

Here's more on the proposed *Karmic* standards: headphone and microphone connectors.

By Jim Weir

KITPLANES, December 1997

You may recall that in the October issue, we began a discussion of some standards that will make life easier for us when wiring radios and accessories to the airplane. This month, we carry that concept of setting new standards still farther with a discussion of headphone and microphone connectors.

Back to the Past

Did you ever wonder why we have 600-ohm or 150-ohm headsets and why an aircraft microphone is so expensive? The answer is that airplanes are the only remaining users of 1920s technology.

Think about it. In the '20s, the only small earpieces being manufactured were for telephones. Good old Alexander Graham's company came up with a standard for the "receiver" (earphone) in the telephones of the day that were wound with enough wire to come up to 300 ohms. When the airplane industry looked for a manufacturer of headphones, the folks that were making telephone earpieces were just as happy to sell the airplane headphones the 300-ohm, telephone variety on the cheap (since they were making them by the millions anyway). And, since airplane headphones used two of the things, wiring two 300-ohm earpieces in series gave us the standard 600-ohm headset, used in everything from Lindy's hop across the pond to the unpleasanties in Vietnam.

The helicopter folks accounted for a wiring change as they literally shook a few headsets apart. Since the 300-ohm earpieces wired in series like Christmas tree bulbs failed when one of the earpieces failed, the new standard was to wire the 300-ohm receivers in *parallel*, giving us 150-ohm headsets, which is the standard today.

No, there is no real law mandating this parallel connection, but the standard today is 100-200 ohms of headset impedance, and we're still using "telephone" parts. Unfortunately, somebody forgot to tell the airplane folks that the telephone folks stopped using those 300ohm earpieces back in the late 1950s, so guess which is the only industry in the world today using 300-ohm earpieces. And guess what happens to the price when there is a very small quantity being made for a very small market.

And then there are the microphones. 1920s telephones used carbon button microphones. As they were being made by the millions, the airplane industry just ported them right over and

made carbon microphones the airplane standard. Once again, the telephone industry stopped using carbon microphones in the late 1950s, but since there were all those airplanes out there with radios built using a carbon microphone as the "standard" microphone, the standard persists in the airplane industry today for a carbon-simulation microphone. That's right; the dynamic or electret microphone you buy today for your Whizbang II headset needs a special amplifier built into it to make the *radio* think the new microphone looks like a carbon element. Care to guess which is the only industry left using this ancient technology? Good guess. And again we have small quantities into a small market.

Now, it wouldn't discomfit me one little bit if we could all get together and decide that what is old is no longer viable. Going to 8-ohm headphones and unamplified dynamic microphones that I can buy at the local Shack at a tenth the cost of what a comparable Dinky Cluck or Teliz "airplane quality" headset will cost me seems like a heck of a good idea. For now, though, let's take this one step at a time.

Time for a Plug

Guess where the aviation microphone and headphone plugs came from. Did I hear *telephone!?* *Wow, you guys are catching on.* Yup, all those old pictures of rows of operators plugging things into giant switchboards used the quarter inch earphone plug and the less common 0.206-inch, three-conductor microphone plug.

Now the quarter-inch phone plug is still used in communications, but the microphone plug is only being made by two companies in the *world*, one in this country and one in Southeast Asia. Guess what happens to price when these few people make things to sell to a very small market. Hey, you guys are really getting good at this.

Getting Modern

Well, I doubt that we can convince the folks who have bought a lot of expensive radios to toss them over the side in favor of our good ideas for headphone impedances, but we can certainly start making a move to use less expensive connectors on our headsets. If we are going to make this paradigm shift (and no, a paradigms and a nickel don't make two-bits), it might be wise to consider a new connector series. What do I want in this connector? Lightweight, cheap, reliable and avail-

able everywhere. Repairable in East Egypt with baling wire and chewing gum. Available for a long time to come. Easy to install and maintain. Lots of varieties.

Let's hold up some connectors to those standards. Certainly the DB series of computer connectors is available and cheap. Repairable in the field? Not easily. And to install them you need that special D-punch that costs about \$150.

How about the four-wire modular telephone connectors? Certainly lightweight, cheap, reliable and available everywhere. More tossaway cheap than repairable, but that is acceptable. However, when I went to design my new headset series this summer, I looked the world over for a panel-mount modular connector. They are not to be had, so you are back to cutting expensive holes in your panel and using glue to mount the receptacles.

How about the small 2.5 and 3.5-mm tape recorder-type connectors? Not only can you get them cheap at Radio Shacks around the world, they have become the *de facto* standard for audio connectors in the music market. And what does that tell us about price and availability? Cheap and better: You can get them in the round threaded mounting shaft variety, which means a two-bit drill and a pair of locking pliers are all that are needed to install them.

Therefore, I suggest that the Karmic Connector for headsets be the 2.5- and 3.5-mm (1/8-inch and 1/4-inch) series. *Karmic?* That's the new interface standard we proposed in the October issue. It stands for *KITPLANES Aircraft Radio InterMediate Connector*.

Making It Work

Which size is microphone and which is earphone? At first blush, we note that keeping the small one for the microphone and the big one for the earphone follows the cent tradition. But there is a problem going that route: The three-pin jack and plug

set we need for the microphone (ground, audio and push-to-talk) is readily available only in the larger 3.5-mm size.

So we need to use the smaller, two conductor 2.5-mm plug and jack for the earphone, which eliminates the use of off-the-shelf headsets with their 3.5-mm stereo plugs.

My thought is that it is better to find repair parts easily than to buy plug-and play (plug and pray?) aircraft headsets from The Shack.

Therefore, I suggest that the Karmic Connector for microphones be the 3.5 mm style with the tip wired to the push -

to-talk switch and the ring (center conductor) to be the microphone audio. The long shaft is the common ground. Similarly, I suggest that the 2.5-mm style be the headphones with the tip the audio line and the long shaft the common ground.

These suggestions will probably not be well received in the hallowed halls of the FCC in Oklahoma City. I suspect that they will assign the same engineer to investigate these ideas that they assigned to the Cessna 171 and the Boeing 717 projects, and the outcome will probably be similar. On the other hand, they scoffed at the idea of an airplane being built out of fiberglass....

Promoting It

So how do we get people on board with these ideas? Well, folks, you are building more than four times the number of personal airplanes than the factories are turning out in a year, and if you accept these standards and start demanding these connectors on your new headsets, guess what. Hey, I'm a manufacturer and my mommy didn't raise no fools. We call this the Golden Rule

of Manufacturing: I'll make anything for people who pay me in gold.

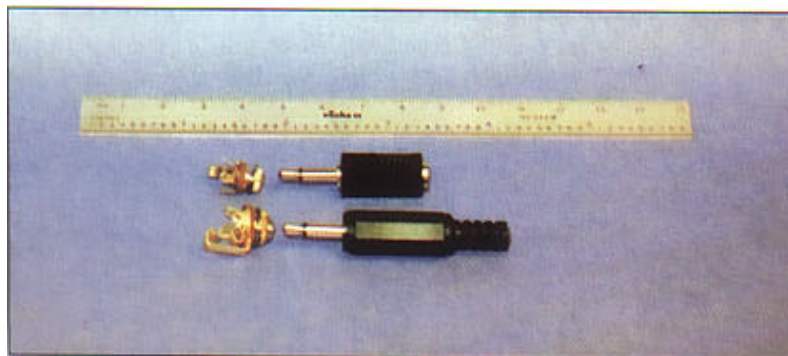
So, as the proposer of this standard and as a supplier of parts, I'll make the first commitment: Every new design coming out of my place, starting in 1998, will give you the option of the



Mil-spec versions of the 1920s-technology mic plugs and jacks are brass that corrodes, causing intermittent connections.



The chrome-plate version of the old-style phone and mic jacks works better electrically.



The proposed Karmic mic and phone connectors take up less than one third the space and are lighter.

old style or the new proposed connector. But consider this: You are going to pay the piper (no pun intended, Beech) if you order the expensive old-style connectors. This Golden Rule stuff works both ways.

I'll go farther. Every new design that comes out of RST after 1998 will be able to drive at least four sets of 8-ohm headphones as well as the old 150/600 Ohm stuff. It will also be able to accept plain unamplified dynamic or electret microphones as well as the old amplified stuff. This means that you can use the current style headsets, unmodified military headsets, or the new designs without any circuit modifications. Olathe and Austin, are you listening?

Next time we will wrap up the Karmic Connector ideas with the rest of the gear in the airplane. So far we've talked about com radios and headsets.

Let's finish with nav radios, GPS, lights, clocks and over electrical goodies. Then we can move on to

topics like how to do electrical drawings for your airplane. **KP**

JIM WEIR is chief avioniker at RST Engineering in Grass Valley, California. He can be reached at e-mail address jim@rst-engr.com but prefers to answer questions in the news-group rec.aviation.homebuilt



Handheld transceiver manufacturers such as Kenwood use this connector series.