Airband Radio Operator Certificate Manual

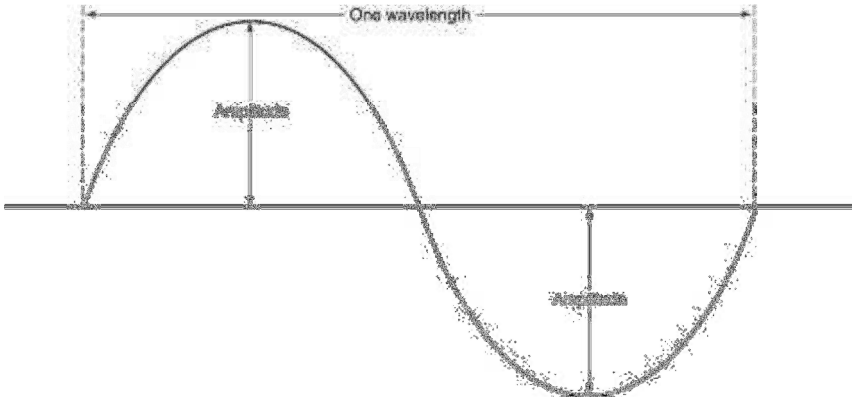
About the airband radio operator license

Very high frequency (VHF) airband radios are becoming more common as a tool for aircraft pilots to identify the location and intention of other aircraft in their vicinity (for VHF use at non-towered aerodromes see Civil Aviation Advisory Publication 166-1(0) and 166-2(0)).[i] In some classes of airspace the use of VHF airband radios is mandatory. Using a VHF airband radio requires a license endorsement. To obtain a VHF airband radio operators license you must satisfactorily (80% pass mark) complete both written and practical exams. This manual provides you with information regarding VHF airband radio use in Australia for the satisfactory completion of the written VHF airband radio operator examination.

Radio communications in Australian are controlled by the Australian Communications and Media Authority (www.acma.gov.au).

About the airband

Airband radios transmit and receive a radio frequency. Radios are set to transmit and receive on specific frequencies across a band of frequencies. The radio waves that are transmitted and received are base on wavelengths and amplitudes.



A **cycle** is one complete wave action. The **frequency, measured in Hertz,** is the number of cycles passing a given point in one second.

One cycle per second	= 1 Hertz (Hz)
1,000 Hz	= 1 kilohertz (KHz)
1,000 KHz	= 1 megahertz (MHz)
1,000 MHz	= 1 gigahertz (GHz)

The **wavelength** is the length of one cycle. The height of the peak or trough from the centreline is called the **amplitude**; the greater the amplitude, the stronger the signal. Signal strength reduces gradually with distance, or more quickly when the signal passes through a more solid barrier – this reduction is called **attenuation**. Amplitude modulation (AM) is where the amplitude of the signal is varied while its frequency remains constant. Frequency modulation conveys information over a carrier wave by varying its instantaneous frequency.

To give consistency across countries the International Telecommunications Union controls broadcasting in various frequency bands. These include:

HF (High Frequency)	3-30MHz
VHF (Very High Frequency)	30-300MHz
UHF (Ultra High Frequency)	300-3000MHz

Within the VHF band, aviation is assigned **118.00 to 135.95 MHz** for voice communication. Airband radios are AM radios. Many radios may either receive and/or transmit on the airband frequency but they need to be AM radios to receive and transmit to other airband radios. That is, radios that are FM radios do not work on the AM airband.
Other frequencies used for aeronautical work:

UHF CB radios- used mainly for retrievals and pilot-to-pilot communications. The HGFA has an allocated frequency (472.125MHz).

HF- used by the Flying Doctor Service.[ii]

VHF effective range (trike wattage)

VHF radios generally give good clear communication with very little distortion. They operate by 'line of sight', ie a straight line path through the atmosphere between sender and receiver (even if they can't actually see each other). Due to the curvature of the earth's surface and objects such as buildings and hills, the higher you are in the atmosphere, the further you can transmit. The table below gives fairly conservative range. When flying at low level (eg, during take-off and landing), terrain and buildings may obstruct the line of sight and reduce VHF signal quality and range.

Altitude (feet) above ground level	VHF range (aircraft to ground)
1,000 FT	40 NM
5,000 FT	90 NM
10,000 FT	120 NM

VHF frequencies

There are a range of different VHF frequencies that are used for different purposes. The whole of Australia is divided up into frequency boundaries for different classes of airspace. These different frequencies can be located on various aeronautical charts, such as ERSA, ERC and VTC.

In class G airspace from 0-3,000' AMSL the frequency is 126.7MHz (Multicoms).
In class G airspace from 3,000' upwards AMSL there is a specific frequency for each area. These areas and frequencies are shown on ERC and ERSA charts in green.
In class E airspace there is a frequency for each area. These areas and frequencies are shown on ERC and ERSA charts in brown.

Within 10nm of certified, registered and military aerodromes, as identified and published in ERSA, and any other aerodromes designated by CASA on a case by case basis, as published in ERSA or by NOTAM there is a Common Traffic Advisory Frequency- Radio: CTAF(R). These frequencies are also shown on ERC and ERSA.

As you move from one CTAF frequency to another just prior to the boundary look for identifying features on a map that has been measured prior to the flight and/or correlated with your GPS and switch your VHF radio to that frequency.

Some common use airband frequencies:

120.850	Sports aviation air to ground
121.500	Distress world wide
122.500	Glider operations
122.700	Glider operations
122.900	Glider operations
123.100	Search and rescue Australia wide
123.450	Air-to-air chat below 20,000'
126.350	Air-to-air chat above 20,000'

The most common frequency is 126.7 (Multicoms).

Calls and broadcasts

A **call** is a message sent to a single station, such as another aircraft or a control tower. A **broadcast** is a message intended for any station within range, for which an acknowledgement is not expected. A broadcast in the vicinity of an aerodrome starts with the location (aerodrome name), followed by the word 'traffic', and ends by repeating the location.
A **report** is a call or broadcast used to provide specific information (see Position Reports).

Radio language

VHF transmissions must be:
- related to aircraft operational needs
- in English (the international language for aviation)

and must NOT:
- be profane or obscene
- be false or intended to deceive
- involve improper use of callsigns, or
- involve social communication

Phonetic alphabet and numerals

Letters are spoken using the phonetic alphabet, eg PON is ***'Papa Oscar November'***.
Numerals are slightly altered to improve clarity; they need not be exaggerated, just spoken clearly as shown below. If radio reception is poor, a word can be spelled out letter by letter using the phonetic alphabet.
Learn these thoroughly. You can practice by reading car number plates aloud.

A Alpha	B Bravo	C Charlie	D Delta
E Echo	F Foxtrot	G Golf	H Hotel
I India	J Juliett	K Kilo	L Lima
M Mike	N November	O Oscar	P Papa
Q Quebec	R Romeo	S Sierra	T Tango
U Uniform	V Victor	W Whisky	X X-ray
Y Yankee	Z Zulu		
0 Ze-ro	1 Wun	2 Too	3 Tree
4 Fow-er	5 Fife	6 Six	7 Sev-en
8 Ait	9 Nin-er		
Decimal Day-see-mal	Hundred Hun-dred	Thousand Tou-sand	

Tranmission of numbers

All numbers used to transmit altitude, cloud height or visibility which contain whole hundreds and thousands are said using the words ***hundred*** or ***thousand***, eg:

Altitudes (ft)	800	***'Eight hundred'***
	1,500	***'One thousand five hundred'***
Cloud height (ft)	4,300	***'Four thousand three hundred'***
Visibility (m)	3,000	***'Three thousand'***

For all other numbers say each digit separately, eg:

Altitude (ft)	6,715	***'Six seven one five'***
Headings (towards)	180	***'One eight zero'***
Wind direction (from)	100°	***'One zero zero degrees'***
(always 3 figures)	020°	***'Zero two zero degrees'***
Wind speed (knots)	18KT, gusting 30	***'One eight knots, gusting three zero'***
Altimeter setting	1000	***'One zero zero zero'***
(or QNH)	1027	***'One zero two seven'***
Frequency	126.7	***'One two six decimal seven'***

Time is given in UTC (universal co-ordinated time). Say each figure separately, eg 55 minutes past the hour is ***'time five five'*** not *'fifty-five'*, 1400 is said ***'time one four zero zero'***. Say the minutes only, unless you are referring to a time more than an hour ahead; eg, if the time is now 0830, you would refer to 0850 as ***'time five zero'*** but 1050 as ***'time one zero five zero'***. Australian Eastern Standard Time (EST) is UTC+10 hours. Australian Eastern Standard (Daylight Saving) Time (EDT) is UTC+11 hours.

Standard words and phrases

These are used to avoid misunderstanding and reduce communication time. Greetings like 'good morning' are used sparingly, and best avoided if the channel is busy. If unsure of standard phrases use brief plain English. Never be afraid to speak just because you are not sure how to say something. Ask others to explain or ***'say again'*** if you did not understand. You should know the phrases in the table over the page.

Callsigns

An individual **callsign** identifies each ground station or aircraft using airband radio. A callsign will be a ground station name, a flight number or aircraft registration. Callsigns of Australian registered (VH) aircraft operating within Australia are the last three letters of the aircraft registration, preceded by the aircraft type. For aircraft/pilots registered with the HGFA the callsign for a hang glider pilot with a HGFA membership number 12345 is *'Hang glider two three four five'*. Ie the last four digits of the HGFA membership number is used.

A radio **call** begins with the callsign of the station being called followed by your aircraft type, your callsign and then the message, eg ***'Melbourne tower, Hang glider two three four five…'***

A **broadcast** in the vicinity of an aerodrome begins with the aerodrome name followed by the word 'traffic', then your aircraft type and callsign, eg ***'Corryong traffic, Hang glider two three four five…'***

A broadcast on an area frequency begins with 'all stations' followed by your aircraft type and callsign.

When reading back information to ATC, give the readback information first and finish with your callsign. To confirm you have received and understood a message, just give your callsign.

STANDARD WORDS AND PHRASES	
ACKNOWLEDGE	Let me know you have received and understood the message
AFFIRM	Yes
APPROVED	Permission granted for the proposed action
BREAK	I hereby indicate separation between parts of a message (used where there is no clear distinction)
BREAK BREAK	I hereby indicate separation between messages to different aircraft in a very busy environment
CANCEL	Cancel the previous clearance
CHECK	Examine a system or procedure (no answer normally expected)
CLEARED	Authorised to proceed under the conditions specified
CONFIRM	Have you correctly received the following…? *or* Did you correctly receive this message?
CONTACT	Establish radio contact with…
CORRECT	That is correct
CORRECTION	An error has been made in this message. The correct version is…
DISREGARD	Consider that transmission as not sent
GO AHEAD	Proceed with your message
HOW DO YOU READ?	What is the readability of my transmission?
I SAY AGAIN	I repeat for clarity or emphasis
MONITOR	Listen out on (frequency)
NEGATIVE	"No" or "Permission is not granted" or "That is not correct"
OVER or OUT	*not normally used in VHF transmissions*
READ BACK	Repeat all or the specified part of a message back exactly as received
RECLEARED	A change has been made to your last clearance and this new clearance supersedes your previous clearance or part of it
REPORT	Give me the following information
REQUEST	I would like to know or I wish to obtain
ROGER	I have received all of your last transmission (NOT to be used as readback or in place of AFFIRM) followed by the callsign of the aircraft sending the message
SAY AGAIN	Repeat all or the following part of your last transmission
SPEAK SLOWER	Reduce your rate of speech
STANDBY	Wait and I will call you
VERIFY	Check and confirm with originator
WILCO	Message received, I understand your message and will comply with it
WORDS TWICE	Please send every word or group of words twice as communication is difficult, *or* since communication is difficult I will send every word or group of words twice.

Operating the controls

This section is important for the practical exam. It is recommended to practise with a VHF radio handset. You can switch on, select a frequency and listen, but you must not transmit until you have an airband radio license and you are in the relevant aircraft .

The radio you use should be a **transceiver**, ie able to transmit as well as receive signals. A **scanner,** which is only able to receive a range of frequencies but cannot transmit, is sometimes used by a balloon crew to listen to the pilot's VHF broadcasts.
Before starting to use any VHF transceiver you should locate and be familiar with the:

Aerial –should be fitted before transmitting or the set may be severely damaged. A 'higher gain' aerial gives more transmitting power. The set will operate best in an upright position with the aerial clear of significant metal objects. If signals are unclear try transmitting from a different position. For permanently affixed antenna on microlights the best place for mounting is vertically above the king post.

ON/OFF switch – When ON, the radio is normally in **standby** mode, ie will receive incoming signals. Power use on standby is quite low compared with transmitting.

PTT (push to talk) or **talk switch** – Radios cannot receive and transmit at the same time, so this switch must be held down while transmitting a message and then released as soon as you finish speaking so that the set returns to standby (receive) mode. Be careful to avoid holding the talk switch down by mistake, for example by stuffing the radio in a tight pocket. If the switch is held down, the set will transmit a signal even if you are not speaking.

While you are transmitting, no-one else can use the frequency - and it is impossible to contact you. This potentially dangerous situation is known as 'open mike'.

Microphone – Locate the 'mike' and hold it close in front of your mouth. Some handheld radios may be supplied with a separate mike that plugs into the set.

Squelch (switch or knob) – To remove unwanted background noise known as static or 'hash', switch on the squelch switch. If there is a squelch knob, turn it *until the hash just disappears*, but not too far or it may also cut out the signal. If the signal is weak, it may be easier to understand without using squelch.

Note: if you leave a radio on standby with hash noise, it will flatten the battery quicker.

Frequency control – This may be a rotating switch, a set of separate switches for each digit, or a keypad. Some sets have options such as **preset** frequencies, frequency **lock** and **scan** facilities. Make sure you know how to use these, especially how to unlock them! Be able to change frequencies accurately and quickly when needed.

Power source – P**ilots are required to carry spare batteries or other power source for handheld VHF radios** (refer AIP GEN 1.5). Know how to change them if a low battery indicator shows or signals become weak. The **output** of a radio is a measure of the signal strength, usually expressed in watts (W).

Fuses – Some radios are fitted with a fuse. Know their location and how to change them if fitted (not usual in a handset type radio).

Getting started

Pre-take-off radio check-

Carry out points 1 to 4 below. If you hear another station transmitting this confirms that you are receiving. Do not carry out points 5 to 8 until you are required to make a call or broadcast:

1. Power on
2. Select frequency
3. Adjust the volume and squelch controls.
4. **Before transmitting, listen for a moment.** You may only interrupt if you have a distress or urgency call.
5. Hold the talk switch down, then wait a fraction of a second before speaking to avoid 'clipping' the start of the first word.
6. Pronounce each word separately and clearly, especially the end of each word.
7. Speak at a steady rate, if anything a little slower than usual.
8. Maintain a constant volume, do not shout or whisper.

A 'squeal' during transmission indicates that two stations are transmitting together.
You may lose part of a message and need to request the message again.

Do not use a radio without an antenna or within a confined space such as a hangar. In these cases the radio waves can feedback into the radio and damage it.

When is a radio required in a hang glider/paraglider/weightshift microlight – and which frequency to use?

Hang gliders and paragliders in private operations must carry and use a VHF radio as below:

Situation	**Frequency**	**What must you do**
Outside of controlled airspace- i) Within 10nm of a non-towered certified, registered, military or designated aerodrome and a height above the aerodrome that could result in conflict with operations at the aerodrome	Use the CTAF (on charts or in ERSA)	When inbound a few minutes from the 10nm boundary change to the CTAF(R) frequency. Maintain a listening watch, broadcast on entering at 10NM and then as necessary for operational safety and to avoid conflict
ii) In Class E airspace	Use the area frequency	Listen, and broadcast as appropriate

The ERSA provides a list of Australian aerodromes in alphabetical order with details of designation, location, runway orientation, facilities and VHF frequencies.

In exceptional circumstances there is provision for a pilot who is not qualified to use an aircraft radio, or where the aircraft is not equipped with a radio, to operate in the vicinity of a non-towered certified, registered, military or designated aerodrome. The aircraft must be operated in visual meteorological conditions by day and to arrive or depart in the company of another aircraft that is radio-equipped and flown by a radio-qualified pilot which will allow the latter to make radio calls on behalf of both aircraft. The radio equipped aircraft should be

manoeuvred to keep the no-radio aircraft at a safe distance (CAR 163) and in sight at all times in order to accurately report its position.

Message situations

Unclear messages: When you hear a transmission but cannot understand it clearly	Hang glider pilot:	'*Station calling Hang glider two three four five, say again'*
Radio check for readability: Readability scale: 1. Unreadable 2. Readable now and then 3. Readable but with difficulty 4. Readable but not perfect 5. Perfectly readable	Hang glider pilot: Tower: Hang glider pilot:	*'Canberra tower, Hang glider two three four five, radio check* *'Hang glider two three four five, reading you five',* *'Hang glider two three four five'*
Standby: If you can't respond immediately:	Hang glider pilot:	*'Standby Hang glider two three four five'*
Correction: After an error, use the word 'correction' before giving the right information	Hang glider pilot:	*'Hang glider two three four five climbing to two thousand Correction three thousand'.*

Broadcast a position report if you see or hear another aircraft

Position report includes: location and 'traffic' your aircraft type and callsign your position; your altitude; your heading your intentions repeat your location	 ***'Forbes traffic*** ***Hang glider two three four five two miles west at one thousand five hundred heading northwest for local flight Forbes'***

If you hear a broadcast indicating another aircraft is in your flight vicinity, but you can't see it you acknowledge the message reception by transmitting your call sign/number, your position, your height amsl and your intentions/heading.

To avoid confusion, say the location twice in the message. Remember the location refers to the **aerodrome**, not the town which may have the same name. Your distance and direction are always given **from the aerodrome** unless you specify otherwise.

Distance is said as ***'miles'***, meaning nautical miles. One nautical mile is approximately 1.8k.

If you see another aircraft and you wish to give your position relative to them give them your height amsl and position relative to their 'clock face'. That is, where they would look for you relation to them viewing an analogue clockface. For example, if you were flying a paraglider and saw a single winged Cessna plane on your right at 3 o'clock and you were at 4,000 feet amsl you would say "White Cessna, Paraglider two three four five calling white Cessna, I am at 9 o'clock at 4000 feet amsl, heading north".

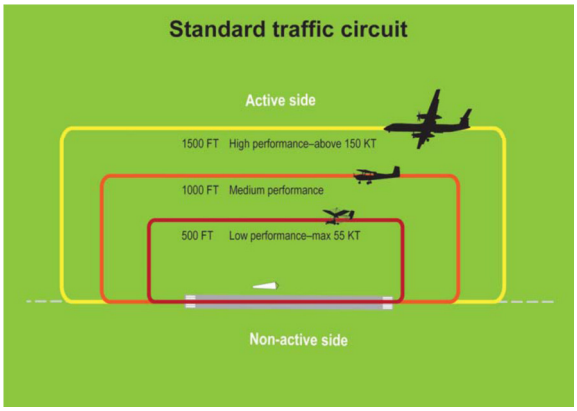
Operations (away from aerodromes)

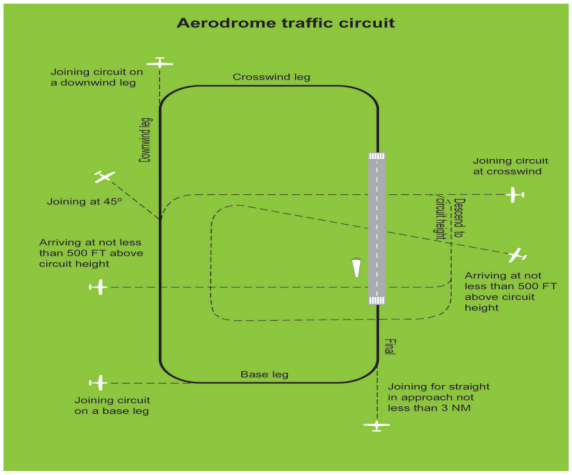
Maintain a listening watch on the **area frequency** (shown on aeronautical charts). Broadcast a position report if you see or hear another aircraft nearby, and respond to calls by other aircraft as appropriate to maintain operational safety. Remember the issue is to improve safety by alerting other aircraft to your location.

Operations in the vicinity of non-towered aerodromes (certified or registered aerodromes)[iii]

Within 10NM of a non-towered aerodrome use the **CTAF (common traffic advisory frequency)** shown for the aerodrome in ERSA and on charts. **If no CTAF is shown, use Multicom 126.7MHz**. Give a position report when taking off or entering within 10NM. After the initial report **only respond as appropriate to maintain operational safety and avoid conflict.** To be able to decide when it is appropriate to respond, you need to understand typical aircraft movements and the radio phrases used to describe them, to identify where other aircraft are and where they wish to go next. Remember the issue is to improve safety by alerting other aircraft to your location.

Standard aerodrome traffic circuit:





Joining a circuit on a base leg or a straight in approach (final established not less than 3nm from runway) ensure you will not conflict and give way to any other circuit traffic flying in the circuit patter, broadcast your intentions and know the wind direction and runway in use.

Check ERSA for circuit directions as some aerodromes are not the standard left-hand circuits.

If you plan to arrive at an unfamiliar aerodrome and you are unfamiliar with the aircraft flying there, the circuit direction or wind direction and speed, overfly the aerodrome not below 2000 feet AGL, descending on the non-active side and joining on the crosswind leg at the height applicable for your aircraft speed.

The most hazardous area in the vicinity of a non-towered aerodrome is within 5nm and up to 3000 feet AGL.

Uncertified or unregistered aerodromes where radio carriage is not mandatory unless required by the aerodrome operator or designated by CASA in indicated in ERSA by UNCR in the top right hand corner. Remember the issue is to improve safety by alerting other aircraft to your location so using a radio to achieve this is good practice irrespective of where you are in the sky.

CAR 166C requires a pilot to make a broadcast whenever it is reasonably necessary to do so to avoid a collision, or the risk of a collision, with another aircraft.
A broadcast must include:
• the name of the aerodrome (your location);
• the aircraft's type; call sign;
• call sign;
• the position of the aircraft;
• the pilot's intentions; and
• repeat the name of the aerodrome (your location)
Effective radio communication involves using standard aviation phraseology as detailed in the Flight Radiotelephone Operator Licence (FROL) syllabus and in AIP. Pilots are expected to maintain a listening watch and respond appropriately to applicable transmissions.

Examples of broadcasts on the CTAF (common traffic advisory frequency) in the vicinity of an aerodrome (Corryong):

<u>Entering 10nm of the aerodrome</u>	Hang glider pilot:	'*Corryong traffic, Hang glider two three four five, ten miles south west tracking north climbing to four thousand to overfly Corryong'*
<u>Before launching within 10nm</u> (Call again as soon as you climb out to advise 'airborne' in case the launch call was not heard)	Hang glider pilot:	*'Corryong traffic, Hang glider two three four five ready for takeoff four miles south east at Mt Elliot, tracking south not above eight thousand, Corryong'*
<u>Entering 10nm of the aerodrome</u> Respond to other traffic, if appropriate to maintain operational safety and avoid conflict	Hang glider pilot:	*'Corryong traffic, Hang glider two three four five, three miles north Corryong tracking south at four thousand, Corryong'.*
<u>Report landed</u>	Hang glider pilot:	'*Corryong traffic, Hang glider two three four five landed three miles south east Corryong'.*

When operating in the vicinity of non-towered aerodromes it is expected that all pilots make positional broadcasts including broadcasts immediately before, or during, taxiing, immediately before entering a runway, 10nm or earlier from the aerodrome, immediately

before joining the circuit and prior to joining other circuit legs. Remember the issue is to improve safety in the skies through the use of VHF radios.

Responses to your broadcasts

Normally a broadcast in the vicinity of an aerodrome will only get a response from another aircraft if that pilot considers it is necessary in order to maintain operational safety. A lack of response does not mean the pilot has not heard the broadcast.

Responding to a request by another aircraft or ground crew

When asked to give your position by another aircraft whilst in flight you should give your height amsl, your position in nautical miles as a magnetic compass bearing from a major feature (eg township or aerodrome).

Communication failure

If you are unable to establish or maintain VHF contact you should:

i) check your radio has power, then check the control settings and any connections.
ii) if still no contact, assume your transmitter is OK and prefix calls with 'transmitting blind' to indicate you are not receiving incoming signals.
iii) continue to transmit your position and intentions as appropriate to keep ATC or other aircraft informed- include 'transmitting blind' at the end of the broadcast.
iv) make a safe landing as soon as practicable if you are flying in an area where radio is required.
v) if another pilot or your retrieve crew can receive VHF, use your CB radio to check that your VHF transmitter is operating correctly and, in particular, is not "open mike".

Emergencies

Under international regulations for the use of aircraft radio, you must:
- assist persons in distress, and
- maintain radio silence on intercepting distress or urgency messages ('Mayday' or 'Pan') unless you are required to relay the message.

Pan Pan is used to signify that there is an urgency on board a boat, ship, aircraft or other vehicle but that, for the time being at least, there is no immediate danger to anyone's life or to the vessel itself. This is referred to as a state of urgency. This is distinct from a Mayday call, which means that there is imminent danger to life or to the continued viability of the aircraft itself.

Distress or urgency calls are first made on the frequency in use at the time. If this is unsuccessful use the **international VHF distress frequency 121.5 MHz** which is monitored by most airlines.

Distress call If no answer to a distress or urgency call, advise frequency change and then repeat your broadcast on 121.5 Mhz.	Hang glider pilot:	*'MAYDAY MAYDAY MAYDAY* <*station being called*> <*your callsign*> <*nature of distress*> <*intentions*> <*position, altitude, heading*> <*other useful information*>*'*
Urgency call	Hang glider pilot:	***'PAN PAN PAN PAN PAN PAN*** <*station being called*> <*your callsign*> <*nature of urgency*> <*intentions*> <*position, altitude, heading*> <*other useful information*>*'*

Relaying emergency calls On hearing an emergency call, stop transmitting and maintain radio silence. If a call is not answered, you should relay the call, i.e. pass on the details to someone who can assist further. If a call is addressed to 'all stations' you should be ready to respond and assist.	Hang glider pilot:	***'Mayday relay Mayday relay Mayday relay, Canberra Tower Hang glider two three four five, Cessna Kilo Alpha Papa reports engine failure making emergency landing two miles north Hall township. I have Cessna in sight will relay and report progress.'***

Using VHF radio for accessing QNH values for a particular aerodrome in Class G or Class E airspace

To obtain the QNH (height above mean sea level) for a particular aerodrome use the particular frequency given in ERSA for that particular aerodrome or contact the AWIS by telephone. The AWIS (aeronautical weather information service) is a service provided by the Australian Bureau of Meteorology.[iv] This service provides weather information for specific locations via a telephone recorded message or via select VHF frequencies. For some locations the weather information is regularly broadcast on the specified VHF frequency while others it requires a one second or three one-second transmit pulses to activate.

Using a VHF radio to provide an aircraft report (AIREP)

If you are flying and experience significant variations to forecast weather conditions it is advisable to issue an aircraft report. An AIREP normally consists of the aircraft's identifier, position (latitude, longitude, and altitude), date and time, flight level, ETA over its next reporting point, destination ETA, fuel remaining, and meteorological information. AIREPs are usually reported at intervals of 10 degrees longitude and are used primarily by airline class aircraft (class A) due to the increased tendency of these aircraft to fly at higher altitudes (i.e. better fuel efficiency).

Transponders

A transponder is a radio device fitted to many aircraft that allow a response from the device if it receives a radio-frequency interrogation signal. Flying in particular classes of airspace require transponders to be fitted and in operation. Aircraft have transponders to assist in identifying them on radar and other aircraft collision avoidance systems. A pilot may be requested to send out a transponder code (this is called a 'squawk'). The pilot selects the appropriate code on the transponder. For transponder code 1200 result in details of the aircraft location and identity to be transmitted to air traffic controllers. This code should be used in the vicinity of non-towered aerodromes. Transponders should be fitted to all aircraft entering controlled airspace, flying under instrument flight rules or more than 15nm offshore.

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[i] http://www.atsb.gov.au/media/2097901/ar2008044%281%29.pdf

[ii] http://www.flyingdoctor.org.au/Communications/HF-and-UHF-Radio-Frequencies/)

[iii] http://www.casa.gov.au/wcmswr/_assets/main/download/caaps/ops/166-1.pdf

[iv] http://www.bom.gov.au/aviation/data/about-us/AWIS_locations.pdf