



# **Onboard Communication & Safety Systems (OCS) Standard**

## **AET Endorsement**

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# NCATT Onboard Communication & Safety Systems Standard Subject, Performance and Task Knowledge Requirements

- I. **Safety**
- II. **Audio Distribution System**
- III. **Cockpit Voice Recorder**
- IV. **Flight Interphone**
- V. **Passenger Address**
- VI. **Emergency Locator Transmitter**

There are twelve (12) *Subject Knowledge, Task Performance and Task Knowledge* activities and functions within the NCATT Onboard Communications and Safety Systems Standard. This Standard was identified and defined by aerospace industry Subject-Matter-Experts (SMEs) through an NCATT facilitated occupational analysis workshop. NCATT workshops focus on the “job” an individual performs in relation to an identified topic or career field.

The NCATT Onboard Communications and Safety Systems Standard can be used by Aerospace Industry education and training entities to develop lesson plans as part of a complete education and training program focused on avionic / electronics systems. The Standard can also be used to develop specialized and/or targeted education and training needs.

The depth, complexity and detail of task performance, task knowledge and subject knowledge, required for *NCATT Accredited* programs, can be determined by referring to the NCATT Level Definitions provided below.

Educational entities that wish to align their programs with the NCATT Standards (and required teaching levels) should refer to the NCATT webpage ([www.ncatt.org](http://www.ncatt.org)) for additional guidance.

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## NCATT LEVEL DEFINITIONS

	Scale Value	Definition: The Individual
Task Performance Levels	1	<b>IS EXTREMELY LIMITED.</b> (Can do simple parts of the task. Needs to be told or shown how to do most of the task)
	2	<b>IS PARTIALLY PROFICIENT.</b> (Can do most parts of the task. Needs only help on hardest parts.)
	3	<b>IS COMPETENT.</b> (Can do all parts of the task. Needs only a spot check of completed work.)
	4	<b>IS HIGHLY PROFICIENT.</b> (Can do the complete task quickly and accurately. Can tell or show others how to do the task.)
Task Knowledge Levels	a	<b>KNOWS NOMENCLATURE.</b> (Can name parts, tools, and simple facts about the task.)
	b	<b>KNOWS PROCEDURES.</b> (Can determine step-by-step procedures for doing the task.)
	c	<b>KNOWS OPERATING PRINCIPLES.</b> (Can identify why and when the task must be done and why each step is needed.)
	d	<b>KNOWS ADVANCED THEORY.</b> (Can predict, isolate, and resolve problems about the task.)
*Subject Knowledge Levels	A	<b>KNOWS FACTS.</b> (Can identify basic facts and terms about the subject.)
	B	<b>KNOWS PRINCIPLE.</b> (Can identify relationship of basic facts and state general principles about the subject.)
	C	<b>KNOWS ANALYSIS.</b> (Can analyze facts and principles and draw conclusions about the subject.)
	D	<b>KNOWS EVALUATION.</b> (Can evaluate conditions and make proper decisions about the subject.)

### Explanations

A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task. (Example: b and 1b)

\*A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.

# NCATT Onboard Communication & Safety Systems Standard Subject, Performance and Task Knowledge Requirements

## I. Safety

### 1. Onboard Communications & Safety System Safety Considerations

#### NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows and can identify the relationship of basic facts and state general principles about *safety* and *safety* issues as applied to general safety practices, flight line operations and maintenance / shop activities. The individual will be able to recognize and use terminology that may be applicable to safety issues specific to this standard, and related to specific subject areas within the standard.

## II. Audio Distribution System

### 2. General

#### NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows and can identify the relationship of basic facts and state general principles about *Audio Distribution Systems* and be able to recognize and use terminology related to this subject.

As general information, the following terms and components are *typically* associated with audio distribution systems.

- Purpose
  - Provides communication link between the flight crew, cabin crew, ground crew and passengers
- Function / Use
  - Intercommunication Control System (ICS) Intercom
    - Ground Calling
    - Service Intercom
    - Flight Intercom
    - Cabin Intercom
    - Emergency Modes of Operation (Pilot Override)
  - Audio Alerting / Traffic Alert and Collision Avoidance System (TCAS)
    - Traffic Advisories
    - Resolution Advisories
      - Preventive
      - Corrective
  - Broadcast / Tape Reproducers
    - Movies
    - Music
    - Messages
    - Pre-recorded announcements

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- Passenger Address (PA)
  - PA Chime
  - Priority Announcements (See Emergency Modes above)

### 3. Tie-In/Integration

#### NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who can identify basic facts and terms about *Audio Distribution System Tie-In/Integration*.

As general information, the following terms and components are *typically* associated with tie-in and integration of audio distribution systems.

- Cockpit Voice Recorder (CVR)
- Traffic Alert and Collision Avoidance System (TCAS)
- Audio Selector Panel
  - Inputs
    - Microphones
    - Handsets
    - Passenger Entertainment System
    - TCAS
  - Outputs
    - Headsets
    - Speakers
    - PA System
    - Passenger Stations
    - TCAS

### 4. Operational Checks / Fault Isolation

#### NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is partially proficient in the performance of the tasks of *Audio Distribution System Operational Checks and Fault Isolation*. The individual will be able to do most parts of the task and will need help only on the hardest parts. In addition, they will know the procedures for the task, and can determine step-by-step procedures for doing the task.

As general information, the following is a *typical* list of audio distribution system operational checks and fault isolation activities.

- Microphones (Fixed Position, Headsets, Handset) and Speaker
  - Voice Operated Transmission (VOX)
  - Oxygen Mask / Microphones
  - Throat Microphones
  - Push to Talk / Press to Transmit (PTT)

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- System
  - Impedance (Z) Matching
  - Grounding and Ground Loops
  - Shielding
- Test Equipment
  - Audio Generator
  - Time Domain Reflectometer (TDR)

## III. Cockpit Voice Recorder (CVR):

### 5. General NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows and can identify the relationship of basic facts and state general principles about the *Cockpit Voice Recorder Systems* and be able to recognize and use terminology related to this subject.

As general information, the following terms and components are *typically* associated with cockpit voice recorder systems.

- History
  - Civil Aeronautics Board (CAB) recommendation to record flight crew conversations for accident investigation purposes
  - Federal Aviation Administration (FAA) conducted a study in 1960 that established the feasibility of CVRs
  - FAA approved installation and operating rules for CVRs in transport category aircraft operating in air carrier service
    - July 1, 1966 for all turbine-powered aircraft
    - January 1, 1967 for all pressurized aircraft with four reciprocating engines
    - Multiple changes in subsequent years
- Equipment
  - Tape CVR
    - Introduction - late 1960s
    - Endless loop-recording / 30 minute loop (U.S. requirement) / Four channel record over
    - Recording medium – magnetic tape
      - Mylar Tape
      - Kapton Tape
      - Metallic Tape
  - Solid-state CVR
    - Introduced in the late 1980s
    - 2-hour loop / Four channel record over
      - Expanded recording capacity
      - Enhanced crash/fire survivability
      - Improved recorder reliability
  - Digital Data Recorders

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- FAA Regulatory Requirement (TSO)
  - 1958 - TSO C-51
  - 1966 - TSO C-51a / TSO C-84
  - 1996 - TSO C-123a/124a
- FAA Regulatory Requirement (Installation)
  - FAR 23.1457
  - FAR 25.1457
  - FAR 27.1457
  - FAR 29.1457
- FAA Regulatory Requirement (Operations)
  - FAR 91.609
  - FAR 121.359
  - FAR 125.227
  - FAR 129.24
  - FAR 135.151
- Basic equipment requirements
  - Audio Inputs
  - Recording Channels (4 channels typical)
  - Markings (Bright Orange or Yellow “Black Box”)
  - Underwater Acoustic Beacon (UAB) / Underwater Locator Beacon (ULB) or Underwater Locating Device (ULD) – 30 day continuous broadcast requirement
  - Locator Beacon on or adjacent to unit (not likely to be separated during crash impact)
  - Automatic erasure prevention device

## 6. Tie-In/Integration NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who can identify basic facts and terms about *CVR System Tie-In/Integration*.

As general information, the following terms and components are *typically* associated with tie-in and integration of cockpit voice recorder systems.

- Cockpit / Flight Deck mounted microphones
  - First and Second Pilot Stations
  - Other Crewmembers on the Flight Deck
- Necessary Pre-amplifiers and Filters
- Audio System (Warnings integrated)
- Electrical Power (115 volts 400 Hz or 28 VDC)
  - Power is from the bus that provides “Maximum Reliability”
    - Does Not jeopardize essential or emergency loads
  - Independent Power Source
    - Provides 10 minutes (plus or minus 1 minute) of electrical power for CVR and both cockpit –mounted microphones
    - Located as close as practicable to the CVR

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- CVR and cockpit-mounted area microphone are switched automatically to independent power source when power to CVR is interrupted by:
  - Normal shutdown
  - Other loss of power through the electrical buss
- Data link communication – when installed
  - Recorded as output signal from the communication unit
  - Signal is translated to usable data

### 7. Operational Checks / Fault Isolation

#### NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is partially proficient in the performance of the tasks of *CVR System Operational Checks and Fault Isolation*. The individual will be able to do most parts of the task and will need help only on the hardest parts. In addition, they will know the procedures for the task, and can determine step-by-step procedures for doing the task.

As general information, the following is a *typical* list of cockpit voice recorder system operational checks and fault isolation activities.

- Instructions for Continued Airworthiness (IAC) Compliance
  - Maintenance
  - Overhaul
  - Heat Absorption Material Retirement
- Confirm recording function and operation of:
  - Voice recording on each channel
    - Hot Microphone
    - Area Microphone
  - All microphones used for conversations on flight deck
  - Voice communications on Interphone System
  - Voice communications on Passenger Address System
  - Voice / Audio Signals identifying Navigation Aids (introduced into audio system)
  - Audio Signals from Alerting or Warning Devices
  - Operation of Crash Sensors (“G” switches)
  - Bulk Erase Inhibit Function
  - Failure Annunciator
  - Self Test Indicator
- Mounting (Inspection and Maintenance)
  - Mounting locations (as per installation instructions) of microphones on flight deck (critical for audio sound pick-up due to background noise)
  - CVR unit mount for mount integrity, damage or corrosion
  - Unit location (as per installation instructions) for:
    - Crushing Protection
    - Rupture Consideration

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- Life Limits on batteries:
  - Independent Power Source
  - Underwater Locator Device (ULD) battery

**Note:** Flight Data Recorders (FDR) are similar to CVRs. A CVR records “voice” (human) information related to an aircraft’s operation and the FDR records flight “data” (aircraft system / component) information. These devices can and are used for many purposes including information that is used for routine maintenance, maintenance trouble-shooting and routine aircraft operations. The CVR and FDR’s primary purpose is to provide critical “real time” flight information that can be used by the Federal Aviation Administration (FAA) and National Transportation Safety Board (NTSB) to investigate, and determine the cause of aircraft accidents. FAA regulatory requirements for Flight Data Recorders can be found in 14 CFR Parts 23.1459 / 25.1459 / 27.1459 / 29.1459 / 91.609 / 121.343 / 121.344; 121.344a / 125.225 / 125.226 / 135.152

## IV. Flight Interphone

### 8. Flight Interphone – Function, Tie-in/Integration and Operational Checks *NCATT Level 2b*

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows basic *Flight Interphone* theory of operation. The individual will be partially proficient in the tasks of operational checks of flight interphone systems. They will know the procedures for operational checks and can determine the step-by-step procedures for doing the task. The individual will be able to do most parts of the task and will need help only on the hardest parts.

As general information, the following is a *typical* list of flight interphone system general knowledge; system tie-in and integration; operational checks and fault isolation activities.

- Use and Purpose
  - Multi-channel phone communication system
  - Cockpit crew communication with the flight crew
  - Cockpit crew communication with ground service crews
- System Components / Operational Check Requirement
  - Headphones
  - Microphones
  - Interphone amplifiers
  - Central Switching Unit
  - Decoder Logic
  - Filter
  - Control Circuits
- Tie-in/Integration with other systems
  - Audio Distribution System
    - Passenger Address System
    - In-flight entertainment
    - Ground Service
    - Audio Warnings

# NCATT Onboard Communication & Safety Systems Standard Subject, Performance and Task Knowledge Requirements

## V. Passenger Address

### 9. Function, Tie-in/Integration and Operational Checks

#### NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows basic *Passenger Address* theory of operation. The individual will be partially proficient in the tasks of operational checks of passenger address systems. They will know the procedures for operational checks and can determine the step-by-step procedures for doing the task. The individual will be able to do most parts of the task and will need help only on the hardest parts.

As general information, the following is a *typical* list of passenger address system general knowledge; system tie-in and integration; operational checks and fault isolation activities.

- History / Use and Purpose
  - Announcements to passengers from flight crew and cabin crew
  - Public Address Chimes
    - Precedence System
      - Pilot information and messages
      - Flight attendant messages
      - Prerecorded announcements
      - Boarding music
- Components / Operational Check Requirements
  - Microphones
  - Public Address Amplifiers
  - Announcement and Boarding Music Tape Deck
  - Annunciator Panel
  - Attendant Control Panels
  - Speakers in ceiling of main cabin
  - Speakers in galleys
  - Speakers in Lavatories
- Tie-in/Integration with other systems
  - Audio Distribution System
    - Passenger Address System
    - In-flight entertainment

# NCATT Onboard Communication & Safety Systems Standard Subject, Performance and Task Knowledge Requirements

## VI. Emergency Locator Transmitter (ELT) System

### 10. General

#### NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who knows and can identify the relationship of basic facts and state general principles about *Emergency Locator Transmitter Systems* and be able to recognize and use terminology related to this subject.

As general information, the following terms and components are *typically* associated with emergency locator transmitters.

- History / Use and Purpose
- Types
  - Automatic Fixed (AF)
  - Automatic Portable (AP)
  - Survival (S)
- FAA Regulatory Requirement
  - FAR 91.207
  - Technical Standard Order (TSO)
    - TSO-C91
    - TSO-C91a
    - TSO-C126
- Frequencies
  - 121.5 / 243.0 MHz (Monitoring by satellite discontinued in 2009)
  - 406.025 MHz

### 11. Tie-In/Integration

#### NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who can identify basic facts and terms about *ELT System Tie-In/Integration*.

As general information, the following terms and components are *typically* associated with tie-in and integration of emergency locator systems.

- TSO-C91a / TSO-C126
  - TSO-C126 units:
    - Aircraft Interface with Aircraft GPS/NAV
  - Control Head (Panel Mounted Switch)
  - Annunciator

# NCATT Onboard Communication & Safety Systems Standard Subject, Performance and Task Knowledge Requirements

## 12. Operational Checks / Fault Isolation

### NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is partially proficient in the performance of the tasks of *ELT System Operational Checks and Fault Isolation*. The individual will be able to do most parts of the task and will need help only on the hardest parts. In addition, they will know the procedures for the task, and can determine step-by-step procedures for doing the task.

As general information, the following is a *typical* list of emergency locator system operational checks and fault isolation activities.

- Operational Test
  - FAA Regulatory Rule
  - Approved Data
  - Test Equipment
  - Time & Duration
- Battery Checks/Replacement
- Antenna
- Coaxial cable and connections
- Mounting