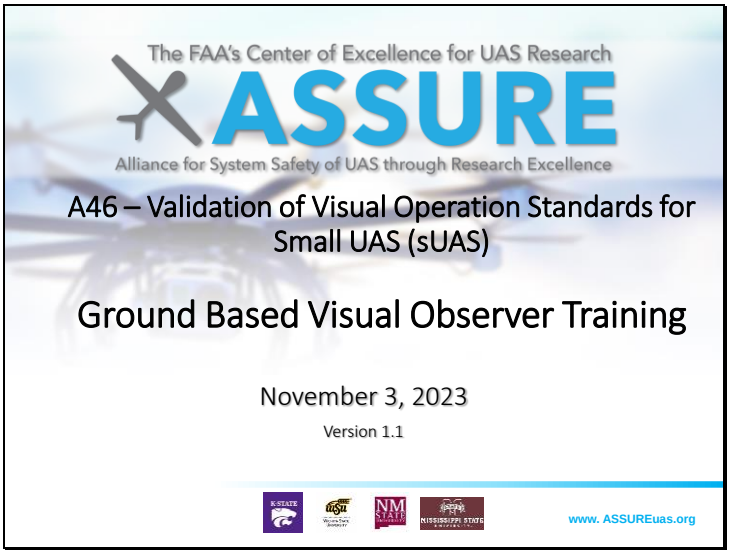
Appendix G – Extended Visual Observer Training Slides

Appendix G provides the extended version of the VO Training PowerPoint created during Task 3-5 of the A46 project. The extended VO Training PowerPoint is intended for use by the FAA for guidance on what the A46 team believes is essential information needed for a VO Training PowerPoint. Each slide is presented individually with any notes suggested for presentation provided underneath the slide.

Slide 1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A46 – Validation of Visual Operation Standards for Small UAS (sUAS)
Ground Based Visual Observer Training
November 3, 2023
Version 1.1
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Slide 2

A46 – Visual Observer Training

Purpose

- To train you to be a second set of eyes and ears to monitor airspace in which the UAS is flying for any potential collision hazard, and to maintain awareness of the position of the UAS at all times, in order to support the RPIC. The VO is a key component in airspace safety.

VO Training Goals

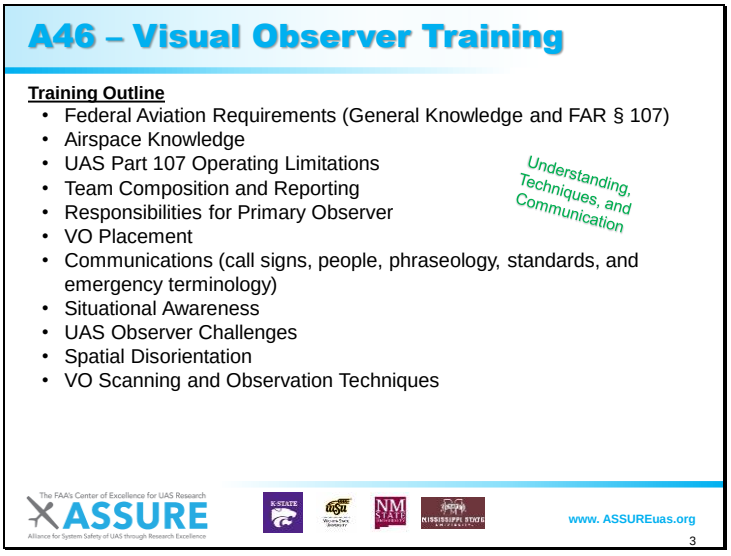
- Flight safety is paramount
- Understand the Federal Aviation Rules and Requirements for small UAS flight operations
- What to look for as a VO
- How to look – techniques for observation and being a good VO
- How to properly communicate information as a VO

Approach

- Provide an overview of the responsibilities of the VO
- Step by step walk through of the baseline knowledge needed
- Practice practical skills required

Focus is on Flight Safety!

Slide 3

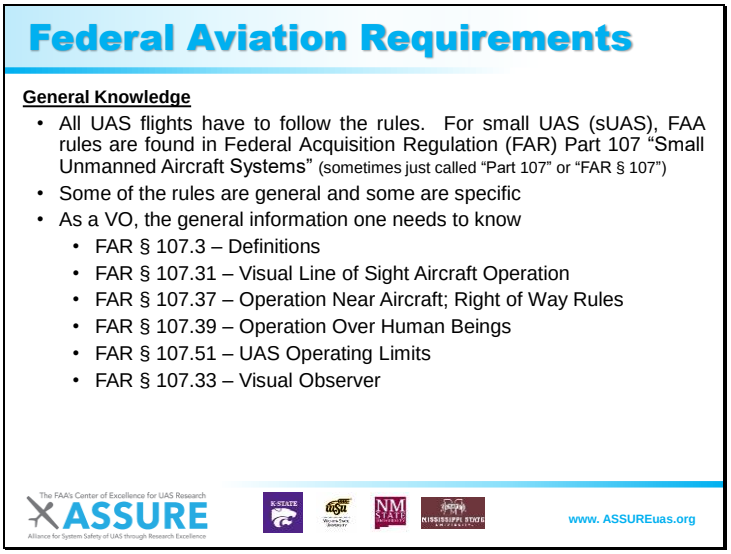


Stay high level on this slide.

Big ticket items include-

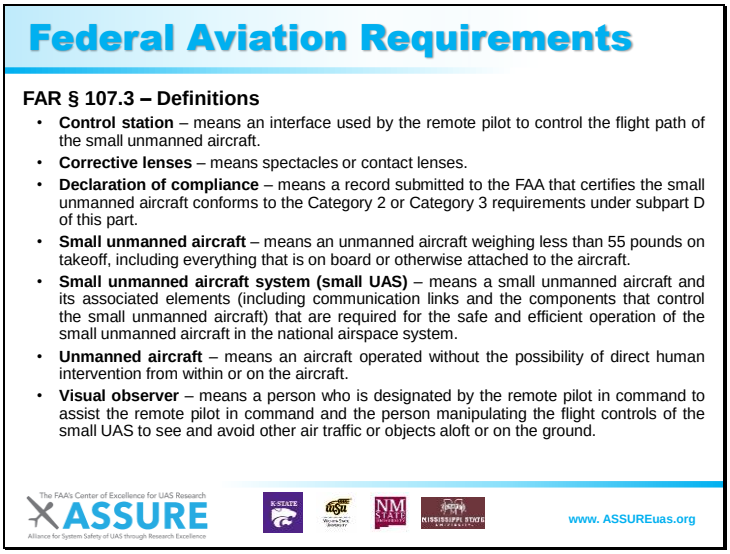
- FAA requirements
- Responsibilities for Visual Observers
- Communications
- VO scanning and observation techniques

Slide 4



Script on slide.
Additional points to mention on this slide: The FAA oversees all of aviation in the United States, including drones. Part 107 outlines the regulations for commercial use of a UAS. Over the next several slides, we will cover .

Slide 5



High level here. Main items are small unmanned aircraft system (what is UAS) and Visual Observer.

Slide 6

Script on slide. Additional notes- While this is somewhat confusing language, the key elements come from the verbiage in Part A, “PRIC, VO, and person manipulating controls must be *able* to see the UAS”. Part B specifies that *someone* in the crew must be looking at the UAS. For instance, the RPIC may be looking down at their screen while the VO maintains visual on the UAS, which would satisfy Part B. However, the RPIC must be *able* to look up and see their aircraft, which would satisfy Part A.

KSU: Inform participants that their operations will be conducted under a BVLOS waiver with no VO requirement.

Slide 7

Federal Aviation Requirements

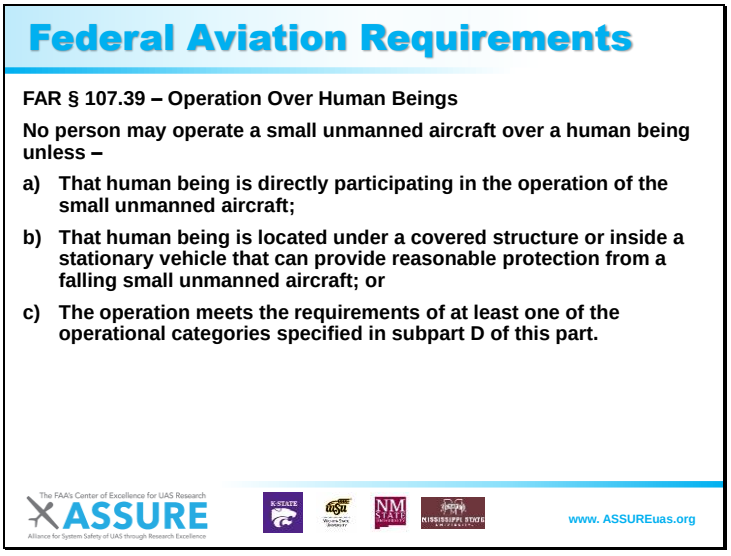
FAR § 107.37 – Operation Near Aircraft; Right of Way Rules

a) Each small unmanned aircraft must yield the right of way to all aircraft, airborne vehicles, and launch and reentry vehicles. Yielding the right of way means that the small unmanned aircraft must give way to the aircraft or vehicle and may not pass over, under, or ahead of it unless well clear.

b) No person may operate a small unmanned aircraft so close to another aircraft as to create a collision hazard.

In summary, the UAS must give the right of way to all other air traffic and must not operate in a way that creates a collision hazard with aircraft

Slide 8

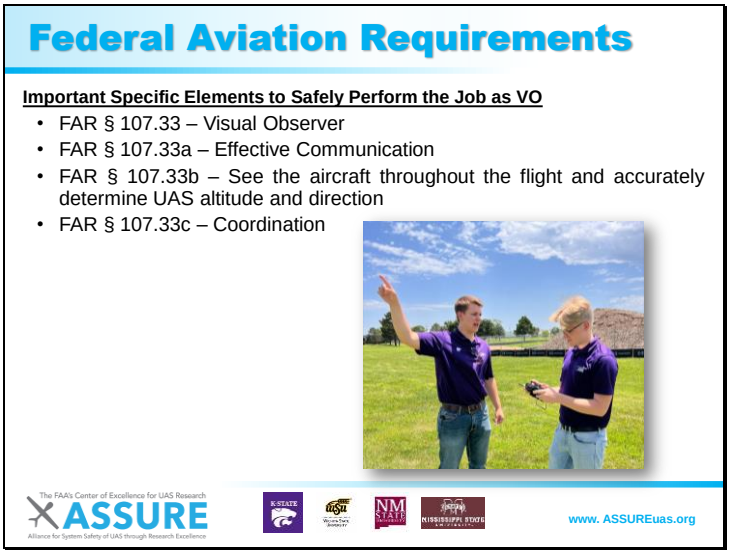


Part A- Someone participating in the operation of the UAS would be the RPIC, the VO(s), or the person manipulating the controls (flying the UAS). Just because someone has knowledge of the UAS flight (spectators at an event), doesn't make them a participant in the operation.

Part C- Falls within one of four categories described by the FAA.

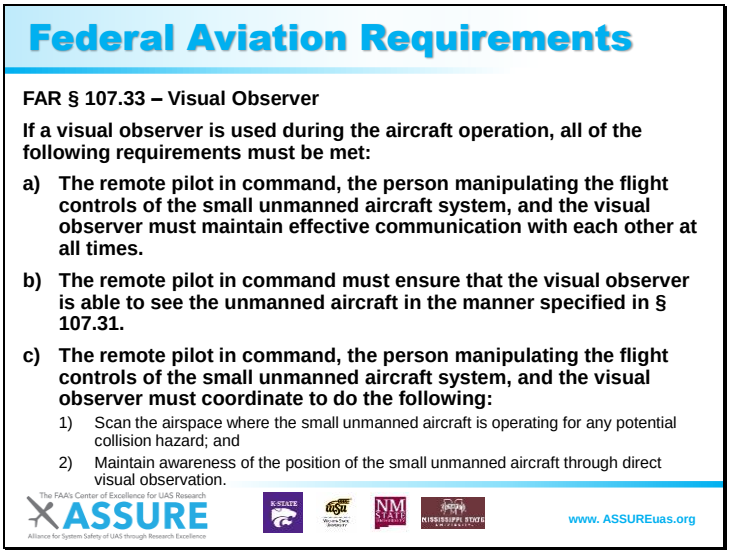
After reading the 3 subpoints of Part 107.39, summarize it with the following: The UAS may not fly over people who are not directly participating in the UAS operation and have a direct impact on the flight, unless those people are under a covered structure or within a stationary vehicle, or the aircraft being operated falls within one of four categories as outlined by the FAA.

Slide 9



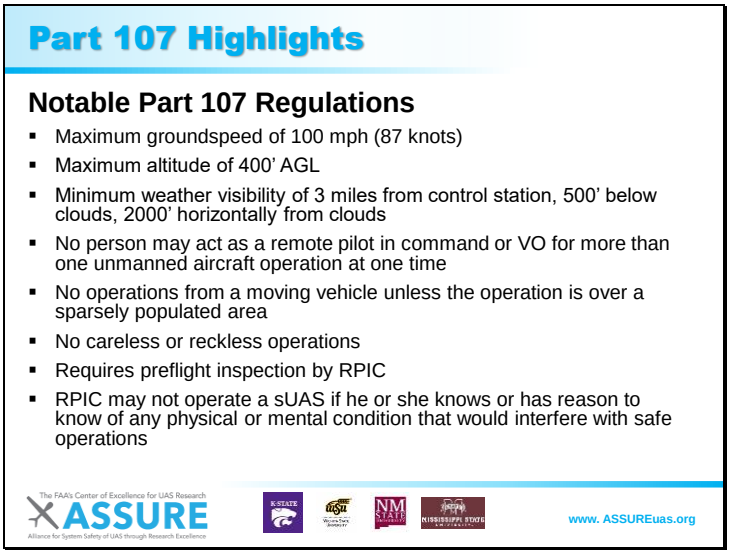
Part 107 even has its own regulation pertaining to Visual Observers. We will take a closer look at Part 107.33 in the next slide.

Slide 10



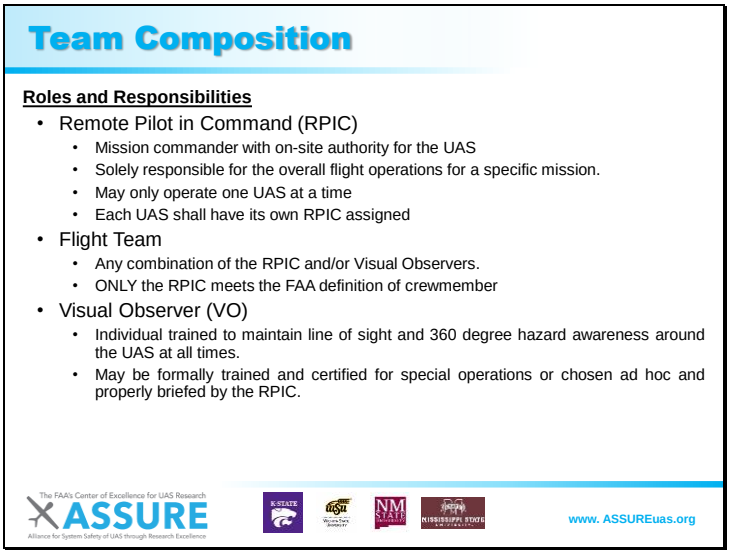
Part B: KSU will announce that their operations are being conducted under a BVLOS waiver where the VO is not able to see the UAS.

Slide 11



Additional notes: There are times when the UAS may climb above 400'. When operating within 400' of a structure, the UAS can fly 400' above that structure's uppermost limit. Additionally, when the RPIC deems it necessary in the event of an emergency, the UAS may climb above 400'.

Slide 12


Team Composition
Roles and Responsibilities
• Remote Pilot in Command (RPIC)
• Mission commander with on-site authority for the UAS
• Solely responsible for the overall flight operations for a specific mission.
• May only operate one UAS at a time
• Each UAS shall have its own RPIC assigned
• Flight Team
• Any combination of the RPIC and/or Visual Observers.
• ONLY the RPIC meets the FAA definition of crewmember
• Visual Observer (VO)
• Individual trained to maintain line of sight and 360 degree hazard awareness around the UAS at all times.
• May be formally trained and certified for special operations or chosen ad hoc and properly briefed by the RPIC.
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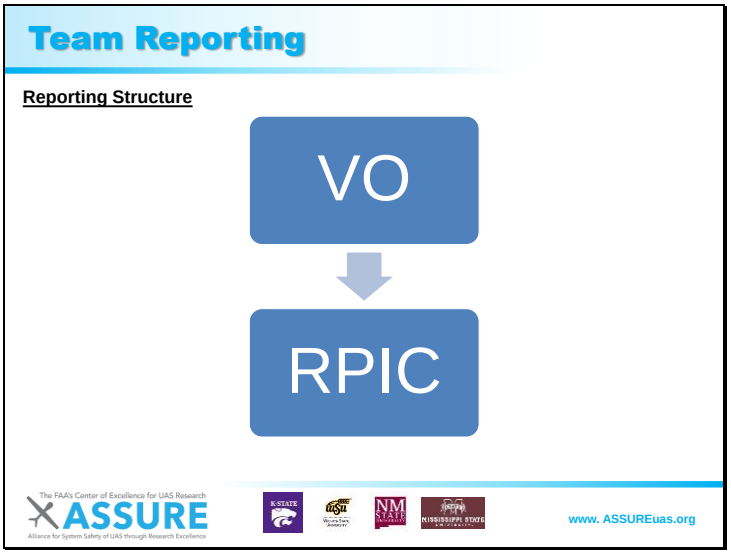
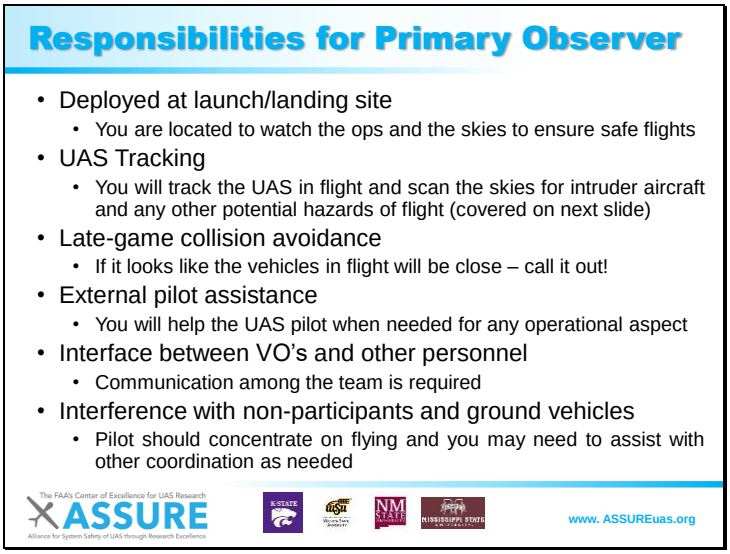
Slide 13



Any hazards or observations should be reported directly to the RPIC.

Slide 14



UAS Tracking- We'll discuss this in the next two slides.

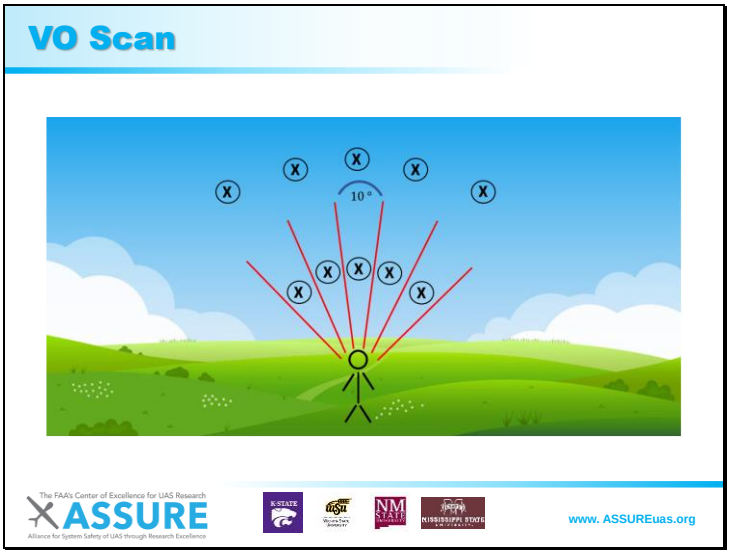
Late-game collision avoidance- The worst thing a VO could do, is doing nothing at all! Even if you are unsure whether or not something is a potential hazard, call it out.

Slide 15

VO Scanning Techniques

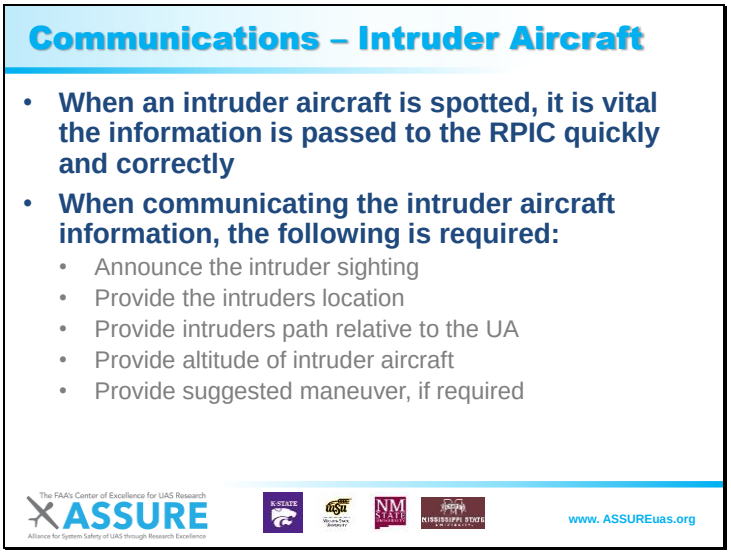
- Various scanning techniques can be used
- Some have different applicability to the particular mission
- For these missions, you will use a sector scan approach
- Scanning Technique
  - 10-degree sectors through the area of responsibility
  - Horizon to operating altitude
  - Work step by step through assigned sector and repeat
  - If VO hears a potential intruder, the visual scan should cease and VO should look in the direction of the sound
  - If aircraft cannot be acquired, visual scan may commence again
- Image on next slide

Slide 16



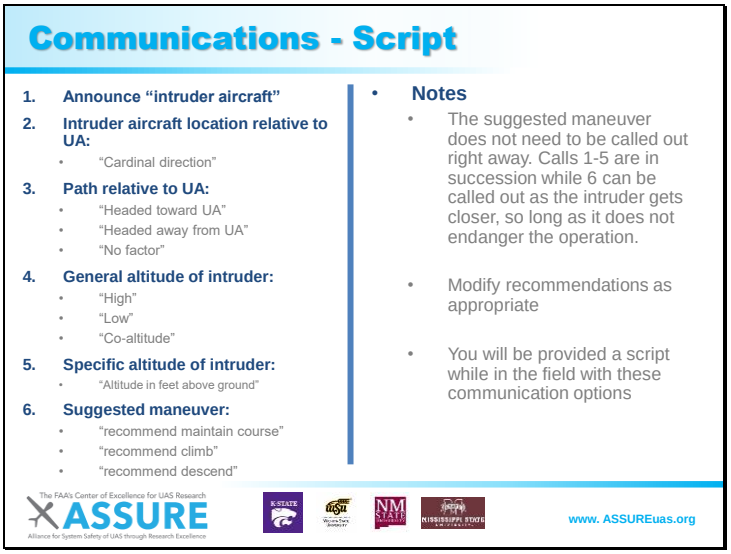
- 10-degree sectors through the area of responsibility.
- Horizon to operating altitude (follow the x's).
- Work step by step through assigned sector and repeat.
- If VO hears a potential intruder, the visual scan should cease, and VO should look in the direction of the sound.
- If aircraft cannot be acquired, visual scan may commence again.

Slide 17



Example of this flow is on the next slide.

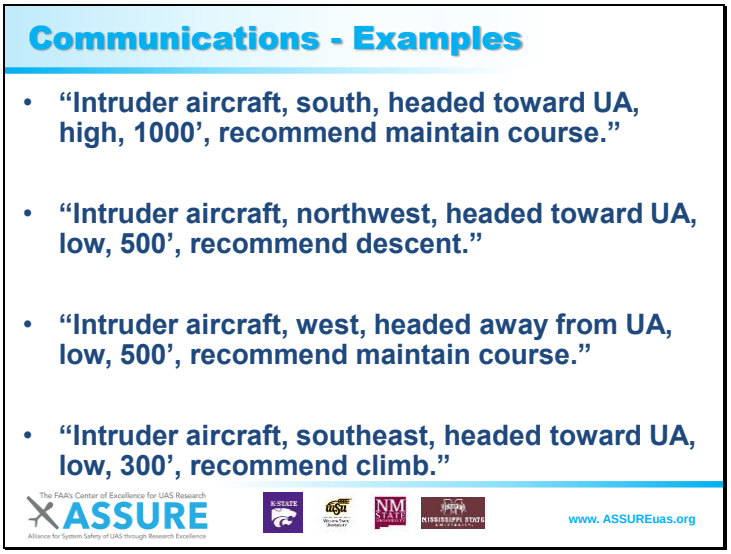
Slide 18



Script on slide. Start on the left side and go through the six steps. For step 3, describe a "No factor." What happens when you see an aircraft that appears to be at several thousand feet? Often times a callout is not necessary in these conditions. However, if you believe the RPIC may hear the aircraft but it is still well outside of the operating area or well above the operating area, a "traffic no factor" call would be reasonable.

For the last "note," inform the participants that the script will follow this same order to assist them with callouts and decisions.

Slide 19


Communications - Examples
• "Intruder aircraft, south, headed toward UA, high, 1000', recommend maintain course."
• "Intruder aircraft, northwest, headed toward UA, low, 500', recommend descent."
• "Intruder aircraft, west, headed away from UA, low, 500', recommend maintain course."
• "Intruder aircraft, southeast, headed toward UA, low, 300', recommend climb."
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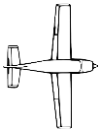
Slide 20

Communications – Practice

Alt: 400’



Alt: 400’

Script:

1.	Announce the Intruder:	“Intruder Aircraft”
2.	Location relative to UA:	“West”
3.	Path relative to UA:	“Headed toward UA”
4.	General altitude relative to UA:	“Co-altitude”
5.	Specific altitude relative to UA:	“400 feet”
6.	Suggested maneuver:	“Recommend descent”

“Intruder aircraft west headed toward UA, co-altitude, 400 feet…recommend descent.”

RPIC/VO

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Slide 21

Communications – Practice

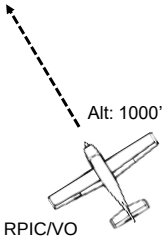
Alt: 400’

Recommend descent could be appropriate as well

Script:

1. Announce the Intruder:	“Intruder Aircraft”
2. Location relative to UA:	“Southeast”
3. Path relative to UA:	“Headed toward UA”
4. General altitude relative to UA:	“High”
5. Specific altitude relative to UA:	“1000 feet”
6. Suggested maneuver:	“Maintain course”

“Intruder aircraft southeast headed toward UA, high, 1000 feet…recommend maintain course.”



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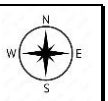
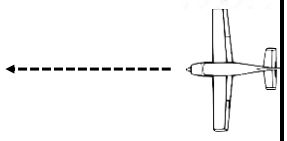
Slide 22

Communications – Practice





Alt: 400’

Script:

1.	Announce the Intruder:	“Intruder Aircraft”
2.	Location relative to UA:	“North”
3.	Path relative to UA:	“No factor”
4.	General altitude relative to UA:	“Co-altitude”
5.	Specific altitude relative to UA:	“400 feet”
6.	Suggested maneuver:	“Maintain course”

Alt: 400’

“Intruder aircraft north heading away, no factor, recommend maintain course.”

RPIC/VO

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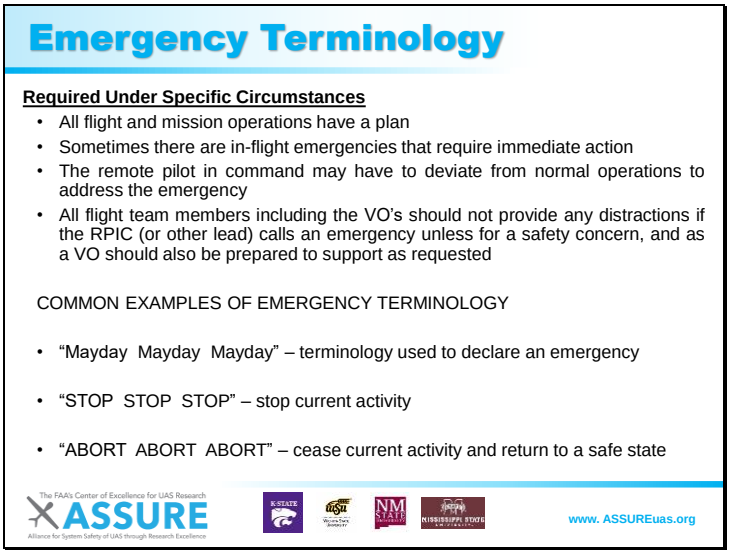
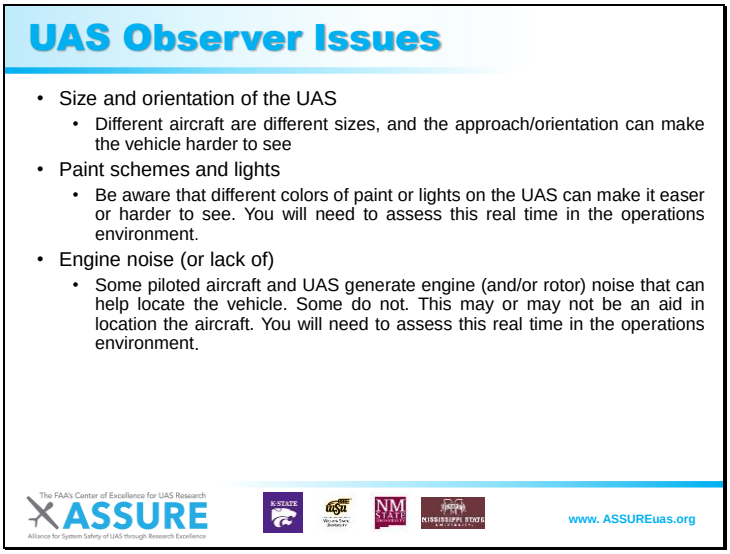
Slide 23



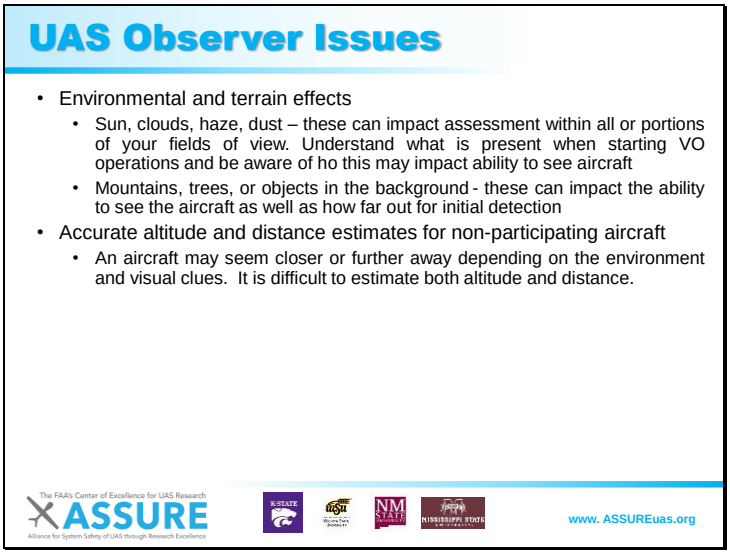
In the event of a non-simulated emergency, the RPIC will inform the crew and proceed with emergency procedures.

Slide 24



For KSU, simulated UAS will be BVLOS so this slide may be covered quickly.

Slide 25


UAS Observer Issues
• Environmental and terrain effects
• Sun, clouds, haze, dust – these can impact assessment within all or portions of your fields of view. Understand what is present when starting VO operations and be aware of ho this may impact ability to see aircraft
• Mountains, trees, or objects in the background - these can impact the ability to see the aircraft as well as how far out for initial detection
• Accurate altitude and distance estimates for non-participating aircraft
• An aircraft may seem closer or further away depending on the environment and visual clues. It is difficult to estimate both altitude and distance.
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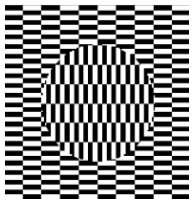
Slide 26

Spatial Disorientation (cont.)

Spatial Disorientation

- When the brain misinterprets its reference, spatial disorientation can occur.
- You need to recognize where these misinterpretations are most likely to occur and to be prepared for such instances.



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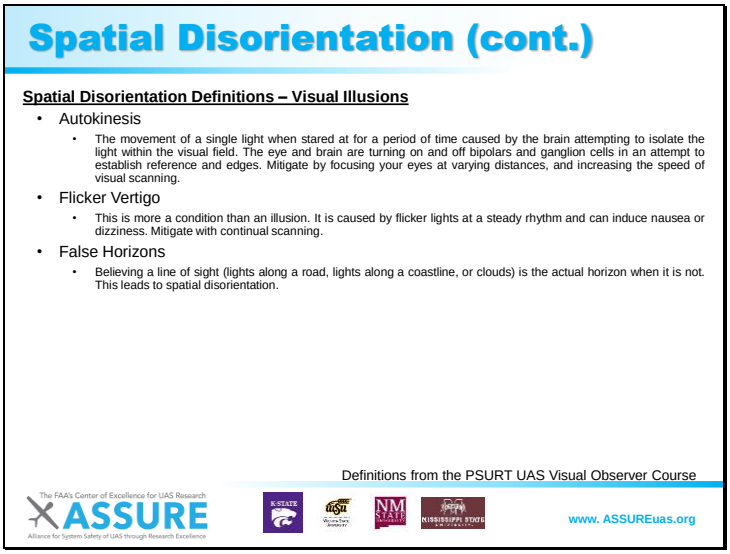
Spatial Disorientation can be summarized by “visual illusions.” Picture represents an example of spatial disorientation / visual illusions.

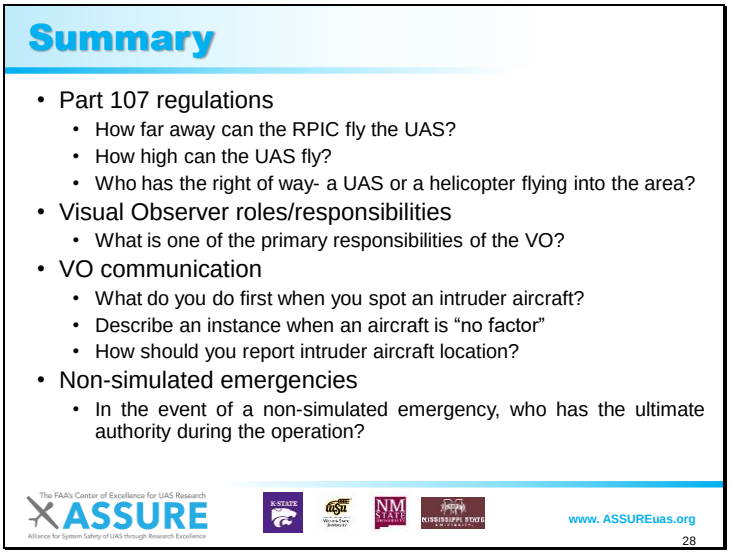
Slide 27



High level only. Many of these will not be experienced by the VO.

Autokinesis should be covered in its entirety.

Slide 28



Regulations-
- Visual line of sight (KSU operating under BVLOS waiver).
- 400' AGL unless flown within 400' of a structure and then not more than 400' above the uppermost limit of the structure.
- All aircraft have right of way over the UAS.

Visual Observer responsibilities (potential answers)-
- Scan the airspace for any intruders.
- Communicate with the RPIC about any hazards to the flight.
- Maintain visual with the UAS.
- Interference with non-participants and ground vehicles.

Communications-
- Announce the intruder to the RPIC/crew.
- An aircraft that is in the vicinity of the operation but does not require maneuvering by the UAS.
- Cardinal direction, movement direction relative to the UAS.

Non-simulated emergencies-
- RPIC will use emergency procedures and direct crew as needed.