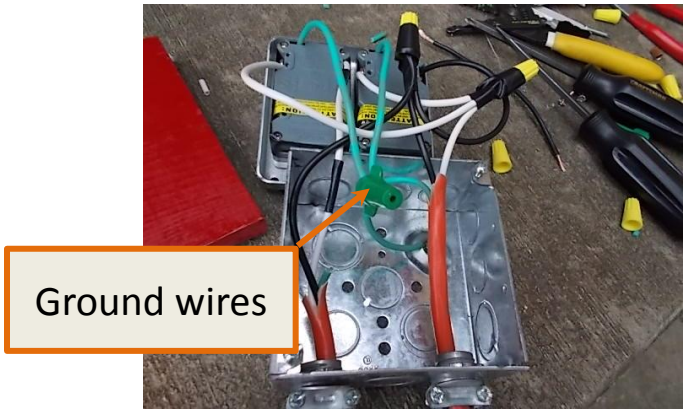

Figure 4: Ground wires. Each receptacle and the metal junction box are connected to the green ground wire leading to the grounded receptacle at the wall.

I attached a three-prong “repair plug” to the remaining Harbor Freight extension cord, which allowed me to use the rest of it to go from the “switched receptacle” to the engine heater.

According to the literature supplied with the device, the relays in the GSM-Auto are rated for 10 amps at 230 VAC. The actual relays in the GSM-Auto unit I received were rated somewhat higher. The setup described here could be used to turn on a dedicated block or oil sump heater, or something as simple as a metal room heater with appropriate ducting (use common sense and consult experts for appropriate guidance to prevent fires).

Anyway, that’s how I put this together. One call to the “aircraft heater” phone number gets the heater started, and when I arrive at my hangar the AeroVee is warmed up and ready to run.

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