An Investigation into

the Effects of

Electromagnetic Interference from

Passenger-carried Electronic Devices on

Aviation Safety
Abstract

Suspected electromagnetic interference (EMI) of aircraft systems in-flight by passengers using personal electronic devices (PEDs) is a concern. Pilots report anomalies with instrumentation relating to PED use at appropriate and inappropriate times. Airline cannot test all new PEDs for compatibility with in-flight usage. Interference is difficult to isolate but seems to affect only some aircraft models that are not well shielded against EMI. Reports on the industry expose the difficulty of the task given advancing technology and the vague regulatory environment. This report recommends that suspected EMI incidences be investigated worldwide and that regulatory breaches be penalised more heavily.
1.0 Introduction

1.1 Issue

This report discusses the occurrences of electromagnetic interference (EMI) of aircraft instruments and the un-commanded movement of flight control systems in-flight.

1.2 Aim

The report aims to establish what is being done to eliminate the problem of EMI and examines the roles of those leading the research effort.

2.0 Background information

Although ‘a complete understanding of the science has frustrated the researchers’ (Frenzel 2000), there seems to be sufficient evidence that a cause and effect relationship exists between the use of PEDs and EMI. According to the International Federation of Airline Pilots there are about twenty EMI incidents involving aircraft each year (Kaiser 1995, p. 35). Until a solution is found, airlines prohibit the use of devices by passengers in-flight below ten thousand feet.

3.0 The mystery of electromagnetic interference

3.1 The airframe manufacturers

3.1.1 Boeing Airplane Company

United States aircraft manufacturer Boeing claims the use of PED produces uncontrolled electromagnetic emissions that could interfere with aircraft systems. Boeing also claims that ‘… PED are not subject to the same equipment qualifications and certification
processes’ as aircraft systems are (Donham 2000). Though many cases have been reported over the years, with PED suspected as the cause, it has proven almost impossible to duplicate these events. In spite of the mounting anecdotal evidence of pilots, Boeing has not been able to find a definite (my underline) correlation between PED and aircraft reports. Of these reports ‘only a few showed a strong (my underline) correlation between the airplane reaction and the suspected PED’ (Donham 2000).

3.1.2 McDonnell Douglas

In the last decade, McDonnell Douglas’ Richesin (1996) claims the number of passengers with electronic devices has grown considerably, and significantly ‘the low voltage operation of modern aircraft digital electronics are potentially more susceptible to EMI’.

He also maintains that:

… during the last three years, the number of events relating to computers, compact disc players, and phones have dramatically increased. And these devices have been found to more likely cause interference with systems, which control the flight of the aircraft (1996).

3.1.3 Airbus Industries

Professor Ladkin (1997) states there are ‘… to his knowledge no reports so far of electromagnetic interference with electronic flight controls’ on the new generation Airbus series. He reports that these systems are shielded very well against electronic signals (Ladkin 1997).
4.0 Regulation of use of PED

4.1 The airline carriers

The airlines and their pilots are at the front line of reporting the events if they occur. The problem for the airlines is one of social and administrative pressures. As Ladkin points out: ‘The question about EMI is – what kind of problem is it? How to obtain a clear instance’ (1997). The current situation allows airline passengers to use PED above ten thousand feet. The regulations state that (US) airlines may only allow the use of PED if they are known to the airline not to cause interference. As has already been noted, it is largely impracticable to submit devices for stringent testing considering the number of such devices on the market. Therefore, if an airline reports and investigates a suspected EMI incident, the law requires and prohibits the use of such a device on board an aircraft. By law then, the device moves from ‘suspected incident’ to ‘prohibition’ on that airline (Ladkin 1997).

Customers who want to use their PED are likely to move to another airline where its use is permitted ‘until they themselves were subject to an incident, (Ladkin 1997). Rather than being a safety issue in its own right, it becomes a commercial issue. The commercial ramification for airlines is the risk of losing business as a consequence of following the regulations. (Ladkin 1997)

4.2 Airline pilot

Ultimately, ‘… the pilot in command is directly responsible for the safety of those on board the aircraft’ (Ladkin 1997). Thus, if an EMI from a
PED is suspected in-flight, by law ‘the pilot will require the device be immediately turned off completely’ (Ladkin 1997). The pilot’s responsibilities will, according to the Federal Aviation Administration (FAA) regulations on such devices, prohibit its reactivation. This also has the effect of precluding any form of correlation testing to observe the interference (Ladkin 1997).

4.3 The regulators

4.3.1 Federal Aviation Administration

The FAA sets the legislative framework while the airlines incorporate these laws into their day-to-day operations. The regulations put the responsibility firmly on each individual airline to determine that there is no interference (Ladkin 1997), because the FAA has yet to ‘determine if there is indeed a problem’ (Ladkin 1997). For airlines, this means looking beyond the commercial pressures evoked by employee reporting, and resisting the discouragement of reports and investigation of suspected EMI incidences. The FAA neither encourages reporting nor takes a proactive role in developing a safety first approach. The rapid advance of personal communications technology has created the potential for a significant increase in EMI (Ladkin 1997).

4.3.2 British Civil Aviation Authority

British Civil Aviation Authority (CAA) spokesman Chris Mason says:
We cannot categorically say that these things interfere with aircraft systems, but they might, and until research proves they are not a danger we require that electronic devices be switched off during takeoff and landing (Collis 1997).

4.3.3 Risks

If social and economic pressures exist for airlines to down-play potential EMI incidents, one could also foresee the possibility of pressure from airline management on airline pilots to downplay anomalies. The result would be general under-reporting and less investigation of suspected EMI incidences.

5.0 Conclusions

5.1 Airframe manufacturers are undecided about whether there is a direct or strong correlation between airplane reaction and suspected use of PEDs.

5.2 Airline carriers are concerned that they will lose business if they ban the use of PEDs on their aircraft. They also have the problem of obtaining certainty that a PED has caused problems.

5.3 Pilots are required to demand that a device be turned off and to prohibit its reactivation and this precludes correlation testing.

5.4 FAA puts responsibility on the airline as the organisation has not yet determined that there is a problem and it does not encourage reporting nor does it have a safety-first approach.

5.5 The British Aviation Authority (CAA) require devices to be switched off during takeoff and landing until research proves they are not a danger.
6.0 Recommendations

This report recommends that in the future:

6.1 Airlines encourage employee reporting of suspected EMI incidents and investigate them.

6.2 The airline industry worldwide cooperate in order to solve the problem of EMI incidents.

6.3 Airlines educate the public about the dangers of unauthorised use of PED in flight.

6.4 Penalties be increased for passengers caught using PED if they breach the regulations.

6.5 The FAA and CAA need to encourage reporting of EMI incidents and to take a proactive role in developing a safety first approach.
7.0 Bibliography


