
DOCUMENT
**GSM-AUS-CPL.001**

DOCUMENT TITLE
# INSTRUMENT RATING

# CHAPTER 8 – NAVIGATION REQUIREMENTS

Version 2.0
December 2017

CONTENTS ..... PAGE

# NAVIGATION REQUIREMENTS

## 8.1 Flight under the IFR

An aircraft operating under the IFR *(ATC AU506)* must be navigated by:

- A full time licensed flight navigator
- An approved self-contained navigation system, or approved long range radio navigation system
- Use of a radio navigation system or systems on routes where, after making allowance for possible tracking errors of ± 9° from the last positive fix, the aircraft will come within the rated coverage of a radio aid which can be used to fix the position of the aircraft. The maximum time interval between positive fixes must not exceed 2 hours.
- Visual reference to the ground or water by day, on route segments where suitable en route radio navigation aids are not available, provided that weather conditions permit flight in VMC and the visual position fixing requirements of JEPPESEN ATC-GENERAL FLIGHT PROCEDURES are able to be met.

**Note:** Area navigation systems may only be used as the primary means of navigation if the system installed in the aircraft has been approved by the CASA and the pilot-in-command operates the system in accordance with the terms of this approval

## 8.2 Time

During flight pilots must maintain a time reference accurate to within ± **30 seconds.**

*(ATC AU507)*

## 8.3 Track Keeping

Tolerances are applied to tracks to assess containment areas for the purposes of ensuring navigational integrity, separation from other aircraft, terrain and obstacle clearance, and avoidance of specified airspace. Although allowing for the errors inherent in the navigation systems used, these tolerances are based on the assumption that the pilot will maintain track as closely as possible. *(ATC AU507)*

The pilot in command must, at all times, take positive action to regain track as soon as a deviation from the correct track is recognized.

When using radio navigation aids as the primary means of navigation:

- The aircraft must be navigated by reference to the aid which provides the most precise track guidance with which the aircraft is equipped and the pilot is qualified to use; and
- Only those aids which specifically define the relevant track must be used for track keeping.

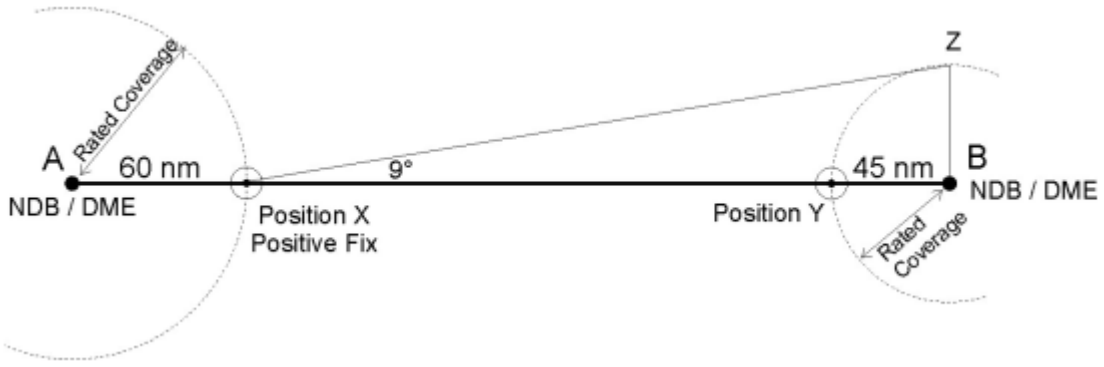
The order of precision is **Localizer, GNSS, VOR and NDB.**

Referring to paragraph 8.1 to the third bullet point on the previous page, a typical examination question could be as follows. You are planning an IFR flight from Alpha to Bravo. Alpha and Bravo each have an NDB with co-located DME. Your GNSS is unserviceable. The rated coverage of the NDB at Bravo is 45 NM and the rated coverage at Alpha is 60 NM. You intend to cruise at 8000 feet and there is a 20 KT tailwind component along the flight planned track. The TAS of your aircraft is 180 KT.

What is the greatest distance from Alpha to Bravo that would permit this flight to be planned?

- 320 NM
- 340 NM
- 370 NM
- 400 NM

The working is as follows:




- A to X is 60 NM (limit of NDB range) and obtain positive fix.
- The distance from X to B is calculated using the 'one-in-60 rule' allowing for 9° track error, and be at the limit of rated coverage of NDB at B (45 NM). Working with triangle XBZ:

$$XB = \frac{ZB \times 60}{\angle ZXB}$$

$$XB = \frac{45 \times 60}{9}$$

$$XB = 300nm$$

and

AX = 60 NM

- Therefore the distance from A to B is 300 + 60 =360 NM.
- With a ground speed is 200 KT and maximum permitted time interval of 2 hours, the distance will be 400 NM.
- The answer will be the lesser distance which is 360 NM.
- Therefore the answer is 'b', 340 NM, as this is the closest correct alternative.

## 8.4 En route Tracking Guidance

When track guidance is provided by radio navigation aids, but navigation is by an approved self-contained navigation system or long range radio navigation system, the pilot must maintain track as defined by the most accurate radio navigation aid available.

## 8.5 Aircraft Off-Track - Advice to ATC

In controlled airspace, separation standards are based on the pilot maintaining track as closely as possible at all times. Corrective action must be taken to regain track as soon as any deviation is observed. *(ATC AU508)*

Additionally, the pilot must immediately notify ATC if the aircraft is found to be off-track by any of the deviations described below:

- Where track guidance is provided by a localizer or VOR—half-scale deflection or more of the Course Deviation Indicator (CDI)
- Where track guidance is provided by NDB or Locator—± 5° or more from the specified bearing
- Where track guidance is provided by DME—± 2 NM or more from the required arc
- When navigating by visual reference to the ground or water—more than 1 NM from the cleared track.

**Note**: The values given above must not be interpreted as defining a sector within which the pilot is permitted to navigate. (JEPPESEN ATC-GENERAL FLIGHT PROCEDURES)

## 8.6 Diversion from Track

In controlled airspace, any diversion from track requires prior clearance from ATC, except in an emergency. The values given in JEPPESEN ATC-GENERAL FLIGHT PROCEDURES must not be interpreted as tolerances within which diversions from track without clearance is permitted.

## 8.7 Diversions Due Weather

In controlled airspace, any diversion from track due weather requires prior clearance from ATC, if out of radio contact, and unable to obtain a clearance, and the pilot in command considers the diversion necessary, a PAN call specifying details of the diversion must be broadcast on the appropriate frequencies.

## 8.8 Avoiding Controlled Airspace and restricted areas

Unless an appropriate clearance has been obtained, the pilot in command of an aircraft operating in Class G airspace, or a VFR aircraft operation in Class E airspace, must not allow the aircraft to enter:

- Airspace for which ATC clearance is required
- An active restricted area.

**Note 1**: Aircraft within controlled airspace or a restricted area may be operating up to the boundary of the airspace.

**Note 2**: For aircraft operating in close proximity to an airspace boundary where there is a risk of an airspace infringement, the pilot in command should consider obtaining a clearance to enter the airspace or altering track to remain well clear.

*(ATC AU508)*

## 8.9 Radio Navigation Systems

An aircraft operated under the IFR, or at night under VFR, must be equipped with at least serviceable and type-approved radio navigation systems as specified in *JEPPESEN ATC - GENERAL FLIGHT PROCEDURES AU500 section, RADIO NAVIGATION SYSTEMS.*