



## NOISE AND HEARING

For the purposes of communication sounds can be considered to be either:

- 1) Signal. (Sounds we want to hear) e.g. passenger's voice, controller's voice.
- 2) Noise. (Sounds we don't want to hear) e.g. hiss, slipstream or 'wind-rush', engine, electrical interference etc.

A measure of how well a communication system deals with each of these is called the Signal to Noise Ratio or S/N ratio. Without getting into heavy maths, a high S/N ratio simply means plenty of signal compared to relatively little noise. The higher the S/N ratio, the better. In order to improve the S/N ratio the designer can either increase the signal or decrease the noise. The latter is by far the most preferable. 'Drowning out' noise with extra signal is very dangerous to your hearing because it is all subjective. The noise doesn't go away, it gets added to.

Noise can be of three types:

- **Environmental noise:** (engines, propellers, slipstream, vibration, external voices etc.)
- **Electrical noise:** (interference from strobes, GPS, ignition systems, giving whining, buzzing, bleeping etc.)
- **Amplification noise:** from the comms system itself. (White noise, Pink noise both of which sound like background hiss, or, in the case of RF feedback, a loud howl or squeal )

### Environmental noise

The FLYCOM noise-cancelling flying helmet has been developed to eliminate as much environmental noise as possible. The defenders have foam and liquid seals. They contain nothing but speakers each set on a foam mounted speaker baffle. The defenders contain no audio circuitry, no batteries, no bulky connections, no volume controls, no helmet lead, thus retaining their original acoustical qualities. Not even the mike boom intrudes inside the defender. Just plenty of space for your ears!

Note: Long/bushy hair, balaclavas (especially thick ones) and some spectacles will all degrade the effectiveness of the defenders' seals against the sides of the head and allow noise in, causing the wearer to crank up the volume to compensate. This will effectively degrade the overall S/N ratio.

**WARNING!** It is quite possible to end up with more dBs inside your defender than there are outside it! Flying with the volume control at maximum (full volume) for any length of time would be hazardous to your hearing. It is designed to be turned down! [See User Information PDFs.](#)

**Remember:** Too much signal is just as damaging to your hearing as too much noise. The hair cells in your inner ear don't know the difference!

### Electrical noise

The FLYCOM system is highly immune to electrical noise (interference). For test purposes it has been run directly from a 'Key West' regulator fitted to a PEGASUS QUANTUM 15 without any battery, capacitor or filter of any kind in the power lead and with absolutely no detectable electrical noise! As clean as running from a discrete battery! For practical reasons a battery is definitely recommended.

#### FLYCOM AVIONICS LIMITED

Laurence Walter House, Addison Road, Sudbury, Suffolk. CO10 2YW England

T: +44 (0)1273 234 181 E: [jade.hawkes@themelgroup.co.uk](mailto:jade.hawkes@themelgroup.co.uk) W: [www.flycom.co.uk](http://www.flycom.co.uk)

Registered in England: Company no. 04853000



If you need to use the Automatic Noise Limiter (ANL) switch on an ICOM radio when it's connected to a FLYCOM intercom, it suggests that you have a wiring or ignition problem on your aircraft. (A mobile phone closer than 500mm will cause interference when it rings. These emit microwaves and are supposed to be switched off in the air anyway).

### Amplification noise

The FLYCOM Mk.1 and Mk.2 intercoms are electronically identical. Their audio amplifiers have been carefully filtered to produce extremely Lo-Fi (as opposed to Hi-Fi) audio. The last thing that is needed in a good comms system is faithful reproduction of the whole audio spectrum! For this reason and others, a music input is not fitted as standard.

A CD/i-pod output can connect into the P2 socket for a solo pilot who must have music. (AUDIO-IN prices) In this configuration the music can be heard when the radio is in receive mode, but goes off automatically during radio transmissions.

A narrow band of the audio spectrum has been selected to give maximum intelligibility. Background hiss (white and pink noise) is only discernible at maximum volume setting.

**This level is unbearably loud (by design) so that it encourages the user to turn down the volume.**

The circuit is semi-ANC. (Active Noise Cancelling). When the volume control is turned down, a very distinct reduction in background noise (increased S/N ratio) is perceived at about 1/3 to 1/2 volume setting. In other words the volume control is more than a volume control, it is also a noise control.

### General Advice

Keeping the mikes close to the pilots' mouths is the easiest way to improve the S/N ratio of any intercom system! The FLYCOM mike is very noise-cancelling and thus should be adjusted very local to the mouth, directly in front of the lips within 'puckering' distance. If the mike is placed off-centre (too high or too low) the audio will lack some upper frequencies and sound 'bassy'.

Ensure a good fit of the seals around the ears. There should be nothing pressing on the ears, only the seals pressing on the sides of the head.

Remember, balaclavas under your defenders, especially thick ones, can damage your hearing. There should be nothing between the seal of the defender and the side of the head. (See environmental noise section above)

Starting from OFF, set the volume to the lowest comfortable listening level for hearing your passenger, not your own side-tone. Side tone is what you hear of your own voice. It has no effect on what your passenger hears or the volume of your radio transmissions. **Then and only then, adjust the radio output volume to suit.** If the controller's voice is too loud turn the radio volume down, (not the helmet volume which has already been set). If he's too quiet, turn up the radio.

### FLYCOM AVIONICS LIMITED

Laurence Walter House, Addison Road, Sudbury, Suffolk. CO10 2YW England

T: +44 (0)1273 234 181 E: [jade.hawkes@themelgroup.co.uk](mailto:jade.hawkes@themelgroup.co.uk) W: [www.flycom.co.uk](http://www.flycom.co.uk)

Registered in England: Company no. 04853000



## Summary

Always set the volume level on the helmets for the intercom first. Usually at about  $\frac{1}{4}$  to  $\frac{1}{2}$  volume. Side-tone should be subliminal. I.e. you notice it when it's not there, but not when it is there. Just like a telephone. (Most people aren't aware that telephones have side-tone. It's just there to stop you shouting or sounding moronic).

If you are conscious of your own side-tone then the helmet volume is definitely too loud. **Set the volume as low as you can bear, not as high as you can bear.** Think about that, they are not the same!

### FLYCOM AVIONICS LIMITED

Laurence Walter House, Addison Road, Sudbury, Suffolk. CO10 2YW England  
T: +44 (0)1273 234 181 E: [jade.hawkes@themelgroup.co.uk](mailto:jade.hawkes@themelgroup.co.uk) W: [www.flycom.co.uk](http://www.flycom.co.uk)  
Registered in England: Company no. 04853000