# MODEL AERONAUTICAL ASSOCIATION OF AUSTRALIA

# INTERFERENCE POLICY

# MOP060

APPROVED: M.A.A.A. President

Date; 30/11/2006

**Table of Contents**





Shading of text identifies changes to the previous version.

# INTERFERENCE POLICY

## 1. INTRODUCTION

There are many potential sources of interference that could affect the operation of model aircraft. This Policy reviews some in general terms and then looks at two specific sources of interference that could be generated at a model flying site. It provides M.A.A.A. Policy and some guidance as to how they should be managed.

## 2. GENERAL INTERFERENCE

It is not the intent of this policy to provide detail information on how to reduce or eliminate inference. Many cases where interference is thought to have occurred are traced to other problems causing loss of positive control such as flying too slowly. Component failure in either the transmitter or the airborne system can of course cause partial or total loss of control

If interference is observed to be at a greater level than normal, then the source should be identified and any necessary changes/precautions taken. Advice should be obtained from experienced modellers in the event that the problem cannot be identified or cured.

In the event of serious interference that could result in loss of control or a crash, then general flying, or at least use of that frequency, should cease until the source has been identified and the necessary actions taken.

Inference can be generated internally within a model. Examples of this are from metal surfaces rubbing together, electric motors used for powering the aircraft, servo motors, ignition noise from petrol engines, internal signal reflections, overloading of the receiver and many others. Suppressing the interference at the source, good layout, bonding metal items together, better receiver antenna installation or changed antenna or cable routing are all possible strategies for reducing the effect of interference. It is always good practice to have a significant bend in the receiver antenna, for example, by routing the antenna up to the tail fin and then down to the edge of the tail plane.

External sources of interference include other model transmitters, spurious signals from high power transmitters, mobile phones, external reflections, power lines and other legal users of the same frequency band. Identifying and eliminating the source is the best strategy but if the source is known and cannot be eliminated then flying either in a different direction or further from the source may assist.

Even though on a different frequency, another model's transmitter can cause interference within a receiver. A particular example is when another transmitter is much closer to the receiver than the controlling transmitter. For this reason it is good practice when a model needs to be recovered from an out landing, or a crash, that the transmitter be left either on the flight line or in the pits area rather than carried out to the model. This is because it might interfere with another flying model that gets near to it. Similarly care should be taken if transmitters are located at different points in the field such as at a separate helicopter area or during dispersed gliding locations. This is one of the reasons for the restrictions placed on 10 KHz operation in MOP013 Frequency Directive.

A receiver may show evidence of interference by being "swamped" by a nearby transmitter through the overloading of the front end of the receiver. If this happens with your own model the transmitter antenna should be retracted in the pit area. Pilots should avoid placing their transmitter antenna within two metres of another model when the transmitter antenna is extended and the transmitter is turned on.

The gain of the antenna systems used on both transmitters and receivers varies in different directions. If the transmitted signal has lower power in the direction of the model, or if the receiver antenna is not very sensitive in the direction of the transmitter, then loss of control can appear to be caused by interference. In fact it is the model going out of range at that point. In the event that a certain model always appears to suffer interference in a particular area of the model flying field, then it is more likely to be caused by loss of signal, due to the antenna system, than anything local to that small area. If such a problem is suspected, make sure that the transmitter antenna is not pointing directly at the model when flying near that area and try a different route for the receive antenna to see if it makes a difference.

## 3. INTERMODULATION

### 3.1 Brief Technical Background

Intermodulation is a problem that occurs when signals mix together in electronic circuitry and produces new signals that are usually unintended. Third order intermodulation produces spurious signals at frequencies of twice the first transmitter frequency minus the second frequency and twice the second frequency minus the first frequency. More simply, these are above and below the operating frequencies at spacings equal to the channel spacing of the two or more operating transmitters. Higher order intermodulation products occur with different mathematical combinations of frequencies. Thus, as one example, if two transmitters are operating at channels 631 and 635 then other signals, third order and above may appear at channels 639, 643, 647, and 627, 623, 619 and so on further away from the original signals. If sufficiently large signals are generated then they can interfere with receivers operating on these other frequencies. These spurious signals are generated in proportion to the strength of original signals and usually get lower in amplitude at frequencies further away from the operating frequencies.

### 3.2 Recommendation

In practice there is unlikely to be a practical problem if the physical separation of the transmitters on a flight line is keep to no less than a minimum of 2 metres. This is the distance that is recommended by M.A.A.A. In the event that this problem is suspected then move the transmitters further apart physically and see if the effect is reduced. It has been observed that occasionally an older transmitter has been more susceptible to generating these spurious signals. In theory, metal objects in close proximity to the transmitters can also contribute.

## 4. INTERMEDIATE FREQUENCY INTERFERENCE

### 4.1 Brief Technical Background

Potentially there is a problem with single conversion receivers operating at the top and the bottom end of the 36 MHz band. This is due to the Intermediate Frequency used in this type of receiver. Model radio control receivers usually have an Intermediate Frequency of 455 kHz. Internally within the receiver an interfering signal may be generated if two transmitters are operating at frequencies separated by 455 kHz. With channel spacing of 10 kHz this will not be an exact channel but in theory could be generated by the two channels on either side of the exact frequency. For example channel 611 could cause a problem with channels 656 and 657. There can only be a potential problem when two transmitters are using frequencies at the top and bottom of the 36MHz band. At other frequencies through the 36MHz band there cannot be a transmitter using a legal frequency that is 455 KHz away from the operating channel.

One version of the Silvertone © keyboard did double up the top and bottom of the band frequencies to enable the use of a single key to eliminate the possibility of another user utilising the potentially interfering channel. Without using this version of the keyboard it is possible to put additional keys in the keyboard as guard keys on the relevant frequency (s) at the other end of the band.

With modern equipment there is unlikely to be a practical problem.

**4.2 Policy**

At M.A.A.A. events, and those advertised interstate, the M.A.A.A. Council has decided that the overlapping keyboard arrangement, on top and bottom frequencies in the 36 MHz frequency band, is not permitted, even though modellers can still make an individual decision to use a guard key(s).

**4.3 Recommendations**

Based on field tests the M.A.A.A. does not recommend adopting the general practice of using an overlapping keyboard.

The M.A.A.A. does allow any modeller, who is concerned about the possibility of this issue affecting his model, to put a guard key(s) in the keyboard on the relevant frequency (s) at the other end of the band.

If anyone is specifically concerned about the possibility of their receiver being affected by Intermediate Frequency interference, then a simple test is possible. This is similar to that described In Annex E of MOP013 Frequency Directive No 5 for adjacent channels. They should arrange to have a transmitter operating on a frequency that is separated by either 450 or 460 kHz from their own, placed 2 metres away from their model with that transmitter aerial fully extended. They then push the aerial of their own transmitter down and walk away from the model. If they can walk 10 metres away and still have full control then this form of interference is not likely to be a problem with their receiver in flight.