

## 4c MOBILE PHONES: A SPECIAL REPORT

# Heed danger signals as you talk on the move

**I**F YOU own a digital mobile phone, you have probably heard the noise it can cause on a radio, or seen the flickering it can cause on a computer screen. You also may have seen warning notices requiring you to switch off cellular phones in hospitals and aircraft.

Clearly, there are times when using your phone will cause annoyance, possibly even danger to yourself and others, but these situations are not always obvious. What are the health and safety implications of mobile phone use?

The problem of mobile phone interference has been worsened by the introduction of the newer GSM system to Australia. There are two major reasons for this.

First, hand-held phones designed for the old analog system contain radio transmitters with an output power of 0.75 watt; digitals have a maximum transmit power of two watt.

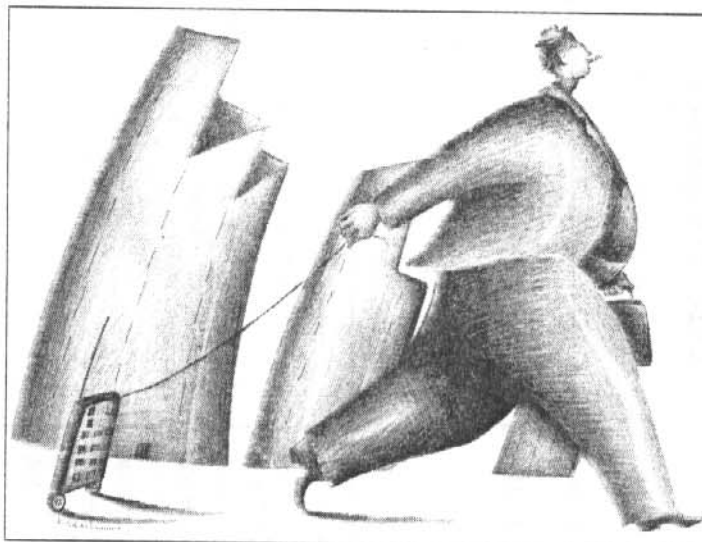
Second, the operation of a digital phone involves a small computer in the handset, switching signal lines between "high" and "low" states at high speed. This furious up-and-down activity, typical of digital computer circuits, is doubly bad news with respect to unwanted emissions.

Not only are these signals close to square in shape (Fourier theory tells us this means that the device can be radiating at just about every possible wavelength), but they are also high-frequency, and stray emissions increase exponentially as the switching frequency increases. These factors explain why a digital phone causes noticeable interference where an analog phone may not.

Although there is recognition that mobile phones can interfere with some medical apparatus, Australian hospitals have not yet established a set of signage conventions. Most hospitals have signs near intensive care areas which instruct visitors to turn off their phones. However, as a visitor, you should switch your phone off before entering the building, and some hospitals explicitly request this.

Much medical "watchdog" equipment operates by measuring minute voltage differences

Turning off your mobile phone is often a matter of etiquette, but there are times when leaving it on may be harmful to yourself and others. **LEWIN EDWARDS** explains when and why you should switch off.



between skin contact points, or by listening to tiny sounds. The input stages of this equipment are designed to detect and amplify small variations for display on a monitor or strip-recorder, which makes such devices highly sensitive to radio frequency interference (RFI).

Nobody is likely to die from you switching on your phone, but you will cause annoyance to medical personnel trying to analyse equipment readings, and potentially, false alarms on critical monitoring equipment. If you hold your phone up to a radio, you can hear the "spikes" which digital mobiles induce in audio amplifiers — imagine how those spikes would confuse an ECG recording.

It is not sufficient merely to divert your phone to a paging service. Digital phones "tickle" the network every so often while switched on, and when a digital phone receives a text message, it sends confirmation back to the network that the message has been delivered.

To avoid interference, you

must switch your handset's power off.

If you need to be contactable in an area where you can't use your mobile, rent a pager; pagers are passive, receive-only devices which cause no appreciable interference.

Mobile phone usage is expressly forbidden in aircraft. This rule originates from the Federal Aviation Authority of the United States, the recommendations of which are followed closely in most countries, including Australia.

The FAA requires that any radio transmitter operated in an aircraft in flight must be licensed for airborne use — your phone has no such license, and as such it is illegal to use it in flight.

There is also a technical problem: as you rise above ground level, your phone can be "heard" by more and more towers, which creates problems for the mobile network.

These were the original reasons for the aircraft ban on mobile phones, but more recently, airlines have raised

questions about RFI-generating equipment potentially interfering with the automatic landing system used to locate the runway, the satellite navigation system used in-flight, and other communications systems.

Although there have been no publicised incidents proven to have been caused by RFI from consumer equipment, RFI emitters are at least theoretically capable of causing malfunctions, and airlines have cracked down on culprit equipment, including computers, CD players and mobile phones.

There also have been concerns over the effect which mobile phone use can have directly on the user. Most manufacturers have a section in the manual which advises you to extend the antenna fully while talking, and to avoid touching the antenna.

This is particularly relevant when using a digital phone, because your handset varies its transmitter power under instructions from the network. Touching or collapsing the antenna reduces its radiating efficiency; the network detects that the signal it is receiving has weakened, and it instructs your phone to increase power — thereby increasing your RF dosage and the interference caused by your phone.

If you are concerned about possible biological effects from mobile phone use, consider buying a hands-free adapter, which will allow you to put some distance between the antenna and your body while using the device. Avoiding helical (stub) antennas may also reduce your dosage, as these antennas are often less efficient than normal long types. (Improving transmission efficiency will also increase your phone's battery "mileage".)

And unless you have a hands-free adapter, turn your phone off while driving. Although the RF interference isn't a driving hazard per se, the temptation to answer a ringing mobile on the seat next to you is difficult to resist; switching off the phone will avoid the situation altogether.

Lewin A.R.W. Edwards is a computer consultant. He can be reached at [sysadm@zws.com](mailto:sysadm@zws.com) <http://www.zws.com> Fax 03 92281335

BYP

Gern

Pu

Com

of th

alrea

one d

mobi

perh:

Th

indus

dita

data

infrat

print

even

Th

(Noki

ously

power

ded

custo

peripi

is a to

which

Flash

acts a

Th

remer

power

the us

pins

They

moun

print

silico

edge

small

The

small.

Nokia

hand-

The s

640 b

LCD

giving

Wh

is pos:

scrolli

is not

read

used

outsid

and b

2110

It h

outsid

pad st

up, an

keybo:

I w

keybo:

ti-ling

it's po

the sar

type o

reason

The

lithium

with t