How to choose the right

Pilot Headset

"Hearing is a valuable sense considered second only to sight"

That is especially true in aviation, where pilots carry a high responsibility. One faulty understanding of a clearance can potentially lead to disastrous consequences.

It goes without saying that a high-quality headset is a vital part of every pilot's personal gear. The headset enables you to communicate hands-free with air traffic control, with other crew members and to the passengers, and at the meantime the headset protects you from harmful noises and fatigue.

Choosing the right headset for your type of flying, is not simple. Regardless of the budget that you like to spent, there are various environmental and technical parameters that you need to take into account. We have those listed for you in this article! You'll discover that the most expensive headsets are not necessarily the best option for you.

Different Functionalities

Hertz (Hz)

As you might remember from the **Human Performance** course, in general, a young person should be able to hear frequencies in the range of 20Hz to 20.000Hz. To give you an idea: peak noise levels generated by the propeller, engine and exhaust all combine around the 100Hz point, while the human voice covers a spectrum from 500Hz to 3.000Hz. Higher-frequency noise is caused mostly by air flowing over the cockpit and fuselage and all different kinds of chimes/alerts/alarm bells.

As you grow older, your hearing deteriorates – this is called *presbycusis*. Most often, it affects the ability to hear high-pitched noises such as a phone ringing or beeping of a microwave. It should not come as a surprise however that ageing doesn't account solely for the increased hearing loss among aviators.

Decibel (dB)

The sound range depends, to a great extent, on **intensity** which is measured in decibels (dB).

The rustle of leaves in a gentle breeze provides a noise level of only 10dB, while a quiet conversation happens at around 30dB. When trucks are passing by on a noisy street, you experience levels of +/- 60dB. In aviation, we regularly get exposed to even higher values… Inside a passenger jet, the general noise level is about 86dB. In the cockpit of a smaller piston-engine aircraft, peak values of around 120-130dB can be encountered during an engine run-up with the windows open - a noise level that makes you feel uncomfortable. If you would stand near a jet aircraft with its engines running, you would experience levels of around 140dB - so high that the threshold of pain is reached and that might even burst your eardrums!

Long or repeated exposure to noise levels over 90dB can cause permanent hearing loss. The louder the sound, the shorter the amount of time it takes for NIHL (noise-induced hearing loss) to happen. That is why the Occupational Safety and Health Organization (OSHA) has established that the maximum level of "safe" exposure to loud sounds is 87dB for up to 8 hours, or 100dB for up to 2 hours.

Pilots are found to have a greater decrease in hearing ability in the high-frequency range of 2-6kHz. Sounds like warning announcements and subtle changes in engine sounds or airflow can thus be missed due to high-frequency hearing loss, and ATC communications become difficult to discern.

Noise Reduction Rating (NRR)

The Noise Reduction Rating or Ratio tells a pilot how many decibels (dB) it can prevent from reaching their ears. The higher the NRR, the more excess noise will be reduced. You might find ratings like "24dB" or "-24dB", but they both mean the same thing – that this particular headset washes out excess noise up to 24dB. A higher NRR cuts out more engine and wind noise, thus preventing **hearing damage** and **noise fatigue**, and makes it easier to understand radio calls.

Passive Noise Reduction (PNR) versus Active Noise Reduction (ANR)

Passive Noise Reduction can be considered as the **analogue** form of noise reduction. It is actually just created by the headset's ear cups and seals clamping tightly on your head, thereby physically stopping the incoming sound waves. These PNR headsets are great at blocking frequencies at 1.000Hz and above, but they are not that comfortable, especially if you have to wear them the whole day.

Active Noise Reducing, or **Electronic Noise Cancelling**, headsets electronically sense the incoming noise by the use of a miniature microphone which is placed inside the ear cup. A sound wave with an identical frequency/wave form but with a 180° phase difference is then created and emitted through a tiny speaker in that same ear cup, thereby cancelling out the unwanted noise. ANR attenuates frequencies in the lower spectrum, from about 20Hz to around 300Hz, but permit higher frequencies to come through so that hearing radios, speech over the intercom, etc. is not affected.

As these headsets don't rely on big ear cups, that need to physically block outside noise, they are usually a lot lighter and thus more comfortable. There are however a couple of downsides, as they usually require a power source and they cost a lot more than PNR headsets.

Dynamic Noise Reduction (DNR)

Dynamic Noise Reducing headsets provide an extra level of noise-cancelling by using digital electronic techniques to remove noise components from the incoming headphone signal. DNR headsets achieve this by digitizing signals in a series of numerical values, which are then processed to look for repetitive noise signals and remove noise components. DNR headsets suppress noise by 15-25dB and noise signals of up to 3.500Hz can be detected and cancelled.

The Microphone

We have covered the ability to cancel incoming noise, but we also need to take into account the outgoing sounds from the microphone. If the microphone of your headset does not have any suppression against noise pick-up, this noise can enter the audio system of the intercom in your airplane, or be transmitted over the radio to other aircraft and ATC, making your calls a lot less clear and understandable.

Headset microphones can be divided into dynamic and electret condensers. Most general aviation headsets nowadays use electret-condenser microphones that generate a powered signal that sounds louder and clearer with less background noise, compared to the non-powered dynamic microphones which are still used on older, especially military aircraft. Most microphones also come with a mic muff, or windscreen, to offer extra suppression of cabin noise.

The Cable Plugs

Each headset cable ends in a specific type of plug(s). Make sure you choose the correct one in function of the aircraft/helicopter type you will most likely fly. If you should change aircraft type in the future, you can always get the appropriate adapter.

Most PNR headsets come with the typical “General Aviation” **dual male plugs** (or PJ plugs). These two plugs have a noticeable size difference so that you don’t get confused when trying to plug them into the jack. The PJ-055 headphone plug is bigger than the PJ-068 microphone plug. These plugs will work in almost all civilian and commercial airplanes, even when other options might work as well. If you're in doubt, these are generally a safe bet.

Some aircraft (like Cirrus and newer Beechcraft) have a 6-pin circular type jack available. In that case, you are looking for a Redel connector, also known as a **Lemo plug** or “Bose Style connector”.

If you are flying an Airbus, Boeing or select ATR aircraft you might find a single 5-pin XLR connector. This XLR connector provides power, microphone and audio to an **XLR-5 plug** (also called “Airbus plug”) equipped headset.

If you fly helicopters you'll most likely be looking for a headset with a single plug. It's slightly shorter than either of the PJ plugs. This single plug provides both microphone and audio to the ear cups. It's generally known as a **U-174/U plug**. Most military aircraft - both fixed wing and helicopter - use a single plug called a **U-93A plug** which is the same size found in a civilian helicopter).

Military headsets are generally low impedance instead of high impedance found in civilian aircraft. In other words, just because the plugs look the same does not mean you should not expect a civilian helicopter headset to work in a military aircraft - or vice versa.

Note that some companies may work with a list of approved (personal) headsets. It has happened that adapter cables used with for example double jack connector headsets to plug into XLR-5 connections were the root cause of recurrent Remote Electronic Units damages and replacements. Make sure you consult the appropriate manuals on beforehand.

What headset is best for you?

Your Comfort

Headsets come in different styles and thus different weights. You can go for an ear cup, over-the-ear or in-the-ear style. The lighter you go, the more comfortable they might feel (although this largely depends on your ears). Furthermore, good ear seals may contain a gel suspension or are breathable to reduce sweat.

Also, thick ear seals that elevate the ear cup away from your ear have been found to increase comfort on long flights. If you share your headset with other pilots, it might be a good idea to bring your own washable cotton ear covers.

Your Flying

You're a **student** or **private pilot** that only flies once or twice a week and you haven't figured out yet if you will still be flying in a year from now? Then go for a decent, yet cheaper PNR headset like the **Pooleys PNR** headset, or the **ASA AirClassics HS-1A**. The latter comes with a lifetime warrantee. Both headsets offer a great value for your money, they are both priced below 200€ and the latter even comes with a free headset bag.
If you're looking for a PNR headset which offers a higher quality and which fits more comfortably on your head, you should go for one of the most famous, best-selling headsets in the world: the David Clark H10-13.4.

As a **flight instructor** or **airline pilot**, spending several hours in a noisy environment, you are better off with an ANR headset, like the **Telex Airman8+**. Whereas **helicopter pilots** usually swear by the **David Clark H10-66**.