Federal Aviation Administration

55054001 EN ROUTE RADAR ASSOCIATE CONTROLLER TRAINING PART A: BASIC CONCEPTS

Lesson 6: IFR Flight Direction, Altitude Assignment, and Altimeter Setting

Version: 1.0 2022.08

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LESSON PLAN DATA SHEET

Course Name	En Route Radar Associate Controller Training Part A: Basic Concepts
Course Number	55054001
Lesson Title	IFR Flight Direction, Altitude Assignment, and Altimeter Settings
Duration	1 hour, 15 minutes (Includes lesson and ELT)
Version	1.0 2022.08
Reference(s)	JO 7110.65, Air Traffic Control, CFR Part 91, General Operating and Flight Rules; JO 7610.4, Special Military Operations; Aeronautical Information Manual (AIM)
Prerequisites	NONE
Handout(s)	NONE
Exercise / Activity	NONE
Scenario	NONE
Assessments	⊙ YES - Written
Materials and Equipment	⊙ Pencil and/or pen
Other Pertinent Information	⊙ **Ensure lesson materials are downloaded to the classroom computer** ⊙ Course 57835, IFR Flight Direction and Altitude Assignment, or current course is available as supplemental training for this lesson. ⊙ This lesson is based on ERAM EAE410. ⊙ The lesson has been reviewed and reflects current orders and manuals as of April 2022.

LESSON ICON LEGEND

	Description
	The Activity icon indicates an exercise, lab, or hands-on activity.
	The Discussion Question icon signals a discussion question to be asked to the students.
	The Handout icon indicates a handout is to be distributed to the students.
	The Instructor Note icon is in hidden text and indicates text that is for the instructor only.
	The Multimedia icon indicates a video or audio clip is in the presentation.
	The Phraseology icon indicates that phraseology is in the content.
	The WBT icon indicates a component of web-based training.
	The Click icon indicates a PPT slide with click-based functionality to present additional information.
	The Definition icon indicates a published definition.

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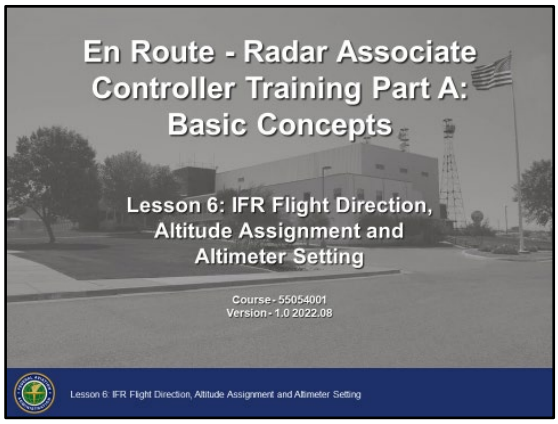
LESSON INTRODUCTION

Lesson Overview



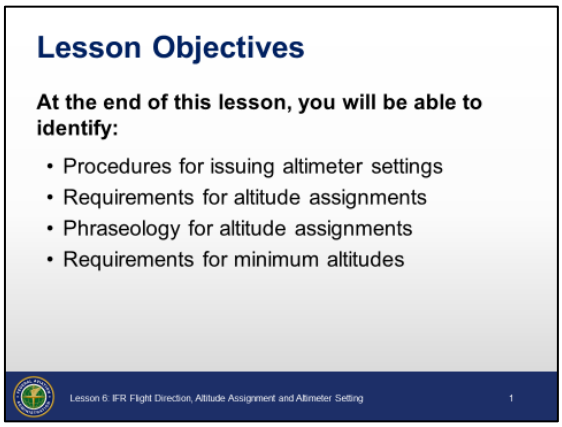
Overview

How do air traffic controllers determine proper altitudes to assign aircraft in order to provide separation from other aircraft? What factors affect these altitudes?

In this lesson you will learn about altitude assignment and minimum altitudes along Air Traffic Service (ATS) routes. Also covered are requirements for issuing altimeter settings to pilots which is important in maintaining the proper altitude.

LESSON INTRODUCTION *(CONT'D)*

Lesson Objectives



Objectives

⊙ At the end of this lesson, you will be able to identify:

- Procedures for issuing altimeter settings
- Requirements for altitude assignments
- Phraseology for altitude assignments
- Requirements for minimum altitudes

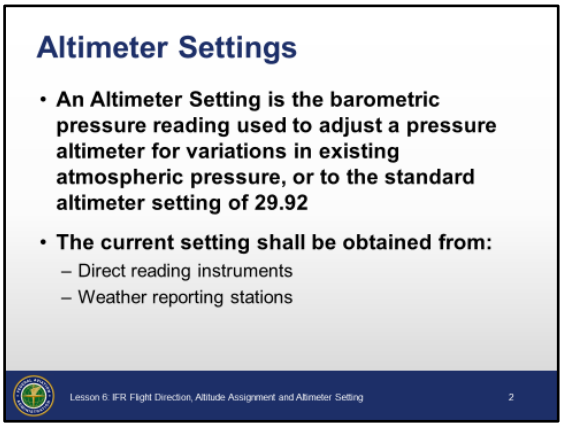
NOTE: There will be a graded end-of-lesson test upon completion of the lesson. The passing score is 70%. If you do not achieve a score of 70%, you will be provided study time and one retake of an alternate end-of-lesson test.

ISSUING ALTIMETER SETTINGS

Altimeter Settings

JO 7110.65, pars. 2-7-1, 2-7-2, PCG

AIM, par. 7-2-1



Altimeter Settings

- An altimeter setting is the barometric pressure reading used to adjust a pressure altimeter for variations in existing pressure, or to the standard altimeter setting of 29.92
- Current altimeter settings shall be obtained from:
  - Direct reading instruments
  - Weather reporting stations

NOTE: The primary source of altimeter settings in the en route environment is weather reporting stations.

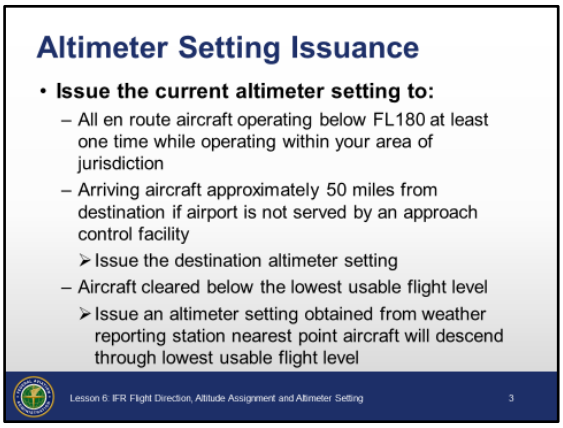
- If a pilot requests altimeter settings in millibars, ask the nearest weather reporting station for the equivalent millibar setting
- For USAF/USA aircraft only, use the term “estimated altimeter” for altimeter settings reported or received as estimated

NOTE: An estimated altimeter is one that is received from a source that has not had the instruments certified.

ISSUING ALTIMETER SETTINGS *(CONT'D)*

Altimeter Setting Issuance

JO 7110.65, par. 2-7-2



Altimeter Setting Issuance

- Issue the current altimeter setting to:
  - All en route aircraft operating below FL180 at least one time while operating within your area of jurisdiction
  - Arriving aircraft approximately 50 miles from the destination if that airport is not served by an approach control facility
    - Issue the destination altimeter
  - Aircraft cleared to descend below the lowest usable flight level
    - Issue an altimeter setting obtained from the weather reporting station nearest the point the aircraft will descend through the lowest usable flight level
- When the altimeter setting is greater than 31.00, issue the altimeter setting and:
  - For en route and arrival aircraft, advise pilots to remain set on 31.00 until reaching the final approach segment
  - For departing aircraft, advise pilots to set the altimeter to 31.00 prior to reaching any mandatory/crossing altitude or 1,500' AGL, whichever is lower
- Identify the source of the report
- When the weather report includes the remarks PRESSURE FALLING RAPIDLY:
  - Issue changes in altimeter setting to aircraft executing a nonprecision instrument approach as frequently as practical
- If the altimeter setting must be obtained from another source by the pilot of an arriving aircraft:
  - Instruct the pilot to obtain the altimeter setting from that source

Continued on next page

ISSUING ALTIMETER SETTINGS *(CONT'D)*

Altimeter Setting Issuance (Cont'd)

JO 7110.65, par. 2-7-2

NOTE: The destination altimeter, whether from a local or remote source, is the setting upon which the instrument approach is predicated. Many approach charts specify the source of altimeter settings as non-FAA facilities.

- Department of Defense (DOD) aircraft operating on "single altimeter settings" shall be issued altimeter settings in accordance with standard procedures while the aircraft are en route to and from:
  - Restricted areas
  - MOAs
  - ATC Assigned Airspace (ATCAA)
- State that the altimeter is over an hour old if that is the case

THE (facility name) ALTIMETER (setting), or, (If the altimeter is more than one hour old) THE (facility name) ALTIMETER (setting) MORE THAN ONE HOUR OLD

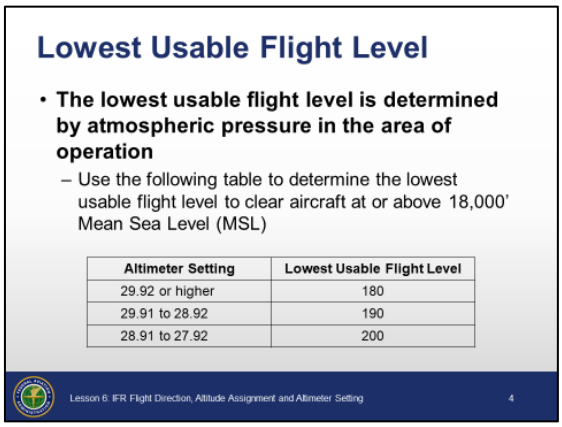
Examples: "THE MCALESTER ALTIMETER TWO NINER NINER FOUR"

"THE MIAMI ALTIMETER TWO NINER EIGHT NINER, MORE THAN ONE HOUR OLD"

ALTIMETER SETTINGS *(CONT'D)*

Lowest Usable Flight Level

JO 7110.65, par. 4-5-4



Lowest Usable Flight Level

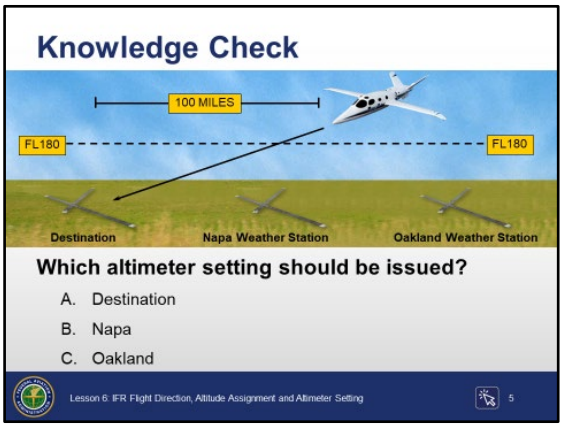
⊙ The lowest usable flight level is determined by atmospheric pressure in the area of operation

- Use the following table to determine the lowest usable flight level to clear an aircraft at or above 18,000' Mean Sea Level (MSL)

Altimeter Setting	Lowest Usable Flight Level
29.92 or higher	180
29.91 to 28.92	190
28.91 to 27.92	200

ALTIMETER SETTINGS *(CONT'D)*

Knowledge Check

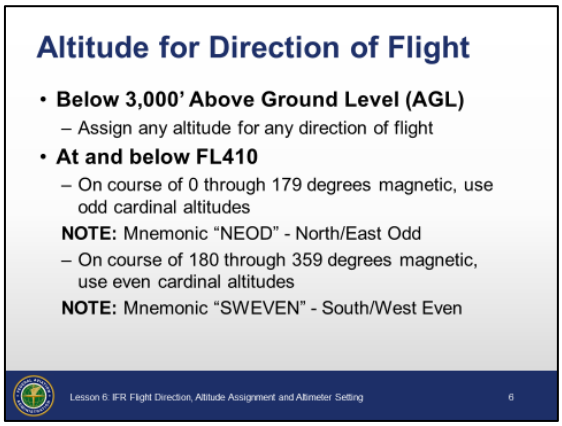


Question: Which altimeter setting should be issued?

REQUIREMENTS FOR ALTITUDE ASSIGNMENT

Altitude for Direction of Flight

JO 7110.65, par. 4-5-2; TBL. 4-5-1



Altitude for Direction of Flight

- Aircraft operating below 3,000' AGL:
  - Assign any altitude for any direction of flight
- Aircraft operating at and below FL410, but at or above 3,000' AGL:
  - On course 0 through 179 degrees magnetic, use odd cardinal altitudes

  NOTE: Mnemonic "NEOD" - North/East Odd
  - On course 180 through 359 degrees magnetic, use even cardinal altitudes

  NOTE: Mnemonic "SWEVEN" - South/West Even
- Aircraft operating above FL410
  - On course 0 through 179 degrees magnetic
    - Intervals 4,000' starting at FL410
  - On course 180 through 359 degrees magnetic
    - Intervals of 4,000' starting at FL430

NOTE: Cardinal altitudes are odd or even thousand foot altitudes or flight levels, e.g., 5,000', 8,000', FL250.

REQUIREMENTS FOR ALTITUDE ASSIGNMENT
(CONT'D)

RVSM Procedures

JO 7110.65, par. 2-1-29

RVSM Procedures

- RVSM airspace is exclusively for RVSM capable aircraft with some exceptions
  - Certain approved types of non-RVSM aircraft will be accommodated in RVSM airspace, workload permitting, these are called excepted aircraft. They are:
    - Department of Defense (DOD) - U.S. military and all NASA DOD certified aircraft
    - MEDEVAC - Civilian airborne ambulance
    - Foreign State aircraft - Aircraft used for transporting a head of state, and those military aircraft associated with international agreements, such as "Open Skies" flights
    - Manufacturer development or certification flights - New production aircraft in the certification and/or development phase that have not received RVSM approval status
- Aircraft not approved for RVSM operations may transition through RVSM airspace to operate above or below it
- Ensure sector-to-sector coordination for all non-RVSM aircraft in RVSM airspace
- Use Negative RVSM in all verbal ground to ground communications involving non-RVSM aircraft while in RVSM airspace

Example: "POINT OUT BAXTER 21 CLIMBING TO FL360, NEGATIVE RVSM"

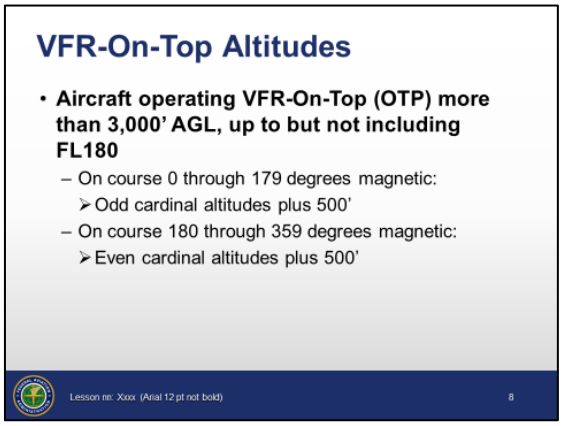
- Apply appropriate separation standards and remove any aircraft from RVSM airspace that advises it is unable RVSM due to equipment
- ATC may allow aircraft to remain in RVSM airspace using reduced separation minima after the loss of a transponder or Mode C altitude reporting

REQUIREMENTS FOR ALTITUDE ASSIGNMENT
(CONT'D)

VFR-On-Top Altitudes

JO 7110.65, par. 7-3-2

CFR 91.159



VFR-On-Top Altitudes

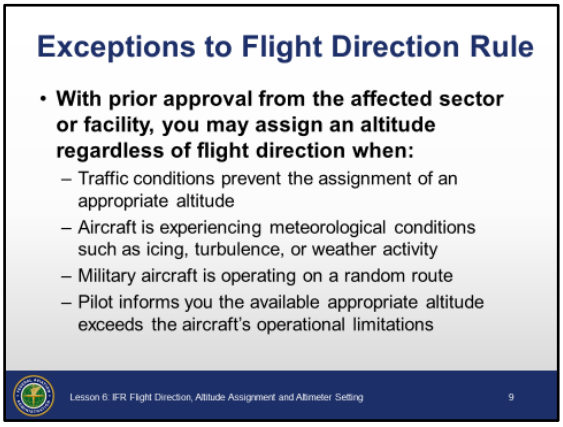
- The appropriate VFR altitude for aircraft operating more than 3,000' AGL, up to but not including FL180:
  - On course 0 through 179 degrees magnetic:
    - Odd cardinal altitudes plus 500', e.g., 5,500', 7,500'
  - On course 180 through 359 degrees magnetic:
    - Even cardinal altitudes plus 500', e.g., 6,500', 8,500'
- Inform an aircraft maintaining VFR-on-top when the pilot is not complying with the altitude for direction of flight requirements

Example: "V-F-R-ON-TOP CRUISING LEVELS FOR YOUR DIRECTION OF FLIGHT ARE ODD/EVEN ALTITUDES PLUS 500 FEET"

REQUIREMENTS FOR ALTITUDE ASSIGNMENT
(CONT'D)

Exceptions to Flight Direction Rule

JO 7110.65, par. 4-5-3



Exceptions to Flight Direction Rule

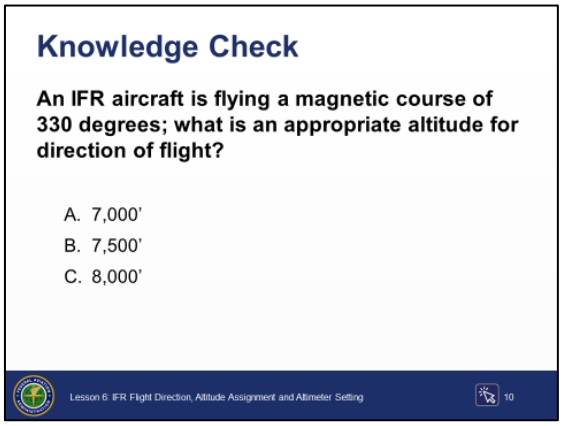
⊙ With prior approval from the affected sector or facility, you may assign an altitude regardless of flight direction when:

- Traffic conditions prevent the assignment of an appropriate altitude
- Aircraft is experiencing meteorological conditions such as:
  - Icing
  - Turbulence
  - Weather activity
- Military aircraft are operating on a random route
- Pilot informs you the available appropriate altitude exceeds the aircraft's operational limitations

Example: "APREQ SKYWEST FOUR TWELVE AT FLIGHT LEVEL TWO FIVE ZERO, INAPPROPRIATE ALTITUDE FOR DIRECTION OF FLIGHT FOR TURBULENCE"

REQUIREMENTS FOR ALTITUDE ASSIGNMENT
(CONT'D)

Knowledge Check

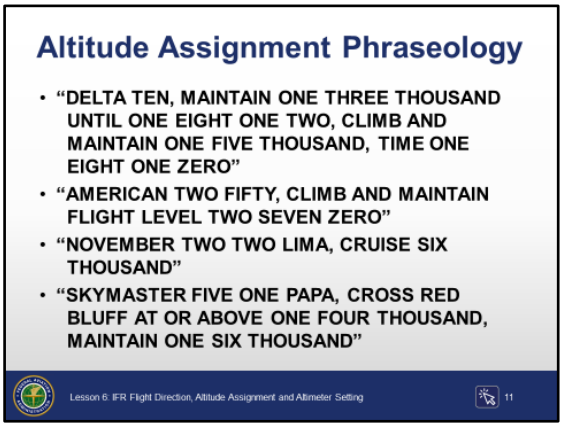


Question: An IFR aircraft is flying a magnetic course of 330 degrees; what is an appropriate altitude for direction of flight?

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT

Altitude Assignment Phraseology

JO 7110.65, par. 4-5-7



Altitude Assignment Phraseology

Examples:

"DELTA TEN, MAINTAIN ONE THREE THOUSAND UNTIL ONE EIGHT ONE TWO, CLIMB AND MAINTAIN ONE FIVE THOUSAND, TIME ONE EIGHT ONE ZERO"

"AMERICAN TWO FIFTY, CLIMB AND MAINTAIN FLIGHT LEVEL TWO SEVEN ZERO"

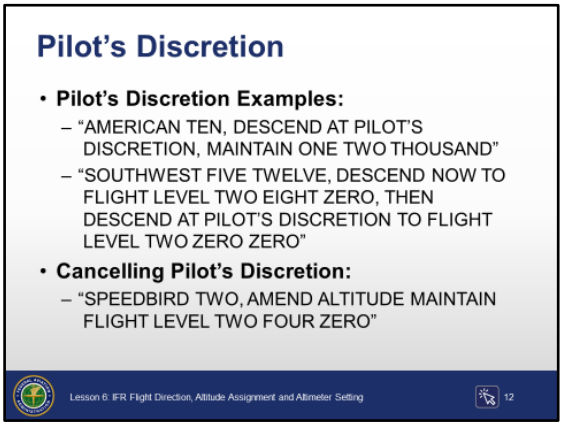
"NOVEMBER TWO TWO LIMA, CRUISE SIX THOUSAND"

"SKYMASTER FIVE ONE PAPA, CROSS RED BLUFF AT OR ABOVE ONE FOUR THOUSAND, MAINTAIN ONE SIX THOUSAND"

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Pilot's Discretion

JO 7110.65, par. 4-5-7, PCG



Pilot's Discretion

⊙ The pilot has the option of starting climb or descent whenever and at whatever rate they wish

- They may temporarily level off at any intermediate altitude
  - However, once they have vacated an altitude, they may not return to that altitude

CLIMB/DESCEND AT PILOT'S DISCRETION

Example: "AMERICAN TEN, DESCEND AT PILOT'S DISCRETION, MAINTAIN ONE TWO THOUSAND"

CLIMB/DESCEND NOW TO (altitude), THEN CLIMB/DESCEND AT PILOT'S DISCRETION, MAINTAIN (altitude)

Example: "SOUTHWEST FIVE TWELVE, DESCEND NOW TO FLIGHT LEVEL TWO EIGHT ZERO, THEN DESCEND AT PILOT'S DISCRETION TO FLIGHT LEVEL TWO ZERO ZERO."

Continued on next page

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Pilot's Discretion (Cont'd)

JO 7110.65, par. 4-5-7, PCG

⊙ Cancelling Pilot's Discretion

- When the pilot's discretion portion of a climb/descent clearance is being canceled by assigning a new altitude, inform the pilot that the new altitude is an "amended altitude"

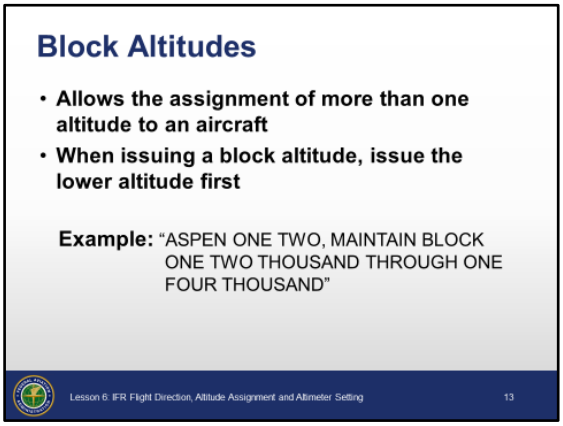
Example: "SPEEDBIRD TWO AMEND ALTITUDE MAINTAIN FLIGHT LEVEL TWO FOUR ZERO"

NOTE: Crossing restrictions allow for pilot's discretion.

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Block Altitudes

JO 7110.65, par. 4-5-7



Block Altitudes

- Allows the assignment of more than one altitude to an aircraft
- When issuing a block altitude, issue the lower altitude first

MAINTAIN BLOCK (altitude) THROUGH (altitude)

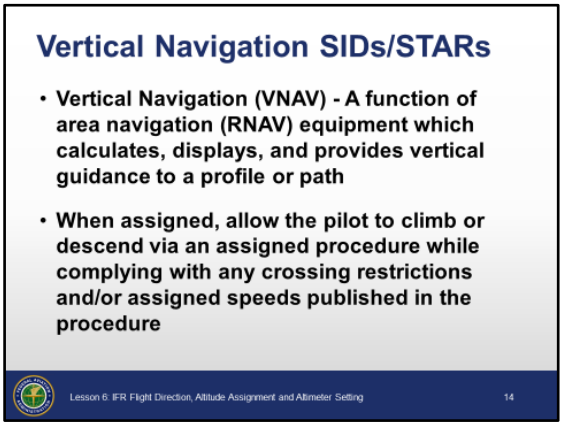
Example: "ASPEN ONE TWO, MAINTAIN BLOCK ONE TWO THOUSAND THROUGH ONE FOUR THOUSAND"

- Can be used for:
  - Aerial refueling
  - Military training routes
  - Turbulence
  - Maintenance testing

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Vertical Navigation SIDs/STARs

JO 7110.65, par. 4-5-7



Vertical Navigation SIDs/STARs

VERTICAL NAVIGATION (VNAV) - A function of area navigation (RNAV) equipment which calculates, displays, and provides vertical guidance to a profile or path.

⊙ When assigned, allow the pilot to climb or descend via an assigned procedure while complying with any crossing restrictions and/or assigned speeds published in the procedure. The pilot must comply with:

- Any crossing restrictions when instructed to "Climb Via" or "Descend Via"
- All published speed restrictions on the SID/STAR independent of a climb via or descend via clearance

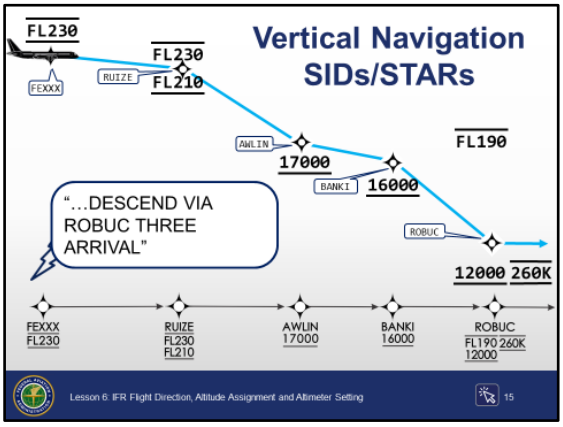
CLIMB VIA - An abbreviated ATC clearance that requires compliance with the procedure lateral path, associated speed restrictions, and altitude restrictions along the cleared route or procedure.

DESCEND VIA - An abbreviated ATC clearance that requires compliance with a published procedure lateral path and associated speed restrictions and provides a pilot discretion descent to comply with published altitude restrictions.

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Vertical Navigation SIDs/STARs (Cont'd)

JO 7110.65, par. 4-5-7



Vertical Navigation SIDs/STARs

- Clearance to "Descend Via" authorizes pilots to descend at pilot's discretion to meet the published restrictions on a STAR

DESCEND VIA (STAR name and number)

Example: "DESCEND VIA ROBUC THREE ARRIVAL"

or

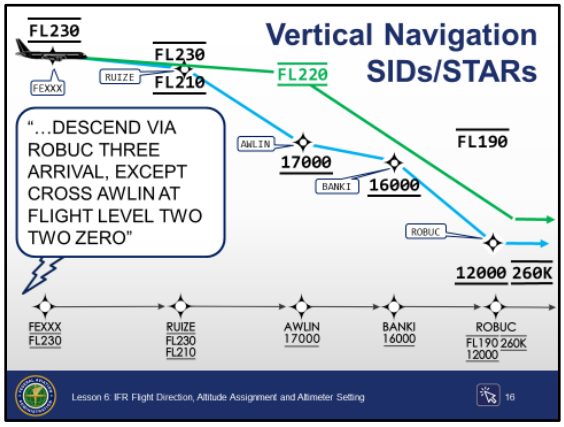
CLIMB VIA (SID name and number)

Example: "CLIMB VIA DAWGS FOUR DEPARTURE"

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Vertical Navigation SIDs/STARs (Cont'd)

JO 7110.65, par. 4-5-7



- If assigning a crossing altitude that differs from the STAR or SID altitude, emphasize the change to the pilot

DESCEND VIA (STAR name and number) ARRIVAL, EXCEPT CROSS (fix, point, waypoint), (revised altitude information)

Example: "UNITED TWO TWELVE DESCEND VIA THE ROBUC THREE ARRIVAL, EXCEPT CROSS AWLIN AT FLIGHT LEVEL TWO TWO ZERO"

- If a SID has a top altitude published and the pilot is instructed to CLIMB VIA SID, the pilot will climb to the published top altitude
  - An interim altitude other than the top altitude may be issued:

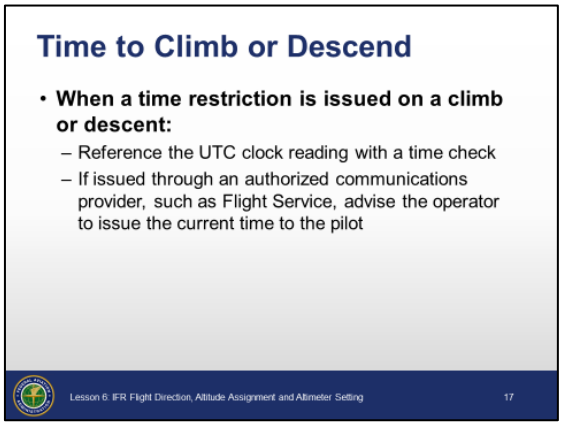
CLIMB VIA SID EXCEPT MAINTAIN (altitude); (additional instructions or information)

Example: "NOVEMBER SEVEN TWO PAPA, CLIMB VIA SID EXCEPT MAINTAIN SEVEN THOUSAND"

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Time to Climb or Descend

JO 7110.65, par. 4-5-7



Time to climb or descend

⊙ When a time restriction is issued on a climb or descent:

- Reference the UTC clock reading with a time check
- If issued through an authorized communications provider, such as Flight Service, advise the operator to issue the current time to the pilot
- Exception
  - When in direct, two way VHF/UHF voice communication with the pilot and the aircraft is in radar contact, you may specify an elapsed time interval restriction, in full minute increments only, without any reference to the UTC clock. The time restriction begins once the clearance has been acknowledged by the pilot.

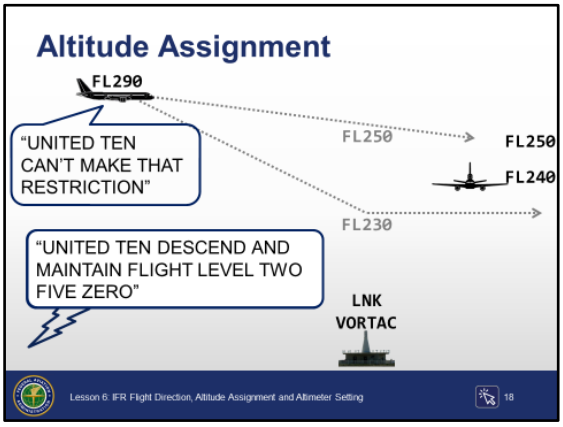
Example: "UNITED FOUR SEVENTEEN, CLIMB TO REACH ONE THREE THOUSAND AT TWO TWO ONE FIVE"

"TIME TWO TWO ONE ONE AND ONE-QUARTER"

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Altitude Assignment

JO 7110.65, par. 4-5-7



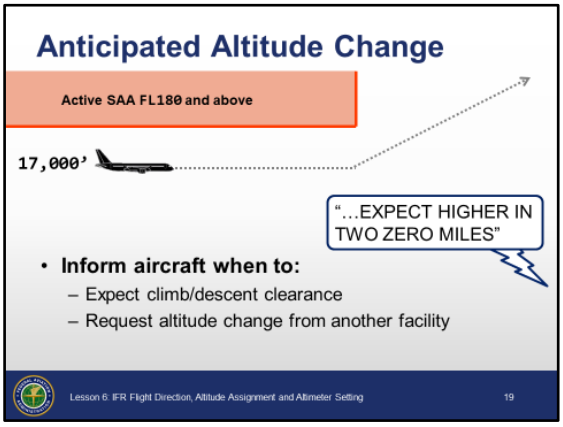
Altitude Assignment

- When a pilot is unable to accept a clearance
  - Issue revised instructions to ensure positive control and standard separation
    - "We will try" and other such acknowledgements do not constitute pilot acceptance of an ATC clearance
  - Issue ATC clearances which conform with normal aircraft operational capabilities and do not require last minute amendments to ensure approved separation
  - EXPEDITE is not to be used in lieu of appropriate restrictions to ensure separation

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Anticipated Altitude Change

JO 7110.65, par. 4-5-8



Anticipated Altitude Change

⊙ Inform aircraft when to:

- Expect climb/descent clearance
- Request altitude change from another facility

EXPECT HIGHER/LOWER IN (number of miles or minutes) MILES/MINUTES

or

AT (fix) REQUEST ALTITUDE/FLIGHT LEVEL CHANGE FROM (name of facility)

If required,

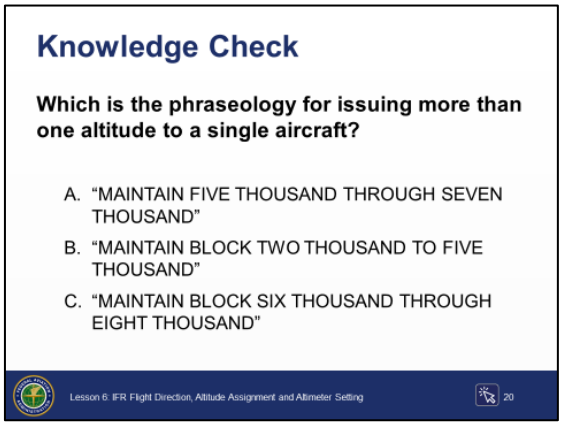
AT (time, fix, or altitude)

Examples: "UNITED FORTY-TWO EXPECT HIGHER IN TWO ZERO MILES"

"AMERICAN FIFTEEN, AT SAWMILL REQUEST FLIGHT LEVEL CHANGE FROM HOUSTON CENTER"

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Knowledge Check

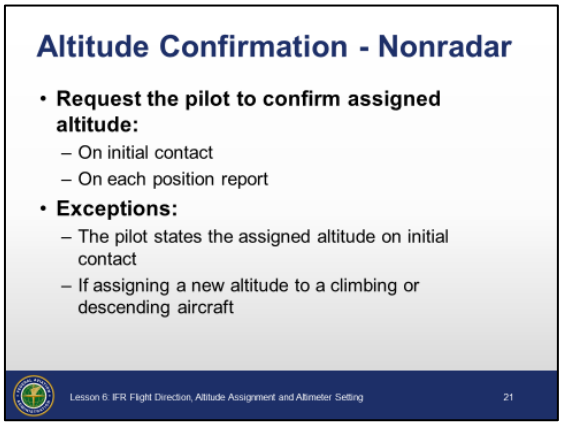


Question: Which is the phraseology for issuing more than one altitude to a single aircraft?

PHRASEOLOGY FOR ALTITUDE ASSIGNMENT
(CONT'D)

Altitude Confirmation - Nonradar

JO 7110.65, par. 4-5-9



Altitude Confirmation - Nonradar

- Request the pilot to confirm assigned altitude:
  - On initial contact
  - On each position report
- Exceptions:
  - The pilot states the assigned altitude on initial contact
  - If assigning a new altitude to a climbing or descending aircraft
- Verification phraseology
  - Aircraft in level flight

    VERIFY AT (altitude/flight level)
  - The aircraft is climbing or descending

    VERIFY ASSIGNED ALTITUDE (altitude)
  - If the aircraft has been assigned a flight level at or above the lowest usable flight level, confirm assigned altitude by stating:

    VERIFY ASSIGNED FLIGHT LEVEL (flight level)
- Reconfirm all pilot altitude readbacks for U.S. Army aircraft

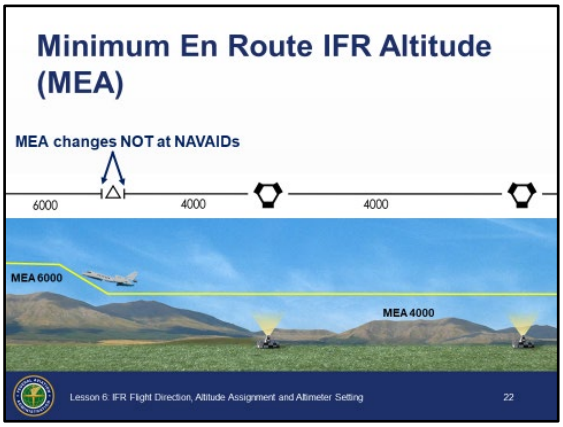
(If altitude readback is correct), AFFIRMATIVE (altitude)

(If altitude readback is not correct), NEGATIVE, CLIMB/DESCEND AND MAINTAIN (altitude)

MINIMUM ALTITUDES

Minimum En Route IFR Altitude (MEA)

JO 7110.65, par. 4-5-6, PCG



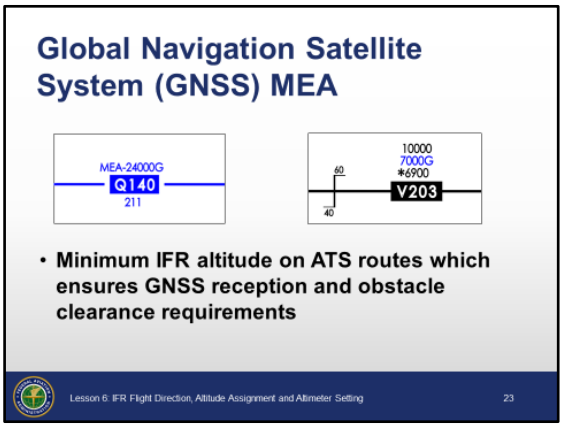
Minimum En Route IFR Altitude (MEA)

- ⊙ The lowest published altitude between radio fixes
  - Ensures acceptable navigational signal coverage
  - Meets obstacle clearance requirements between those fixes

MINIMUM ALTITUDES *(CONT'D)*

Global Navigation Satellite System (GNSS) MEA

JO 7110.65, par. 4-5-6, PCG



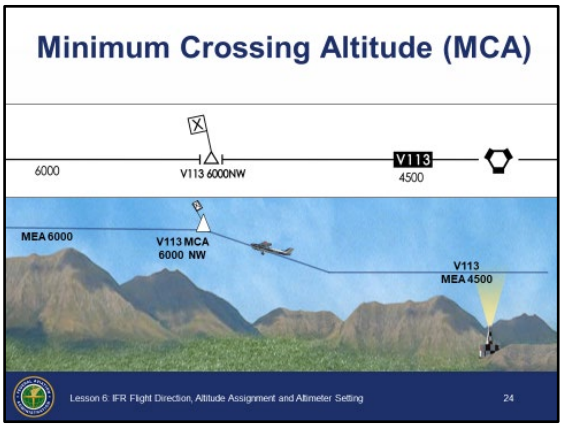
Global Navigation Satellite System (GNSS) MEA

- The minimum en route IFR altitude on a published ATS route or route segment which ensures acceptable GNSS reception and meets obstacle clearance requirements
- GNSS equipped aircraft may be cleared to operate on jet routes below the MEA (but not below the prescribed minimum altitude for IFR operations) or above the maximum authorized altitude if, in either case radar service is provided

MINIMUM ALTITUDES *(CONT'D)*

Minimum Crossing Altitude (MCA)

JO 7110.65, par. 4-5-6; PCG



Minimum Crossing Altitude (MCA)

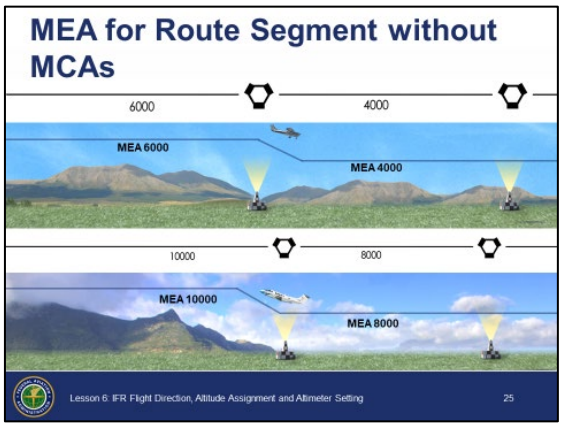
- The lowest altitude at certain fixes in which an aircraft must cross when proceeding in the direction of a higher MEA
  - Indicated on charts by a flag with an "X"
- If an aircraft must climb to a higher altitude where an MCA is published, the clearance should be given soon enough to allow it to comply with the crossing restriction

MINIMUM ALTITUDES *(CONT'D)*

MEA for Route Segment without MCAs

JO 7110.65, par. 4-5-6

CFR Part 91.177



MEA for Route Segment without MCAs

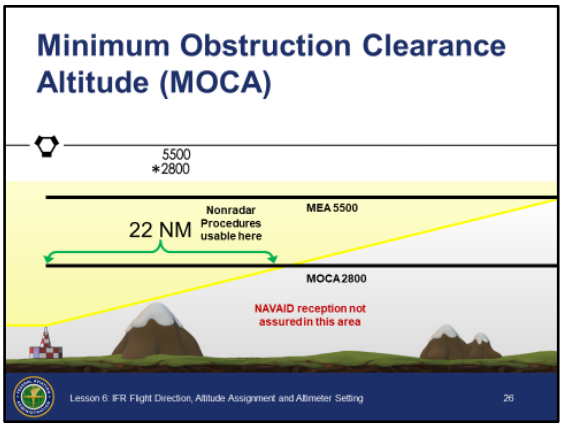
⊙ Clear aircraft at or above the MEA for route segments being flown

- When a lower MEA for subsequent segments of the route is applicable:
  - Issue the lower MEA only after the aircraft is over or past the fix/NAVAID where the lower MEA applies, unless a crossing restriction at or above the higher MEA is issued
- When a higher altitude is required because of an MEA change, the aircraft shall be cleared to begin climb to the higher MEA as follows:
  - Issue the higher MEA prior to or immediately after passing the fix where the higher MEA is designated

MINIMUM ALTITUDES *(CONT'D)*

Minimum Obstruction Clearance Altitude (MOCA)

JO 7110.65, par. 4-5-6; PCG

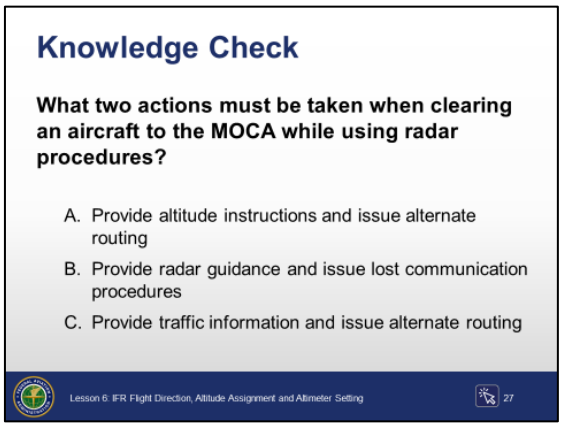


Minimum Obstruction Clearance Altitude (MOCA)

- The lowest published altitude in effect between radio fixes on VOR airways, off-airway routes, or route segments which meets obstacle clearance requirements for the entire route segment and which ensures acceptable navigational coverage only within 22 NM of a VOR
- An aircraft may be cleared below the MEA, but not below the MOCA for the route segment being flown if:
  - The altitude assigned is at least 300' above the floor of controlled airspace and the following actions are taken:
    - Nonradar Procedures:
      - Aircraft may only be assigned a published MOCA within 22 NM of the NAVAID
    - Radar Procedures:
      - Lost communication instructions must be issued and the aircraft is receiving radar service

MINIMUM ALTITUDES *(CONT'D)*

Knowledge Check

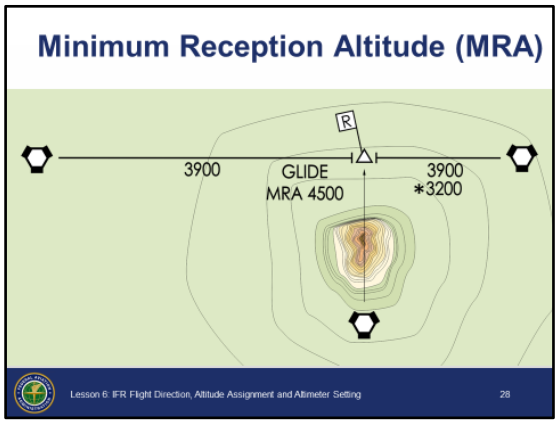


Question: What two actions must be taken when clearing an aircraft to the MOCA while using radar procedures?

MINIMUM ALTITUDES *(CONT'D)*

Minimum Reception Altitude (MRA)

JO 7110.65, PCG

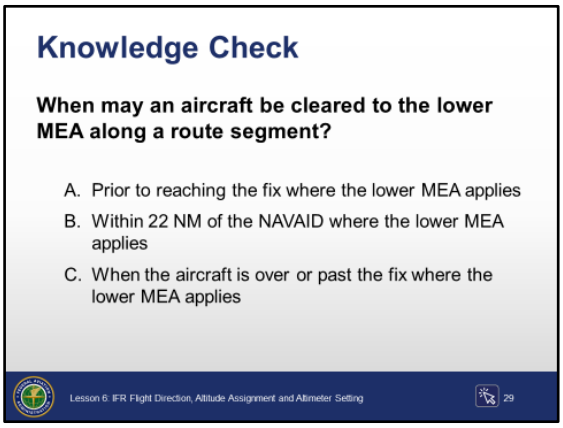


Minimum Reception Altitude (MRA)

- The lowest altitude at which an intersection can be determined
  - Indicated on charts by a flag with an "R"
  - MRAs are determined by FAA flight inspection traversing an entire route of flight to establish the minimum altitude the navigation signal can be received for the route and for off-course NAVAID facilities that determine a fix
  - When the MRA at the fix is higher than the MEA, an MRA is established for the fix and is the lowest altitude at which an intersection can be determined
  - MRA does not apply to GNSS equipped aircraft

MINIMUM ALTITUDES *(CONT'D)*

Knowledge Check



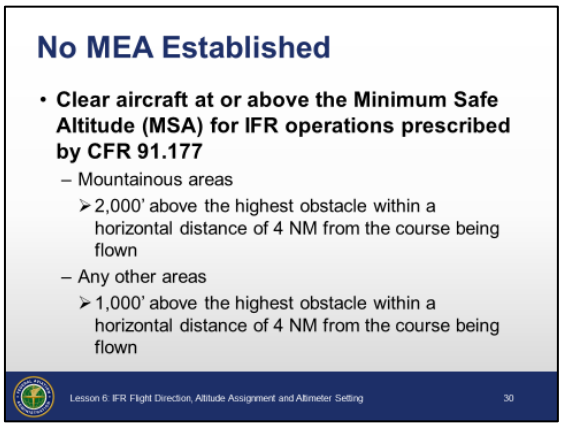
Question: When may an aircraft be cleared to the lower MEA along a route segment?

MINIMUM ALTITUDES *(CONT'D)*

No MEA Established

JO 7110.65, par. 4-5-6

CFR 91.177

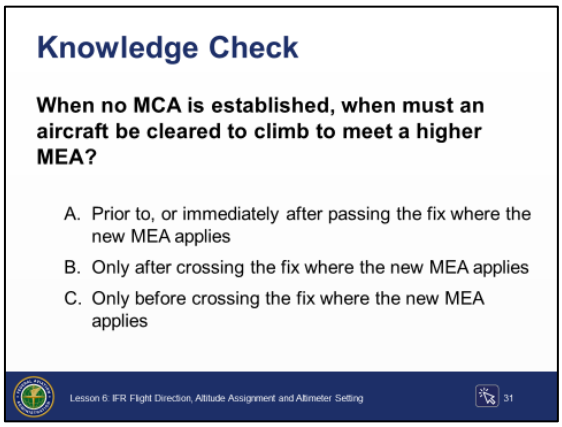


No MEA Established

- Clear aircraft at or above the Minimum Safe Altitude (MSA) for IFR operations
  - Mountainous areas
    - 2,000' above the highest obstacle within a horizontal distance of 4 NM from the course being flown
  - Any other areas
    - 1,000' above the highest obstacle within a horizontal distance of 4 NM from the course being flown

MINIMUM ALTITUDES *(CONT'D)*

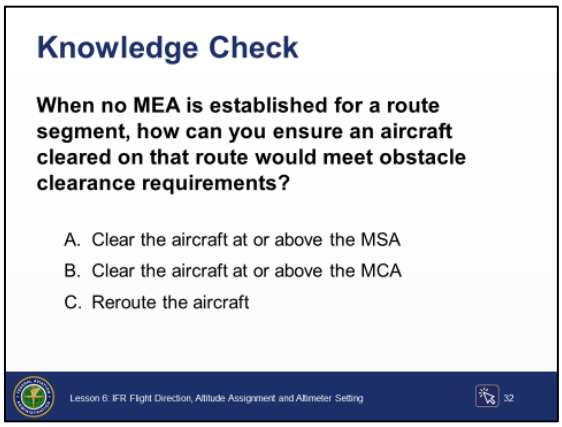
Knowledge Check



Question: When no MCA is established, when must an aircraft be cleared to climb to meet a higher MEA?

MINIMUM ALTITUDES *(CONT'D)*

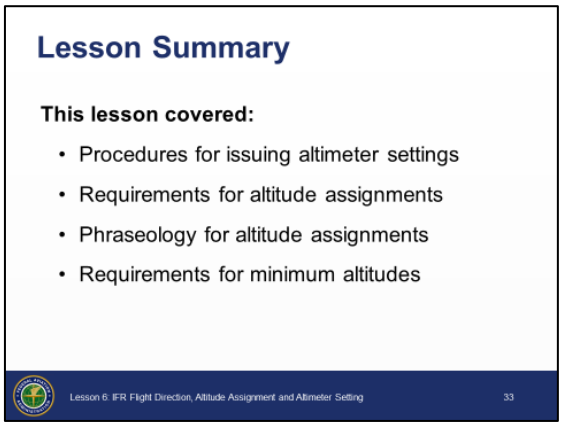
Knowledge Check



Question: When no MEA is established for a route segment, how can you ensure an aircraft cleared on that route would meet obstacle clearance requirements?

CONCLUSION

Lesson Summary



Summary

- Procedures for issuing altimeter settings
  - Destination airport
  - Descending below flight levels
  - DOD single altimeter settings
  - Old altimeters
- Requirements for assigning altitudes
  - Direction of flight
  - RVSM airspace
    - Exceptions to RVSM airspace requirements
  - VFR-On-Top altitude
  - Exceptions to direction of flight
  - Phraseology
  - Pilot's discretion
  - Block altitude
  - Vertical navigation SIDs/STARs

Continued on next page

CONCLUSION *(CONT'D)*

Lesson Summary (Cont'd)

- Phraseology for altitude assignments
  - Pilot's discretion
  - Block altitudes
  - Vertical navigations SIDs/STARs
  - Time to climb or descend
  - Altitude assignments
  - Anticipated altitude change
  - Altitude confirmation - nonradar
- Requirements for minimum altitudes
  - Minimum En Route Altitude (MEA)
  - Global Navigation Satellite System (GNSS) MEA
  - Minimum Crossing Altitude (MCA)
  - MEA changes
  - Minimum Obstruction Clearance Altitude (MOCA)
  - Minimum Reception Altitude (MRA)
  - No MEA established