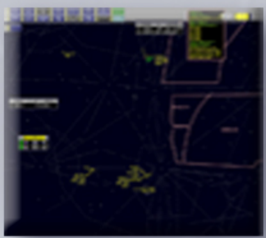
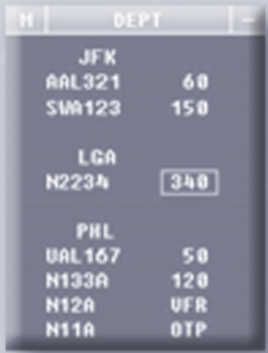
FAA Lesson Plan



En Route Stage 4
Radar Controller Training



Student

Beacon Code Assignment
Lesson 5

55055
V.1.06

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LESSON PLAN DATA SHEET

COURSE NAME:	RADAR CONTROLLER TRAINING
COURSE NUMBER:	55055
LESSON TITLE:	BEACON CODE ASSIGNMENT
DATE REVISED:	2014-04
VERSION:	V.1.06
REFERENCES:	JO 7110.65V, Air Traffic Control; JO 7110.66D CHG 2, National Beacon Code Allocation Plan (NBCAP); JO 7610.4S, Special Operations; JO 7110.311B, Procedural Guidance For FAA Order JO 7110.65 following En Route Automation Modernization (ERAM) Implementation; 14 CFR 91.215, ATC transponder and altitude reporting equipment and use; TI 6110.100, En Route Automation Modernization (ERAM) Air Traffic Manual (ATM): R-Position User Manual; ERAM EDSM SRS 210.04 V1B1, En Route Automation Modernization (ERAM) En Route Display Management (EDSM) R-Position and General EDSM Requirements Volume 1, Book 1; ERAM EDSM SRS 210.04 V1B2, En Route Automation Modernization (ERAM) En Route Display Management (EDSM) Appendices for R-Position and General EDSM Requirements Volume 1, Book 2; ERAM MONF SRS 210.18, En Route Automation Modernization (ERAM) Monitor Flights (MONF)
HANDOUTS:	NONE
EXERCISES:	YES, SCENARIO-BASED EXERCISE TO BE COMPLETED AFTER LESSON 8
END-OF-LESSON TEST:	YES
PERFORMANCE TEST:	NONE
MATERIALS:	NONE
OTHER PERTINENT INFORMATION:	THIS LESSON IS BASED ON ERAM BUILD EAC1500. THIS LESSON HAS BEEN REVIEWED AND REFLECTS CURRENT ORDERS AND MANUALS AS OF APRIL 2014.

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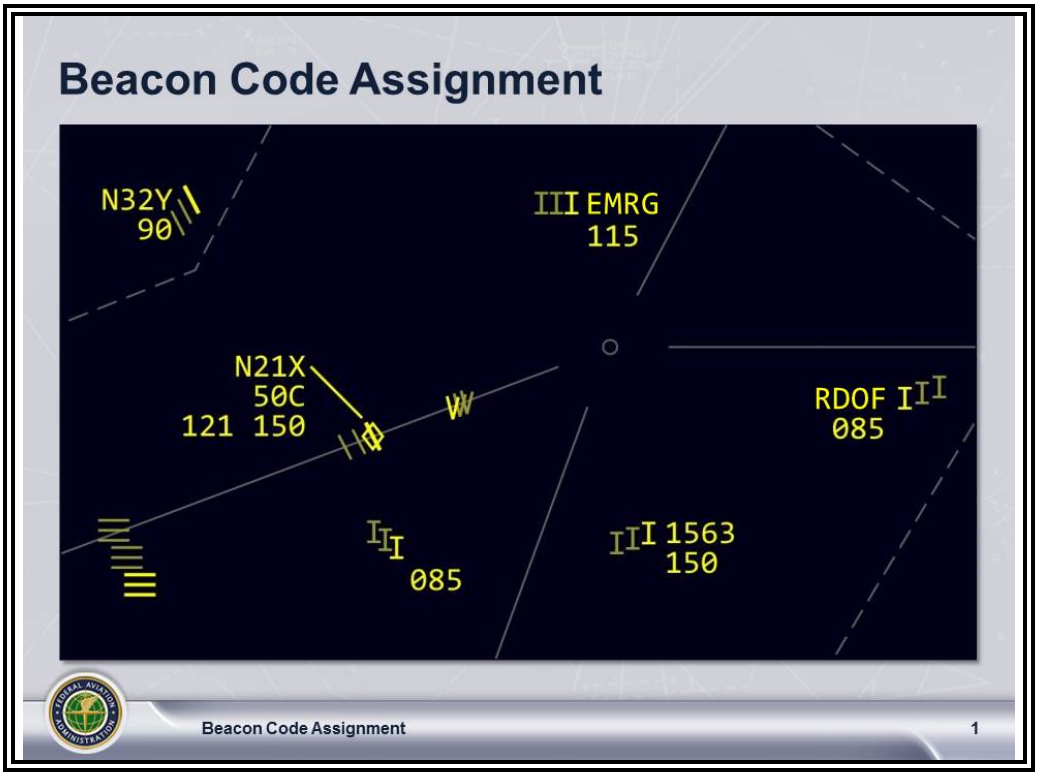
INTRODUCTION



A thorough knowledge of the authorized beacon code assignment criteria and related computer command input requirements is essential to you as a Radar Controller. It will enable you to properly assign beacon codes to aircraft and make computer entries.

The phraseology associated with code assignments and for issuing advisories relating to transponder equipment is necessary for effective control actions.

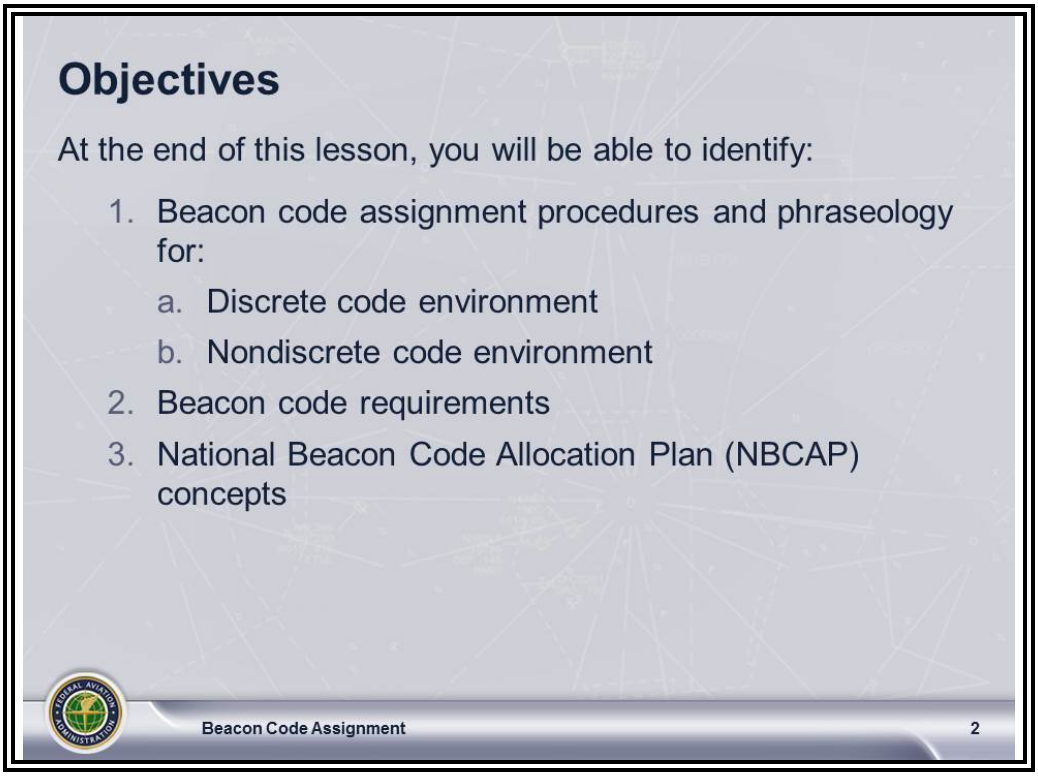
Purpose

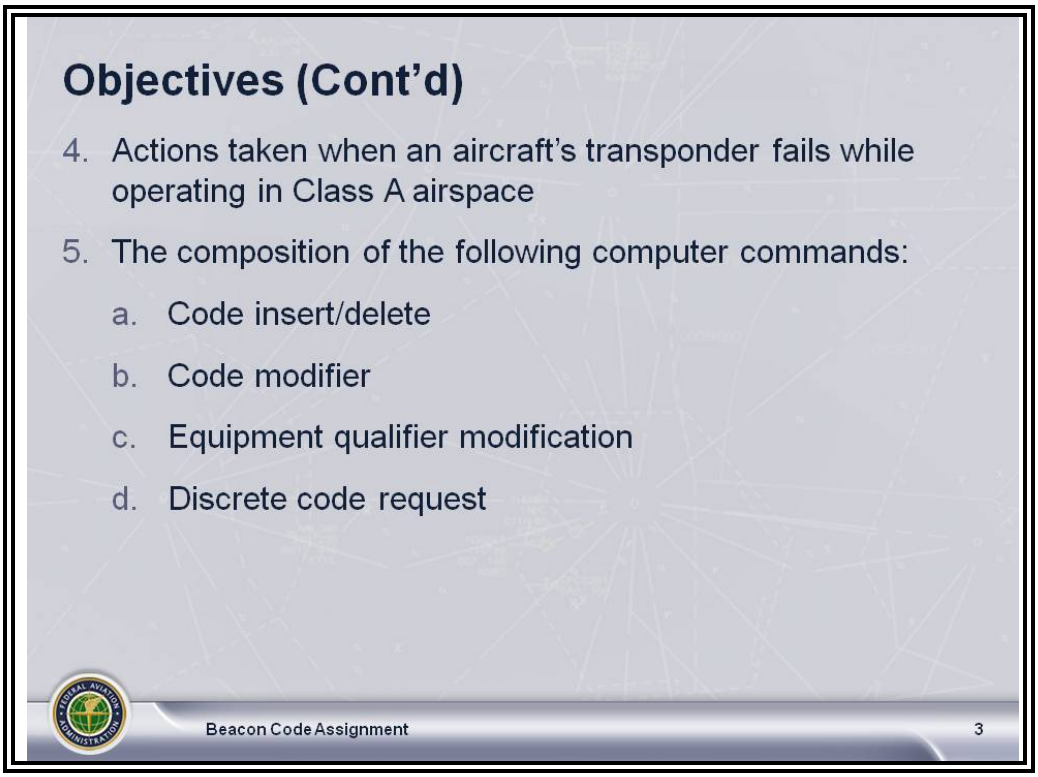
This lesson covers the National Beacon Code Allocation Plan (NBCAP) and 14 CFR 91.215, which explains aircraft transponder and Mode C requirements.

This lesson also covers command entries associated with beacon code requests and equipment modifiers.

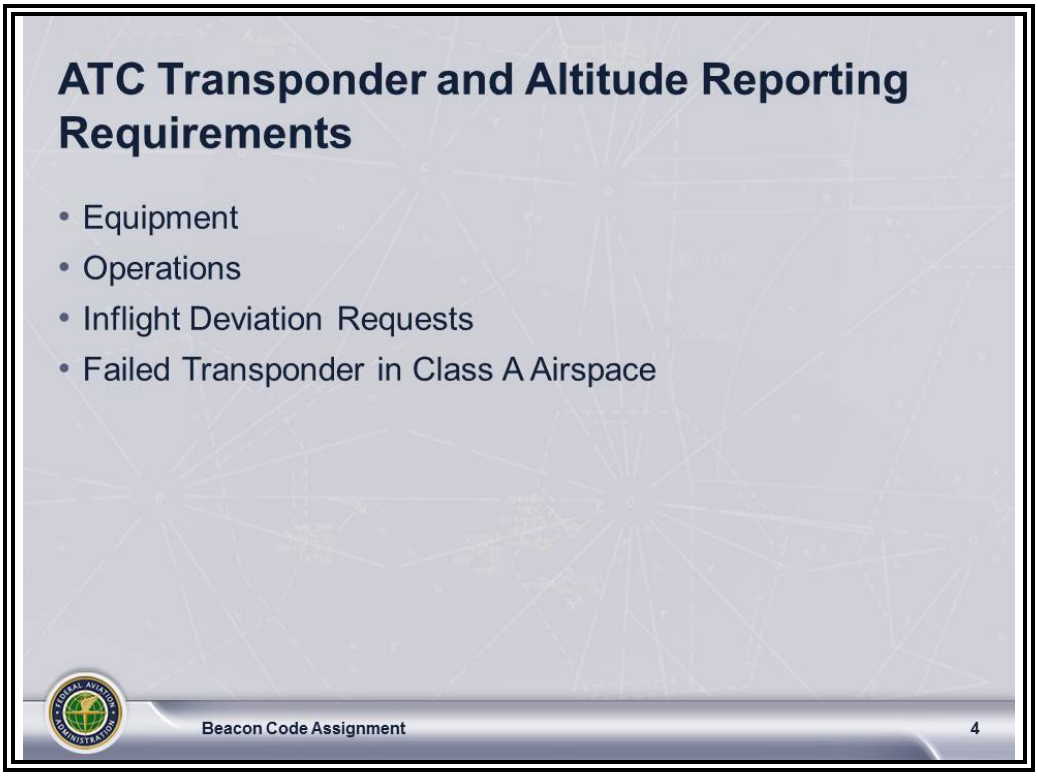
INTRODUCTION *(Continued)*

Objectives





ATC TRANSPONDER AND ALTITUDE REPORTING REQUIREMENTS



Equipment
14 CFR 91.215

- Aircraft are required to have one of the following with Mode C altitude reporting capability:
  - Operable Mode 3/A 4096 code transponder
  - Operable Mode S transponder

Operations
14 CFR 91.215

- All aircraft:
  - Class A, B, and C
  - Within 30 miles of a specific airport listed in Appendix D section 1 of FAR 91.215 up to 10,000 MSL
  - Above the ceiling and within the lateral boundaries of Class B or C designated for a specific airport up to and including 10,000 MSL

Continued on next page

ATC TRANSPONDER AND ALTITUDE REPORTING REQUIREMENTS *(Continued)*

Operations (Cont'd)
14 CFR 91.215

- At and above 10,000 MSL excluding airspace at and below 2,500 AGL unless a glider or balloon
- Surface to 10,000 MSL within 10NM of an airport listed in FAR 91.215 appendix D section 2 excluding the airspace below 1,200 AGL outside of the lateral boundaries of the surface area of the airspace designated for that airport unless a glider or balloon

NOTE: For more information regarding balloon and glider operations see FAR 91.215 section b3.

Inflight Deviation Requests
JO 7110.65, par. 5-2-21

⊙ For IFR aircraft:

- Without transponder equipment installed
  - Do **NOT** approve except in emergency.
- With inoperable transponder
  - Approve, disapprove, or withdraw previous approval solely on the basis of traffic and other operational factors.

⊙ For an inflight VFR aircraft with an inoperable transponder or Mode C, or not equipped with Mode C, **suggest** that the aircraft do one of the following:

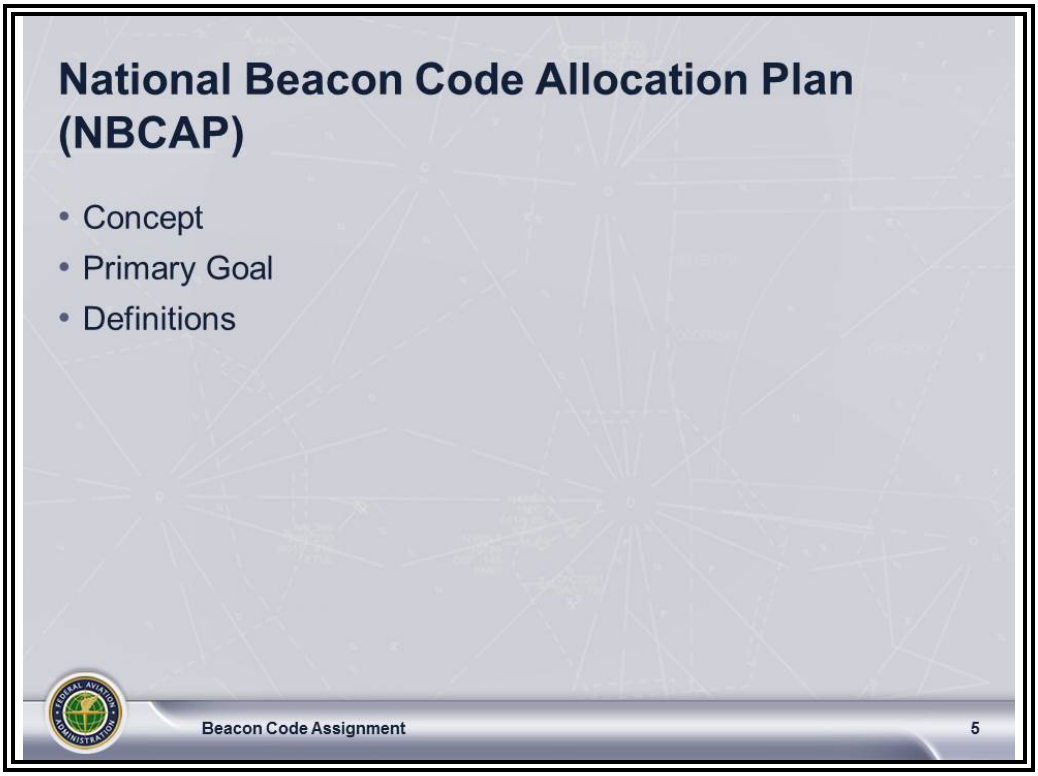
- Conduct flight in airspace not affected by 14 CFR 91.215.
- File an IFR flight plan.
- Provide a VFR route of flight and maintain radio contact with ATC.

Failed Transponder In Class A Airspace
JO 7110.65, par. 5-2-16

⊙ Disapprove flight in Class A airspace based solely on traffic conditions or other operational factors.

NATIONAL BEACON CODE ALLOCATION PLAN (NBCAP)

National Beacon Code Allocation Plan (NBCAP)
7110.66, pars.1, 11



Concept
7110.66, par. 6

- Each ARTCC computer has allocated discrete codes.

Primary Goal
7110.66, par. 6

- Minimize code changes.
- Retain the same code from takeoff to touchdown.

NATIONAL BEACON CODE ALLOCATION PLAN (NBCAP) *(Continued)*

Definitions
7110.66,
pars.1, 11

NBCAP Airspace applies to all Air Traffic Control (ATC) facilities that provide services in the United States (U.S.) domestic or oceanic airspace.

Nondiscrete Codes are codes that end in zero zero.

Examples: 0100, 1200, 7600, 7700

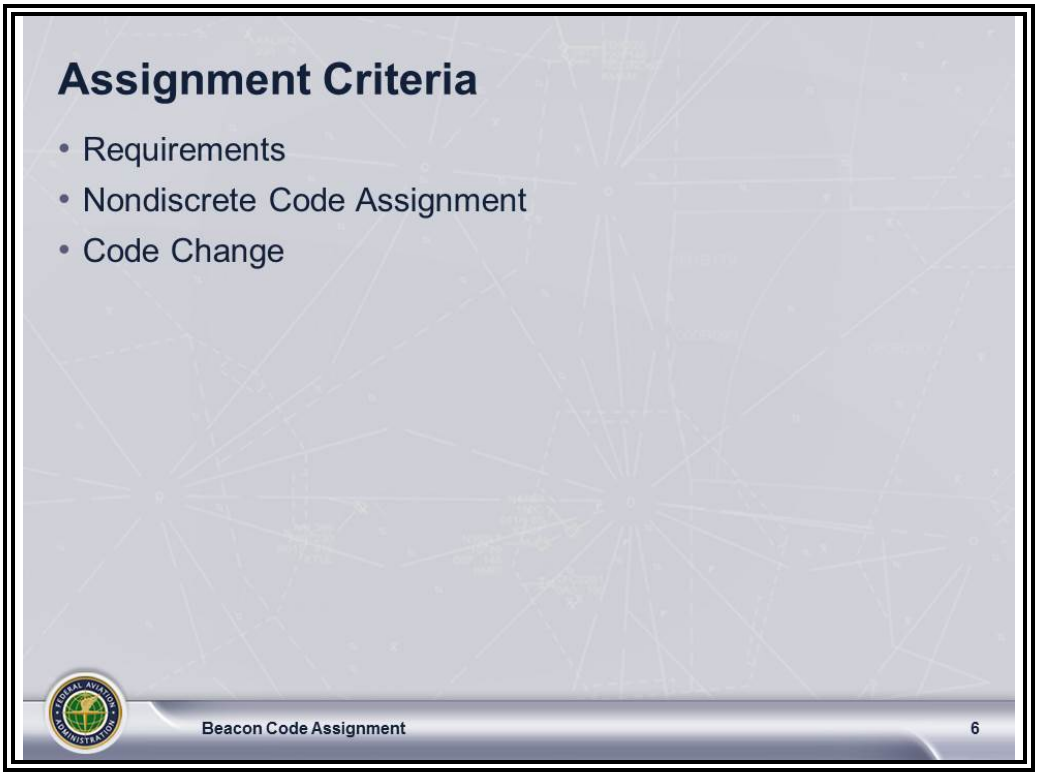
- There are 64 nondiscrete codes.

Discrete Codes are codes that end in other than zero zero.

- There are 4032 discrete codes.
- Assigned by computer

ASSIGNMENT CRITERIA

Requirements
JO 7110.65, pars. 5-2-1 thru 5-2-4, 5-2-6;
JO 7110.311B, par. 5-2-2



⊙ Assign beacon codes to Mode 3/A equipped aircraft only.

- Mode 3/A is the common military/civil mode for air traffic control.

⊙ Give first preference to use of discrete codes.

- Issue discrete computer assigned codes.

NOTE: It is important that controllers use only computer generated beacon codes. There may be serious consequences otherwise. For example, Approach Controls have the discretion to suppress low altitude/traffic alerts for specific beacon code subsets. An aircraft issued a non-computer generated beacon code that subsequently flies through Approach Control airspace may not receive crucial alerts. Controllers may or may not know which beacon code subsets to use, but the computer does and will always assign an appropriate beacon code.

- Codes may be modified as required.

✈ **Phraseology**

"SQUAWK THREE/ALFA (code)," or "SQUAWK (code)."

- Make handoffs on computer assigned code.

ASSIGNMENT CRITERIA *(Continued)*

Nondiscrete Code Assignment
JO 7110.65, pars. 5-2-3, 5-2-4, 5-2-6;
JO 7110.66, par. 7

⊙ Assign an appropriate nondiscrete beacon code from function codes.

- Make handoffs on an appropriate nondiscrete beacon code unless otherwise coordinated.

⊙ When in a nondiscrete/mixed environment:

- Assign an appropriate nondiscrete beacon code from function codes.
- Assign a nondiscrete code prior to handoff.
- Hand off to terminal facilities when specified in a Letter of Agreement (LOA).
  - Within NBCAP airspace, use:
    - → Codes 0100 to 0400, inclusive
    - → Other code authorized by the En Route and Oceanic Services, Safety and Operations Support Directorate
  - Outside NBCAP airspace, use:
    - → Code 1000, or
    - → Codes 0100 to 0700, inclusive, or
    - → Other code authorized by the En Route and Oceanic Services, Safety and Operations Support Directorate

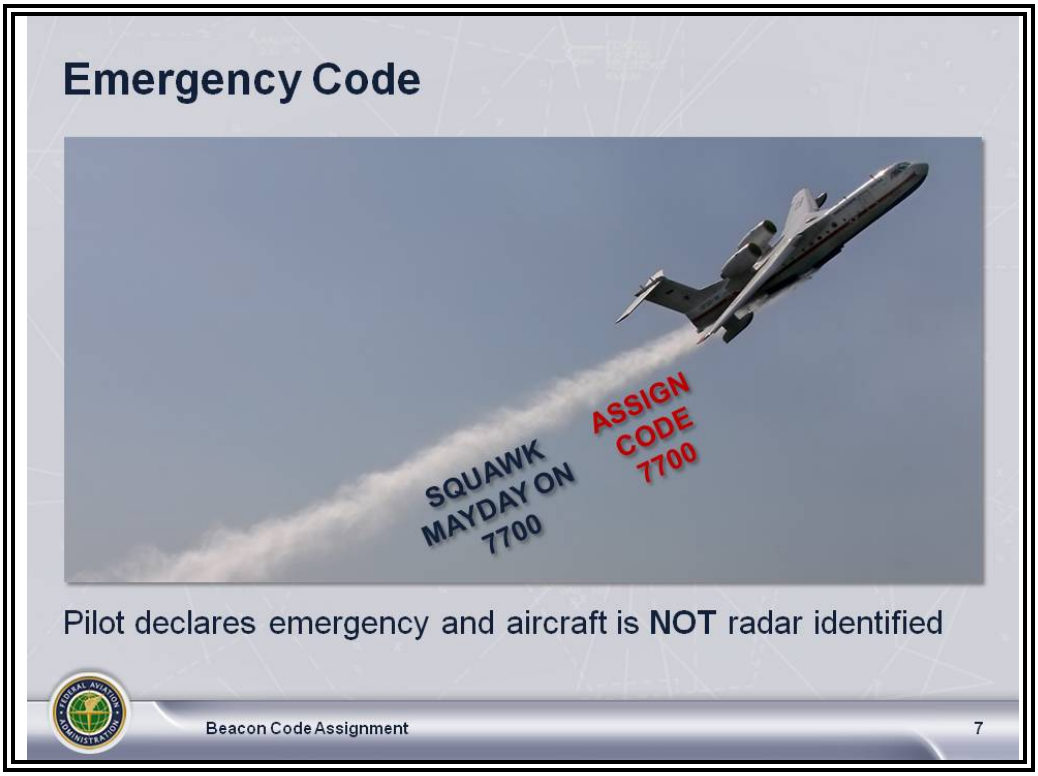
Code Change
JO 7110.65, par. 5-2-5

⊙ Do **NOT** request a code change until the aircraft is in your area of responsibility, unless:

- Specified in a Letter of Agreement
- Coordinated at the time of handoff

EMERGENCIES

Code Assignment Procedures
JO 7110.65, par. 5-2-7



- Assign code 7700 when:
  - Pilot declares an emergency and is **NOT** radar identified

Phraseology

"SQUAWK MAYDAY ON 7700."

  - The data block will blink EMRG.

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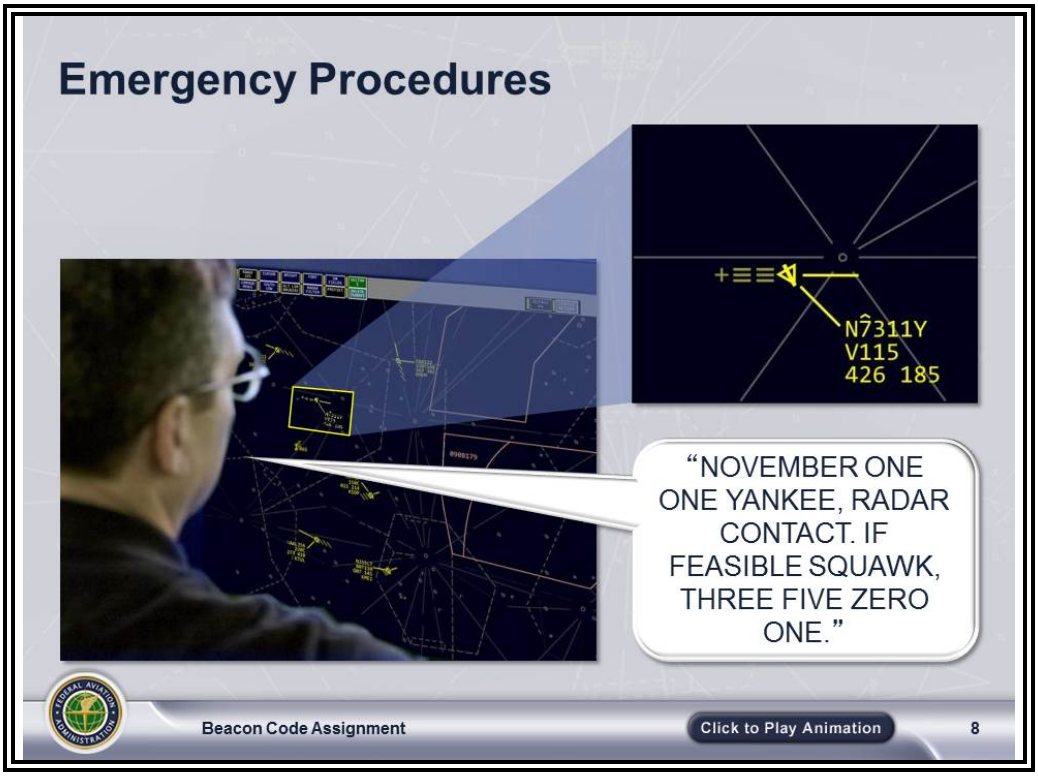
EMERGENCIES *(Continued)*

Code Assignment Procedures (Cont'd)
JO 7110.65, par. 5-2-7



⊙ After radio and radar contact are established:

- Request a code change to an appropriate discrete code or function code, except for single-piloted helicopters and single-piloted turbojet aircraft.

✈ **Phraseology**

"RADAR CONTACT (position). IF FEASIBLE, SQUAWK (code)."

– Code change will signify to other radar facilities that the emergency aircraft is identified and under ATC control.

Radio Failure
JO 7110.65, pars. 5-2-8, 10-4-4;
JO 7610.4, par. 7-3-1

⊙ If two-way communication is lost, the pilot can be expected to:

- Squawk code 7600

  – RDOF blinks in the data block.

Continued on next page

EMERGENCIES *(Continued)*

Radio Failure (Cont'd)
JO 7110.65, pars. 5-2-8, 10-4-4;
JO 7610.4, par. 7-3-1

⊙ Controller must apply lost communications procedures.

- Broadcast clearance through any available means, including:
  - Flight Service Station (FSS)
  - Aeronautical Radio, Incorporated (ARINC)
  - Voice feature of a NAVAID
  - Emergency Frequency 121.5 or 243.0
- Attempt to re-establish communication by having the aircraft use its transponder or make turns to acknowledge clearances and answer questions.

Hijacked Aircraft
JO 7110.65, par. 10-2-6;
JO 7610.4, pars. 7-3-1, 7-3-5

⊙ Hijack attempts or actual events are a matter of national security and require special handling.

- Policy and procedures for hijack situations are detailed in FAA Order JO 7610.4, Special Operations.
  - FAA Order JO 7610.4 describes reporting requirements, air crew procedures, air traffic procedures, and escort of interceptor procedures for hijack situations.

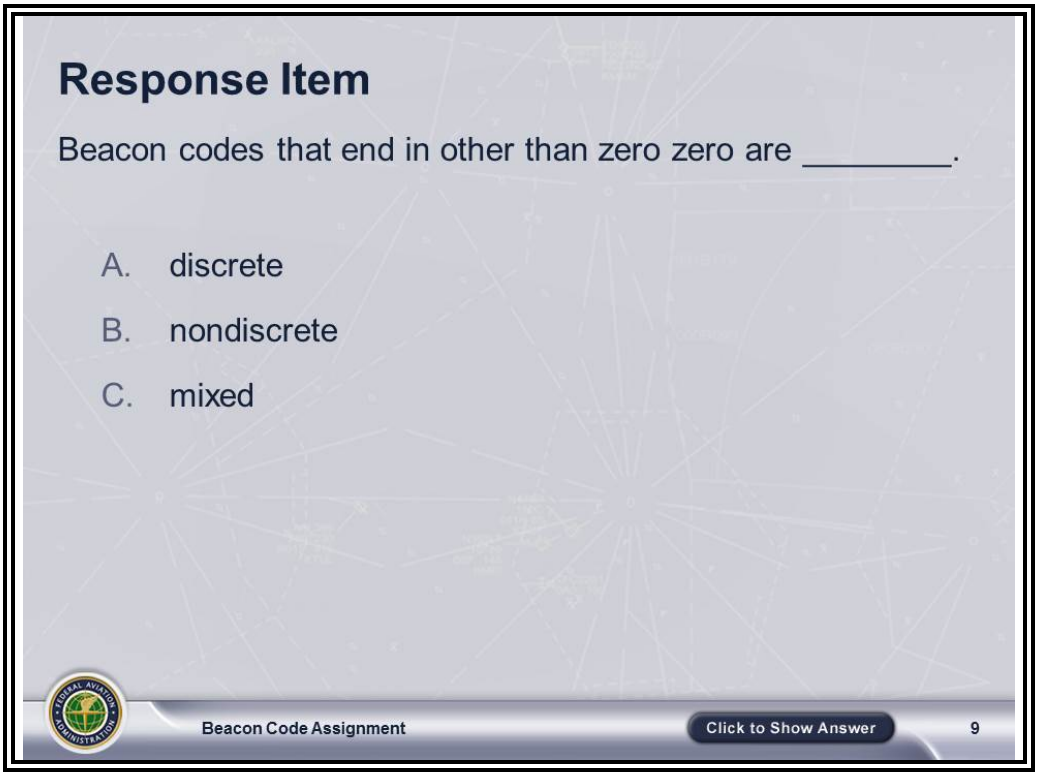
⊙ If an aircraft is hijacked, the pilot may squawk code 7500.

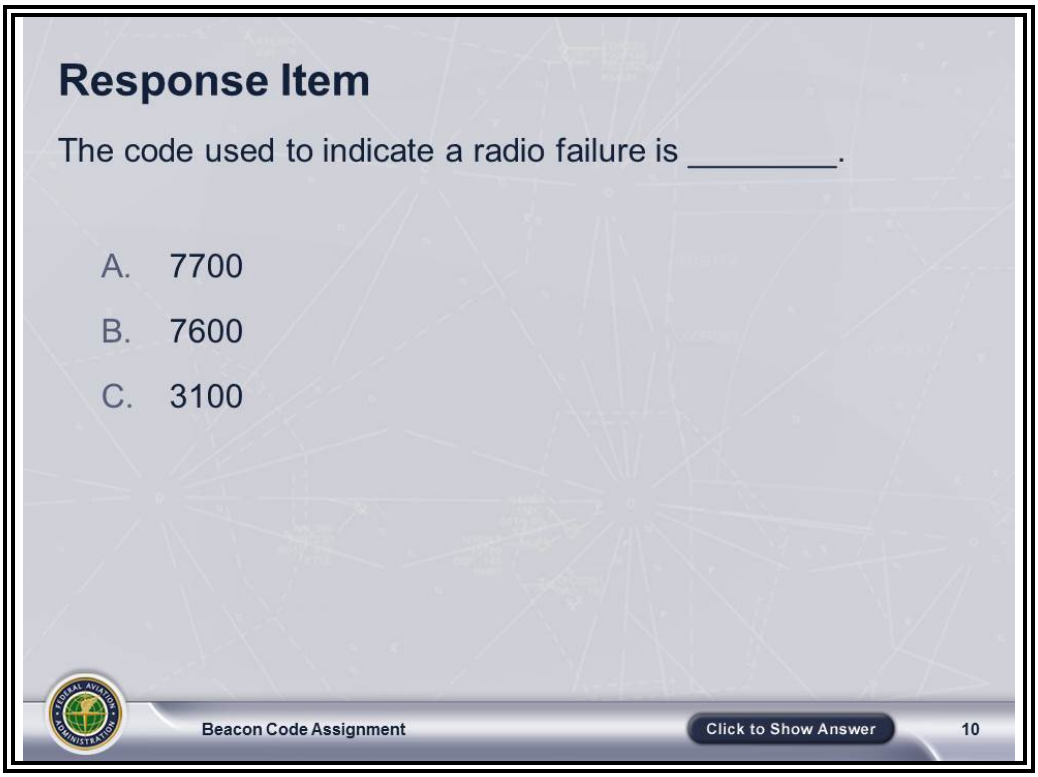
NOTE: Procedures for radio failures and hijacked aircraft are covered in more detail in Lesson 12, Radar Emergencies.

✈ **Phraseology**
JO 7610.4, par. 7-4-2

"(Aircraft call sign) (ATC facility identification) CONFIRM THAT YOU ARE INTENTIONALLY SQUAWKING 7500."

Review





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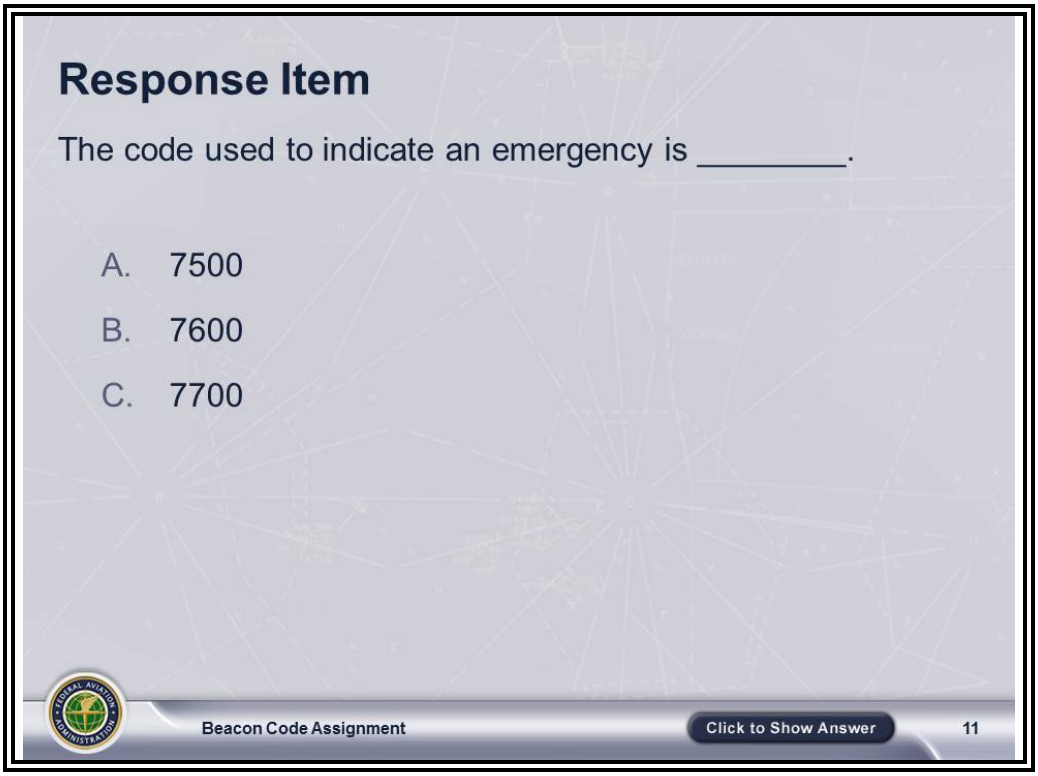
EMERGENCIES *(Continued)*

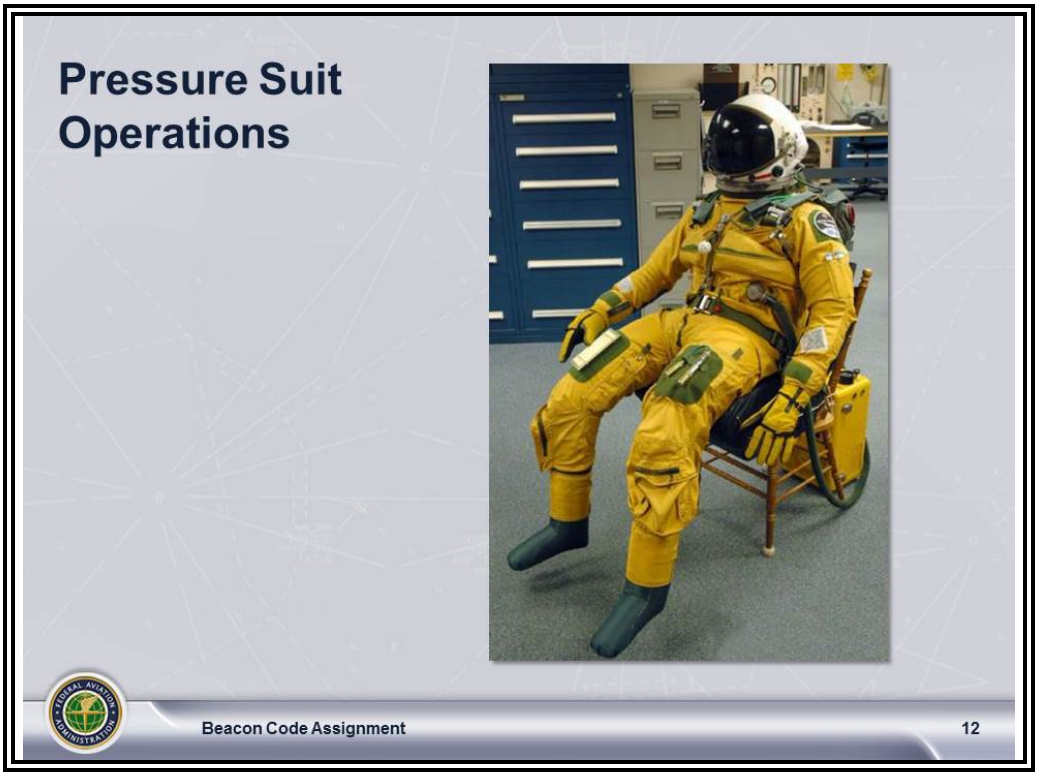
Review (Cont'd)



QUESTION: What is the hijack code?

PRESSURE SUIT AND OPERATIONS ABOVE FL600

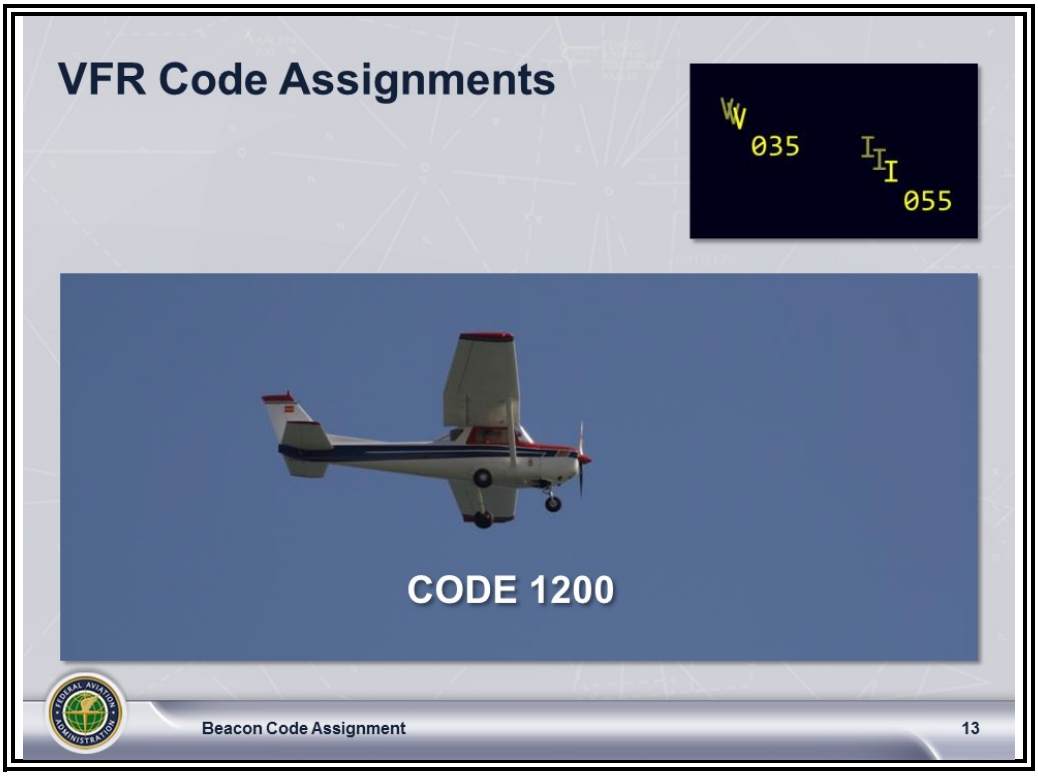
Procedures
JO 7110.65,
par. 5-2-10



- Code 4400 and discrete codes 4440 through 4465 are reserved for use by:
  - U2
  - Pressure suit flights
  - Aircraft operations above FL600
- Codes are preset on the ground.
  - The same code is used above and below FL600.
- Emergency code 7700 can be activated.

VFR CODE ASSIGNMENTS

VFR Code Assignments
JO 7110.65,
par. 5-2-9



VFR Aircraft Receiving Radar Advisories
JO 7110.65,
par. 5-2-9

⊙ Assign appropriate function or computer assigned codes to VFR aircraft receiving radar advisories.

- If the aircraft is outside your area of responsibility, retain it on your frequency **ONLY** if:
  - Operational benefit is gained.
  - Coordination is effected:
    - → As soon as possible after position identification, and
    - → Prior to issuing control instructions or providing a service other than a safety alert or traffic advisory

VFR CODE ASSIGNMENTS *(Continued)*

Code 1200
JO 7110.65,
par. 5-2-9

⊙ Code 1200 is used by:

- VFR aircraft **NOT** being provided services by an ATC facility
- IFR aircraft that cancel IFR flight plan and do **NOT** request radar advisories
- VFR aircraft when terminating radar services

✈ **Phraseology**

"SQUAWK VFR," or "SQUAWK 1200."

VFR to IFR

⊙ When aircraft change from VFR to IFR, ensure Mode C aircraft are assigned beacon codes to allow Minimum Safe Altitude Warning (MSAW) alarms.

STANDBY OR NORMAL TRANSPONDER OPERATION

Procedures
JO 7110.65,
par. 5-2-12

⊙ Assign standby.

- This is one method of radar identification.

✈ **Phraseology**

"SQUAWK STANDBY."

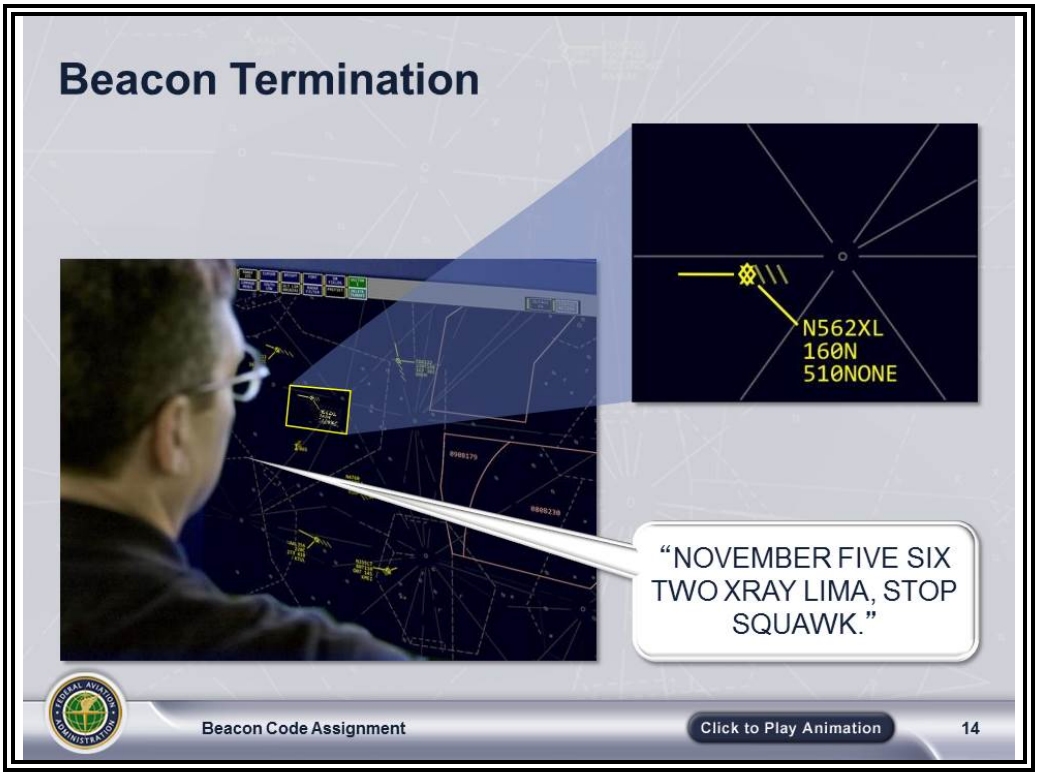
⊙ Assign normal as soon as possible when standby is no longer needed.

✈ **Phraseology**

"SQUAWK NORMAL."

BEACON TERMINATION

Procedures
JO 7110.65,
par. 5-2-22



- Request aircraft to turn off its transponder using the following phraseology:
  - Nonmilitary

✈ **Phraseology**

"STOP SQUAWK."

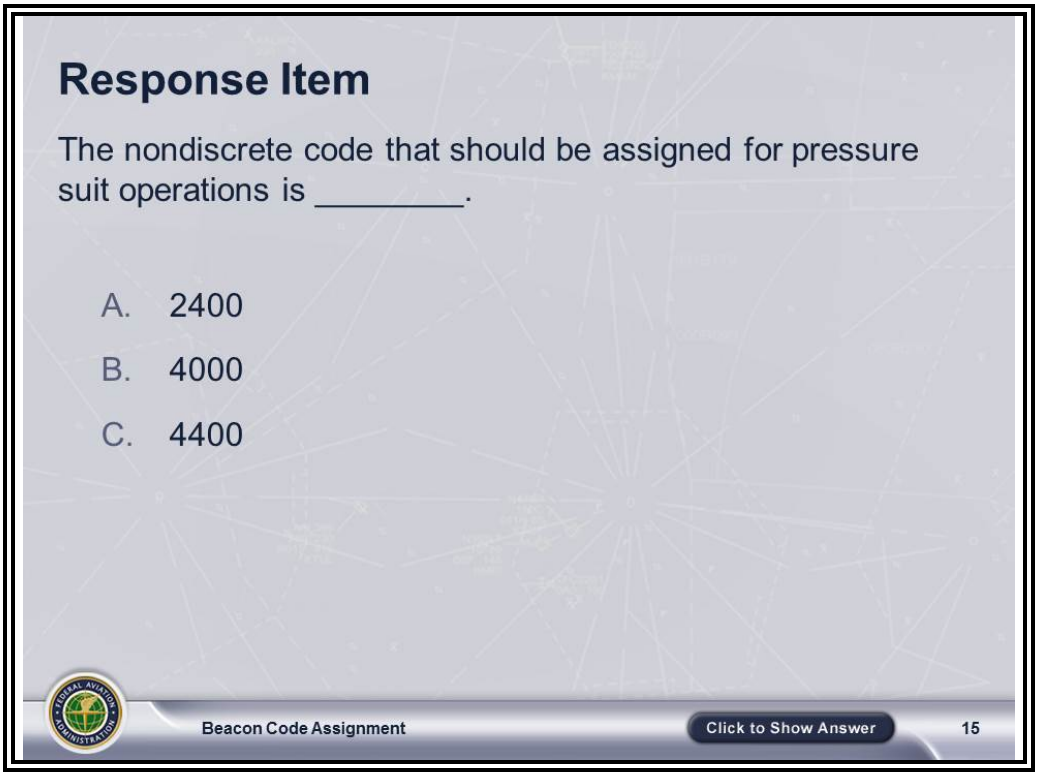
  - Military

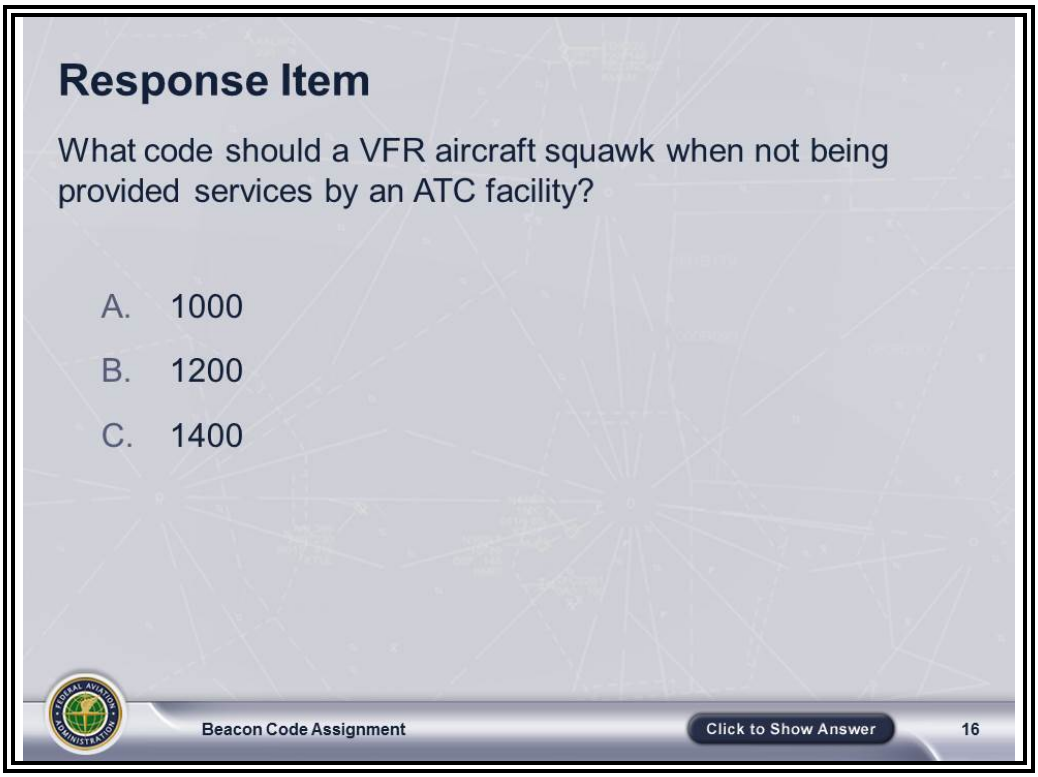
✈ **Phraseology**

"STOP SQUAWK (mode in use)."

REVIEW

Review





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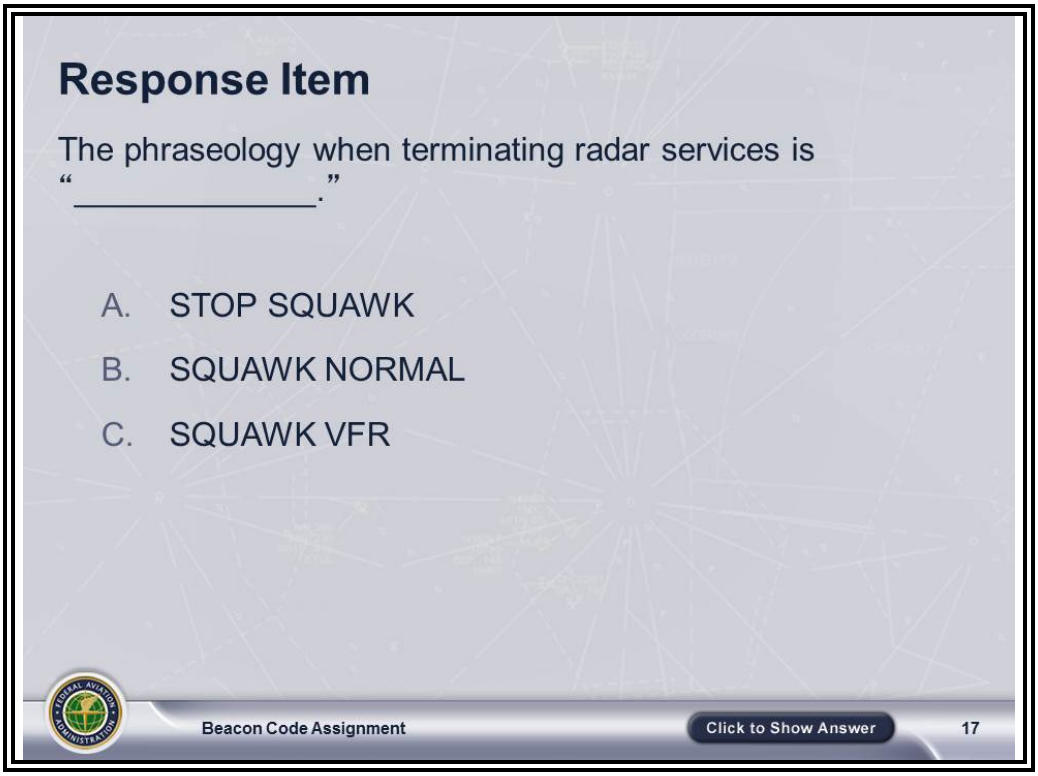
REVIEW *(Continued)*

Review (Cont'd)



QUESTION: What is the phraseology to be used when standby transponder operation is no longer needed?

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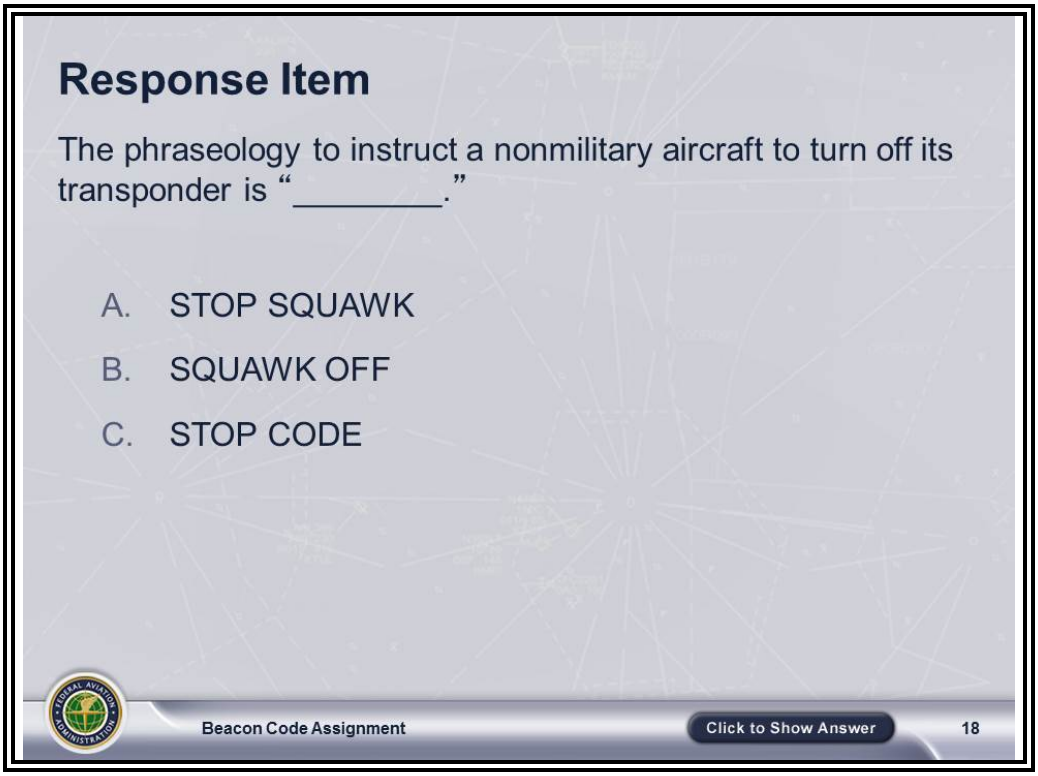
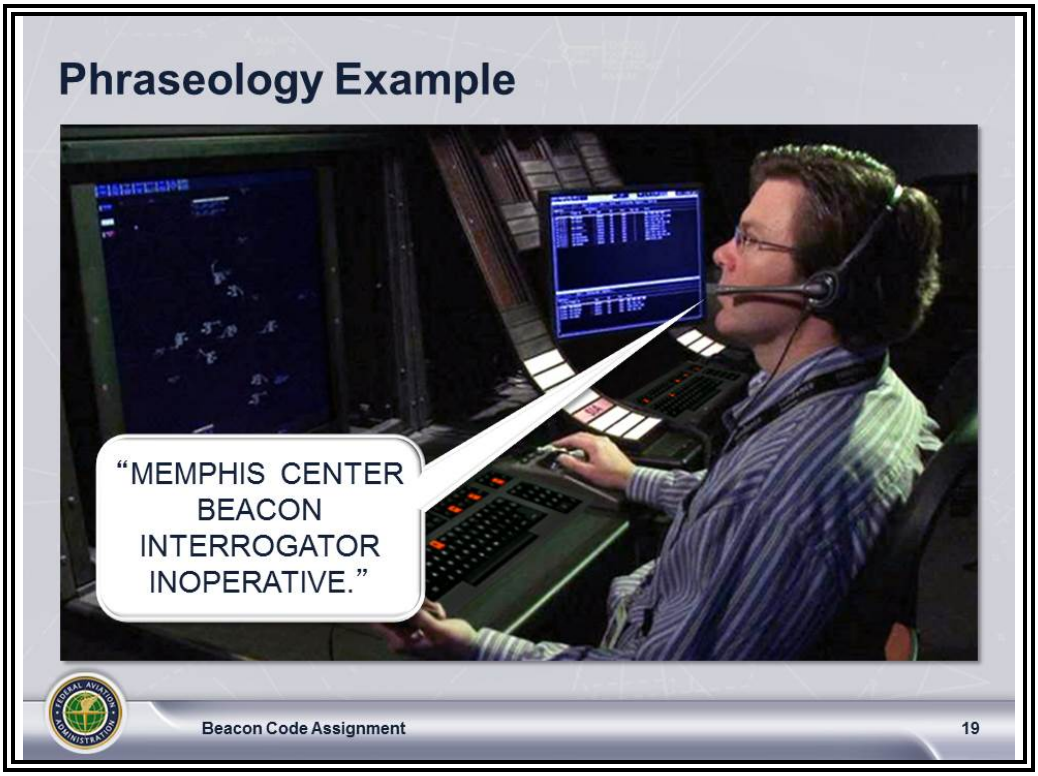
REVIEW *(Continued)*

Review (Cont'd)



EQUIPMENT MALFUNCTIONS

Inoperative or Malfunctioning Interrogator
JO 7110.65,
par. 5-2-15



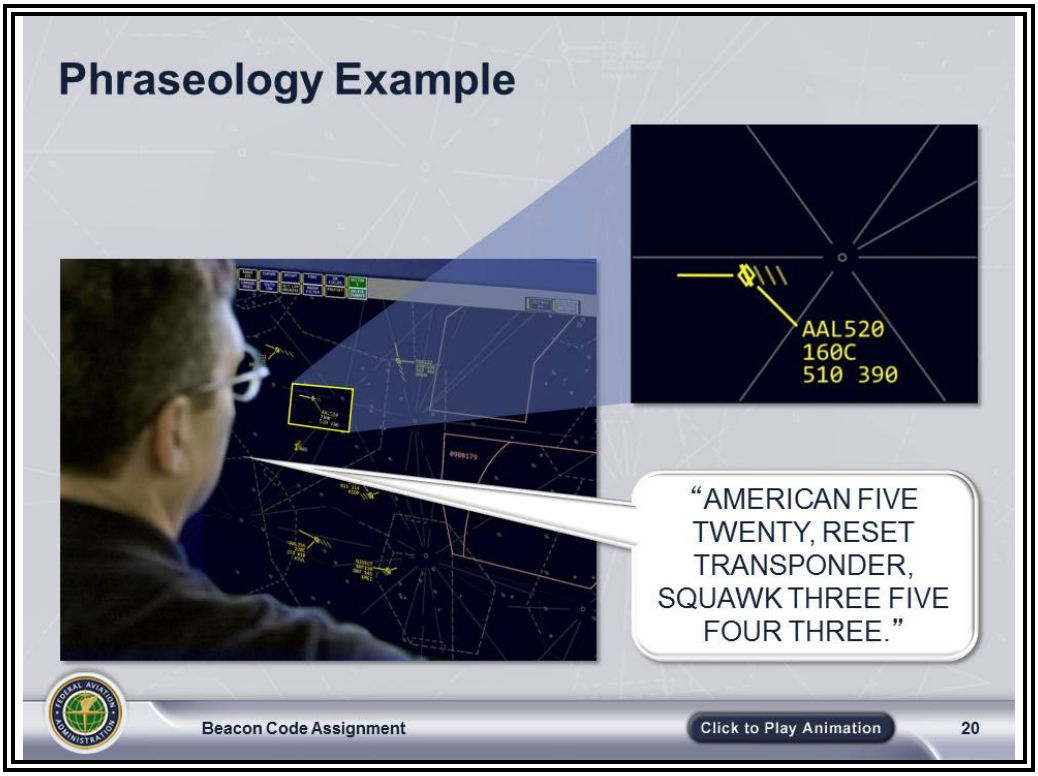
- Inform the aircraft concerned when a ground interrogator is inoperative or malfunctioning.

✈ **Phraseology**

"(Name of facility or control function) BEACON INTERROGATOR INOPERATIVE/MALFUNCTIONING."

EQUIPMENT MALFUNCTIONS *(Continued)*

Malfunctioning Transponder or Failure to Display Assigned Beacon Code
JO 7110.65, par. 5-2-14



⊙ Inform aircraft when:

- Assigned beacon code is **NOT** being displayed.

✈ **Phraseology**

"(Identification) RESET TRANSPONDER, SQUAWK (appropriate code)."

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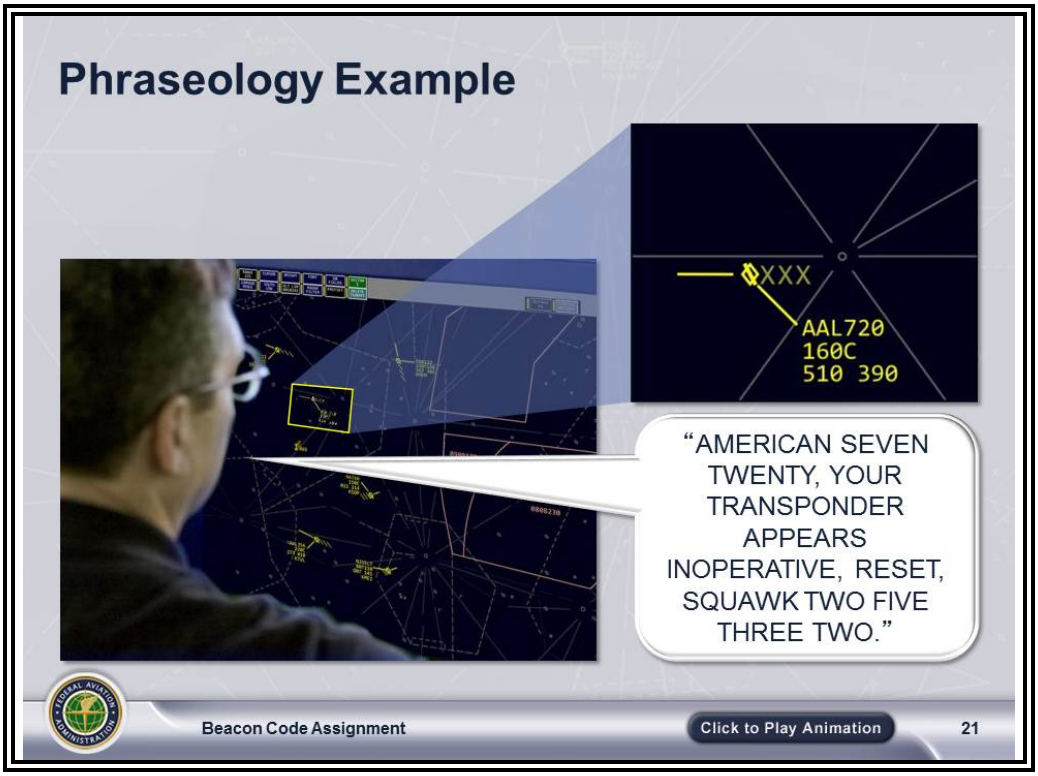
EQUIPMENT MALFUNCTIONS *(Continued)*

Malfunctioning Transponder or Failure to Display Assigned Beacon Code (Cont'd)
JO 7110.65, par. 5-2-14



- Transponder appears to be inoperative or malfunctioning

✈ **Phraseology**

"(Identification) YOUR TRANSPONDER APPEARS INOPERATIVE/ MALFUNCTIONING, RESET, SQUAWK (appropriate code)."

- Coordinate with next sector/facility.

AUTOMATIC ALTITUDE REPORTING (MODE C)

Requirements
JO 7110.65,
par. 5-2-20

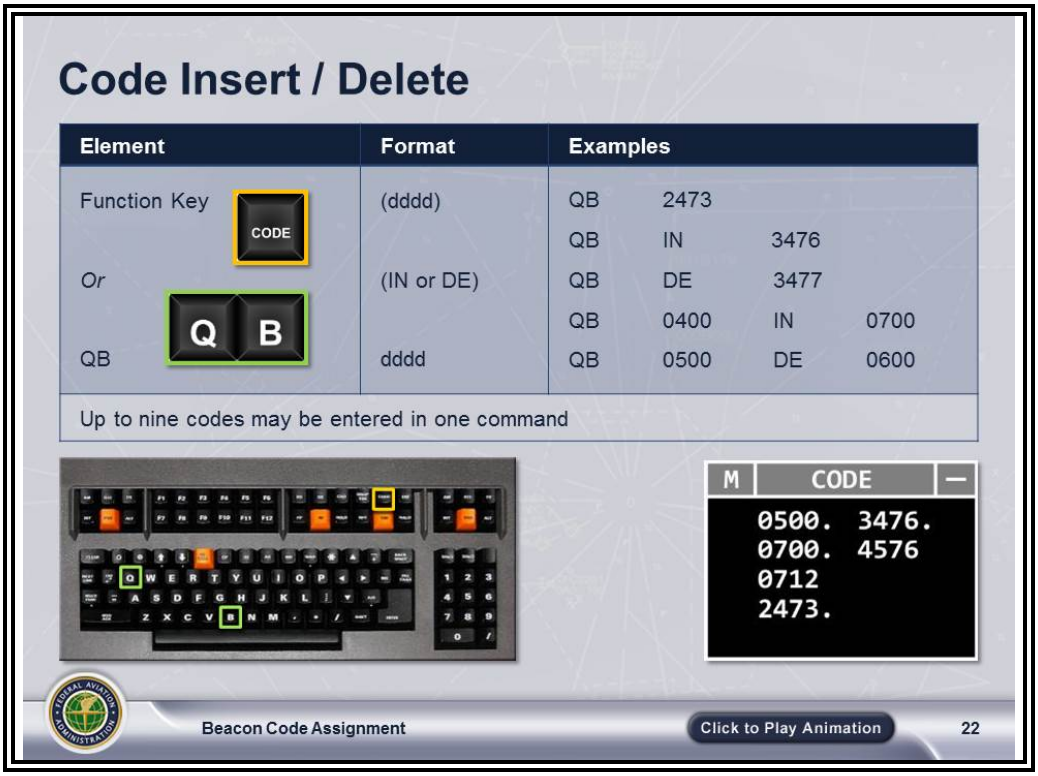
⊙ Inform an aircraft when the altitude reporting feature of its transponder is to be turned:

✈ Phraseology

- On - “SQUAWK ALTITUDE.”
- Off - “STOP ALTITUDE SQUAWK.”
  - Not all aircraft have the capability to disengage altitude squawk independently from beacon code squawk.

COMMAND COMPOSITION

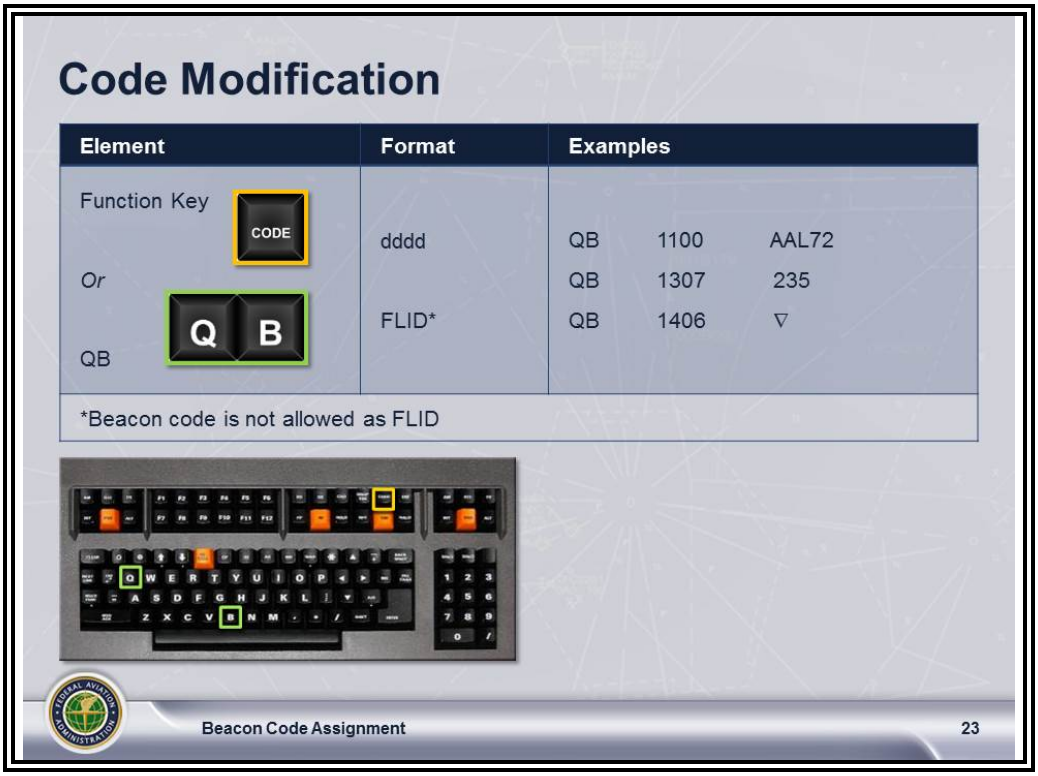
Code Insert/ Delete
TI 6110.100, par.13.2; ERAM EDSM SRS 210.04 V1B1, pars. 3.2.4.1.2.2.7.2.1-3; ERAM EDSM SRS 210.4 V1B2, Table 22



- Causes a code or codes to be inserted in or deleted from the Beacon Code View.
  - If the code is on the list, it is deleted; if it is not on the list, the code will be added.
  - Using the IN or DE is not required, but is an option for command entry which ensures the intended result.
- Results in an updated Beacon Code View
- Places a period (.) following the inserted code in the Beacon Code View

COMMAND COMPOSITION *(Continued)*

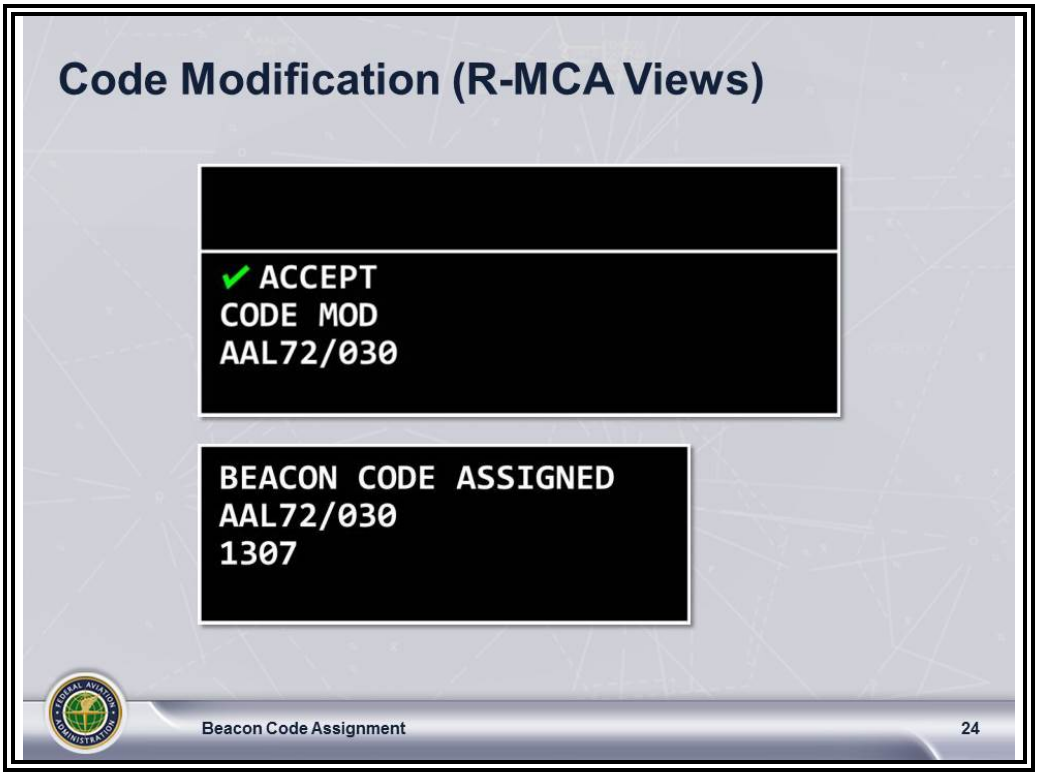
Code Modification
TI 6110.100, par. 13.2, app. B; ERAM EDSM SRS 210.04 V1B1, par. 3.2.3.2.3.2.37.2; ERAM EDSM SRS 210.04 V1B2, Table 22



- Used to assign a specific code to an aircraft
  - The aircraft equipment qualifier must indicate the appropriate transponder.

COMMAND COMPOSITION *(Continued)*

Code Modification (R-MCA Views)
TI 6110.100, par. 13.2, app. B; SRS 210.04 V1B1, par. 3.2.3.2.3.2.37.2; ERAM EDSM SRS 210.04 V1B2, Table 22



- Assigns the code requested, if available
  - The code is inserted in the Beacon Code View.
  - Update messages are sent to other sectors.

COMMAND COMPOSITION *(Continued)*

Aircraft Equipment Suffixes
JO 7110.65,
par. 2-3-8, 2-3-9

Aircraft Equipment Suffixes

	Navigation Capability	Transponder Capability	Suffix
RVSM	Any	Failed Transponder or Failed Mode C Capability	/H
	No GNSS, No RNAV	Transponder with Mode C	/W
	RNAV, No GNSS	Transponder with Mode C	/Z
	GNSS	Transponder with Mode C	/L
No RVSM	No DME	No Transponder	/X
		Transponder with No Mode C	/T
		Transponder with Mode C	/U
	DME	No Transponder	/D
		Transponder with No Mode C	/B
		Transponder with Mode C	/A
	TACAN	No Transponder	/M
		Transponder with No Mode C	/N
		Transponder with Mode C	/P
	RNAV, No GNSS	No Transponder	/Y
		Transponder with No Mode C	/C
		Transponder with Mode C	/I
	GNSS	No Transponder	/V
		Transponder with No Mode C	/S
		Transponder with Mode C	/G

Beacon Code Assignment 25

- Equipment qualifiers (letter suffixes) signify the type of equipment that the aircraft is equipped with.
  - Mode C altitude encoding: /U, /A, /P, /I, /G, /W, /L, /Z
  - RVSM Mode C qualifiers: /L, /W, /Z
  - Mode 3/A non-altitude encoding: /T, /B, /N, /C, /S
  - Mode C or transponder failure in RVSM airspace qualifier: /H
  - No transponder qualifiers: /X, /D, /M, /Y, /V
- GNSS-equipped aircraft:
  - Have an equipment suffix of /G, /L, /S, or /V
  - May be determined by executing an ICAO flight plan readout and verifying a filed G in the ICAO equipment list

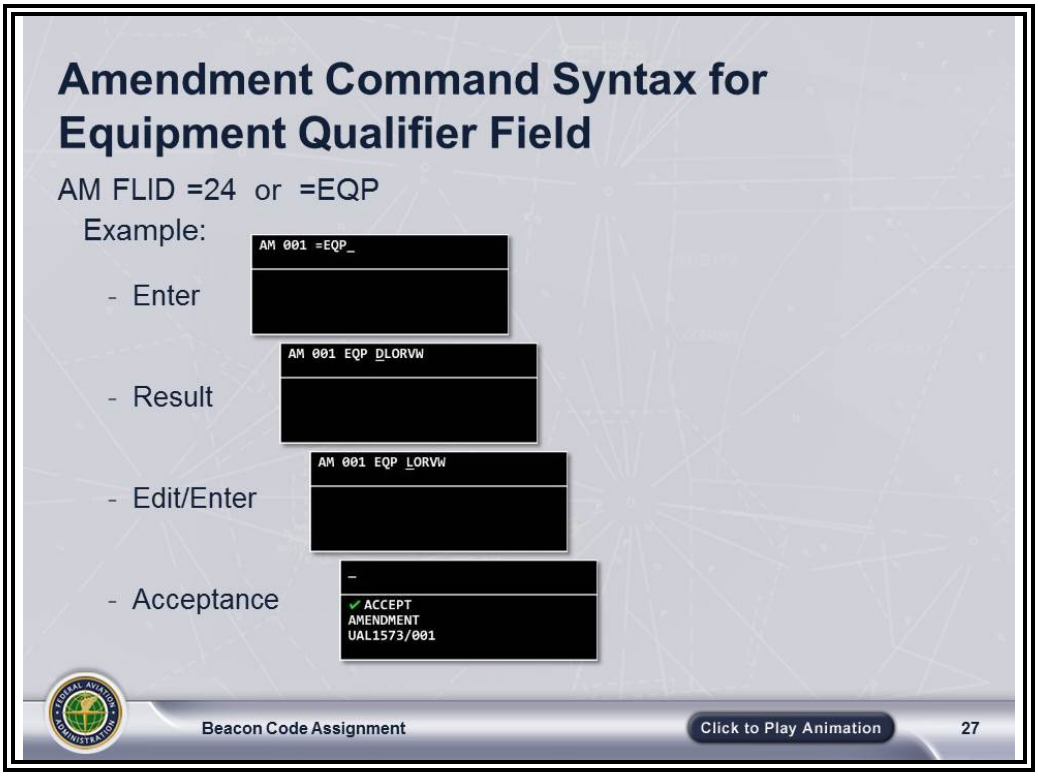
COMMAND COMPOSITION *(Continued)*

Equipment Qualifier Modification
TI 6110.100, par. 13.2;
SRS 210.04 V1B1, par. 3.2.3.2.3.2.37.2;
JO 7110.65, pars. 2-3-8

- Used to change, delete, or add an equipment qualifier
  - The number 0 deletes any qualifier.
- Results of qualifier change:
  - Code change
  - Code deletion
  - Code assignment
  - Updated messages sent to other sectors
- Uses adapted letter only (L, G, A, T, U, etc.)

COMMAND COMPOSITION *(Continued)*

Amendment Command Syntax for Equipment Qualifier Field
SRS 210.04 V1B1, par. 3.2.3.2.3.2.16

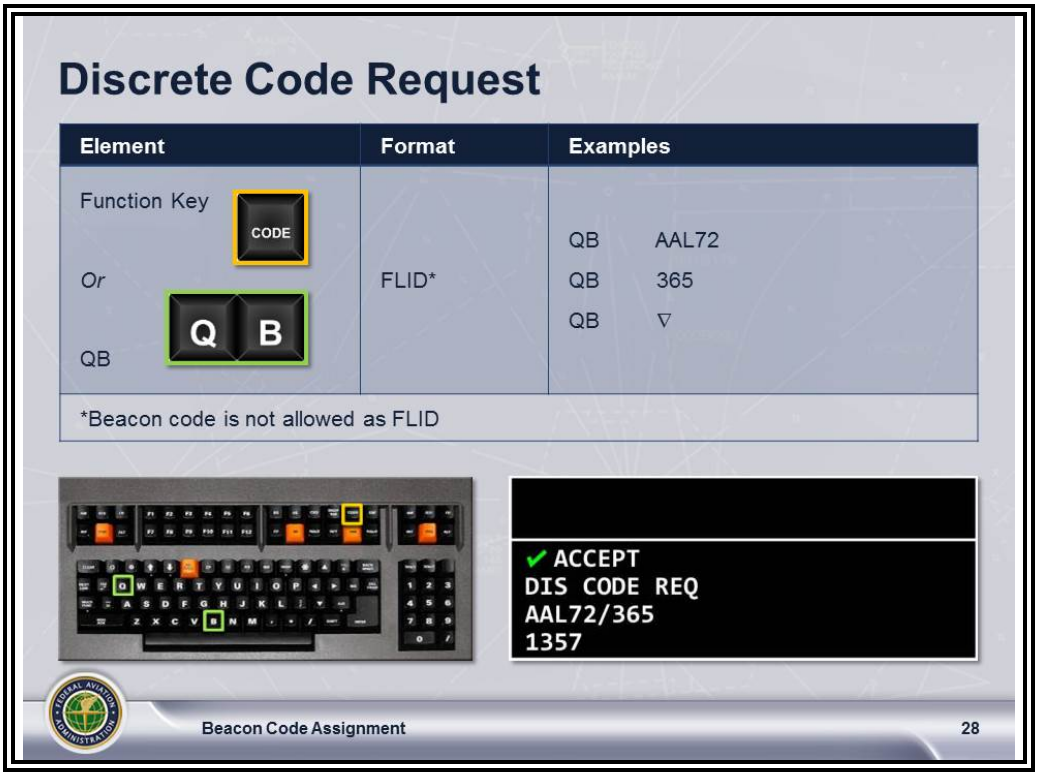


NOTE: Modifying the equipment qualifier via the Equipment Template in EDST or using the AM command as depicted in the slide ensures ICAO data is not inadvertently deleted or amended.

- Permits accurate modification of the ICAO equipment qualifier field in the flight plan.
- AM Command Result:
  - Stored contents of the ICAO Radio Communications, Navigation, and Approach Aid Qualifiers will display in the MCA Preview Area within the AM command.
  - Cursor will be positioned at the beginning of the equipment field.
- Add or delete the equipment values and press ENTER to complete the command.

COMMAND COMPOSITION *(Continued)*

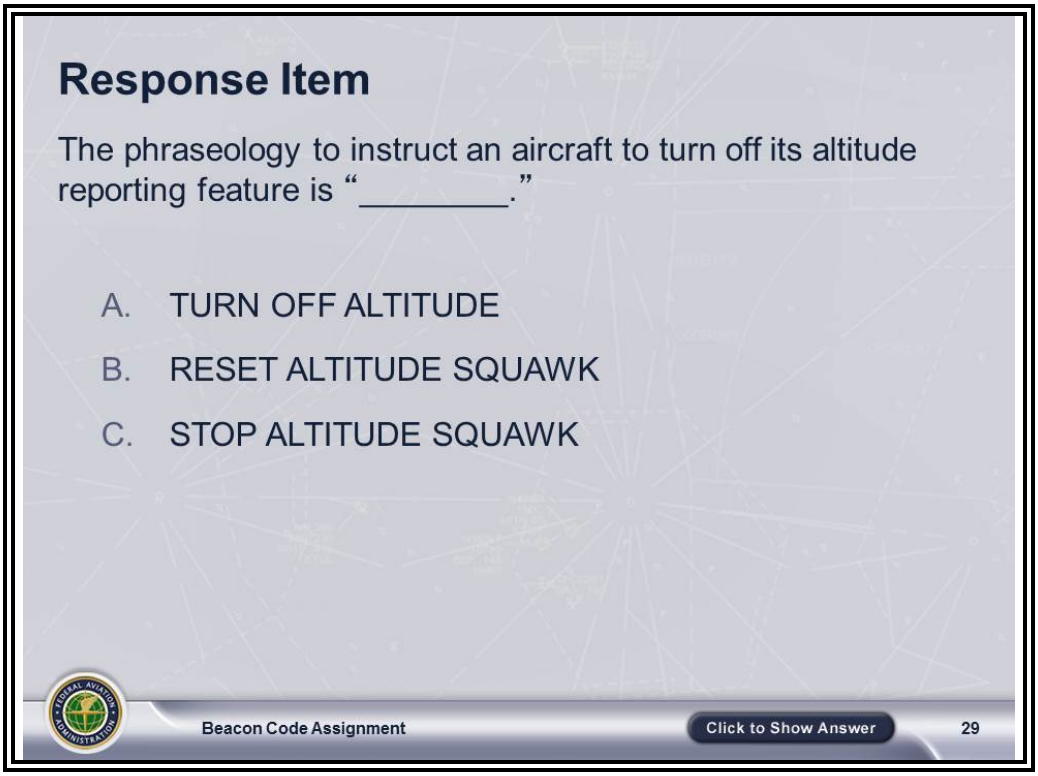
Discrete Code Request
TI 6110.100, par. 13.2; ERAM EDSM SRS 210.04 V1B1, par. 3.2.3.2.3.2.37.2; JO 7110.311B, par. 5-3-3; ERAM MONF SRS 210.18, par. 3.2.2.2.1.1.1

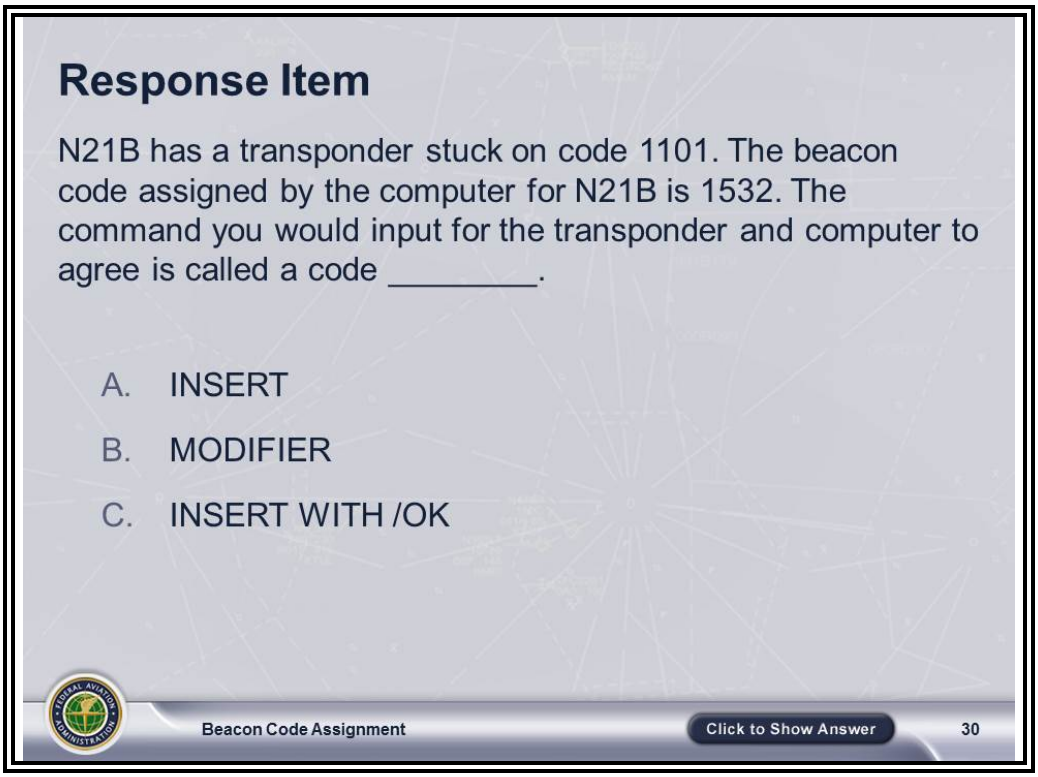


- Used to request or change a discrete beacon code assignment
- Results of command:
  - Aircraft presently assigned a discrete code will be assigned a new code unless the new code is unavailable.
  - Aircraft with no code or an assigned nondiscrete code is assigned a new code.
    - New code appears in the MCA and the Response Area.
  - A tentative flight plan is created for pop-up aircraft.
  - Aircraft is made eligible for automatic track association.
  - Beacon Code View is updated.
  - Update messages are sent to other sectors.

COMMAND COMPOSITION *(Continued)*

Review





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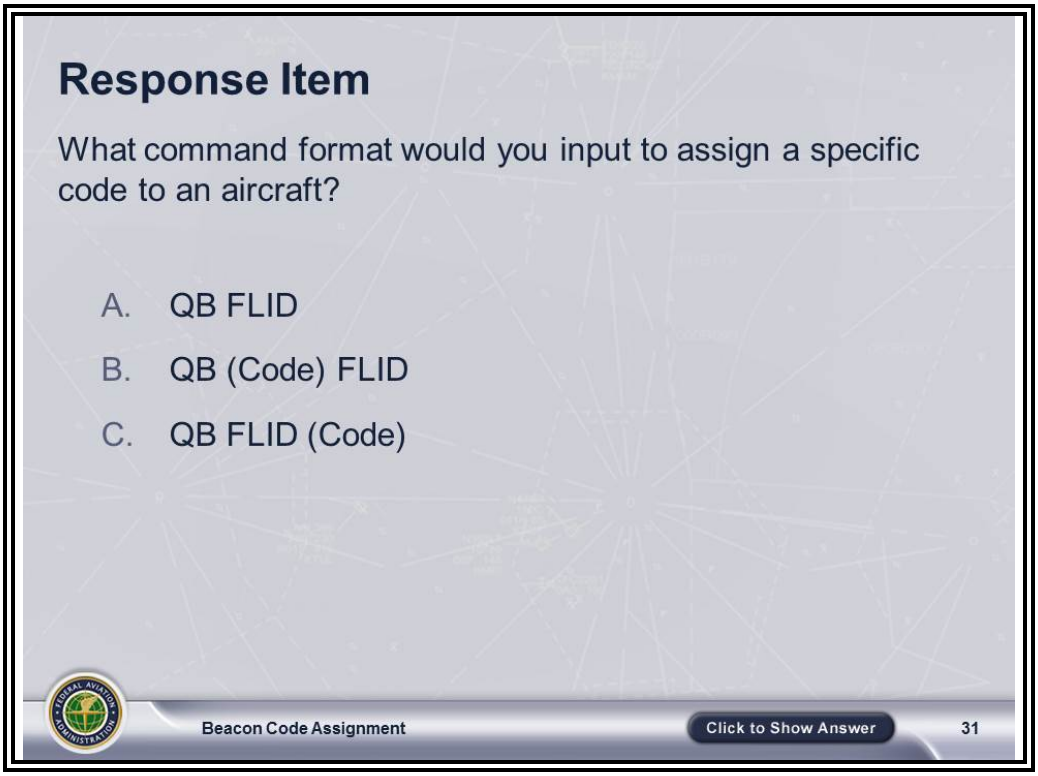
COMMAND COMPOSITION *(Continued)*

Review (Cont'd)



CONCLUSION

Summary

- Beacon code assignment procedures and phraseology for:
  - Discrete code environment
  - Nondiscrete code environment
- Beacon code requirements
- National Beacon Code Allocation Plan (NBCAP)
- Actions taken when an aircraft's transponder fails while operating in Class A airspace
- Composition of the following computer commands:
  - Code insert/delete
  - Code modifier
  - Equipment qualifier modification
  - Discrete code request

End-of-Lesson Test

- Your instructor will now administer the End-of-Lesson Test.