Federal Aviation Administration

55054002 EN ROUTE RADAR ASSOCIATE CONTROLLER TRAINING PART B: NONRADAR

Lesson 1: Longitudinal Separation

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 B: Nonradar
Course Number	55054002
Lesson Title	Longitudinal Separation
Duration	2 hours 30 minutes (includes lesson, practice exercises, and ELT)
Version	1.0 2022.08
Reference(s)	JO 7110.65, Air Traffic Control; AIM, Aeronautical Information Manual; FAA-H-8083-25B, Pilot's Handbook of Aeronautical Knowledge
Prerequisites	NONE
Handout(s)	⊙ Practice Exercise *HO01_L01 (Print file prior to class)*
Exercise / Activity	Refer to handout for: ⊙ Practice Exercise 1, Applying 44 Knot and 22 Knot Separation ⊙ Practice Exercise 2, Applying Same Course Separation ⊙ Practice Exercise 3, Applying Opposite Course Separation
Scenario	NONE
Assessments	YES - Written *(Refer to ELT01_L01 , print prior to class)*
Materials and Equipment	⊙ Pencil and/or pen
Other Pertinent Information	⊙ **Ensure lesson materials are downloaded to the classroom computer** ⊙ Course 57058 - NONRADAR SEPARATION, 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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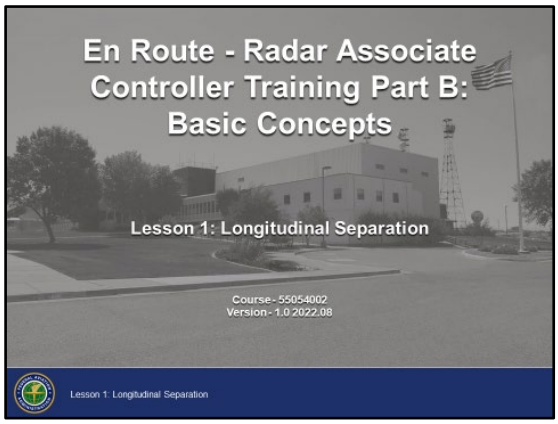
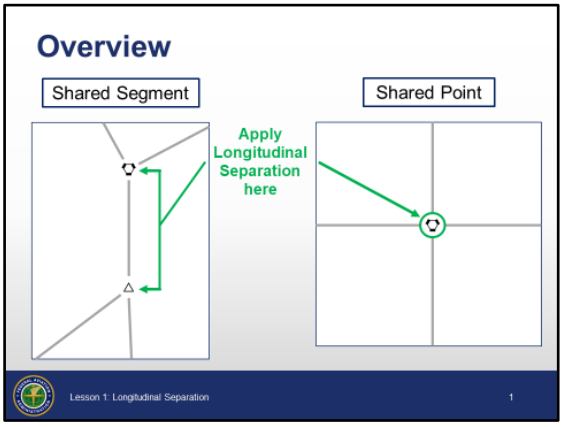
LESSON INTRODUCTION

Overview

JO 7110.65, Pilot/Controller Glossary (PCG)



Click to advance to next slide



Overview

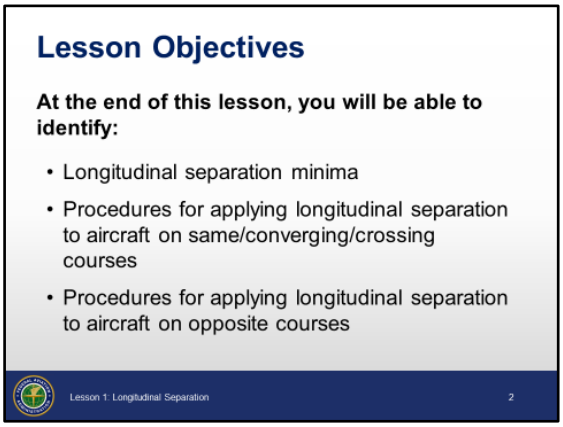
LONGITUDINAL SEPARATION - The longitudinal spacing of aircraft at the same altitude by a minimum distance expressed in units of time or miles.

Anytime aircraft at the same altitude share the same route, either a point or a line segment, longitudinal separation may be used.

This lesson will cover longitudinal separation and its application in air traffic control situations.

LESSON INTRODUCTION *(CONT'D)*

Lesson Objectives



Objectives

Review the lesson objectives.

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

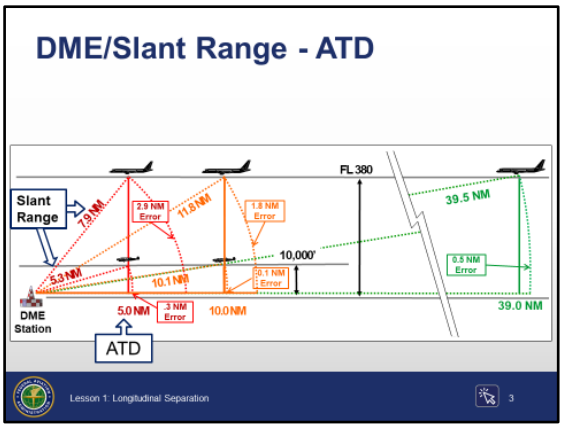
- Longitudinal separation minima
- Procedures for applying longitudinal separation to aircraft on same/converging/crossing courses
- Procedures for applying longitudinal separation to aircraft on opposite courses

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.

DME Slant Range - ATD

JO 7110.65, PCG

FAA-H-8083-25B, Glossary



This slide is animated, 3 clicks.

DME Slant Range - ATD

Review each definition and refer to the slide. Emphasize how slant range differs from ATD and slant range errors increase as the aircraft moves closer to the DME station.

DISTANCE MEASURING EQUIPMENT (DME) - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

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

ALONG-TRACK DISTANCE (ATD) - The horizontal distance between the aircraft's current position and a fix measured by an area navigation (RNAV) system that is not subject to slant-range errors.

Click to show aircraft at FL380, 39 NM from the station. Emphasize how the error between ATD and slant range DME are negligible.

Click to show the two aircraft at 10 NM. Emphasize how the errors are significant at FL380, but negligible AOB 10,000'.

Click to show the two aircraft at 5 NM. Emphasize how the errors are again significant at FL380, but negligible AOB 10,000'.

Continued on next page

SEPARATION MINIMA *(CONT'D)*

DME/Slant Range - ATD (Cont'd)

JO 7110.65, pars. 6-1-1, 6-4-2, 6-4-5

Use mileage-based (DME and/or ATD) procedures and minima only when direct pilot/controller VHF or UHF voice communications are maintained

⊙ Use mileage based procedures and minima between:

- DME equipped aircraft
- RNAV equipped aircraft using ATD
- DME and ATD aircraft:
  - Provided the DME aircraft is either 10,000' or below, or outside of 10 miles from the DME NAVAID, or
  - Advise the pilot of an RNAV aircraft to use DME distances when applying DME separation along VOR airways/routes

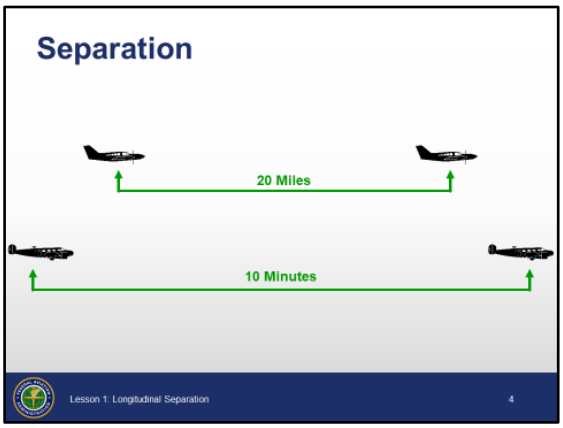
 USE DME DISTANCES

NOTE: Not all RNAV aircraft are capable of reporting slant range. For example, GPS reports distance-to-waypoint as ATD. This is the reason for the 10,000'/10 mile limitation.

SEPARATION MINIMA *(CONT'D)*

Separation

JO 7110.65, par. 6-4-2



Separation

- 20 miles or 10 minutes
  - This is the standard if no other rules apply
  - Other rules may allow for lower separation minima

    Example: The 44 knot rule allows for 5 miles or 3 minutes.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES

Climbing Through an Altitude

JO 7110.65, par. 6-4-2

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Climbing Through an Altitude

⊙ 10 Miles may be applied when a following aircraft is climbing through the altitude of a leading aircraft

Click to show following aircraft climbing

- Used between:
  - DME equipped aircraft
  - RNAV equipped aircraft using ATD
  - DME and ATD aircraft, provided the DME aircraft is either 10,000' or below or outside of 10 miles from the DME NAVAID

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Descending Through an Altitude

JO 7110.65, par. 6-4-2

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Descending Through an Altitude

⊙ 10 Miles may be applied when a leading aircraft is descending through the altitude of a following aircraft

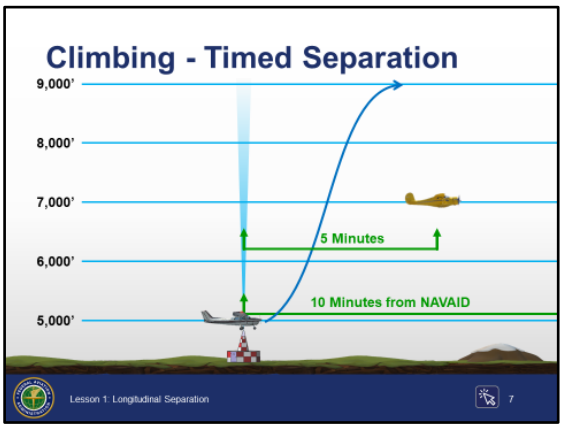
Click to show leading aircraft descending.

- Used between:
  - DME equipped aircraft
  - RNAV equipped aircraft using ATD
  - DME and ATD aircraft, provided the DME aircraft is either 10,000' or below or outside of 10 miles from the DME NAVAID

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Climbing - Timed Separation

JO 7110.65, pars. 6-1-2, 6-1-3, 6-4-2



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Climbing - Timed Separation

- 5 minutes may be applied when:
  - Climbing aircraft is following
  - Aircraft are separated by not more than 4,000' when the altitude change started
  - Altitude change starts within 10 minutes after a following aircraft reports over a fix reported over by the leading aircraft or has acknowledged a clearance specifying the time to cross the same fix

Click to show following aircraft climbing

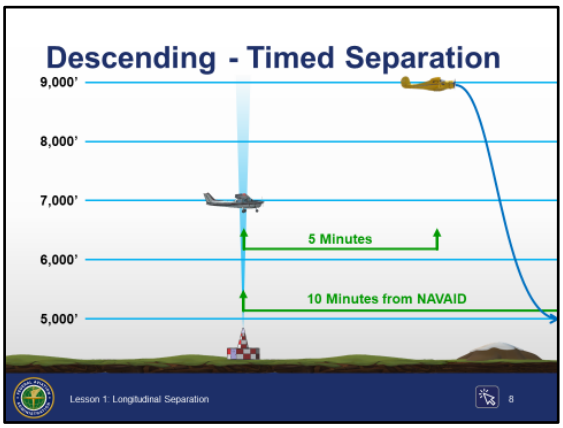
- Position reporting
  - When a position report affecting separation is not received, take action to obtain the report no later than 5 minutes after the aircraft was estimated over the fix
  - Do not require an aircraft to make the same position report to more than one facility

NOTE: Position reporting requirements are applicable to all types of separation.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Descending - Timed Separation

JO 7110.65, par. 6-4-2



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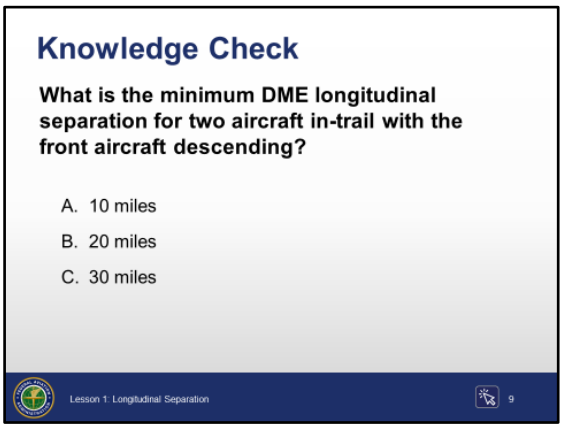
Descending - Timed Separation

- 5 minutes may be applied when:
  - Descending aircraft is leading
  - Aircraft are separated by not more than 4,000' when the altitude change started
  - Altitude change is started within 10 minutes after a following aircraft reports over a fix reported over by the leading aircraft or has acknowledged a clearance specifying the time to cross the same fix

Click to show leading aircraft descending.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

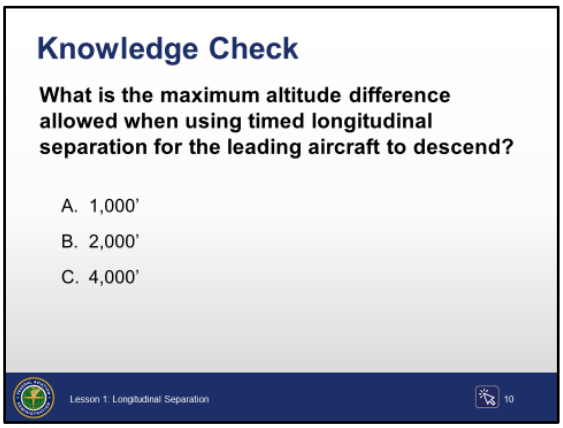


Question: What is the minimum DME longitudinal separation for two aircraft in-trail with the front aircraft descending?

***Answer**: A. 10 miles*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

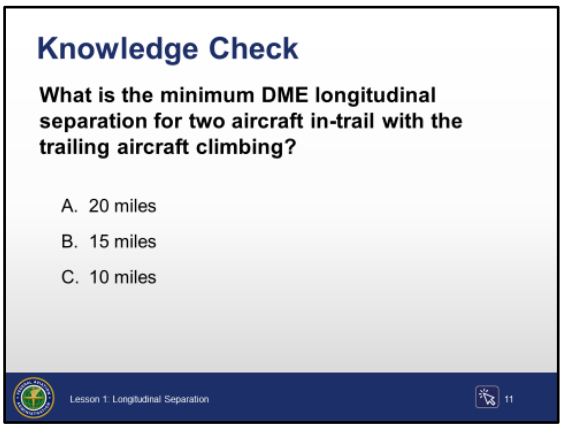


Question: What is the maximum altitude difference allowed when using timed longitudinal separation for the leading aircraft to descend?

***Answer**: C. 4,000'*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

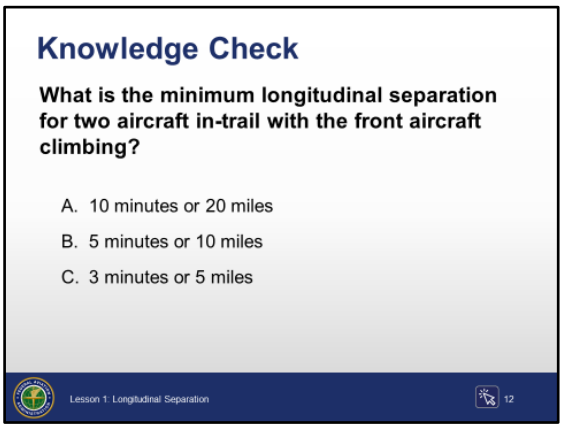


Question: What is the minimum DME longitudinal separation for two aircraft in-trail with the trailing aircraft climbing?

***Answer**: C. 10 miles*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

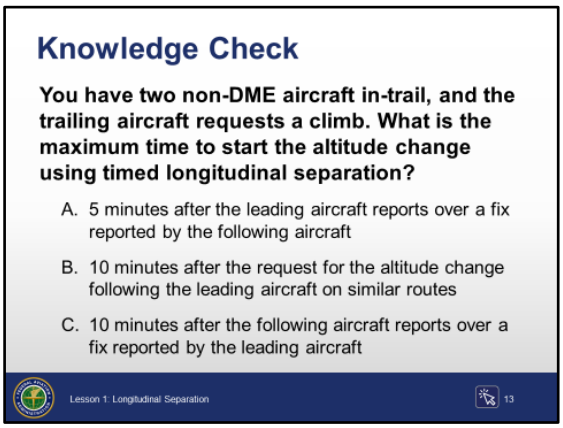


Question: What is the minimum longitudinal separation for two aircraft in-trail with the front aircraft climbing?

***Answer**: A. 10 minutes or 20 miles*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

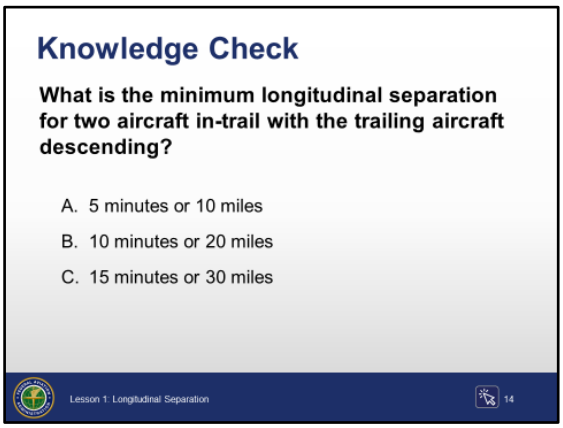


Question: You have two non-DME aircraft in-trail, and the trailing aircraft requests a climb. What is the maximum time to start the altitude change using timed longitudinal separation?

***Answer**: C. 10 minutes after the following aircraft reports over a fix reported by the leading aircraft*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check



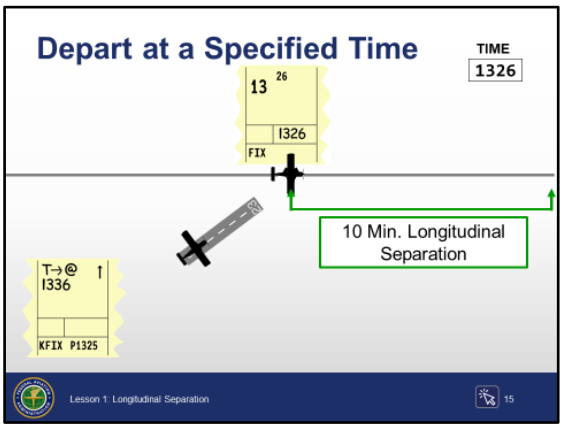
Question: What is the minimum longitudinal separation for two aircraft in-trail with the trailing aircraft descending?

***Answer**: B. 10 minutes or 20 miles*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Depart at a Specified Time

JO 7110.65, pars. 6-4-1, 6-4-2



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Depart at a Specified Time

- Instructions may be issued to a departure to ensure proper longitudinal separation

  Example: "DEPART AT 1336, CLEARANCE VOID IF NOT OFF BY 1350"

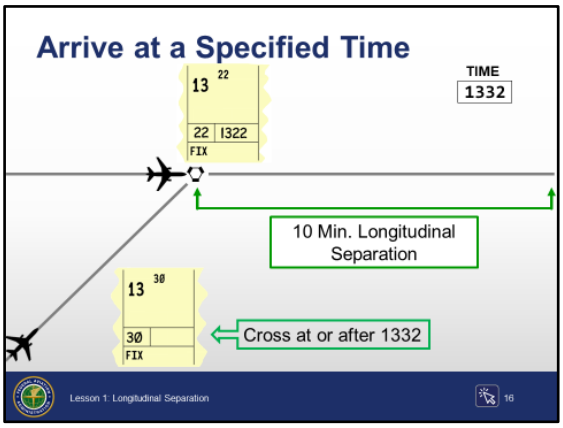
Discuss the en route aircraft fix time of 1326. The departure is restricted to takeoff at 1336 ensuring 10 minutes longitudinal separation.

Click to show en route aircraft crossing the fix and the departure at 1336.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Arrive at a Specified Time

JO 7110.65, pars. 6-4-1, 6-4-2



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Arrive at a Specified Time

- An en route aircraft may be restricted to cross a fix at or before or at or after a specified time
  - If able, aircraft will adjust its speed to accommodate the restriction

CROSS (fix) AT OR BEFORE (time)

CROSS (fix) AT OR AFTER (time)

Example: "CROSS HVQ VORTAC AT OR AFTER 1332"

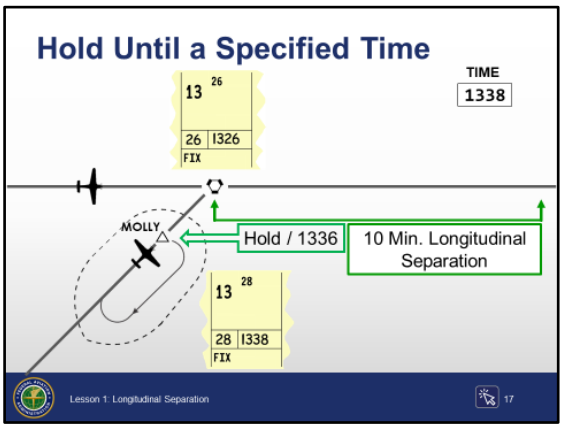
Discuss the en route aircraft fix time of 1322. To ensure 10 minutes longitudinal separation, the following aircraft is restricted to cross the fix at 1332.

Click to show aircraft moving along the route.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Hold Until a Specified Time

JO 7110.65, par. 6-4-1, 6-4-2



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Hold Until a Specified Time

- If an aircraft cannot adjust its speed to follow another by the appropriate minima, a hold may be issued to ensure longitudinal separation

  Example: "HOLD SOUTHWEST OF MOLLY AS PUBLISHED UNTIL 1336 THEN PROCEED ON COURSE"

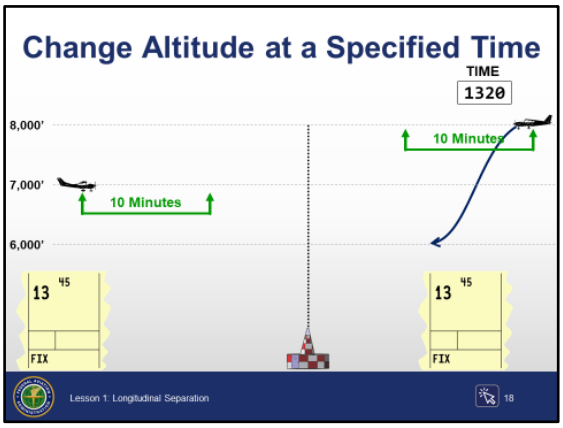
Discuss the en route aircraft fix time of 1326. To ensure 10 minutes longitudinal separation, the following aircraft is issued a hold with a clearance to depart the hold at 1336.

Click to show the hold and the fix times.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Change Altitude at a Specified Time

JO 7110.65, pars. 6-4-1, 6-4-3



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Change Altitude at a Specified Time

- When controlling by time vertical separation must be accomplished 10 minutes before the aircraft cross

  Example: "DESCEND AND MAINTAIN 6,000. DESCEND AS TO BE LEVEL BY 1335, TIME 1320"

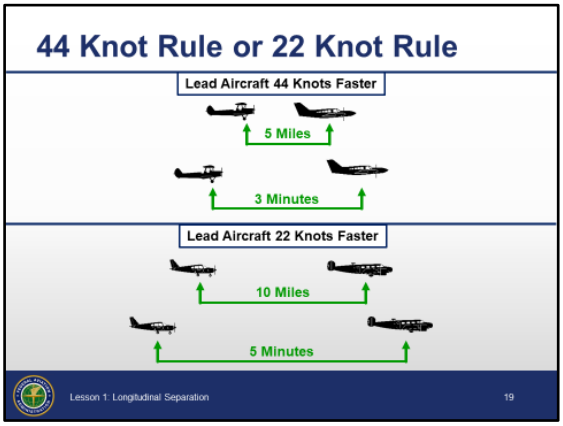
Discuss how longitudinal separation is ensured by having the descending aircraft complete the altitude change 10 minutes prior to crossing.

Click to show aircraft descending

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

44 or 22 Knot Rule

JO 7110.65, par. 6-4-2



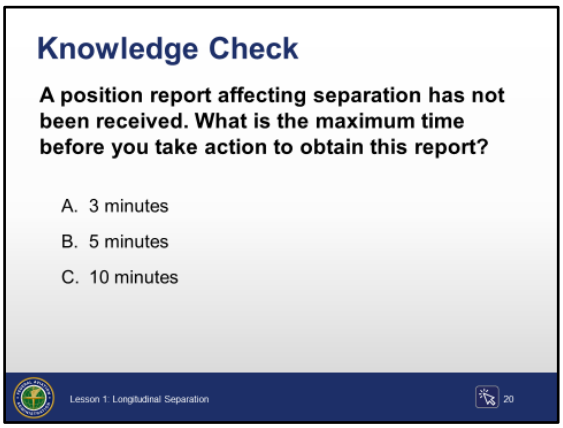
44 Knot Rule or 22 Knot Rule

- The 10 minute or 20 mile longitudinal standard can be reduced in situations where the leading aircraft is 44 knots or 22 knots faster than the following aircraft if the following conditions are met:
  - A departing aircraft follows a preceding aircraft which has taken off from the same or adjacent airport
  - A departing aircraft follows a preceding en route aircraft which has reported over a fix serving the departure airport
  - An en route aircraft follows a preceding en route aircraft which has reported over the same fix
- Minima:
  - 44 knot leading aircraft
    - 5 miles
    - 3 minutes
  - 22 knot leading aircraft
    - 10 miles
    - 5 minutes

NOTE: A faster leading aircraft must either depart the same/adjacent airport or report a common fix before this reduced separation can be applied. This cannot be applied to aircraft in-trail without a position report.

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

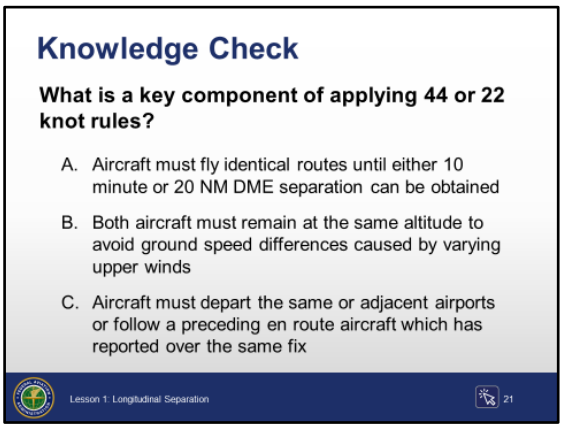


Question: A position report affecting separation has not been received. What is the maximum time before you take action to obtain this report?

***Answer**: B. 5 minutes*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

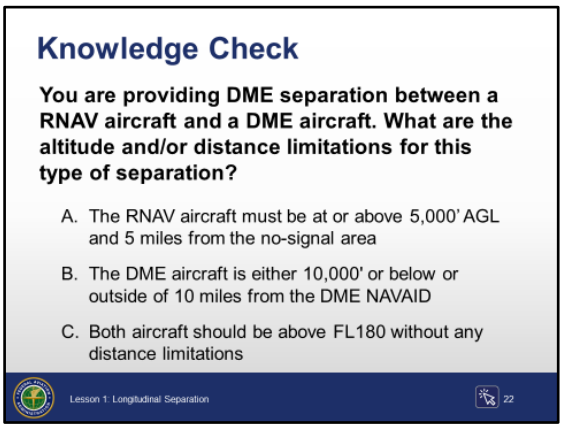


Question: What is a key component of applying 44 or 22 knot rules?

***Answer**: C. Aircraft must depart the same or adjacent airports or follow a preceding en route aircraft which has reported over the same fix*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

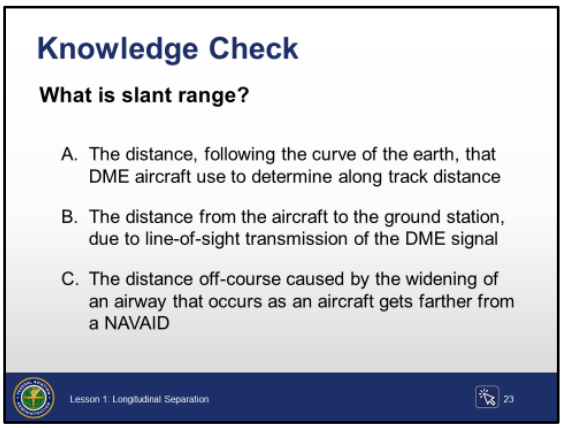


Question: You are providing DME separation between a RNAV aircraft and a DME aircraft. What are the altitude and/or distance limitations for this type of separation?

***Answer**: B. The DME aircraft is either 10,000' or below or outside of 10 miles from the DME NAVAID*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

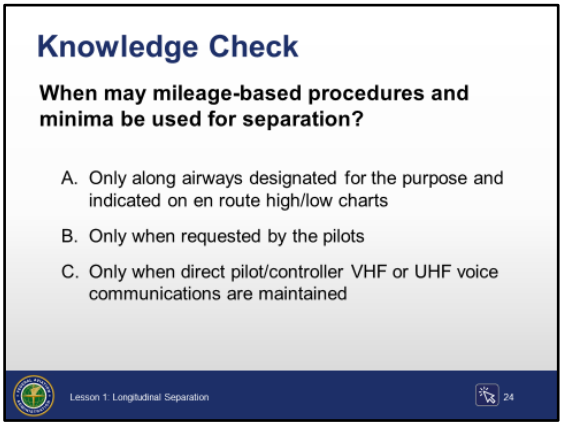


Question: What is slant range?

***Answer**: B. The distance from the aircraft to the ground station, due to line-of-sight transmission of the DME signal*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

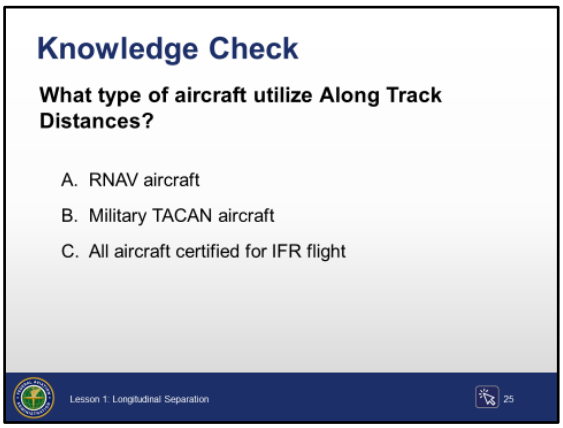


Question: When may mileage-based procedures and minima be used for separation?

***Answer**: C. Only when direct pilot/controller VHF or UHF voice communications are maintained*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

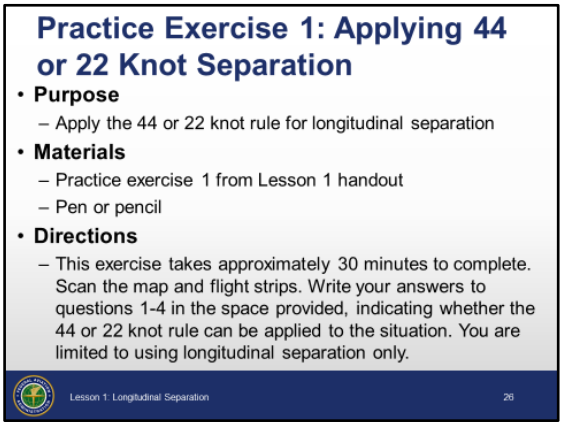
Knowledge Check



Question: What type of aircraft utilize Along Track Distances?

***Answer**: A. RNAV aircraft*

PRACTICE EXERCISE 1: APPLYING 44 OR 22 KNOT SEPARATION



Purpose

Apply the 44 or 22 knot rule for longitudinal separation

Materials

Handout: *HO01_L01*

- Practice exercise 1 from Lesson 1 handout
- Pen or pencil

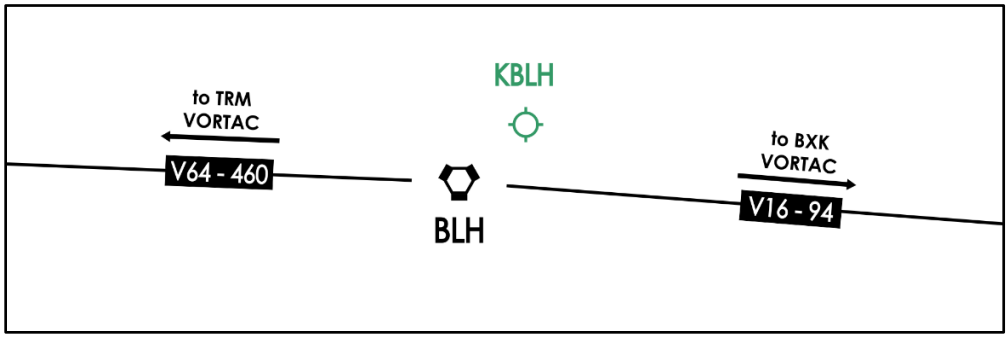
Directions

This exercise takes approximately 30 minutes to complete. Scan the map and flight strips. Write your answers to questions 1-4 in the space provided, indicating whether the 44 or 22 knot rule can be applied to the situation. You are limited to using longitudinal separation only.

Allow students to complete each question and review the answer before proceeding to the next question. Flight strips are included in PowerPoint presentation.

PRACTICE EXERCISE 1: APPLYING 44 OR 22 KNOT SEPARATION *(CONT'D)*

1.



N84PR C414/T T210 G212 Ø2 226 Ø1	BXK Ø220	Ø2 47 Ø247 BLH	8Ø✓	TRM	KDVT PXR V16 BLH V64 SLI KLGB	1572
N21HA C310/T T168 Ø2 2Ø6 Ø1		↑ KBLH PØ225		TRM 8Ø	KBLH BLH V64 HEMET KHMT/Ø1ØØ	2167

Time is 0248. What is the earliest time N21HA may be released? Explain your answer.

Answer: *0252 is the earliest departure time (reported BLH time + 5 minutes).*

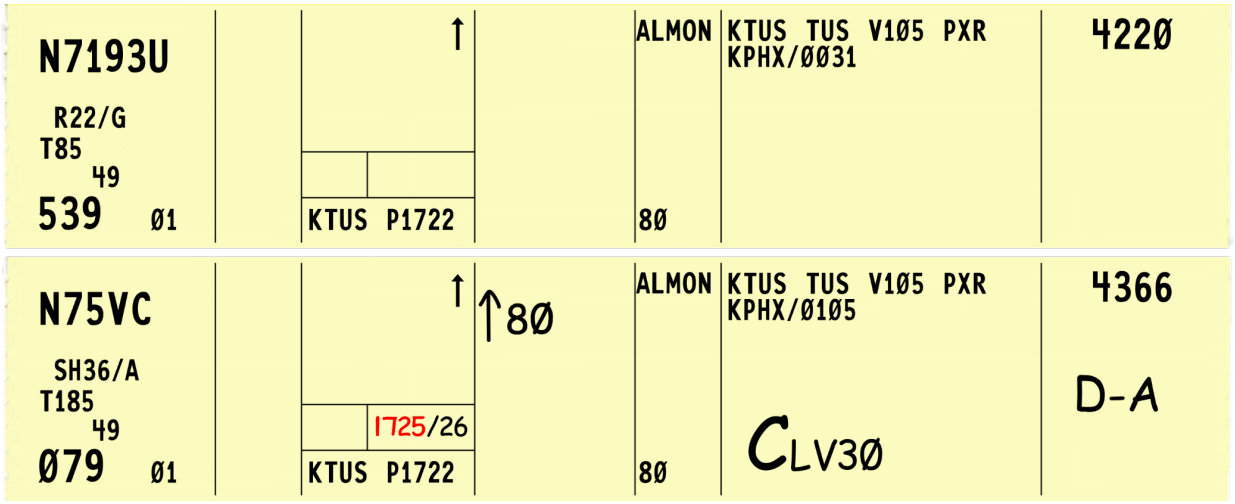
Explanation: *N21HA will follow N84PR which has reported over BLH VORTAC.*

N21HA speed is 168 knots; N84PR speed is 210 knots, 42 knots faster.

Minimum separation is 5 minutes using the 22 knot rule.

PRACTICE EXERCISE 1: APPLYING 44 OR 22 KNOT SEPARATION *(CONT'D)*

2.



Time is 1726. What is the earliest time N7193U may be released? Explain your answer.

Answer: *1729 is the earliest departure time (reported departure time + 3 minutes).*

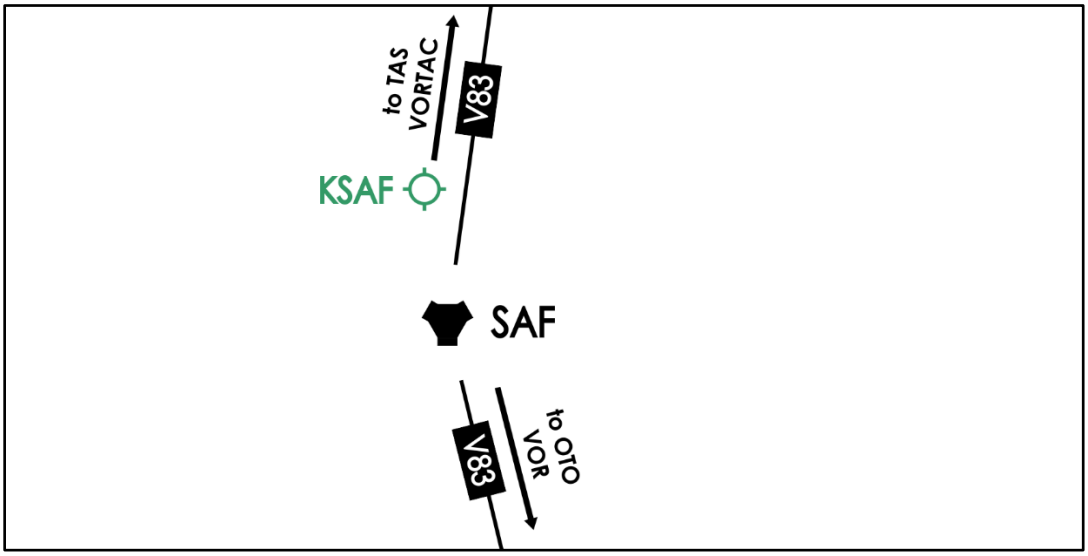
N7193U will follow N75VC off the same airport.

N7193U speed is 85 knots; N75VC speed is 185 knots, 100 knots faster.

Explanation: *Minimum separation is 3 minutes using the 44 knot rule.*

PRACTICE EXERCISE 1: APPLYING 44 OR 22 KNOT SEPARATION *(CONT'D)*

3.



N7178Q C172/G T130 G111 16 356 Ø1	TAS Ø22Ø	2Ø 22 22 SAF	9Ø✓	OTO	KMVI ALS V83 CME KROW/Ø232	1572
N115LF CL3Ø/L T458 16 7Ø1 Ø1		↑ KSAF P2Ø3Ø		OTO 4ØØ	KSAF SAF V83 OTO TCS J13 BECON UT13 LMM SJD MMSD/Ø141	2167

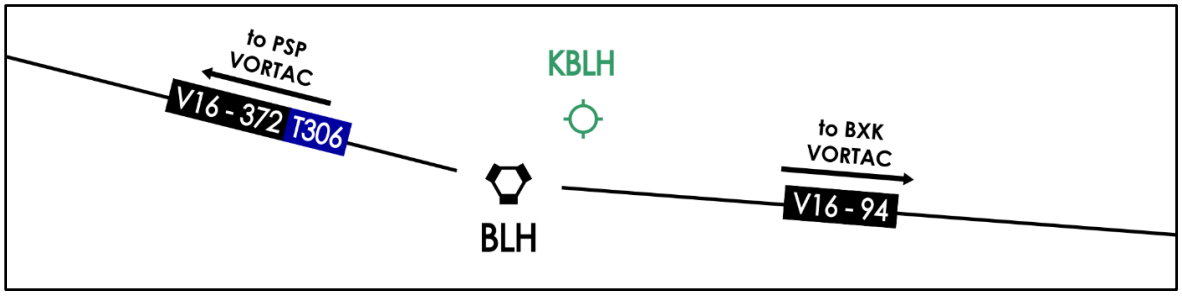
Time is 2023. What is the earliest time N115LF may be released? Explain your answer.

Answer: *N115LF cannot be released using the 44 or 22 knot rules.*

Explanation: *A slower aircraft may be released after a faster aircraft but there is no provision to release a faster aircraft in front of a slower en route aircraft using the 44 or 22 knot rule.*

PRACTICE EXERCISE 1: APPLYING 44 OR 22 KNOT SEPARATION *(CONT'D)*

4.



N72AZ PC12/L T244 G232 42 971 Ø4	BXK 1558	16 22 22 1622 BLH	8Ø✓	PSP	KPHX BXK V16 PSP KPSP/Ø1Ø9	1572
N323RB SR22/G T155 42 Ø91 Ø1		↑ KBLH P163Ø		PSP 8Ø	KBLH BLH V16 PSP V386 SOGGI APLES PMD V197 EHF COREZ AVE V107 PXN WINDY SMONE KLVK/Ø3Ø8	2167
N55ØBZ BE55/G T19Ø 16 7Ø1 Ø1		↑ KBLH P163Ø		PSP 8Ø	KBLH BLH V16 DODGR KEMT/ØØ45	1Ø25

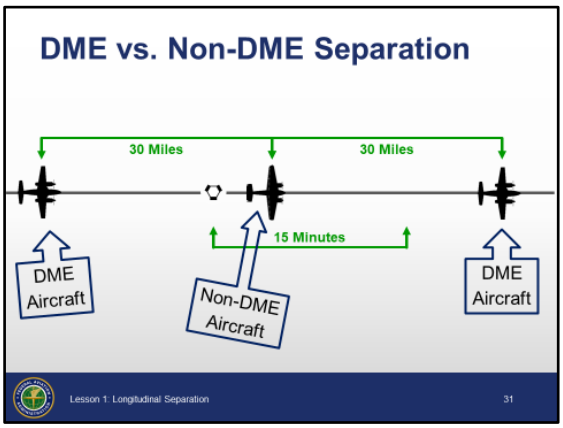
Time is 1625. What is the most efficient order to release N323RB and N550BZ? Explain your answer.

Answer: *N72AZ has reported BLH. N550BZ is 54 knots slower and can depart now using 3 minute separation with the 44 knot rule.* ***Explanation:*** *N323RB is 35 knots slower than N550BZ. N323RB can depart 5 minutes after N550BZ departs using the 22 knot rule.*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

DME vs. Non-DME Separation

JO 7110.65, par. 6-4-2



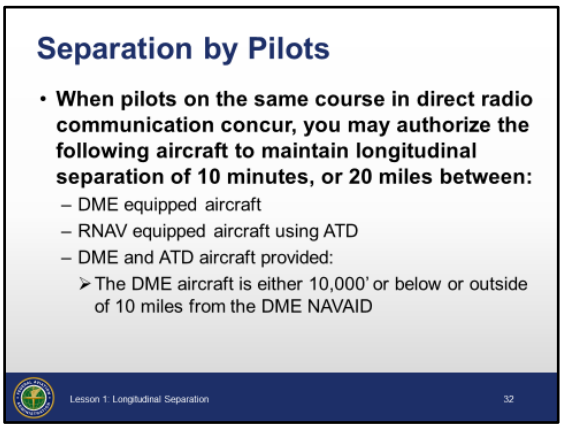
DME vs. Non-DME Separation

- 30 miles between aircraft, when one is using DME/ATD and the other is not, if both the following conditions are met:
  - The aircraft using DME/ATD derives distance information by reference to the same NAVAID or waypoint over which the aircraft not using DME/ATD has reported
  - The aircraft not using DME/ATD is within 15 minutes of the NAVAID

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Separation by Pilots

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



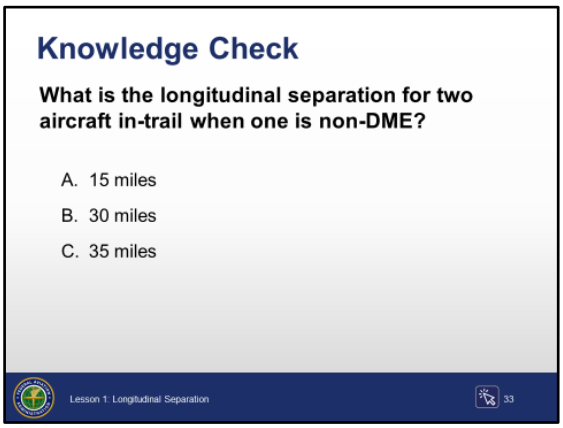
Separation by Pilots

- When pilots of aircraft on the same course in direct radio communication with each other concur, you may authorize the following aircraft to maintain longitudinal separation of 10 minutes, or 20 miles between:
  - DME equipped aircraft
  - RNAV equipped aircraft using ATD
  - DME and ATD aircraft:
    - Provided the DME aircraft is either 10,000' or below, or outside of 10 miles from the DME NAVAID, or
    - Advise the pilot of an RNAV aircraft to use DME distances when applying DME separation along VOR airways/routes

MAINTAIN AT LEAST ONE ZERO MINUTES/TWO ZERO MILES SEPARATION FROM (ident)

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

Knowledge Check

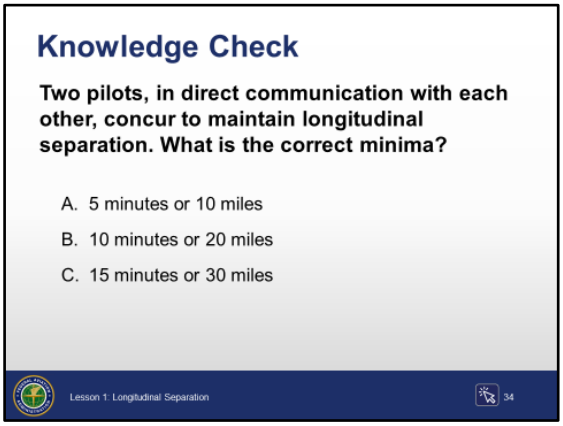


Question: What is the longitudinal separation for two aircraft in-trail when one is non-DME?

***Answer**: B. 30 miles*

SEPARATION PROCEDURES - SAME/CONVERGING/CROSSING COURSES *(CONT'D)*

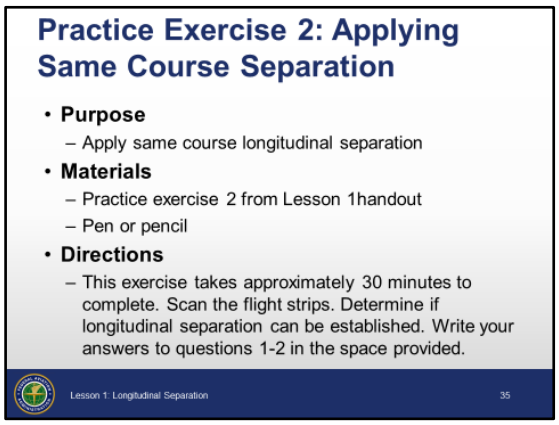
Knowledge Check



Question: Two pilots, in direct communication with each other, concur to maintain longitudinal separation. What is the correct minima?

***Answer**: B. 10 minutes or 20 miles*

PRACTICE EXERCISE 2: APPLYING SAME COURSE SEPARATION



Purpose

Apply same course longitudinal separation

Materials

Handout: *HO01_L01*

- Practice exercise 2 from Lesson 1 handout
- Pen or pencil

Directions

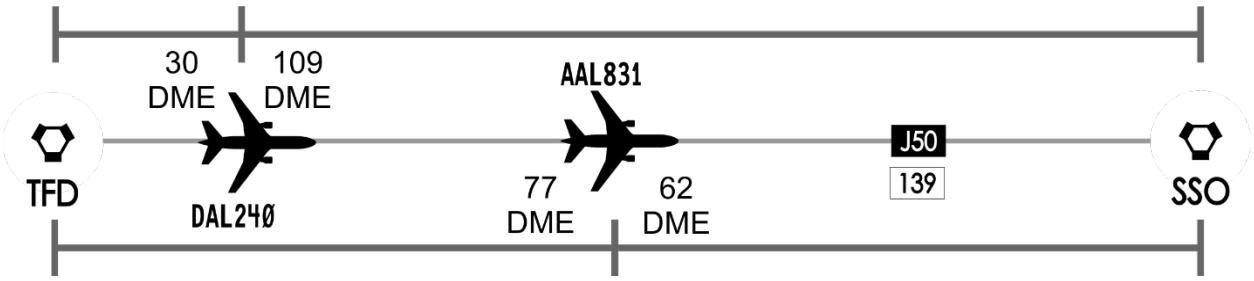
This exercise takes approximately 30 minutes to complete. Scan the flight strips. Determine if longitudinal separation can be established. Write your answers to questions 1-2 in the space provided.

Allow the students to complete each question and review the correct application of longitudinal separation before proceeding to the next example.

A map will show you aircraft positions for the student queries. PowerPoint slides are available for each flight strip depiction.

PRACTICE EXERCISE 2: APPLYING SAME COURSE SEPARATION *(CONT'D)*

1.



Use the map above to answer requests for DME reports. If there is no response, prompt the students about possible solutions. TFD VORTAC is "Stanfield" and SSO VORTAC is "San Simon."

DAL240 B738/L T448 G456 Ø2 226 Ø1	TFD Ø231	Ø2 49 49 SSO	37Ø✓	EWM	KLAX DOTSS2 CNERY BLH J169 TFD J5Ø SSO J4 INK GEEKY SOCKK3 KDFW	4111
AAL831 A319/L T458 G465 Ø2 226 Ø1	TFD Ø225	Ø2 43 43 SSO	35Ø✓	EWM	KLAX DOTSS2 CNERY BLH J169 TFD J5Ø SSO J4 INK GEEKY SOCKK3 KDFW	43Ø6

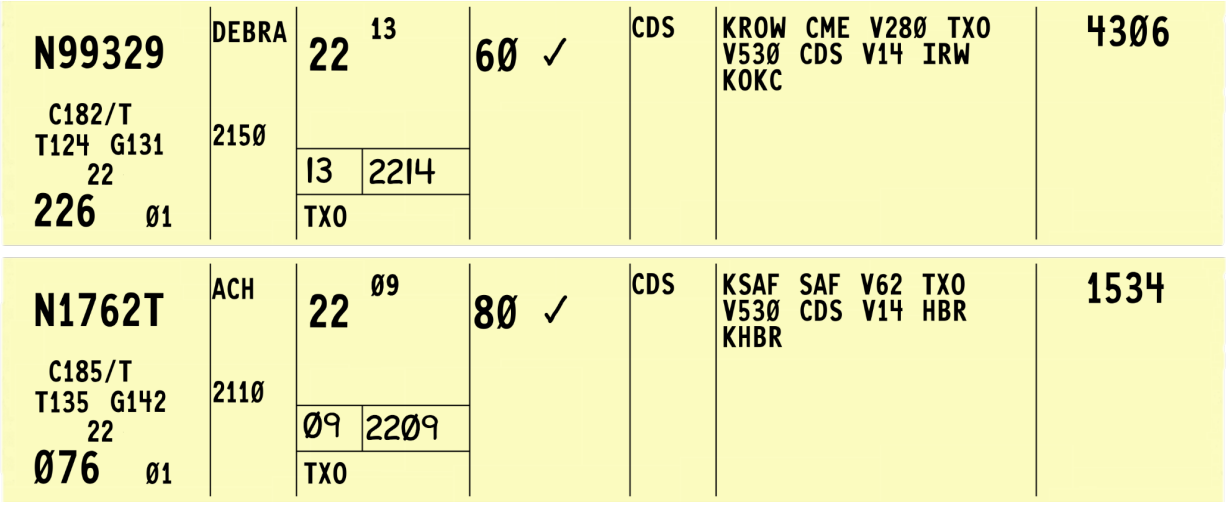
Time is 0235. DAL240 requests a descent to FL330. Indicate what steps you would use and the minima to apply in order to accommodate this request.

Answer: *Obtain DME reports to show more than 20 NM in-trail. Issue a descent to DAL240.*

Explanation: *Speeds are similar. The trailing aircraft is descending, 20 NM longitudinal separation is needed.*

PRACTICE EXERCISE 2: APPLYING SAME COURSE SEPARATION *(CONT'D)*

2.



Time is 2221. N99329 is requesting a climb to 10,000'. Can you issue this clearance? Explain your answer.

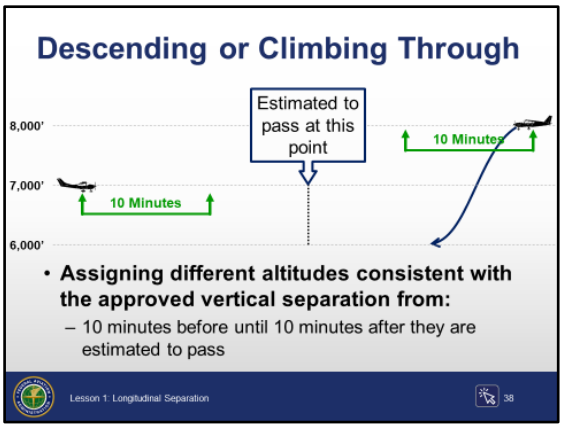
Answer: *Yes.*

Explanation: *N99329 is the slower trailing aircraft climbing. The time is within 10 minute window for altitude changes. The aircraft are 5 minutes in-trail and within 4,000'.*

SEPARATION PROCEDURES - OPPOSITE COURSES

Descending or Climbing Through

JO 7110.65, par. 6-4-3



This slide is animated, 1 click.

Descending or Climbing Through

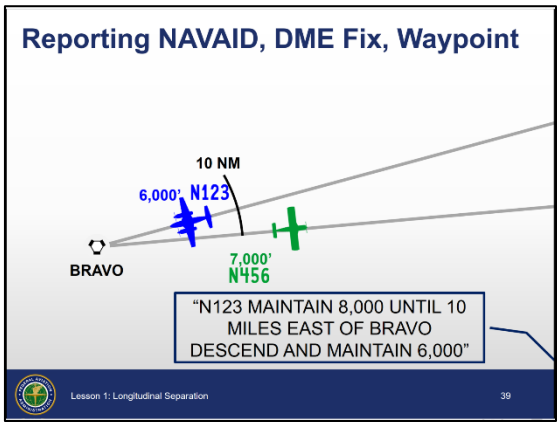
- Separate aircraft traveling opposite courses by assigning different altitudes consistent with the approved vertical separation from:
  - 10 minutes before until 10 minutes after they are estimated to pass

Click to show aircraft descending from 8,000' to 6,000' prior to crossing.

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Reporting NAVAID, DME Fix, Waypoint

JO 7110.65, par. 6-4-3



This slide is animated, 3 clicks.

Reporting NAVAID, DME fix, Waypoint

⊙ Vertical separation may be discontinued when:

- Both aircraft have reported passing NAVAIDs, DME fixes, or waypoints indicating they have passed each other

  Example:

  N123: "N123, REQUEST 6,000"

Click to show controller asking for a DME report from N456

Controller: "N456, SAY DME EAST OF BRAVO"

N456: "N456 IS 10 MILES EAST OF BRAVO"

Click to show clearance to N123 at 10 NM DME from BRAVO which ensures the aircraft have passed.

Controller: "N123 MAINTAIN 8,000 UNTIL 10 MILES EAST OF BRAVO DESCEND AND MAINTAIN 6,000"

Click to show WILCO response and aircraft movement after clearance, allow time for N123 to descend.

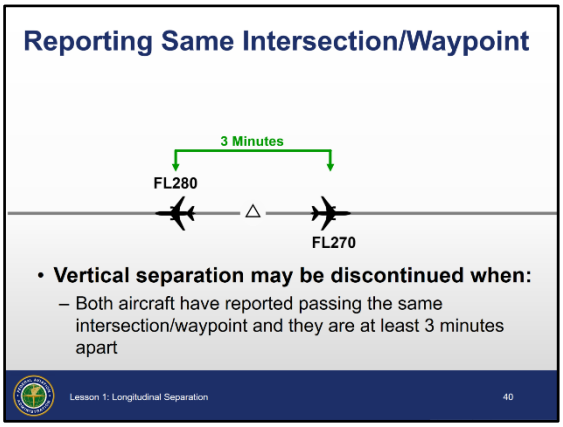
N123: "N123 WILCO"

NOTE: This procedure is not limited to aircraft operating in opposite directions along the same airway or radial. It may also be applied to aircraft established on diverging airways or radials of the same NAVAID.

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Reporting Same Intersection/ Waypoint

JO 7110.65, par. 6-4-3



This slide is animated, 1 click.

Reporting Same Intersection/Waypoint

⊙ Vertical separation may be discontinued when:

- Both aircraft have reported passing the same intersection/waypoint and they are at least 3 minutes apart

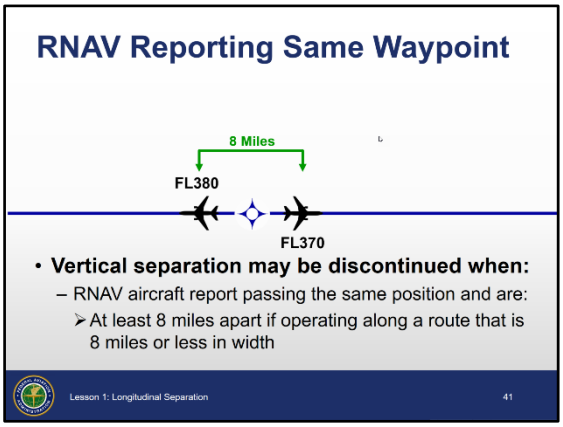
  NOTE: Aircraft must be 3 minutes apart, not 3 minutes after passing. If each aircraft is 1½ minutes from the crossing, the total is 3 minutes.

Stress this minimum is expressed in time to contrast with the two following pages which are expressed in miles.

Click to show aircraft passing at intersection.

RNAV Reporting Same Waypoint

JO 7110.65, par. 6-4-3



This slide is animated, 1 click.

RNAV Reporting Same Waypoint

⊙ Vertical separation may be discontinued when:

- Two RNAV aircraft have reported passing the same position and are:
  - At least 8 miles apart if operating along a route that is 8 miles or less in width

    or

  - 18 miles apart if operating along an expanded route

    except

  - 30 miles must be applied if operating along that portion of any route segment defined by a navigation station requiring extended usable distance limitations beyond 130 miles

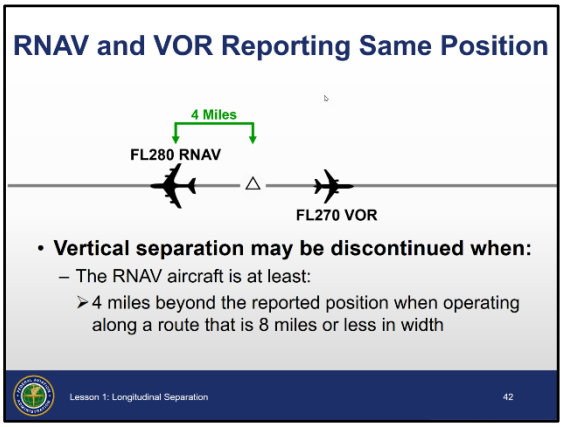
NOTE: Expanded routes are route segments more than 8 miles wide (protected airspace). Route width and expanded route width will be covered in the next lesson.

Click to show aircraft passing at waypoint.

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

RNAV and VOR Reporting Same Position

JO 7110.65, par. 6-4-3



This slide is animated, 1 click.

RNAV and VOR Reporting Same Position

⊙ Vertical separation may be discontinued when:

- An aircraft utilizing RNAV and an aircraft utilizing VOR have reported passing the same position and the RNAV aircraft is at least:
  - 4 miles beyond the reported position when operating along a route that is 8 miles or less in width
  - 9 miles beyond the point when operating along an expanded route

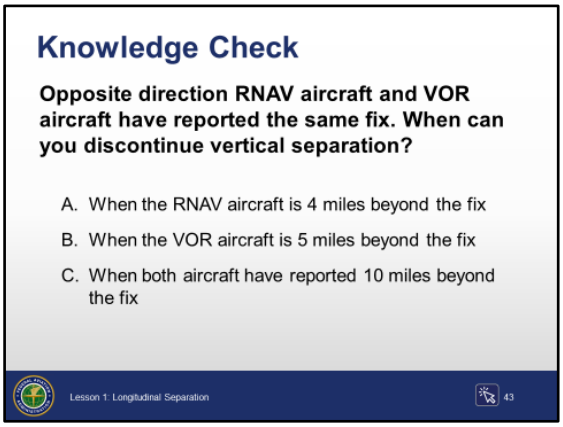
    except

  - 15 miles must be applied if operating along that portion of any route segment defined by a navigation station requiring extended usable distance limitation beyond 130 miles, or 3 minutes apart whichever is greater

Click to show aircraft passing at fix.

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Knowledge Check

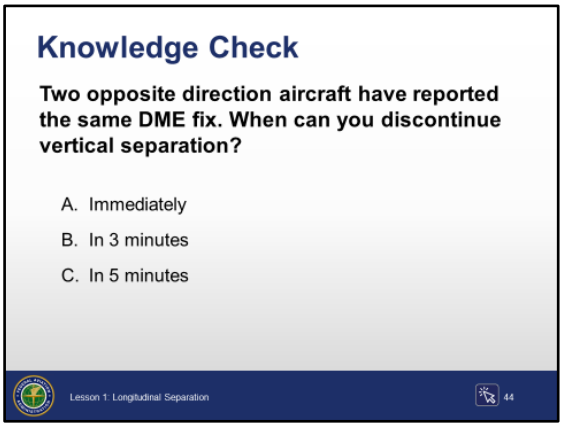


Question: Opposite direction RNAV aircraft and VOR aircraft have reported the same fix. When can you discontinue vertical separation?

***Answer**: A. When the RNAV aircraft is 4 miles beyond the fix*

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Knowledge Check

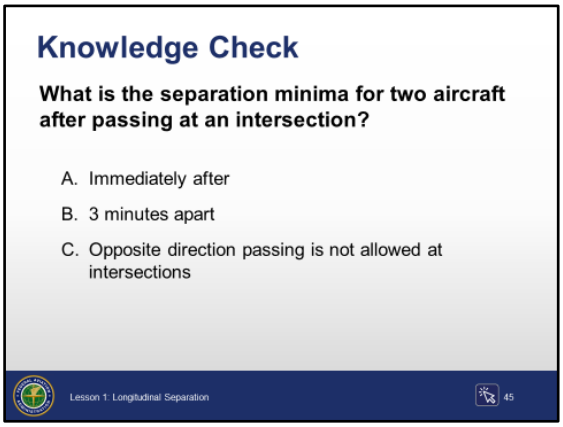


Question: Two opposite direction aircraft have reported the same DME fix. When can you discontinue vertical separation?

***Answer**: A. Immediately*

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Knowledge Check

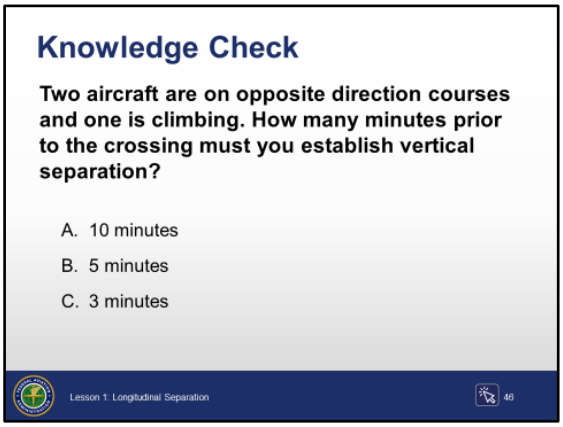


Question: What is the separation minima for two aircraft after passing at an intersection?

***Answer**: B. 3 minutes apart*

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

Knowledge Check

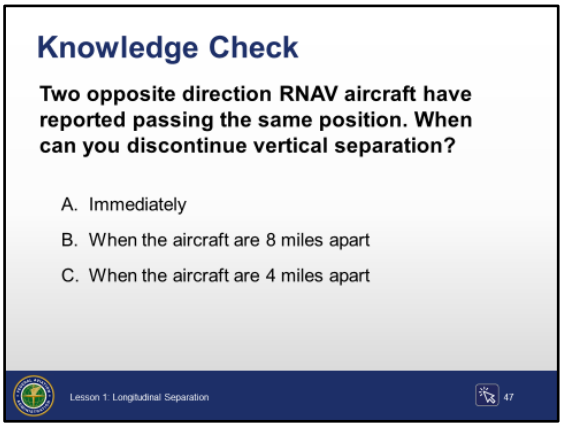


Question: Two aircraft are on opposite direction courses and one is climbing. How many minutes prior to the crossing must you establish vertical separation?

***Answer**: A. 10 minutes*

SEPARATION PROCEDURES - OPPOSITE COURSES
(CONT'D)

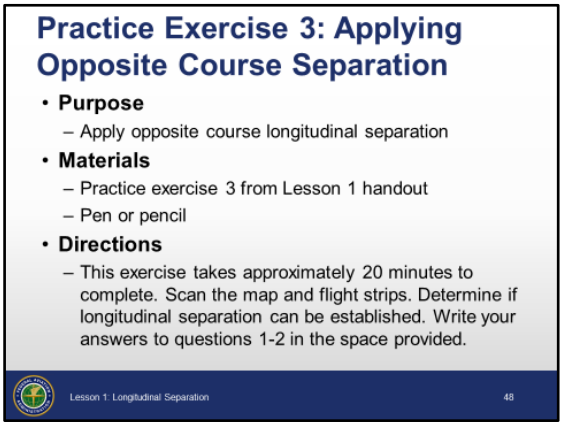
Knowledge Check



Question: Two opposite direction RNAV aircraft have reported passing the same position. When can you discontinue vertical separation?

***Answer**: B. When the aircraft are 8 miles apart*

PRACTICE EXERCISE 3: APPLYING OPPOSITE COURSE SEPARATION



Purpose

Apply opposite course longitudinal separation

Materials

Handout: *HO01_L01*

- Practice exercise 3 from Lesson 1 handout
- Pen or pencil

Directions

This exercise takes approximately 20 minutes to complete. Scan the map and flight strips. Determine if longitudinal separation can be established. Write your answers to questions 1-2 in the space provided.

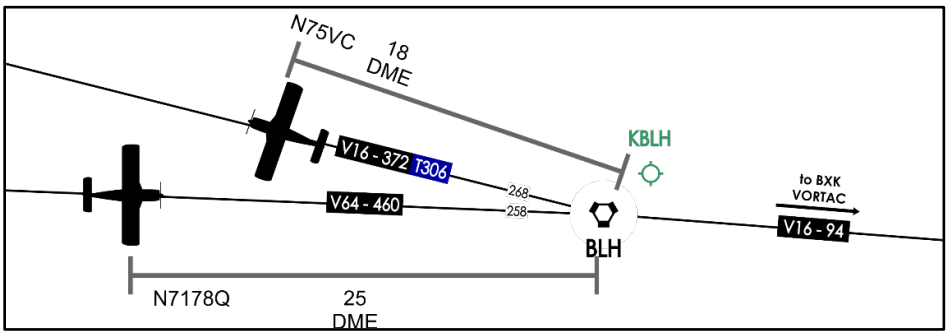
Allow the students to complete each question and review the correct application of longitudinal separation before proceeding to the next example.

A map will show you aircraft positions for the student queries. PowerPoint slides are available for each flight strip depiction.

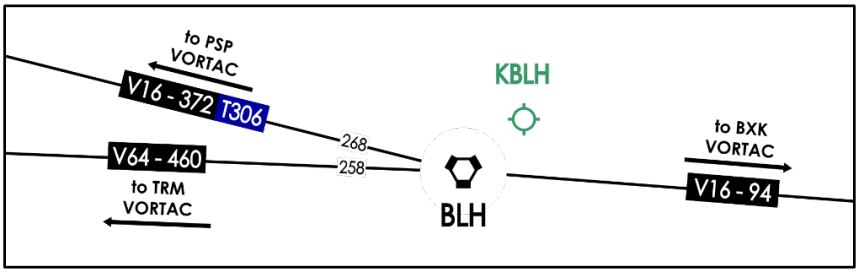
Continued on next page

PRACTICE EXERCISE 3: APPLYING OPPOSITE COURSE SEPARATION *(CONT'D)*

1.



Use the map above to answer the question on the next.page about discontinuing vertical separation using DME reports. If there is no response, prompt the students about possible solutions. ***NOTE:*** *BLH VORTAC is "Blythe".*



N7178Q C172/G T130 G111 16 356 04	TRM 1002	10 48 ↓ 48 BLH	90✓		KTOA WILMA V64 BLH KBLH/1052	1572
N75VC SH36/A T185 16 079 01		↑ 1025/26 KBLH P1022	↑80 ~~60~~	PSP 80	KBLH BLH V16 DODGR KEMT/0049 CLV30	4366 D-A

Continued on next page

PRACTICE EXERCISE 3: APPLYING OPPOSITE COURSE SEPARATION *(CONT'D)*

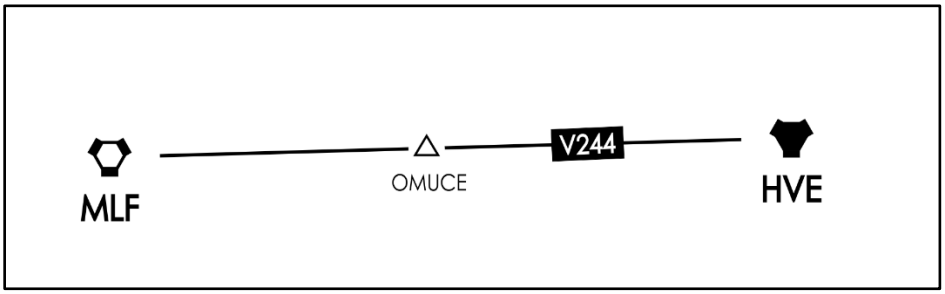
Time is 1034. N7178Q requests lower. How can you provide separation?

Answer: *Ask N75VC to say DME from BLH (Blythe).* Clear N7178Q to maintain 9,000' until the DME mileage reported by N75VC.

Explanation: *The DME aircraft is below 10,000' so* DME/ATD slant range is not an issue. The aircraft have passed the same DME and vertical separation *can be discontinued.*

PRACTICE EXERCISE 3: APPLYING OPPOSITE COURSE SEPARATION *(CONT'D)*

2.



N14HJ PC12/A T180 G194 23 773 04	HVE 0041	01 14 14 MLF	160✓	EWM	KGUC HBU V244 TPH KTPH/0221 RP OMUCE/58	1534
N161JW BE20/A T230 G215 23 226 03	TFD 0231	00 43 43 0043 MLF	170✓	HVE	KCDC V235 MLF V244 MTK KMTJ/0136 RP OMUCE/58	2654

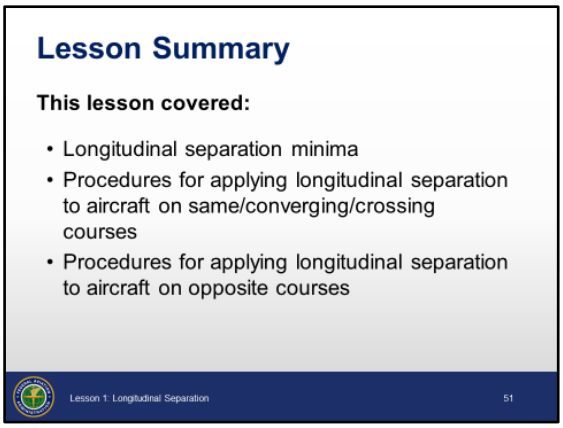
Time is 0058. N161JW is requesting lower. Can you issue the clearance? Explain your answer.

Answer: *No.*

Explanation: *The aircraft are not 3 minutes apart. However, when 1 1/2 minutes has passed since the reports , a descent can be issued.*

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

- Longitudinal separation minima
  - DME/slant range - ATD
  - Separation
    - 20 Miles
    - 10 Minutes
- Procedures for applying longitudinal separation to aircraft on same/converging/crossing courses
  - Climbing through an altitude
  - Descending through an altitude
  - Climbing - timed separation
  - Descending - timed separation
  - Depart at a specified time
  - Arrive at a specified time
  - Hold until a specified time
  - Change altitude at a specified time
  - 44 or 22 knot rule
  - DME vs. non-DME separation
  - Separation by pilots

Continued on next page

CONCLUSION *(CONT'D)*

Lesson Summary (Cont'd)

- Procedures for applying longitudinal separation to aircraft on opposite courses
  - Descending or climbing through
  - Reporting NAVAID, DME fix, waypoint
  - Reporting same intersection/waypoint
  - Reporting same RNAV waypoint
  - RNAV/VOR reporting same position

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.