PER-392 Drone Assessment and Response Tactics, Residential

Course Design Document

PER-392 DART, Residential, Course Design Document, Version IC2021(1)
FEMA/TPP
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FEMA's National Training and Education Division (NTED) offers a full catalog of courses at no cost to help build critical skills that responders need to function effectively in mass consequence events. Course subjects range from Weapons of Mass Destruction (WMD) terrorism, cybersecurity, and agro-terrorism to citizen preparedness and public works. NTED courses include multiple delivery methods: instructor led (direct deliveries), train-the-trainers (indirect deliveries), customized (conferences and seminars), and web-based. Instructor led courses are offered in residence (i.e. at a training facility) or through mobile programs, in which courses are brought to state and local jurisdictions that request the training. www.firstrespondertraining.gov has a list of NTED courses.

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Course Overview

Details

Title	PER-392 Drone Assessment and Response Tactics, Residential
Level	Performance
Delivery Type	Residential
Duration in Days	3
Duration in Hours	24
Primary Core Capability	Threats and Hazards Identification
Secondary Core Capability	Interdiction and Disruption
Community Lifeline(s)	Safety and Security, Communications
Mission Area(s)	Prevention, Protection, Mitigation, Response, Recovery
Target Audience	All emergency first responders
Training Certificate	Certificate of Completion, Certificate of Attendance
Continuing Education Units	2.4
Date Certified	00/00/2021
Version	IC2021(1)

Description

The Drone Assessment and Response Tactics (DART), Residential course provides emergency personnel with the knowledge and skills necessary to detect, identify, track, assess, respond, and report Unmanned Aircraft Systems (UAS) activity. Participants are presented with information on the current UAS criminal and terrorist threat, analog and electronic UAS detection techniques, and response tactics to address this threat. This course includes performance-based field demonstrations and exercises where participants are presented with varying UAS types, their capabilities, and simulated UAS threats involving Improvised Explosive Devices (IEDs).

The Drone Assessment and Response Tactics (DART), Residential course is an in-person format course hosted at the New Mexico Tech (NMT) Energetic Materials Research and Testing Center (EMRTC) training facilities.

Terminal Learning Objectives (TLOs)

- Recognize Unmanned Aircraft Systems (UAS) uses and components.
- Recognize the threat posed by the criminal and terrorist use of commercially available Unmanned Aircraft Systems (UAS) technology.
- Identify Counter Unmanned Aircraft System (C-UAS) tactics available to emergency first responders.
- Recognize regulations, laws, and policies pertaining to the use of Unmanned Aircraft Systems (UAS).
- Identify the Tactics, Techniques, and Procedures (TTPs) to detect UAS activity using visual, audio, or technological resources.
- Identify Unmanned Aircraft Systems (UAS) activity by distinguishing the type of UAS, classifying the payload, and determining possible unsafe or suspicious operation.
- Recognize effective methods to track Unmanned Aircraft Systems (UAS) activity and communicate this information to appropriate authorities.
- Assess Unmanned Aircraft Systems (UAS) activity and recommend response options and considerations.

- Discuss response considerations to deter unsafe, suspicious, or not actionable Unmanned Aircraft Systems (UAS) activity.
- Collect evidence from and report Unmanned Aircraft System (UAS) activity to the appropriate agencies.
- Recognize the issues when unknown UAS operations occur at a fire incident.
- Review successful use of integrated C-UAS at major event.
- Demonstrate the complex C-UAS response at associated 2017 NFL games.
- Recognize Unmanned Aircraft System (UAS) types and their characteristics.
- Detect and assess Unmanned Aircraft System (UAS) activity using a combination of analog and electronic detection methods.
- Recognize Unmanned Aircraft System (UAS) types and their characteristics.

Target Audience

Emergency first responders.

Prerequisites

N/A

Modules

Title	Duration (hours)
Module 1: Introduction	1.5
Module 2: Introduction to UAS	1.5
Module 3: UAS as a Threat	1.0
Module 4: C-UAS Tactics Overview	1.0
Module 5: UAS Regulations Overview	0.75
Module 6: Detect UAS Activity	1.25
Module 7: Identify UAS Activity	1.25
Module 8: Track UAS Activity	0.75
Module 9: Assess UAS Activity	0.75
Module 10: Respond to UAS Activity	0.75
Module 11: Report UAS Activity	0.75
Module 12: Conclusion	0.75
Case Study 1: El Cajete Wildfire	0.75
Case Study 2: Fort Lauderdale International Boat Show (FLIBS)	0.75
Case Study 3: NFL San Francisco Bay Area	0.75
Field Lab 1: UAS Characteristics	2.75
Field Lab 2: UAS Detection and Assessment	1.50
Field Lab 3: Improvised Explosive Devices (IEDs) and UAS	1.50

Testing and Certification

Participants are administered a pre-test and a post-test as part of a course delivery. The pre-test and post-test enable program administrators to assess the level of knowledge gained by participants. Post-test scoring is used to evaluate the ability of participants to grasp the learning objectives presented in a course. Participants are awarded one of the following certificates by NMT/EMRTC after completing a course:

1. Certificate of Attendance
2. Certificate of Completion
3. Certificate of Completion – Train-the-Trainer

Certificate of Attendance

A Certificate of Attendance is awarded to a participant who has attended the course but has not achieved a 70% score or higher on the post-test knowledge assessment. As a result, a participant is certified to have attended the course.

Additionally, a Certificate of Attendance is awarded to all participants in a course where no academic credit is available.

Certificate of Completion

A Certificate of Completion is awarded to a participant who has attended the course and has achieved a 70% score or higher on the post-test knowledge assessment. As a result, a participant is certified to have attended and successfully completed the course.

Additionally, academic credit is available through New Mexico Tech at a monetary cost to participants who receive a Certificate of Completion.

Certificate of Completion – Train-the-Trainer

A Certificate of Completion – Train-the-Trainer is awarded to a participant who has attended the course, has achieved a 90% score or higher on the post-test knowledge assessment, and is a certified trainer in their local jurisdiction. As a result, a participant is certified to have attended and successfully completed the course. Participant is certified to teach the awareness level version of the course.

Academic credit is available to participant when available in the course.

To receive a Certificate of Completion – Train-the-Trainer, participants must provide instructor certification documentation from their local agency/state to NMT/EMRTC prior to attending the course and during course registration.

Evaluation Strategies

Participant perception of learning (Kirkpatrick's Level 1) will be measured by the DHS Student Assessment of Course and Instructors Form, to be filled out by the participants at the end of each course, as required by DHS. Pre- and post-test questions and performance activities will be used to determine mastery of the course objectives (Kirkpatrick's Level 2).

Required Materials and Resources

- Facilities
- Classroom Materials
- Participant Materials (Per Participant)

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Course Outline

Module 1: Introduction

Scope Statement

In this module, participants are presented with information on the Federal Emergency Management Agency (FEMA), New Mexico Tech (NMT) and the Energetic Materials Research and Testing Center (EMRTC) as it pertains to the development and purpose of this course. Instructors and participants discuss course expectations and learning objectives and their outcomes. Additionally, administrative and procedural information is presented regarding the successful operation of the course. This module concludes with the administration of a knowledge assessment to measure entry-level participant knowledge of the subject presented in the course.

Terminal Learning Objective (TLO)

- N/A

Enabling Learning Objectives (ELOs)

- N/A

Lesson Topics

- Introduction
    - Module 1 Introduction
    - Distribution Limits
    - Notice
    - Conduct and Learning Accommodations
    - NMT/EMRTC
    - National Domestic Preparedness Consortium
- Course Information
    - Course Agenda
    - Course Goal
    - Counter-UAS Response Continuum
    - Course Map
    - Field Laboratory Guidelines
    - Participant Introductions
- Knowledge Assessment
    - Certification
    - Knowledge Assessment: Pre-Test
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 2: Introduction to UAS

Scope Statement

This module is an introduction to UAS and presents baseline information on UAS. The participants learn multiple UAS formats and respective functions through provided examples of UAS applications in agriculture, firefighting, law enforcement, and commerce. This module emphasizes the six key components of the UAS: the aircraft, sensor/payload, data link, ground system, flight crew, and ground support equipment. The module concludes with an introduction to Counter-UAS (C-UAS), which are elaborated upon in subsequent modules.

Terminal Learning Objective (TLO)

- Recognize Unmanned Aircraft Systems (UAS) uses and components.

Enabling Learning Objectives (ELOs)

- Identify UAS types and their components.
- Identify UAS commercial uses.

Lesson Topics

- Introduction
  - Module 2 UAS Introduction
  - Course Map
  - Learning Objectives
- Introduction to UAS
  - Components of a UAS
  - UAS: Sizes and Types
  - UAS: Class and Category
  - Sensors/Payloads
  - UAS Control
  - Ground Control Station (GCS)
  - Smartphone as GCS
  - Flight Crew
  - Ground Support Equipment
  - Anatomy of UAS
- Type of UAS
  - Fixed-Wing
  - SenseFly eBee X
  - Multi-Rotor
  - Parrot ANAFI
  - Hybrid
  - Super Huge Mugin 4450
- UAS Uses
  - UAS Uses
  - UAS in Agriculture
  - UAS in Firefighting
  - UAS in Law Enforcement
  - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 3: UAS as a Threat

Scope Statement

UAS continue to evolve as a threat and are readily being adopted as a useful tool for criminals and terrorists alike. This module discusses the evolution of unmanned airborne threats from crude balloon designs to the modern criminal and terrorist uses of commercially available UAS. Establishing a threat baseline for participants provides context and significance for C-US tactics taught in follow-on modules and enhances the key learning points of the course.

Terminal Learning Objective (TLO)

- Recognize the threat posed by the criminal and terrorist use of commercially available Unmanned Aircraft Systems (UAS) technology.

Enabling Learning Objectives (ELOs)

- Recognize the unsafe/suspicious use of UAS.
- Recognize the suspicious/terrorist use of UAS.

Lesson Topics

- Introduction
    - Module 3 UAS as a Threat
    - Course Map
    - Learning Objectives
    - Notice
- UAS History
    - Discussion: First UAS Attack
    - The Kettering Bug
    - Fu-Go Campaign
    - UAS are Common Today
- Criminal Unsafe/Illegal UAS Use
    - Criminal Use of UAS
    - Trafficking of Goods and People
    - Harassing LEO
    - Prison Contraband
    - Prison Break
    - Disturbing the Peace
    - Voyeurism
    - Reckless Endangerment
- Participant Discussion
    - Discussion: Your Experience
- Identify Suspicious/Terrorist Use of UAS
    - Terror Usage of UAS
    - Propaganda
    - Intelligence, Surveillance, and Reconnaissance (ISR)
    - Modifications
    - Example of UAS Weaponization
    - Example of UAS Munitions
    - Terrorist Organizations with UAS
    - Hezbollah
    - Hamas
    - ISIS UAS Training Program
    - ISIS UAS Attack
    - Yemen Air Attack

    - Rezwan Ferdaus
    - Potential Targets Are Everywhere
    - Fears for the Future
    - History Lesson
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 4: C-UAS Tactics Overview

Scope Statement

This module introduces the concept of tactics available to first responders when confronted with unplanned UAS sightings and references the underlying legal prohibitions that prevent the use of C-UAS defeat technologies. Participants are introduced to basic C-UAS tactics currently employed in a military setting so they may differentiate between those technologies and the legal options of first responders regarding C-UAS use within the United States. The building blocks for allowable C-UAS actions are introduced as concepts starting with a new C-UAS logical framework, a look at problem solving, and a proposed decision cycle. All of this leads to allowable tactics, techniques, and procedures first responders could employ within today's C-UAS legal parameters.

Terminal Learning Objective (TLO)

- Identify Counter-Unmanned Aircraft System (C-UAS) tactics available to emergency first responders.

Enabling Learning Objectives (ELOs)

- Recognize the difference between military and first responder C-UAS tactics.
- Identify the six C-UAS tactics used by first responders: Detect, Identify, Track, Assess, Respond, and Report.

Lesson Topics

- Introduction
    - C-UAS Tactics Overview
    - Course Map
    - Learning Objectives
- Identify C-UAS Tactics
    - Changing Regulations/Rules
    - Introduction to Tactics
    - Challenge of C-UAS Tactics
- Differentiate C-UAS Tactics
    - Military vs. First Responder Tactics
    - 1851 Civil Defense Film
    - Kinetic Kill Technology
    - Old C-UAS Tactics: Russia
    - UAS Attack
    - New C-UAS Tactics: Russia
    - C-UAS Tactics: U.S. Military
    - C-UAS Laser
    - C-UAS Tactics: First Responder
- C-UAS Tactics
    - C-UAS Tactics Framework
    - Problem Solving 101
    - Decision Cycle
    - Tactics, Techniques, and Procedures (TTPs)
    - C-UAS Tactics
    - Detect
    - Identify
    - Track
    - Assess
    - Respond
    - Report

- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 5: UAS Regulations Overview

Scope Statement

Moving beyond available C-UAS equipment and technologies, this module presents current UAS laws, policies, and overarching aviation regulations to educate participants on the diverse conventions related to UAS activities. Participants learn the legal history of government rulings to understand how and why UAS and C-UAS regulations are evolving. Participants learn the difference (and similarities) between commercial and hobby UAS operations, the elements of planned UAS flights that can be waived, the concepts of airspace, and which agency authorities apply in a reported UAS incident: local, state, or federal. Finally, four UAS scenarios are presented and discussed in small group break-out discussions so participants can demonstrate their proficiency in various UAS-related rules, laws, and policies.

Terminal Learning Objective (TLO)

- Recognize regulations, laws, and policies pertaining to the use of Unmanned Aircraft Systems (UAS).

Enabling Learning Objectives (ELOs)

- Discuss regulations which apply to the use of UAS.
- Define controlled airspace in relation to FAA regulations.
- Determine agency authority to enforce FAA regulations.

Lesson Topics

- Introduction
    - UAS Regulations Overview
    - Course Map
    - Learning Objectives
- Introduce Regulations
    - History of UAS Regulations
    - Overview of Federal UAS Regulations
    - UAS Operations
    - Commercial Regulations
    - Other Part 107 Requirements
    - Hobbyist Rules
    - Community-Based Organization (CBO)
    - Commercial and Hobbyist Regulations
    - FAA UAS Website
    - All Operators Must:
    - Reminder
    - Emergencies
- Identify Airspace
    - Public Use
    - Waivers
    - Airspace
    - Airspace Explained
    - State and Local Restrictions
- Determine Agency Authority
    - C-UAS Legal Considerations
    - Reporting – Individuals
    - Federal Law Enforcement
    - Reporting – State/Local Agencies
    - Local Laws
- Guided Discussion

    - Discussion: Small Group Scenarios
    - Scenario #1
    - Scenario #2
    - Scenario #3
    - Scenario #4
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 6: Detect UAS Activity

Scope Statement

Included in this module are discussions of pertinent terminology, descriptions of types of detection available, and clues used for detection. Audio and visual UAS detection techniques as well as more sophisticated detection with the use of C-UAS technology are examined. More than simply watching for patterns of movement or listening to the specific hum of a UAS, this module instructs participants to look for clues of UAS activity. An emphasis on identifying the UAS operator is critical in UAS detection as well as a person using UAS equipment, an antenna, first person goggles, or the controlling device. In addition to these visual and audio techniques, the use of C-UAS technology is examined in this module. C-UAS technology uses integrated sensors to include radio frequency, radar, acoustics, electro-optical, and infrared. All of which make UAS detection more accurate.

Terminal Learning Objective (TLO)

- Identify the Tactics, Techniques, and Procedures (TTPs) to detect UAS activity using visual, audio, or technological resources.

Enabling Learning Objectives (ELOs)

- Identify the TTPs to conduct audio detection of a UAS.
- Identify the TTPs to conduct visual detection of a UAS.
- Identify the TTPs to conduct detection of a UAS operator.

Lesson Topics

- Introduction
    - Detect UAS Activity
    - Course Map
    - Learning Objectives
    - Reminder
    - C-UAS Tactics
    - Detection Goals
    - Detection History
- Conduct Audio Detection
    - UAS Audible Detection
    - Audible Detection: Localization
    - Audible Detection: Atmospheric Effects
    - Audible Detection: UAS Types
    - Audible Detection TTPs
- Conduct Visual Detection
    - Human Vision
    - Visual Detection: Fundamentals
    - Visual Detection: Vertical Scanning Techniques
    - Visual Detection: Airborne Objects
    - Visual Detection TTPs
- Use C-UAS Technology
    - Counter Unmanned Aircraft Systems (C-UAS)
    - C-UAS Legal Considerations
    - C-UAS Detection
    - Radio Frequency (RF) Systems
    - Radar Systems
    - Acoustic Sensing
    - Electro-Optical (EO) and Infrared (IR) Systems
    - “Noise” and False Positives

    - Integrated Approach: Combining Sensors
- Detect UAS Operator
    - Detect the Operator
    - Operator Detection: Equipment
    - Operator Detection: UAS Controllers
    - UAS Control Styles
    - First Person Video (FPV)
    - Think like the Operator
    - Look for the Antenna
    - Scan Up as Well as Down
    - Operator Detection TTPs
    - Progression of Autonomy
    - Review
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 7: Identify UAS Activity

Scope Statement

In this module, participants are taught to identify a UAS, its payload, and its operator. Different types of UAS are introduced, including classes, categories, and the different types of payloads (commercial, non-lethal, lethal) are taught. Lethal payloads are described in detail, including weaponized and bomb-dropping UAS. Included in the presentation is information on the various types of UAS controllers. This helps identify the UAS operator(s).

Terminal Learning Objective (TLO)

- Identify Unmanned Aircraft Systems (UAS) activity by distinguishing the type of UAS, classifying the payload, and determining possible unsafe or suspicious operation.

Enabling Learning Objectives (ELOs)

- Identify the type of UAS.
- Classify UAS manufactured and homemade payloads.
- Identify UAS operator indicators to determine UAS operation type.

Lesson Topics

- Introduction
    - Identify UAS Activity
    - Course Map
    - Learning Objectives
    - C-UAS Tactics
- Identify Type of UAS
    - General > Precise
    - UAS Classes
    - Class and Category
    - Multi-Rotor Micro and FPV Racers
    - Multi-Rotor Light
    - Multi-Rotor Heavy
    - Fixed-Wing Light
    - Fixed-Wing Heavy
    - Rotary-Wing Light
    - Rotary-Wing Heavy
    - Hybrid
- Determine UAS Payload
    - Disclaimer
    - UAS Payload Types
    - Sensors
    - Multi-Rotor Micro/FPV and Light
    - Multi-Rotor Medium
    - Multi-Rotor Heavy
    - Fixed-Wing
    - Rotary-Wing
    - LiDAR Sensor Package
    - Cargo
    - Examples: Cargo (Fixed)
    - Examples: Cargo (Sling)
    - Agricultural Payloads
    - Weapons Payloads
    - Potential UAS CBRE Payloads

    - Chemical Payloads
    - Biological Payloads
    - Radiological Payloads
    - Nuclear Payloads
    - Explosive Payloads
    - Terrorist Drop Systems
- Identify the UAS Operator
    - Identifying the Operator
    - Modification Progression
    - Standard Commercial Support Equipment
    - Suspicious Support Equipment
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 8: Track UAS Activity

Scope Statement

This module introduces the steps and techniques to track UAS, forecast intended path/target, call for assistance, and report UAS activity. Different methods of tracking are introduced, including visual and technological means. Techniques for location, tracking, recognition, and prediction of UAS flight paths are introduced with an overall understanding that the goal is to effectively communicate this activity to appropriate C-UAS officials. The need for collaboration and fusion with available C-UAS technologies reinforces accurate location reporting and identification of the UAS operator. Tracking techniques are proposed with usable memory aids. Techniques are presented in a way that first responders can use with or without C-UAS technologies.

Terminal Learning Objective (TLO)

- Recognize effective methods to track Unmanned Aircraft Systems (UAS) activity and communicate this information to appropriate authorities.

Enabling Learning Objectives (ELOs)

- Identify analog methods to locate and track a UAS.
- Report UAS activity using the Size, Payload, Location, Activity, Time (SPLAT) reporting method.

Lesson Topics

- Introduction
    - Track UAS Activity
    - Course Map
    - Learning Objectives
    - C-UAS Tactics
- Locate and Track UAS Activity
    - Visual Tracking
    - ASSUME: Not always a bad thing
    - Tracking Basics
    - SADD: Judging Speed
    - SADD: Altitude
    - SADD: Determine Direction
    - SADD: Estimate Distance
    - UAS Range Estimator: Reference Card
    - Move as Necessary
    - A Note on Flight Paths
    - What causes RTH?
    - Recognizing RTH
    - UAS to Operator
    - Tracking UAS TTPs
- Tracking Technology
    - UAS Tracking Technology
    - Sensor Fusion
- Communicate UAS Activity
    - Clear Communication
    - Initial Reports
    - Subsequent Report
    - SPLAT: Size
    - SPLAT: Payload
    - SPLAT: Location
    - SPLAT: Activity

    - SPLAT:Time
    - Communication TTPs
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 9: Track UAS Activity

Scope Statement

This module instructs participants on how to assess a UAS activity and use previously-presented skills to facilitate identification of UAS in a spectrum from harmless to threating. The overall intent of this module is to introduce a decision cycle designed to assist agencies responding to a UAS event to find, follow, and decide if the UAS is a threat or, more specifically, to assess UAS activity and determine whether it is unsafe, suspicious, or not actionable. This module details three basic steps within the decision cycle. Step one involves taking in clues to begin the classification of the UAS activity and determining whether it could be considered "unsafe." Step two involves factors to identify any "suspicious" UAS operations when considering related UAS laws or regulations. The final step is to decide whether a UAS-related situation warrants a response. Overall, the main point of this module is to teach a logical observation, evaluation, and decision-making (i.e., assessment) process using a proposed decision cycle to determine if a response is required.

Terminal Learning Objective (TLO)

- Assess Unmanned Aircraft Systems (UAS) activity and recommend response options and considerations.

Enabling Learning Objectives (ELOs)

- Recognize unsafe UAS activity.
- Identify suspicious UAS operations.

Lesson Topics

- Introduction
    - Assess UAS Activity
    - Course Map
    - Terminal Learning Objective
    - C-UAS Tactics
    - Decision Cycle
- Recognize Unsafe UAS Activity
    - Categorize the Threat
    - Step 1
    - Unsafe Activity
    - Assess – Capability
    - Capability: Payload
    - Capability: UAS
    - Lethality vs Drone Crash/Payload Dropped
    - Assess – Opportunity
    - Bad Actors Have OODA Loops Too
    - Scenario 1 – Is it Unsafe?
    - Scenario 2 – Is it Unsafe?
- Suspicious UAS Operations
    - Step 2
    - Step 2: Is it Suspicious?
    - Legal Authority
    - Violations
    - Scenario 1 – Is it Suspicious?
    - Scenario 2 – Is it Suspicious?
    - Scenario 3 – Is it Suspicious?
    - Scenario 4 – Is it Suspicious?
    - Step 3

    - It is Not Actionable, But…
    - Assess Goals
- Determine Appropriate Response to UAS Activity
    - Decide
    - No Response
    - Responding
    - What to Do
    - When to Take Action
    - Situations for Discussion
    - Scenario 1 – Unsafe, Suspicious, or Not Actionable?
    - Scenario 2 – Unsafe, Suspicious, or Not Actionable?
    - Scenario 3 – Unsafe, Suspicious, or Not Actionable?
    - Scenario 4 – Unsafe, Suspicious, or Not Actionable?
    - Scenario 5 – Unsafe, Suspicious, or Not Actionable?
    - Make the decision cycle faster?
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 10: Respond to UAS Activity

Scope Statement

This module enables participants to understand C-UAS equipment and technologies and to respond to UAS activity (based upon various scenarios) to compel compliance and ensure public safety. Following a short refresher on detection, identification, tracking, and assessment, participants respond to unplanned UAS reporting and/or sightings, discuss available first responder actions to investigate, deter, and defeat a UAS with the potential to threaten public safety. Learning incorporates presentations on C-UAS defeat technologies and contrasts those options with important considerations, unintended consequences, and relevant federal authorities.

Terminal Learning Objective (TLO)

- Discuss response considerations to deter unsafe, suspicious, or not actionable Unmanned Aircraft Systems (UAS) activity.

Enabling Learning Objectives (ELOs)

- Identify deter and response actions available to first responders.
- Discuss availability of UAS defeat technology and their limitations.

Lesson Topics

- Introduction
    - Respond to UAS Activity
    - Course Map
    - Learning Objectives
    - C-UAS Tactics
- Respond to Unsafe or Suspicious UAS Activity
    - Public Safety
    - What Do We Do?
    - Respond: Investigate
    - Respond: Deter
    - Role of Law Enforcement
- Understand C-UAS Defeat Technology
    - Respond: Mitigate
    - C-UAS Technology
    - Kinetic Tests – Defeating UAS
    - Before Any C-UAS Action, Consider
    - Unintended Consequences
    - Preventing Emerging Threats Act of 2018
    - UAS NOTAM FDC 8/2311
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 11: Report UAS Activity

Scope Statement

Moving to the final logical stage of this DART course, the Report module outlines what a first responder can do to actively integrate into a larger-scale investigation. Participants learn recommended reporting formats, what to record regarding the UAS and its operator, and who to interact with during any resultant investigation. The module contains robust discussions on evidence preservation and collection, available forensic resources, and data security. Finally, an overview of available federal resources is presented so first responders can successfully integrate into and actively support post-incident investigations.

Terminal Learning Objective (TLO)

- Collect evidence from and report Unmanned Aircraft System (UAS) activity to the appropriate agencies.

Enabling Learning Objectives (ELOs)

- Identify UAS activity information and data collection sources.
- Identify appropriate federal agencies to report UAS activity.

Lesson Topics

- Introduction
    - Report UAS Activity
    - Course Map
    - Learning Objectives
    - C-UAS Tactics
- Collect Evidence
    - Initial Report
    - Following a UAS Incident
    - Find the Operator
    - Subsequent Report
    - UAS Incident Response and Investigation
    - Secure the Scene/Gather Evidence
    - Sources of Evidence
    - The Obvious
    - UAS Evidence
    - UAS Flight Profile
    - Take Witness Statements
    - Photograph/Videotape the Scene
    - The Hidden
    - Inside a Phantom
    - UAS Control Board
    - The Invisible
    - UAS Forensics Resources
    - Forensic Resource: NIST Database
    - The Digital
    - Social Media
    - C-UAS Data
    - Example: 911 AirGuard C-UAS System
    - UAS Incident Reporting: Final Reminders
- Contact Appropriate Agencies
    - Reporting Options
    - Whose Investigation is This?
    - FAA Regional Operations Center (ROC)

    - Law Enforcement Assistance Program (LEAP)
    - FBI Resources
    - Know Your Authority
    - Potential Federal Charges
    - New UAS Provisions
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Module 12: Conclusion

Scope Statement

This module concludes the Drone Assessment and Response Tactics course. During this module, participants discuss additional training available from New Mexico Tech and complete the course post-test. The course post-test measures the exit-level knowledge of the learning objectives presented in the course; participants receive course certification after completing the post-test and all course requirements.

Terminal Learning Objective (TLO)

- N/A

Enabling Learning Objectives (ELOs)

- N/A

Lesson Topics

- Introduction
    - Conclusion
    - Course Map
- Conclusion
    - Counter-UAS Response Continuum
    - Detect
    - Identify
    - Track
    - Assess
    - Respond
    - Report
- Knowledge Assessment
    - Knowledge Assessment: Post-Test
- Additional Training
    - Related Training
    - Additional Training
- Summary
    - Contact Information
    - Thank You

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Case Study 1: El Cajete Wildfire

Scope Statement

This Case Study takes the participant through the details of a very large 2017 New Mexico forest fire, which rapidly progressed in the course of a few days to burn about 1,325 acres of land. The presence of unsafe UAS flights on the third day caused all aerial firefighting operations to cease, which contributed to additional fire growth overnight. This Case Study highlights how uncoordinated or unintentional UAS operations are unsafe to both air and ground crews, and more importantly, this module presents the federal restrictions and laws that make UAS presence near a wildfire illegal. The goal of this course is to underscore how irresponsible UAS flights can negatively affect all aircraft operations, regardless of the location or purpose, to include wildfires, MedEvacs, and airport safety. Interspersed throughout this module, participants see multiple videos from the National Interagency Fire Center, the FAA, and the Bureau of Land Management, which are designed to reinforce the slogan: “If you fly, we can’t.”

Terminal Learning Objective (TLO)

- Recognize the issues when unknown UAS operations occur at a fire incident.

Enabling Learning Objectives (ELOs)

- Review how fighting a forest fire is affected by unsafe or suspicious UAS.
- Understand the legal considerations to UAS operations at a fire incident.

Lesson Topics

- Introduction
    - Introduction
    - Course Map
    - Learning Objectives
- UAS Effect Upon Fire Operations
    - Wildfires Are Deadly
    - Video: UAS Disrupts CalFire Operation
    - Santa Fe National Forest
    - Incident Commander’s Concern
    - El Cajete Fire
    - Size Up Concerns
    - Day One – First Detection
    - Day One – Rapid Fire Growth
    - Video: News Video Day 1
    - Day One – The Threat
    - Day Two – Rapid Fire Expansion
    - Day Two – The Ground Game
    - Day Two – Aerial Ops
    - Day Three – UAS Incursion
    - Day Three – UAS Response
    - Day Three – CAD Reporting
    - Video: Day Three – The Incursion
    - Day Three – The Delay
    - Day Three – The Culprit
    - If You Fly … We Can’t
- Legal Considerations
    - Laws and UAS Operations
    - Temporary Flight Restrictions (TFRs)
    - FAA Reauthorization Act of 2018
    - Video: “If YOU Fly … We Can’t”

    - Video: Public Safety Announcement
    - Recent Incidents … It's Not Just Fires!!
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Case Study 2: Fort Lauderdale International Boat Show (FLIBS)

Scope Statement

This Case Study examines the 2017 Fort Lauderdale International Boat Show (FLIBS), one of the largest events of its type in the world, and how event managers used coordinated C-UAS methodologies and equipment to respond to and mitigate the potential threat of UAS. Drawing from the experiences of a contracted C-UAS team, this module presents multiple phases of a successful C-UAS plan necessary to adequately prepare and integrate with law enforcement when responding to the suspicious presence of a UAS. Using examples of a cohesively organized C-UAS plan and using C-UAS detection methods embedded within a functioning unified command center, this C-UAS team employed elements of this C-UAS course to reinforce the TTPs of Detect, Identify, Track, Assess, Respond, and Report. This study demonstrates how detection by visual means and C-UAS technology was accomplished through notable interaction with law enforcement to successfully mitigate over 20 suspicious UAS flights and interdict over a dozen UAS operators.

Terminal Learning Objective (TLO)

- Review successful use of integrated C-UAS at major event.

Enabling Learning Objectives (ELOs)

- Demonstrate pre-planning for integrated C-UAS.
- Review C-UAS use in support of a public safety response.

Lesson Topics

- Introduction
    - Introduction
    - Course Map
    - Learning Objectives
- Pre-Planning for C-UAS
    - FLIBS Introduction
    - C-UAS Mission and Objectives
    - Pre-Planning: Concerns
    - Pre-Planning: C-UAS Tactics
    - C-UAS Execution
- C-UAS and Public Safety Response
    - C-UAS Activity
    - Negligent Operator Incident
    - Map Legend
    - Initial Detection
    - Confirmed Detection
    - C-UAS Launces UAS
    - Screenshot Video Feed
    - Tracking the UAS
    - Finding the Operator
    - Social Media Location of Interest
    - Waiting Game
    - The Post
    - Digital Footprint
    - Police Interview
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Case Study 3: NFL San Francisco Bay Area

Scope Statement

Focusing on a series of intentional UAS flights over two 2017 San Francisco Bay Area NFL football games, this module presents participants with real-life examples related to the complexities of C-UAS planning, response, and prosecution for the pilot. This module is designed to highlight two separate but related events that led law enforcement to coordinate an initial response to identify and arrest the individual operating a modified, commercial UAS designed to drop propaganda leaflets onto the crowds inside two NFL stadiums. Pictures of the perpetrator and video of the actual UAS in operation demonstrate the simplicity of his UAS modifications and ease of deployment over a large crowd of people. Additionally, the module reinforces learning points with a review of applicable FAA regulations and recently enacted federal UAS laws.

Terminal Learning Objective (TLO)

- Demonstrate the complex C-UAS response at associated 2017 NFL games.

Enabling Learning Objectives (ELOs)

- Review examples of sporting event C-UAS security plans.
- Discuss past responses following suspicious UAS events.

Lesson Topics

- Introduction
  - Introduction
  - Course Map
  - Learning Objectives
- NFL C-UAS Security Plans
  - NFL Football Games
  - Levi's Stadium
  - San Jose International Airport (SJC)
  - Oakland-Alameda County Coliseum
  - Oakland International Airport (OAK)
  - Levi's Stadium Security Plan
  - Oakland Coliseum Security Plan
- C-UAS Response
  - Video: UAS Dropping Leaflets
  - Scenario: Levi's Stadium
  - Scenario: Oakland Stadium
  - Scenario: Who Is In Charge?
  - Levi's Stadium – Response
  - Oakland Coliseum – Response
  - Timeline of Events
  - The Suspect
  - Commercial Equipment Used
  - Video: News of NFL Leaflet Drops
  - Red X Society
  - Post Incident Analysis and Lessons Learned
- Summary
  - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

There are no practical exercises associated with this module.

Field Lab 1: UAS Characteristics

Scope Statement

In this field laboratory, participants are presented with flight demonstrations for various Unmanned Aircraft Systems (UAS) and discuss their characteristics. Flight demonstrations include flights from hybrid (fixed wing) and multi-copter UAS. These demonstrations provide auditory and visual detection range recognition for varying UAS. The identification of UAS auditory and visual characteristics is a critical element in detecting UAS activity.

Terminal Learning Objective (TLO)

- Recognize Unmanned Aircraft System (UAS) types and their characteristics.

Enabling Learning Objectives (ELOs)

- Identify multi-copter and fixed-wing UAS characteristics.
- Identify multi-copter and fixed-wing UAS visual and audio detection ranges.
- Discuss UAS operating methods and their behavioral characteristics.

Lesson Topics

- Introduction
    - Field Laboratory 1 UAS Characteristics
    - Course Map
    - Learning Objectives
- Brief
    - Location
    - Discussion: Expectations
- Operation
    - Site Overview
    - Field Laboratory 1 Site Setup
    - Discussion: UAS Characteristics
    - Flight Demonstration: Quantum Trinity F90+
    - Quantum Trinity F90+
    - Flight Demonstration: DJI Mavic Mini
    - DJI Mavic Mini
    - Flight of Mavic Mini
    - Flight Demonstration: Parrot Anafi
    - Parrot Anafi
    - Flight Demonstration: DJI Mavic 2
    - DJI Mavic 2
    - Flight of Mavic 2
    - Flight Demonstration: DJI Phantom 4 Pro
    - Flight of Phantom 4
    - Discussion: First Person View (FPV)
    - Demonstration: First Person View (FPV)
    - Flight Demonstration: DJI Inspire 2
    - DJI Inspire 2
    - Flight of Inspire 2
    - Flight Demonstration: DJI Matrice 210
    - DJI Matrice 210
    - Flight of Matrice 210
    - Flight Demonstration: DJI Matrice 600
    - DJI Matrice 600
    - Flight of Matrice 600

    - Discussion: UAS Hazards
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

Discussion: Expectations

Instructors lead participants in a discussion designed to check existing participant knowledge on the varying types of Unmanned Aircraft Systems (UAS) and their characteristics by examining a series of images.

Discussion: First Person View (FPV)

Instructors lead participants in a discussion designed to familiarize participants with the First-Person View (FPV) control method for UAS by demonstrating the use of a FPV headset in conjunction with a UAS flight.

Discussion: UAS Hazards

Instructors lead participants in a discussion designed to assess the perceived threat of UAS to participants' day-to-day operations.

Field Lab 2: UAS Detection and Assessment

Scope Statement

In this field laboratory, participants are presented with a scenario where they are tasked with detecting and assessing Unmanned Aircraft System (UAS) activity. Detection methods presented in this exercise include both analog and electronic methods to include radar and radio frequency tracking. Participants discuss the methods of mitigating hazards to themselves or the public when UAS activity is assessed as a threat. This scenario-based exercise gives participants the opportunity to practice detection and assessment of UAS activity in an urban environment.

Terminal Learning Objective (TLO)

- Detect and assess Unmanned Aircraft System (UAS) activity using a combination of analog and electronic detection methods.

Enabling Learning Objectives (ELOs)

- Detect UAS activity through visual and auditory detection techniques.
- Observe UAS activity through electronic detection techniques.
- Assess UAS activity as unsafe or suspicious.

Lesson Topics

- Introduction
    - Field Laboratory 1 UAS Characteristics
    - Course Map
    - Learning Objectives
    - Field Laboratory Exercise
- Brief
    - Stations
    - Location
    - Station 1, Detection and Assessment
    - Station 1, UAS Range Estimator Card
    - Station 2, Detection Technology
- Field Operations
    - Field Laboratory Safety
    - Site Overview
    - Station 1 Setup
    - Station 2 Setup
    - Field Exercise Flight Profiles
    - Group 1
    - DJI Mavic 2
    - DJI Mavic, Flight Profile
    - DJI Phantom 4 with Drop Mechanism
    - Phantom 4 with Drop Mechanism, Flight Profile
    - DJI Inspire and Pipe Bomb Drop
    - DJI Inspire and Pipe Bomb Drop, Flight Profile
    - Group 2
    - DJI Mavic 2 with Speaker
    - DJI Mavic with Speaker, Flight Profile
    - DJI Phantom 4
    - DJI Phantom 4, Flight Profile
    - DJI Matrice 210 and Package Drop
    - DJI Matrice and Package Drop, Flight Profile
- Debrief

    - Discussion: Detection and Assessment
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

Station 1, Detection and Assessment

Instructors lead participants in a detection and assessment exercise designed to provide them with the opportunity to detect and assess UAS activity.

Station 2, Detection Technology

Instructors lead participants in a discussion designed to familiarize them with the electronic UAS activity detection technology available.

Field Lab 3: Improvised Explosive Devices (IEDs) and UAS

Scope Statement

In this field laboratory, participants are presented with flight demonstrations of various Unmanned Aircraft Systems (UAS) delivering an explosive payload or Improvised Explosive Device (IED). These demonstrations allow participants to recognize the hazards associated with a weaponized UAS and the necessity to properly assess a UAS threats and implement strategies to mitigate effects on the ground.

Terminal Learning Objective (TLO)

- Recognize Unmanned Aircraft System (UAS) types and their characteristics.

Enabling Learning Objectives (ELOs)

- Identify multi-copter and fixed-wing UAS characteristics.
- Identify multi-copter and fixed-wing UAS visual and audio detection ranges.
- Discuss UAS operating methods and their behavioral characteristics.

Lesson Topics

- Introduction
    - Introduction
    - Course Map
    - Learning Objectives
- Brief
    - Location
    - IEDs and UAS
    - Recognize, Avoid, Isolate, Notify
    - Explosive Materials
    - Video: Blast Effects
    - Blast Injuries
    - Structural Damage
    - Other Hazards
    - Distance and Shielding
    - Bomb Threat and Stand-off Card
    - Evacuation or Shelter Considerations
    - Video: Distance & Shielding
- Field Operations
    - Field Laboratory 3 Site Setup
    - Flight Demonstration: IED Drop
    - Post Blast – IED Drop
    - IED Drop
    - Demonstration: Landed UAS IED
    - Post Blast – Landed UAS IED
    - Landed UAS IED
- Debrief
    - Discussion: IED and UAS Hazards
- Summary
    - Summary

Instructional Strategy

Instruction of this module consists of an instructor-led presentation.

Assessment Strategy

Course instructors administer a pre-test and post-test to assess participant knowledge of the learning objectives presented in the course. Entry-level and exit-level assessment data is evaluated to measure knowledge gain.

Practical Exercise Statement

N/A

Agenda

Day 1

08:00AM-09:30AM	Module 01: Introduction
09:30AM-10:30AM	Module 02 Introduction to Unmanned Aircraft Systems (UAS)
10:30AM-11:45AM	Module 03: UAS As a Threat
11:45AM-12:30PM	Module 04: Counter-UAS (C-UAS) Tactics Overview
12:30PM-1:30PM	Break
1:30PM-4:00PM	Field Laboratory 1: UAS Characteristics
4:00PM-5:00PM	Case Study: El Cajete Wildfire

Day 2:

08:00AM-09:25AM	Module 05: UAS Regulations Overview
09:25AM-10:20AM	Case Study: Fort Lauderdale International Boat Show (FLIBS)
10:20AM-11:30AM	Module 06: Detect UAS Activity
11:30AM-12:30PM	Break
12:30PM-1:10PM	Module 07: Identify UAS Activity
1:10PM-2:00PM	Module 08: Track UAS Activity
2:00PM-5:00PM	Field Laboratory 2: UAS Detection and Assessment

Day 3

08:00AM-09:40AM	Module 9: Assess UAS Activity
09:40AM-10:25AM	Module 10: Respond to UAS Activity
10:25AM-11:10AM	Module 11: Report UAS Activity
11:10AM-11:45AM	Case Study: NFL San Francisco Bay Area
11:45AM-12:45PM	Break
12:45PM-3:45PM	Field Laboratory 3: Improvised Explosive Devices (IEDs) and UAS
3:45PM-5:00PM	Module 12: Conclusion