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FLIGHT RADIO FOR GYROPLANES

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Preface

This booklet is a **basic** guide for gyroplane pilots wanting to understand the basics of very high frequency (VHF) air band radio.

The booklet outlines the characteristics of VHF transmissions, their advantages and limitations and some common equipment faults that may require troubleshooting by the operator.

Many types of VHF radio are used, so specific instructions on operating techniques for these various types are not included. Operators must use the specific handbook provided with their equipment and operate the equipment in accordance with that handbook.

CASA Regulations mandate using VHF radio in nominated situations; however, this booklet will not provide further information on this as it can be accessed in ASRA manuals and publications. Refer to Appendix 1 for information on how to access this information.

The requirements for the issue of and the privileges and limitations of an ASRA Radio Operator endorsement may be found in the ASRA Operations Manual.

Amendments may be required and should that be necessary, the booklet will be reprinted as a whole. Amendments must be agreed to by CASA prior to operational use.

Enquiries and suggestions regarding the content of this booklet should be directed to the ASRA Training and Safety Manager or the ASRA Operations Manager, whose contact information is documented in ***Gyro News*** and on the ASRA website at www.asra.org.au

General

a. Very high frequency (VHF) is the radio frequency that ranges from 30 MHz to 300 MHz. Within this range, frequencies or frequency bands are allocated for specific purposes. This allocation is the responsibility of the International Telecommunication Union (ITU).

b. The frequency band allocated for aviation communications is from 118.00 MHz to 136.95 MHz inclusive, with dedicated frequencies within this band allocated for specific purposes (e.g. 121.5 MHz is dedicated for emergency communications only).

c. The Civil Aviation Regulations state, in part, that the operation of radio communication equipment within the aviation band is only permitted by a person who holds a Flight Radiotelephone Operator Licence. Gyroplane pilots who operate such equipment in association with gyroplane operations are exempt from this regulation provided that they hold an ASRA-issued Flight Radio Endorsement. The holder of a Flight Radiotelephone Operator Licence may automatically be issued with an ASRA Radio Operator Endorsement.

Characteristics of VHF radio

a. VHF propagation characteristics are ideal for short distance communications, and have a range generally somewhat further than line of sight from the transmitter. The ionosphere reflects high frequencies (HF), but usually not VHF radio and thus transmissions are restricted to the local area and don't interfere with transmissions that are outside the nominal line-of-sight range of VHF. VHF is also less affected by atmospheric noise and interference from electrical equipment than lower frequencies. Although it is more easily blocked by land features than HF and lower frequencies, it is less affected by buildings and other less substantial objects.

b. VHF signals propagate under normal conditions as a near line-of-sight phenomenon. This results in VHF transmission range being a function of transmitter power, receiver sensitivity and distance to the horizon. However, the distance of the radio horizon is slightly extended over the geometric line of sight to the horizon. This is because radio waves are weakly bent back towards the earth by the atmosphere. The following formula gives an approximation of the line-of-sight horizon distance:

Dist (NM) = $\sqrt{1.5 \times Ht\ (ft)}$

where:
Dist (NM) is distance in nautical miles
Ht is the height of the transmitter above that of the receiver in feet

From this formula, for a transmitter that is located at 1000 ft AGL, its radio range will be approximately 38 NM; at 5000 ft the radio range will be approximately 86 NM.

Therefore, if the transmitter is significantly higher than the receiver, the radio range will be greater. Hence an airliner cruising at 35,000 ft AGL could expect a radio range of 229 NM.

NOTE: The increasing use of ground repeater stations and satellite relays will significantly increase the radio range of transmissions in a specific area.

Carrier Wave

a. To make voice transmissions, the carrier wave must be adapted. This is achieved using amplitude modulation (AM). This is completed automatically within the radio equipment and cannot be altered by the operator during normal operations.

Frequency Allocation

a. The broad frequency band for air band radio is allocated by the ITU, whereas State authorities allocate the specific frequencies within their areas of responsibility.

b. Two flight information regions (FIR) have been designated in Australia and are controlled by centres in Melbourne and Brisbane. Within these FIRs, flight information areas (FIA) with specific dimensions have been designated. FIRs merely define areas of responsibility for the controlling entity, whereas FIAs have specific frequencies assigned for use within them. Frequencies have been allocated so that their use in one FIA will not interfere with those in another.

c. The allocated frequencies mentioned above are shown on some aeronautical charts and are explained in Section 5.

d. In addition to frequencies being allocated for general use, they are also allocated for specific purposes Australia wide and should be used only for the purpose specified. Examples follow:

121.5 – Emergency use only. This frequency is monitored by some air traffic services (ATS) and by airliners during the enroute phase of their flights.

123.45 – Used for the exchange of operational information between individual aircraft. Not monitored by ATS.

126.7 – This MULTICOM frequency is allocated for use at non controlled aerodromes where a common traffic advisory frequency (CTAF) has not been designated. Standard transmissions should be made on this frequency to assist with the see-and-avoid collision avoidance principle.

Be aware that if the aerodrome is not marked on avigation charts, other pilots in the vicinity may be operating on the appropriate **area frequency**.

Aeronautical Charts

a. There are many aeronautical charts associated with aviation. This section deals only with those charts and publications that provide information pertinent to air band radio.

b. En route Supplement Australia (ERSA) provides information on radio frequencies to be used during operations in the vicinity of the listed aerodromes.

c. Planning Chart Australia (PCA) provides an estimate of flight information services range coverage at 5000’ and 10,000’.

d. Visual navigation charts (VNC) contain some radio communication data.

e. Visual terminal charts (VTC) are intended for use up to FL180 (flight level 180 or 18,000') and contain appropriate airspace and radio communication information. The legend on the front of these charts defines colour coding for listed frequencies.

f. Enroute Chart Low (ERC – L) provides information for operations below 20,000' and includes flight information service frequencies, control area and zone boundaries, FIA boundaries and some CTAF areas and frequencies.

Radio Equipment Operation – Normal

a. The following lists radio controls that are common to all types of VHF radios regardless of the manufacturer or model:

Power (PWR) switch connects the radio to its power source, that is, either internal or aircraft batteries. This switch may be incorporated into the volume control switch and can be referred to as the ON/OFF switch.

Volume switch controls the audio volume of the signals being received.

Squelch switch is a variable filter that filters out unwanted background noise allowing transmissions to be received clearly. Most are operated manually, however some units incorporate automatic squelch. The correct use of this switch will be explained in the applicable radio equipment handbook and operators must be familiar with its use.

Frequency selector is used to select the frequency that is desired or required. Later model radios are capable of selecting frequencies down to three decimal places.

Radio Equipment Operation – Non-Normal

a. The handbook applicable to the radio model being used will provide specific troubleshooting information. The following is a general guide for most types of equipment.

b. **No power to the radio**

Check that the internal battery (if fitted) is secure in its housing.

Check the condition of an external battery if used.

Ensure any radio or avionics master switch is in the ON position.

Check the operation of the ON/OFF switch.

Check that any fuses or circuit breakers in the power circuit to the radio are intact.

CAUTION. Some of the above checks may require using multimeter or similar equipment. Persons not familiar with the operation of this equipment should seek advice or assistance from a person with the appropriate knowledge.

c. **No acknowledgment of transmissions**

Check that the correct frequency is selected.

Check the positions of the volume and squelch controls.

Check that the antenna connections are secure.

Ensure that the transmission indicator (if fitted) indicates carrier wave generation.

Ensure that obstacles or transmitter position are not affecting the transmission or reception.

Select another frequency on which acknowledgment could be expected (an ATC control frequency).

d. **Other problems**

Reception sounds like all hash or squeals

Only one station should transmit at any one time. When two stations transmit simultaneously, the above often occurs. The transmission “Two in together” is often heard after such a conflict despite the fact that it is not a recommended transmission. However, if one transmitter is significantly more powerful than another, this transmitter may “drown out” transmissions from a lower powered one.

Loud squeal heard during transmissions

Most likely a problem with the antenna connections, location or applicability. This problem occurs mostly with hand-held radios that are adapted for use in aircraft. It may be necessary to discard the supplied whip antenna and use an after-market antenna designed specifically for Airband VHF, and re-positioned away from the handset and other metallic influences. Antennae must be tuned to specific frequencies for efficient operation. Antennae associated with Airband VHF are usually tuned to a mid-band frequency which is adequate for coverage within the remainder of the band. Using remote antennae often leads to problems with antenna location, the presence or absence of a suitable ground plane and tuning taking into account the length of the cable from the antenna to the radio set. Specialised equipment and knowledge is often required and a person possessing such knowledge and equipment may need to be consulted.

There appears to be a signal but no voice is heard

Often described by the transmission “Carrier wave only, no modulation”. This is most likely caused by a faulty microphone, press-to-talk switch or the wiring associated with these.

Radio Check Call

a. When conducting a radio check, preface the transmission with the station that you expect or would like to answer. For example, “Brisbane centre”, “Gyro twelve seventy seven” or “Alpha traffic”.

Following is an example of a radio check transmission: “Alpha traffic, gyro thirteen twenty six, radio check on one one eight decimal one”.

Always specify the frequency as a check to ensure the intended frequency is tuned. The expected reply would be “Gyro thirteen twenty six, Tecnam thirty nine seventy nine, readability five”.

Always acknowledge this transmission. For example, “Gyro thirteen twenty six, Roger”. (See Section 11 for correct pronunciation of letters and numbers).

b. The strength and readability of transmissions are described using numbers in accordance with the following scale:

Number	Meaning
1	Unreadable
2	Readable now and then
3	Readable but with difficulty
4	Readable
5	Perfectly readable

e.g. “Strength 5, readability 3” means the signal is strong but the transmission is difficult to read.

Standard Phraseology – Normal

a. Standard phraseology is used in aviation to shorten radio transmission. There may be situations where a standard phrase or word has not been assigned. In this case, plain English should be used, speaking clearly and slowly using a minimum number of words. The following lists some standard phrases and their meaning:

Standard phrase	Meaning
Acknowledge	Confirm that my message has been received and understood.
Affirm	That is correct / Yes.
Break	This transmission is being interrupted to address another station.
Break, Break	I hereby indicate separation between messages to different aircraft.
Contact	Call (nominated station) on (nominated frequency).
Copied	I have received and understood the transmission.
Correction	The following information corrects an error in my last transmission.
Disregard	Take no notice of my last transmission.
Do you read	Are you receiving my transmissions?
Expedite	Please act as quickly as possible.
Go ahead	Proceed with your transmission.
How do you read	What is the signal strength and clarity of my transmission?
Inbound	I am intending to land at (nominated airfield).
Joining crosswind	I will enter the circuit for the nominated runway on the crosswind leg.
Joining downwind	I will enter the circuit for the nominated runway at the beginning of the downwind leg.
Joining mid-downwind	I will enter the circuit for the nominated runway midway between the beginning and end of the downwind leg.
Leaving	I am about to leave (nominated altitude) or I am on descent and have left (nominated altitude).
Maintaining	I am maintaining (nominated altitude).
Monitor	Listen out on (nominated frequency).
Negative	That is incorrect / No.
Overflying	I am overflying a (nominated position) at (nominated altitude).
Radio check	I'm requesting a report on the signal strength and clarity of my transmission.
Reading you (X)	I am receiving you at strength (X).
Relaying for	I am relaying a transmission from (nominated station).
Report	Make a report in accordance with my following transmission.
Request	I require an answer to my following request.
Roger	I have received and understood your transmission.
Say again	Repeat your last transmission.
Say again all after	Repeat your last transmission after (nominated word or phrase).
Say again slowly	Repeat your last transmission slowly.
Standby	Please wait for my next transmission.
Turning downwind	I am in the circuit, about to turn downwind.
Wilco	Message received, understood and will be complied with.

NOTE: Some of the above phrases may not be recommended by the AIP, however, they are in common use and the meanings should be understood.

b. Positional broadcasts

In the vicinity of a non-controlled aerodrome, a pilot **must** make a broadcast when he is in a situation where he becomes aware of a potential conflict between his aircraft and another.

The following broadcasts are recommended at all times:

- During taxiing or before takeoff
- Inbound to an aerodrome, at least 10 NM from the aerodrome, or further for high-performance aircraft, or at busy aerodromes.
- Overflying or in the vicinity of, but not landing at a non-controlled aerodrome.

The following broadcasts may be used if there is traffic in the area that may benefit from this additional communication:

- Entering a runway
- Joining the circuit
- Making a straight-in approach, not less than 3 NM from the runway threshold
- Joining on base leg
- During an instrument approach. Either when established at the final approach fix or when commencing the missed approach
- Once clear of the active runway

The standard broadcast format is;

a. {Location} Traffic
b. {Aircraft type}
c. {Callsign}
d. {Position/level/intentions}
e. {Location}

Non-essential chat must be kept to a minimum to avoid frequency clutter.

Following are examples of positional broadcasts that are recommended at **all** times and should be considered mandatory **at certified and registered aerodromes**:

POSITION	BROADCAST
During taxiing or before takeoff	“Bathurst traffic, gyro ninety-one twenty-two (G 9122), taxiing Bathurst for circuits, runway one seven, Bathurst”
Inbound (before 10 NM)	“Bathurst traffic, gyro ninety-one

	twenty-two, one one miles north, one thousand five hundred, inbound, ETA (25), Bathurst"
Overflying or in the vicinity of a non-controlled aerodrome, but not landing there	"Bathurst traffic, gyro ninety-one twenty-two, one one miles south east, two thousand five hundred, overflying for {destination or next turning point} Bathurst"

Following are examples of positional broadcasts that may be useful at non-controlled aerodromes, if there is traffic in the area that may benefit from this additional communication.

POSITION	BROADCAST
Entering a runway	"Bathurst traffic, gyro ninety-one twenty-two, entering, rolling runway one seven, for circuits, Bathurst"
Joining the circuit	"Bathurst traffic, gyro ninety-one twenty-two, joining crosswind (downwind), runway one seven, Bathurst"
Making a straight-in approach nit less than 3 NM from the threshold	"Bathurst traffic, gyro ninety-one twenty-two, three-mile final straight in, runway one seven, Bathurst"
Joining on base leg	"Bathurst traffic, gyro ninety-one twenty-two, joining base, runway one seven, Bathurst"
During an instrument approach, either when established at the final approach fix or when commencing the missed approach	"Bathurst traffic, gyro ninety-one twenty-two, conducting a missed approach, runway one seven, tracking to the west, climbing to {altitude}, Bathurst"
Clear of the active runway(s)	"Bathurst traffic, gyro ninety-one twenty-two, clear of runway one seven, Bathurst"

When at or in the vicinity of non-controlled aerodromes that have not been assigned a discrete frequency, **use 126.7**. Be aware that if the aerodrome is not marked on avigation charts, other pilots in the vicinity may be operating on the appropriate **area frequency**.

Standard Phraseology – Emergency

a. The phraseology used in emergencies has been standardised so as to indicate the seriousness of the emergency, and to provide the information necessary to allow the authorities to effect rapid search and rescue operations.

b. There are two types of emergencies that have been allocated specific phraseology, these being distress and urgency. The declaration of an emergency indicates that the pilot in command considers that the aircraft or its occupants are in actual, imminent or potential danger. Where the pilot in command considers that there is actual or imminent danger to the operation, his declaration of the emergency should be a Distress Message. Where there is a potential danger to the operation, an Urgency Message would be applicable. The declaration of any emergency is not irreversible and the declaration may be withdrawn by the pilot in command at any time. In this case, contact with the appropriate authorities should be initiated as soon as possible after the event.

c. Situations where a Distress Message is applicable include but are not limited to: engine failure, propeller failure, air-frame failure, mid-air collision, engine or cabin fire, pilot incapacitation, passenger incapacitation. A Distress Message should follow the following format:

"MAYDAY" (spoken three times)

"<aircraft callsign>" (spoken three times)

State position …

State nature of the emergency …

State intentions of the pilot in command …

For example:

"MAYDAY, MAYDAY, MAYDAY, gyro twelve twenty four, gyro twelve twenty four, gyro twelve twenty four, four miles west Bathurst, engine failure, landing in ploughed paddock, two POB".

Also provide any other information that may facilitate the early location of the aircraft and rescue of the occupants.

NOTE: It is vital that control of the aircraft is not compromised in an attempt to transmit a Distress Message.

A station that receives a Distress Message may request additional information (e.g. persons on board), which should be provided if possible.

A MAYDAY call takes priority over any other transmission without exception.

d. Situations where an Urgency Message is applicable include but are not limited to: partial engine failure, abnormal air-frame vibration, abnormal control response, insufficient fuel to reach a recognised airfield or landing area, deteriorating weather conditions, insufficient daylight to complete the operation, unsure of position, navigational assistance required. An Urgency Message should follow the following format:

"PAN, PAN" (spoken three times)

"<aircraft callsign>" (spoken three times)

State position …

State nature of emergency …

State intentions of pilot in command …

State number of persons on board (POB)…

For example:

"PAN PAN, PAN PAN, PAN PAN, gyro twelve twenty four, (gyro twelve twenty four, gyro twelve twenty four), three miles south east Bathurst, rudder control failure, attempting forced landing on bitumen road, one POB".

NOTE: Requests for additional information may be received and such information should be provided, if doing so will not compromise control of the aircraft. An urgency situation may be upgraded to one of distress at any time.

Prohibited Messages

Radio operators are **strictly prohibited** from sending messages:

a. containing profane or obscene language
b. of a deceptive or false nature
c. involving the improper use of the call sign of another aircraft
d. that do not pertain to operational requirements
e. of a personal nature.

Phonetic Alphabet and Numbers

a. Letters and numbers when used in aviation transmissions should be pronounced in accordance with the following table:

A	Alpha	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa (Pap Ah)
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliet	W	Whisky
K	Kilo	X	Xray
L	Lima (Leema)	Y	Yankee
M	Mike	Z	Zulu
0	Zero	5	Fife
1	Wun	6	Six
2	Too	7	Seven
3	Tree	8	Aight
4	Fower	9	Niner
Decimal	Dayseemal	100	Wun hundred
1000	Wun tousand	1500	Wun tousand fife hundred
10,000	Wun zero tousand		

Date and Time System

a. Universal Coordinated Time (UTC) is used for all date/time references in aviation. This replaces the former Greenwich Mean Time (GMT) which was referenced to the longitude of the city of Greenwich in the UK. Locations east and west of this datum are divided into fifteen degree time zones. Each time zone differs from the datum by one hour. Zones to the east of the datum are UTC plus the appropriate adjustment. Zones to the west are UTC minus the appropriate adjustment.

b. Three time zones span the Australian mainland—Western Standard Time (WST), Central Standard Time (CST) and Eastern Standard Time (EST). As all Australian time zones are east of the datum, WST is UTC plus 8 hours, CST is UTC plus 9 ½ hours and EST is UTC plus 10 hours. During daylight saving, the adjustment is increased by one hour respectively. For example, 0500 UTC is 1500 EST, except during daylight saving periods when 0500 UTC is 1600 EST.

c. In aviation-related documentation, the date/time group is mostly depicted as month, day and time on the 24-hour clock. Thus, 03031930 indicates 30 minutes past 7 PM on March 3rd, UTC. Applying the adjustments for the standard times listed above, the local time in WST would be 30 minutes past 3 AM on March 4th. Local time in CST is 5 AM on March 4th and local time in EST is 30 minutes past 5 AM on March 4th. It is vitally important that this system is adhered to, especially for aircraft transiting between time zones. Be aware that some documentation depicts the date/time group as a 10-digit group where the first two digits refer to the year e.g. 1403031930

d. It is usual to transmit only the minutes of a date/time group except where the time being transmitted is more than one hour from the present time. For example:

(1) The present time is 0016 UTC. “Kilcoy traffic, gyro seven zero seven, seven miles south, inbound, ETA two five, Kilcoy”.

(2) The present time is 0147 UTC. “Blackbutt traffic, gyro seven zero seven, position, Blackbutt at four seven, two thousand five hundred, estimating Wondai at 0251”.

Search and Rescue

a. The purpose of the Search and Rescue (SAR) organisation is to provide assistance to aircraft in distress and to search for, provide aid to, and organise the rescue of survivors of aircraft accidents and forced landings.

b. Airservices Australia is responsible for providing SAR alerting and in-flight emergency response service. The Joint Rescue Coordination Centre (JRCC) Australia is responsible for the conduct of SAR for missing aircraft, aircraft reported crashed and emergency locator transmitter (ELT) searches within the region under Australian jurisdiction.

c. Emergency phases. All ATS Units have been designated as alerting posts and are responsible for the declaration of the appropriate emergency phase. The three (3) phases of emergency situations are: Uncertainty Phase, Alert Phase and Distress

Phase. For information on the situations for which these phases may be declared, refer to AIP Australia Chapter GEN 3.6.

d. The efficacy of any SAR action is directly related to the amount and accuracy of details notified and to any position details reported in flight. When notifying of in-flight difficulties, early advice and the degree of apprehension felt by the pilot will enhance the assistance which can be provided by the ground organisation.

e. An ATS unit can provided a “watch” over the safe conduct of a flight. This is known as a SARWATCH and in gyroplanes it is most commonly activated by the pilot contacting the appropriate ATS unit by radio and nominating a SARTIME. A SARTIME is a time nominated by the pilot (in UTC) which is usually some time after the planned ETA at a destination. If by the expiration of the nominated SARTIME, the ATS unit has not had contact with the gyroplane, standard procedures are followed that may result if one or all of the emergency phases being declared as appropriate. Where a pilot has nominated a SARTIME, it is vital that an ATS unit is advised of the safe arrival of the gyroplane at its destination prior to the expiration of the SARTIME.

An example of a transmission cancelling a SARTIME is:

“Brisbane centre flight watch, Gyro ten twenty-one, landed Kilcoy, cancel SARTIME.”

Where there is doubt that the gyroplane will arrive at its destination before the expiry of the nominated SARTIME, the pilot should contact an ATS unit and amend the SARTIME to one later than the planned new arrival time.

Where a pilot is unable to cancel a SARTIME due to equipment failure, an ATS unit must be contacted as soon as possible after landing to advise of the safe arrival. This contact may be via telephone or by using the radio of another aircraft that is on the ground.

Appendix 1

For information on:	Refer to:
Mandatory broadcasts	ASRA Guide to Flight Rules and Procedures (as amended) https://asra.org.au/download_file/view/67/209
Call signs	ASRA Operations Manual Section 4.02 – 1 (as amended) https://asra.org.au/download_file/view/120/209 and AIP Gen 3.4 – 18 para 4.14 (as amended) https://www.airservicesaustralia.com/aip/aip.asp
VHF	http://en.wikipedia.org/wiki/VHF