AIRCRAFT RADIO INSTALLATION – MGL V6 and V10 COM RADIOS

Any installation occurs in three phases – Planning, Installation and Setup.

PLANNING

The planning phase involves such things as deciding where to mount the unit – on the panel or remotely - what facilities (features) you are going to use and how you are going to use them. And where are you going to mount the antenna.

For example, how many seats does your aircraft have – to decide how many positions/places are going to be needed on the Intercom? Would you like to be able to use an 'Isolate' facility on the Intercom to allow your passengers to talk amongst themselves while you do the flying in peace – and how would you like this arranged? Does your aircraft have a central stick requiring only one PTT or separate sticks for Pilot and Copilot that might need a PTT for each? Would you like to connect your MP3 player so that you can have background music while you fly? Are you going to connect any audio alarms or enunciators from an EFIS or engine monitoring system to the intercom so that you can hear them rather than just see them? How about controlling the radio from an EFIS?

There are many possibilities. We suggest you make a list of all your decisions. This will help when it comes to Setup time.

INSTALLATION

This is about how the Radio is going to be connected up when mounted in the aircraft.

WIRING
Wiring of the Radio to the rest of the aircraft electrical system includes three important details – *routing*, *grounding* and *shielding*.

Routing relates to how wires are positioned in the aircraft. Wires associated with the radio should not be run next to wires from other (electrically) noisy equipment such as the EFIS(s), Transponder, Servos, Strobes and so on. When wires are close together, noise can 'jump the gap' and spoil the performance (and sound) of the radio.
Never share a radio power supply or ground with an EFIS system. Keep the radios power supply and ground well separated from any digital equipment.

Ground wiring for the radio is VERY IMPORTANT. Both the V6 and the V10 include sophisticated internally mounted filters to protect against electrical noise on the positive supply lead. There is no way to provide such filtering for the negative supply lead or ground wire. Only good grounding techniques can help. The radio must have a 'quiet' ground. Thus the negative supply lead (or ground wire) should have its own connection to the negative pole of the battery or a dedicated "quiet" ground point that may only be shared with other electrical users that do not produce electrical noise on the ground connection.

Shielded wiring for all audio inputs and outputs is desirable. It is required for microphone inputs. For headset connections, jacks should be insulated from the airframe or panel either with insulating washers or by mounting them on a separate insulating plate. The ground side (sleeve) of each jack is then returned separately to the appropriate ground pin on the radio connector using shielded wire. This applies to both microphone and headphone jacks. Each jack – microphone or headphone – must have its own separate shielded wire. The shields must not be connected together at the jack ends of the wires, only at the radio end. Remember the noise that can 'jump the gap' – this can cause feedback in the intercom if separate shields are not correctly connected. Very undesirable. Serial communications and high level audio lines should also be shielded. In this case, the shields should only be connected at the radio end – again to the appropriate ground pin. All these shields are part of the ground wiring – all referred back to that all-important 'quiet' ground.
In a nutshell: Shields may only be connected to ground on one side. They must not be used to carry a signal or current.

MONO/STEREO issues

If you wire your V6 stereo outputs to a stereo headset socket - that works fine as long as your headset(s) are in fact stereo or at least use a stereo plug with one of the bands disconnected internally.
If you plug in a mono headset with a mono plug (tip and solid band) then you will be shorting the R+L output amplifiers in the radio together. This can cause distortion and generally unpleasant sound.

You have two possible solutions if you have to use mono headsets and have the V6 wired for stereo output:

a) At the socket, route each signal (L and R) through a 4.7 ohm resistor. This will ensure that the two amplifiers are not going to fight each other.
b) Route only one of the amplifiers to to socket (L or R does not matter) and leave the other one disconnected.

The V6 radios amplifiers do not have output resistors built in as the radio has been designed such that it can directly drive 8 ohm stereo speakers for base station operation. It is also common to use speakers in gliders.

ANTENNA
The antenna, its mounting and connecting coaxial cable is critical to the performance of the radio. It has a direct effect on the range for both transmission and reception.

As to type of antenna, we recommend one designed for aircraft usage. It is possible to use a simple whip antenna, but this must then be 'cut' for correct match and will only operate correctly over a limited part of the aircraft range of frequencies. An antenna designed for aircraft use provides correct operation over the full range of aircraft frequencies.

Where should you mount it? Have a look at similar aircraft. Talk to other owners. In general, it should have the best possible all round view of the horizon – whether above or below the body of the aircraft. Also, it must have a 'ground plane' – if it is not a dipole type. A ground plane is a metal surface (ideally) with a minimum diameter of about 1.3m (50inches) having the antenna mounted in the middle. This is easy in a metal aircraft. In aircraft of wooden and composite construction it is usually provided by a separate metal sheet. If your antenna manufacturer has recommended dimensions for the plate, follow them.

If your aircraft has digital instruments mount the antenna as far away as possible from these devices as they may radiate small amounts of interference that your radio can receive. This becomes more critical if your aircraft is made from wood or fibre glass which does not provide any form of shielding.

Coaxial cable to connect the antenna to the radio should be type RG400. RG58 is an acceptable substitute. If you make up the cable yourself – and even if you have it made up for you – an acceptable first test of the cable can use an ohmmeter. Test for continuity of each of the shield and the inner conductors end-to-end. Then, with the cable disconnected from the antenna, check that there is no connection (i.e. an open circuit) between the inner conductor and the shield. Ensure that your connections are secure and will not corrode over time resulting in bad performance in the future.

A full test of the complete antenna installation requires a directional power meter. A Bird Thruline Model 43 (with an appropriate 'slug') is a good example. An accepted standard is that returned (reflected) power is less than one tenth (10%) of outgoing (forward) power if the installation is operating correctly. This standard should be applied at both ends of the coax. At the radio end, forward power will indicate the output power of the transmitter – about 6-7 watts for both the V6 and the V10. At the antenna end, forward power will be less than at the radio end due to loss in the coax. It should still be more than 4 watts (for 6 watts output from the radio). For an aircraft antenna, reflected power should be less than 10% of this value for any frequency in the band – from 118MHz to 136.975MHz. Note that a check on reflected

power at the radio end will show even less than the 10% of 4 watts (or so) – again due to loss of the reflected power going back through the coax. The 10% reflected power criterion at the radio end is therefore not a true indication of satisfactory installation.

The antenna is a reciprocal device. What is good for transmission is also good for reception. So a satisfactory result for the reflected power test using the transmitter indicates that the antenna will also be working correctly for the receiver.

SETUP
Now is the time for that list you made so long ago during the Planning stage. Switch on the Radio and enter all the configuration settings.

After configuration, the FIRST ADJUSTMENT to make is MICROPHONE GAIN.

This is critical. The Intercom VOGAD/VOX cannot work properly if the Mic Gain is not correctly adjusted. If the gain is set very low, then the unit increases the gain automatically during transmit so that the signal 'sounds loud enough'. Of course, in order to hear the intercom it is natural to turn up the volume for the intercom. This means that the sidetone (during transmit) sounds too loud (the microphone sensitivity 'increases'). With the correct (higher) microphone gain the volume for the intercom will have a lower setting and the sound of the sidetone is now 'in balance' with the intercom. The microphone gain setting must be done by the user (according to how loudly he speaks) in the aircraft with his own headset.

If you have selected separate Mic Gains, they must all be adjusted. It is acceptable to use different makes of headset for each Intercom position but the Mic Gains must be adjusted correctly. In that case Headphone levels may need to be changed using the Headphone volume controls on each Headset. As described above, an indication that Mic Gain(s) has not been setup correctly is that the sidetone level (on transmit) is very different from the levels from the receiver and over the Intercom – i.e. the microphone sensitivity seems to change when going from Intercom/receive to transmit.

After setting Microphone gain everything else can be adjusted, starting with intercom/headphone volume and continuing through the likes of music and auxiliary input levels.

All methods of adjustment and possible configuration settings are explained in the Quick Reference Manual supplied with the radio. Also, the full Manual is available at www.mglavionics.co.za.

Quick tip: Microphone gain setting: If your microphone gain is set correctly, your voice level in the headsets (sidetone) will be the same regardless if you are transmitting or just speaking into the intercom. If the levels are not the same, you must adjust the microphone gain. The reason why the levels can be different is due to the digital modulator in the transmitter which tries to “fix” levels that are too soft or too loud. This makes the side tone during transmission a useful reference for adjusting the microphone level.

If microphone levels are too high you will find that VOX or VOGAD system cannot operate properly. For example you may have to increase the level setting on the VOX or VOGAD very high before it starts cutting out the background noise. This is because the level from the microphone is too high. If the level from the microphone is too low you will have to raise your voice before the VOX or VOGAD system will open, even with fairly low settings.

For a typical installation in a normal closed cockpit light sport aircraft a VOGAD setting of 3 – 4 using the VOGAD medium system is used. You can use this as a reference for your microphone level adjustment.

INTERFERENCE
The installation may be subject to interference.

Interference can only ‘get into’ the Radio via the antenna or the wiring. To find out which it is, disconnect the antenna from the back of the Radio. If the interference disappears then it is

coming in through the antenna and will have to be tackled at source. Of course, if it's only 'minor', just closing the Squelch a couple of tics will block it out without reducing receiver sensitivity too much. If it is coming through the wiring then revisit the Wiring discussion above.

MGL Avionics
2012/02/07