

Zephyr Drone Simulator



Joseph M. Burgett, PhD
Associate Professor

Introduction

- Joe Burgett, PhD
 - Clemson Professor
 - General Contractor
 - Part 107 pilot
 - Training for SCDOT
 - Research: Applied Drone Technology



Nieri Family Department of
**CONSTRUCTION SCIENCE
AND MANAGEMENT**
Clemson University



Value of a Simulator

- Convenient
- Low cost
 - Equipment, time, and effort
- Consistent environmental conditions
 - Testing and monitoring improvement
- Free!
 - FHWA STIC incentive funds
 - Zephyr Drone Simulator



Web-based Download



CONNECTI...
Client



ContextCa...
Engine



ContextCa...
Master



ContextCa...
Editor CO...



ContextCa...
Viewer



Little Arms
Launcher



FLIR Thermal
Studio



FLIR for class



DJI Thermal
Analysis Tool





1.7.6

jmburg@clemson.edu

Login

Exit



Reset
Password

Select a Drone

Zephyr Drones



Phantom 3



Phantom 4



Inspire 1



Inspire 2



3DR Solo



Syma X5C



X-Star



Bebop 2



Mavic



Typhoon



Titan



AG-6A



HD Racer



Matrice



Phantom 4

The fourth generation of the Phantom series from DJI. This quadcopter includes GPS, 3-axis gimbal, and forward optical collision avoidance. Released in 2016, the Phantom 4 features a top speed of 20 m/s and flight time of around 28 min.

Change Module

Select Drone



 Search

General



Tutorial



Basic Training



The Hill



Obstacle
Course



Community
Park



Parking Lot



Drone Racing



Yard



Flight Path
Practice



Kids with
Drones



NIST Training
Course



NIST Testing
Course

Industry-Specific Scenarios



Tower
Inspection



Skip Fredricks
Edition



Bridge
Inspection



Tutorial

The tutorial for Zephyr. Start here if you are a beginner.

Load Scenario

Select a Module

Monopole



1
Columns
Around the
Tower



2
Circle the
Tower



3
Columns Around the
Tower
(LOS Signal Feed
Loss)



4
Circle the Tower
(LOS Signal
Feed Loss)



5
Columns Around the
Tower
(Random Signal
Feed Loss)



6
Circle the Tower
(Random Signal
Feed Loss)

Lattice



1
Columns
Around the
Tower



2
Circle the
Tower



3
Columns Around the
Tower
(LOS Signal Feed
Loss)



4
Circle the Tower
(LOS Signal
Feed Loss)



5
Columns Around the
Tower
(Random Signal
Feed Loss)



6
Circle the Tower
(Random Signal
Feed Loss)

Guyed



1
Columns
Around the
Tower



2
Circle the
Tower



3
Columns Around the
Tower
(LOS Signal Feed
Loss)



4
Circle the Tower
(LOS Signal
Feed Loss)



5
Columns Around the
Tower
(Random Signal
Feed Loss)



6
Circle the Tower
(Random Signal
Feed Loss)



Circle the Tower

Best Score: N/A

Grade: N/A

Select Module

1.0

Fly up and face the tower

1.1

Circle the tower counter clockwise while continuing to face it

2.0

Land here and power off

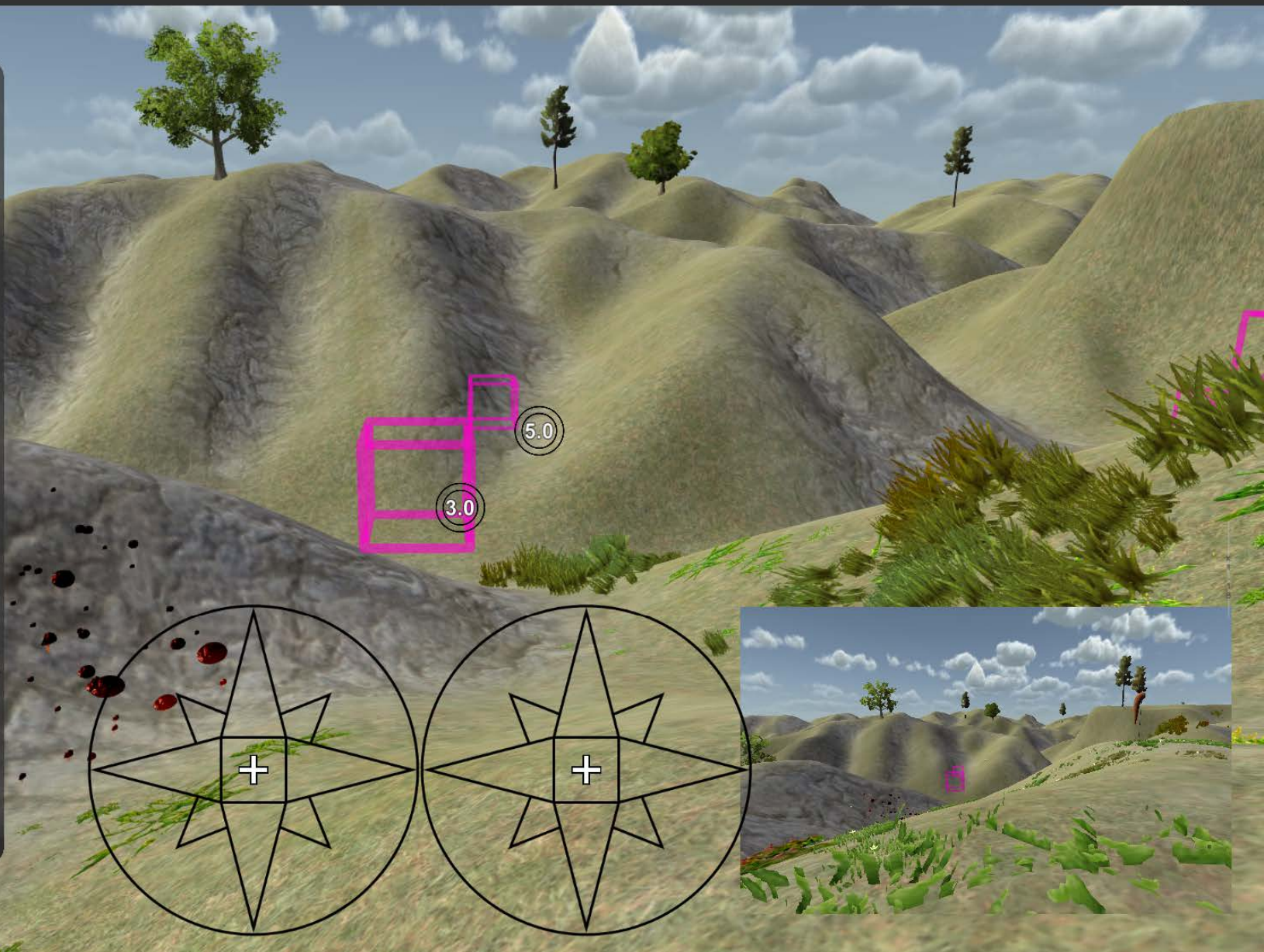
▲ Collapse


▼ Expand



GPS CM IOCOff H West D 0088.47 FT  00  00 S: 0000.07 MPH A 0010.40 FT  98% 

- 1.0 Explore to find the mushrooms. Not all objectives need to be completed. Do not break line of sight!
- 2.0
- 3.0
- 3.1 Collect a mushroom sample
- 5.0
- 6.0
- 7.0 Land and power off





 Collapse



 Expand

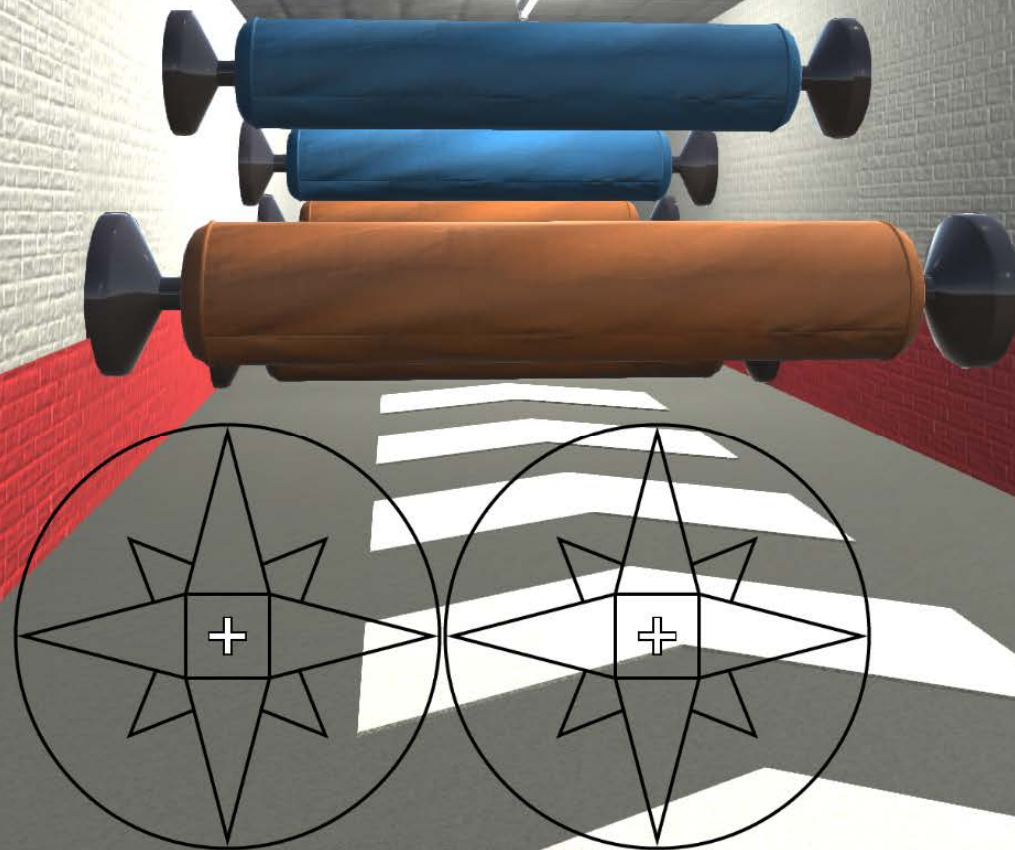
GPS CM IOCOff H East D 0239.70 FT  00  00 S: 0000.03 MPH A 0010.93 FT  97% 

00:34:82

 **Timed Race**

 Complete the obstacle course

 Collapse  Expand



GPS CM IOCOff H East D 0188.42 FT  00  01 S: 0000.08 MPH A 0011.38 FT  93% 

- 1.0 Playground Challenge
- 2.0 Slide
- 3.0 See-saw 1
- 4.0 See-saw 2
- 5.0 Dome Outside
- 6.0 Monkey Bars

▲ Collapse ▼ Expand



GPS CM IOCOff H South D 0000.19 FT  00  00 S: 0000.06 MPH A 0011.55 FT  99% 

1.0 Zig-zag

1.1

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9







1.10


 Collapse


 Expand

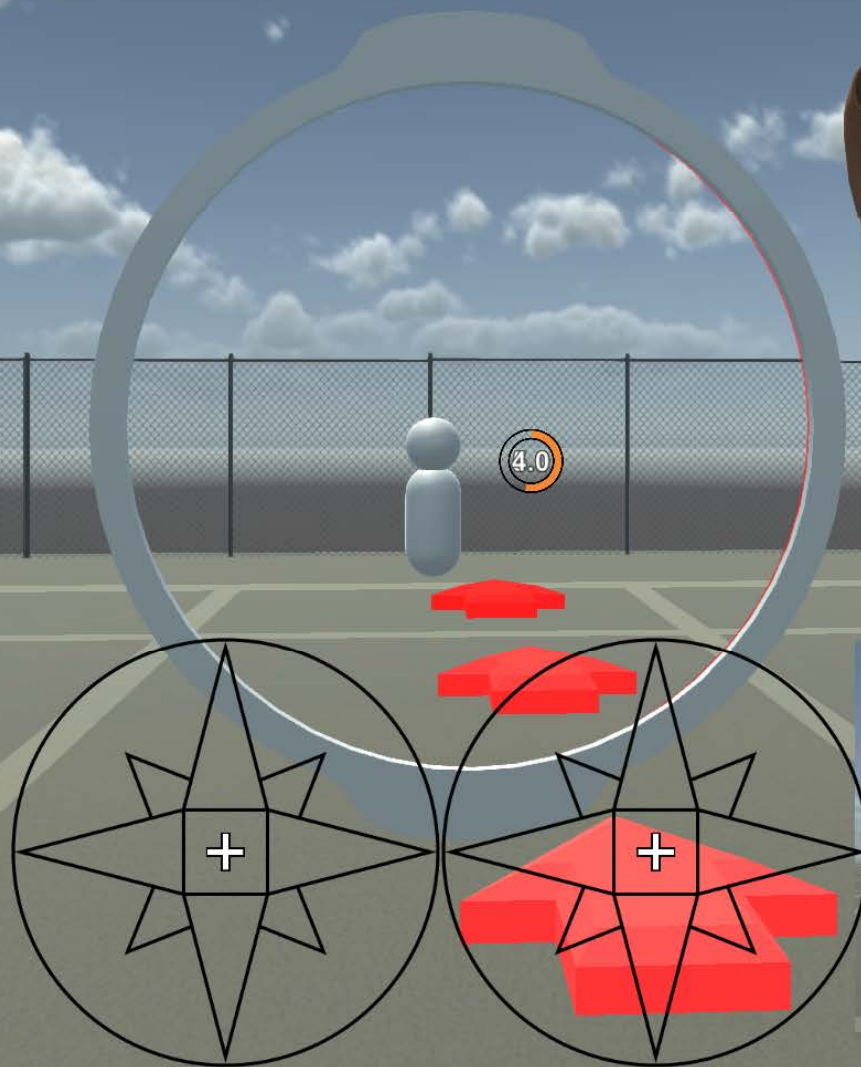


GPS CM IOCOff H South D 0014.71 FT  00  00 S: 0000.03 MPH A 0006.27 FT  99% 

-  Take off and hover in the indicated spot at 6.5ft.
-  Fly straight out following the arrows closely for 10 meters.
-  Hold a hover at 6.5ft in the center of the ring.
-  Fly straight back following the arrows closely for 10 meters.
-  Hold a hover at 6.5ft in the center of the ring.
-  Land the drone as closely as you can to the center of the starting point.

 Collapse

 Expand





 Search

General



Tutorial



Basic Training



The Hill



Obstacle
Course



Community
Park



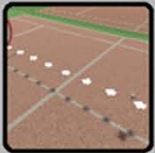
Parking Lot



Drone Racing



Yard



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Practice



Kids with
Drones



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Course



NIST Testing
Course

Industry-Specific Scenarios



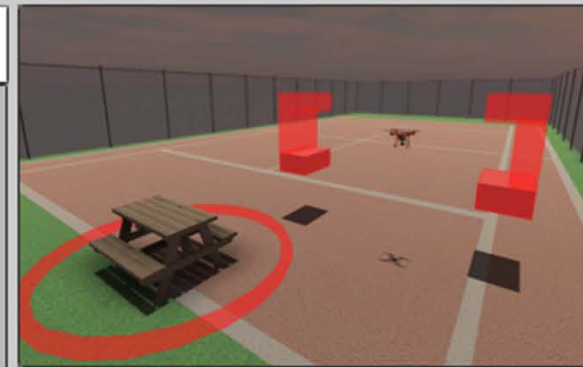
Tower
Inspection



Skip Fredricks
Edition



Bridge
Inspection



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Load Scenario



Select a Module

 Search

Free Flight & Tutorial



1



2

Free Flight Bridge Tutorial

Bridge Inspection



1



2



3



4



5

Bridge Module One Bridge Module Two Bridge Module Three Bridge Module Four Bridge Module Five

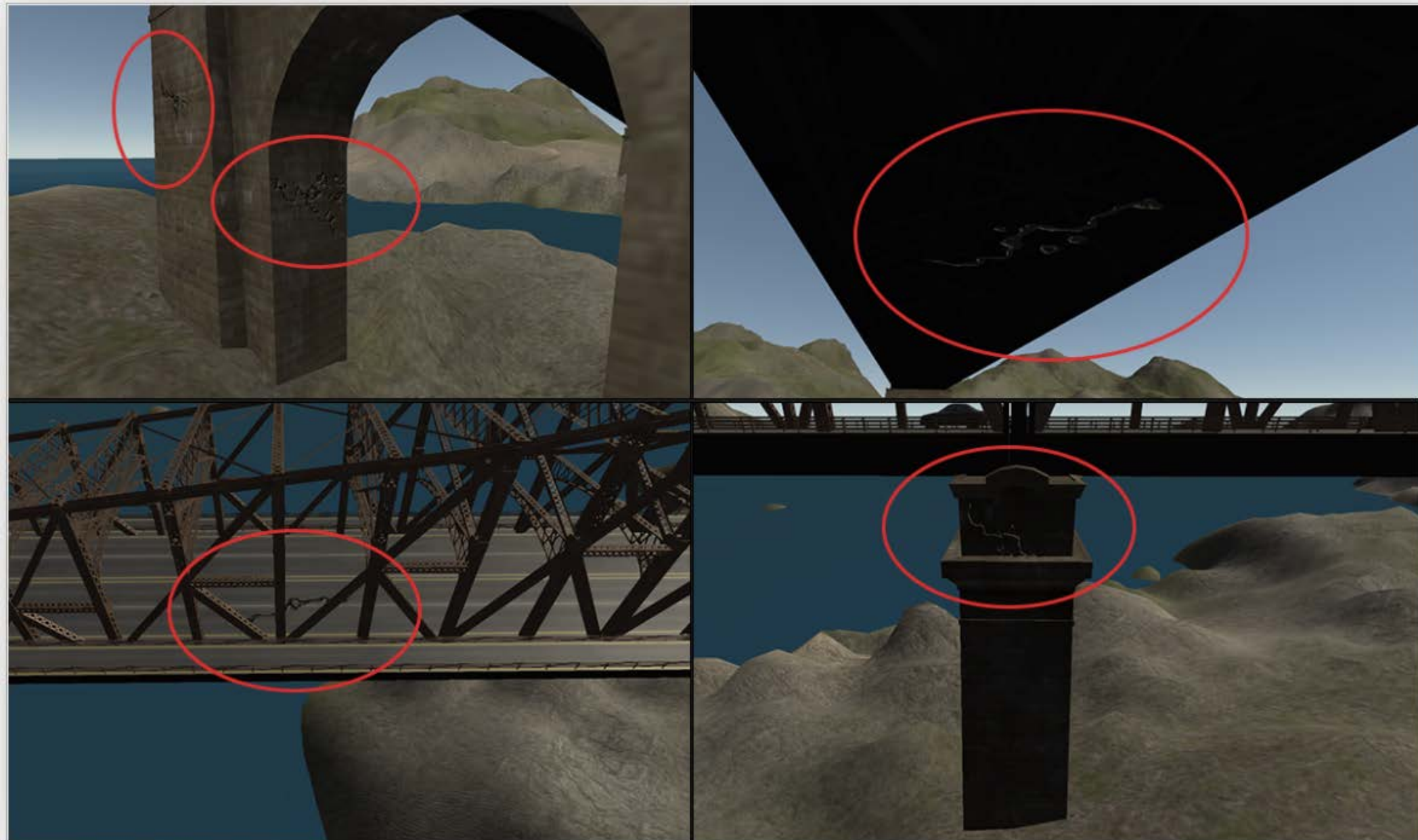


Free Flight

Best Score: {0}

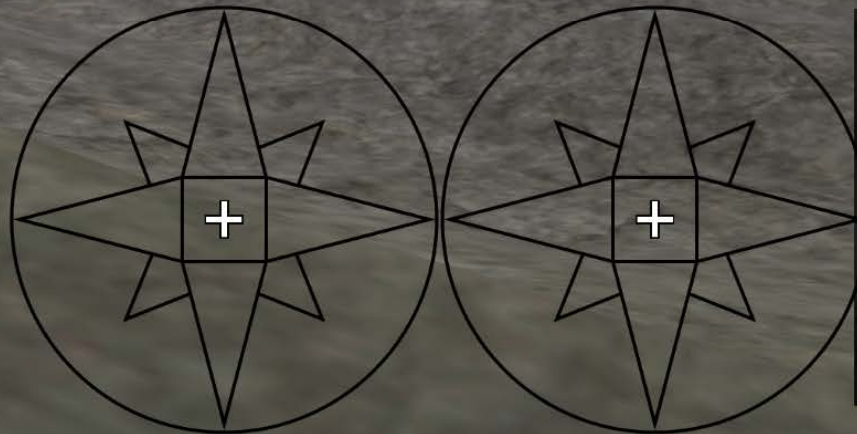
Grade: {1}

Select Module



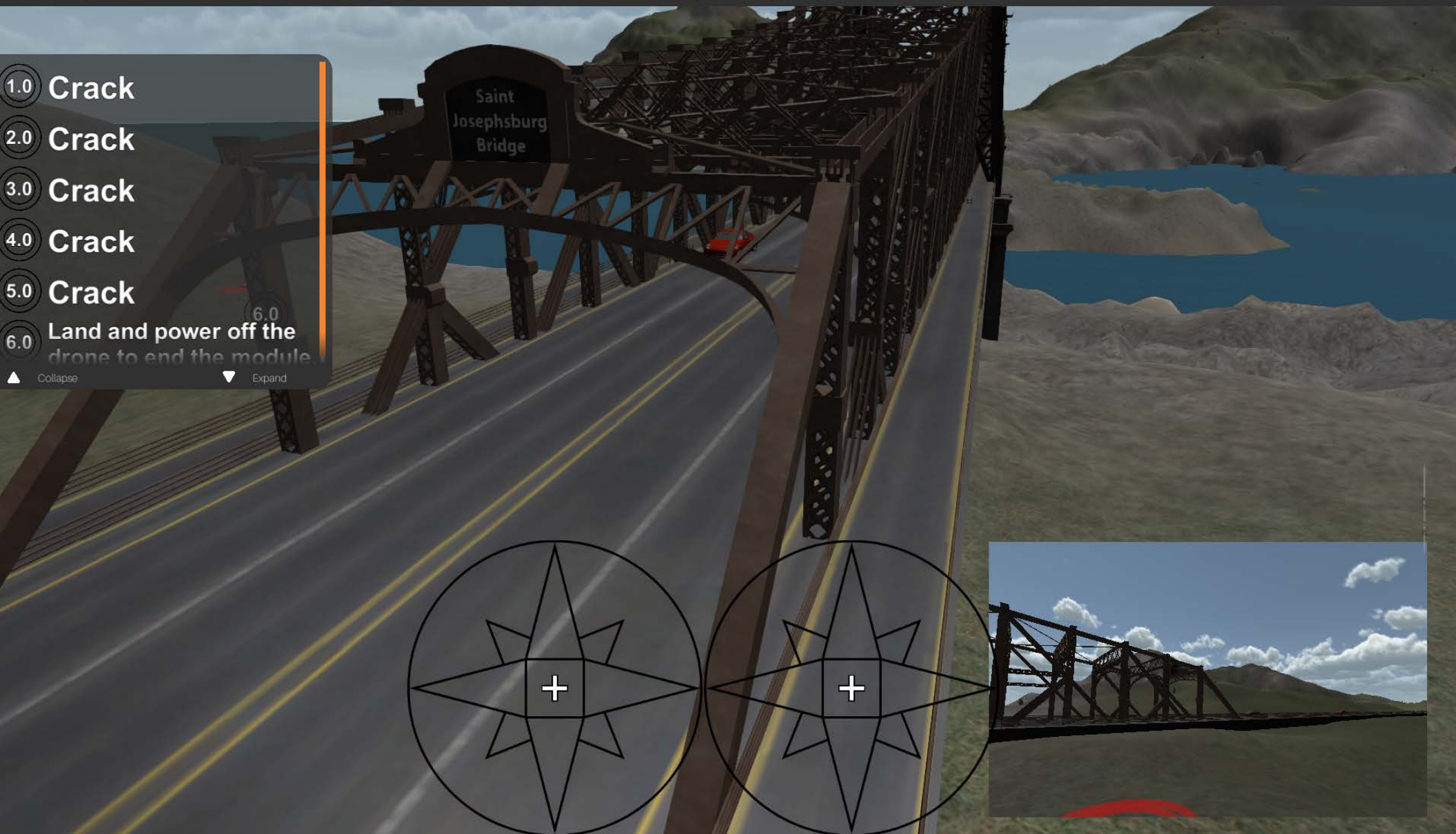
GPS CM IOCOff H East D 0254.89 FT  00  00 S: 0000.09 MPH A 0022.30 FT  97% 

- 1.0 Crack
 - 2.0 Crack
 - 3.0 Crack
 - 4.0 Crack
 - 5.0 Crack
 - 6.0 Land and power off the drone to end the module.
-  Collapse  Expand





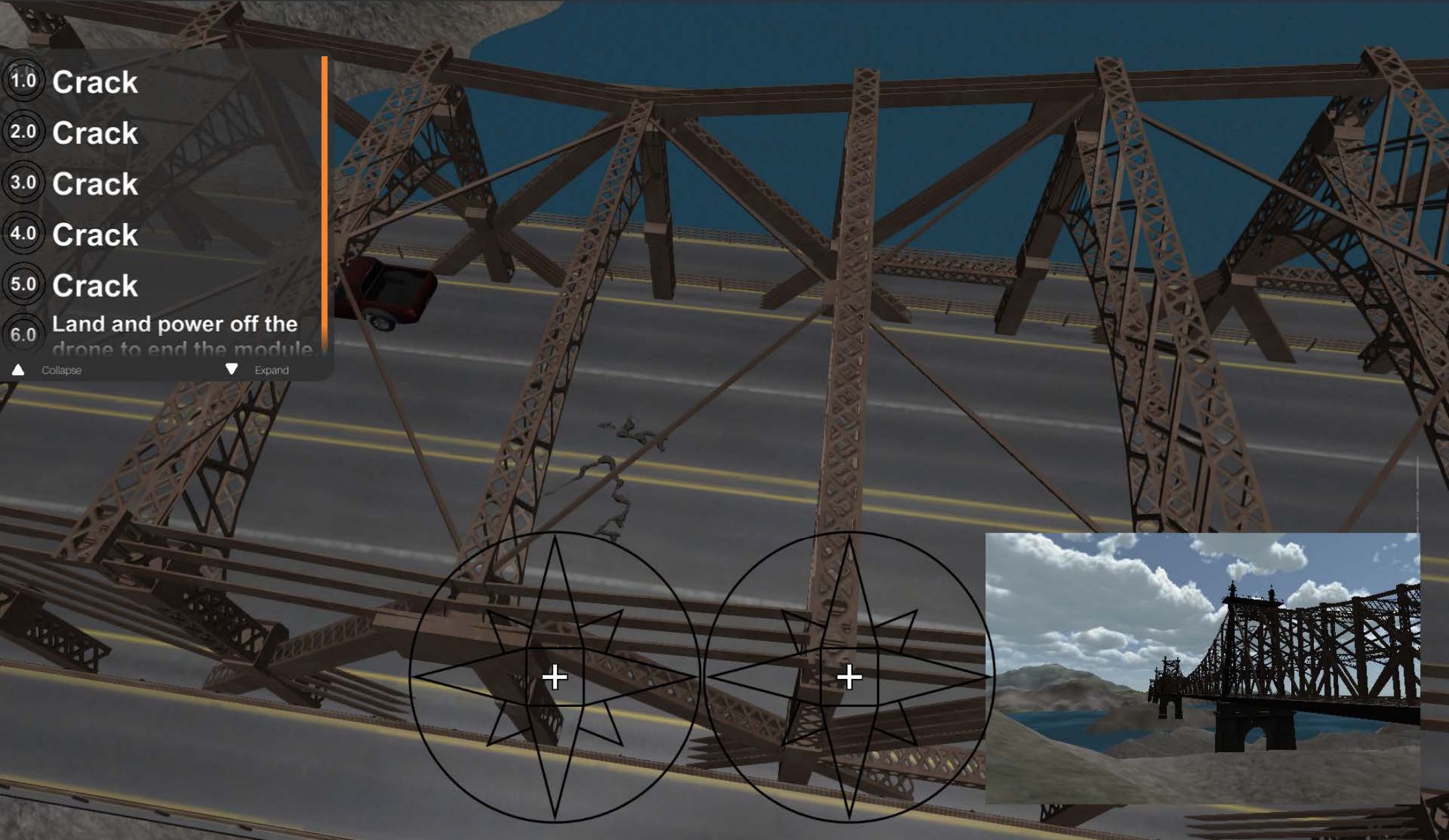
GPS CM IOCOff H North D 0197.62 FT  00  00 S: 0000.03 MPH A 0036.47 FT  94% 

- 1.0 Crack
 - 2.0 Crack
 - 3.0 Crack
 - 4.0 Crack
 - 5.0 Crack
 - 6.0 Land and power off the drone to end the module.
- ▲ Collapse ▼ Expand



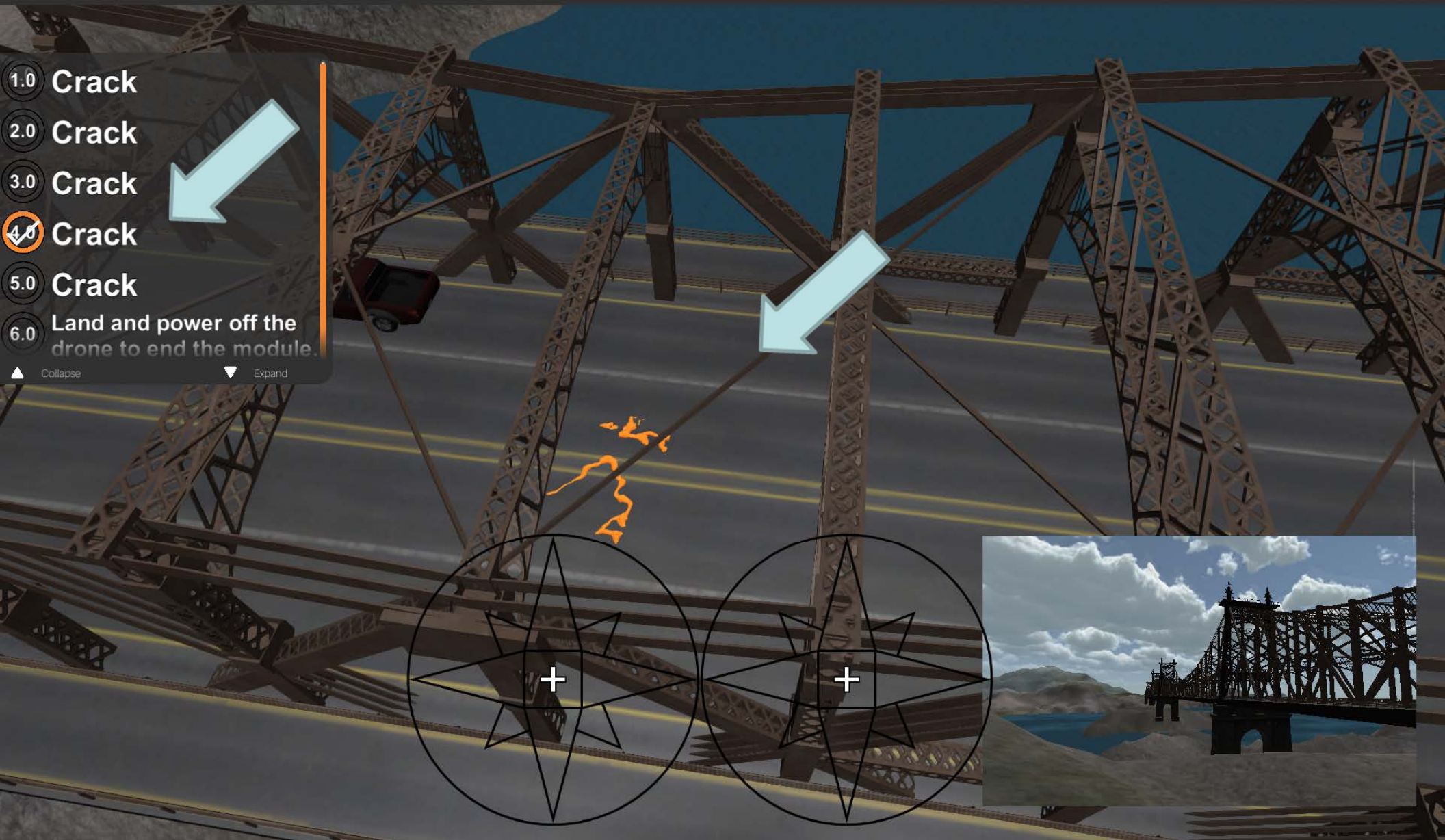
GPS CM IOCOff H West D 0671.50 FT  00  00 S: 0000.03 MPH A 0075.22 FT  91% 

- 1.0 Crack
 - 2.0 Crack
 - 3.0 Crack
 - 4.0 Crack
 - 5.0 Crack
 - 6.0 Land and power off the drone to end the module.
-  Collapse  Expand



GPS CM IOCOff H West D 0671.28 FT 00 00 S: 0000.03 MPH A 0075.21 FT 90%

- 1.0 Crack
 - 2.0 Crack
 - 3.0 Crack
 - 4.0 Crack
 - 5.0 Crack
 - 6.0 Land and power off the drone to end the module.
- ▲ Collapse ▼ Expand





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Industry-Specific Scenarios



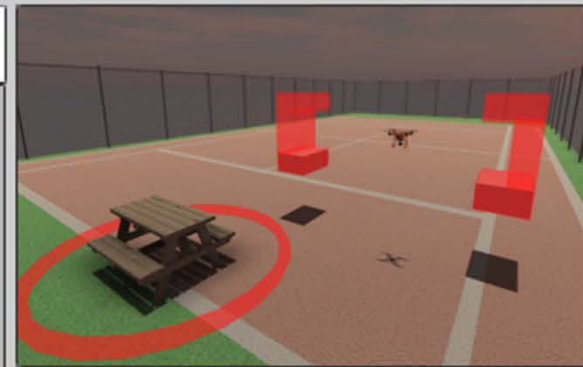
Tower
Inspection



Skip Fredricks
Edition



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Inspection



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Load Scenario

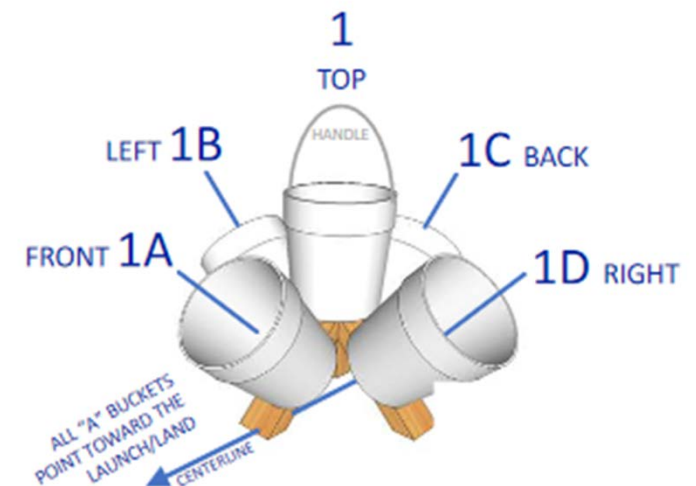
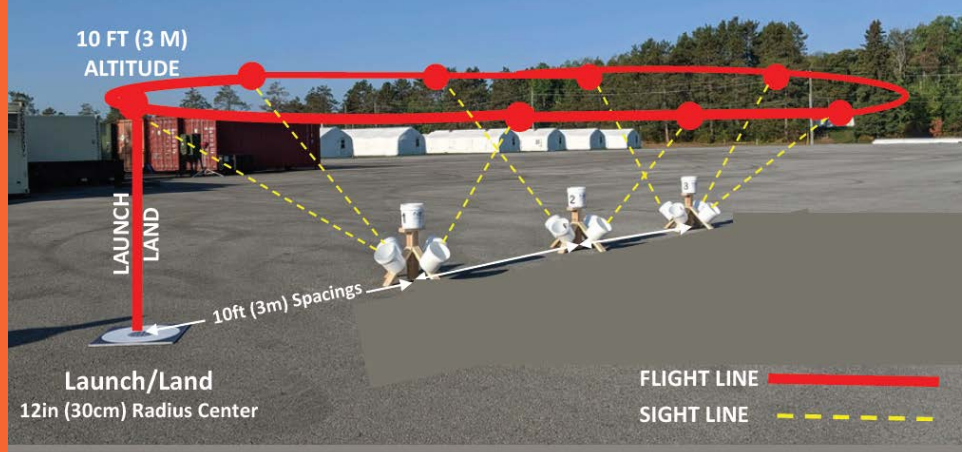
Standard Test Methods for Small Unmanned Aircraft Systems

Basic Proficiency Evaluation for Remote Pilots

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

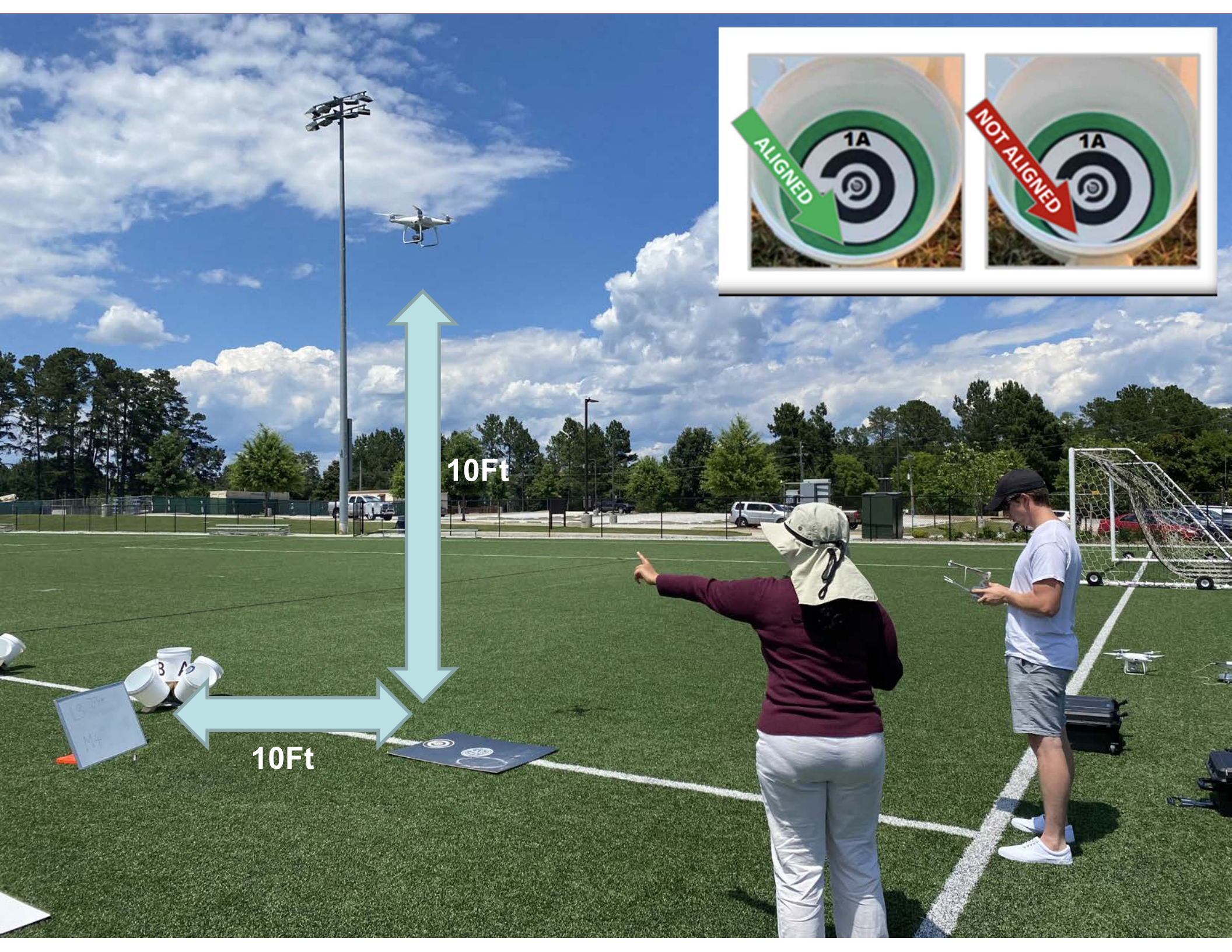


TRAVERSE TEST Right and Left Ovals Around All Three Bucket Stands









Select a Module

10ft Testing



Ten Foot
Position Test



Ten Foot
Traversal Test



Ten Foot
Orbital Test



Ten Foot Spiral
Test



Ten Foot
Recon Test

20ft Testing



Twenty Foot
Position Test



Twenty Foot
Traversal Test



Twenty Foot
Orbital Test



Twenty Foot
Spiral Test



Twenty Foot
Recon Test

30ft Testing



Thirty Foot
Position Test



Twenty Foot
Traversal Test



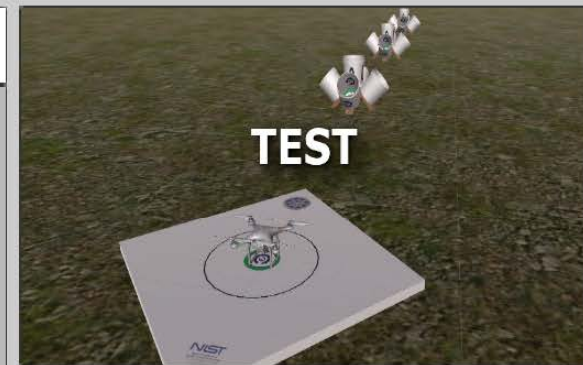
Thirty Foot
Orbital Test



Thirty Foot
Spiral Test



Thirty Foot
Recon Test



Ten Foot Position Test

Complete the NIST 10ft Positional lane.

Target S Altitude: 10ft(7-13ft)

Target Time: < 5:00

Best Score: {0}

Grade: {1}

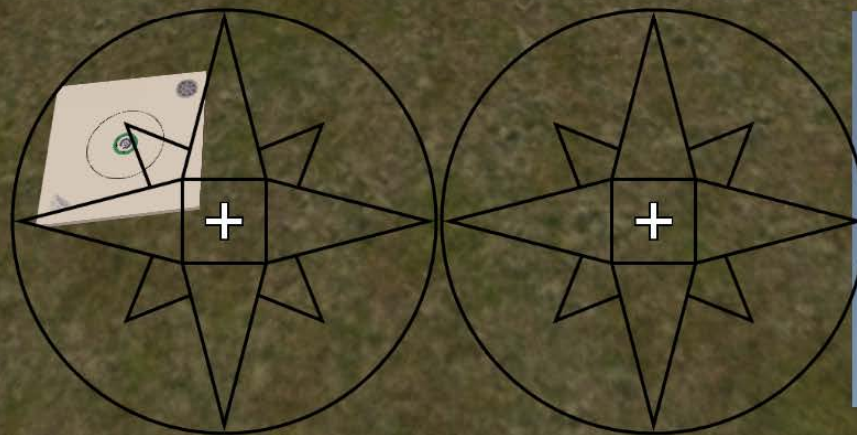
Select Module

GPS CM IOCOff H North D 0018.15 FT  00  00 S: 0000.04 MPH A 0026.67 FT  98% 

00:30:24

- 1.0 1. Align and capture target 1
- 2.0 2. Align and capture target 1A
- 3.0 3. Align and capture target 1B
- 4.0 4. Align and capture target 1C
- 5.0 5. Align and capture target 1D
- 6.0 6. Align and capture target 2
- 7.0 7. Align and capture target 2A
- 8.0 8. Align and capture target 2D
- 9.0 9. Align and capture

 Collapse  Expand





FAQ News Shop



Get Zephyr

Logout



Joe Burgett
Institution Admin



Clemson University

HOME

MANAGE

REPORTS

ORDERS

DOWNLOAD ZEPHYR

DOWNLOAD

REQUEST REPORT

jmburg@clemson.edu



No Course

NIST Test

No Module

CLEAR

Show Reports with Score of "0" ☒

Show Uncompleted Reports ☒

Show Highest Score for Each Module ☒

Select a User

Brock, Tyler

tbrock@scetv.org

Brock, Jeremy

jbrock@safetymedic.net

browning, doug

dbrowning@walshgroup.com

Bryan, Bryan

bryan.jackson@wsp.com

Burch, Joe

jburch@horrycountyschools.net

Burgett, Joe

jmburg@clemson.edu

Burgett-TEST, Joe

joe.burgett@sciduc.org

Burnett, Robert

robert.burnett@uig.net

Byrd, Bethany

babyrd@clemson.edu

Byron, Byron

bbragg@surveyworks.com

Carlson, Scott

Joe Burgett

Reports: 39

No.	Date	Scene	Module	Score	View
1	08/21/2021 06:12:28 AM	NIST Test	Ten Foot Position Test	20 / 20	
2	08/03/2021 03:28:23 PM	NIST Test	Thirty Foot Recon Test	20 / 20	
3	08/03/2021 09:19:19 AM	NIST Test	Twenty Foot Traversal Test	20 / 20	
4	08/03/2021 09:16:24 AM	NIST Test	Twenty Foot Position Test	20 / 20	
5	08/03/2021 09:13:49 AM	NIST Test	Ten Foot Recon Test	20 / 20	
6	08/03/2021 09:00:50 AM	NIST Test	Ten Foot Orbital Test	20 / 20	
7	01/16/2022 03:26:19 PM	NIST Test	Ten Foot Traversal Test	19 / 20	
8	09/20/2021 08:28:24 AM	NIST Test	Thirty Foot Position Test	18 / 20	
9	08/03/2021 03:14:32 PM	NIST Test	Twenty Foot Recon Test	18 / 20	
10	08/03/2021 03:11:09 PM	NIST Test	Twenty Foot Spiral Test	18 / 20	
11	08/03/2021 09:06:43 AM	NIST Test	Ten Foot Spiral Test	18 / 20	
12	08/03/2021 03:20:47 PM	NIST Test	Thirty Foot Orbital Test	16 / 20	
13	08/03/2021 03:23:12 PM	NIST Test	Thirty Foot Spiral Test	12 / 20	
14	08/03/2021 09:25:32 AM	NIST Test	Twenty Foot Orbital Test	11 / 20	

Closing Comments

- Commissioned Study
 - Pilot test a FHWA Flight Proficiency Certification
 - Participants / Steering Committee Members
- Access to software
 - 10 licenses to all state DOTs at no cost
 - Email JMBurg@clemson.edu



Questions



DRONE COURSE FOR PROFESSIONALS
THROUGH CLEMSON UNIVERSITY

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www.clemsondrone.com