Federal Aviation Administration

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

Lesson 8: Holding Aircraft

Version: 1.0 2022.08

INSTRUCTOR LESSON PLAN

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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	Holding Aircraft
Duration	1 Hour, 15 minutes (Includes lesson and ELT)
Version	1.0 2022.08
Reference(s)	JO 7110.65, Air Traffic Control; FAA Order 8260.3, TERPS; JO 7210.3, Facility Operation Administration; Aeronautical Information Manual (AIM)
Prerequisites	NONE
Handout(s)	NONE
Exercise / Activity	NONE
Scenario	NONE
Assessments	⊙ YES - Written *(Refer to ELT01_L08, print prior to class)*.
Materials and Equipment	⊙ Pencil and/or pen
Other Pertinent Information	⊙ **Ensure lesson materials are downloaded to the classroom computer** ⊙ Course 57840, Holding Aircraft, 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.

 *As you prep for this lesson, recall and be prepared to talk about examples and personal experiences that illustrate or explain the teaching points in the lesson.*

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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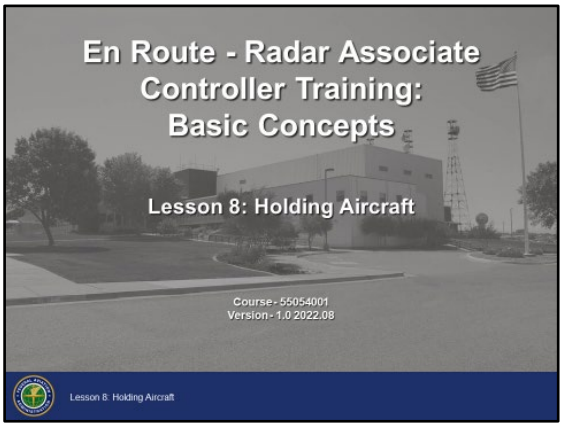
LESSON INTRODUCTION

Overview

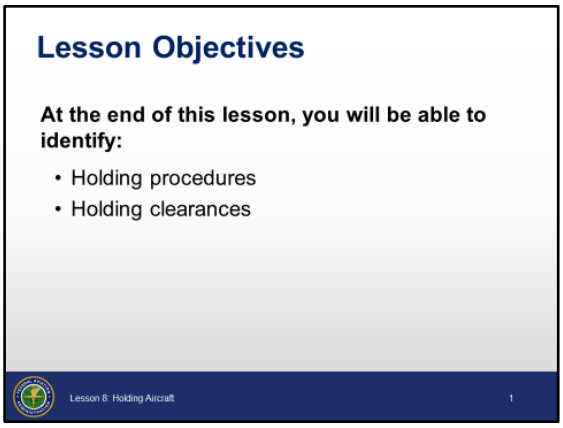


Overview

Holding is necessary to prevent sector saturation and used to sequence traffic for terminal arrivals, such as to meet time-based traffic management metering times.

LESSON INTRODUCTION *(CONT'D)*

Lesson Objectives



Objectives

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

- Holding procedures
- Holding clearances

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.

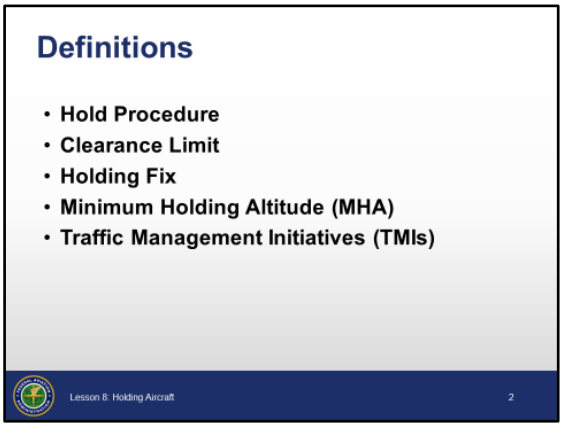
Review the lesson objectives.

HOLDING PROCEDURES

Definitions

JO 7110.65, par. 11-1-2; PCG

JO 7210.3, par. 18-6-1



Definitions

HOLD PROCEDURE - Predetermined maneuver which keeps aircraft within a specified airspace while awaiting further clearance from air traffic control. This procedure is also used during ground operations to keep aircraft within a specified area or at a specified point while awaiting further clearance from air traffic control.

CLEARANCE LIMIT - The fix, point, or location to which an aircraft is cleared when issued an air traffic clearance.

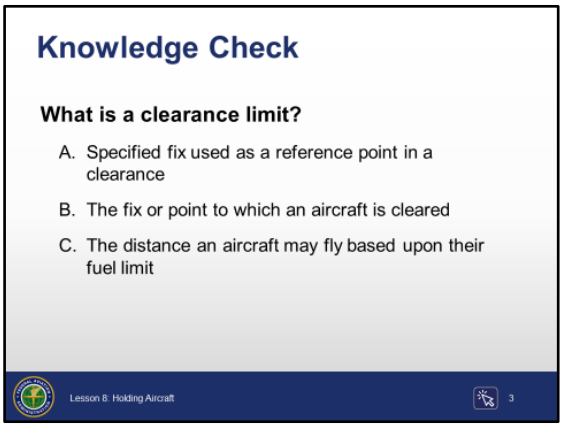
HOLDING FIX - A specified fix identifiable to a pilot by NAVAIDs or visual reference to the ground used as a reference point in establishing and maintaining the position of an aircraft while holding.

MINIMUM HOLDING ALTITUDE (MHA) - The lowest altitude prescribed for a holding pattern which assures navigational signal coverage and communications and meets obstacle clearance requirements.

TRAFFIC MANAGEMENT INITIATIVES (TMIs) - Techniques used to manage demand with capacity in the NAS.

HOLDING PROCEDURES *(CONT'D)*

Knowledge Check



Question: What is a clearance limit?

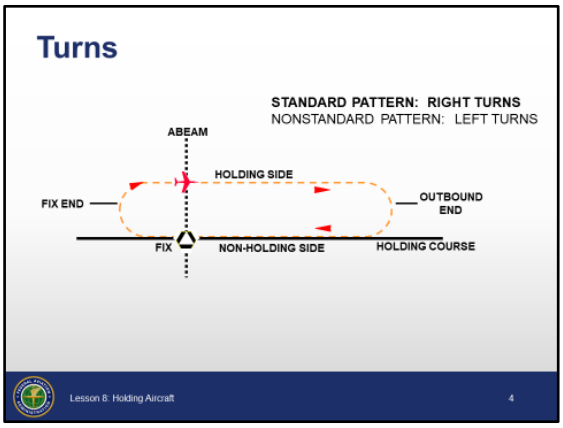
Answer: *B. The fix or point to which an aircraft is cleared*

HOLDING PROCEDURES *(CONT'D)*

Turns

AIM, par. 5-3-8

JO 7110.65, par. 4-6-4



Turns

- Standard pattern - Right turns
  - Direction of turns does not need to be specified when issuing right turns
- Nonstandard pattern - Left turns
  - Direction of turns always needs to be specified when issuing left turns

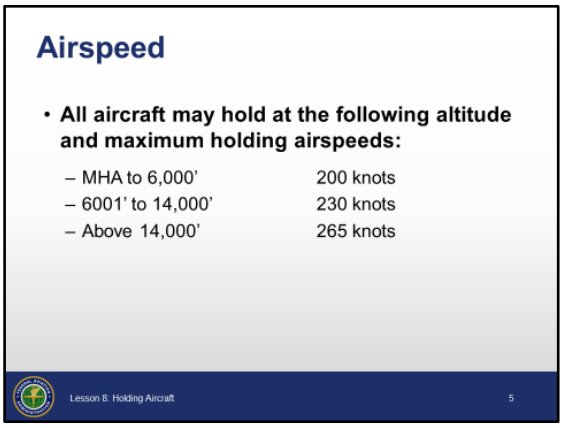
Emphasize right vs. left turns when issuing holding.

HOLDING PROCEDURES *(CONT'D)*

Airspeed

AIM, par. 5-3-8

JO 7110.65, par. 4-6-4



Airspeed

- All aircraft may hold at the following altitude and maximum holding airspeeds:
  - Minimum Holding Altitude (MHA) to 6,000' - 200 knots
  - 6,001' to 14,000' - 230 knots
  - Above 14,000' - 265 knots

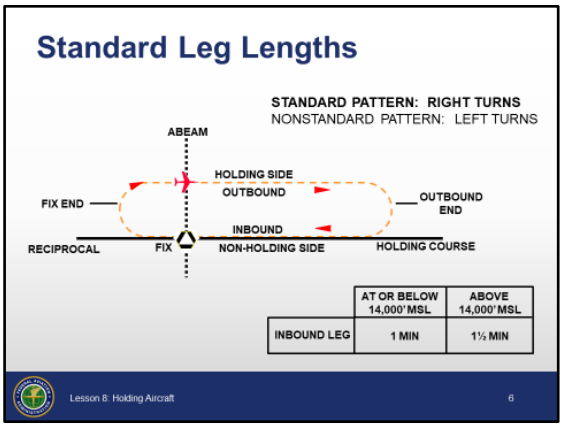
NOTE: Exceptions to maximum holding airspeed can be found in AIM paragraph 5-3-8.

HOLDING PROCEDURES *(CONT'D)*

Standard Leg Lengths

AIM, par. 5-3-8

JO 7110.65, par. 4-6-4



Standard Leg Lengths

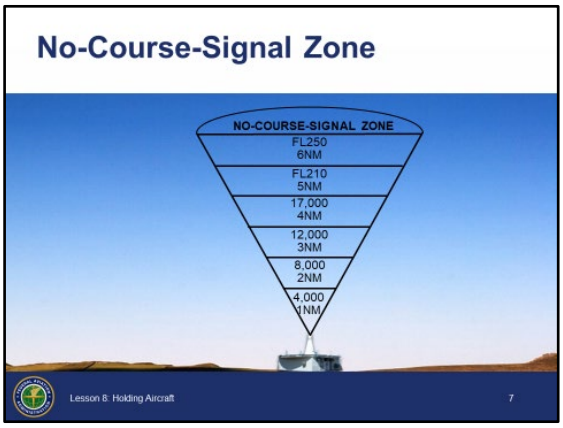
- At or below 14,000' - 1 minute
- Above 14,000' - 1½ minutes
- Leg lengths may also be issued in miles to DME and RNAV equipped aircraft

NOTE: Leg lengths may be increased if the pilot requests it and the controller deems it appropriate.

HOLDING PROCEDURES *(CONT'D)*

No-Course-Signal Zone

FAA Order 8260.3, Section 17-4



No-Course-Signal Zone

- The no-course-signal zone is the area above a NAVAID in which course information may not be available
  - The area is cone shaped, getting larger at higher altitudes
  - Course and DME information, if available, may be inaccurate and unusable

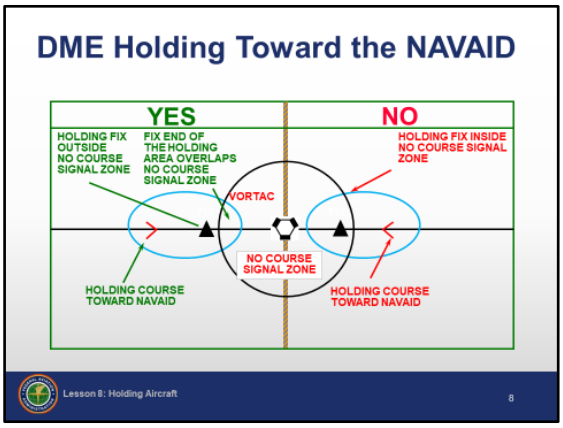
  NOTE: An airborne DME reading of 5 NM at FL300 would indicate that the aircraft is directly over the NAVAID, because distance measured is slant range.

  SLANT RANGE - The horizontal distance from the aircraft antenna to the ground station, due to line-of-sight transmission of the DME signal.

- The minimum fix-to-NAVAID distance is determined by the aircraft holding altitude

DME Holding Toward the NAVAID

FAA Order 8260.3, par. 16-4-3



DME Holding Toward the NAVAID

- Holding fix must be outside the no-course-signal zone

NOTE: Holding may be accomplished inbound to the DME fix, either toward or away from a NAVAID.

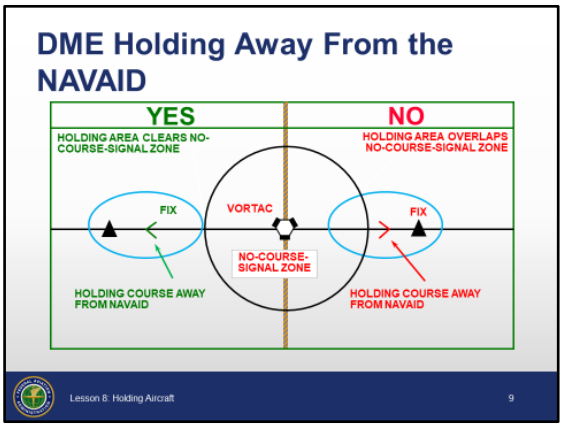
- The fix end of the holding pattern can overlap the no-course-signal zone, provided entry is not made through the no-course-signal zone

Explain the difference on the slide regarding the holding fix location, either inside, or outside of the no-course-signal zone.

HOLDING PROCEDURES *(CONT'D)*

DME Holding Away From the NAVAID

FAA Order 8260.3, Section 16-4-5



DME Holding Away From the NAVAID

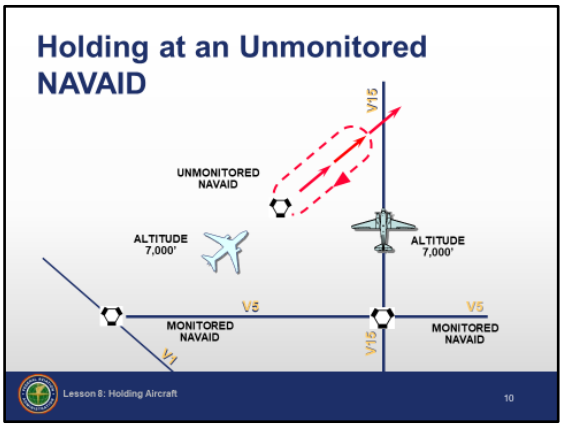
- When holding away from the NAVAID, no part of the holding pattern may lie within the no-course-signal zone

Explain why the course reversal cannot occur inside the no-course signal zone. The pilot using DME leg lengths cannot determine when to turn.

HOLDING PROCEDURES *(CONT'D)*

Unmonitored NAVAID

JO 7110.65, par. 4-6-7



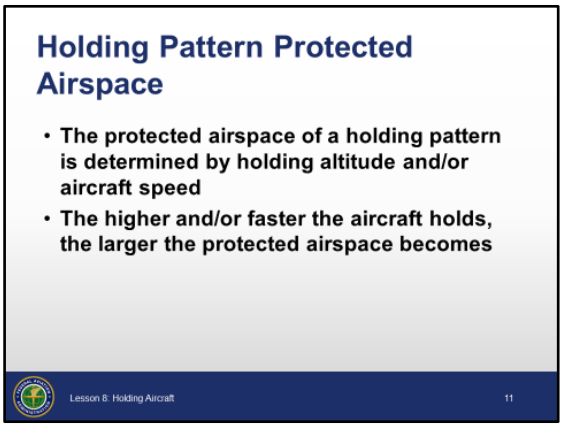
Holding at an Unmonitored NAVAID

- When a NAVAID is unmonitored, the operational status and accuracy of the NAVAID cannot be determined
- Separate holding aircraft from other aircraft occupying the same course which the holding aircraft will follow if it does not receive signals from the NAVAID

Explain that at an unmonitored NAVAID, ATC does not know the operational status of the NAVAID, and that if signal is lost, the aircraft may not remain in the holding pattern protected airspace.

Holding Pattern Protected Airspace

FAA Order 8260.3, Section 16-3



Holding Pattern Protected Airspace

- ⊙ The protected airspace of a holding pattern is determined by holding altitude and/or aircraft speed
- ⊙ The higher and/or faster the aircraft holds, the larger the protected airspace becomes
  - Each holding pattern size is related to one or more even-numbered altitudes/flight levels, each identified by a pattern number for easy reference

NOTE: Holding pattern size and altitude charts are found in FAA Order 8260.3, TERPS.

HOLDING PROCEDURES *(CONT'D)*

Holding Flight Path Deviation

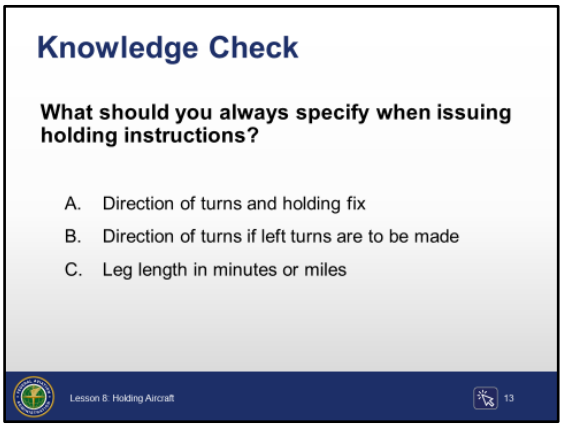
JO 7110.65, par. 4-6-6

Holding Flight Path Deviation

- Approve a pilot request to deviate from the holding pattern if obstacles and traffic conditions permit
  - Take into consideration surrounding airspace and terrain

HOLDING PROCEDURES *(CONT'D)*

Knowledge Check



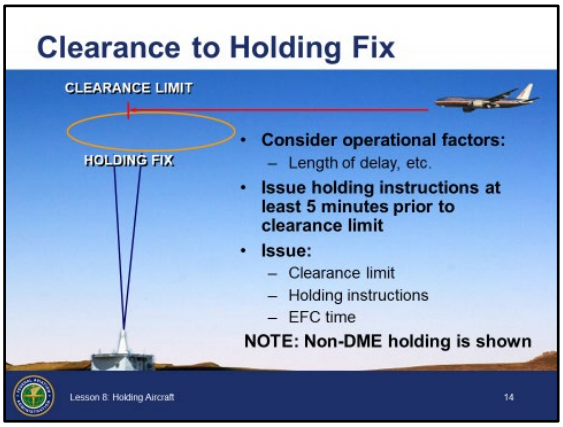
Question: What should you always specify when issuing holding instructions?

Answer *B. Direction of turns if left turns are to be made*

HOLDING CLEARANCES

Clearance to Holding Fix

JO 7110.65, par. 4-6-1



Clearance to Holding Fix

⊙ When necessary to clear an aircraft to a fix other than the destination airport, consider operational factors such as:

- Length of delay
- Holding airspace limitations
- NAVAIDs
- Altitude
- Meteorological conditions

⊙ When delay is expected, issue holding instructions at least 5 minutes before the aircraft is estimated to reach the clearance limit

- Provides the pilot time to start speed reduction
- Compensates for small differences in pilot/center ETAs at the holding fix when in a nonradar environment

⊙ Issue the following:

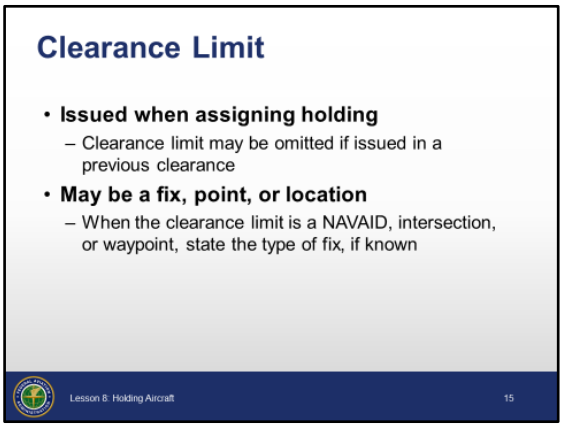
- Clearance limit
- Holding Instructions
  - May be eliminated when you inform the pilot that no delay is expected
- Expect Further Clearance (EFC) time
  - Do not issue if no delay is expected

NOTE: Non-DME holding is depicted, because the holding fix is within the no-course-signal zone.

HOLDING CLEARANCES *(CONT'D)*

Clearance Limit

JO 7110.65, pars. 4-6-1, 4-6-4, 4-6-5



Clearance Limit

- ⊙ Issued when assigning holding
  - Clearance limit may be omitted if issued in a previous clearance
    - In this case the holding clearance will begin with the direction of holding
- ⊙ May be a fix, point, or location
  - When the clearance limit is a NAVAID, intersection, or waypoint, state the type of fix, if known

  Examples: "CLEARED TO RED BLUFF VORTAC"
  "CLEARED TO RAIDR WAYPOINT"
- ⊙ If any part of the route beyond a clearance limit differs from the last routing cleared, issue the route the pilot can expect beyond the clearance limit

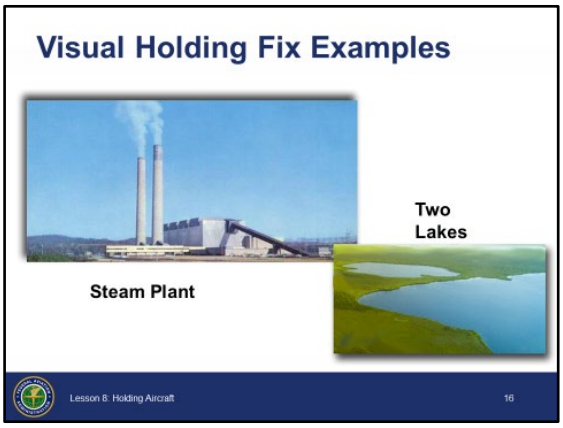
EXPECT FURTHER CLEARANCE VIA (routing)

Example: "EXPECT FURTHER CLEARANCE VIA DIRECT STILLWATER V-O-R, VICTOR TWO TWENTY-SIX SNAPY INTERSECTION, DIRECT NEWARK"

HOLDING CLEARANCES *(CONT'D)*

Visual Holding Fix

JO 7110.65, par. 4-6-5



Visual Holding Fix

⊙ The holding fix is determined by visual reference to the surface

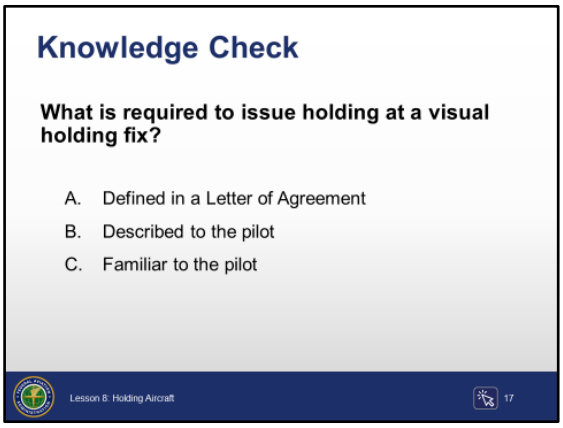
- The pilot must be familiar with the fix

HOLD AT (location) UNTIL (time or other condition).

Example: "NOVEMBER SIX TANGO DELTA, HOLD AT TWO LAKES UNTIL ONE THREE ZERO ZERO"

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check

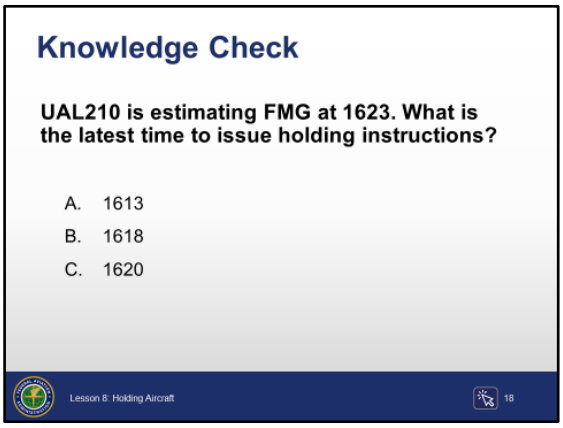


Question: What is required to issue holding at a visual holding fix?

Answer: *C. Familiar to the pilot*

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check



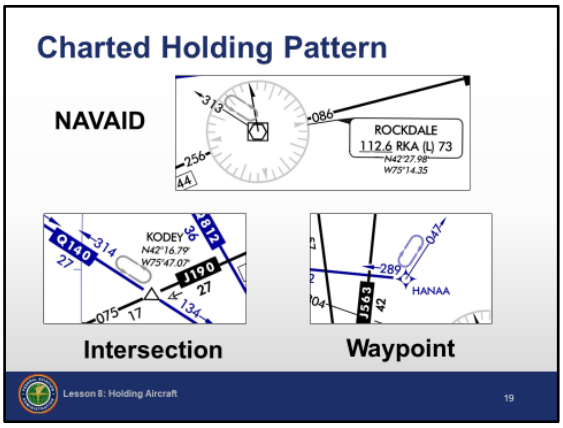
Question: UAL210 is estimating FMG at 1623. What is the latest time to issue holding instructions?

Answer: *B. 1618*

HOLDING CLEARANCES *(CONT'D)*

Charted Holding Pattern

JO 7110.65, par. 4-6-1



Charted Holding Pattern

- Omit all holding instructions except charted direction and the statement AS PUBLISHED

CLEARED TO (fix), HOLD (direction), AS PUBLISHED, EXPECT FURTHER CLEARANCE (time)

Example: "CLEARED TO KODEY INTERSECTION, HOLD NORTHWEST, AS PUBLISHED, EXPECT FURTHER CLEARANCE TWO TWO ONE ZERO"

- Always issue complete holding instructions when requested by the pilot

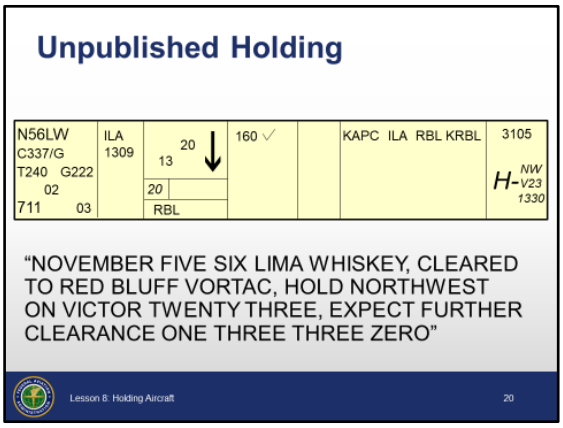
- Charted holding patterns are published on low/high altitude en route, area, and STAR charts
  - Holding patterns are not published on VFR sectional charts

HOLDING CLEARANCES *(CONT'D)*

Unpublished Holding

JO 7110.65, par. 4-6-4

AIM, par. 5-3-8



Unpublished Holding

The clearance will appear on the slide after a delay.

⊙ Holding may be issued at locations where there is no published holding, however complete holding instructions must be issued, as follows:

- Clearance limit, if not previously issued
- Direction of holding from fix/waypoint using eight cardinal compass points
- Holding fix or waypoint
  - The holding fix may be omitted if included at the beginning of the transmission as the clearance limit
- Radial, course, bearing, track, azimuth, airway, or route on which aircraft is to hold
- Leg length
  - In miles if DME or RNAV is to be used
  - In minutes if the pilot requests it, or the controller considers it necessary
- Direction of turns if:
  - Left turns are to be made
  - Pilot requests it
  - Controller deems it necessary

HOLD (direction) OF (fix/waypoint) ON (specified radial, course, bearing, track, airway, azimuth, or route)

Continued on next page

HOLDING CLEARANCES *(CONT'D)*

Unpublished Holding (Cont'd)

JO 7110.65, par. 4-6-4

AIM; par. 5-3-8

Example: "NOVEMBER FIVE SIX LIMA WHISKEY, CLEARED TO RED BLUFF VORTAC, HOLD NORTHWEST ON VICTOR TWENTY-THREE, EXPECT FURTHER CLEARANCE ONE THREE THREE ZERO"

If leg length is specified,

(Number of minutes/miles) MINUTE/MILE LEG

If direction of turn is specified,

LEFT/RIGHT TURNS

Example: "CIRRUS SIX FOXTROT XRAY, HOLD SOUTH OF SKAGGS ISLAND VORTAC ON VICTOR EIGHTY-SEVEN, ONE MINUTE LEG, LEFT TURNS, EXPECT FURTHER CLEARANCE ONE EIGHT TWO FIVE"

Example: "AMERICAN FIVE-EIGHTY, HOLD NORTHWEST OF SACRAMENTO VORTAC ON THE THREE FOUR ZERO RADIAL FOUR ZERO MILE FIX, TWO ZERO MILE LEG, LEFT TURNS, EXPECT FURTHER CLEARANCE ONE TWO THREE ZERO"

- Issue maximum holding airspeed advisories when an aircraft is:
  - Approved to exceed the maximum airspeed of a pattern and cleared into a holding pattern that will protect for the greater speed; or
  - Observed deviating from holding pattern airspace; or
  - Cleared into an airspeed-restricted holding pattern in which the restricted airspeed icon has not been published

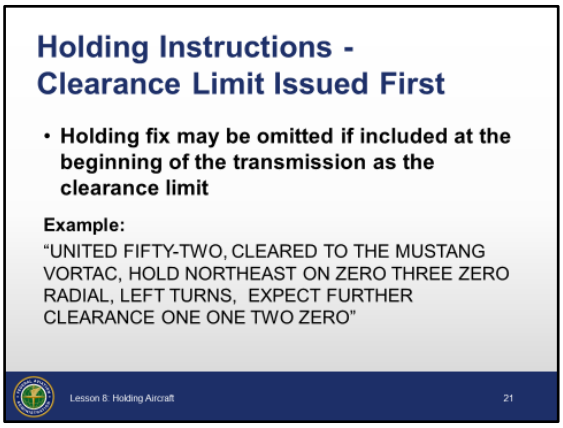
(Aircraft identification) (holding instructions, when needed) MAXIMUM HOLDING AIRSPEED IS (speed in knots)

HOLDING CLEARANCES *(CONT'D)*

Holding Instructions - Clearance Limit Issued First

JO 7110.65, par. 4-6-4

AIM, par. 5-3-8



Clearance Limit Issued First

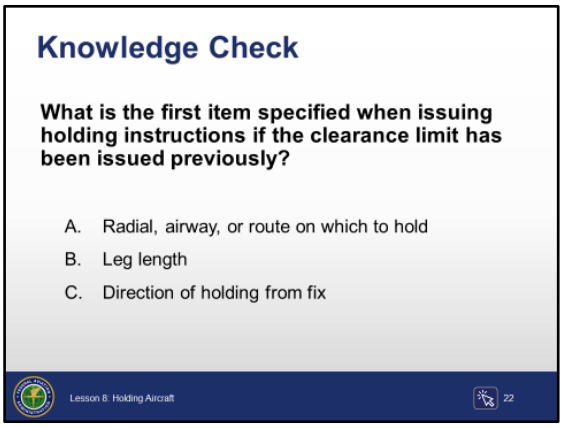
- The holding fix may be omitted if included at the beginning of the transmission as the clearance limit

HOLD (direction) ON (specified radial, course, bearing, track, airway, azimuth, or route)…

Example: "UNITED FIFTY-TWO CLEARED TO THE MUSTANG VORTAC, HOLD NORTHEAST ON ZERO THREE ZERO RADIAL, LEFT TURNS, EXPECT FURTHER CLEARANCE ONE ONE TWO ZERO"

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check



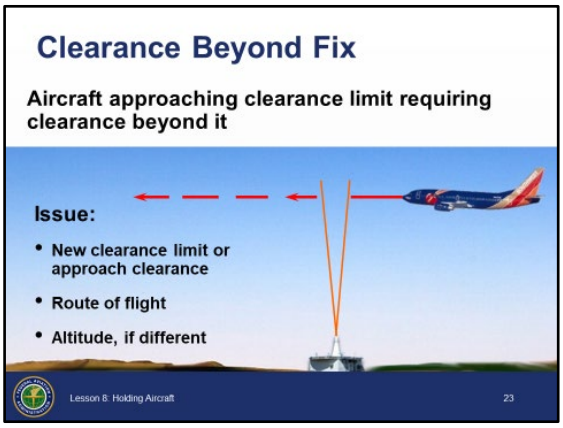
Question: What is the first item specified when issuing holding instructions if the clearance limit has been issued previously?

Answer: *C. Direction of holding from fix*

HOLDING CLEARANCES *(CONT'D)*

Clearance Beyond Fix

JO 7110.65, par. 4-6-2



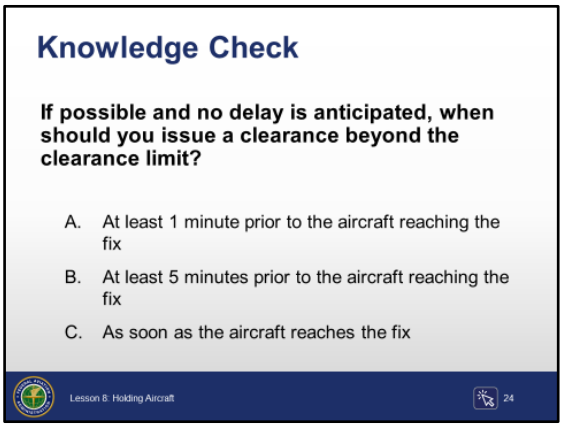
Clearance Beyond Fix

- ⊙ If no delay is expected, issue a clearance beyond the clearance limit:
  - As soon as possible
  - At least 5 minutes prior to the aircraft reaching the fix, when possible
- ⊙ Include the following items when issuing clearance beyond the clearance limit:
  - Clearance limit or approach clearance
  - Route of flight, specifying one of the following:
    - Complete details of the route (airway, route, course, fix(es), azimuth course, heading, arc, or vector), or
    - The phrase:

      VIA LAST ROUTING CLEARED
      - Used to reduce verbiage, only used when the most recently issued routing to the new clearance limit is valid
  - Assigned altitude, if different from current altitude
- ⊙ If no clearance beyond fix has been issued:
  - The pilot is expected to hold as depicted on charts (low/high altitude, en route, area, and STAR)
  - If there is no charted pattern, and no holding instructions have been issued:
    - The pilot should request instructions prior to reaching the fix
    - If unable to obtain holding instructions, the pilot should hold in a standard pattern on the course approaching the fix and request further clearance as soon as possible

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check

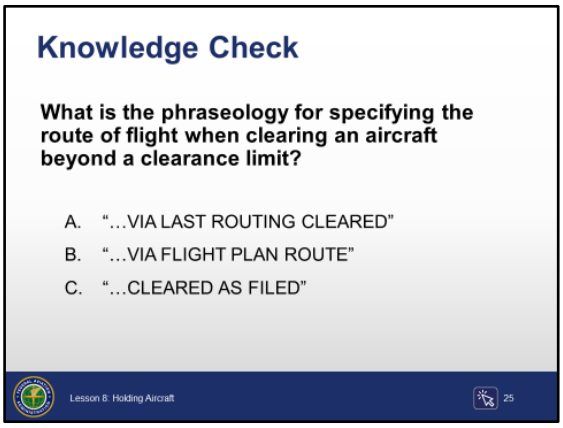


Question: If possible, and no delay is anticipated, when should you issue a clearance beyond the clearance limit?

Answer: *B. At least 5 minutes prior to the aircraft reaching the fix*

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check



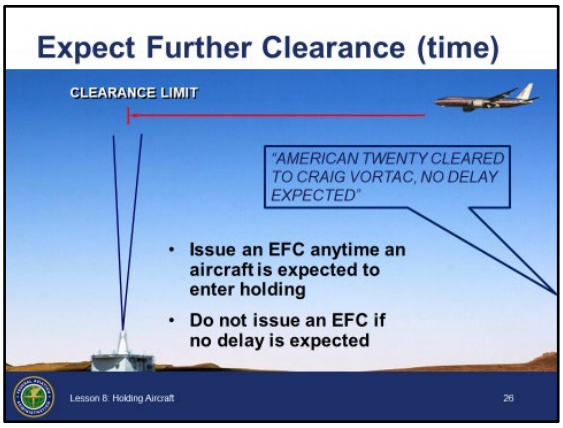
Question: What is the phraseology for specifying the route of flight when clearing an aircraft beyond a clearance limit?

Answer: *A. "…VIA LAST ROUTING CLEARED"*

HOLDING CLEARANCES *(CONT'D)*

EFC (time)

JO 7110.65, par. 4-6-1



Expect Further Clearance (time)

⊙ After assigning holding instructions, issue an EFC anytime an aircraft is expected to enter holding

- If delay is longer than anticipated, issue a new EFC prior to expiration of the current EFC

EXPECT FURTHER CLEARANCE (time)

Example: "DELTA FORTY CLEARED TO LOZIT INTERSECTION TO HOLD NORTHWEST AS PUBLISHED, EXPECT FURTHER CLEARANCE TWO ONE THREE ZERO"

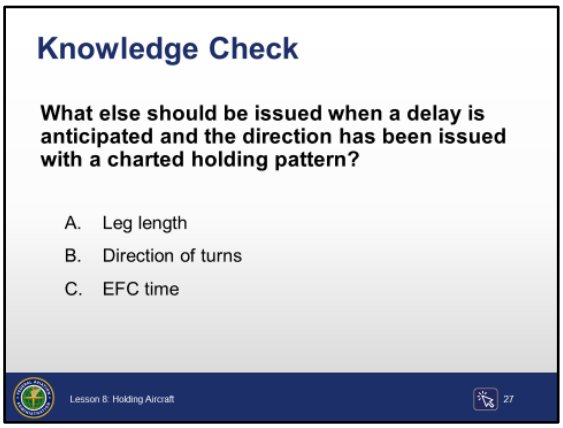
⊙ Do not issue an EFC if no delay is expected

CLEARED TO (fix), NO DELAY EXPECTED

Example: "AMERICAN TWENTY CLEARED TO CRAIG VORTAC, NO DELAY EXPECTED"

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check



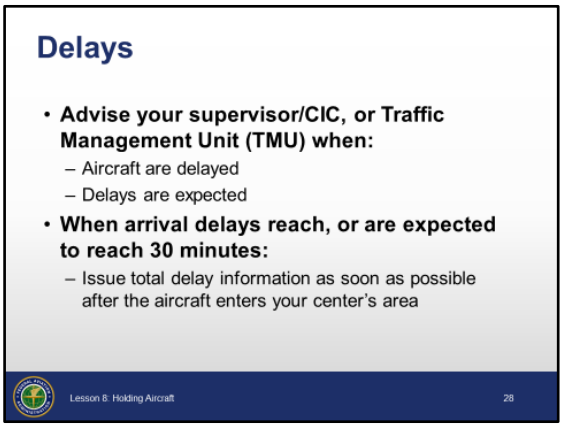
Question: What else should be issued when a delay is anticipated and the direction has been issued with a charted holding pattern?

Answer: *C. EFC time*

HOLDING CLEARANCES *(CONT'D)*

Delays

JO 7110.65, par. 4-6-3



Delays

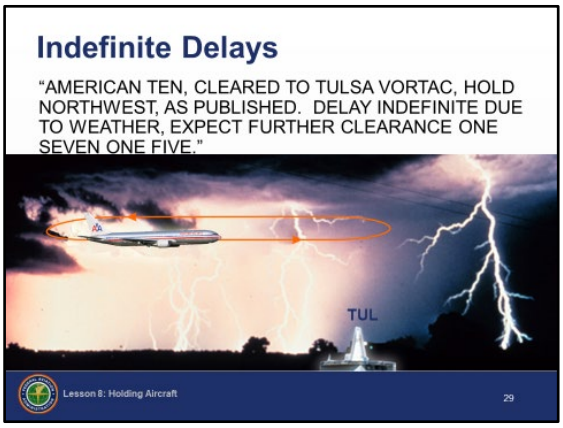
- ⊙ Advise your supervisor/CIC, or Traffic Management Unit (TMU) when:
  - Aircraft are delayed
  - Delays are expected
- ⊙ When arrival delays reach, or are anticipated to reach 30 minutes:
  - Issue total delay information as soon as possible after the aircraft enters your center's area
    - Issued by the first controller to communicate with the aircraft
    - May be omitted when available via ATIS, unless the pilot requests it

(Airport) ARRIVAL DELAYS (time in minutes/hours)

HOLDING CLEARANCES *(CONT'D)*

Indefinite Delays

JO 7110.65, par. 4-6-1



Indefinite Delays

- ⊙ Advise the pilot the delay will be indefinite, and the reason if known
  - After determining the reason for the delay, advise the pilot as soon as possible
- ⊙ Issue an EFC time
  - Make every possible effort to provide the pilot with the best possible estimate of the delay and the reason

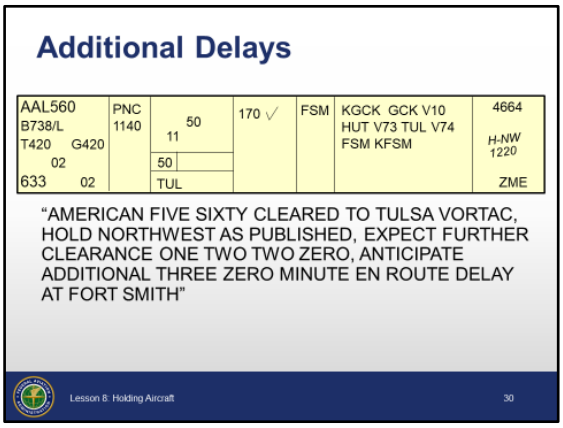
DELAY INDEFINITE, (reason if known), EXPECT FURTHER CLEARANCE (time)

Example: "AMERICAN TEN, CLEARED TO TULSA VORTAC, HOLD NORTHWEST AS PUBLISHED. DELAY INDEFINITE DUE TO WEATHER, EXPECT FURTHER CLEARANCE ONE SEVEN ONE FIVE"

HOLDING CLEARANCES *(CONT'D)*

Additional Delays

JO 7110.65, par. 4-6-1



Additional Delays

⊙ If there is one additional delay fix, state:

- Fix name
- Best estimate of additional delay

EXPECT FURTHER CLEARANCE (time),

and, if required,

ANTICIPATE ADDITIONAL (time in minutes/hours) MINUTE/HOUR DELAY AT (fix),

or,

ANTICIPATE ADDITIONAL (time in minutes/hours) MINUTE/HOUR EN ROUTE DELAY

Example: "AMERICAN FIVE SIXTY CLEARED TO TULSA VORTAC, HOLD NORTHWEST AS PUBLISHED, EXPECT FURTHER CLEARANCE ONE TWO TWO ZERO. ANTICIPATE ADDITIONAL THREE ZERO MINUTE EN ROUTE DELAY AT FORT SMITH"

⊙ If there is more than one additional delay fix:

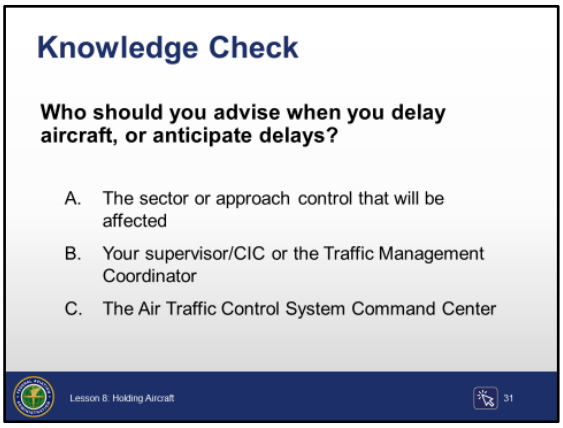
- State total additional en route delay
- Omit naming specific fixes

⊙ Terminal delays:

- When additional holding is expected in an approach control area, state the total additional terminal delay

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check

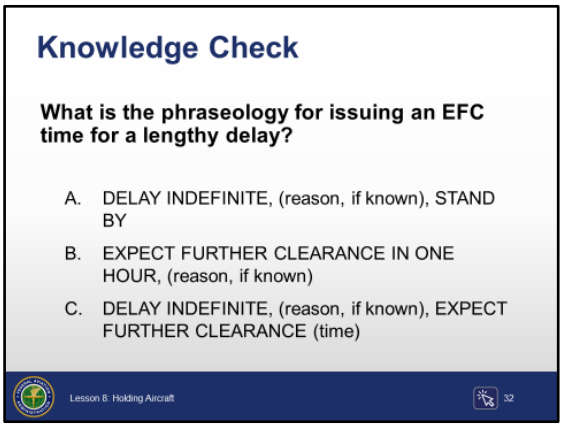


Question: Who should you advise when you delay aircraft, or anticipate delays?

Answer: *B. Your supervisor/CIC or the Traffic Management Coordinator*

HOLDING CLEARANCES *(CONT'D)*

Knowledge Check

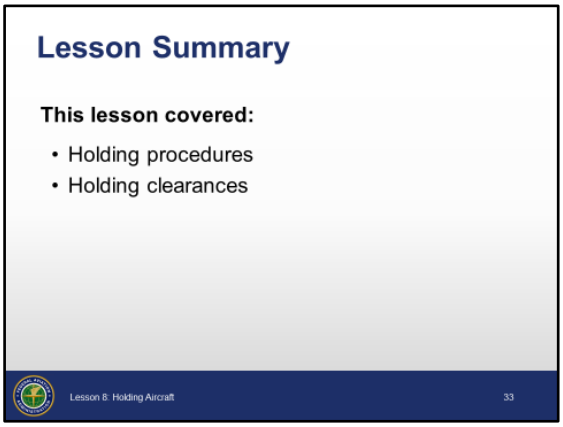


Question: What is the phraseology for issuing an EFC time for a lengthy delay?

Answer: *C. DELAY INDEFINITE, (reason, if known), EXPECT FURTHER CLEARANCE (time)*

CONCLUSION

Lesson Summary



Review and elaborate briefly on the following topics. Ask students if they have questions about any of the concepts covered in the lesson.

Summary

- ⊙ Holding procedures
  - Holding clearance terminology
    - Hold procedure
    - Clearance limit
    - Holding fix
    - Minimum Holding Altitude (MHA)
    - Traffic Management Initiatives (TMIs)
  - Turns
  - Airspeed
  - Holding pattern leg lengths
  - No-Course-Signal Zone
  - DME holding towards the NAVAID
  - DME holding away from the NAVAID
  - Unmonitored NAVAID
  - Holding pattern protected airspace
  - Holding flight path deviation
- ⊙ Holding clearances
  - Clearance to holding fix

Continued on next page

CONCLUSION *(CONT'D)*

Lesson Summary (Cont'd)

- Clearance limit
- Visual holding fix
- Charted holding pattern
- Unpublished holding
- Holding instructions - Clearance limit issued first
- Clearance beyond fix
- Expect Further Clearance time
- Delays
- Indefinite delays
- Additional delays

Hand out and administer the end of lesson test. Provide feedback on missed items, including why particular answers are correct, as well as why some responses are incorrect.