Federal Aviation Administration

Data Communications Initial Services En Route Ghost Pilot (GP)

Lesson 1: *Introduction to Data Comm*

Course 55155002

Version: 2

FAA-ERAM-2017-0423

INSTRUCTOR LESSON PLAN

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LESSON PLAN DATA SHEET

Section	Description
Course Name	Data Communications Initial Services En Route Ghost Pilot (GP)
Course Number	55155002
Lesson Title	Introduction to Data Comm
Duration	1 hour
Date Revised	October 2017
Version	2
Software Compatibility	Microsoft Word, Power Point
Reference(s)	• TI 6110.104, R-Position Quick Reference Cards • TI 6110.108, Automation and Modernization Quick Reference Card • TI 6110.100, R-Position User Manual • TI 6110.101, RA-Position User Manual • FAA JO 7110.65, Air Traffic Control
Handout(s)	None
Exercise(s)/ Activity(s)	None
Assessments	None
Materials and Equipment	Intro to Data Comm video. Length: 11:47
Other Pertinent Information	Introduction to Data Comm video on page 10.

LESSON 1 SCHEDULE

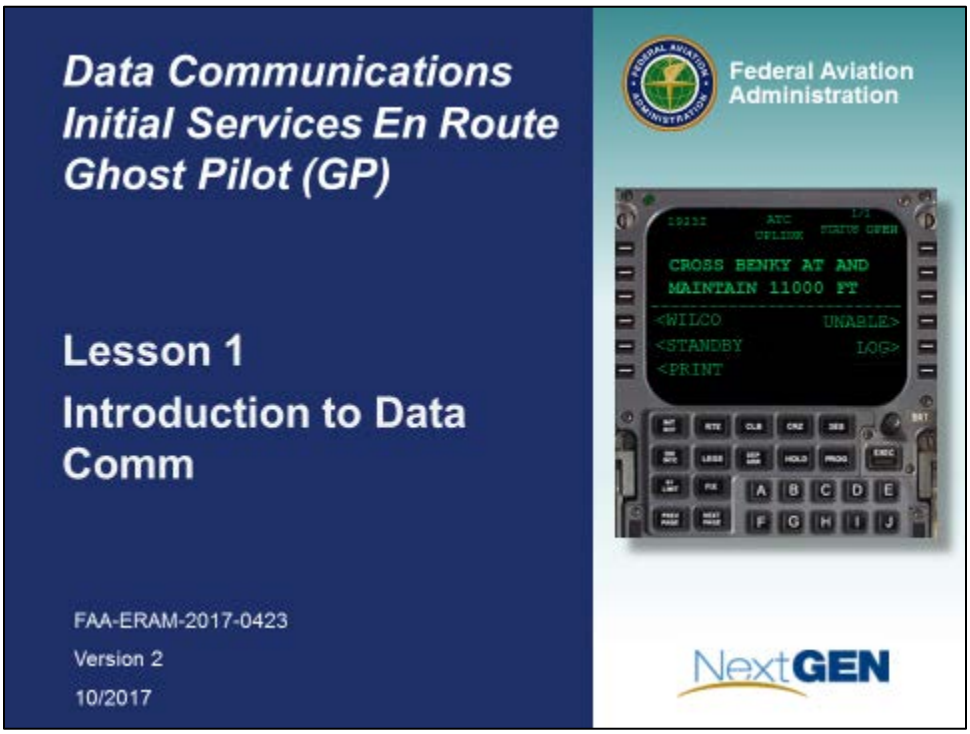
Topic	Instructional and Assessment Methods	Duration
Introduction to the Course	• ILT / Not Tested	0:05
1. What is Data Comm?	• ILT-AV / Knowledge	0:05
2. Data Comm Initial Services Capabilities	• ILT / Knowledge	0:15
3. Impact to sector operations due to Data Comm	• ILT / Knowledge	0:05
4. Basic characteristics of a TOC	• ILT / Knowledge	0:20
5. Basic characteristics of an Altitude clearance uplink	• ILT / Knowledge	0:10
Total duration of Lesson 1		**1:00**

Legend

	
Mouse Click	Movie

LESSON INTRODUCTION, OVERVIEW, AND OBJECTIVES

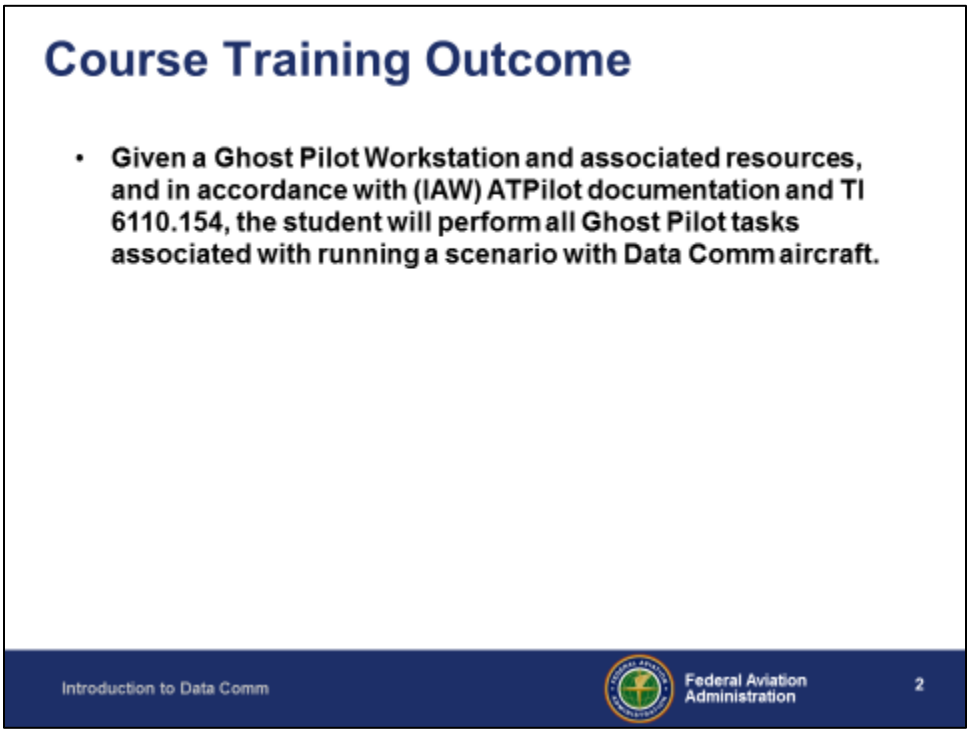
Slide - 1.



Instructor Notes

Gain attention and start the lesson. Explain that the lesson is intended provide an introduction to the course and to the Data Comm system.

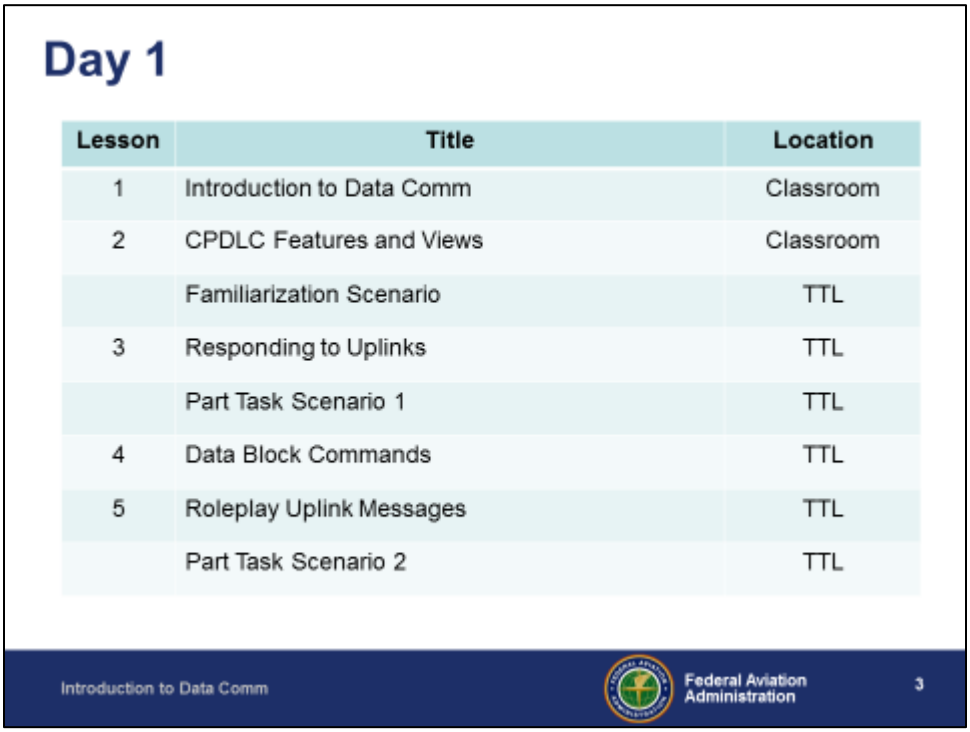
Slide - 2.



Instructor Notes

Review training outcome.

Slide - 3.



Student Content

Day 1 consists of the following:

Lesson 1 – Introduction to Data Comm

Lesson 2 –CPDLC Features and Views

Familiarization Scenario

Lesson 3– Responding to Uplinks

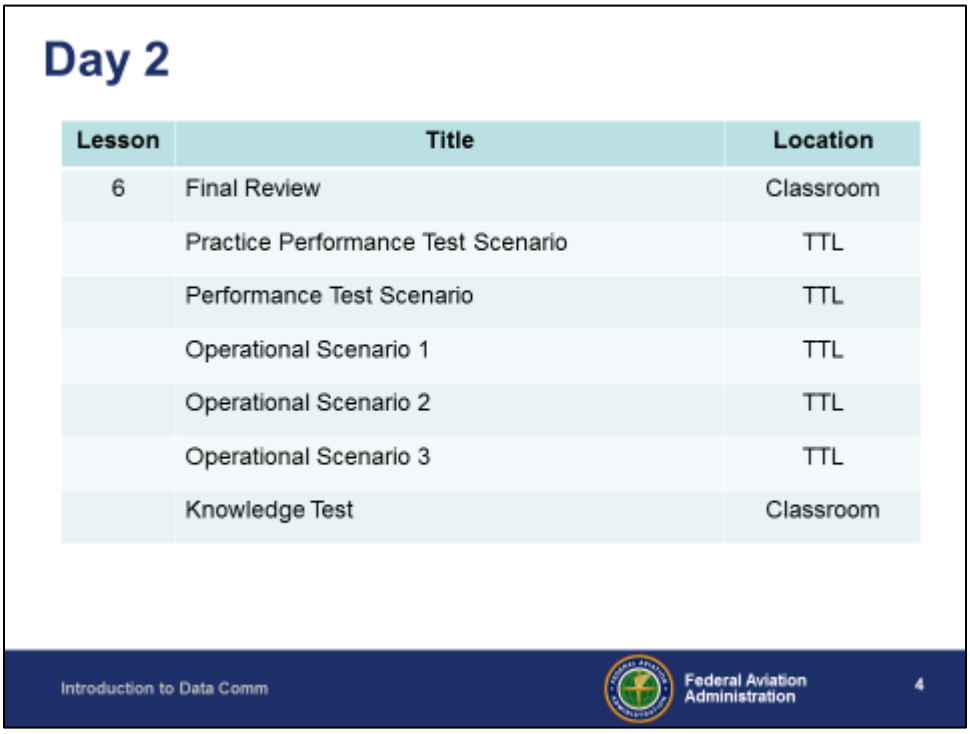
Part Task Scenario 1

Lesson 4 – Data Block Commands

Lesson 5 – Roleplay Uplink Messages

Part Task Scenario 2

Slide - 4.



Student Content

Day 2 consists of the following:

Lesson 6 – Final Review

Practice Performance Test Scenario

Performance Test Scenario

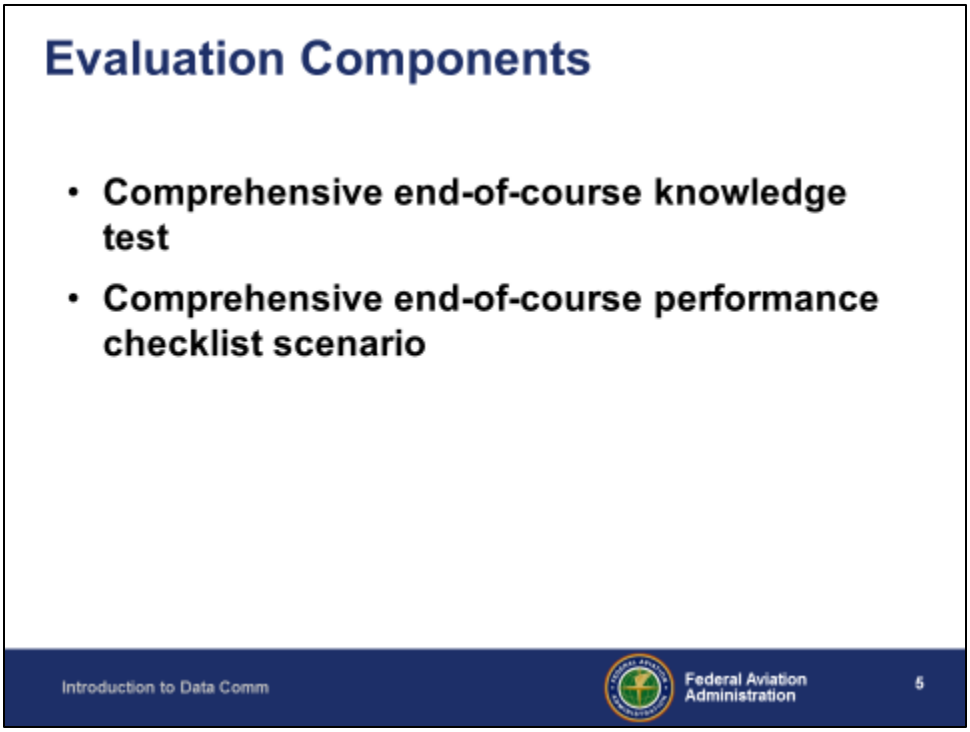
Operational Scenario 1

Operational Scenario 2

Operational Scenario 3

Knowledge Test

Slide - 5.



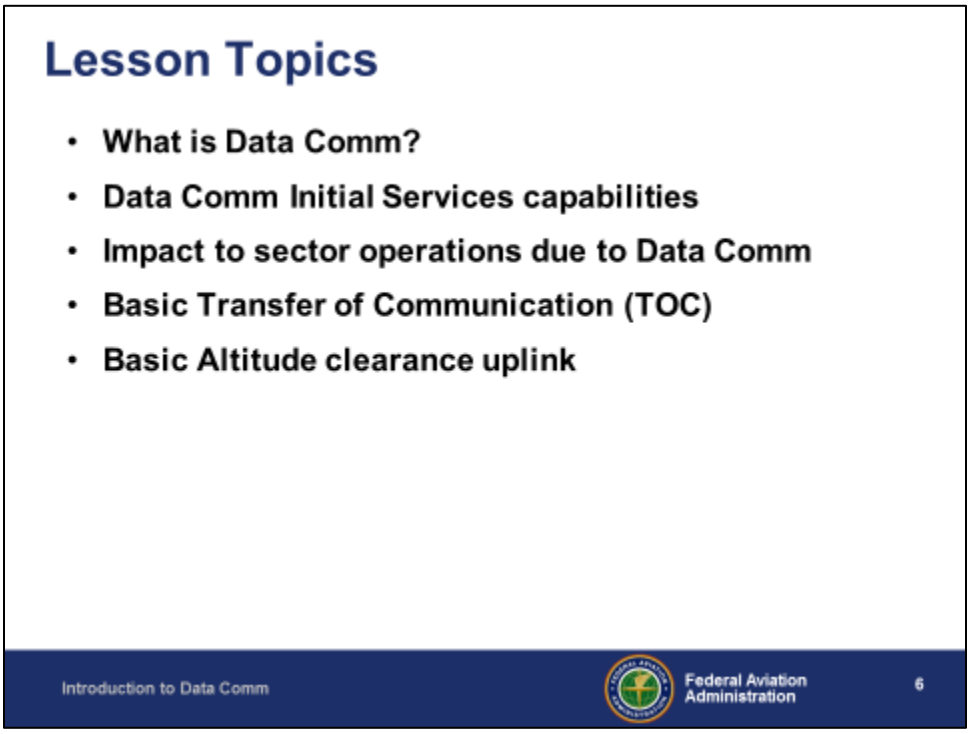
Student Content

There are two evaluation components to the course:

- Comprehensive end-of-course knowledge test
  - Delivered via eLMS
  - Feedback provided for each missed question
  - Alternate question provided for any missed question

- Comprehensive end-of-course performance scenario
  - Feedback provided by instructors during the scenario

Slide - 6.



Student Content

Lesson 1 covers the following topics:

Topic 1 – What is Data Comm?

- Description of Data Comm
- Automation systems involved in Data Comm message exchange

Topic 2 – Data Comm Initial Services capabilities

- TOC types, altimeter settings, altitude clearances, PIDS

Topic 3 – Impacts to sector operations

- System latency
- Mixed communication environment

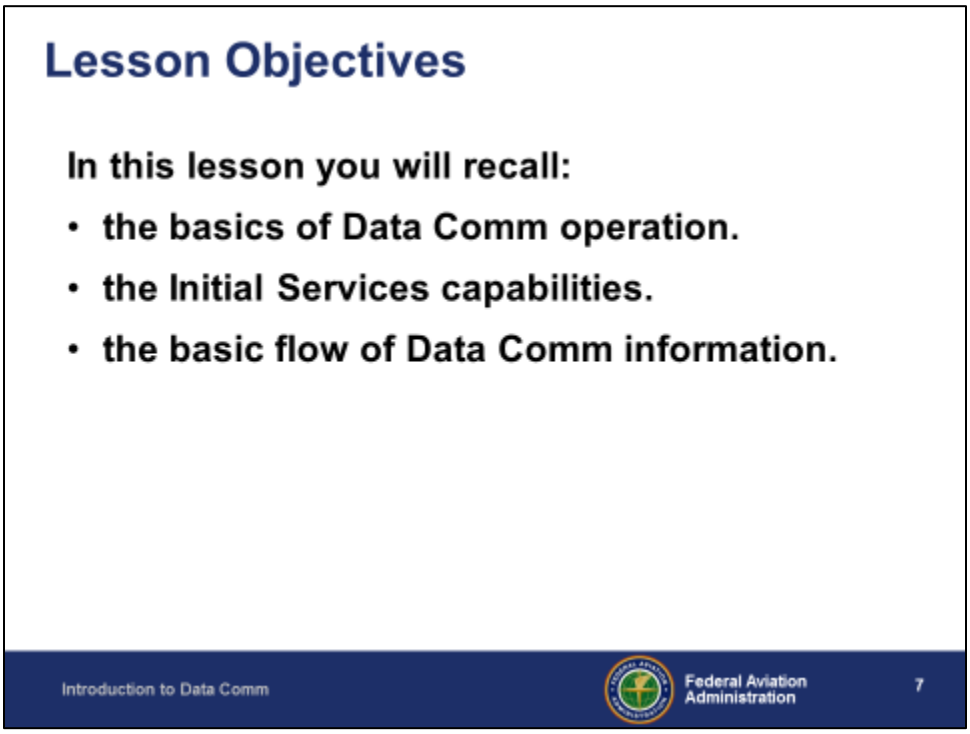
Topic 4 - Basic Transfer of Communication (TOC)

- TOC message, Releasing a HELD TOC, Nominal Contact TOC, Contact vs. Monitor TOCS, Nominal Monitor TOC, IC Uplink

Topic 5 - Basic Altitude clearance uplink

- Supported clearances, Optional instructions, Keyboard commands, System processing, Altitude menu

Slide - 7.



Instructor Notes

Briefly cover lesson objectives.

Student Content

These objectives will be accomplished in accordance with the following references:

- TI 6110.104, R-Position Quick Reference Cards
- TI 6110.108, Automation and Modernization Quick Reference Card
- TI 6110.100, R-Position User Manual
- TI 6110.101, RA-Position User Manual
- FAA JO 7110.65, Air Traffic Control

TOPIC 1: What is Data Comm?

Slide - 8.

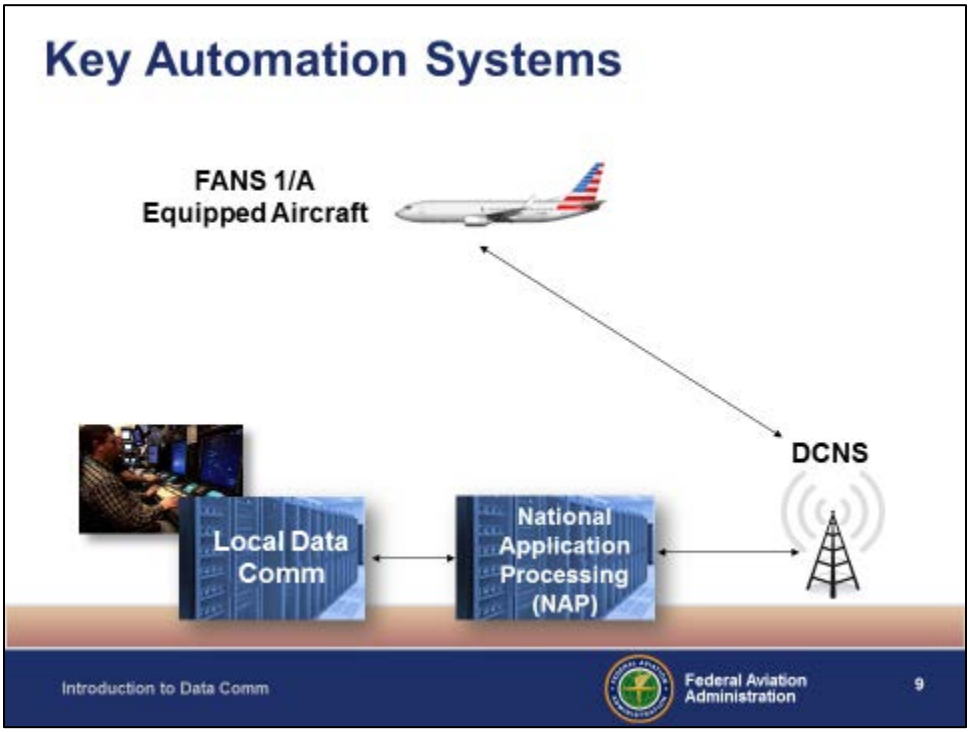
Student Content

Data Comm is short for Data Communications. It is the name of the FAA system that provides a means for controllers to communicate silently with properly equipped aircraft via supported digital messages. Voice is always available and should be used when delay is not operationally acceptable. Throughout the aviation industry the system is also known as Controller Pilot Data Link Communication (CPDLC). The terms Data Comm, CPDLC and Data Link are all used interchangeably.

Instructor Notes

Click on the movie icon on the slide to begin the video Introduction to Data Comm, length: 11:47.

Slide - 9.



Instructor Notes

Slide builds with six clicks.

Student Content

There are a number of key automation systems that make it possible for En Route controllers to exchange Data Comm messages with the aircraft.

Click once.

At each local facility, Data Comm software has been integrated into ERAM. Controllers will see new full data block (FDB) and Aircraft List (ACL) symbols, new and revised menus, and new views. New keyboard commands options are also available to uplink messages.

After a controller enters the desired command, the local ERAM will validate the entry just as it currently does. There will also be additional error checks specific to Data Comm. If no errors are encountered, Data Comm will build the appropriate uplink message. The controller will see new FDB and ACL coding indicating there is a message being uplinked and the system is waiting for a pilot response.

Definitions:

- UPLINK: Data Comm message sent from the ground system to the aircraft.
- DOWNLINK: Data Comm message sent from the aircraft to the ground system.

 *Click twice.*

The local Data Comm software will then send the message to the active National Data Comm site, also known as the National Application Processing (NAP), for transmission to the aircraft. There are two National Data Comm sites, one at Salt Lake center and one at Atlanta center. Those facilities have additional Data Comm hardware and software to accomplish three key functions:

- Manage all message transmission functions. This includes functions such as security and message traffic flow.
- Manage the aircraft logon process. Aircraft must be logged on to Data Comm in order to exchange messages.
- Manage which facility can exchange messages with an aircraft at any given time. Only one facility at a time can do so. That facility is the Logical Data Authority, or LDA.

 *Click twice.*

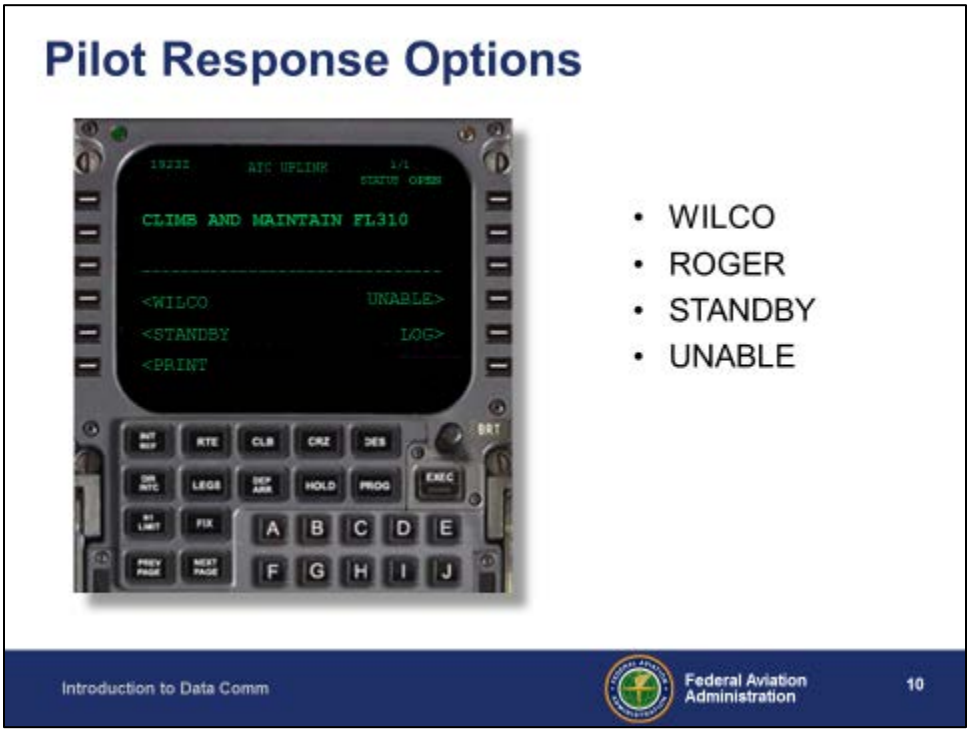
From the NAP, the message is routed to the Data Comm Network Service, or DCNS,

 *Click once.*

for transmission to the aircraft. The key purpose of the DCNS is to provide the network of transceivers that serve as the actual digital link to the aircraft. These towers are connected to the NAPs, and to each other, via ground to ground circuits.

To be CPDLC capable, an aircraft must be equipped with a Flight Management System (FMS) that complies with the Future Air Navigation System, or FANS 1/A specifications.

Slide - 10.



Student Content

On the flight deck, the uplink message is displayed on a Control Display Unit, or CDU. The flight crew manages all FMS inputs using buttons and keys on the CDU. When a CPDLC message is received, an audio tone will alert the pilot. The pilot can then display the uplink message.

To respond to the message the pilot presses one of the multi-function buttons on the side of the CDU. The basic response options available are:

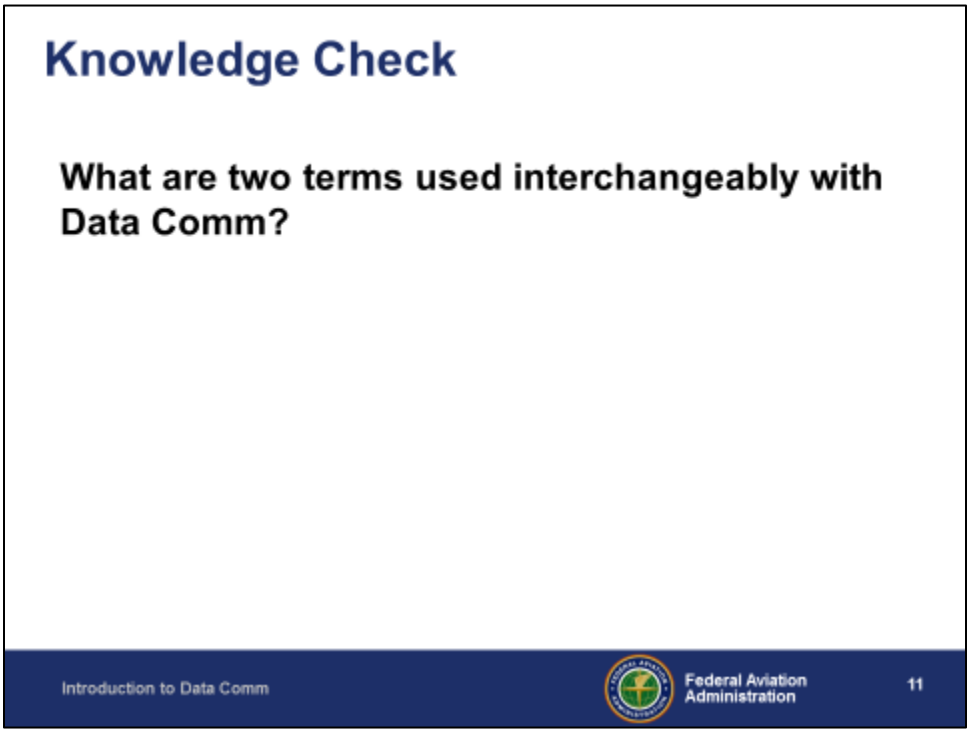
- WILCO (available for clearance or instruction messages)
- ROGER (available for informational messages)
- STANDBY
- UNABLE

While the system is waiting for a pilot response, the status of the message is considered to be “Open.”

When the response is received, the system will set the message status to “Closed.” The controller will then see the appropriate FDB and ACL changes based on the pilot response.

Knowledge Check

Slide - 11.

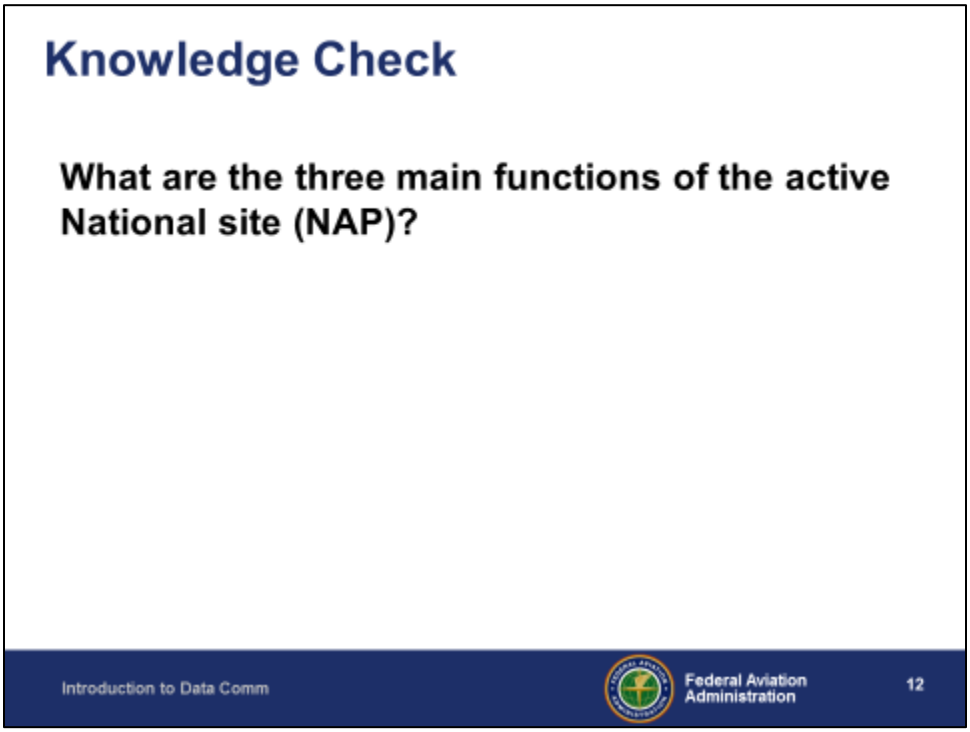


Instructor Notes

For all Knowledge Check questions, once a student has answered, click once to reveal the answer.

Answer: Controller Pilot Data Link Communications (CPDLC) and Data Link.

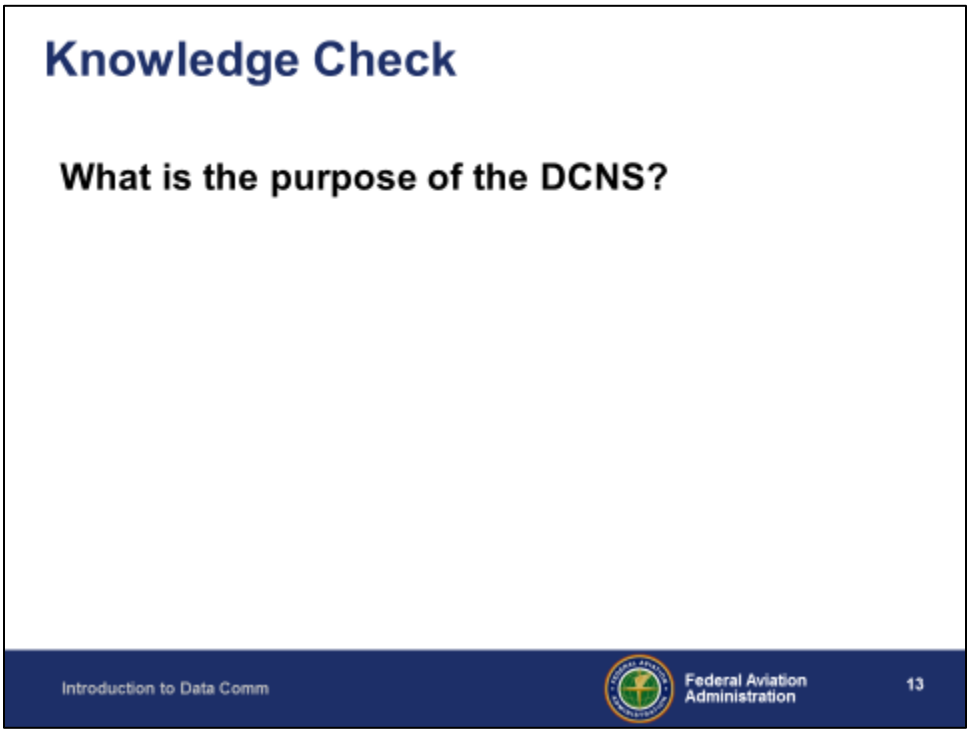
Slide - 12.



Instructor Notes

Answer: Manage aircraft logon processing, manage message transmission, and manage which facility can exchange messages with an aircraft at any given time.

Slide - 13.

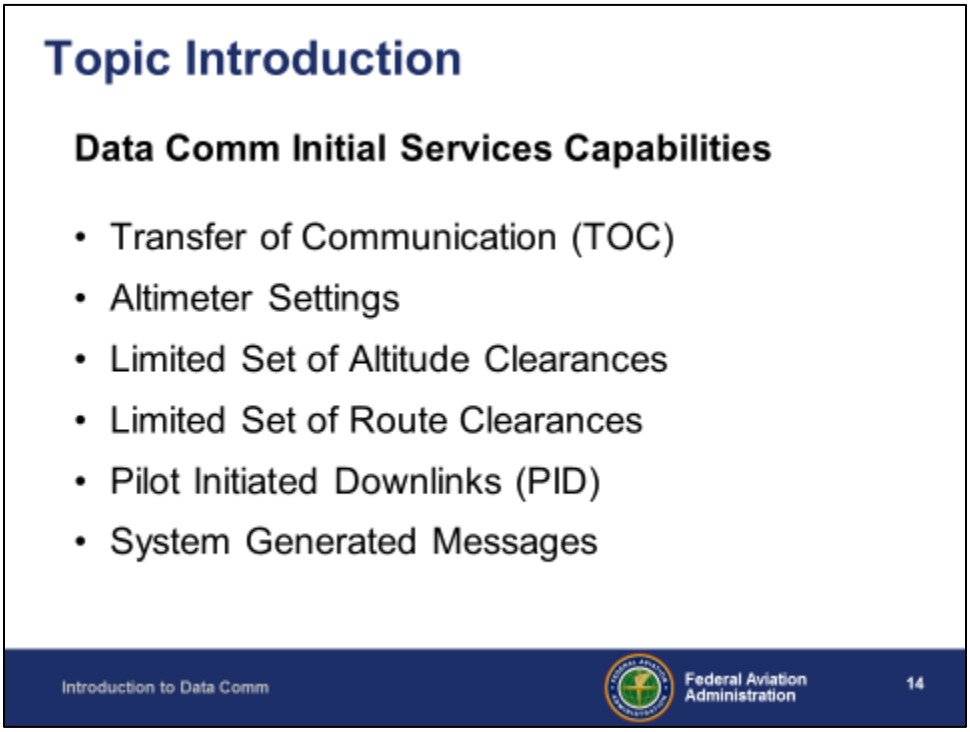


Instructor Notes

Answer: To provide the network of transceivers that serve as the actual digital link to the aircraft.

TOPIC 2: Data Comm Initial Services Capabilities

Slide - 14.

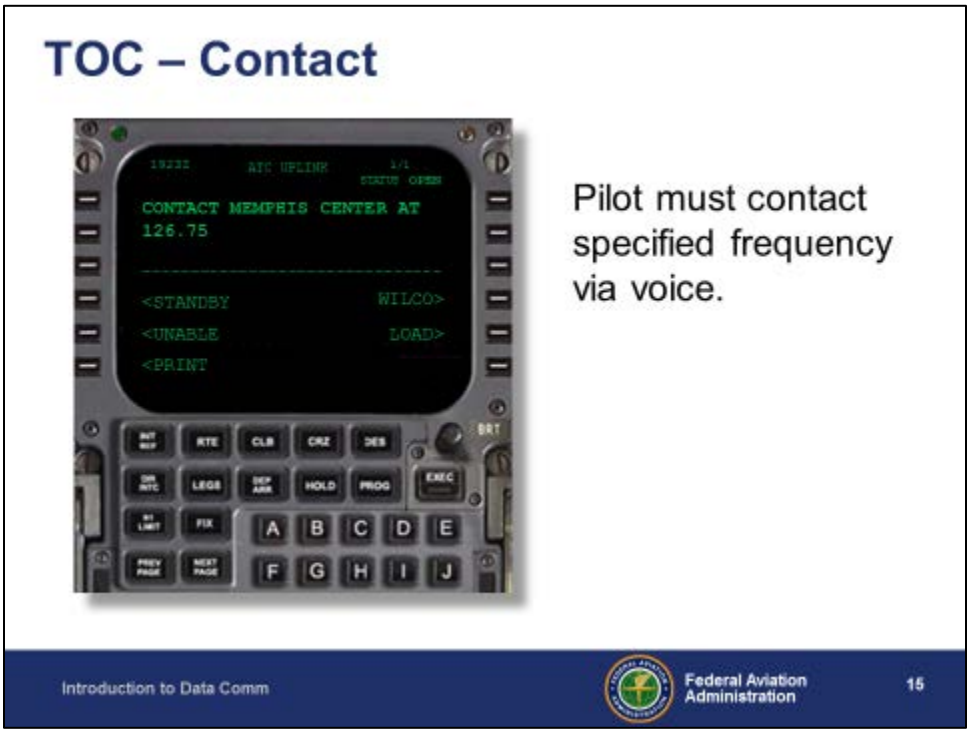


Student Content

The initial set of Data Comm capabilities are:

- Transfer of Communication (TOC)
- Altimeter Settings
- Limited Set of Altitude Clearances
- Limited Set of Route Clearances
- Pilot Initiated Downlinks (PID)
- System Generated Messages

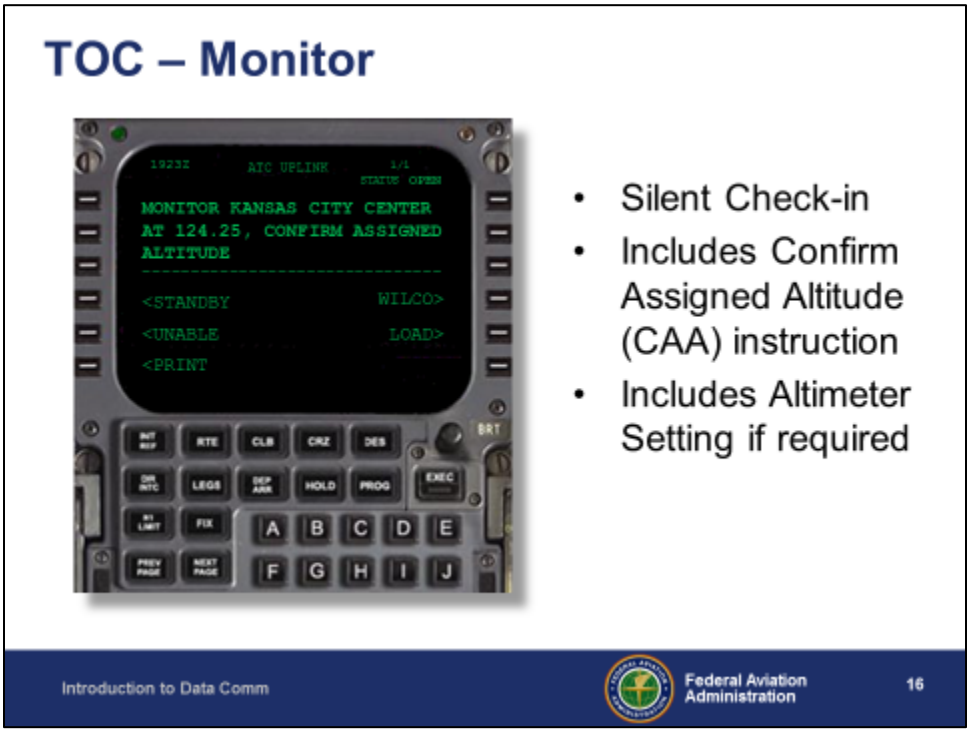
Slide - 15.



Student Content

Data Comm will allow a controller to uplink a frequency change message that instructs the pilot to contact a specified frequency. A CONTACT TOC means the pilot must check in via voice.

Slide - 16.



Student Content

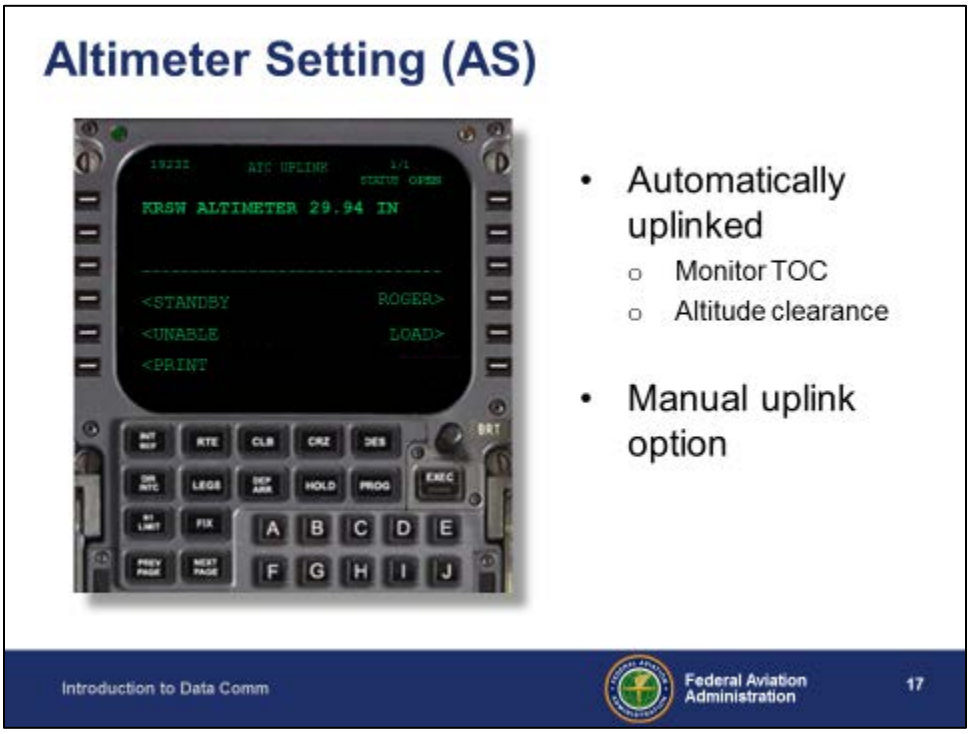
If all necessary conditions are satisfied, Data Comm will allow a controller to uplink a frequency change message that instructs the pilot to monitor a specified frequency. A MONITOR TOC means the pilot will switch to the specified frequency but not use voice to check-in. Instead the system will complete all required check-in actions.

This is called a silent check-in.

A MONITOR TOC will always include a CONFIRM ASSIGNED ALTITUDE (CAA) instruction. The pilot is required to downlink the currently cleared altitude and the system will compare that altitude to the altitude displayed in the FDB. The controller will be alerted if the altitudes don't match.

If required, the system will also uplink the Altimeter Setting for the appropriate reporting station.

Slide - 17.



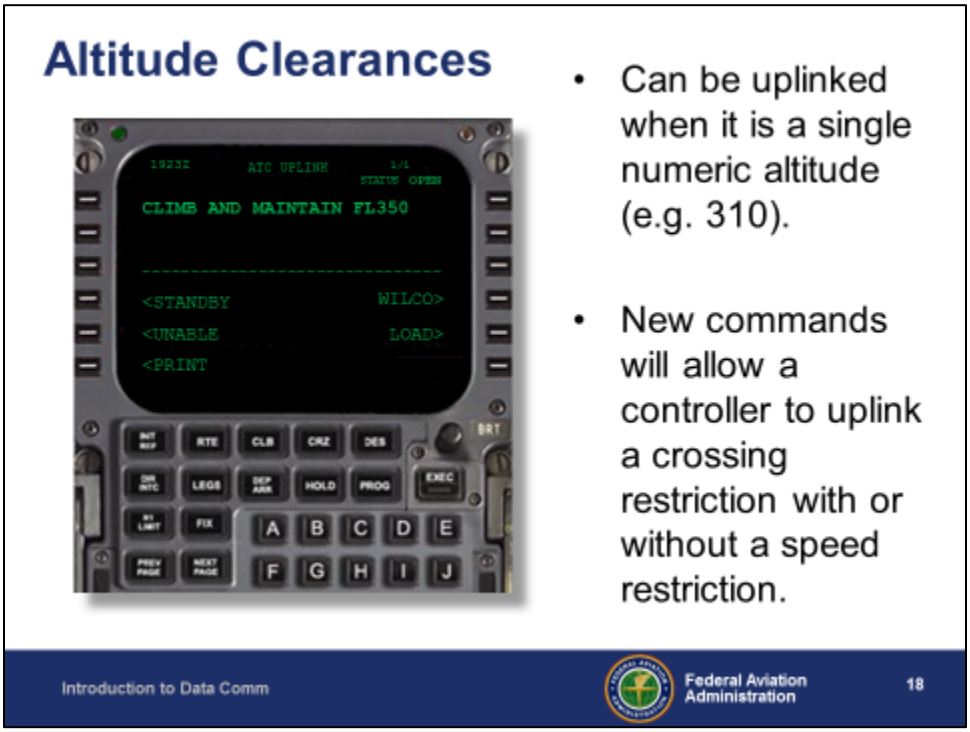
Student Content

Data Comm will automatically uplink an Altimeter Setting message whenever there is a procedural requirement to do so.

The Altimeter Setting will be automatically uplinked as part of a MONITOR frequency change message and whenever Data Comm is used to uplink an altitude clearance that requires an Altimeter Setting be provided.

A controller will also be able to manually uplink an Altimeter Setting at any time.

Slide - 18.

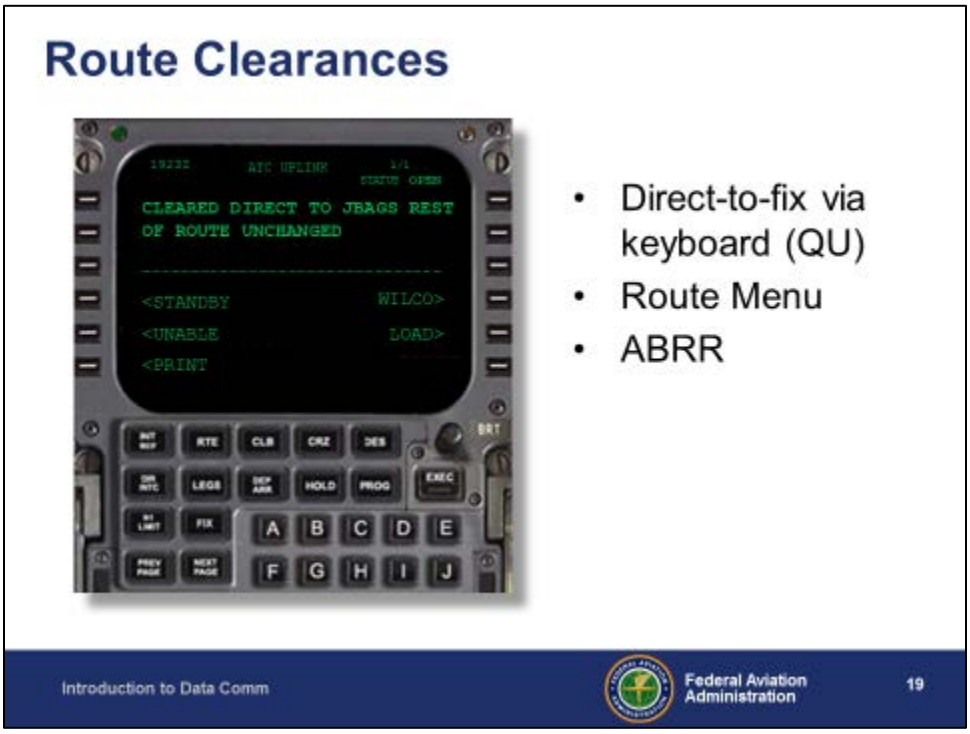


Student Content

Data Comm will allow a controller to uplink an altitude clearance when that altitude is a single numeric altitude (e.g., 310). Other altitudes such as block altitudes or “on top” altitudes are not supported.

New commands will allow a controller to uplink a crossing restriction with or without a speed restriction.

Slide - 19.



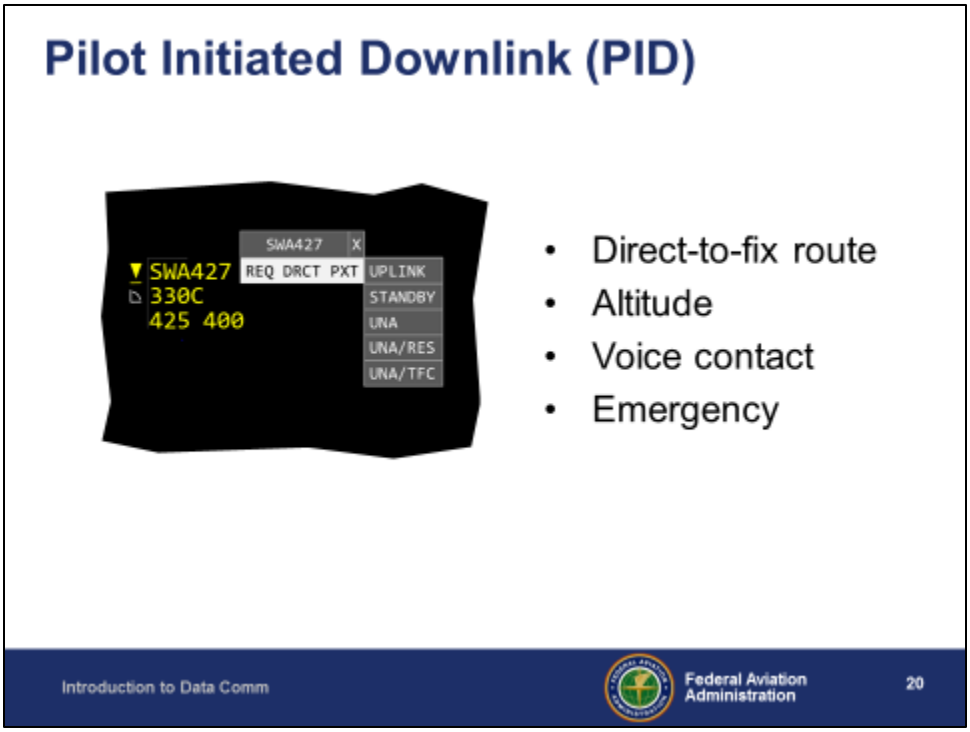
Student Content

Data Comm will allow a controller to uplink a limited set of route clearances.

From the R and RA keyboards, a controller will be able to enter a Direct-to-Fix amendment (QU) plus /U and the system will generate the appropriate clearance uplink

From the RA position, the Route menu, Graphic Plan Display (GPD), Plans Display, and Airborne Reroute (ABRR) menus have been modified to include an Uplink option.

Slide - 20.



Student Content

Pilots will be able to downlink a limited set of requests. These are referred to as normal Pilot Initiated Downlinks, or PIDs. There are three possible requests:

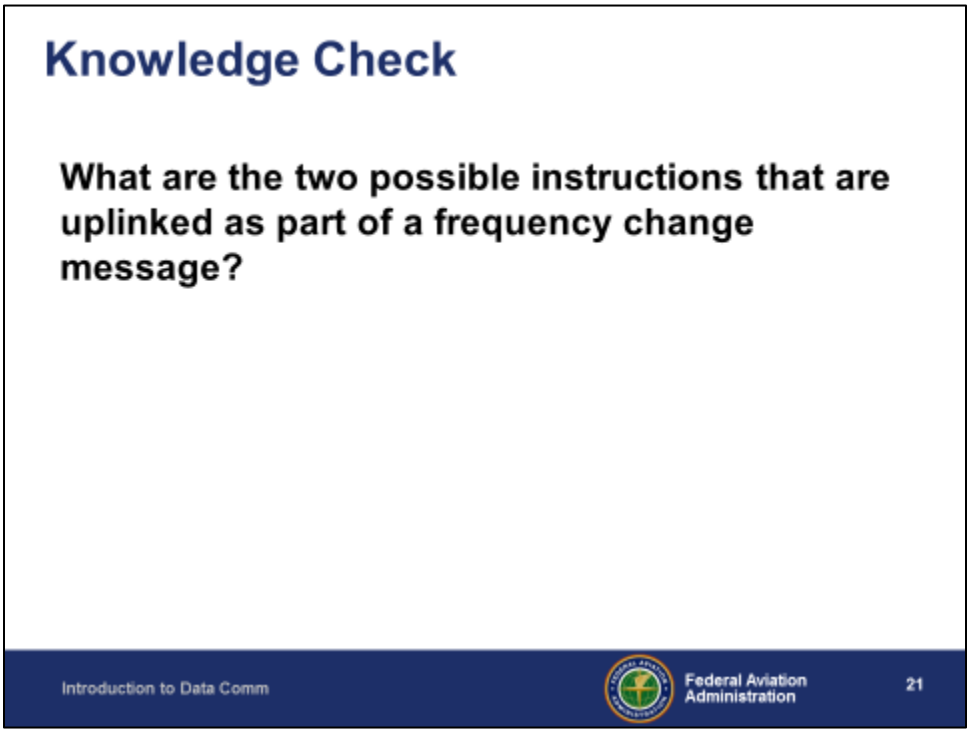
- Direct-to-fix route
- Altitude
- Voice contact

The controller will be able to approve or reject the requests, and the system will uplink the appropriate response.

A pilot can also downlink an emergency PID.

Knowledge Check

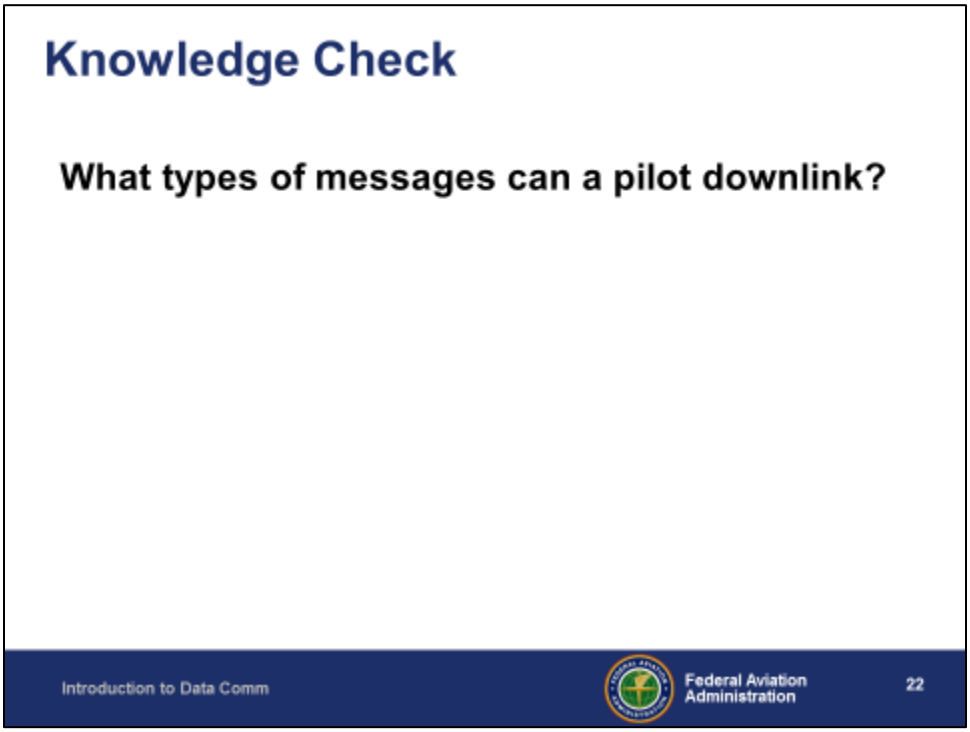
Slide - 21.



Instructor Notes

Answer: Contact and Monitor

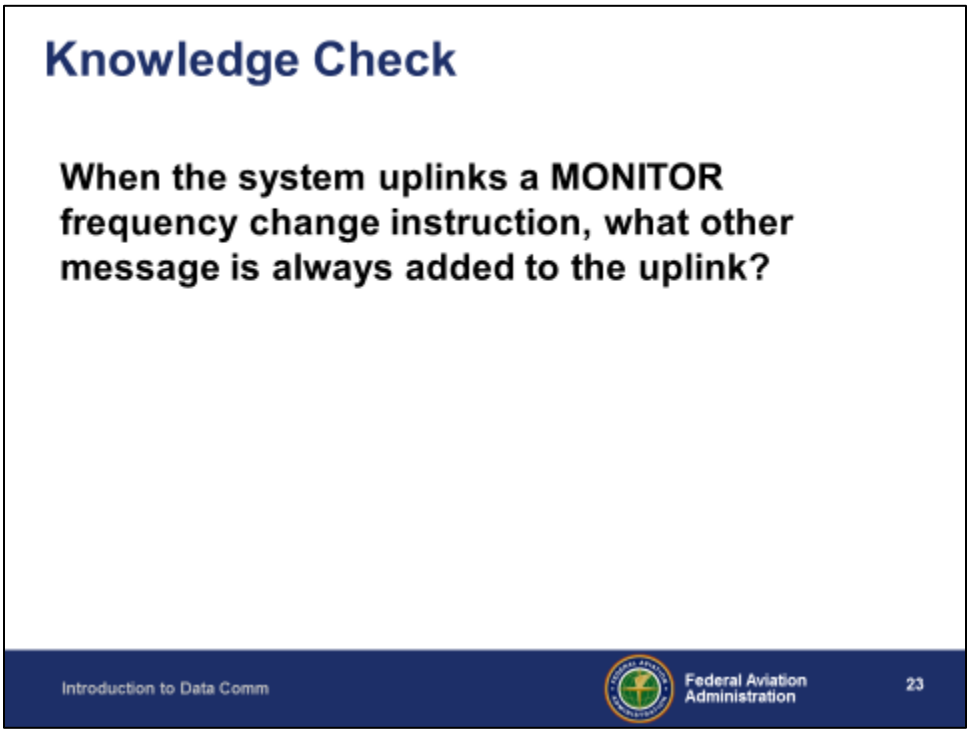
Slide - 22.



Instructor Notes

Answer: Altitude, Direct-to-fix, Emergency and Voice Communication.

Slide - 23.

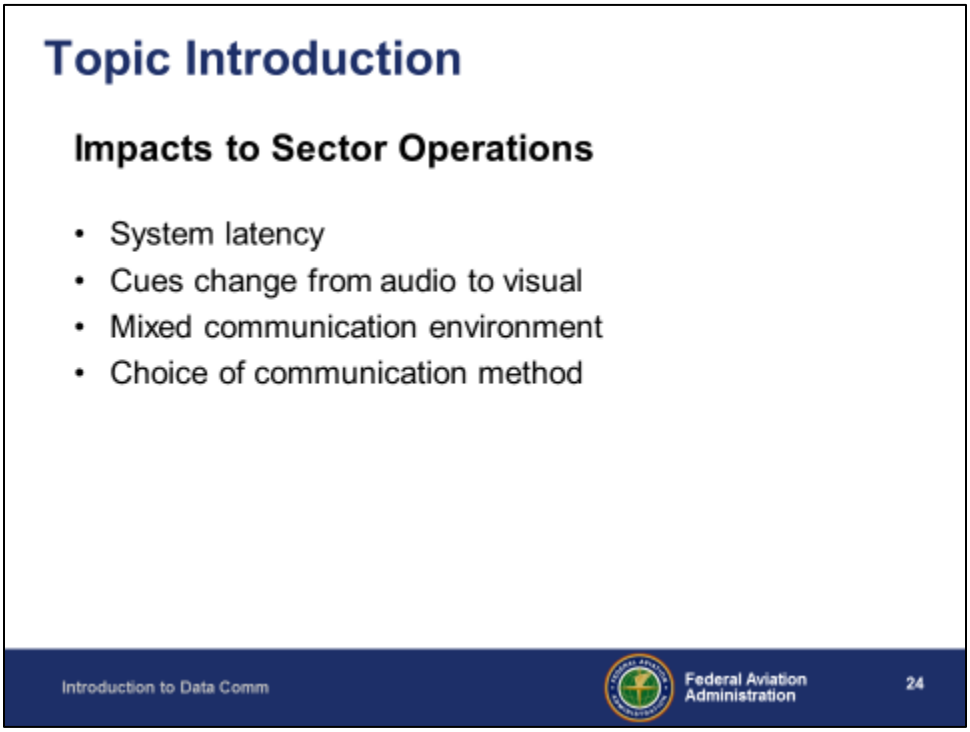


Instructor Notes

Answer: Confirm Assigned Altitude (CAA)

TOPIC 3: Impacts to Sector Operations

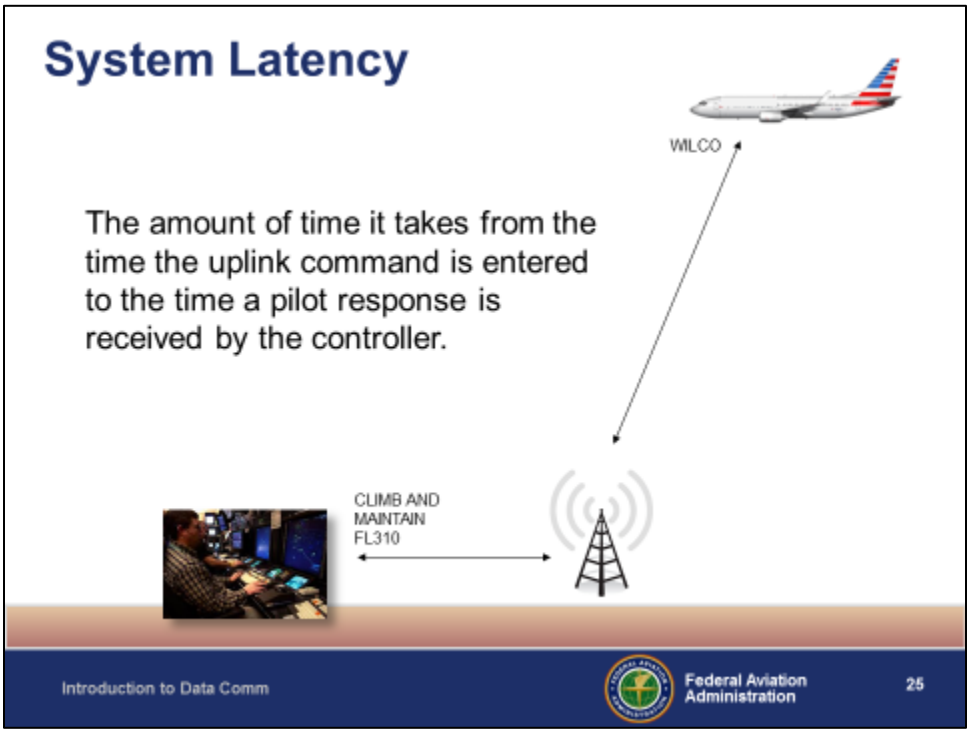
Slide - 24.



Student Content

This section covers some key impacts to sector operations that will result from the implementation of Data Comm.

Slide - 25.



Instructor Notes

Click four times during first paragraph to animate graphic.

Student Content

The term System Latency refers to the amount of time that elapses from the time an uplink command is entered to the time a pilot response is received.

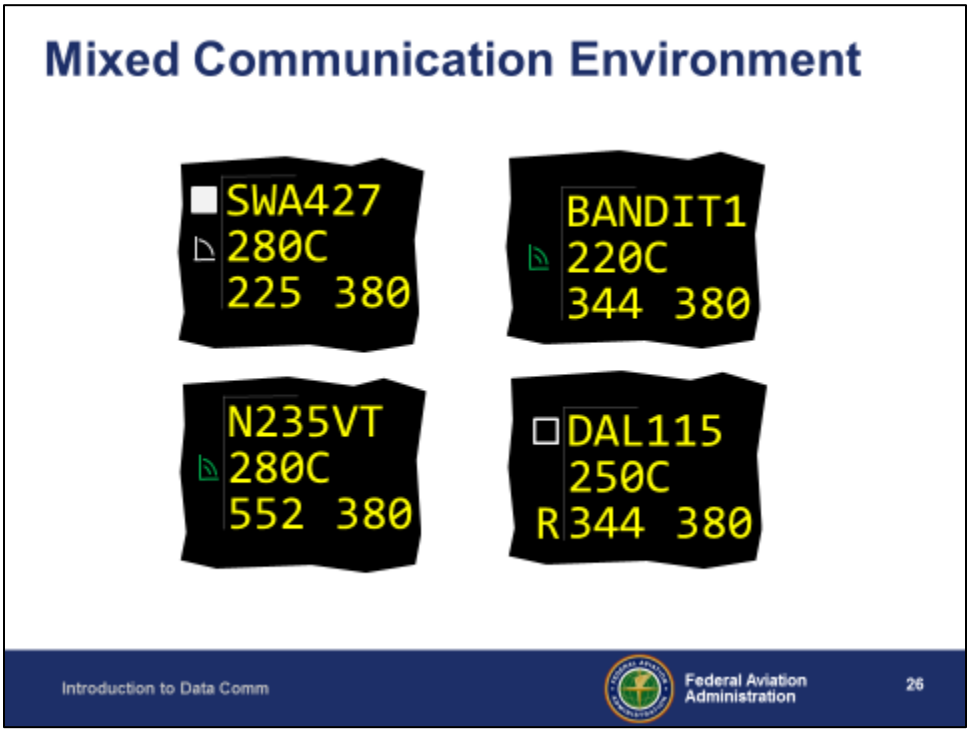
System Latency results from a combination of factors that include network delays, transmission delays and the time it takes for a pilot to read, comprehend, and respond to an uplink. No hard and fast delay values can be provided; however, some have estimated delays from 10 to 30 seconds each way.

System Latency will affect the work environment in two ways.

- First, rather than issuing a clearance via voice and then waiting for the pilot to readback the clearance, a controller using Data Comm may issue multiple clearances consecutively and then monitor for multiple pilot responses as part of the scanning process.

- Second, any Data Comm clearance must be issued early enough to account for the possible delay.

Slide - 26.

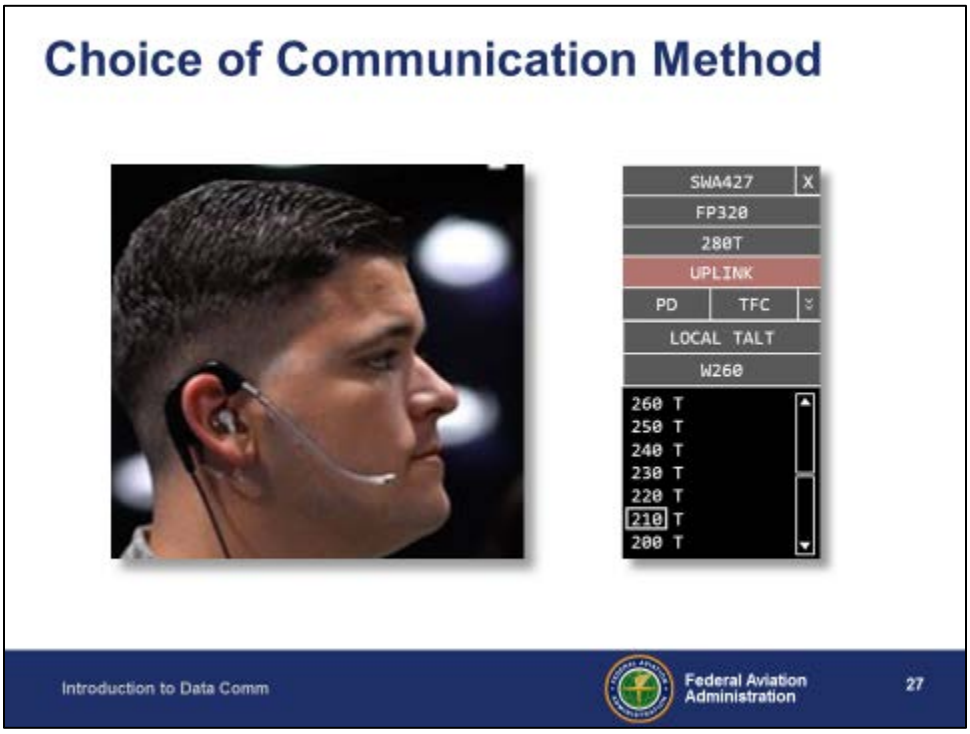


Student Content

Since aircraft must be properly equipped to use Data Comm, controllers will be operating in a mixed communication mode environment.

Controllers will now need to determine which aircraft are Data Comm capable and which are not. Data Comm capable aircraft will have new data block indicators that should facilitate this task.

Slide - 27.



Student Content

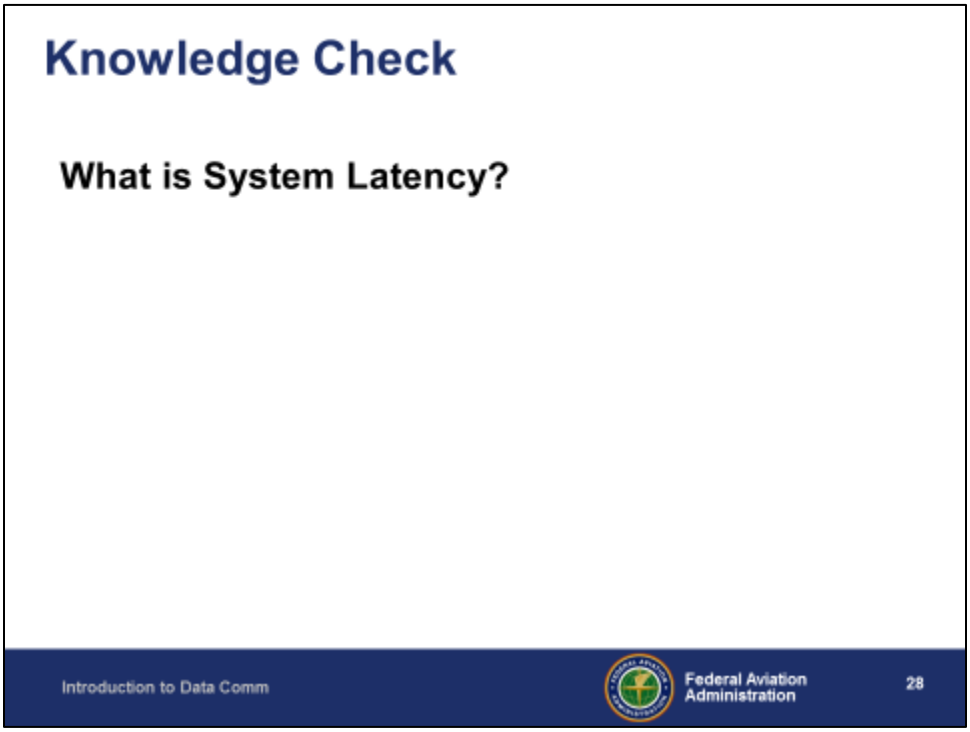
Once a controller determines that an aircraft is CPDLC equipped, the controller must decide whether to use Data Comm or voice to communicate. Data Comm has the potential to make the sector more efficient when used for routine communications such as transfers of communication, routine crossing restrictions, and reroutes.

Because of system latency, Data Comm should not be used for tactical clearances that require prompt execution. Voice should always be used whenever delay is not operationally acceptable.

National or local procedures will require voice communications in certain situations.

Knowledge Check

Slide - 28.



Instructor Notes

Answer: The amount of time that elapses from the time an uplink command is entered to the time a pilot response is received.

TOPIC 4: Basic Data Comm Transfer of Communication

Slide - 29.

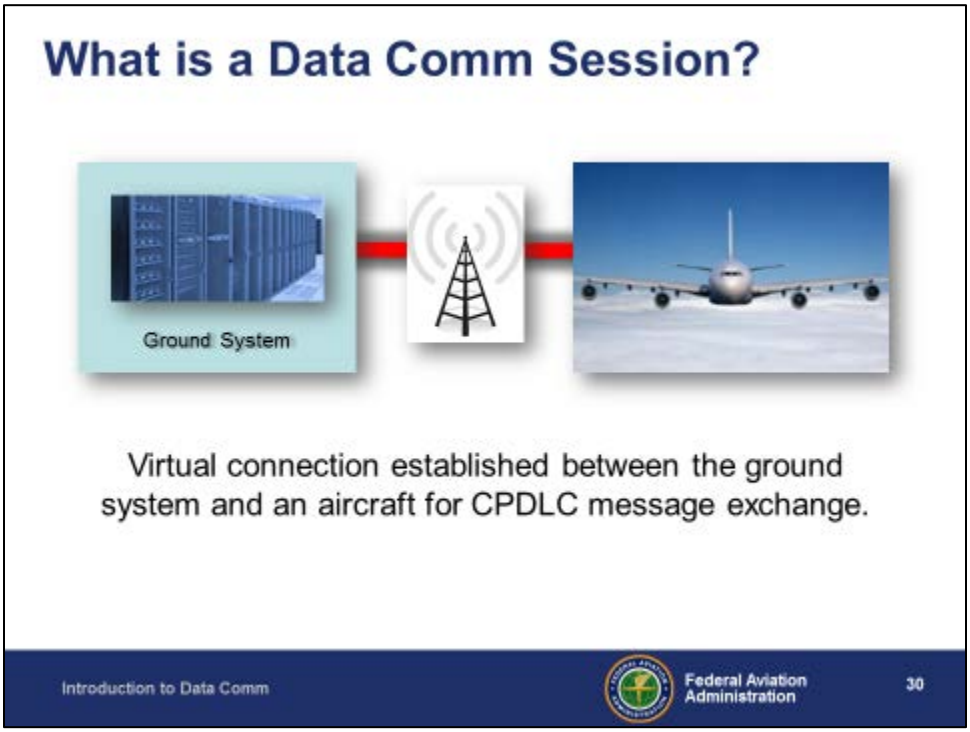
Student Content

For Data Comm aircraft, every track control change results in the system creating a Held TOC entry. The entry is “held” so the controller may release it at the operationally appropriate time. When the Held TOC is released by the controller, the system builds and uplinks the appropriate frequency change message.

In this section we will describe the following:

- Contents of the Held TOC entry
- The conditions the system uses to determine whether to uplink a CONTACT or a MONITOR instruction
- Characteristics of an Initial Contact (IC) message

Slide - 30.



Student Content

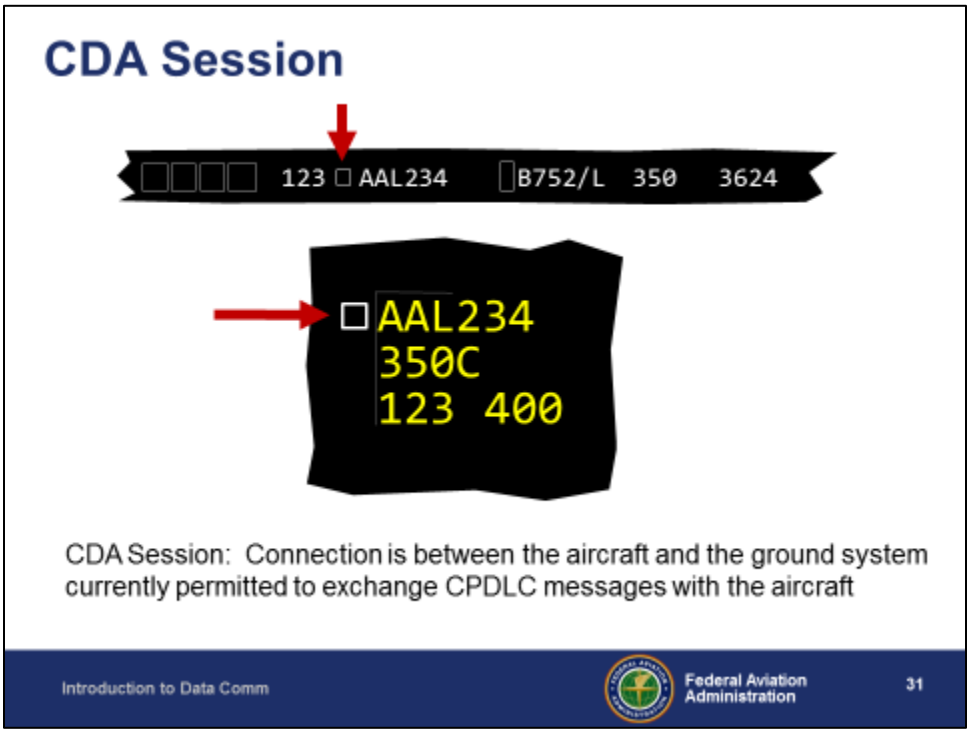
A Data Comm session is the virtual connection that must be established between a properly equipped aircraft and the Data Comm ground system in order to exchange CPDLC messages.

It is impossible to communicate with an aircraft using Data Comm if a Data Comm session has not been established.

The Data Comm ground system is considered a single entity and referred to as KUSA. A pilot must log on to KUSA before the session can get established. Sessions are typically started automatically after a pilot logs on to the system.

Once a session is started it will typically remain active throughout the En route portion of the flight.

Slide - 31.



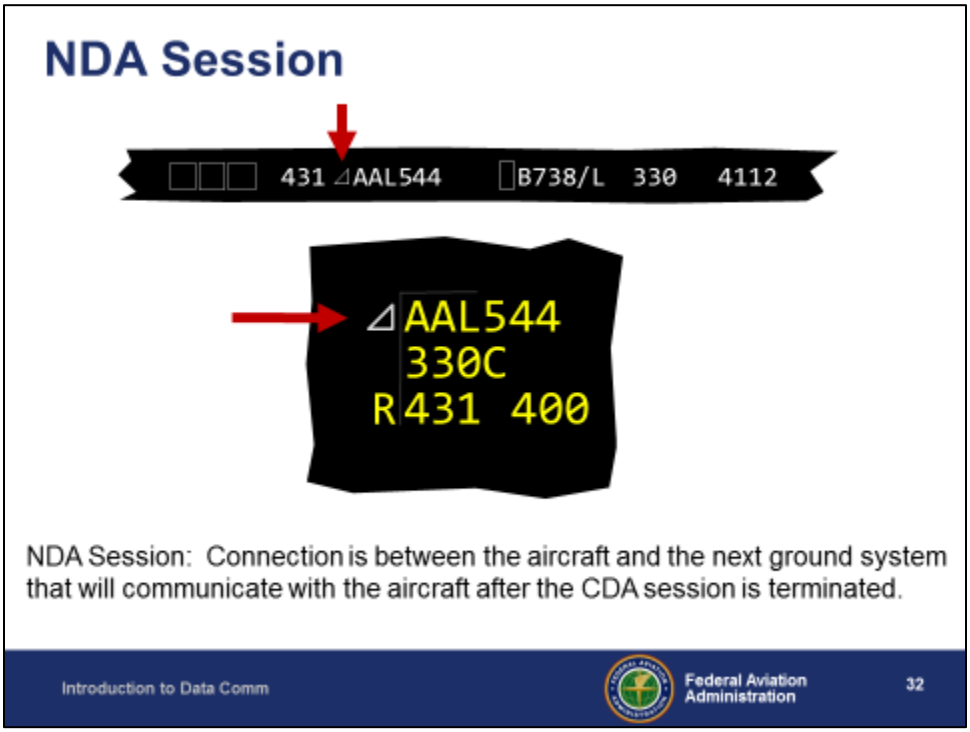
Student Content

A Current Data Authority, or CDA, session exists when the connection is between the aircraft and the ground system (the technical term is Data Authority) that is currently permitted to exchange CPDLC messages with the aircraft.

The entire US ground system is considered a single data authority and is referred to as KUSA. Other ground systems adjacent to the US are Canada and Advanced Technologies and Oceanic Procedures (ATOP).

The CDA session indicator is a hollow white square to the left of the call sign. It is displayed on both the full data block (FDB) and on the Aircraft List (ACL). This will be the most frequently seen session indicator for most U.S controllers.

Slide - 32.



Student Content

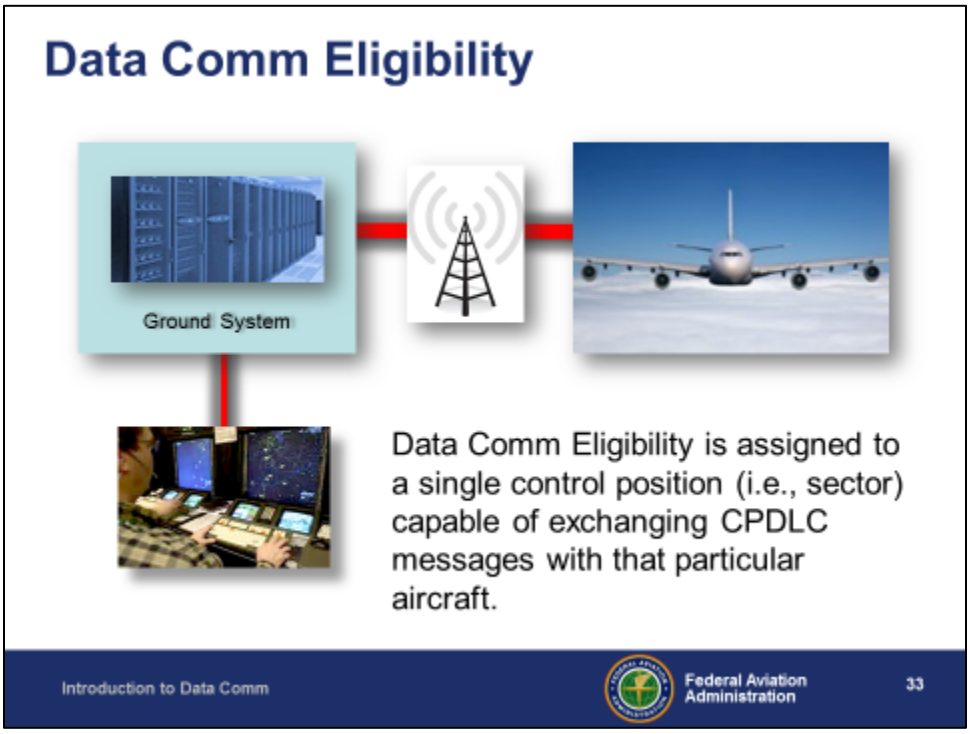
An NDA session exists when the connection is between the aircraft and the next ground system that will exchange CDPLC messages with the aircraft once the CDA session is terminated. An NDA session is intended to ensure there is no loss of Data Comm service for an aircraft as it transitions from one ground system to the next.

For example, an aircraft in Canadian airspace is inbound to US airspace. While in Canadian airspace, the aircraft would have a CDA session with the Canadian CPDLC ground system and an NDA session with the US ground system. Once the Canadian CDA session is terminated, the US NDA session will automatically become a CDA session.

The NDA session indicator is a white triangle to the left of the call sign. It is displayed on both the FDB and on the ACL. This session indicator will typically only be seen by US controllers working sectors adjacent to non US airspace and ATOP.

If an FDB does not include either a CDA or an NDA session indicator, that aircraft does not have a session established and is unable to communicate via Data Comm.

Slide - 33.



Student Content

Once a CDA session has been established with the aircraft, the Data Comm system ensures that only one control position at a time can communicate with that aircraft. The control position could be a TDLS clearance delivery position for proposed departures or an En Route sector for active flights.

The one control position allowed to communicate with the aircraft via Data Comm is said to have “eligibility.”

In the En Route environment, eligibility for an aircraft is transferred automatically by the local ERAM as the aircraft proceeds from sector to sector in that facility. No controller action is required.

- The local ERAM assigning eligibility to sectors is called the Logical Data Authority or LDA.
- When an aircraft is handed off to a new ERAM, the receiving ERAM becomes the LDA and begins to assign eligibility to sectors in that facility.
- Assignment of LDA from ERAM to ERAM is accomplished by the active National site (NAP).

En Route controllers do have two options for manual control of Data Comm eligibility. Controllers can:

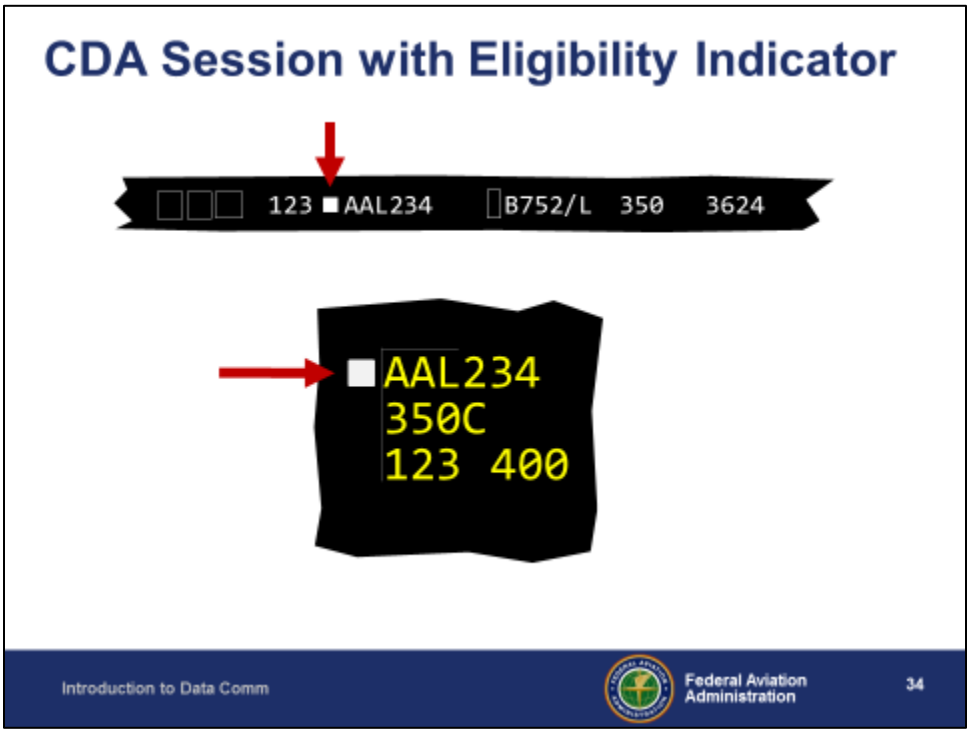
- Manually release eligibility and let the system automatically reassign to another sector.

- Manually steal eligibility.

    - Stealing eligibility is specific to Data Comm and not the same thing as stealing track control. It is possible to steal eligibility without having track control. In addition, when you steal track control you are not assigned Data Comm eligibility.

In some cases, eligibility is assigned to the national Data Comm site (NAP). For example, an aircraft that exits Center airspace enters TRACON airspace, then enters the next Center's airspace. While in TRACON airspace, eligibility is assigned to "national."

Slide - 34.



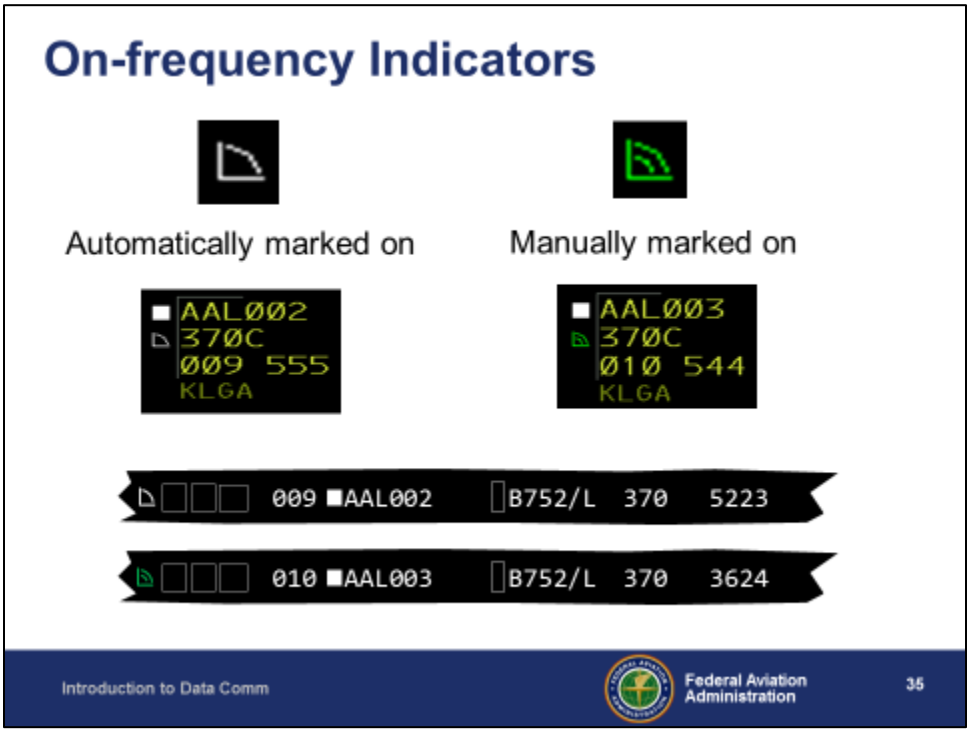
Student Content

Eligibility is indicated by a filled-in CDA session indicator. It is displayed on both the FDB and on the ACL.

In the En Route environment, the sector with eligibility for an aircraft will always have an FDB displayed.

Ask students whether the controller working AAL234 would be able to communicate with the aircraft using Data Comm. The answer is no. Two of the three required conditions have been met, the aircraft has a CDA session and the sector has eligibility. The third condition has not been met. The aircraft must be marked on frequency.

Slide - 35.



Student Content

The third condition that must be satisfied in order for a sector to be able to communicate with an aircraft via Data Comm is that the aircraft be marked on-frequency. ERAM already provides the ability to manually mark an aircraft on-frequency.

Data Comm will automatically mark the aircraft on-frequency whenever a pilot downlinks a WILCO response to a MONITOR Transfer of Communication uplink. This feature is part of a silent check-in. Two things to keep in mind:

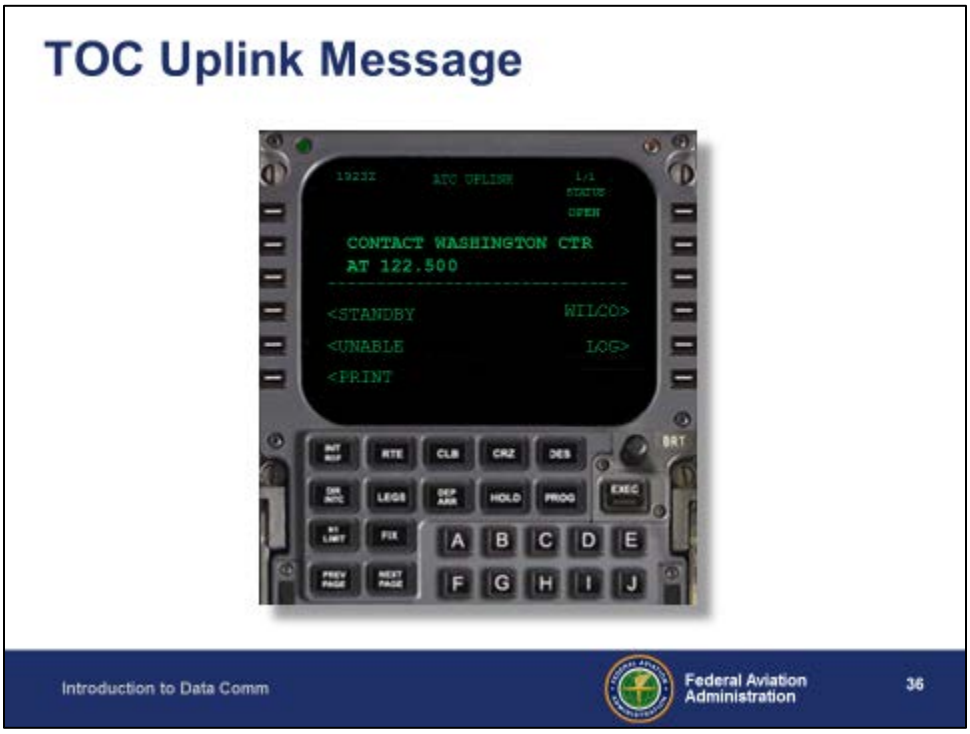
- After Data Comm automatically marks an aircraft on-frequency, a controller still has the option to trackball enter on the indicator, or use the QN command, to convert it to a manual indicator.

- If a manual on-frequency indicator is already displayed, it will remain in place.

The automatic on-frequency indicator is white, instead of green, and has a single arc, instead of two. The indicators appear to the left of the altitude in an FDB and in the bookkeeping box on the ACL.

While a flight is marked on-frequency, the flight is not eligible for system deletion from the ACL (i.e., the entry will partially gray out.). This also means that if the on-frequency indicator is displayed the controller can't manually remove the entry from the ACL.

Slide - 36.



Student Content

A Transfer of Communication, or TOC, uplink instructs the flight crew to either CONTACT or MONITOR Air Traffic Control (ATC) on a specified frequency.

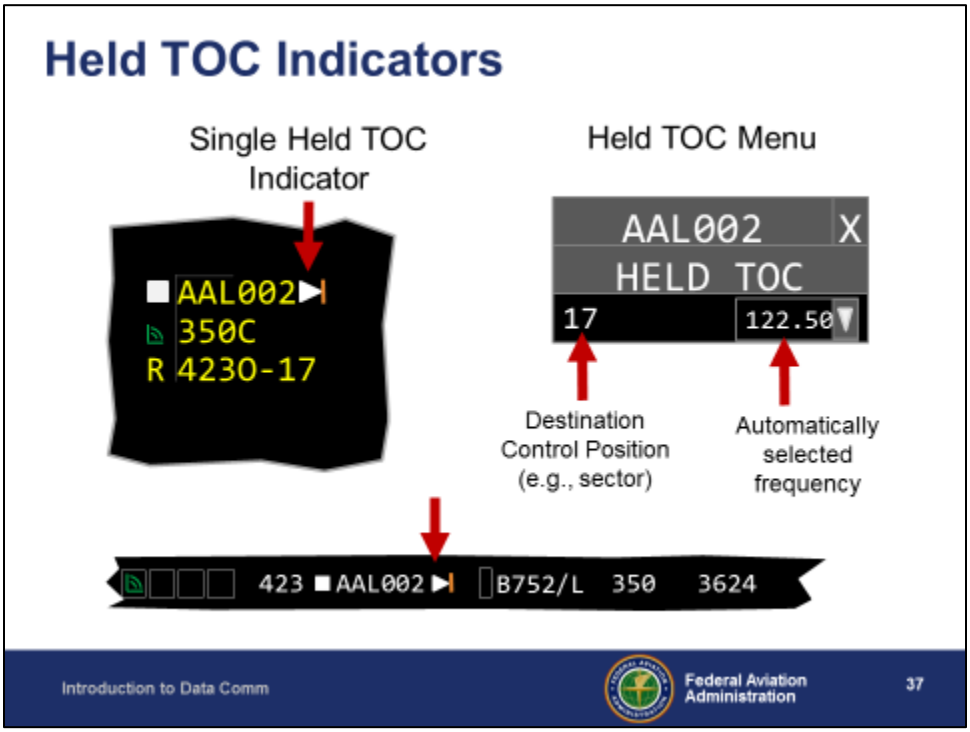
A CONTACT TOC means the flight crew must check-in via voice.

- After the flight crew checks-in, the controller must manually mark the aircraft on-frequency to communicate via Data Comm.

A MONITOR TOC means the flight crew must switch to the specified frequency but will not check-in via voice.

- This is considered a silent check-in and includes a confirmation of assigned altitude check and, if necessary, an altimeter setting uplink.
- When a pilot responds to the TOC uplink with a WILCO it is assumed they have switched to the new frequency.
- The FDB and ACL entry at the receiving sector will display the automatic on-frequency indicator.

Slide - 37.



Student Content

Whenever there is a track control change the system will automatically build a Held TOC entry. Track control changes include both hand offs and steal track commands.

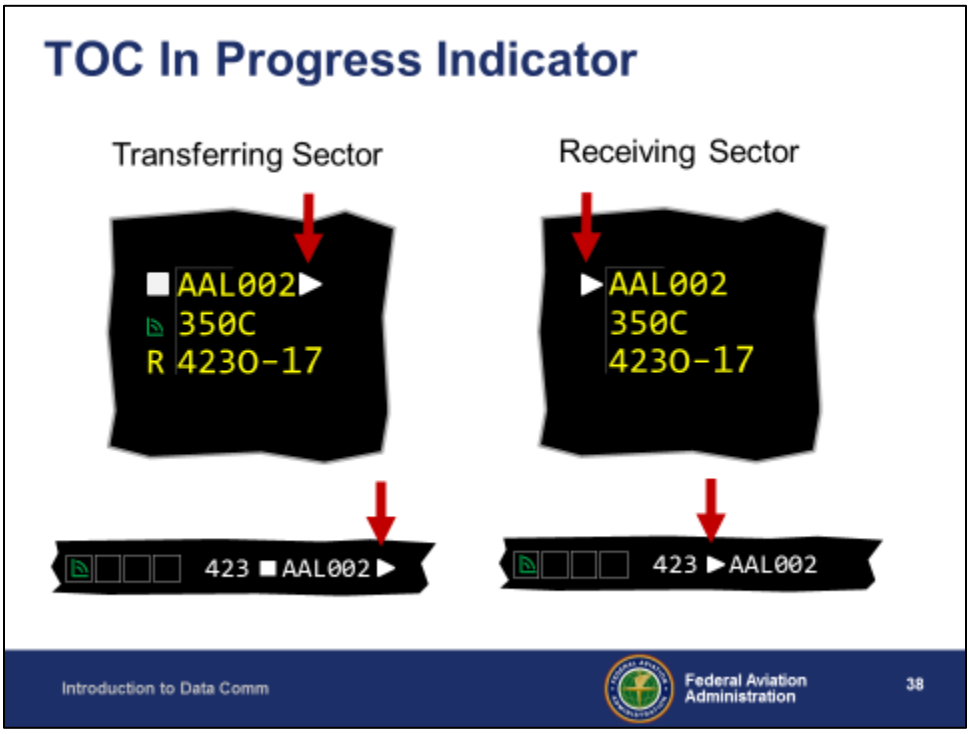
A normal Held TOC entry also includes an automatically selected frequency appropriate for the destination control position.

The controller can release the Held TOC when it is operationally appropriate to do so. However, system latency should be taken into consideration.

When the Held TOC is released, the system will build the appropriate TOC message and begin the uplink process to the aircraft.

Remember, system latency refers to the amount of time that elapses from the time an uplink command is entered to the time a pilot response is received. It must always be considered by the controller when using Data Comm.

Slide - 38.



Student Content

Once the controller releases the Held TOC, the system will uplink the TOC message to the aircraft. During the period between release of the Held TOC and receipt of a response from the aircraft, a TOC In Progress indicator will be displayed on the FDB and ACL.

The TOC In Progress indicator at the transferring sector is a triangle to the right of the call sign.

At the receiving sector, the CDA session without eligibility indicator is replaced by a white triangle.

Slide - 39.

Student Content

When a Held TOC is released, the system will automatically determine whether to uplink a CONTACT or a MONITOR TOC. The system makes the determination by checking several conditions. If all conditions are satisfied, the system will send a MONITOR TOC. If any condition is not satisfied, the system will send a CONTACT TOC.

Instructor Note: If students ask for more information, the seven conditions are:

1. The handoff must be an intra-facility handoff.

The key reason for this is that FAA Order 7110.65 requires a controller to verify an aircraft's Mode C altitude upon initial contact following an inter-facility handoff. Because any altitude downlink will be affected by system latency, and since Mode C altitudes can change so quickly during climbs and descents, pilots must report their current altitude via voice

As a result, handoffs to another Center or to a TRACON will always result in a CONTACT message.

2. The receiving sector preference is set to MONITOR

With the Sector Settings view, the controller can set up a general setting for the receiving sector, as well as exceptions. For example, the controller could set up the receiving sector for silent check-in from all sectors except for the one directly underneath.

The settings can be saved as part of a pref set and automatically set when that pref set is loaded.

3. The system selected frequency for the uplink must be an adapted frequency for the receiving sector.

Normally this won't be an issue since all frequencies routinely used by a sector will be in adaptation and the automatically selected frequency is based on that adaptation.

However, a controller does have the ability to manually enter a frequency that is not adapted for a sector. Since this would be an unusual situation, the system is designed to send a CONTACT instruction when it happens.

4. The aircraft must be RVSM capable.

Non-RVSM capable aircraft will always receive a CONTACT instruction regardless of assigned altitude.

5. The Initial Contact (IC) service must be enabled.

The Initial Contact (IC) service provides the processing required to automatically compare an aircraft's downlinked altitude to the altitude displayed in the FDB to verify they match. The IC service can be enabled or disabled at a facility. If the IC service is disabled, the system won't uplink a Confirm Assigned Altitude message to start the automatic verification process. This means the pilot must check in via voice to do so.

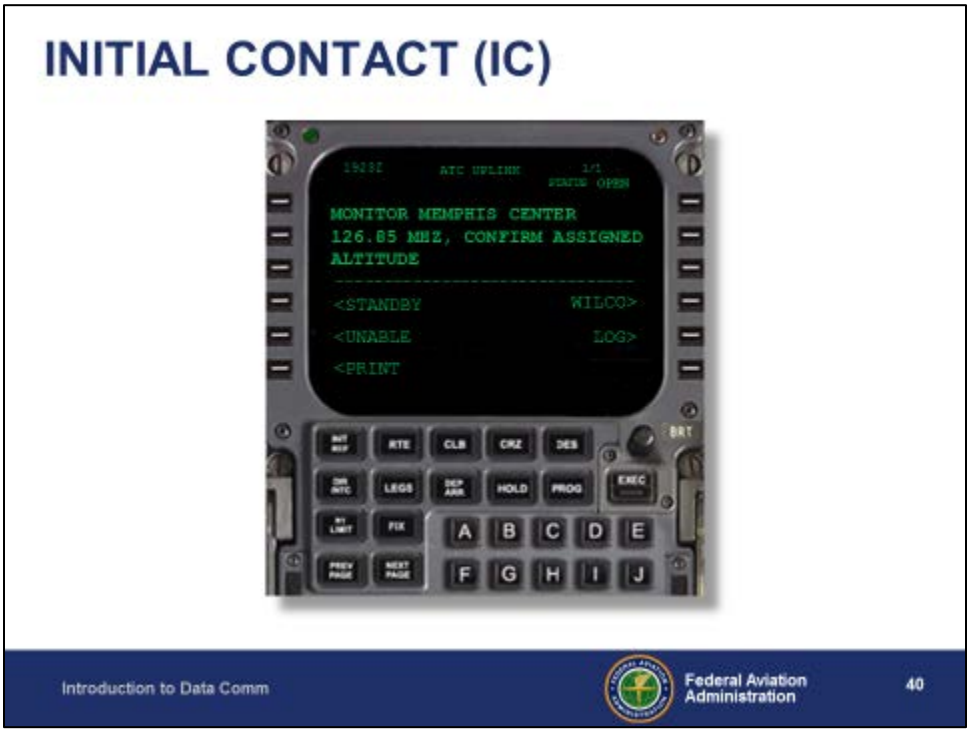
6. The assigned altitude must be a single altitude.

The IC service does not support confirming altitudes other than a single altitude. For example, if the aircraft has an assigned block altitude, the system can't send the Confirm Assigned Altitude uplink and so a CONTACT instruction will be uplinked.

7. The aircraft must not have a procedure altitude in the data block.

ERAM provides the capability to enter a procedure altitude in the FDB. The IC service, however, does not verify procedure altitudes. As a result, the system will always uplink a CONTACT instruction if the FDB contains a procedure altitude.

Slide - 40.



Student Content

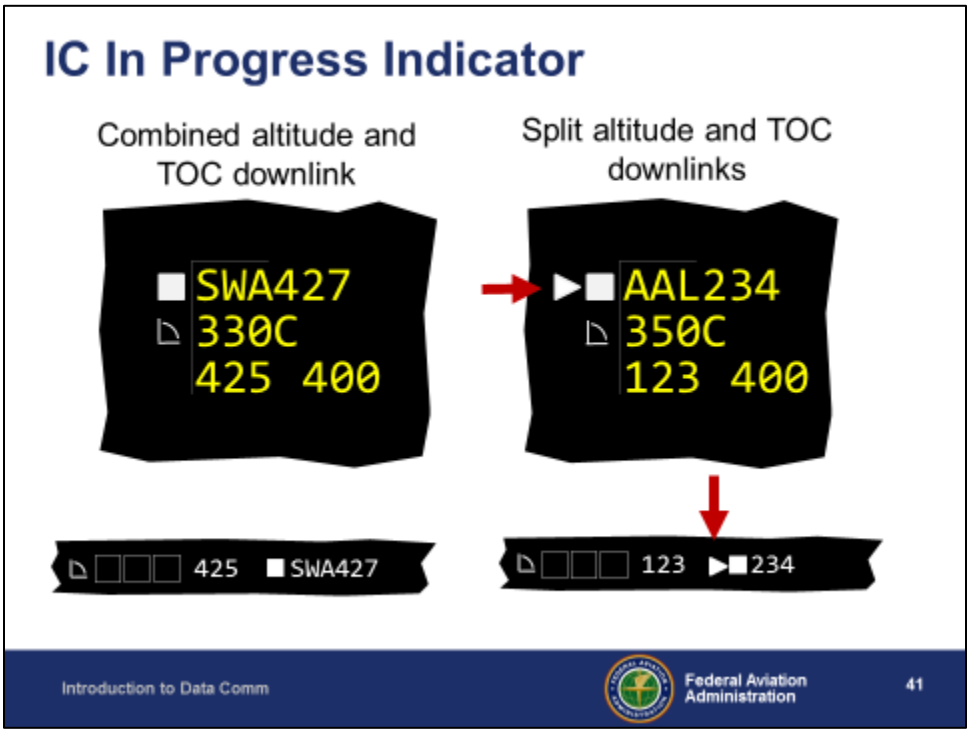
When a MONITOR TOC is sent to the aircraft, the system will add CONFIRM ASSIGNED ALTITUDE (CAA) to the uplink message. This requires the pilot to downlink the flight's ATC cleared altitude and replaces the pilot voice "check-in" procedure.

The ground system checks whether the pilot downlinked assigned altitude matches the altitude displayed in that flight's data block or, when applicable, a locally adapted waiver altitude.

The system provides indications to the sending and receiving controller if the downlinked assigned altitude does not match the FDB or adapted waiver altitude. The Data Comm service that does the processing required to accomplish this is called the Initial Contact, or IC, service.

Additionally, Data Comm will automatically uplink an altimeter setting. The system determines the appropriate reporting station to use in the AS uplink based on the aircraft trajectory.

Slide - 41.



Student Content

Depending on an aircraft's avionics, the altitude downlink may come combined with the pilot's response to the TOC or a pilot may have to send two separate messages. This will affect what the controller sees.

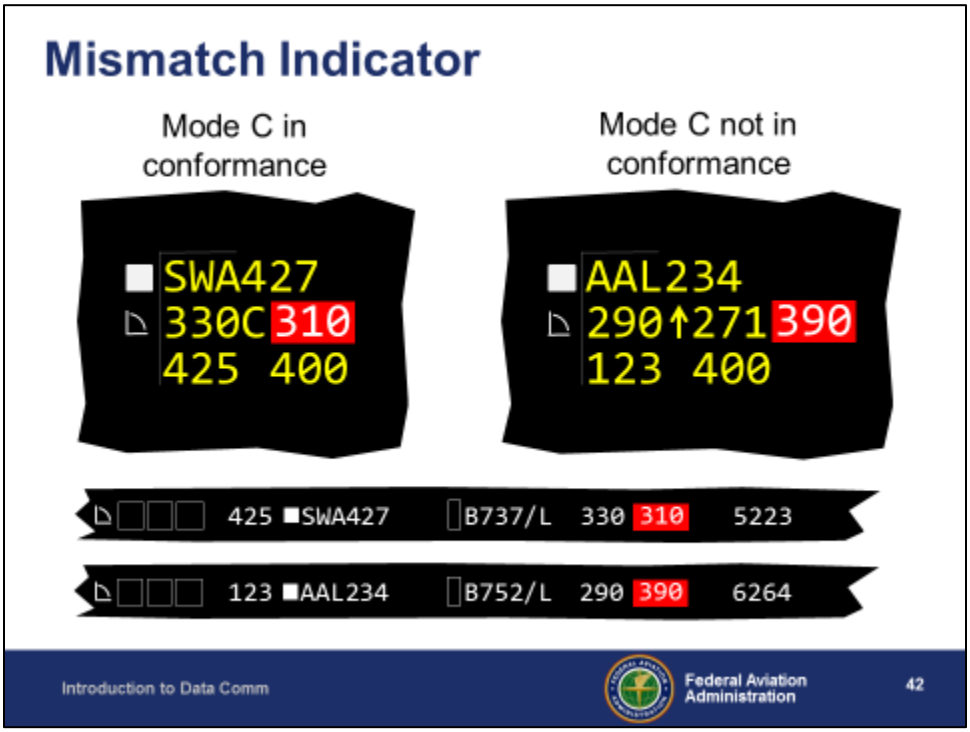
If the CAA is combined with the WILCO response to the TOC:

- A CDA with eligibility indicator and an auto on-frequency indicator appear after the WILCO response by the aircraft.

If the downlinked altitude comes as a separate message (also referred to as split IC):

- IC In Progress indicator is displayed.
- If the downlink altitude matches the ATC cleared altitude, the IC In Progress indicator is removed.

Slide - 42.

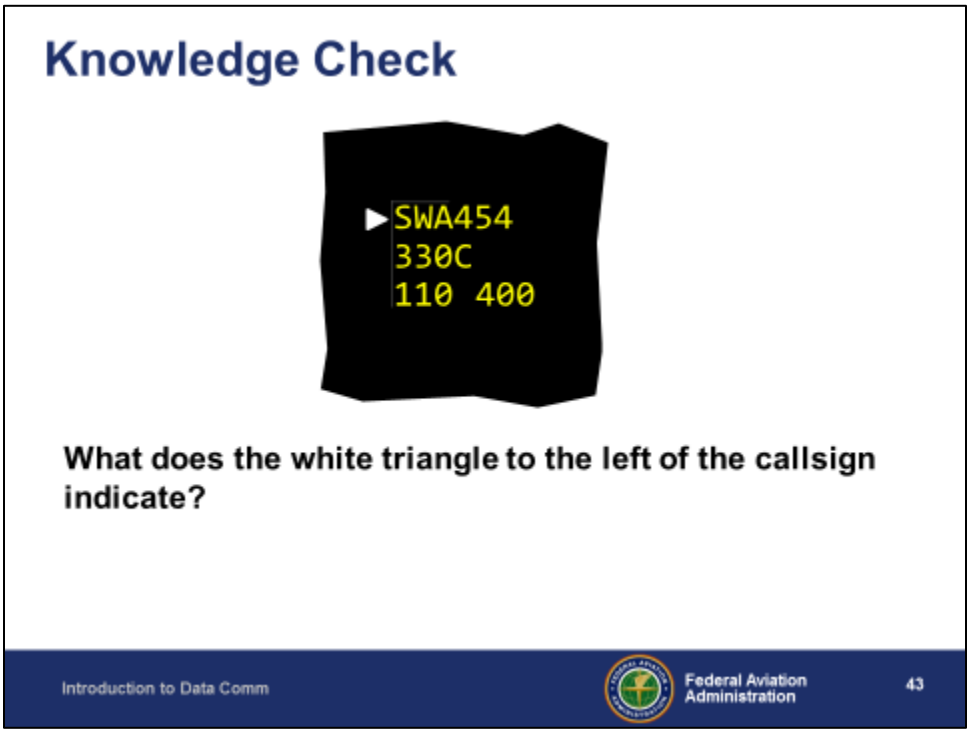


Student Content

If the assigned altitude downlinked by the aircraft does not match the altitude displayed in the data block or, if applicable, the locally adapted waiver altitude, an IC Mismatch indicator will be displayed.

On the data block, the mismatch indicator appears to the right of the Mode C altitude so the position of the mismatch indicator is slightly different depending on whether the Mode C altitude is in conformance or not.

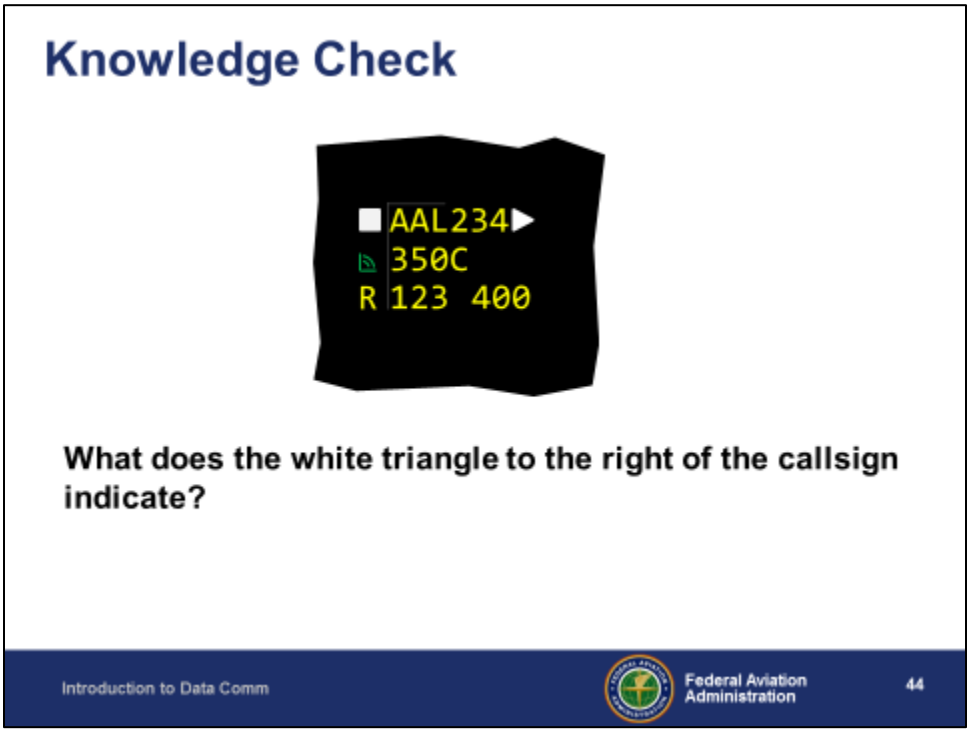
Slide - 43.



Instructor Notes

Answer: It is an indication to the receiving sector that there is a TOC in progress and the system is waiting for a pilot response.

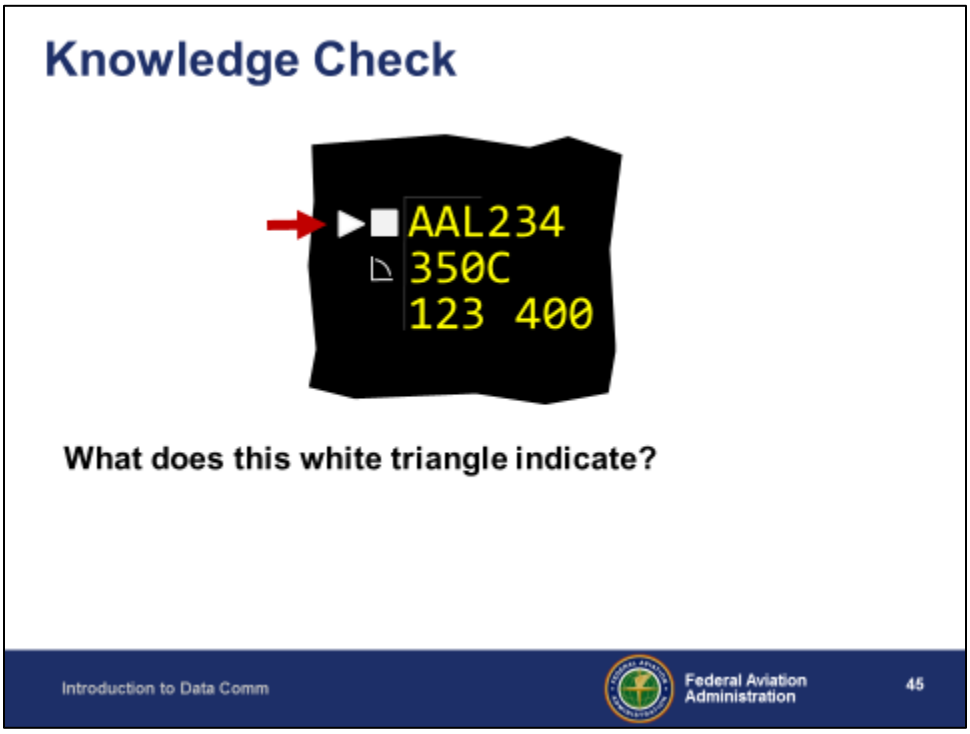
Slide - 44.



Instructor Notes

Answer: It is an indication to the transferring sector that there is a TOC in progress and the system is waiting for a pilot response.

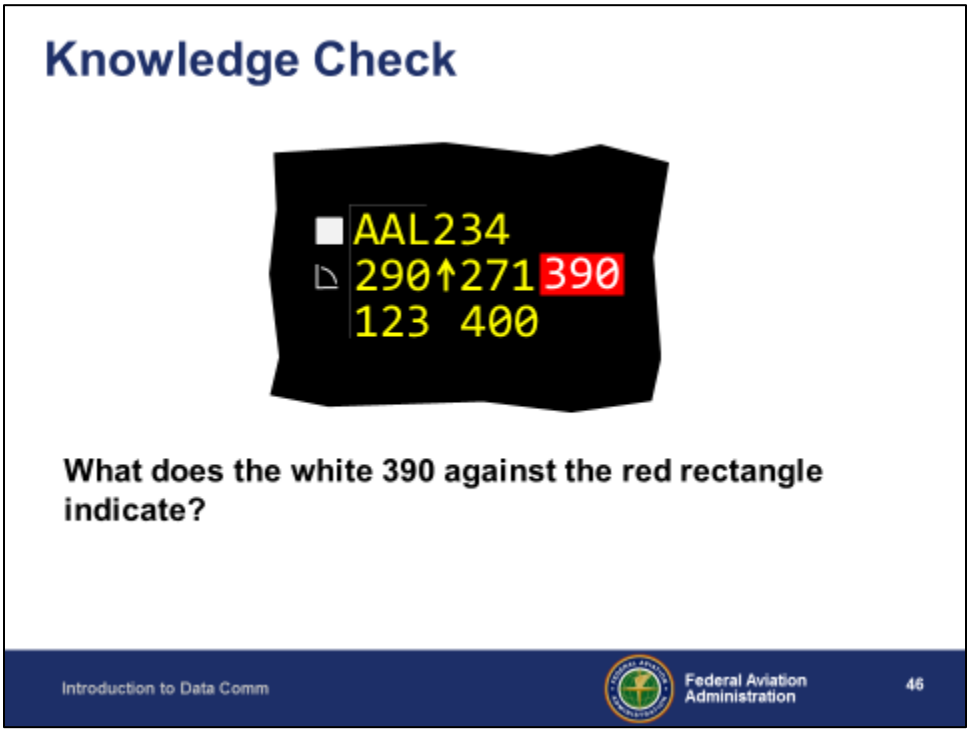
Slide - 45.



Instructor Notes

Answer: It is an IC In Progress indicator when the downlinked altitude is separate from the TOC response.

Slide - 46.

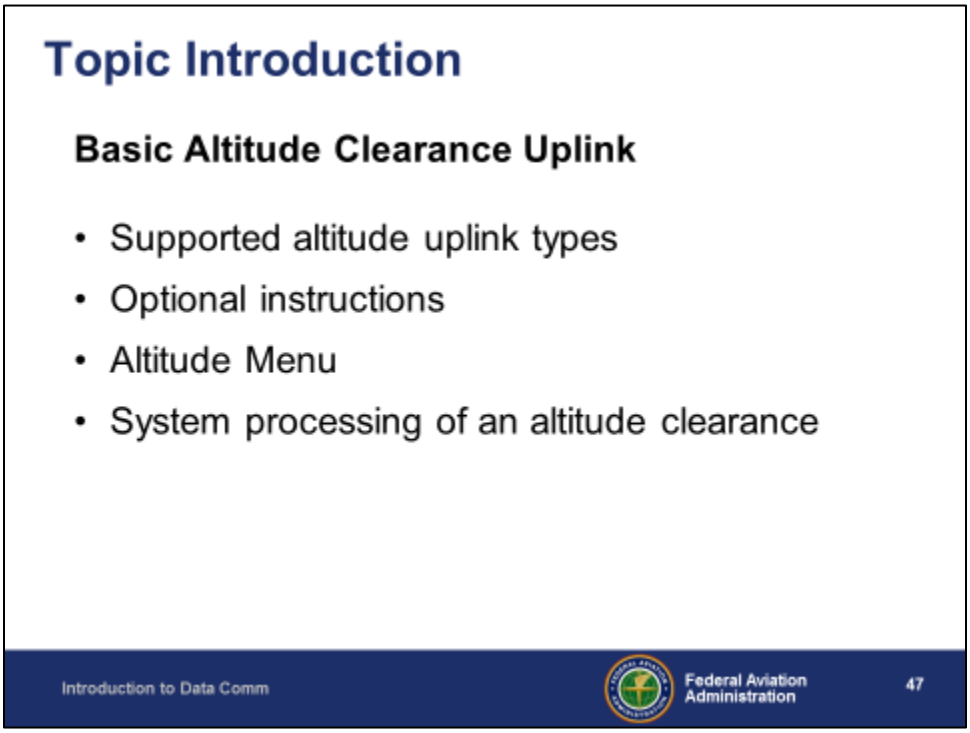


Instructor Notes

Answer: It is an IC mismatch indicator. The aircraft reports that they are cleared to FL 390.

TOPIC 5: Basic Altitude Clearance Uplink

Slide - 47.



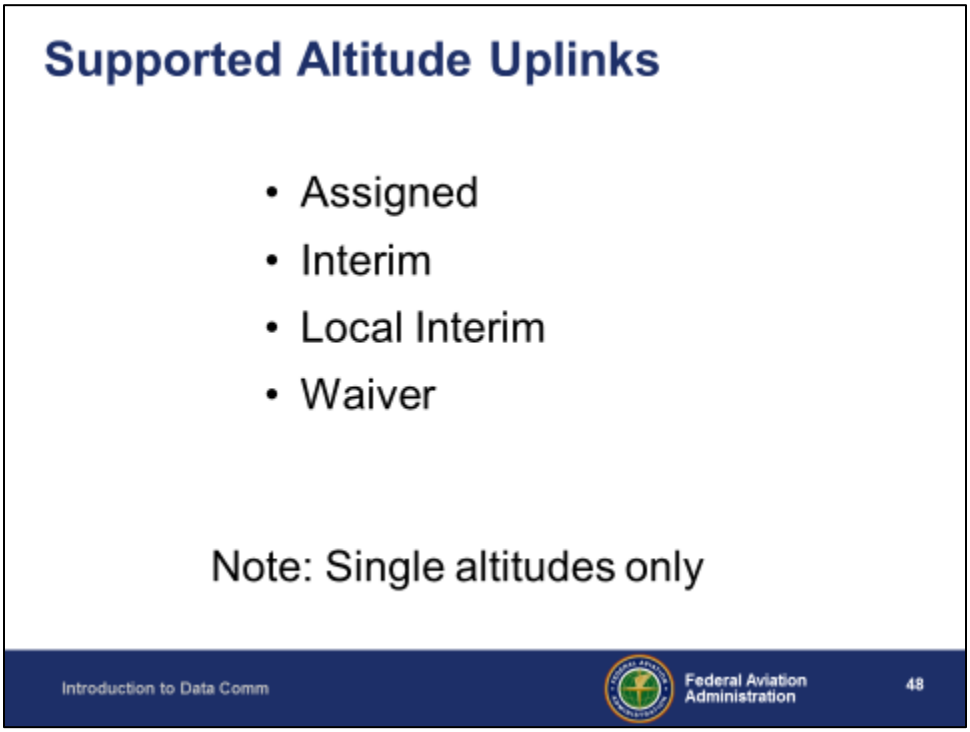
Student Content

Data Comm provides the capability to uplink an altitude clearance.

Four altitude uplink types are supported and each can be modified with optional instructions.

ERAM will validate the command, and if valid, update the flight plan. After the flight plan is updated, Data Comm will build the uplink message and send it.

Slide - 48.



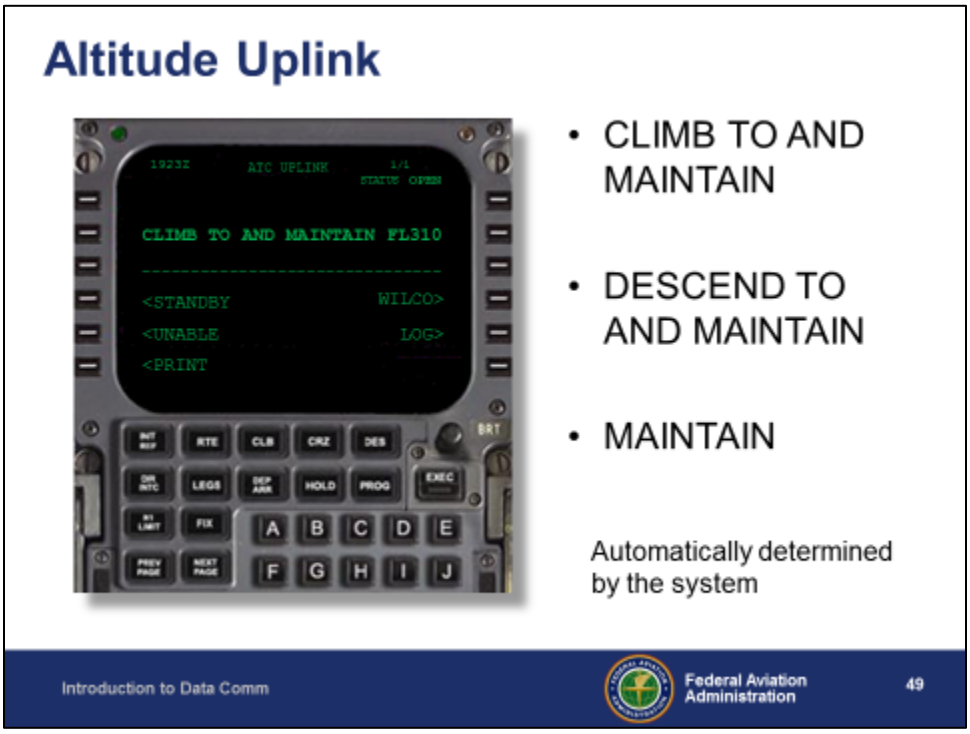
Student Content

The following Altitude uplink types are supported:

- Assigned altitude
- Interim altitude
- Local Interim altitude
- Waiver altitude

It is important to remember that Data Comm only uplinks single altitudes, for example 310. The system will reject any attempt to uplink block altitudes, VFR, OTP, ABV, or ALT/FIX/ALT altitudes.

Slide - 49.



Student Content

Controllers can add optional urgency elements to the uplink message.

A controller can add an instruction to EXPEDITE or to climb or descend IMMEDIATELY. Given the amount of time it takes to transmit the uplink message (i.e. system latency), these two urgency options are intended as a communication failsafe for NORDO, stuck mic, or similar situations. The resulting messages when an urgency option is used are:

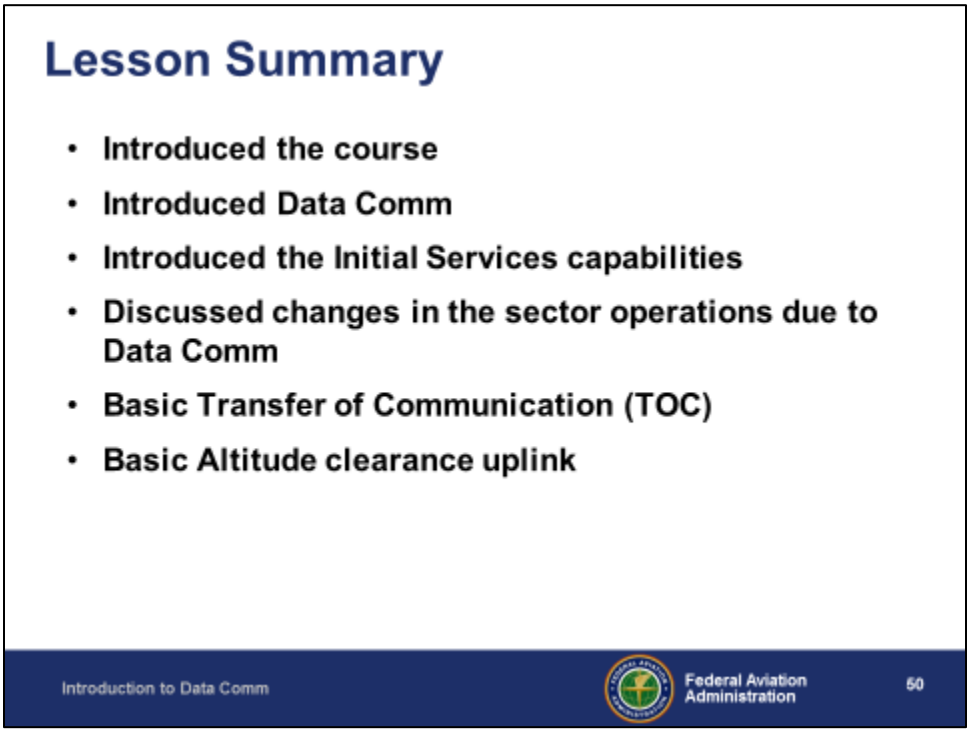
- EXPEDITE CLIMB TO or EXPEDITE DESCENT TO
- IMMEDIATELY CLIMB TO or IMMEDIATELY DESCEND TO

Another Urgency option is AT PILOTS DISCRETION.

Optional urgency elements are added to the beginning of the uplink message.

The system is designed so only one of the three optional “Urgency” elements (i.e., Expedite, Immediately, At Pilot’s Discretion) can be added to any given uplink.

Slide - 50.



Instructor Notes

Review lesson topics.

Student Content

Definitions:

- Data Comm: A means for controllers to communicate silently with properly equipped aircraft via supported digital messages.
- Uplink: Data Comm message sent from the ground system to the aircraft.
- Downlink: Data Comm message sent from the aircraft to the ground system.
- NAP: National Application Processing.

The basic pilot response options available in Data Comm are: WILCO, ROGER, STANDBY, UNABLE

The initial set of Data Comm capabilities are:

- Transfer of Communication (TOC)
- Uplink Altimeter Settings
- Limited Set of Altitude Clearances
- Limited Set of Route Clearances
- Pilot Initiated Downlinks (PID)

Impacts to Sector Operations

- System latency
    - The amount of time that elapses from the time an uplink command is entered to the time a pilot response is received.
- Cues change from audio to visual
- Mixed communication environment
- Choice of communication method

Basic Transfer of Communication (TOC)

- A Data Comm session is the virtual connection that must be established between a properly equipped aircraft and the Data Comm ground system in order to exchange CPDLC messages.
- A Current Data Authority, or CDA, session exists when the connection is between the aircraft and the ground system that is currently permitted to exchange CPDLC messages with the aircraft.
- The entire US ground system is considered a single data authority and is referred to as KUSA. Other ground systems adjacent to the US are Canada and Advanced ATOP.

A TOC uplink instructs the flight crew to either CONTACT or MONITOR ATC on a specified frequency.

- A CONTACT instruction means the flight crew must check-in via voice.
    - After the flight crew checks-in, the controller must manually mark the aircraft on-frequency to communicate via Data Comm.
- A MONITOR instruction means the flight crew must switch to the specified frequency but will not check-in via voice.
    - The FDB and ACL entry at the receiving sector will display the automatic on-frequency indicator.

When a MONITOR TOC is sent to the aircraft, the system will add CONFIRM ASSIGNED ALTITUDE (CAA) to the uplink message. This requires the pilot to downlink the flight's ATC cleared altitude and replaces the pilot voice "check-in" procedure.

Basic Altitude Clearance uplink

- Data Comm provides the capability to uplink an altitude clearance.
- Four altitude uplink types are supported and each can be modified with optional instructions:
    - Assigned altitude
    - Interim altitude
    - Local Interim altitude
    - Waiver altitude

LESSON END

Slide - 51.

Student Content

That concludes Lesson 1: Introduction to Data Comm.