Federal Aviation Administration

Initial En Route Qualification Training

Instructor
Lesson 35
Radar Transition

Course 50148001

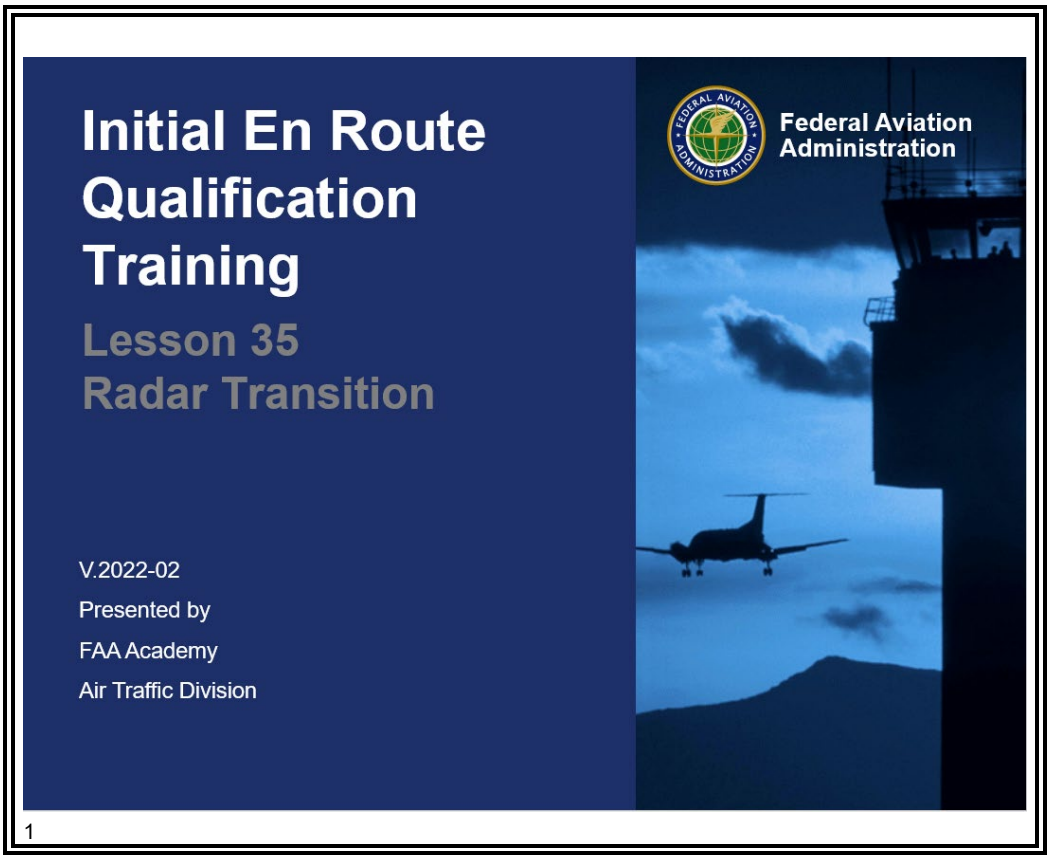
LESSON PLAN DATA SHEET

COURSE NAME:	INITIAL EN ROUTE QUALIFICATION TRAINING
COURSE NUMBER:	50148001
LESSON TITLE:	RADAR TRANSITION
DURATION:	2+30 HOURS
DATE REVISED:	2022-02
VERSION:	V.2022-02
REFERENCE(S):	N JO 7110.65
HANDOUT(S):	NONE
EXERCISE(S)/ ACTIVITY(S):	FIX RADIAL DISTANCE ACTIVITY
END-OF-LESSON TEST:	NONE
PERFORMANCE TEST:	NONE
MATERIALS:	NONE
OTHER PERTINENT INFORMATION:	*INSTRUCTOR KEY FOR THE ELEARNING(S) IS INCLUDED AS AN APPENDIX IN THIS DOCUMENT*

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

INTRODUCTION

Gain Attention

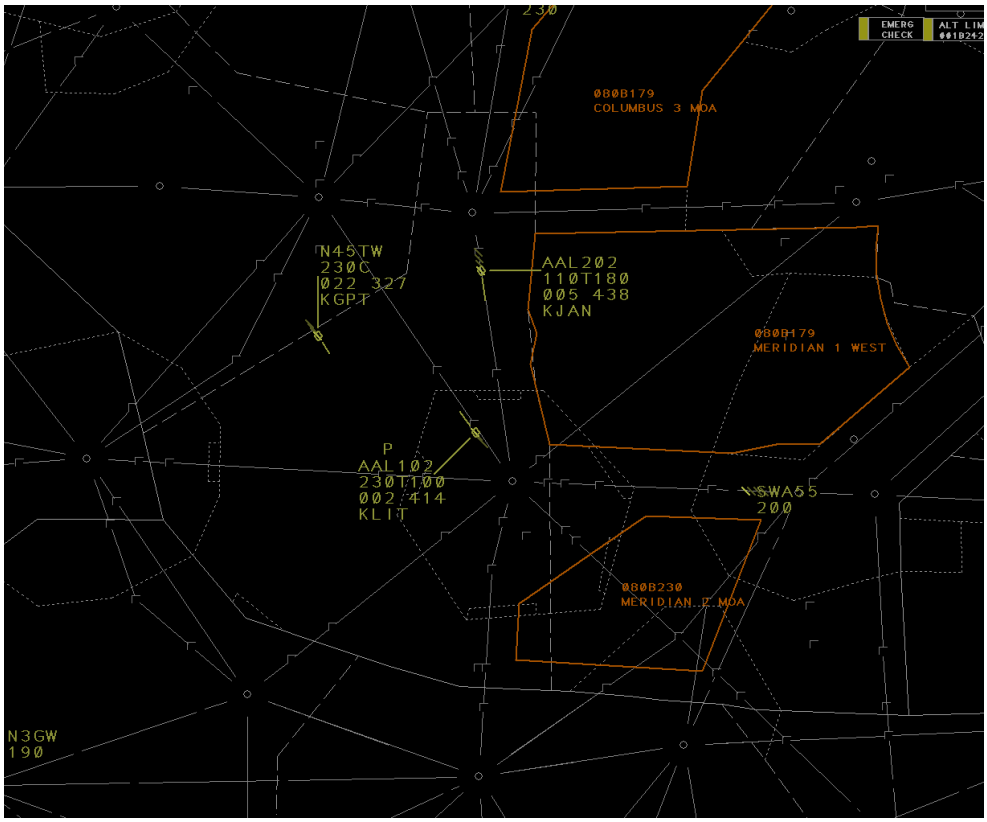


In the nonradar section of the course, you acquired the basic foundational knowledge needed to be a successful air traffic controller. In the second part of the course, you will learn the specifics required to be a Radar Associate Controller.

INTRODUCTION *(Continued)*

Opening Scenario

RADAR TRANSITION



2

As you move into the radar portion of the course, material will be reviewed and introduced that will enable a successful transition from nonradar to radar.

Purpose

This lesson reviews data previously learned as well as provides comparisons between nonradar and radar data that will assist you in understanding the information taught in subsequent radar lessons.

INTRODUCTION *(Continued)*

Lesson Objectives

LESSON OBJECTIVES

- At the end of this lesson, you will be familiar with:
  - Flight information differences between nonradar and radar
  - Standard Terminal Arrival Routes (STARS)
  - Letters of Agreements (LOAs)
  - Sector 66 airspace
  - Fix Radial Distances (FRDs)

3

☞ ***NOTE:*** *Teach from graphic.*

FLIGHT INFORMATION

Flight Information
JO 7110.65, fig 2-3-1
TBL2-3-1

FLIGHT INFORMATION

UAL80 A319/F T420 66 04	MEI	05 12 05 1205 MHZ	160✓	STUEE 160	KMGM V18 MLU KSHV O SLOW CLIMBER	

Radar Example

UAL80 A319/F T420 G420 66 381 04	MEI	05 12 MHZ	160✓	R	KMGM V18 MLU KSHV O SLOW CLIMBER	1521

4

☞ ***NOTE:*** *Review the differences between nonradar and radar flight information.*

⊙ Radar strips are system-generated and almost all have:

- CIDs
  - Which is another way to identify an aircraft
- Beacon codes
  - Beacon codes will **not** appear on strips for aircraft that do **not** have a transponder
- Ground Speed

NAVIGATION & EQUIPMENT CAPABILITIES

Navigation & Equipment Capabilities
JO 7110.65
TBL 2-3-10,

⊙ In a Radar environment, it is important to know the equipment capabilities of each aircraft. Unlike in nonradar where aircraft are assigned airways, in the radar environment it is a mixture of aircraft on airways and point to point (direct) routes. You need to know the different aircraft equipment suffixes and understand their navigational capabilities.

Examples:

- **/I**, aircraft are RNAV and able to fly direct routes.
- **/A**, aircraft are not RNAV and must be receiving a NAVAID or issued a heading to fly.

⊙ Aircraft with GNSS capability (/L, /V, /S, or /G) may be cleared off an airport via a point to point route provided the points are published NAVAIDS, waypoints, fixes, or airports. The points must be displayed on controller video maps or depicted on the controller chart displayed at the controller position. When applying nonradar separation the maximum distance between points must not exceed 500 miles, and you must protect 4 miles either side of the route centerline.

⊙ RNAV equipped aircraft require radar monitoring to fly direct routes while GNSS equipped aircraft may fly direct routes without radar monitoring.

⊙ Knowing equipment qualifiers is also essential in providing the proper separation between aircraft.

Examples:

- **/L**, aircraft are RVSM equipped.
- **/U**, aircraft are not RVSM equipped.

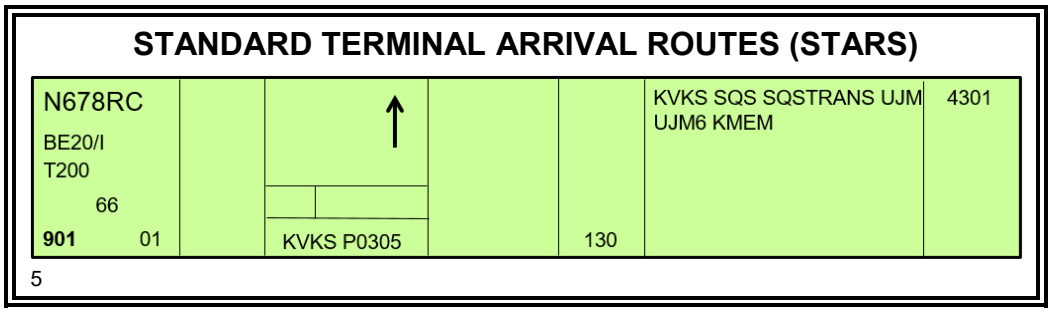
NOTE: For a list of aircraft equipment qualifiers refer to the chart in NR LP05 PG. 55.

NOTE: "Radar contact" replaces pilot estimates and fix progression times.

⊙ In ZAE radar scenarios, strips are generally **only** posted for nonradar flights, such as arrivals and departures for KGWO, KVKS, 0M8, etc., and for aircraft below radar coverage.

STANDARD TERMINAL ARRIVAL ROUTES (STARS)

Standard Terminal Arrival Routes (STARS)
JO 7110.65, par. 11-1-2



- Published procedure.
- Used at large airports to standardize routings and aid in sequencing arrivals to an airport.
- Generally, ATC will **not** clear an aircraft direct to any fix further than the fix immediately prior to the STAR name.

  Example: UJM UJM6 KMEM

  - A clearance direct to UJM **may** be permitted depending on traffic
  - A clearance direct to KMEM will almost **never** be permitted
- The following STARs may be encountered during ERAM scenarios in Aero Center:

  - KMEM
    - UJM (Marvel) arrival
  - KDFW/KDAL
    - CQY (Cedar Creek) arrival
    - YEAGR arrival
  - KIAH/KHOU
    - HUDZY arrival
    - OHIIO arrival
  - KNEW/KMSY
    - RYTHM arrival

Continued next page

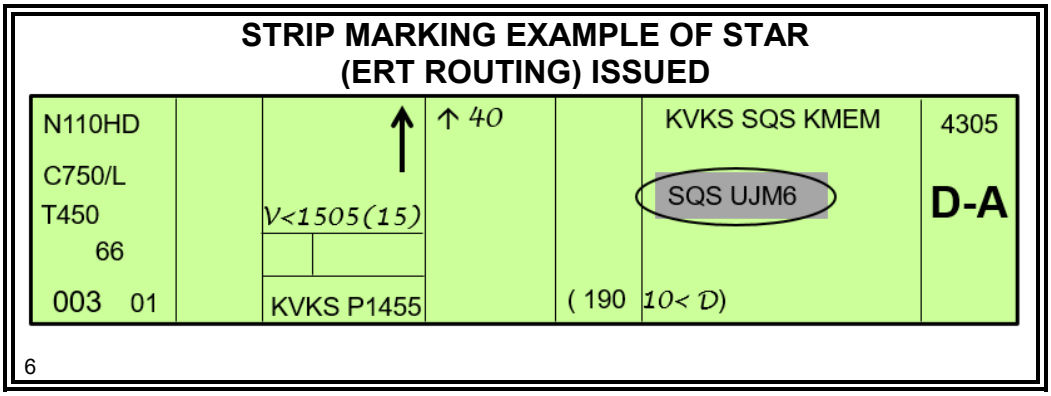
STANDARD TERMINAL ARRIVAL ROUTES (STARS)
(Continued)

Standard Terminal Arrival Routes (STARS), (Cont'd)
JO 7110.65, par. 11-1-2

- KSTL
  - KOOOP arrival
- KATL
  - LGC (LaGrange) arrival
  - RMG (Rome) arrival
- KDEN
  - QUAIL arrival
- KPHX
  - SUNSS arrival

Strip Marking Example of STAR (ERT ROUTING) Issued

STRIP MARKING EXAMPLE OF STAR (ERT ROUTING) ISSUED



LETTERS OF AGREEMENT

Letters of Agreement

- As you learned in nonradar, Letters of Agreement (LOAs) are instrumental in reducing the need to coordinate routine procedures as well as in delegating specific responsibilities.

  - Having a thorough knowledge of all applicable LOAs will **not only** reduce your workload, but also reduce the potential for errors

NOTE: You will need to know the following LOAs for the remainder of this course.

LETTERS OF AGREEMENT – (ZAE/ZFW)

Aero ARTCC and Fort Worth ARTCC LOA

3. PROCEDURES:

a. RADAR:

(1) During periods of automated data transfer between facilities, coordination shall be effected with the receiving ARTCC before departure of an aircraft when the departure point is less than 5 minutes flying time from the ARTCC boundary.

(2) Interim Altitude procedures:

a) Interim altitude is authorized between facilities.

b) Use of interim altitude must be considered valid coordination.

(3) Transponder codes may be changed without coordination upon initial contact, provided both facilities are operating under ERAM.

(4) The transferring ARTCC shall initiate coordination for a lower altitude with the appropriate low altitude sector in the receiving ARTCC for all aircraft at and above FL240 proposing to land at airports within 75 nautical miles (NM) of the ARTCC boundary. Additionally, the transferring ARTCC shall ensure that point outs are made to all affected sectors.

(5) Interfacility and intrafacility Automated Information Transfer (AIT) shall be in accordance with FAA Order JO 7110.65, paragraphs 5-4-8 through 5-4-11.

(6) The time requirement of JO 7110.65 para 2-2-6a may be reduced from 15 minutes to 5 minutes when using automated systems.

LETTERS OF AGREEMENT – (ZAE/ZHU)

Aero ARTCC and Houston ARTCC LOA

3. PROCEDURES:

b. RADAR:

(1) When ERAM equipment is being used to effect coordination, coordinate with the receiving center before departure of an aircraft when the departure point is less than 5 minutes flying time from the ARTCC boundary.

(2) The transferring controller shall take the following action when exercising control of aircraft landing at the airports listed below: (APREQ of IAFDOF and/or descent is not required)

a) Houston ARTCC shall ensure that all aircraft west of J31 landing at Vicksburg Airport (KVKS) or in the Jackson terminal area cross the center boundary at or below FL230 descending to 11,000 feet. However, prop/turboprop aircraft landing in the Jackson terminal area from the PCU-LO sector shall be issued descent clearance to 7,000 feet.

b) Aero ARTCC shall ensure that all aircraft above 13,000 feet and west of J35 landing at Alexandria International Airport (KAEX) or Esler Regional Airport (KESF) cross the center boundary at or below FL230 descending to 13,000 feet.

c) Aero ARTCC shall ensure that all aircraft above 6,000 feet and west of the ZAE sector 66/65 common boundary landing at KHEZ or KMCB cross the ZAE/ZHU center boundary at or below 12,000 feet descending to 6000 feet unless otherwise coordinated.

(3) Transponder codes may be changed without coordination upon initial contact, provided both facilities are operating under ERAM.

(4) Interim Altitude procedures:

a) Interim altitude is authorized between facilities.

b) Use of interim altitude must be considered valid coordination.

Continued on next page

Aero ARTCC and Houston ARTCC LOA (Cont'd)

(5) Interfacility and intrafacility Automated Information Transfer (AIT) shall be in accordance with FAA Order JO 7110.65, paragraphs 5-4-8 through 5-4-11.

(6) The time requirement of JO 7110.65 para 2-2-6a may be reduced from 15 minutes to 5 minutes when using automated systems.

LETTERS OF AGREEMENT – (ZAE/GWO)

Aero ARTCC and Greenwood ATCT LOA

3. PROCEDURES:

a. ARRIVALS:

(1) When FDIO is operational, arrival information need not be forwarded unless the sequence of aircraft changes and/or the aircraft is issued an approach to a runway other than the tower specified runway-in-use.

(2) When FDIO is not operational, ARTCC shall forward arrival information, including specific approach issued, prior to clearance permitting flight in Class D Surface Area.

(3) When a controller receives a UTM notification to an FDIO only facility, they shall effect manual coordination for the flight plan data. In addition, the controller shall verify the flight plan data to the receiving facility within three minutes of the transfer of control point estimate. (This procedure will not be simulated in the present training program)

(4) ATCT is authorized to clear aircraft for a visual approach, weather permitting, provided prior coordination is effected with ARTCC before clearance is issued.

(5) Transfer of communications shall be accomplished prior to the time an aircraft reaches the final approach fix inbound or, if executing a visual approach, 5 miles from the airport or prior to entering the surface area, unless otherwise coordinated.

(6) ATCT shall inform ARTCC immediately of aircraft executing an unscheduled missed approach.

Continued on next page

Aero ARTCC and Greenwood ATCT LOA (Cont'd)

a. DEPARTURES:

(1) ATCT shall:

a.) Request a release from ARTCC, specifying the destination airport, in the order aircraft will depart.

b.) Issue clearances utilizing data received on the FDIO. Aircraft may be cleared "As Filed" unless ARTCC has issued alternate routing instructions or "FRC" (Full Route Clearance) is noted in remarks.

c.) Advise aircraft to expect requested altitude 10 minutes after departure when ARTCC releases aircraft to an interim altitude.

d.) Advise ARTCC if the aircraft will not depart within three minutes of the time ARTCC issues the release. (NOTE: This is NOT a clearance void time and should not be considered so for separation.)

e.) Advise IFR departures to contact ARTCC on 125.0/325.0 as appropriate.

(2) ARTCC:

a.) When FDIO is not available, ARTCC assumes responsibility for issuing full departure clearances.

b.) When issuing a release, ARTCC shall assign an altitude to maintain and any alternate routing or other instructions as necessary.

(3) SPECIAL VFR OPERATIONS:

a.) For aircraft with a functioning two-way radio, ATCT is authorized to conduct Special VFR operations within the Greenwood, Mississippi, Class D Surface Area at or below 2,700 feet MSL upon approval by ARTCC.

Aero ARTCC and Jackson ATCT LOA

3. PROCEDURES:

a. RADAR: During radar operations, ATCT vertical limits shall be at and below 10,000 feet. The ARTCC and ATCT shall transition arrivals, departures, and overflights as follows:

(1) ARRIVALS:

a.) ARTCC shall clear all arrivals to the destination airport via routings which ensure aircraft and aircraft's route transition within the confines of the Arrival Transition Areas (ATAs) as depicted in Aero ARTCC and Jackson ATCT LOA Attachment 1.

b.) ARTCC shall clear turbojet arrivals, operating at or above 11,000 feet to the destination airport, to cross the ATCT lateral boundary at 11,000 feet and 250 knots. Propeller-driven aircraft shall cross the lateral boundary at 7,000 feet.

c.) Turbojets operating at and below 10,000 feet require individual coordination.

d.) ARTCC shall transfer control of all arrivals for descent, speed reduction, and turns direct to the airport, after a radar handoff and communications transfer have been completed.

e.) When notified that holding is required, ARTCC shall clear subsequent arrivals to the appropriate holding fix depicted in Attachment 1. ATCT shall not transition holding aircraft beyond the arrival holding fix above 10,000 feet

(2) DEPARTURES:

a.) ATCT shall clear all departures via routings, which ensure aircraft transition within the confines of the Departure Transition Areas (DTAs) as depicted in Aero ARTCC and Jackson ATCT LOA Attachment 1.

b.) ATCT shall clear aircraft requesting 11,000 feet or above to maintain 10,000 feet and to expect the requested altitude 10 minutes after departure.

c.) ATCT shall clear aircraft requesting 10,000 feet or below to the requested altitude.

Continued on next page

Aero ARTCC and Jackson ATCT LOA (Cont'd)

d.) ATCT shall provide a minimum of 5-NM separation, constant or increasing, between departures and/or en route aircraft entering ARTCC airspace at the same altitude.

e.) Transfer of Control Point (TCP) shall be the ARTCC/ATCT boundary.

(3) OVERFLIGHTS: Overflights shall be cleared via the route/altitude printed on the strip or as coordinated. IAFDOF coordination is not required.

a.) ARTCC will clear and route aircraft at 10,000 and below on routes that are clear of MEI 1 West MOA.

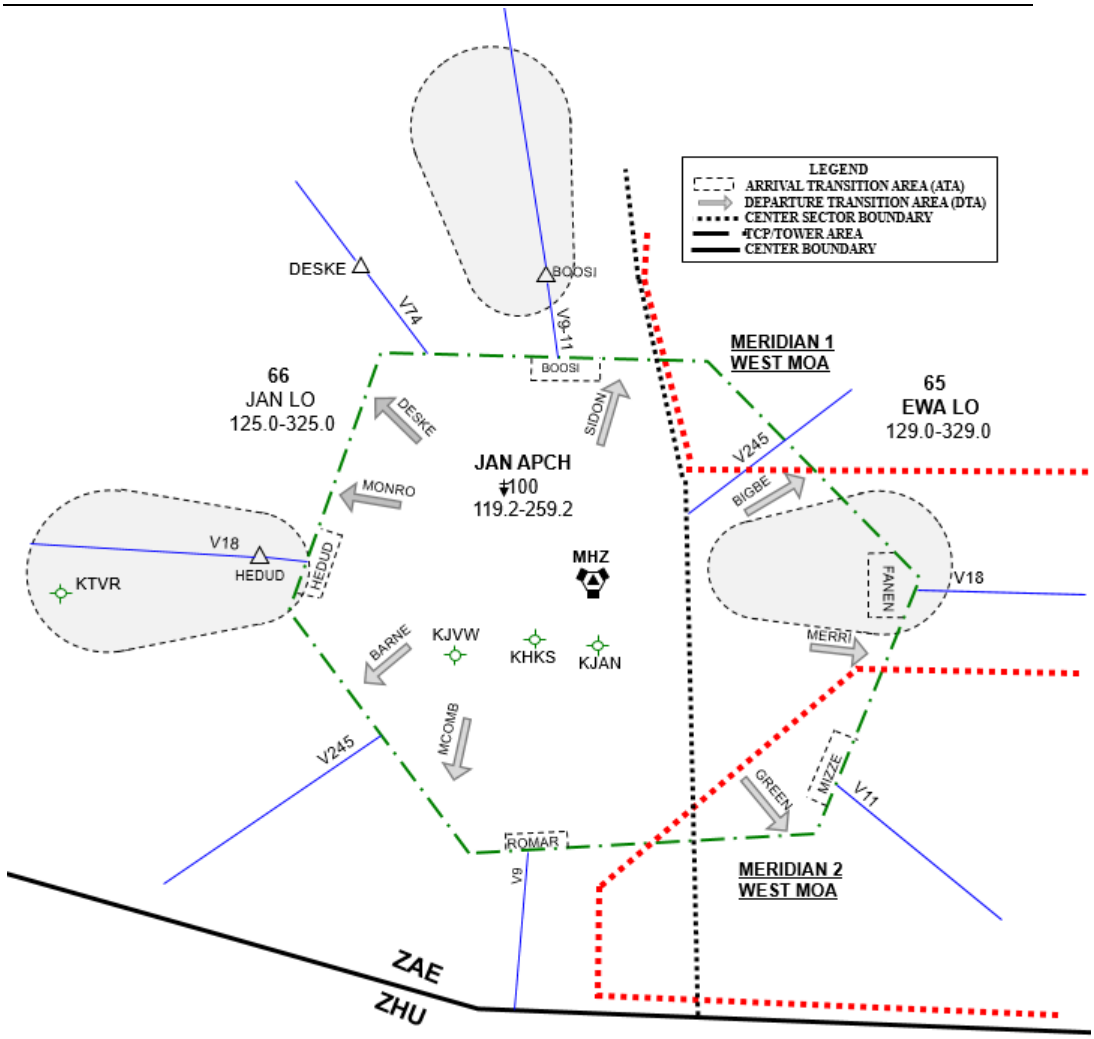
(4) OTHER:

a.) When an aircraft that will cross the boundary in a climb or descent, ARTCC shall:

i. Initiate the handoff and then APREQ the climb/descent if the aircraft's final altitude is at or below 10,000 feet.

ii. Effect a point out, if required, before the aircraft transitions approach airspace.

ATTACHMENT 1



Aero ARTCC and Monroe ATCT LOA

3. PROCEDURES:

a. RADAR: During radar operations, ATCT vertical limits shall be at and below 12,000 feet.

(1) ARRIVALS:

a.) ARTCC shall clear all arrivals to the destination airport via routings which ensure aircraft and aircraft's route transition within the confines of the Arrival Transition Areas (ATAs) as depicted in Aero ARTCC and Monroe ATCT LOA Attachment 1 and shall assign the appropriate altitude as listed below:

i. Turbojets shall cross 31 miles east of MLU VORTAC at 13,000 feet. Turbojets operating below 13,000 feet require individual coordination.

ii. All other arrivals shall cross 31 miles east of MLU VORTAC at 7,000 feet.

b.) ARTCC shall transfer control for turns, speed adjustments, and descent of all arriving aircraft after a radar handoff and transfer of communications have been accomplished.

c.) ATCT shall not reverse, hold, or climb an arrival without ARTCC approval.

d.) ATCT shall transition arrivals into terminal airspace prior to adjacent ARTCC (ZFW) boundary.

If they fail to do so, ATCT is responsible for point out coordination with ZFW.

e.) When notified that holding is required, ARTCC shall clear all subsequent arrivals to the STUEE intersection at or above 13,000 feet to hold northeast on V18.

i. If this is required, ARTCC is responsible for point out coordination with ZFW.

ii. Individual coordination with ATCT is required for aircraft at or below 12,000 feet.

f) When notified that ATCT is accepting arrivals:

i. For aircraft at 13,000 in hold, ARTCC shall issue a communications change to MLU approach.

Continued on next page

Aero ARTCC and Monroe ATCT LOA (Cont'd)

ii. For aircraft at 14,000 and above in hold, ARTCC shall descend aircraft to 13,000 when available and issue a communications change.

iii. ATCT shall descend aircraft in holding into their airspace and then issue the applicable routing.

(2) DEPARTURES:

a.) ATCT shall clear all departures via routings, which ensure aircraft transition within the confines of the Departure Transition Areas (DTAs) as depicted in Aero ARTCC and Monroe ATCT LOA Attachment 1.

b.) ATCT shall clear aircraft requesting 13,000 feet or above to maintain 12,000 feet and expect further clearance to the requested altitude 10 minutes after departure.

c.) ATCT shall clear aircraft requesting 12,000 feet or below to the requested altitude.

(3) OVERFLIGHTS:

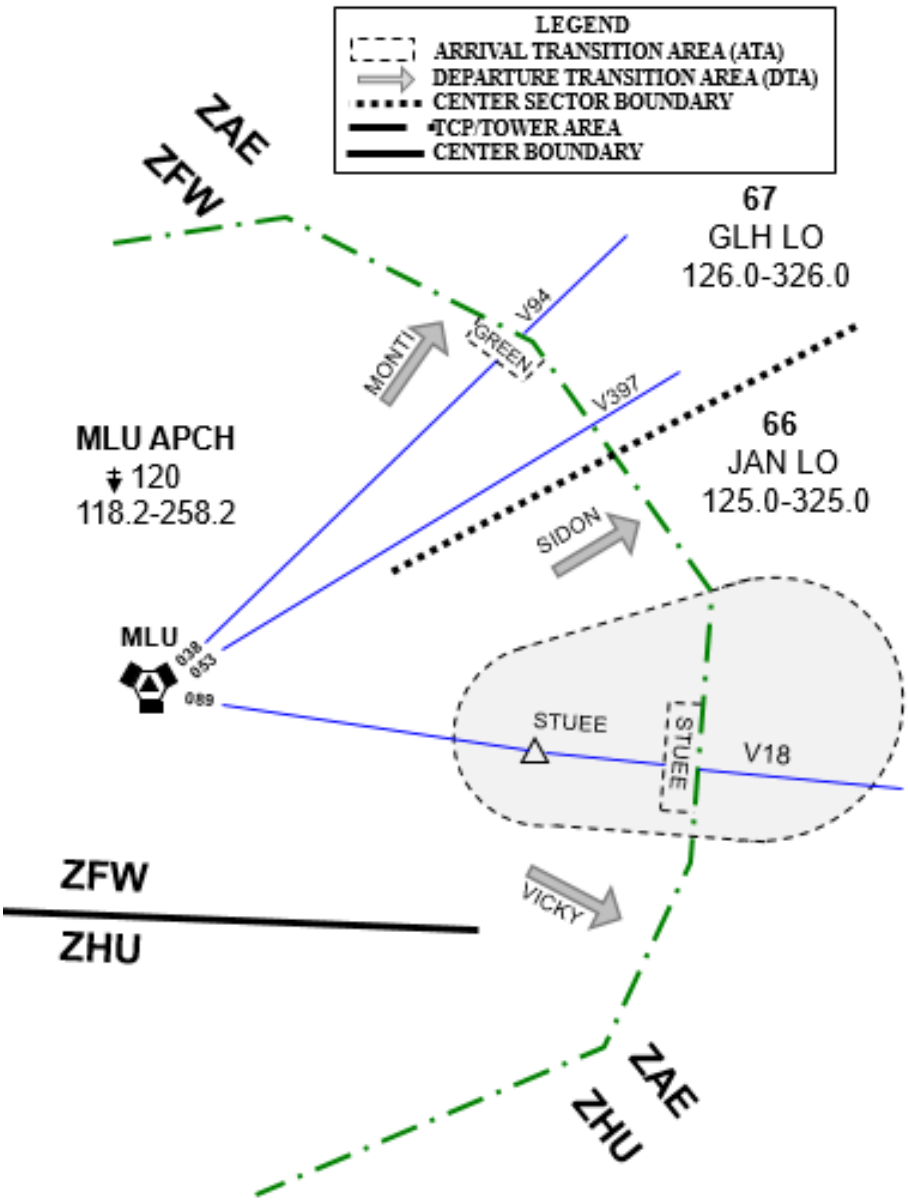
a) Overflights shall be cleared via the route/altitude printed on the strip or as coordinated.

(4) OTHER:

a) When an aircraft that will cross the boundary in a climb or decent, ARTCC shall:

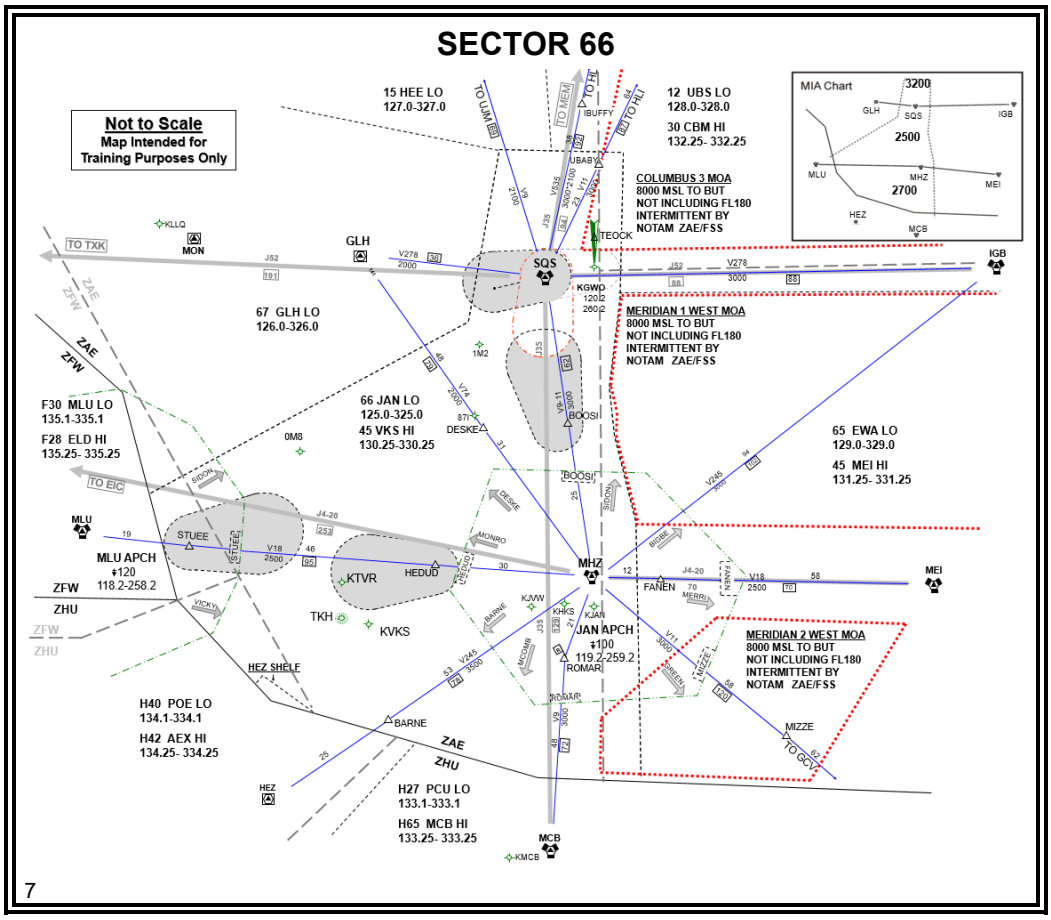
i. Initiate the handoff and then APREQ the climb/descent for aircraft if their final altitude is at or below 12,000 feet.

ii. Effect a point out, if required, before the aircraft transitions approach airspace.


LEGEND
ARRIVAL TRANSITION AREA (ATA)
DEPARTURE TRANSITION AREA (DTA)
CENTER SECTOR BOUNDARY
TCP/TOWER AREA
CENTER BOUNDARY
ZAE
ZFW
67
GLH LO
126.0-326.0
V94
GREEN
MONTI
V397
MLU APCH
120
118.2-258.2
66
JAN LO
125.0-325.0
SIDON
MLU
038
053
089
STUEE
STUEE
V18
ZFW
ZHU
VICKY
ZAE
ZHU

AIRSPACE

Sector 66



☞ ***NOTE:*** *Review the Sector 66 airspace and point out the differences compared to the map used in the nonradar portion of the course.*

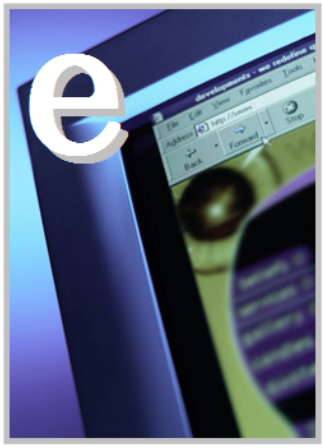
- Re-examine high altitude boundaries
- Review jet routes

NOTE: Refer to Appendix A for a full page version of the Sector 66 radar map.

ACTIVITY: FIX RADIAL DISTANCE

Activity

ACTIVITY: FIX RADIAL DISTANCE



Purpose: to review and practice working with fix radial distances

8

☞ ***NOTE:*** *Students will now review an eLearning activity from the nonradar potion of the course. Have them access the IET eLearning menu and select the activity for Lesson 11.*

Description

In this activity, you will be presented with information related to the components that comprise a fix radial distance fix and then will be asked to answer a series of related questions. Feedback will be given immediately.

Directions

Access the IET eLearning menu. Select **Lesson 11 – Route Assignments**. Click on the title to launch the **Fix Radial Distance** activity.

Time Allotted

30 minutes

☞ ***NOTE:*** *Refer to Appendix B for the Instructor Key for this eLearning activity.*

☞ ***NOTE:*** *Remember to disable the eLearning capability after students complete the eLearning.*

KNOWLEDGE CHECK

Knowledge Check

KNOWLEDGE CHECK

QUESTION: During radar procedures, Jackson turbojet arrivals operating at or above 11,000 feet shall be cleared to cross the ATCT lateral boundary _____ feet and _____ knots.

A. descending to 11,000; at 250

B. descending to 10,000; at 260

C. at 11,000; 250

9

☞ **NOTE:** Click once to show answer.

ANSWER: *C*

Continued on next page

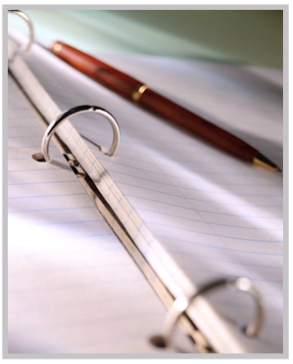
IN CONCLUSION

Lesson Review

LESSON REVIEW

The following topics were covered in this lesson:

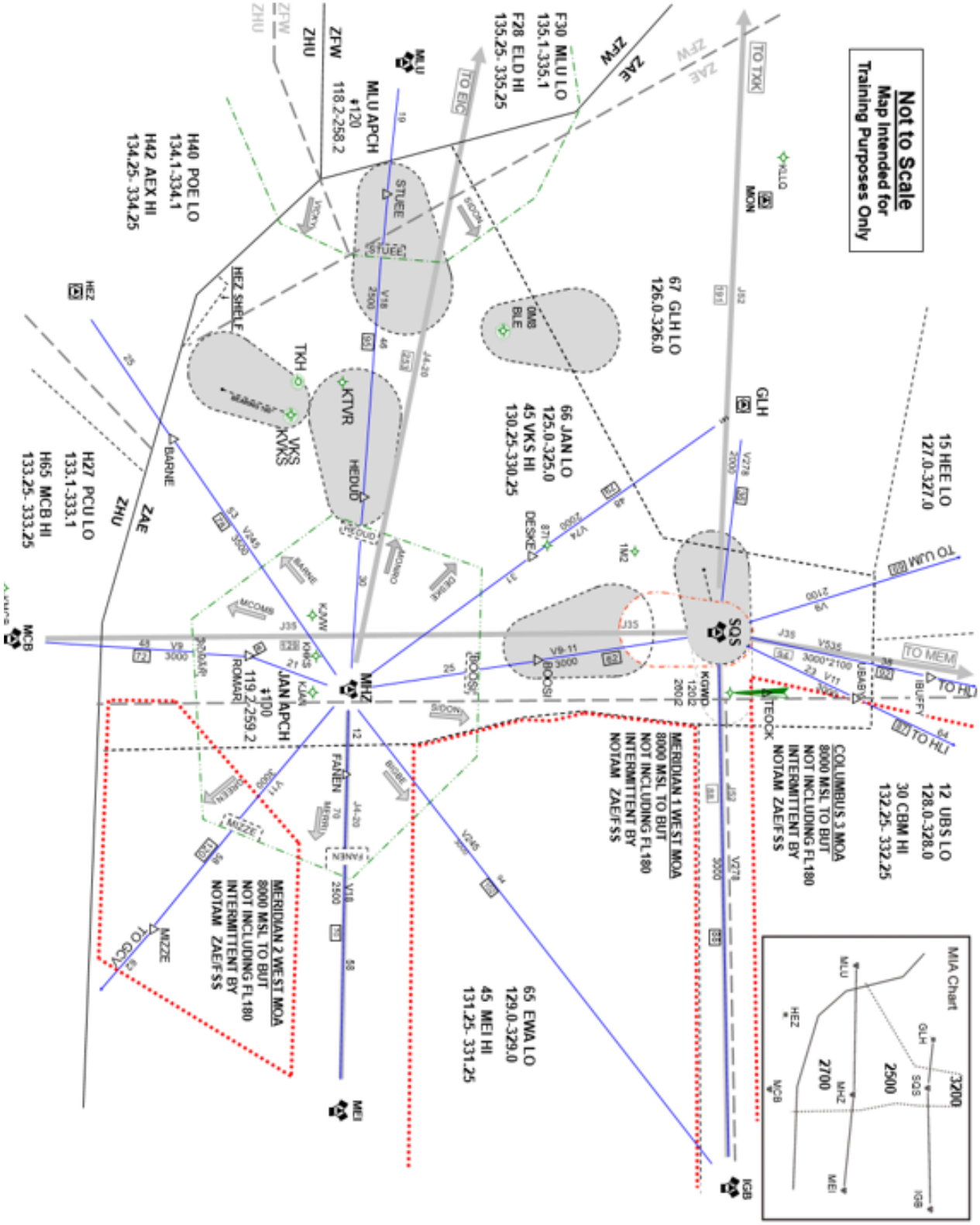
- Flight information
- Standard Terminal Arrival Routes (STARS)
- LOAs
- Sector 66
- FRDs



10

☞ ***NOTE:*** *Teach from graphic. Review and elaborate briefly on the topics covered in this lesson.*

APPENDIX A: SECTOR 66 RADAR MAP



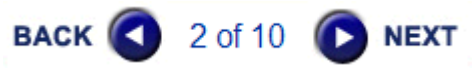
APPENDIX B: INSTRUCTOR KEY FOR ELEARNING ACTIVITY

Purpose

This document serves as a guide for facilitating the eLearning activities of the Initial En Route Training course and provides an overview of the objectives and content of the eLearning activities within this lesson.

Navigation

- To navigate within the eLearning activities, a Navigation Bar is positioned at the top right of the page and contains the following options:
  - MAIN MENU: Allows students to access a main menu listing all of the elearning activities
  - RESOURCES: Allows students to access additional resources, including:
    - A **Glossary** link
    - A **References** link
    - A **Help** link
  - EXIT: Allows students to exit from the eLearning activity at any time



- To navigate within an activity, a navigation tab is also positioned near the top right of the screen, just below the navigation bar.
  - The navigation tab contains the following buttons:
    - BACK: When active, returns students to the previous page
    - NEXT: When active, allows students to advance to the next page

NOTE: Inactive **BACK** and **NEXT** buttons indicate students are at the beginning or at the end of a lesson.

Navigation Tips

- To refresh a page or reset an activity, press **F5**.
- You can advance to a specific page in the activity without completing the activity. Click the **NEXT** or **BACK** buttons until the page is displayed.

Continued on next page

APPENDIX B: INSTRUCTOR KEY FOR ELEARNING ACTIVITIES *(Continued)*

Lesson Title	Lesson 35 Radar Transition
eLearning Objective	The objective of this eLearning activity is to reinforce interpreting and locating Fix Radial Distance (FRD) elements when they are encountered in a clearance, in a route, or on a flight progress strip.
eLearning Activity	⊙ In Lesson 35 the students will complete one eLearning activity from Lesson 11, Route Assignments: • Fix Radial Distance
Activity Description	In this activity, students are first presented with a brief refresher on Fix Radial Distances, then they review the map and given flight progress strips to answer fill-in-the-blank and multiple choice questions and to plot routes of flights focusing on FRDs.
Activity Content	⊙ Page 1 contains an activity introduction. ⊙ Page 2 contains a rollover activity in which students are given a refresher on FRDs. ⊙ Page 3 contains a series of fill-in-the-blank questions regarding FRDs. ⊙ Pages 4-5 contain an activity in which students must identify components of FRDs. ⊙ Pages 6-11 contains a series of multiple choice questions about FRDs. ⊙ Page 12 contains an activity in which students pick points on the map and answer multiple choice questions related to specific locations. ⊙ Pages 13-15 contain an activity in which students drag and drop FRDs onto appropriate location on the map. ⊙ Pages 16-25 contain an activity in which students review given flight progress strips and answer multiple choice questions regarding FRDs. ⊙ Page 26 contains an activity in which students plot route of flights based on the FRDs in given flight progress strips.

Continued on next page

APPENDIX B: INSTRUCTOR KEY FOR ELEARNING ACTIVITY *(Continued)*

Activity Specifics

- Rollover activity
  - On page 2, students must click **ZOOM IN** in order to rollover the components of the given FRD and to read the definitions.
- Fill-in-the-blank questions
  - On page 3, students have two attempts to type in their answer before they are given the correct answer.
- Click the FRD component activity
  - On pages 4-5, students have one attempt to click the appropriate location on the given FRD before they are given the correct answer.
- Multiple choice questions
  - On pages 6-11 and 16-25, students have one attempt to respond to each question before they are given the correct answer.
- Multiple choice questions with map
  - On page 12, students have two attempts to answer the multiple choice question regarding each point indicated on the map before they are given the correct answer.
- Drag and drop questions
  - On pages 13-15, students have two attempts to drag and drop the FRD to the map before they are shown the correct answer.
    - Students must drag and drop the correct answers onto the map once the answers are given.
- Interactive map activity
  - On page 26, students have two attempts to plot each part of the route of flight before they shown the correct answer.