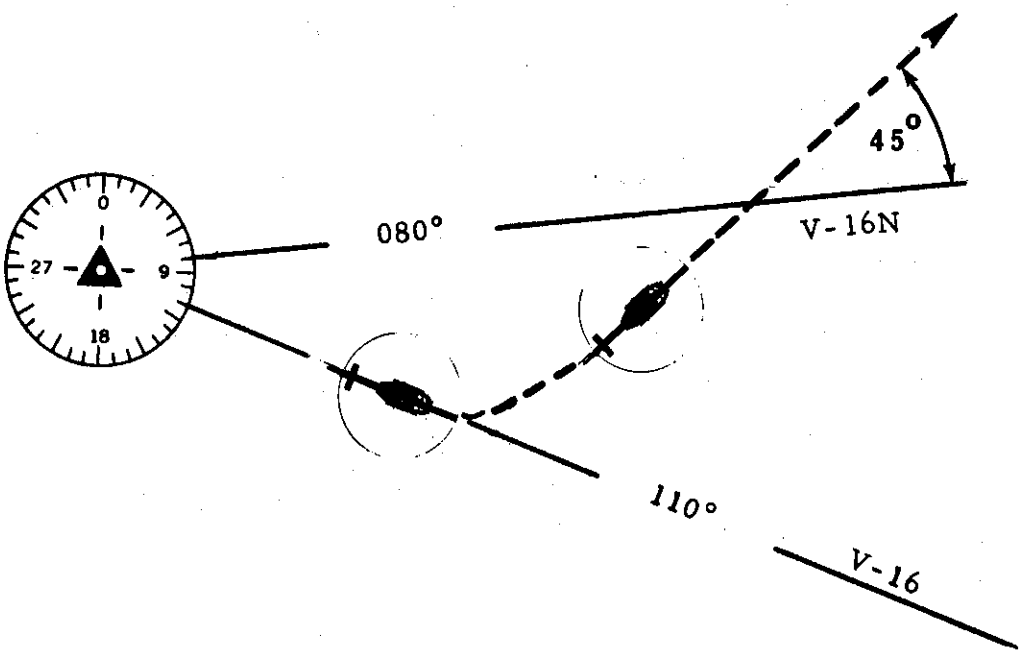
Answers: 1. A.
2. B.

FRAME 81

TRACK INTERCEPTION

Often it will be necessary for you to intercept a new track. You have been tracking outbound on V-16 but ATC issues a new clearance to V-16N.

Forty-five degrees (45°) is the standard interception angle used in a situation like this. In this case, in order to intercept V-16N at a 45° angle you would turn to a heading of _____°.



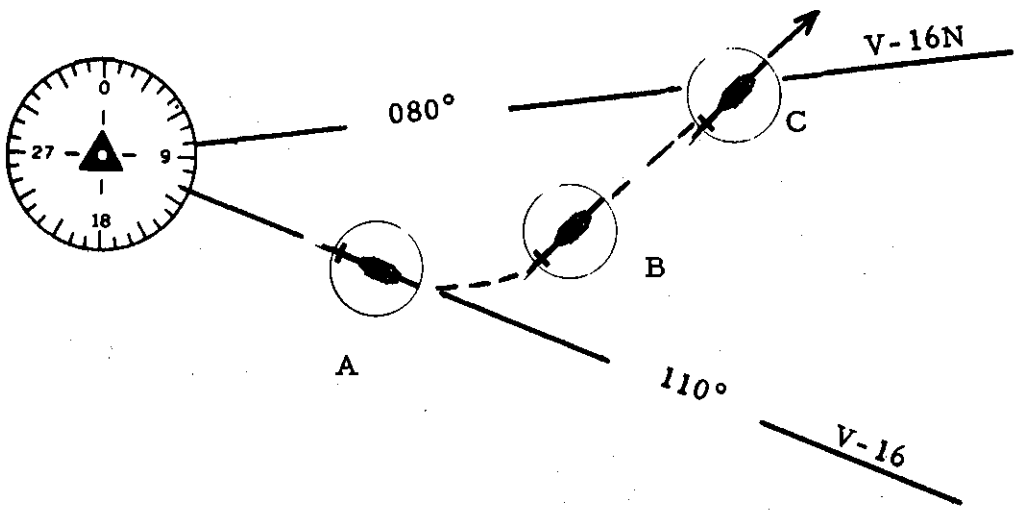
Answer: 035°

FRAME 82

The course selector must be reset to intercept the new track of 080°.

The aviator turns to a heading of 035°, sets the course selector to _____°, and while at position B, observes that the omni needle is deflected to the _____(left - right).

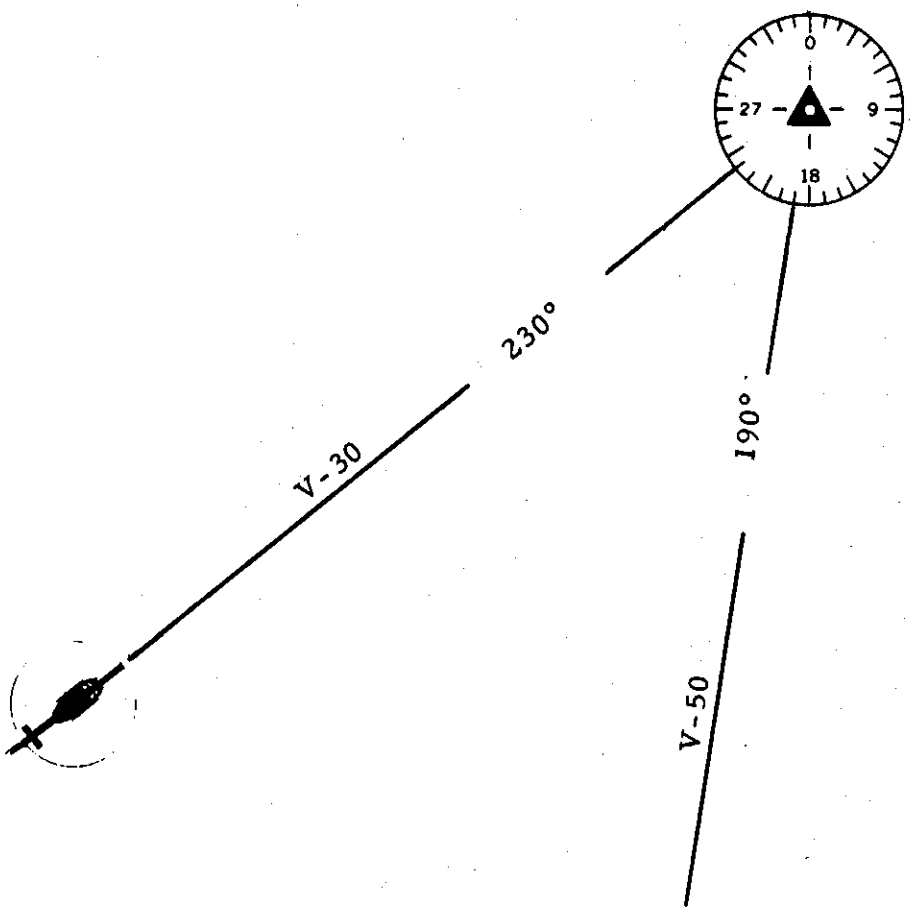
The aviator knows when he reaches position C because the omni needle centers on the outbound course of 080°.



Answers: 080°, left

FRAME 83

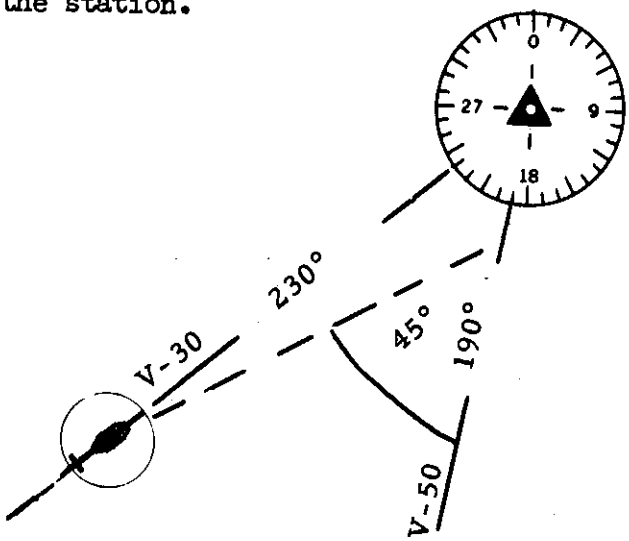
A different example will show that a 45° intercept angle is not always desirable. You are tracking inbound on V-30 and air traffic control instructs you to intercept and track inbound on V-50. What is the angular difference between V-50 and V-30? _____°



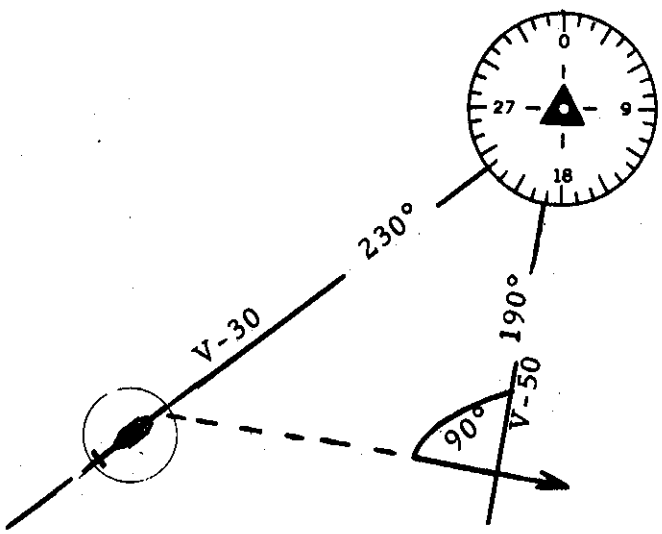
Answers: 40°

FRAME 84

If the aviator attempts to intercept V-50 at a 45° angle from his present position, the intercept would not be accomplished until the aircraft is very close to the station.



The situation above can be avoided if the aviator intercepts the new track at a 90° angle. To do this, the aviator would turn right to a heading of _____°.



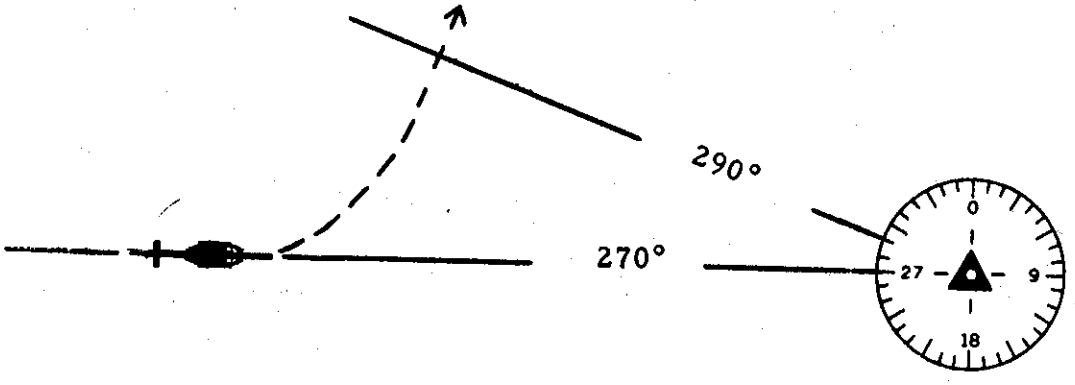
Answer: 100°

FRAME 85

A 90° intercept angle should also be used at any time air traffic control instructs the aviator to "expedite." In the situation below, air traffic control has directed the aviator to intercept and track inbound on the 290° radial and has specified "expedite."

1. The inbound track on the 290° radial is _____°.

2. To "expedite" the intercept, the aviator would turn _____ (left - right) to a heading of _____°.

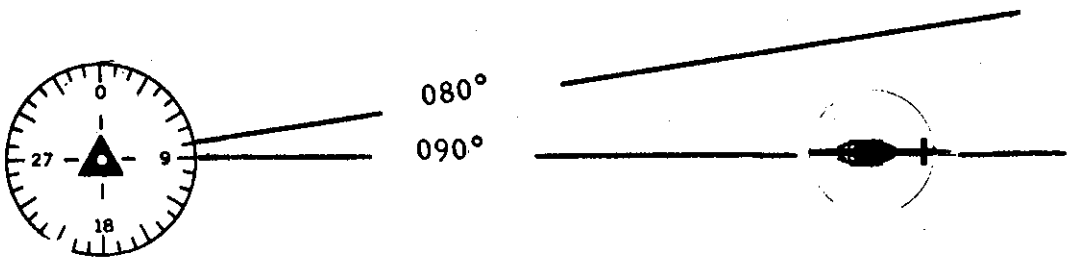


Answers: 1. 110°
2. 020°

FRAME 86

The interception of a new track is usually made at a 45° or 90° angle, depending on the circumstances. However, the aviator may decide to use still a different interception angle if good judgment dictates it.

In the situation below, the aviator is very close to the station tracking inbound on a track of 270° (090° radial). The aviator is instructed to intercept and track inbound on the 260° track (080° radial). Since the aircraft is very close to the station, the aviator knows that a 45° intercept is not practical. He elects to use a 20° intercept and turns to a heading of _____° to intercept the 260° track at a 20° angle.



Answer: 280°

FRAME 87

Although 45° and 90° are used as standard intercept angles, the aviator may use a different angle if he deems it appropriate, provided it will not conflict with the air traffic clearance issued by ATC. The aviator must consider the following questions in deciding how to intercept:

a. What is the angular difference between my present location and the new track?

b. How close to the station am I?

c. What does my ATC clearance require?

d. How strong are the winds?

GO TO THE NEXT PAGE

No answer required - continue below.

FRAME 88

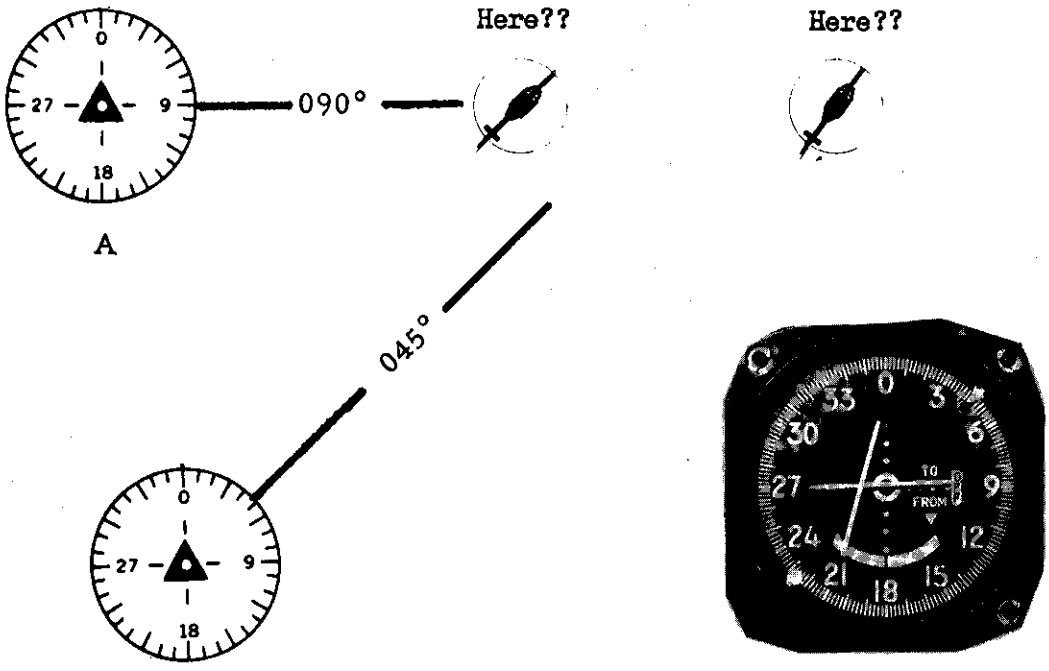
Occasionally, you may be directed to intercept a track and not know exactly where it is located from your present postion. Right? Left? Ahead?

Assume you have been tracking outbound from station A on the 090° radial and receive a clearance to intercept and track outbound on the 045° radial from station B. You are not sure if the 045° radial from B is ahead of, or behind you. A simple solution is:

1. Turn parallel to the desired track.

2. Tune and identify the station and set the course selector for the desired course.

3. Now - look at the needle. It immediately shows that the track is to your _____. Using a standard 45° intercept angle, you would now turn to a heading of _____°.



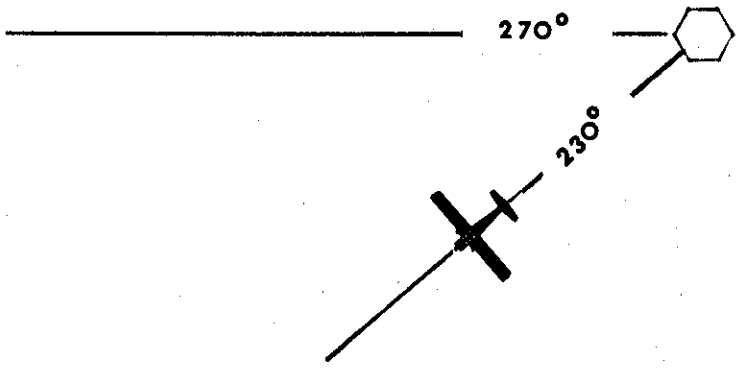
Answers: left, 0° (360°)

FRAME 89

Turning parallel to a track is a simple and effective way of determining exactly where the track is located (left or right). Of course, it is not practical or necessary to turn parallel to the track if you know exactly where it is.

The two examples which follow help illustrate the necessity to turn parallel.

A. You are tracking outbound on the 230° radial, heading 230°. You are instructed to intercept the 270° radial and track outbound. Do you know where the 270° track is? (left - right) _____
Would you turn parallel to the 270° track? _____



B. You are somewhere generally south of a station. You are instructed to intercept and track inbound on the 175° radial (355° inbound). Do you know where the desired inbound track (355°) is located? _____ Would you turn parallel to track to help in locating it? _____
_____

Answers: A. Yes - right, No - turn to 315° and intercept.
B. Not exactly, Yes - parallel.

FRAME 90

VOR RECEIVER CHECKS

Unless omni receivers are maintained and inspected under an FAA approved procedure, Federal Air Regulations (FAR 91) require an operational check of the equipment if it is used for IFR flights.

The operational check must have been made within the preceeding 10 hours flight time on the aircraft, and within the past 10 days before the flight.

A safe practice is to make an operational check of omni equipment prior to each IFR flight.

What would you assume an operational check consist of?

A. An accuracy check of the course selector and needle.

B. A check to insure proper sensing of the TO-FROM indicator.

C. A check to insure proper reaction of the Warning flag.

D. A check to insure 10° needle swing from center to each side.

E. All of the above.

Answer: E. All of the above.

FRAME 91

If a pilot performed an operational check of omni equipment and found it out of tolerance, an entry would be made on the DA Form 2408-13 in the aircraft log.

If you check the aircraft log and find a "circled red X", (X), shown under STATUS TODAY and in the Remarks section found the entry- "course indicator out of tolerance", that aircraft would be restricted to _____ type flight.

Unless another FAA approved procedure is used to check omni receivers, FAR Part 91 requires that operational checks be performed within the preceeding _____hours flight time, and also within the last _____days.

Answers: VFR
10 (hours), 10 (days)

FRAME 92

The information below is taken from FLIP, Section II. Use it as a reference for this frame and the following frames as required.

One method of checking omni equipment is the use of VOR test facility (VOT). This facility is available at some airports. Where can you find the frequency on which VOT is operating for a particular airport? _____

In using VOT, if the knob is turned until the needle is centered, the course selector should read _____° with the TO-FROM indicator showing _____.

VOR RECEIVER CHECK POINTS

VOR RECEIVER CHECK

1. The following facilities are available for operational checks of airborne VOR equipment:

   a. VOR test facility (VOT) (on selected civil and joint use airfields). VOT frequencies are listed opposite "COMMUNICATIONS" in the Aerodrome/Facility Directory listings in the IFR and VFR Supplements.

   b. Certified airborne check points (on established airways and/or in the vicinity of selected VOR facilities).

   c. Certified check points on the airport surface (Military and civil airfields).

   (1) The VOR test facility (VOT) transmits a test signal which provides users of VOR a convenient and accurate means to determine the operational status of their receivers. The facility is primarily designed for checking the VOR receiver while the aircraft is on the ground, however, it may also be used while in flight. Since VOT facilities are very low powered, in-flight checks should be restricted to low altitude near the facility. Adequate signal strength is present when the VOT identification is received and the VOR course warning flag is not in view. The radiated test signal is used by tuning the receiver to the designated frequency of the test facility. With the Course Deviation Indicator centered, the course selector shall read 0° with the "To-From" indicator reading "From," or the course selector should read 180° with the "To-From" indicator reading "To." Should the VOR receiver be of the automatic indicating type, the indication should be 180°. (This is true for all airborne receivers except Mitchell, which will indicate 0°.) Two means of identification are used with the VOR radiated test signal. In some cases a continuous series of dots are used, while in others, a continuous 1020 cycle tone will identify the test signal. The maximum permissible indicated error is ± 4 degrees. Information concerning an individual test signal can be obtained from the local control tower.

   (2) Airborne and ground check points consist of certified radials that should be received at specific points on the airport surface or over specific landmarks while airborne in the immediate vicinity of the airport. Should an error in excess of ± 4° be indicated through use of the ground check or ± 6° using the airborne check, IFR flight should not be attempted.

   (3) TACAN receiver check point tolerances: Military bases normally designate a specific ground point for checking the accuracy of aircraft TACAN receivers. The tolerances for the ground check are similar to the VOR within plus or minus 4° of the designated radial and within one-half mile or 3% of the distance to the facility, whichever is greater.

2. The list of VOR airborne check points and VOR ground check points is given on the following pages.

NOTE: The information is provided in the following order: Facility name (plus airport name, if needed); bearing in degrees magnetic from the VOR; location of the check point (distances in nautical miles); and altitude (in feet MSL, if any)

Answers: Opposite COMMUNICATIONS in the Airport/Facility Directory in IFR and VFR Supplements.

0° FROM (or 180° TO)

FRAME 93

Refer to VOR Receiver Check Point data on frame 80, if necessary.

What type of identification is used with the VOT? _____

Assume you are making an omni check using VOT and the needle will not center with the course selector set on 0°; but, by moving the course selector to 357°, you can make the needle center. Is this within the permissible tolerance? _____Yes _____No.

You could not use the omni set for instrument flight unless the needle will center within the permissible error - or course selector settings from _____° to _____°.

Answer: Continuous series of dots, or continuous 1020 cycle tone.
Yes, permissible tolerance is plus or minus (±) 4°
356° to 004° (4 degrees on each side of 0°)

FRAME 94

Where VOT is available it should be used to check omni equipment. However, many airports do not have VOT but do have check points consisting of certified radials that should be received at specified locations. These may be either Airborne Check Points or Ground Check Points. Listings of both types are found in FLIP, Section II.

According to information shown in Frame 80, the permissible equipment error (tolerance) is:

For ground check points: ____°

For airborne check points: ____°

Answers: ± (plus or minus) 4°

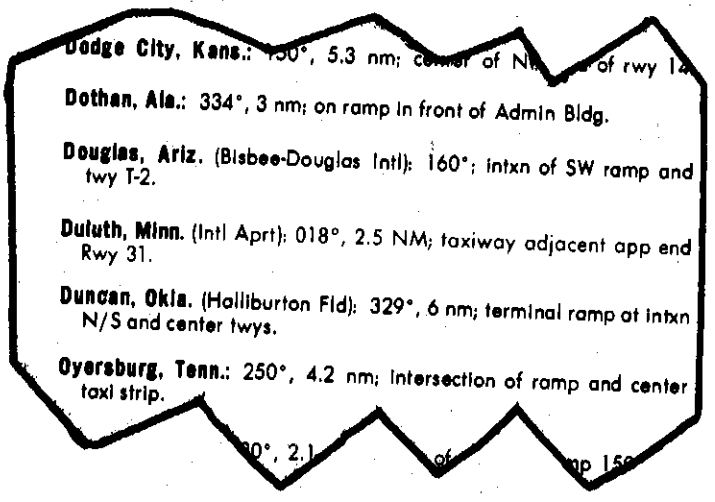
± 6°

FRAME 95

Several typical ground check points have been extracted from FLIP and shown below. The bearings shown are from the VOR and when set on the course selector will give a FROM indication.

If you wanted to check your omni receiver at Dothan, Ala., you would

1. Taxi to _____
2. Set the course selector on _____° and check for a FROM indication.
3. Check to see that the needle _____.
4. If the needle does not center, you can move the course selector a few degrees within the permissible error (tolerance) to see if it will center. At Dothan, the needle should center with the course selector set between _____° and _____°.



Answers: 1. ramp in front of Administration Building
2. 334°
3. centers
4. 330° and 338° (permissible error = ± 4°)

FRAME 96

Published Airborne Check Points are similar to ground check points but often include a minimum altitude at which the check should be performed. Also, it has been pointed out that the permissible error for an airborne check is ± 6°.

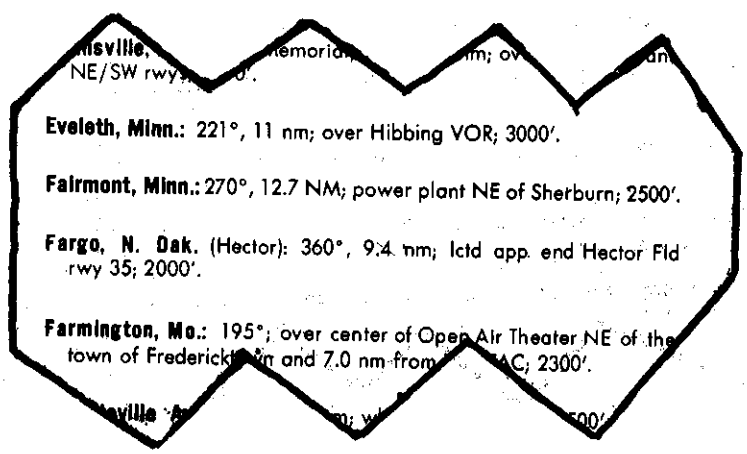
Several Airborne Check Points are shown below.

1. From the information given, you can determine that the Airborne Check should be performed under _____ (IFR/VFR) conditions.

2. The check at Fargo, North Dakota should be performed by flying over the end of runway _____ at _____ Field.

3. At Fargo, the course selector should be set on _____°. If the needle will not center on this setting, it should center with a setting between _____° and _____°.

4. You may get an unreliable test of the equipment if the check is performed at an altitude lower than _____ feet.



Answers: 1. VFR
2. 35, Hector
3. 360° (0°), 354° and 006°
4. 2000 ft.

FRAME 97

In aircraft equipped with dual omni receivers, and alternative type of check is permitted.

Assume that both receivers are tuned to the same station; one indicator gives a centered needle with the course selector set on 300° - sense indicator showing FROM.

1. You would set the other course selector to _____° also.
2. Expect the sense indicator to show _____.
3. And, expect the needle to _____.

4. The permissible error for the dual receiver check is the same as for VOT and Ground Check Points. In the situation above, the needle of the second indicator should center with the course selector set at one point between _____° and _____°.

The dual receiver check does not rely on VOT or certified radials; it is a check of one set against the other. Suppose the two sets do not give centered needles within ± 4°,

5. Do you know which set is in error? _____Yes _____No
6. What would you do? _____

Answers: 1. 300°
2. FROM
3. center
4. 296° and 304°
5. ✓ No
6. Check each receiver separately using VOT, or a certified check point.

FRAME 98

You recall that the omni needle can show deviation from the course up to a maximum of _____° right or left.

When performing an operational check of omni equipment, it is a good practice to check needle swing to verify that it will swing 10° right and left.

FAR 91 does not specify a tolerance or error permissible for needle swing, but a good rule of thumb is 8° to 12°.

Assume that the published check radial in FLIP is 160°. The needle should make a full swing ...

... left if the course selector is rotated to _____°.

... right if the course selector is rotated to _____°.

Based on the 8° to 12° rule above, a full left swing might occur with the course selector setting between _____° and _____°.

Answers: 10°
150°
170°
148° to 152°

FRAME 99

This concludes the discussion of enroute omni flight procedures. You will retain and develop proficiency with these procedures only after practice in flight.

Appendix A at the back of this program is a performance check which will help the student and instructor evaluate what has been learned from this program. The student should complete the performance check and turn it in to the instructor for grading and critique. The instructor will discuss any point not fully understood by the student.

Number Wrong_____

PERFORMANCE CHECK
VOR ENROUTE

Name_____ Class_____ Date_____

1. A pilot tunes an omni station but does not receive the station identification. He should interpt this to mean that:

A. an unreliable signal is being transmitted from a station undergoing maintenance.

B. an unreliable signal is being received because he is either too low or too far away.

C. the station is equipped with an automatic identification feature

D. his receiver is malfunctioning

2. After tuning and identifying an omni station, a pilot observes that the OFF Warning flag is still showing. This means:

A. the wrong station has been tuned

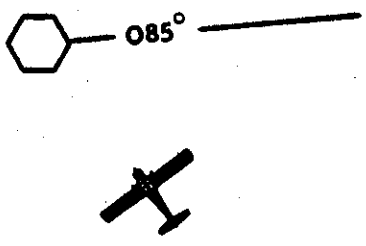
B. reception of the signal is unreliable

C. a faulty signal is being transmitted from a station undergoing maintenance.

D. the receiver is malfunctioning.

3. An aircraft is southeast of a VOR and after tuning and identifying the station, the pilot sets the course selector arrow on 085°. How will the sense indicator and vertical needle react?

	Sense Indicator	Needle
A.	TO	left
B.	FROM	left
C.	TO	right
D.	FROM	right



4. Radials are published as

A. magnetic inbound

B. magnetic outbound

C. true inbound

D. true outbound

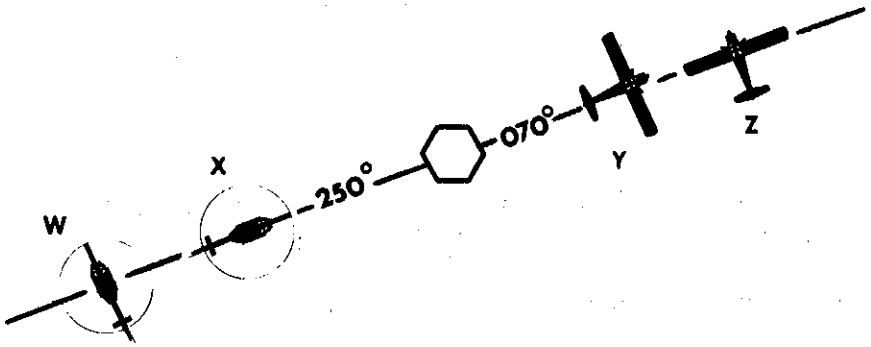
5. Which of the aircraft in the diagram are represented by the instrument shown?

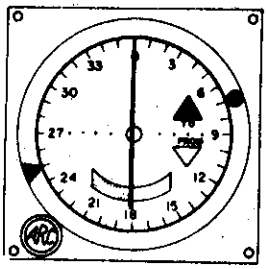
A. Only Y

B. Only X

C. Both Y and Z

D. Both W and X





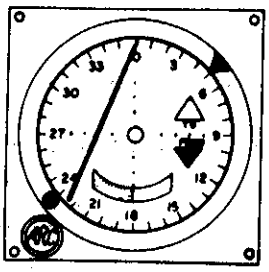
6. The instrument shows that the

A. aircraft is 4° left of the 50° radial.

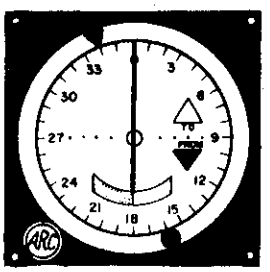
B. aircraft is 6° left of the 50° radial.

C. 50o radial is 4° left of the aircraft.

D. 50° radial is 6° left of the aircraft.



7. The instrument shows that the aircraft is on the



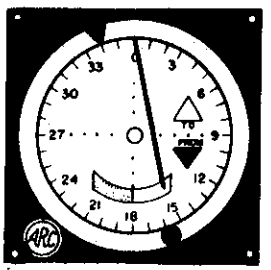
A. 340° radial - station is south southeast

B. 160° radial - station is north northwest

C. 340° radial - station is north northwest

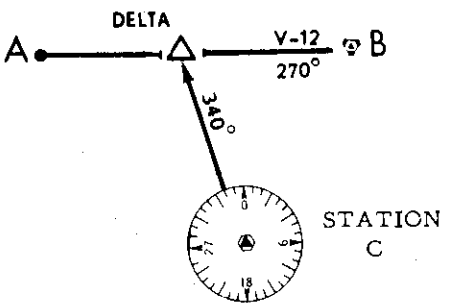
D. 160° radial - station is south southeast

8. An aircraft is tracking westbound on V-12. After tuning to station C and setting the course selector, the pilot observes the course indicator as shown. The aircraft has:



A. not yet reached Delta

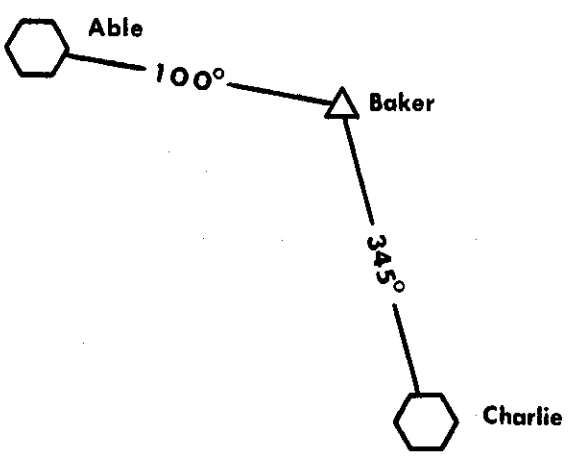
B. passed Delta

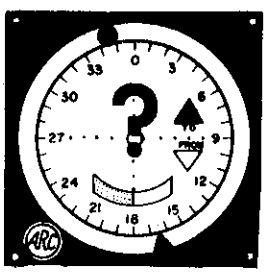


9. An aircraft is enroute from Able to Charlie via the Baker intersection. Prior to reaching Baker the pilot tunes Charlie and sets the course selector as shown. He should expect the needle to swing to the

A. left

B. right



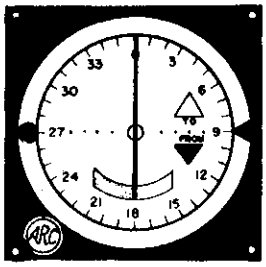


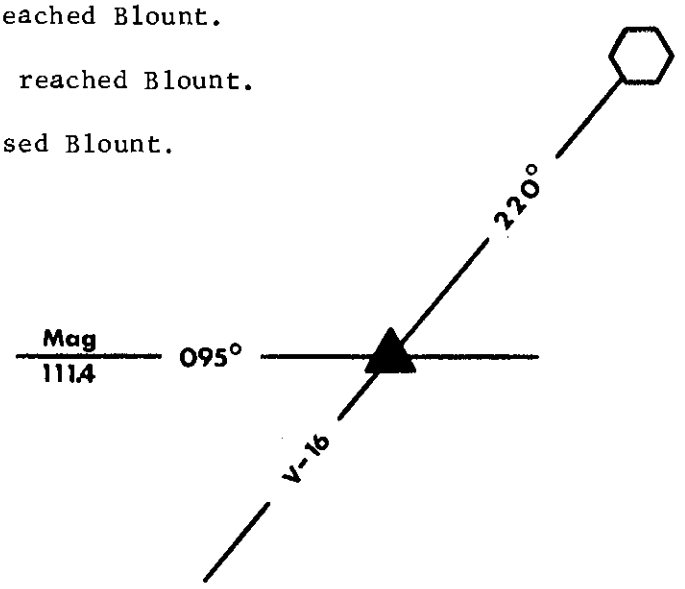
10. A pilot is southwest bound on V-16 and must report reaching the Blount intersection. He assumes he has not reached Blount, tunes in MAG and sets the course selector to check his present radial location. (Please note the setting). The reaction of the needle:

A. confirms that he has not reached Blount.

B. indicates that he has just reached Blount.

C. shows that he has just passed Blount.





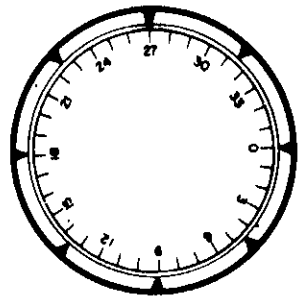
11. A pilot is tracking westbound into an omni station in a UH-1C with a true airspeed of 100K. The instruments below show that he has crosswinds from the

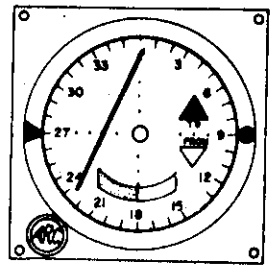
A. north, he should turn to a heading of 290°

B. south, he should turn to a heading of 250°

C. north, he should turn to a heading of 300°

D. south, he should turn to a heading of 240°



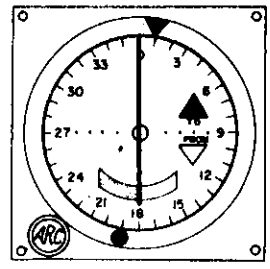


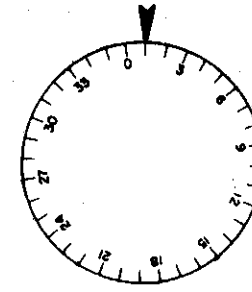
12. A pilot tracking northbound (360°) into an omni station was blown off track by a crosswind from the east. He applied a correction and returned to the track. His new heading which will give the recommended crab angle should be

	TAS over 90 k	TAS 90 k or less
A.	010°	015°
B.	015°	010°
C.	350°	345°
D.	345°	350°

13. Based on the present location of the aircraft, determine the heading necessary to intercept the 220° radial at an angle of 45° proceeding outbound.

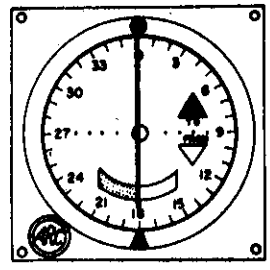
A. 265°
B. 175°
C. 085°
D. 355°

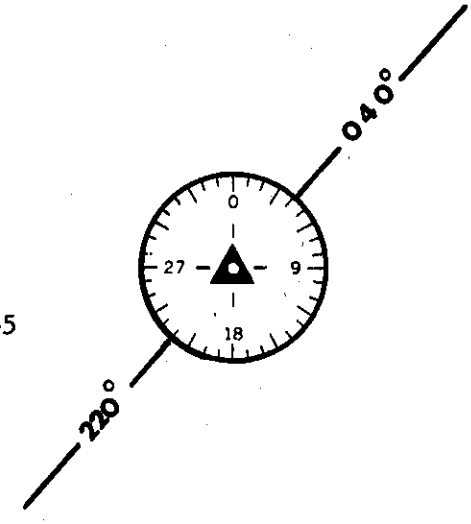




14. A pilot has been directed to intercept and track inbound on the 040° radial. After determining his present location from the course indicator, what heading would be turn to in order to intercept at an angle of 90°?

A. 130°
B. 310°





15. A pilot is maintaining an east bound track from station A on V-11 with the heading and course indicator as shown. At the time he tunes ahead to station B to continue inbound, how should the instruments appear?

	Heading	Sense Indicator	Course Selector (Arrow)
A.	080	FROM	090
B.	260	FROM	270°
C.	090	TO	270°
D.	080	TO	090°

16. An aircraft is inbound to the Dothan VOR enroute to Crestview VOR maintaining the airway track and assigned altitude. He observes that the sense indicator changes from TO to FROM. This indicates that he:

A. should rotate the course selector 180°.

B. has flown over the station.

C. should tune ahead to Crestview.

D. should verify station identification and check the OFF flag.

17. At some airports a radiated test signal called VOT is available for performing operational checks of omni receivers. You can determine availability of VOT by counsulting

A. Aerodrome/Facility Director, IFR and VFR Enroute Supplements, FLIP.
B. Section II, FLIP.
C. Section I, FLIP.
D. All of the above.

18. An operational check of omni receivers has a permissible error of $\pm 4^{\circ}$ for

A. Airborne and Ground Check Points.
B. VOT only.
C. VOT and Dual receiver checks only.
D. VOT, Ground Check Points, and Dual receiver checks.

19. How should the course selector arrow be set and what is the reaction of the TO-FROM indicator when using VOT?

A. 0° - FROM
B. 180° - FROM
C. Published bearing - FROM
D. Published bearing - TO

20. A published omni Airborne Check shows a bearing of 210°. The receiver is within permissible error limits if the needle will center with the course selector set between

A. 260° to 214° only
B. 204° to 216° only
C. 207° to 213° only
D. 200° to 220° only

NOTE: Detach the performance check, pages A-1 through A-5, and turn it in to the instructor for grading and critique.