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Title: Adapting Aviation Headsets to Ham Radios
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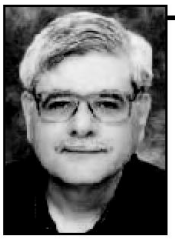

AG1YK

HINTS & KINKS

ADAPTING AVIATION HEADSETS TO HAM RADIOS

◊ Aviation headsets are widely used for commercial and private aircraft. These are rugged, expensive sets with a frequency response well-suited for Amateur Radio. If you have one you probably have wondered if it could be used with your amateur equipment. The short answer is yes, but…

Here's a way to do it. The headset earphones may be either 300 Ω stereo or 150 Ω monaural (some older sets are series connected 600 Ω). The plug fits a standard ¼ inch phone jack (two or three conductor to match). Stereo versions usually have a mono/stereo switch. If not, a RadioShack 274-360 stereo-to-mono adapter will match a mono radio jack.

Most ham radios these days are designed for 8 Ω headphones. If your radio works with a Heil Pro Set type headset (200 Ω), you are good to go. If not, a RadioShack audio output transformer (276-1380) will do the job. Hook it up backwards (that is, the 8 Ω side to the radio's phone jack) and use half of the 1000 Ω primary (= 250 Ω) for the headphones. The match will be close enough.

Adapting the Microphone

Modern aviation headsets use an electret circuit that mimics the old-style carbon microphone. A dc voltage, in the range of 5-16 V at a few milliamperes, is required. Nominal output is 400 mV into a 150-500 Ω load. A PL068 microphone plug is standard and matches a 0.210 inch three conductor jack. Tip is PTT (push-to-talk) and the ring is audio.

The microphone cannot be used with ham radios without an adapter circuit. Most circuits I have seen use a small transformer to better match the microphone impedance to the radio. A simple resistive circuit will also work well and provide the reduction in microphone audio output to match ham radios. Modern ham radios can provide the needed bias voltage at the microphone jack (ICOM and Kenwood provide 8 V, TenTec 9 V, Yaesu 5 V, etc). Radios without such a voltage can use a 9 V battery. For ICOM radios use pin 2 for the bias.

The circuit shown in Figure 1 (the parts list is in Table 2) does the job. R1 provides the load for the aviation microphone. R1 plus R2 supply the dc voltage from the radio (or battery). For Yaesu radios with 5 V, eliminate R2 and C1 and connect R1 directly to the +5 V pin. C2 isolates the circuit from the microphone voltage and C3 isolates bias, if any, from the radio microphone pin (ie, ICOM radios). C5 reduces the chance of RFI via the bias supply.

Most radios are designed for microphone impedance of 600 Ω or so. This is provided by R4, which also worked with my vintage Collins KWM2A. The divider consisting of R3, R5, C4 and R4 reduces microphone audio output to an appropriate level. C4 creates a selectable "DX" rising frequency response. R5 reduces "normal" response by 2 dB to keep average output similar to that of the "DX" response.

By selecting different values for R3 (and related R5 and C4) we can adjust the microphone output to match just about any microphone/radio combination. Table 1 has values to match a popular Heil cartridge, other dynamic and electret microphones (as used by ICOM, Yaesu, Kenwood, etc). Values are also shown for older ICOM radios such as the IC-745/751/781 and early 706s, which require even higher output. Feel free to make further adjustments to these values to match your radio.

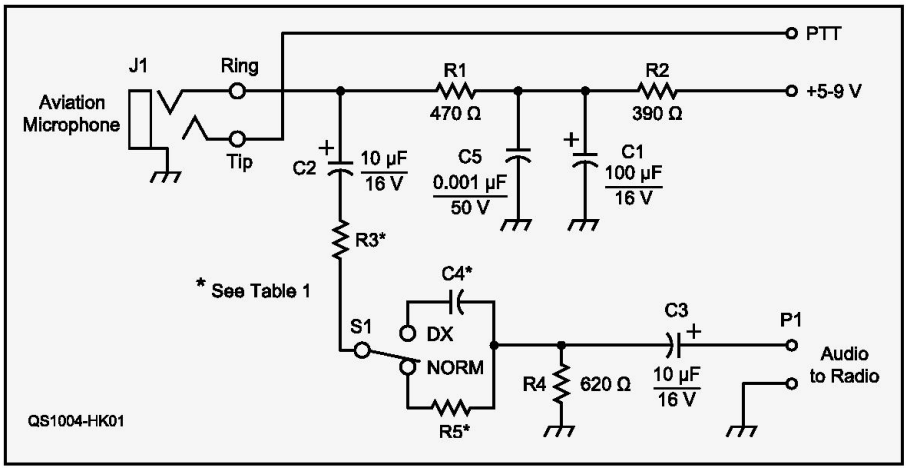

Figure 1 — Schematic of the aviation headphones adapter needed to interface the headphones to a ham transceiver.

Table 1

Aviation Headphone Adapter Microphone Equivalents

Microphone Equivalent Output	*R3*	*R5*	*C4*
Heil HC-5 (–68 dB)	18 k	3.5 k	0.01 µF
Dynamic microphone (–62 dB)	9.1 k	1.8 k	0.02 µF
Electret (–54 dB)	3.5 k	680	0.05 µF
Older ICOM radios (–46 dB)	1.5 k	300	0.12 µF

Table 2

Aviation Headphone Adapter Parts List

C1	100 µF, 16 V (not needed for Yaesu)
C2, C3	10 µF, 16 V
C4	See Table 1
C5	0.001 µF, 50 V
J1	0.210 3-conductor jack (Mouser 501-S-12B)
R1	470 Ω, ¼ W
R2	390 Ω, ¼ W (not needed for Yaesu)
R3	¼ W (see Table 1)
R4	620, ¼ W
R5	¼ W (see Table 1)
P1	Plug to match radio microphone jack
S1	SPDT miniature toggle switch (Mouser 108-1MS1T2B3M1QE-EVX)
T1	1000 Ω center-tapped to 8 Ω audio transformer (RadioShack 276-1380) if needed, see text

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Figure 2 — A completed headset/adapter. The black box contains the adapter circuit for the aviation headset.

The jack is a Switchcraft S12B. The PTT connection can be ignored if not needed. You will also need a plug to match your radio's microphone jack. A little RadioShack 1 × 2 × 3 inch plastic box (270-1801) will accommodate the components. If you also need a 9 V battery, a larger 270-1802 box will work.

Aviation microphones are designed to be RFI resistant and I have not had problems with this circuit. A 0.001 µF capacitor across the circuit output to ground could be added if necessary. The finished product is shown in Figure 2.

A spectrum analysis of my headset (a SoftComm C-20) and the circuit shows the frequency response is flat up through 3200 Hz with a sizeable drop off thereafter. The "DX" frequency response is similar to Heil HC-4 cartridges.

The noise-canceling aviation microphone and 23 dB headphone isolation are very helpful in noisy environments and contests. The around-the-ear muffs are comfortable, especially with glasses. During on-the-air tests I have received numerous compliments about the audio quality. Since aviation headsets are designed to a specific standard, other brands and models should have comparable performance. — *73, John Raydo, KØIZ, 4901 NW 79th St, Kansas City, MO 64151-1099*, **k0iz@arrl.net**

AN IMPROVED MOBILE CONSOLE

◊ It was getting to be that time — the time to get a new radio. I really liked the idea of removable control modules and settled on the Yaesu FT-7800R mobile transceiver. The separate control panel provides many possibilities regarding how to install the radio. The automobile was a Buick LeSabre, which has the car battery under the rear seat (some GM engineer must be a ham) and no front center console. What more could any ham ask for?

JERRY SOBEL, KØMBB

Figure 3 — The completed center console mounted in place. Note the bracket securing the FT-7800 control head.

Well, I didn't want to drill any holes; I didn't want to fish wires up under the instrument panel and I wanted easy viewing of the radio control head and to be able to hear the radio easily (read external speaker).

While perusing the automotive department at the local discount store, I noticed the console (see Figure 3). This after-market center console immediately evolved in my ham mind's eye into a mobile mount that could easily be modified to meet all of my requirements.

A piece of masonite was cut and sanded to fit the tape/CD storage space. It is supported by the ridges used to separate the media. The center of the masonite was overlaid with a piece of perf board and holes located for mounting a 4 inch speaker. The perf board drill guide was taped in place and using a 1/16 inch drill bit, all 1000 holes were drilled. One might just cut a round hole and cover it with speaker cloth or a preformed speaker grill but the masonite provides a firm base to support items which might be stowed in the shallower compartment.

JERRY SOBEL, KØMBB

Figure 4 — A close-up view of the aluminum bracket used to hold the control head.

A ½ inch hole was drilled in the bottom of the speaker compartment as well as just behind the cup holders (more on this later). I had some scrap lamp cord and used this as speaker wire, knotting the end for strain relief. A mating plug was installed on the other end for use with the '7800R. Purists might want to use shielded audio cable. I also mounted a short screw in the center of the speaker grill to act as a handle to lift the speaker assembly out when needed.

Now about that extra hole. I fashioned a small aluminum clip (see Figure 4) to be mounted in the center of the console above the cup holders with two self tapping screws. A piece of aluminum about 2½ × 1 inch was slightly bent to form a hook at one end to hold the control head.

I just clamped the metal behind and slightly above the edge of an old hinge in a vise. I then hammered the aluminum over the edge to form the hook. This was then filed and wire brushed to remove any burrs and sharp edges. A small strip of black electrical tape was folded over the upper front of the plastic control head to further protect it.

Adjust the tension of the clip to firmly hold the control head. This "spring clamp" then secures the control head at an angle perfect for viewing and adjusting. Oh yes, the extra hole is for the control head cable to exit below the console and under the seat to the radio body on the floor behind the driver's seat.

I can see the control head easily and can use the somewhat shallower compartment on top of the speaker (nothing liquid please) and the cup holders as well. Fidelity from the 4 inch speaker is great and everything is easily transported to my other Buick LeSabre when switching cars. Best of all — the entire project was very inexpensive (read cheap). Changes and modifications to this design are numerous and I'd be interested in knowing what others come up with. — *73, Jerry Sobel, KØMBB, 10409 Broom Hill Dr, Las Vegas, NV 89134-7337*, **arsk0mbb@aol.com**

UNISTRUT ANTENNA SUPPORT

◊ When considering a center support for the installation of an inverted V antenna I decided on the following requirements: a strong material, easy assembly, corrosion resistant and with tilt-over capability. The initial design was to use several 10-12 foot sections of antenna mast or 2 inch galvanized pipe coupled together. Due to the cost of antenna