Australian Government
Civil Aviation Safety Authority

CASA Guidance on Acceptable ECG Variations for DAMEs and Assessors

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This document becomes an uncontrolled document when printed.

This document contains guidance material intended to assist CASA officers, delegates and the aviation industry in understanding the operation of the aviation legislation. However, you should not rely on this document as a legal reference. Refer to the civil aviation legislation including the Civil Aviation Act 1988 (Cth), its related regulations and any other legislative instruments—to ascertain the requirements of, and the obligations imposed by or under, the law.

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Glossary

Acronyms and abbreviations

Acronym / Abbreviation	Description
AEB	Atrial ectopic beat
AME	Aviation medical examiner
AMS	Aviation Medicine Section (UK CAA)
AV	Atrio-ventricular
AVNRT	Atrioventricular nodal reentrant tachycardia
BPM	Beats per minute
CASA	Civil Aviation Safety Authority
ECG	Electrocardiogram
FAA	Federal Aviation Administration
IRBBB	Incomplete right bundle branch block
LAD	Left axis deviation
LAFB	Left anterior fascicular block
LBBB	Left bundle branch block
LVH	Left ventricular hypertrophy
RBBB	Right bundle branch block
PAC	Premature atrial contraction/complex
PVC	Premature ventricular contraction/complex
SVE	Supraventricular ectopic beats
VE	Ventricular ectopics
VPB	Ventricular premature beat
WPW	Wolff-Parkinson-White (WPW) syndrome

Definitions

Term	Definition
PR	The PR interval is the time from the onset of the P wave to the start of the QRS complex.
QRS	QRS complex includes the Q wave, R wave, and S wave.
QT	QT interval represents the duration of ventricular electrical systole, which includes ventricular activation and recovery.
RSR	The RSR pattern represents a delay in activation within the basal part of the right ventricle (RV).
ST	The ST segment encompasses the region between the end of ventricular depolarization and beginning of ventricular repolarization on the ECG.

Revision history

Amendments/revisions of this guide are recorded below in order of most recent first.

Version No.	Date	Parts/Sections	Details
1.0	Aug 2023	All	First issue

1 CASA Guidance on ECG Variations

1.1 Scope

The purpose of this document is to ensure consistent evaluation of ECGs in Aviation Medical Assessments to enable accurate aeromedical risk assessment.

This guidance material aims to provide comprehensive guidance to Designated Aviation Medical Examiners (DAMEs) and Assessors regarding acceptable variations in electrocardiogram (ECG) results and a sample of abnormal ECG findings.

The document assists in promoting consistent evaluation and interpretation of ECGs during aviation medical assessments, ensuring aviation professionals' health and safety while maintaining regulatory compliance.

DAMEs are expected to assess any ECG findings (whether triggered by routine age-related requirements or when an ECG has been conducted for other reasons) as either Normal/Acceptable CASA ECG aviation or Abnormal.

1.2 Responsible Parties

This document is for use primarily by CASA and delegates such as DAMEs.

2 Acceptable ECG Variations

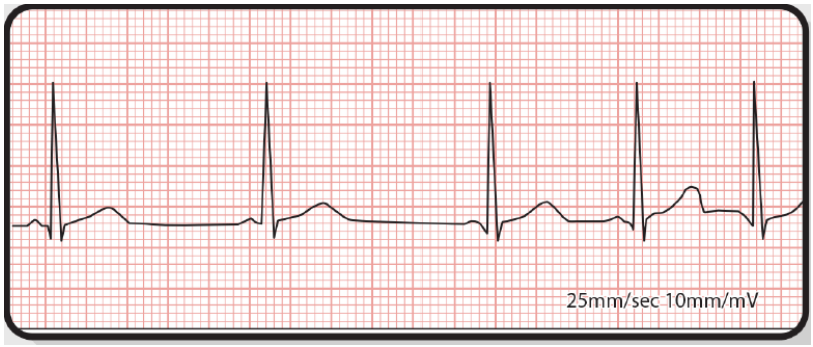
2.1 Purpose

To provide DAMES and Assessors information on aeromedically acceptable ECG variations that will normally be accepted without any additional investigations.

2.2 Variations

2.2.1 Sinus arrythmia

Sinus Arrythmia is a normal variant



2.2.2 Early repolarisation

(Defined as appearance of a J wave on a normal heart heat pattern)

Early repolarisation appears as elevation of the J point of ST where the ST segment is concave up. It is more prevalent in younger persons.

2.2.3 First degree AV block with PR interval <210ms.

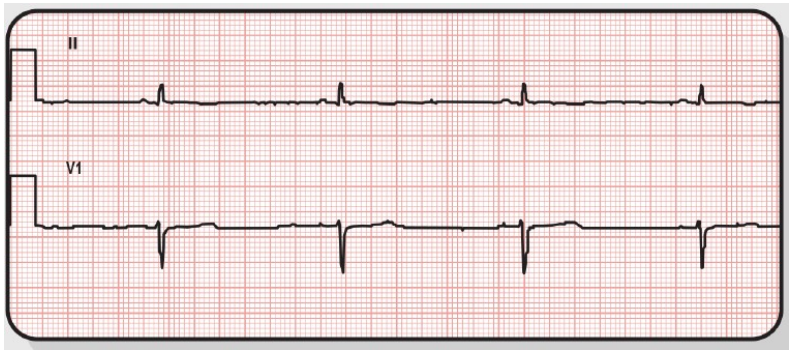
Note: FAA guidance to <300ms if no other findings in a healthy pilot – may seek Cardiologist input if unsure.

2.2.4 Sinus bradycardia

Sinus bradycardia is a normal variant if the pilot is 49 or younger, and their heart rate is greater than 44 beats per minute.

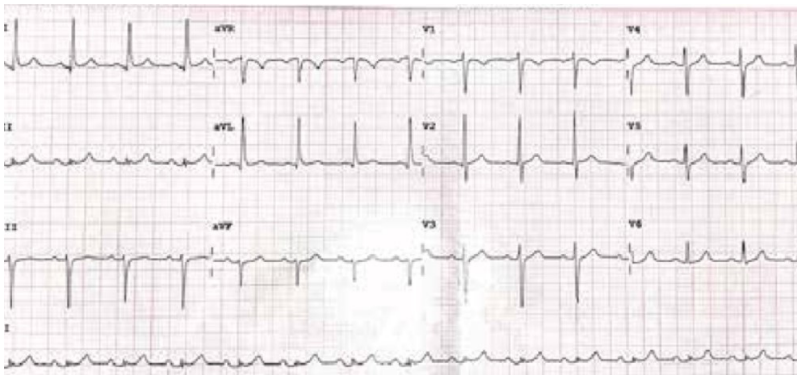
At age 50 and older, their heart rate must be greater than 48 beats per minute.

Note: Sinus bradycardia can pass if >44 bpm in under 50 yrs age OR pulse is normal in medical. (Between 45-100)



2.2.5 Left axis deviation

Left axis deviation (less than or equal to -30 degrees and QRS<120 ms)

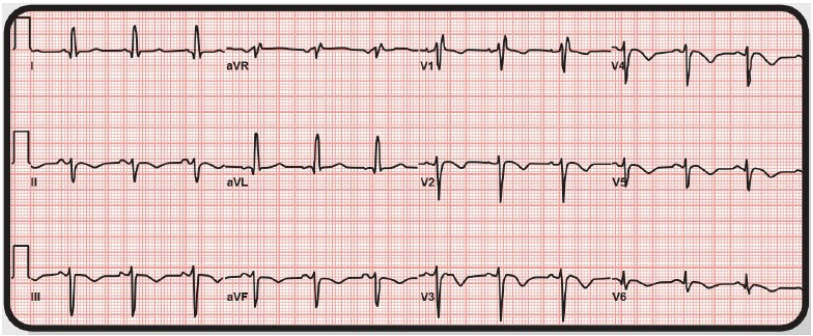


2.2.6 RSR V1/V2 or Incomplete right bundle branch block (Incomplete RBBB)

RSR V1/V2 or Incomplete right bundle branch block (Incomplete RBBB) with QRS <120ms

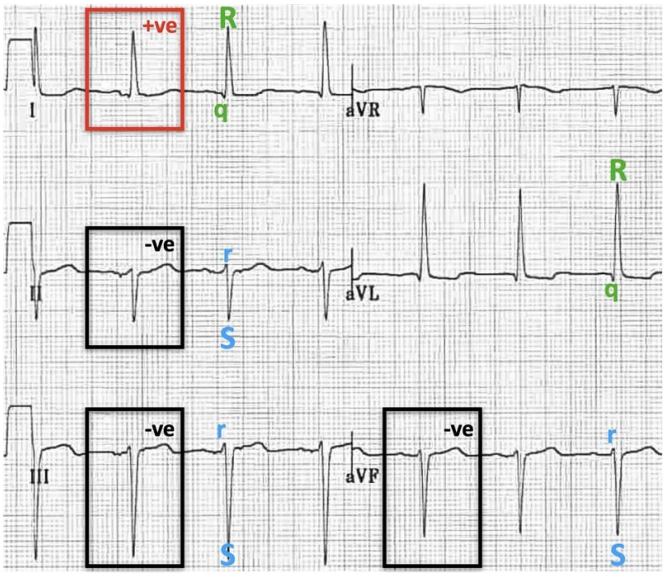
An incomplete right bundle branch block is an RSR pattern that is 0.10 to 0.11 seconds, or stated differently, is a QRS complex during less than 0.12 seconds.

This is quite common in healthy people.



2.2.7 Left anterior fascicular block (LAFB) or left axis deviation

Left anterior fascicular block (LAFB) or Left Axis Deviation (with no changes to previous ECGs cleared by Cardiologist)



2.2.8 Isolated (single) premature beat

(1 atrial ectopic beat (AEB) or premature atrial contraction/complex (PAC) or VPB (ventricular premature beat) / PVC (premature ventricular contraction/complex) on 12 lead ECG)

Single Premature Ventricular Contraction

A single premature ventricular contraction (PVC) is a normal variant. However, two or more PVCs on a 12 lead ECG would require a workup.

2.2.9 Wandering atrial pacemaker

A wandering atrial pacemaker looks similar to ectopic atrial rhythm, depending on the interpretive output of your diagnostic equipment.

2.3 Additional guidance

The CAA NZ &FAA information provided below is for information on how other jurisdictions might work up these issues. Please note CASA guidance is the rule to be enforced. If in doubt refer to CASA Avmed.

Please see NZ CAA ECG guidelines.

Please see UK CAA Abnormal ECG guidelines

Please see FAA ECG guidelines

Please see FAA Guide for Aviation Medical Examiners

3 Unacceptable/abnormal ECG variations

3.1 Purpose

Abnormal ECG findings that may disqualify a pilot from aviation duties and require clearance by CASA are below. **This is not an exhaustive list and a general guide.**

The UK abnormal ECG guidelines may assist on how other jurisdictions might work up these issues. **Please note CASA guidance is the rule to be enforced. If in doubt refer to CASA Avmed.**

3.2 Abnormal ECGs

3.2.1 Atrial fibrillation

This is an irregular and often rapid heart rate that can cause dizziness and fatigue and increase the risk of stroke and other cardiovascular complications.

Refer to the Clinical Practice Guidelines here

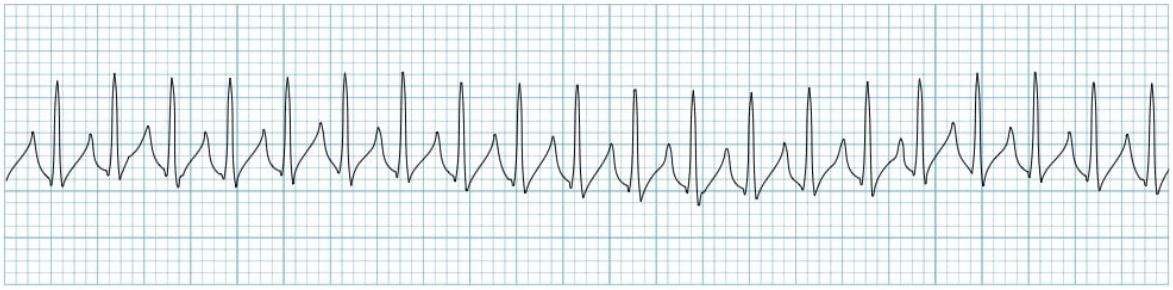
3.2.2 Atrial flutter

This is a regular and often rapid heart rate that can cause dizziness and fatigue and increase the risk of stroke and other cardiovascular complications. May convert to Atrial Fibrillation

3.2.3 Supraventricular tachycardia

This a regular and often rapid heart rate that can cause distracting palpations and fatigue. There are many types – refer link here for further details,

One example of SVT below:



3.2.4 Brugada syndrome

Brugada Syndrome is a genetic condition that can cause life-threatening arrhythmias and sudden cardiac death.

3.2.5 Wolf Parkinson White syndrome

Or any of Preexcitation syndromes

3.2.6 Ventricular tachycardia (VT)

VT is a rapid heart rhythm originating from the ventricles, which can be life-threatening if not treated promptly.

3.2.7 Bundle branch blocks (BBBs)

Complete left bundle branch block (LBBB) can indicate electrical conduction abnormalities and may warrant further evaluation. New Right Bundle Branch Block will require further investigation.

3.2.8 High-degree AV blocks

Second-degree Mobitz II AV block or third-degree AV block can be serious conduction disturbances requiring evaluation and treatment.

3.2.9 Complete heart block

Complete heart block refers to a condition where there is no conduction of electrical signals between the atria and ventricles, leading to a slow and potentially unstable heart rhythm.

3.2.10 Prolonged QT interval

A prolonged QT interval on the ECG may indicate an increased risk of life-threatening arrhythmias, such as Torsades de Pointes.

3.2.11 ST-segment abnormalities

ST-segment elevations or depressions can be signs of cardiac ischemia or injury, indicating potential coronary artery disease or heart attack.

3.2.12 Ventricular fibrillation (VF)

VF is a chaotic, disorganized rhythm that results in the heart's inability to pump blood effectively and is a medical emergency requiring immediate resuscitation.

4 Investigations required for abnormal ECGs

4.1 Direction

CASA Avmed will review all abnormal ECGs and provide specific case by case guidance as to next steps.

For overall guidance please refer to the Clinical Practice Guidelines here.