

TRACKING AND INTERCEPTING

FULFILLS IR.V.A & CFII PTS VII.A

Objective	
The student shall understand the procedures to tune and identify ground-based navigation courses and to load and activate satellite-based area navigation. The student shall become familiar with determining their relative position to a NAVAID, intercepting a course to/from a NAVAID/fix at an appropriate angle, and compensating for wind drift.	
Instructor Actions	Student Actions
- Relate this lesson to previous lessons on navigation equipment (VORs, GPS, etc) - Discuss procedures for intercepting an airway at an appropriate intercept angle - Explain the purpose of arcs - Discuss how to intercept, track, and depart an arc, and utilizing the GPS for DME information - Explain how to recognize the effects of wind	- Take notes and participate in instructor's discussion - Practice determining intercept angles from self-made scenarios - Practice flying tracking/intercepting procedures with instructor or safety pilot - Practice flying arcs with instructor or safety pilot
Case Studies	Equipment
	- Computer - FAR/AIM - White Board
Completion Standards	
The student shall demonstrate proficiency in tracking and intercepting linear and arc navigation courses.	

ELEMENTS

1. AIRWAY/GPS Courses	1
2. Determining our Position	
2.1. Intercepting a Radial	
2.2. Wind Correction	
3. Arcs.....	2
3.1. Intercepting	
3.2. Steps to Establishing in the Arc	
3.3. Leaving the Arc	
3.4. Adjusting for Wind Correction	

RESOURCES

FAA-S-ACS-8C IR ACS - Area V Task A

FAA-S-8089-9B CFII PTS - Area VII Task A

FAA-H-8083-15B Instrument Flying Handbook - Chapter 9: Navigation Systems

FAA-H-8083-15B Instrument Flying Handbook – Chapter 10: IFR Flight

FAA-H-8083-16B Instrument Procedures Handbook - Chapter 2: En Route Operations

AIM 1-1 Navigation Aids

ERAU Special VFR Tracking and Intercepting Video

ERAU Special VFR Arcs Video

1. AIRWAY/GPS COURSES

After we master the fundamentals of basic attitude instrument flying: the straight and level, turns, climbs/descents, etc, we can apply those skills to operation IFR tasks. The next skill to master is tracking and intercepting of airways, GPS courses, and even more complex VOR/DME arcs.

2. Determining our Position

Determining our position relative to a VOR is straight forward: simply rotate the OBS until the CDI centers. Preferably, we desire to read the radial (rather than the bearing) since most often our objective is to track a given radial.

2.1. Intercepting a Radial

Rather than concerning ourself with mental math in the cockpit, a simple and effective method is to intercept a course at a 45° angle.

Draw Examples

2.2. Wind Correction

Rather than concerning ourself with mental math in the cockpit, a simple and effective method is to intercept a course at a 45° angle.

3. ARCS

DME arcs allow aircraft to arc segments around a VOR rather than just toward or away from it. Imagine a VOR on the airport or aligned with the extended centerline of a runway. The pilot can use that VOR in the enroute environment on an airway, then transition on an arc to become aligned with the runway, and follow the same VOR in the approach phase.

3.1. Intercepting

Arcs will always be joined perpendicularly, since if the pilot is not on the arc they are flying to/from the VOR, which is perpendicular to the arc. When following a transition route on a known heading, performing the intercept is simple. However, the pilot may be cleared from their present position (potentially off a published segment) to intercept the arc. In this case:

1. Determine the aircraft's current radial from the station
2. Begin tracking inbound/outbound, as required (may require referencing DME)
3. Calculate the perpendicular heading ($\pm 90^\circ$ from intercept heading) to join the arc
4. Turn to the perpendicular heading ~0.5 NM prior to arc
5. Once intercepted, turn CDI 10° and then begin "turn 10, twist 10". Pilots should always be flying to re-intercept, i.e. flying toward a deflected needle to center it.

3.2. Steps to Establishing in the Arc

You may be directed directly to an IAF along the arc or to the arc itself. Either way, you must calculate the perpendicular heading.

Draw

Once turned, rotate the OBS 10° ahead of the radial you are leaving.

TURN 10 TWIST 10

3.3. Leaving the Arc

From a lead radial, start a half-standard rate turn. Tune to the localizer if necessary.

3.4. Adjusting for Wind Correction

By virtue of its shape, the wind correction for the arc varies throughout the procedure. If the aircraft is inside the arc, the pilot can simply refrain from performing the "turn 10" portion of "turn 10 twist 10." This will cause the aircraft to reintercept the arc's designated DME radius.

Conversely, if outside the arc, it may be necessary to turn more than 10° . Depending on the magnitude of deviation, an additional 5- 10° of turn may be necessary.