Stall Warning Upgrade 9/2022

The stall warning light and horn prototype was successfully installed and tested. It is accurate and reliable. The horn silencer works but the ability to hear the piezo horn (which is quite loud) cannot be heard from its position in the center tunnel. While airborne the piezo alarm produces sufficient decibels to be heard but not with ANR or even with the Halo headset by Quiet Technologies. Older, non ANR headsets may allow the horn to be heard. Even with the horn located near the pilots right thigh, today's pilot headsets sufficiently block cockpit noise including warning horns. However, if doing stalls or slow flight, the warning light functions, but an audible warning stall tone and a light warning would be preferable.

In another paper I describe various audible warning systems of both tone and verbal warnings, and I find adding an audio warning through the pilot's headset to be the best all-around audio warning to add to the light and horn normally installed. The two place experimental aircraft normally has an intercom installed and since there is evidence that supports most two place flights take place with two pilots or a pilot and a flight savvy passenger the headset audio warning along with the light and a warning horn is an excellent warning addition. This triple redundant warning system allows visual, cockpit horn and headphone warning regardless of equipment the pilot is equipped with.

The headphone audio warning can be wired into the auxiliary sound input of an intercom so both occupants could hear it. Even if the intercom is set to mute the auxiliary music, the pilot would still normally hear it. Different intercoms have different muting programs, so each aircraft intercom is going to be slightly different. The audio input to an intercom requires a very low power input not unlike that put out by an MP3 player (about 2 volts peak to peak).

A second way would be to wire directly to the pilots headphone jack. The signal strength would have to be strong enough to provide a good volume and the signal wattage would have to be adjustable as an intercom would do. Output directly to the headset requires at least twice the power and more than likely would feed back into the intercom so great care must be taken in the design and testing of a direct headset phone input to make it useable and prevent interference/back-feed.

I prefer to input the warning audio to the intercom's music or aux audio input. Obtaining an off the shelf solution will be easier. With the advent of small recording/playback devices (like used in MP3 and greeting cards) which output a low power signal which an intercom can handle with little to no modification. Of course these MP3 type players operate on 3-5 volt input. Therefore, a 12 to 3-5 voltage regulator is necessary.

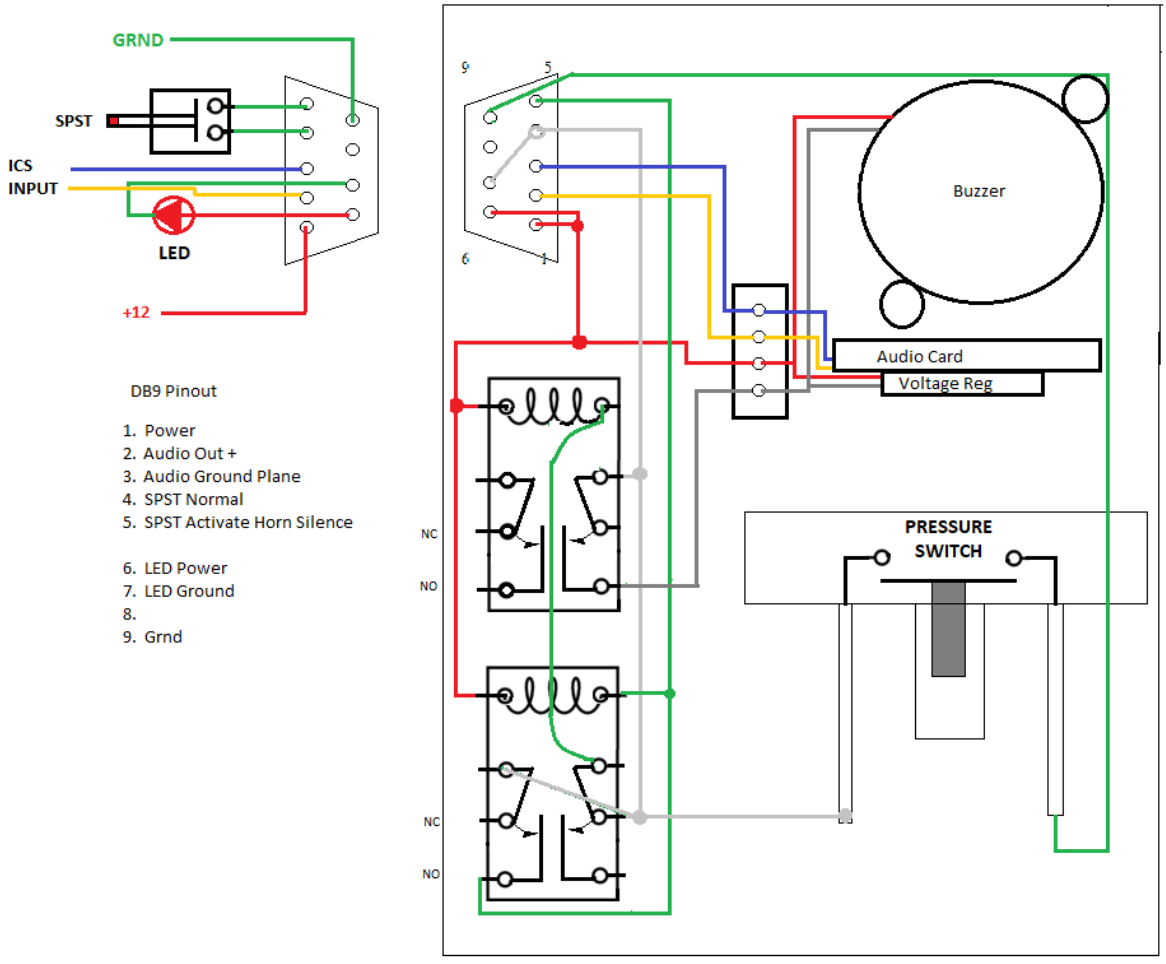
The prototype board is still a mess of wires. This can easily be addressed by assembling the new board of the same material but by running short straight wires or lead strips under the card and connecting the solder dots just as would be done on a PCB.

Obviously, some additional parts are needed:

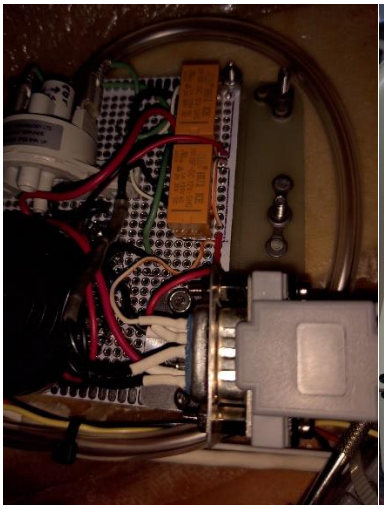
1. 4 and or 8 pin PCB board pin and receptacles. (Ordered)
2. 9 pin D-sub 90-degree board mount connector. (Ordered)
3. D-Sub Jack Screws long 4-40.
4. Some fiberglass angle fabricated to hold the volt reg/audio card.
5. New DPDT 12-volt relays and buzzers which are on hand.
6. New PCB experimental prototyping board. On Hand.

Preliminary drawing is shown below of the 2021 installation which has been tested and works well:

Upgraded PCB Board Design



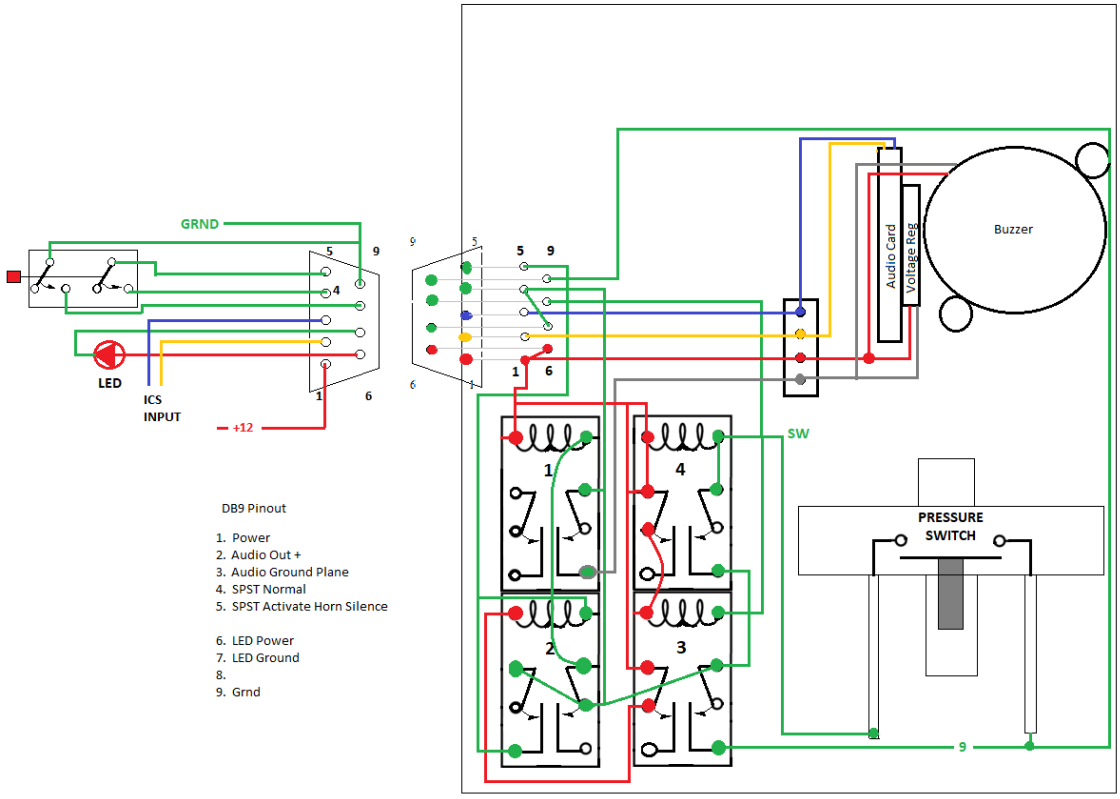
Installed here is what it looks like in the tunnel and the light and silence button:



In 9/2022 I wanted to go a step farther and put in a self test feature with the voice warning audio stream into the intercom. Due to the complexity of today's aircraft, troubleshooting is somewhat difficult, and it would be a welcome addition to have a push to test button. Since panel space is at a premium, I decided to build a self-test and silence button that allowed a single button on the panel face. This can be accomplished with a combination of a double pole push button and two more relays. Although this increases the amount of wire, and time to do tedious exacting soldering, it is a very convenient system. Bottom line is, once power is on the aircraft simply push to test the Test/Silence button to test the circuit and light. In flight if the AoA triggers the stall warning pneumatic switch, the pilot may push the Test/Silence button and silence the horn and audio. Of course, the warning light will still work regardless.

Pictured below is the schematic which is ready to wire up over the winter of 22-23.

Stall Warning Horn, Light, Headset Audio with Single Warning Test and Horn/Audio Reset



As you can see the push to test function simply shorts the pressure switch and with power on will activate the light, horn and audio card piped to the intercom. The push to test if the stall warning is activated will silence the "bitching betty" and horn but leave the light operational.