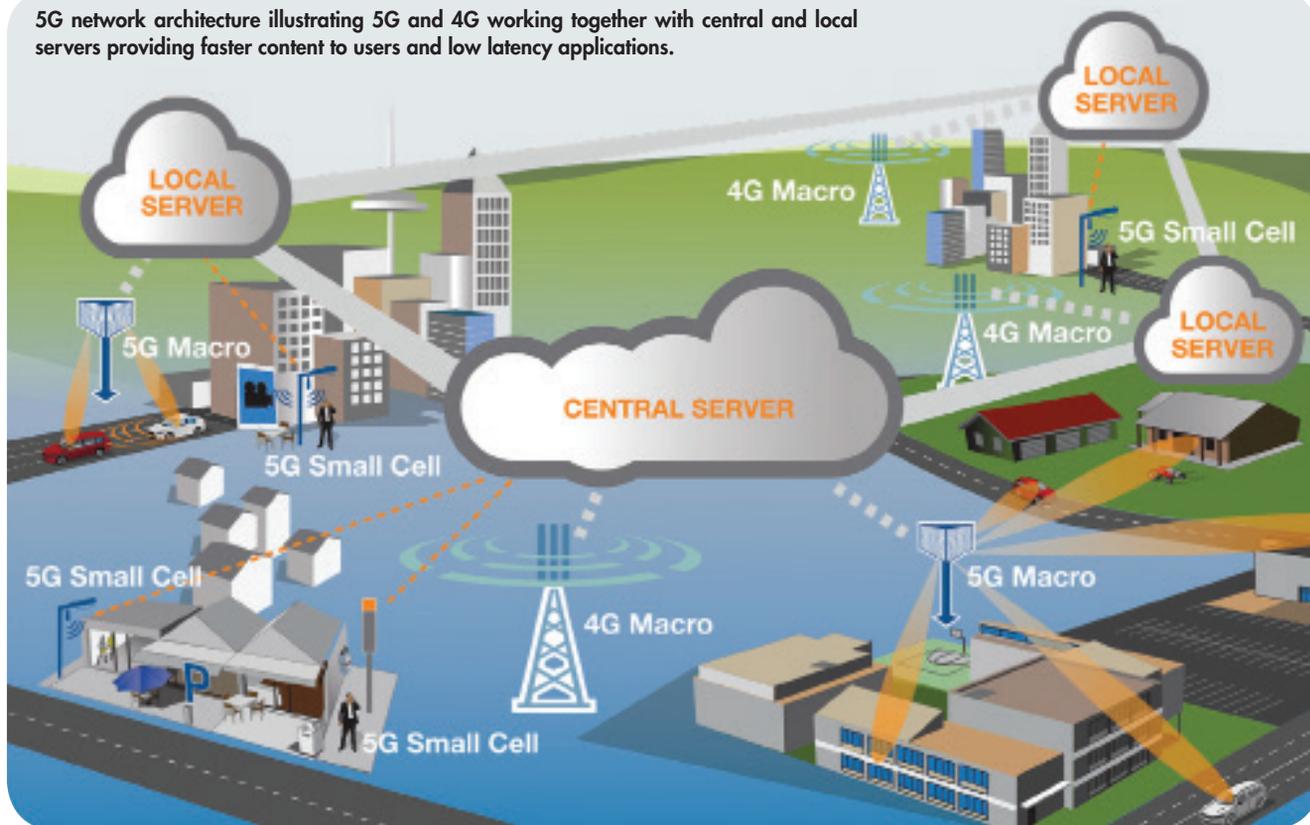


5G and electromagnetic fields

With more bandwidth, EMFs become stronger.

5G network architecture illustrating 5G and 4G working together with central and local servers providing faster content to users and low latency applications.



**By Owen Davies
Contributing Writer**

Recently, we tried to cut through the babble about 5G, look at actual data, and figure out how troublesome it really is for aviation. See *Pro Pilot*, April 2022, page 8. Since then, the Federal Communications Commission (FCC) has doubled down on blaming its victims, ordering avionics makers to bring their “defective” radar altimeters up to a standard of signal discrimination required in no other country.

However, that is not our topic here. This time, we will look at what electromagnetic fields (EMFs) may be doing – not to your equipment, but to you.

Why EMFs matters

Many hundreds of scientific studies have linked radiofrequency EMFs

to serious medical issues. They include DNA damage, rare brain cancers, including glioma and acoustic neuroma, salivary tumors, heart disease, diabetes, sperm abnormalities, reduced volumes of the brain’s gray matter and damaged white matter, neuropsychiatric disorders such as anxiety and depression, and even very early onset Alzheimer’s disease. The list seems to grow almost daily.

This may be significant to pilots. Nina Anderson, a retired corporate pilot who has built a second career as a respected consultant specializing in EMF issues, reports that jet cockpits are the most EMF-dense environment she has ever examined. Every flight instrument and radio contributes its share.

We should note that all findings of a link between EMFs and health are disputed. For every study showing that electromagnetic fields subvert biological systems, scientists funded

by the telecommunications industry can provide one to refute it, plus an explanation of why the other research was methodologically flawed or otherwise invalid. They do so routinely.

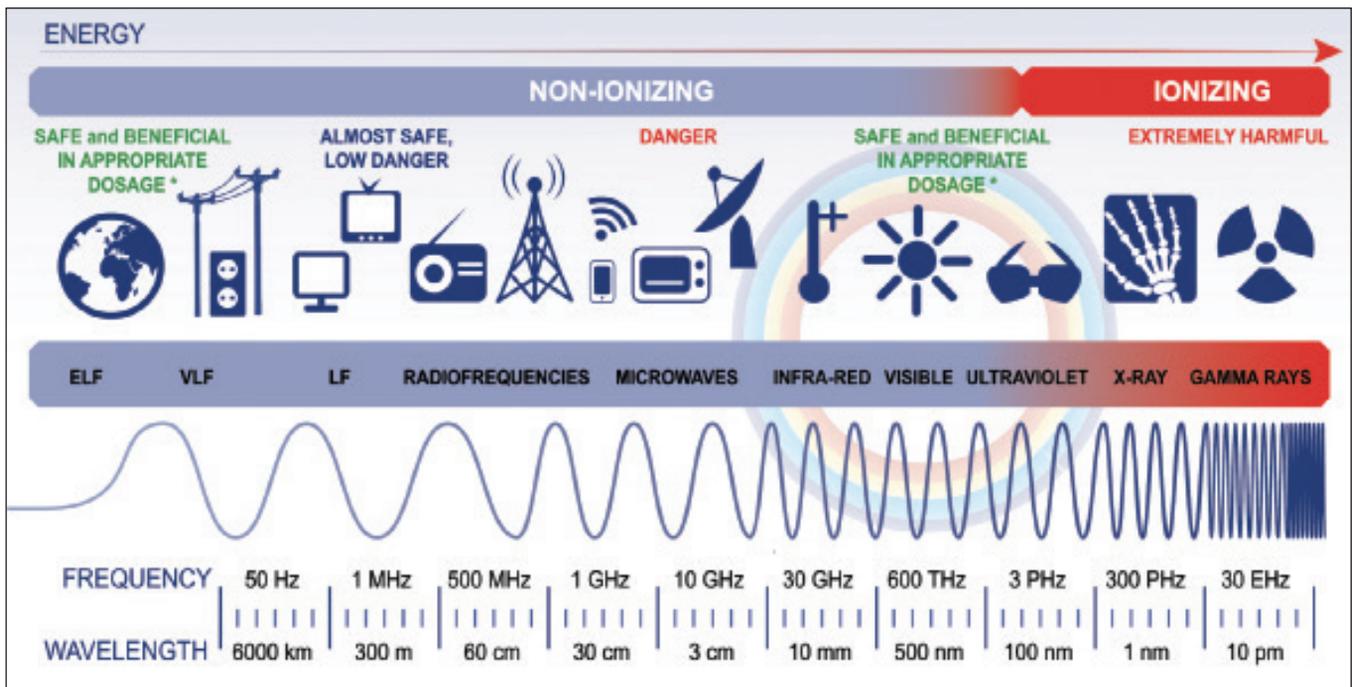
Anderson has little sympathy for them. A similarity to the tobacco industry may have been mentioned.

Nonetheless, since the 1990s, the great preponderance of independent evidence has shown that exposure to EMFs has medical consequences. A lot more supporting data has been added since then.

What has changed

Nature exposes all life to EMFs. Most forms are weak, and distributed over a wide range of frequencies. The sun’s ultraviolet light causes burns and skin cancers, and contributes to skin aging. As far as we know, natural EMFs otherwise are harmless.

Technology is different. The EMFs



our artifacts create are stronger than most natural fields, and we marinate in them 24/7. Their frequencies often are well-suited to couple with biological processes. They're also polarized, where natural EMFs are not. This can greatly amplify their biological effects.

EMF sources abound in our homes and workplaces – even on the street. Wifi, Bluetooth devices, computers, microwave ovens, “smart” electric meters, and the inverters that turn DC electricity from solar panels to 120V AC all generate EMFs at varying frequencies and power. A single fluorescent light can add high-frequency voltage spikes to electricity that arrived “clean.” Turn off all these devices, and we still would receive EMFs from our neighbors – especially in apartments – and when passing cellphone towers.

In the years ahead, we will experience even more EMFs. Devices connected to the “internet of things” pass data and control signals back and forth wirelessly almost constantly. Estimates vary, but they could be 30 to 50 billion of them by 2025. In time, their “electrosmog” will fill the air as London’s pea-soup fogs did in the age of coal.

Why 5G matters

Cellphones are a particular concern because they broadcast next to our ears at frequencies that in recent generations can extend into the

microwave range. And in all but the most rural areas, tower transmissions are with us always.

Each new generation of phones carries more data faster than the last by transmitting at higher frequencies. 4G phones, for example, operate at 2.5 GHz microwave frequencies. 5G extends to 39 GHz. And generations up to 8G already are under development.

The good news is that the electrical component of high-frequency EMFs penetrates barely 1 mm into the body. The bad is that it couples to biological processes much more efficiently than phone transmissions used to, and nothing keeps their magnetic component at bay.

There is more. Buildings block 5G signals, so many more transmitters are needed to serve an urban area. They also use beam forming to aim all their power in one direction rather than omnidirectionally, as previous cell technologies have done. Standing in a 5G beam at a given distance subjects us to much more powerful electromagnetic radiation than 4G did, and because there are more transmitters, we have more opportunity for exposure.

Telecoms point out that no one has ever shown 5G transmissions harm human health, and this is true. The technology is so new that no one has had time to carry out the necessary studies. Yet, even for 4G, the data is compelling. As long ago as 2009, neurosurgeon Vini G Khurana at the

Australian National University, and colleagues in Australia, Austria, and Sweden, reviewed long-term epidemiologic studies of cell phones and brain cancer. They found that using a cell phone for 10 years or more doubled the risk of glioma and acoustic neuroma, but only on the side of the head where users held their phones.

In Malta, researchers studied the incidence of glioblastoma multiforme, the rare brain cancer scientists have long suspected might be linked to the use of cell phones. From 2008 through 2017, the number of people who had used cell phones for 10 years or more, when excess cancers are considered most likely to appear, was rising fast. Medical records showed an obvious trend. In 2008, there were only 0.73 cases per 100,000 population. Ten years later, there were 4.49 per 100,000. Something might have caused this other than the growing use of cell phones, but no credible alternative has been suggested.

Moreover, researchers at the Yale School of Public Health reported in 2020 on genetic variations that predispose people to develop thyroid cancer. Heavy cell phone use more than doubled the risk of thyroid cancer in those with any of four such variations.

Professional critics can find ways to trash any inconvenient research. For the rest of us, the picture should be clear.

The bottom Line

EMFs can affect us in ways that are especially important in the air. Known effects that appear within the duration of an average flight include fatigue, irritability, an inability to concentrate, and mild cognitive impairment resulting in task saturation, mistaken priorities, complacency, and spatial disorientation.

Between 1993 and 2013, US Air Force pilots were involved in 72 severe accidents attributed to spatial disorientation. The incidents resulted in 101 deaths and 65 aircraft lost. The possibility that electromagnetic fields were to blame concerned the Defense Advanced Research Projects Agency (DARPA) enough that in October 2020 it initiated a 2-year project called Impact of Cockpit Electro-Magnetics on Aircrew Neurology (ICEMAN).

ICEMAN appears to have been dormant for some 20 months, but in May DARPA issued a \$371,000 grant to Spotlight Labs, specialists in human factors analytics in Haddonfield NJ, and Norwich University in Vermont. Engineers there will use 5 workstations to simulate EMF in the cockpit of an F-16 and identify any effects on experienced F-16 pilots. ICEMAN has \$1.5 million in total funding and is scheduled to last 3 years.

A hint of what ICEMAN could find comes from the International Association of Fire Fighters. As early as 2004, the organization published a resolution stating that it did not want telecom infrastructure located near fire stations. The issue came up when fire fighters in Santa Barbara responding to emergencies could not remember such basic information as where they were going or how to administer CPR. The problem affected those operating from stations with cell towers nearby. According to Dr Gunnar Heuser, now retired from the UCLA Medical Center Department of Medicine, brain scans showed changes in their gray and white matter.

Looking ahead

Regulators and advisory bodies have been remarkably unmoved by all this evidence. A few decades ago, the only known hazard of radio frequency (RF) signals was excessive heating: when powerful enough, RF can warm tissues like a microwave



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oven. Emissions were known to cause corneal damage in this way, and FCC regulations were designed to prevent that kind of injury. They have remained unchanged since 1977. Independent researchers say they are 10 to 100 times higher than they should be.

The official positions of nearly all regulators and medical bodies match that of the telecom industry exactly. FCC, FDA, and even the National Cancer Institute declare, in FCC's words, "At relatively low levels of exposure to RF radiation, ie, levels lower than those that would produce significant heating, the evidence for production of harmful biological effects is ambiguous and unproven." The World Health Organization (WHO) concurs. Yet, one government body does not. In 2019, the New Hampshire state legislature created a commission to study the environmental and health effects of evolving 5G technology. It reported in November 2020 that 5G signals unambiguously couple with biological processes in ways that caused health problems. It also concluded that regulators and advisory bodies had been captured by the telecoms they were supposed to police. They had cause to believe it.

The picture is clearest at WHO

The guidelines most European governments rely on for EMF standards come from the International Commission on Non-Ionizing Radiation Protection (ICNIRP) – a private non-governmental organization based in Germany. In practice, it is tightly bound to both WHO and the telecom industry.

ICNIRP was founded in 1992. Its first chairman was Australian biophysicist Michael Repacholi. He had no background in EMF research, and he immediately adopted the idea that only heating injury matters. Four years later, he became founding chairman of the WHO EMF Project and established the same policy there. Despite what might seem a conflict of interest, he held both offices simultaneously.

His chosen successor at WHO was Emilie van Deventer, an electrical engineer from the University of Toronto praised by the university magazine for her "invaluable" service to the telecom industry. It brought in donations and lucrative research contracts. She received research funding from the Natural Sciences & Engineering Research Council of Canada, Communications & Information Technology Ontario, and Nortel, then Canada's largest telecommunications company. Deventer took office in 2008 and remains head of the EMF Project today.

The EMF Project is WHO's sole authority on electromagnetic radiation. It established the organization's current policy in a 2016 monograph. The 6-member core group in charge of writing it had only 1 independent member. The rest belonged to ICNIRP and many to other industry groups. Their rejection of non-thermal risks from EMF remains unchanged.

Similar – although less obvious – influences can be found at most regulatory bodies concerned with EMF. In the US, of course, we also have congressmen to run interference for donors companies. Their interest in tightening regulations is, at best, inconspicuous.

In all, anyone concerned about the possible health risks of EMFs will have to protect themselves. How that can be accomplished in the cockpit is not obvious.

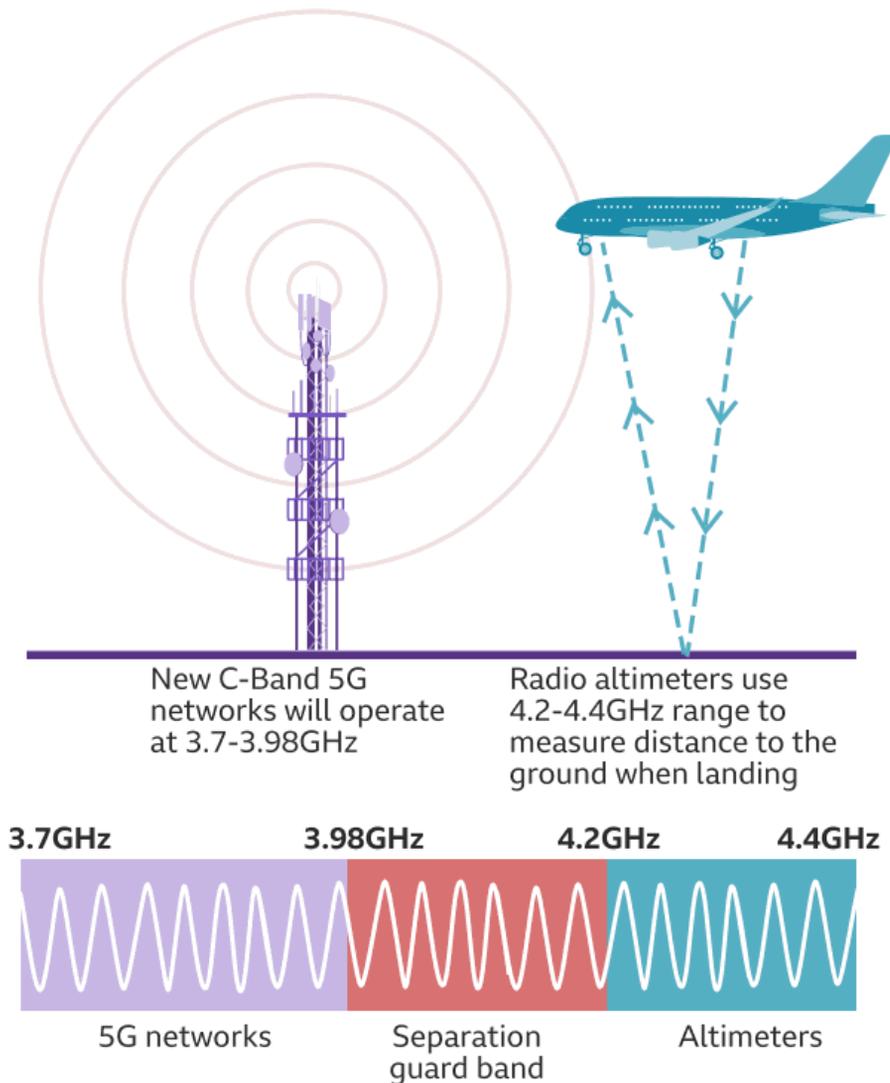
If you are interested in more information about EMFs, it can be found at the Scientific Alliance for Education (www.safehelpsyou.org). ✈



Owen Davies is a veteran freelance writer specializing in technology. He has been a futurist at Forecasting International and TechCast Global.



New 5G spectrum in US faces resistance from aviation industry



Source: Federal Communications Commission, Federal Aviation Administration

