Aerial Drone Tests and Scorable Scenarios for Evaluating System Capabilities and Remote Pilot Proficiency in Level 3 Open, Level 4 Obstructed, and Level 5 Confined Environments

Developed by the National Institute of Standards and Technology

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Level 5 Confined Environments

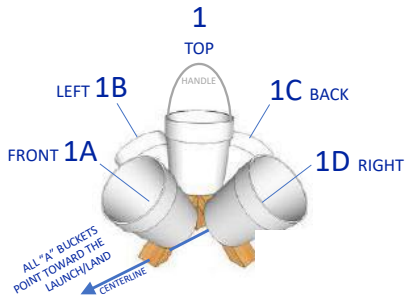
LEVEL 1 | OPEN LANE
BASIC PROFICIENCY

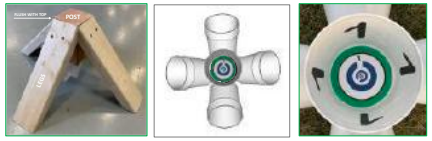
The Position and Traverse tests are performed sequentially by a remote pilot in direct line of sight, or with the pilot's back turned to represent flying beyond visual line of sight with an assisting visual observer. The aircraft flies the designated flight paths to align with one or more white buckets. Each alignment requires a single image of the inscribed green ring inside the bottom of the buckets. Perform all 40 alignments and accurate landings within the designated time limit. Visual acuity targets evaluate camera pointing and zooming capabilities along with color, thermal, hazmat labels, or other objects. Faults resulting in an end-of-trial include extreme deviations from the intended flight path or contact with the apparatus, ground, or safety enclosure.

FABRICATION

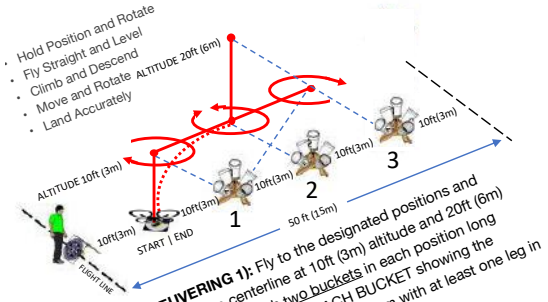
- (QTY 01) 15m (50ft) measuring tape centerline
- (QTY 01) square panel with 30cm (12in) radius circle
- (QTY 03) 10x10x15cm (4x4x6in) posts
- (QTY 12) 5x10x30cm (2x4x12in) legs with 45deg tapers
- (QTY 30) 7.5cm (3in) screws attach legs to post – 2 per
- (QTY 30) 4cm (1-1/2in) screws attach buckets – 2 per
- (QTY 15) 7.5-liter (2-gallon) white buckets
- (QTY 52) 20cm (8in) round polyester weatherproof labels. Download and print targets and lettering from the online USAGE GUIDE or at RobotTestMethods.nist.gov.
- A thick black marker can also be used to inscribe 2.5cm (1in) rings inside buckets with written letters and numbers.

ALIGNED ALIGNED **NOT** ALIGNED

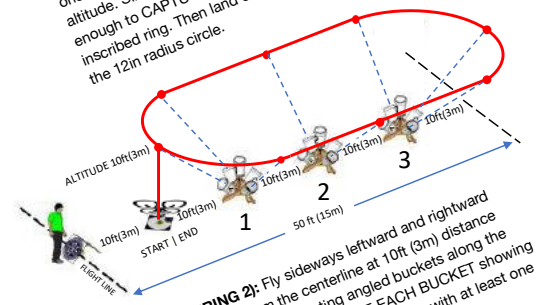




FLIGHT PATHS



POSITION (MANEUVERING 1): Fly to the designated positions and orientations along the lane centerline at 10ft (3m) altitude and 20ft (6m) altitude. Simultaneously align with two buckets in each position long enough to CAPTURE ONE IMAGE OF EACH BUCKET showing the inscribed ring. Then land centered on the platform with at least one leg in the 12in radius circle.



TRAVERSE (MANEUVERING 2): Fly sideways leftward and rightward around all three stands offset from the centerline at 10ft (3m) distance and altitude. Align with the outward pointing angled buckets along the path long enough to CAPTURE ONE IMAGE OF EACH BUCKET showing the inscribed rings. Then land centered on the platform with at least one leg in the 12in radius circle.

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LEVEL 1 | OPEN LANE
BASIC PROFICIENCY

Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

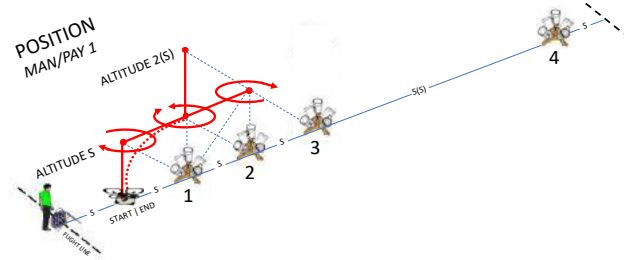
Facility Location _____

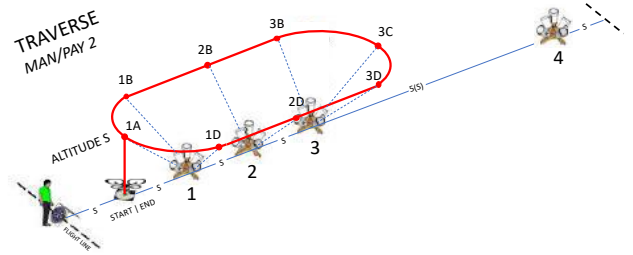
Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

BUCKET DIAM. (CIRCLE ONE)		LANE SPACING (S) (CIRCLE ONE)			VISIBILITY (CIRCLE ONE)		WIND (FILL IN)		PILOT VIEW (CIRCLE ONE)		TIME LIMIT (CIRCLE ONE or FILL IN)		
4 IN (10 CM)	8 IN (20 CM)	5 FT (1.5 M)	10 FT (3 M)	20 FT (6 M)	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE ___ MPH	GUSTS ___ MPH	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN

ALIGNMENT SCORE: Circle bucket identifiers for images with UNBROKEN RINGS. Strike through all BROKEN RINGS and incomplete buckets.





CAPTURE ONLY ONE IMAGE OF EACH BUCKET – CIRCLE ALIGNED IMAGES AND LANDINGS

	CAPTURE PRE-LAUNCH CLOCK IMAGE – **LAUNCH TIME (HH:MM:SS)**	: :
	POSITION TEST – FLYING ALONG CENTERLINE	**CIRCLE ALIGNED**
1	**LAUNCH AND HOVER** OVER STAND #1 TO ALIGN WITH	1 & 2A
2	**YAW LEFTWARD 360°** OVER STAND #1 TO ALIGN WITH	1 & 2A
3	**YAW RIGHTWARD 360°** OVER STAND #1 ALIGN WITH	1 & 2A
4	**CLIMB VERTICALLY** OVER STAND #1 TO ALIGN WITH	1 & 3A
5	**DESCEND VERTICALLY** OVER STAND #1 TO ALIGN WITH	1 & 2A
6	**PITCH FORWARD** OVER STAND #2 TO ALIGN WITH	2 & 3A
7	**PITCH BACKWARD** OVER STAND #1 TO ALIGN WITH	1 & 2A
8	**PITCH FORWARD** OVER STAND #2 THEN **YAW LEFT 180°**	2 & 1C
9	**PITCH FORWARD** OVER LANDING THEN **YAW RIGHT 180°**	L & 1A
10	**LAND IN CIRCLE** (ONE OR MORE LEGS) – WORTH 2 POINTS	1pt & 1pt
	TRAVERSE TEST – FLYING LEFTWARD	**CIRCLE ALIGNED**
11	**HOVER** OVER THE LAUNCH PLATFORM TO ALIGN WITH	1A
12	**ORBIT 90° LEFTWARD** AROUND STAND #1 TO ALIGN WITH	1B
13	**ROLL LEFTWARD** TO STAND #2 TO ALIGN WITH	2B
14	**ROLL LEFTWARD** TO STAND #3 TO ALIGN WITH	3B
15	**ORBIT 90° LEFTWARD** AROUND STAND #3 TO ALIGN WITH	3C
16	**ORBIT 90° LEFTWARD** AROUND STAND #3 TO ALIGN WITH	3D
17	**ROLL LEFTWARD** TO STAND #2 TO ALIGN WITH	2D
18	**ROLL LEFTWARD** TO STAND #1 TO ALIGN WITH	1D
19	**ORBIT 90° LEFTWARD** AROUND STAND #1 TO ALIGN WITH	1A
20	**LAND IN CIRCLE** (ONE OR MORE LEGS) – WORTH 1 POINT	1pt
	TRAVERSE TEST – FLYING RIGHTWARD	**CIRCLE ALIGNED**
21	**HOVER** OVER THE LAUNCH PLATFORM TO ALIGN WITH	1A
22	**ORBIT 90° RIGHTWARD** AROUND STAND #1 TO ALIGN WITH	1D
23	**ROLL RIGHTWARD** TO STAND #2 TO ALIGN WITH	2D
24	**ROLL RIGHTWARD** TO STAND #3 TO ALIGN WITH	3D
25	**ORBIT 90° RIGHTWARD** AROUND STAND #3 TO ALIGN WITH	3C
26	**ORBIT 90° RIGHTWARD** AROUND STAND #3 TO ALIGN WITH	3B
27	**ROLL RIGHTWARD** TO STAND #2 TO ALIGN WITH	2B
28	**ROLL RIGHTWARD** TO STAND #1 TO ALIGN WITH	1B
29	**ORBIT 90° RIGHTWARD** AROUND STAND #1 TO ALIGN WITH	1A
30	**LAND IN CIRCLE** (ONE OR MORE LEGS) – WORTH 1 POINT	1pt
	CAPTURE CLOCK IMAGE AFTER LANDING – **LAND TIME (HH:MM:SS)**	: :
	STOP THE TIMER OR CALCULATE RESULT – **ELASPED TIME (MM:SS)**	:
	_____ / 40 MINIMUM PASSING SCORE – **TOTAL SCORE (POINTS)**	

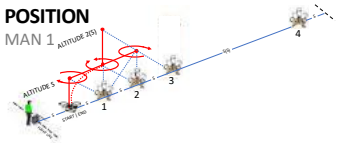
CIRCLE ONE: **FAIL (SCORE | TIME | SAFETY)** OR **PASS**

M LEVEL 2 | OPEN LANE
MANEUVERING ONLY

Perform 5 different flight paths around the omni bucket stands. Each flight path includes as sequence of alignments with one or more buckets. Capture a SINGLE IMAGE of the inscribed ring inside each bucket and land accurately.

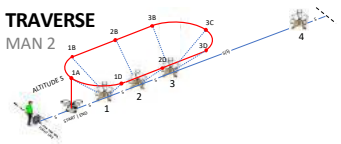
- Score ALIGNMENT POINTS after trial from images with UNBROKEN RINGS (5 pts) or BROKEN RINGS (1 pt).
- Land CENTERED (5 pts) with the aircraft center inside the designated 60 cm (24 inch) diameter circle, or OFFSET (1 pt) with at least one propeller motor inside the circle.
- Start timer at launch and end after the last task is completed. Trial time limits are typically 5 minutes each (25 minutes to complete all 5 tests) although organizations may set their own trial time limits and passing scores.
- Extreme deviations from the intended flight path, or contact with any object, ends the trial to ensure safety.

POSITION
MAN 1



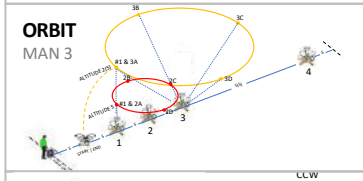
- Demonstrate basic flight maneuvers between designated hover positions, orientations, and altitudes along the lane centerline at altitudes S and 2(S).
- Climb, descend, yaw, pitch, and roll to simultaneously align with downward buckets to check position then forward buckets to check altitude.
- **Complete 10 positions along the lane centerline with 18 alignments and 1 accurate landing (counts double) to score up to 100 points.**

TRAVERSE
MAN 2



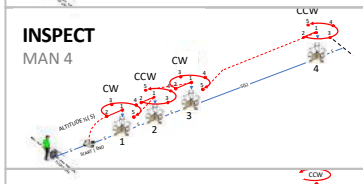
- Fly sideways parallel to objects while looking forward to identify features as if along a road, truck, bus, building, fence, tree line, etc.
- Maintain altitude S flying leftward and rightward around the first three bucket stands to align with all the designated buckets.
- **Complete 1 lap leftward then 1 lap rightward with 18 alignments and 2 accurate landings to score up to 100 points.**

ORBIT
MAN 3



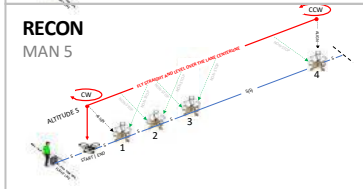
- Fly circular orbits around designated bucket stands while looking inward to identify features on all four sides. Fly altitude 2(S) leftward and rightward around stand #3 (white), then altitude S leftward and rightward around stand #2 (black).
- Each orbit has 5 bucket alignments starting with 1 downward radius check then 4 altitude checks around the orbit looking inward at the angled buckets.
- **Complete 4 orbits with 20 alignments to score up to 100 points.**

INSPECT
MAN 4



- Fly in closer proximity around objects to inspect detailed features on top and all four sides of the bucket stands.
- Maintain altitude 1/2(S) starting on top of each bucket stand with alternating leftward and rightward rotations to inspect all four sides of each bucket stand.
- **Complete all 4 stands with 20 alignments to score up to 100 points.**

RECON
MAN 5



- Fly straight and level over the centerline to establish a stable hover over an object down range to perform reconnaissance tasks.
- Maintain altitude S to align with buckets and the landing at each end of the lane. Reconnaissance tasks are performed every 8(S) over a total distance of 80(S).
- **Complete 5 laps (or 10 lane lengths) with 20 alignments to score up to 100 points.**

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M LEVEL 2 | OPEN LANE
MANEUVERING ONLY

Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

Facility Location _____

Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

BUCKET DIAM.		LANE SPACING (S)			VISIBILITY		WIND		PILOT VIEW		TIME LIMIT		
4 IN (10 CM)	8 IN (20 CM)	5 FT (1.5 M)	10 FT (3 M)	20 FT (6 M)	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE ___ MPH	GUSTS ___ MPH	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN
(CIRCLE ONE)		(CIRCLE ONE)			(CIRCLE ONE)		(FILL IN)		(CIRCLE ONE)		(CIRCLE ONE or FILL IN)		

ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts) or BROKEN RINGS (1 pt). Draw a line through all incomplete.

POSITION (MAN 1)

18 IMAGES TO CAPTURE
1 Landing Scored Twice

START TIMER
LAUNCH TO ALT S
YAW L-360
YAW R-360
CLIMB
DESCEND
FORWARD
BACKWARD
FORWARD & YAW L-180
FORWARD & YAW R-180
LAND
END TIMER

ALIGNMENT BUCKET SEQUENCE	IMAGE POINTS
1	5 1
2A	5 1
1	5 1
2A	5 1
1	5 1
2A	5 1
1	5 1
3A	5 1
1	5 1
2A	5 1
2	5 1
3A	5 1
1	5 1
2A	5 1
UPSIDE DOWN 2	5 1
1C	5 1
L	5 1
1A	5 1
◯ COUNTS DOUBLE	5 1
	/100
ELAPSED TIME	

PASS FAIL
(CIRCLE ONE)

TRAVERSE (MAN 2)

18 IMAGES TO CAPTURE
2 Landings Scored Separately

START TIMER
LAUNCH TO ALT S
LEFTWARD
LAND
LAUNCH TO ALT S
RIGHTWARD
LAND
END TIMER

ALIGNMENT BUCKET SEQUENCE	IMAGE POINTS
1A	5 1
1B	5 1
2B	5 1
3B	5 1
3C	5 1
3D	5 1
2D	5 1
1D	5 1
1A	5 1
◯	5 1
1A	5 1
1D	5 1
2D	5 1
3D	5 1
3C	5 1
3B	5 1
2B	5 1
1B	5 1
1A	5 1
◯	5 1
	/100
ELAPSED TIME	

PASS FAIL
(CIRCLE ONE)

ORBIT (MAN 3)

20 IMAGES TO CAPTURE
No Landing

START TIMER
LAUNCH TO ALT 2(S)
LEFTWARD
REVERSE
RIGHTWARD
DESCEND TO ALT S
LEFTWARD
REVERSE
RIGHTWARD
END TIMER

ALIGNMENT BUCKET SEQUENCE	IMAGE POINTS
1	5 1
3A	5 1
3B	5 1
3C	5 1
3D	5 1
1	5 1
3A	5 1
3D	5 1
3C	5 1
3B	5 1
1	5 1
2A	5 1
2B	5 1
2C	5 1
2D	5 1
1	5 1
2A	5 1
2D	5 1
2C	5 1
2B	5 1
	/100
ELAPSED TIME	

PASS FAIL
(CIRCLE ONE)

INSPECT (MAN 4)

20 IMAGES TO CAPTURE
No Landing

START TIMER
LAUNCH TO ALT 1/2(S)
LEFTWARD
NEXT STAND
RIGHTWARD
NEXT STAND
LEFTWARD
NEXT STAND
RIGHTWARD
END TIMER

ALIGNMENT BUCKET SEQUENCE	IMAGE POINTS
1	5 1
1A	5 1
1B	5 1
1C	5 1
1D	5 1
2	5 1
2A	5 1
2D	5 1
2C	5 1
2B	5 1
3	5 1
3A	5 1
3B	5 1
3C	5 1
3D	5 1
4	5 1
4A	5 1
4D	5 1
4C	5 1
4B	5 1
	/100
ELAPSED TIME	

PASS FAIL
(CIRCLE ONE)

RECON (MAN 5)

20 IMAGES TO CAPTURE
No Landing

START TIMER
LAUNCH TO ALT S
UP RANGE
LAP 2
UP RANGE
LAP 3
UP RANGE
LAP 4
UP RANGE
LAP 5
UP RANGE
END TIMER

ALIGNMENT BUCKET SEQUENCE	IMAGE POINTS
4	5 1
UPSIDE DOWN 4	5 1
L	5 1
1A	5 1
4	5 1
UPSIDE DOWN 4	5 1
L	5 1
1A	5 1
4	5 1
UPSIDE DOWN 4	5 1
L	5 1
1A	5 1
4	5 1
UPSIDE DOWN 4	5 1
L	5 1
1A	5 1
4	5 1
UPSIDE DOWN 4	5 1
L	5 1
1A	5 1
	/100
ELAPSED TIME	

PASS FAIL
(CIRCLE ONE)

Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

20 ALIGNMENTS TOTAL UP TO 100 POINTS

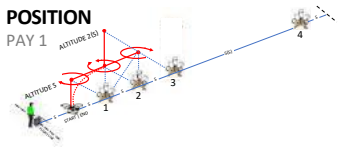
- Align with each bucket to capture a SINGLE IMAGE of the inscribed alignment ring. Only the first image is scored.
- Score captured images as:
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Score accurate landings as:
  - CENTERED (5 pts) with the aircraft center point inside the 60 cm (24 in) diameter circle.
  - OFFSET (1 pts) with at least one propeller motor inside the circle.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

LEVEL 3 | OPEN LANE
PAYLOAD FUNCTIONALITY

Perform 5 different flight paths around the omni bucket stands. Each flight path includes a sequence of alignments with one or more buckets. While aligned with each bucket, control camera zoom and exposure to capture a SINGLE IMAGE of the inscribed ring and IDENTIFY TARGETS inside each bucket.

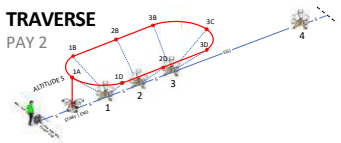
- Score ALIGNMENT POINTS after the trial from images with UNBROKEN RINGS (5 pts) or BROKEN RINGS (1 pt).
- Score ACUITY POINTS by calling out the 5 increasingly small VISUAL ACUITY TARGET GAPS (1 pt each).
- Land CENTERED (5 pts) with the aircraft center inside the designated 60 cm (24 inch) diameter circle, or OFFSET (1 pt) with at least one propeller motor inside the circle.
- Start timer at launch and end after the last task is completed. Trial time limits are typically 5 minutes each (25 minutes to complete all 5 tests) although organizations may set their own trial time limits and passing scores.
- Extreme deviations from the intended flight path, or contact with any object, ends the trial to ensure safety.

POSITION
PAY 1



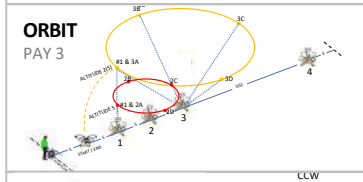
- Demonstrate basic flight maneuvers between designated hover positions, orientations, and altitudes along the lane centerline at altitudes S and 2(S).
- Climb, descend, yaw, pitch, and roll to simultaneously align with downward buckets to check position then forward buckets to check altitude.
- **Complete 10 positions along the lane centerline with 18 alignments and 1 accurate landing (counts double) to score up to 100 points.**

TRAVERSE
PAY 2



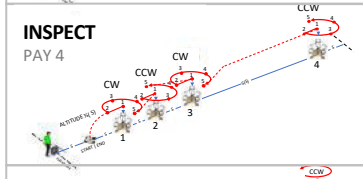
- Fly sideways parallel to objects while looking forward to identify features as if along a road, truck, bus, building, fence, tree line, etc.
- Maintain altitude S flying leftward and rightward around the first three bucket stands to align with all the designated buckets.
- **Complete 1 lap leftward then 1 lap rightward with 18 alignments and 2 accurate landings to score up to 100 points.**

ORBIT
PAY 3



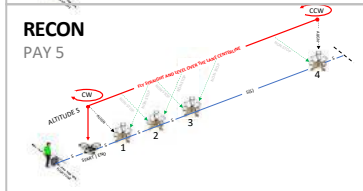
- Fly circular orbits around designated bucket stands while looking inward to identify features on all four sides. Fly altitude 2(S) leftward and rightward around stand #3 (white), then altitude S leftward and rightward around stand #2 (black).
- Each orbit has 5 bucket alignments starting with 1 downward radius check then 4 altitude checks around the orbit looking inward at the angled buckets.
- **Complete 4 orbits with 20 alignments to score up to 100 points.**

INSPECT
PAY 4



- Fly in closer proximity around objects to inspect detailed features on top and all four sides of the bucket stands.
- Maintain altitude 1/2(S) starting on top of each bucket stand with alternating leftward and rightward rotations to inspect all four sides of each bucket stand.
- **Complete all 4 stands with 20 alignments to score up to 100 points.**

RECON
PAY 5



- Fly straight and level over the centerline to establish a stable hover over an object down range to perform reconnaissance tasks.
- Maintain altitude S to align with buckets and the landing at each end of the lane. Reconnaissance tasks are performed every 8(S) over a total distance of 80(S).
- **Complete 5 laps (or 10 lane lengths) with 20 alignments to score up to 100 points.**

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Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

Facility Location _____

Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

LEVEL 3 | OPEN LANE
PAYLOAD FUNCTIONALITY

BUCKET DIAM. (CIRCLE ONE)	LANE SPACING (S) (CIRCLE ONE)	VISIBILITY (CIRCLE ONE)	WIND (FILL IN)	PILOT VIEW (CIRCLE ONE)	TIME LIMIT (CIRCLE ONE or FILL IN)
4 IN (10 CM) / 8 IN (20 CM)	5 FT (1.5 M) / 10 FT (3 M) / 20 FT (6 M)	LIGHTED 300+ LUX / DARK < 1 LUX	AVERAGE ____ MPH / GUSTS ____ MPH	LINE OF SIGHT FACINE LANE OPTIONAL V.O. / INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN / 10 MIN / ____ MIN

ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts) or BROKEN RINGS (1 pt). Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 point each).

POSITION (PAY 1)

20 IMAGES TO CAPTURE
- 18 ALIGNMENTS
- 2 PERCH TARGETS

ALIGNMENT			ACUITY	
	ALIGN BUCKET	IMAGE POINTS	CORRECT GAPS (1 POINT EACH)	
HOVER	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
+YAW 180	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
YAW 360	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
CLIMB	1	5 1	T BL R BR L	
	3A	5 1	BR T TL R BL	
DESCEND	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
FORWARD	2	5 1	BL T BR R TL	
	3A	5 1	BR T TL R BL	
BACKWARD	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
ROLL 180	2	5 1	TR B TL L BR	
	1C	5 1	BR R TL L BR	
ROLL 360	L	5 1	B TR L BL T	
LAND	1A	5 1	TR B TR L BR	
	(P1)	5 1	BL R TL L BL	
	(P2)	5 1	L BR T TL B	
		/100		/100

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

TRAVERSE (PAY 2)

20 IMAGES TO CAPTURE
- 18 ALIGNMENTS
- 2 PERCH TARGETS

ALIGNMENT			ACUITY	
	ALIGN BUCKET	IMAGE POINTS	CORRECT GAPS (1 POINT EACH)	
LEFTWARD	1A	5 1	TR B TR L BR	
	1B	5 1	R TL T BL B	
	2B	5 1	TL R TR L BR	
	3B	5 1	B TR R BL T	
	3C	5 1	BL R BL T BR	
	3D	5 1	L TL R BR T	
	2D	5 1	TR B TL B BL	
	1D	5 1	B TL R BL T	
	1A	5 1	TR B TR L BR	
	(P1)	5 1	BL R TL L BL	
RIGHTWARD	1A	5 1	TR B TR L BR	
	1D	5 1	B TL R BL T	
	2D	5 1	TR B TL B BL	
	3D	5 1	L TL R BR T	
	3C	5 1	BL R BL T BR	
	3B	5 1	B TR R BL T	
	2B	5 1	TL R TR L BR	
	1B	5 1	R TL T BL B	
	1A	5 1	TR B TR L BR	
	(P2)	5 1	L BR T TL B	
		/100		/100

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

ORBIT (PAY 3)

20 IMAGES TO CAPTURE
- 20 ALIGNMENTS
- NO LANDING

ALIGNMENT			ACUITY	
	ALIGN BUCKET	IMAGE POINTS	CORRECT GAPS (1 POINT EACH)	
ALT 2(S) – LEFTWARD	1	5 1	T BL R BR L	
	3A	5 1	BR T TL R BL	
	3B	5 1	B TR R BL T	
	3C	5 1	BL R BL T BR	
	3D	5 1	L TL R BR T	
ALT 2(S) – RIGHTWARD	1	5 1	T BL R BR L	
	3A	5 1	BR T TL R BL	
	3D	5 1	L TL R BR T	
	3C	5 1	BL R BL T BR	
	3B	5 1	B TR R BL T	
ALT 1(S) – LEFTWARD	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
	2B	5 1	TL R TR L BR	
	2C	5 1	T BL R TL B	
	2D	5 1	TR B TL B BL	
ALT 1(S) – RIGHTWARD	1	5 1	T BL R BR L	
	2A	5 1	L BR T TL R	
	2D	5 1	TR B TL B BL	
	2C	5 1	T BL R TL B	
	2B	5 1	TL R TR L BR	
		/100		/100

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

INSPECT (PAY 4)

20 IMAGES TO CAPTURE
- 20 ALIGNMENTS
- NO LANDING

ALIGNMENT			ACUITY	
	ALIGN BUCKET	IMAGE POINTS	CORRECT GAPS (1 POINT EACH)	
ALT 1(S) – LEFTWARD	1	5 1	T BL R BR L	
	1A	5 1	TR B TR L BR	
	1B	5 1	R TL T BL B	
	1C	5 1	BR R TL L BR	
	1D	5 1	B TL R BL T	
ALT 1(S) – RIGHTWARD	2	5 1	BL T BR R TL	
	2A	5 1	L BR T TL R	
	2D	5 1	TR B TL B BL	
	2C	5 1	T BL R TL B	
	2B	5 1	TL R TR L BR	
ALT 1(S) – LEFTWARD	3	5 1	R TL B BL R	
	3A	5 1	BR T TL R BL	
	3B	5 1	B TR R BL T	
	3C	5 1	BL R BL T BR	
	3D	5 1	L TL R BR T	
ALT 1(S) – RIGHTWARD	4	5 1	TL B TR R BR	
	4A	5 1	T BL B TR L	
	4D	5 1	BR B TL B TR	
	4C	5 1	R BL T TR B	
	4B	5 1	TR L BL R TL	
		/100		/100

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

RECON (PAY 5)

20 IMAGES TO CAPTURE
- 20 ALIGNMENTS
- NO LANDING

ALIGNMENT			ACUITY	
	ALIGN BUCKET	IMAGE POINTS	CORRECT GAPS (1 POINT EACH)	
LAP 1	4	5 1	TL B TR R BR	
	4	5 1	BR T BL L TL	
	L	5 1	B TR L BL T	
	1A	5 1	TR B TR L BR	
LAP 2	4	5 1	TL B TR R BR	
	4	5 1	BR T BL L TL	
	L	5 1	B TR L BL T	
	1A	5 1	TR B TR L BR	
LAP 3	4	5 1	TL B TR R BR	
	4	5 1	BR T BL L TL	
	L	5 1	B TR L BL T	
	1A	5 1	TR B TR L BR	
LAP 4	4	5 1	TL B TR R BR	
	4	5 1	BR T BL L TL	
	L	5 1	B TR L BL T	
	1A	5 1	TR B TR L BR	
LAP 5	4	5 1	TL B TR R BR	
	4	5 1	BR T BL L TL	
	L	5 1	B TR L BL T	
	1A	5 1	TR B TR L BR	
		/100		/100

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

20 ALIGNMENTS TOTAL UP TO 100 POINTS

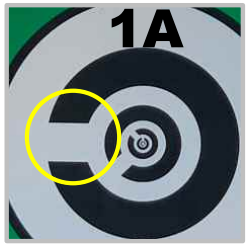
- Align with each bucket to capture a SINGLE IMAGE of the inscribed alignment ring. Only the first image is scored.
- Score captured images as:
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Score accurate landings as:
  - CENTERED (5 pts) with the aircraft center point inside the 60 cm (24 in) diameter circle.
  - OFFSET (1 pts) with at least one propeller motor inside the circle.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

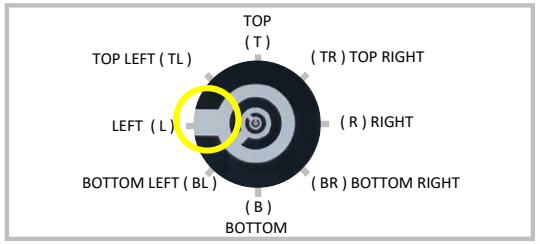
Scoring Acuity Points

Identify increasingly small visual acuity targets

ALIGN THEN CONTROL ZOOM AND EXPOSURE

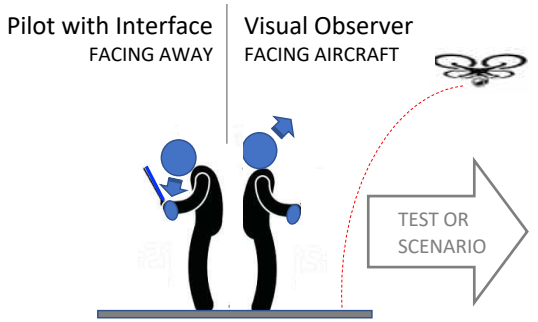
20 TARGETS TOTAL UP TO 100 POINTS





REPORT GAP DIRECTIONS RELATIVE TO THE BUCKET NUMBER (TOP)

- While aligned with each bucket, IDENTIFY ACUITY TARGETS using camera zoom and exposure controls.
- Verbally call out as many of the Concentric C gap directions as possible (1 pt each) with a Proctor.
- Fly facing away from the test lane or scenario (with a Visual Observer) to evaluate flying interface only as if beyond visual line of sight (BVLOS).

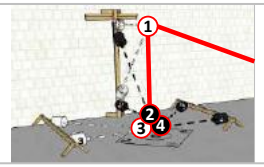


LEVEL 4 | OBSTRUCTED
PAYLOAD FUNCTIONALITY

Perform 5 different flight paths to triangulate around the dual bucket rails. Each flight path includes alignments with perpendicular buckets then angled buckets using zoom and exposure control to identify recessed targets.

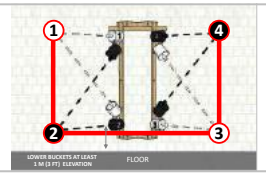
- All sequences have 10 positions with 20 buckets to score: **1 2 3 4 – 3 2 1 – 2 3 4** *(forward–reverse–forward)*
- Score ALIGNMENT POINTS by capturing a SINGLE IMAGE of the inscribed rings to verify alignments during or after the trial: UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt).
- Score ACUITY POINTS by calling out the 5 increasingly small VISUAL ACUITY TARGET GAPS (1 pt each).
- Start timer at launch and end after the last task is completed. Trial time limits are typically 5 minutes each (25 minutes to complete all 5 tests) although organizations may set their own trial time limits and passing scores.
- Extreme deviations from the intended flight path, or contact with any object, ends the trial to ensure safety.

PERCH
PAY 6



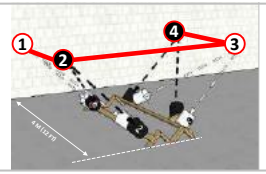
- Land or hover just above the ground within proximity to a wall or obstacle with additional ground obstacles on both sides. Launch and land repeatedly if necessary to score all buckets in the sequence of perch tasks.
- Inspect **vertical** and **horizontal** object features **all around the aircraft**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

WALL
PAY 7



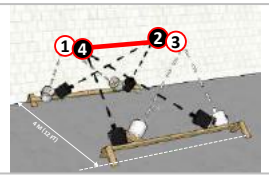
- Fly within proximity to a wall or obstacle at **45 degrees from forward** of the aircraft.
- Inspect **vertical** object features **upward** and **downward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

GROUND
PAY 8



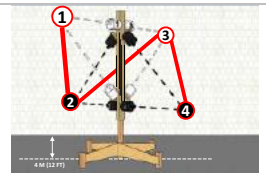
- Fly within proximity to a wall or obstacles at **90 degrees from forward** of the aircraft.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

ALLEY
PAY 9



- Fly within proximity to a wall or obstacle in **front of the aircraft (0 degrees)** and **behind the aircraft (180 degrees)**.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

POST
PAY 10



- Fly within proximity to a post and wall or obstacle and pass between the post and the wall.
- Inspect **vertical** object features **upward** and **downward** all around the post.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

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VERSION 2023A

LEVEL 4 | OBSTRUCTED
PAYLOAD FUNCTIONALITY

Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

Facility Location _____

Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

BUCKET DIAMETER		VISIBILITY			WIND		PILOT VIEW		TIME LIMIT		
4 IN (10 CM)	8 IN (20 CM)	LIGHTED 300+ LUX	DIM 1-300 LUX	DARK < 1 LUX	AVERAGE ____ MPH	GUSTS ____ MPH	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN
(CIRCLE ONE)		(CIRCLE ONE)			(FILL IN)		(CIRCLE ONE)		(CIRCLE ONE or FILL IN)		

ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt), Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 pt each).

PERCH (PAY 6)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS
- WHILE PERCHED

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	WHILE PERCHED
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

WALL (PAY 7)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

GROUND (PAY 8)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

ALLEY (PAY 9)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

POST (PAY 10)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

10 ALIGNMENT RINGS TOTAL 50 POINTS

CAPTURE IMAGES OF THE INSCRIBED RINGS AND LAND ACCURATELY.

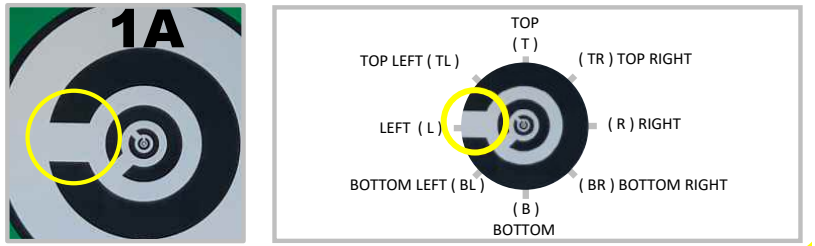
- First align with each PERPENDICULAR BUCKET to capture a SINGLE ALIGNMENT IMAGE of the inscribed ring.
- Score captured images with
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Accurate landings are not scored.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

Scoring Acuity Points

Identify increasingly small visual acuity targets

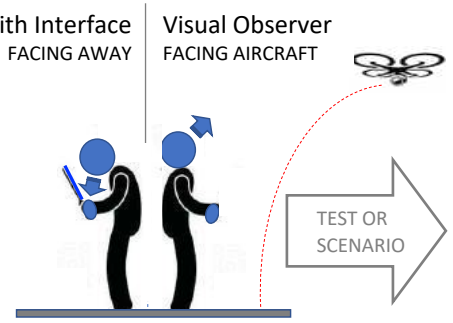
ALIGN THEN CONTROL ZOOM AND EXPOSURE

10 ACUITY TARGETS TOTAL 50 POINTS



REPORT GAP DIRECTIONS RELATIVE TO THE BUCKET NUMBER (TOP)

- Then align with each ANGLED BUCKET to IDENTIFY ACUITY TARGETS using camera zoom and exposure controls.
- Call out as many of the Concentric C gap directions as possible (1 pt each).
- Fly facing away from the test lane or scenario with a Visual Observer to evaluate flying interface only as if beyond visual line of sight.

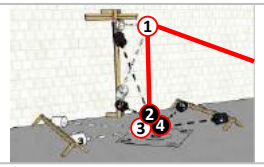


LEVEL 5 | CONFINED
PAYLOAD FUNCTIONALITY

Perform the designated flight paths to triangulate around dual bucket rails in various orientations. Align with perpendicular buckets then angled buckets. Use zoom and exposure control to identify targets inside the buckets.

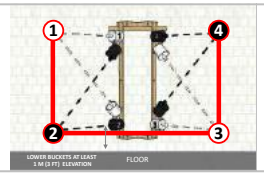
- All sequences have 10 positions with 20 buckets to score: **1 2 3 4 – 3 2 1 – 2 3 4** *(forward–reverse–forward)*
- Score ALIGNMENT POINTS by capturing a SINGLE IMAGE of the inscribed rings to verify alignments during or after the trial: UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt).
- Score ACUITY POINTS by identifying and calling out the 5 increasingly small VISUAL ACUITY TARGET GAPS (1 pt each).
- Start timer at launch and end after the last task is completed. Trial time limits are typically 5 minutes each (25 minutes to complete all 5 tests) although organizations may set their own trial time limits and passing scores.
- Extreme deviations from the intended flight path, or contact with any object, ends the trial to ensure safety.

PERCH
PAY 6



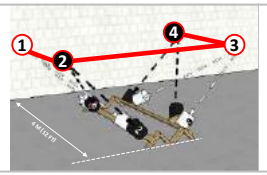
- Land or hover just above the ground within proximity to a wall or obstacle with additional ground obstacles on both sides. Launch and land repeatedly if necessary to score all buckets in the sequence of perch tasks.
- Inspect **vertical** and **horizontal** object features **all around the aircraft**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

WALL
PAY 7



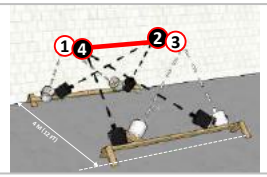
- Fly within proximity to a wall or obstacle at **45 degrees from forward** of the aircraft.
- Inspect **vertical** object features **upward** and **downward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

GROUND
PAY 8



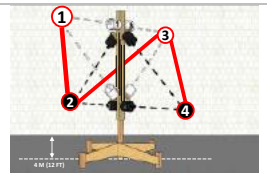
- Fly within proximity to a wall or obstacles at **90 degrees from forward** of the aircraft.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

ALLEY
PAY 9



- Fly within proximity to a wall or obstacle in **front of the aircraft (0 degrees)** and **behind the aircraft (180 degrees)**.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

POST
PAY 10



- Fly within proximity to a post and wall or obstacle and pass between the post and the wall.
- Inspect **vertical** object features **upward** and **downward** all around the post.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

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VERSION 2023A

LEVEL 5 | CONFINED
PAYLOAD FUNCTIONALITY

Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

Facility Location _____

Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

BUCKET DIAMETER		VISIBILITY			WIND		PILOT VIEW		TIME LIMIT		
2 IN (5 CM)	4 IN (10 CM)	LIGHTED 300+ LUX	DIM 1-300 LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN
(CIRCLE ONE)		(CIRCLE ONE)			___ MPH	___ MPH	(CIRCLE ONE)		(CIRCLE ONE or FILL IN)		

ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt), Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 pt each).

PERCH (PAY 6)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS
- WHILE PERCHED

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	WHILE PERCHED
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE		SCORE
/50		/50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

WALL (PAY 7)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE		SCORE
/50		/50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

GROUND (PAY 8)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE		SCORE
/50		/50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

ALLEY (PAY 9)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE		SCORE
/50		/50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

POST (PAY 10)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE		SCORE
/50		/50

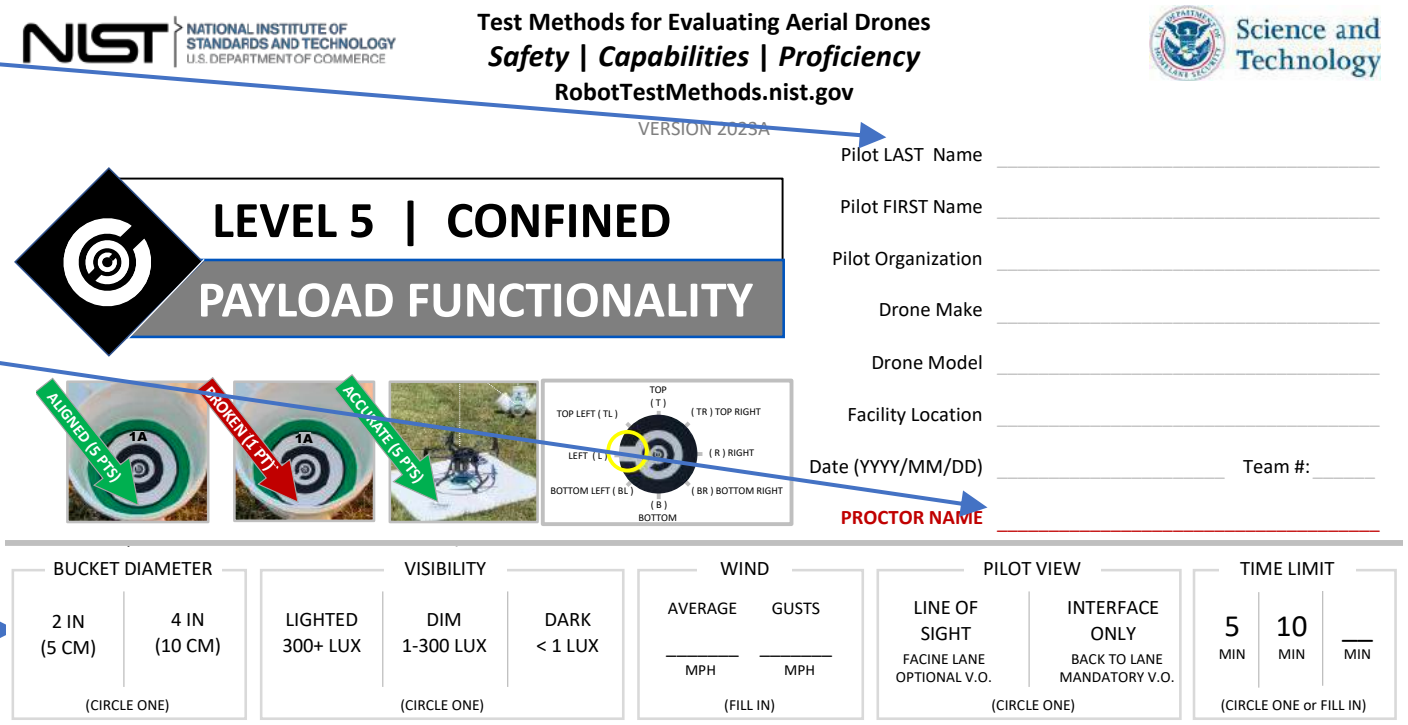
ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

Level 5 Confined Lane

Payload Functionality Trials

- Fill in the header information completely!
- PROCTOR ATTESTATION
  (The Proctor's printed name)
- Bucket Size
- Lighting
- Wind
- Pilot view
- Time limit



12

Level 5 Confined Lane

Payload Functionality Trials

Brief reminders.

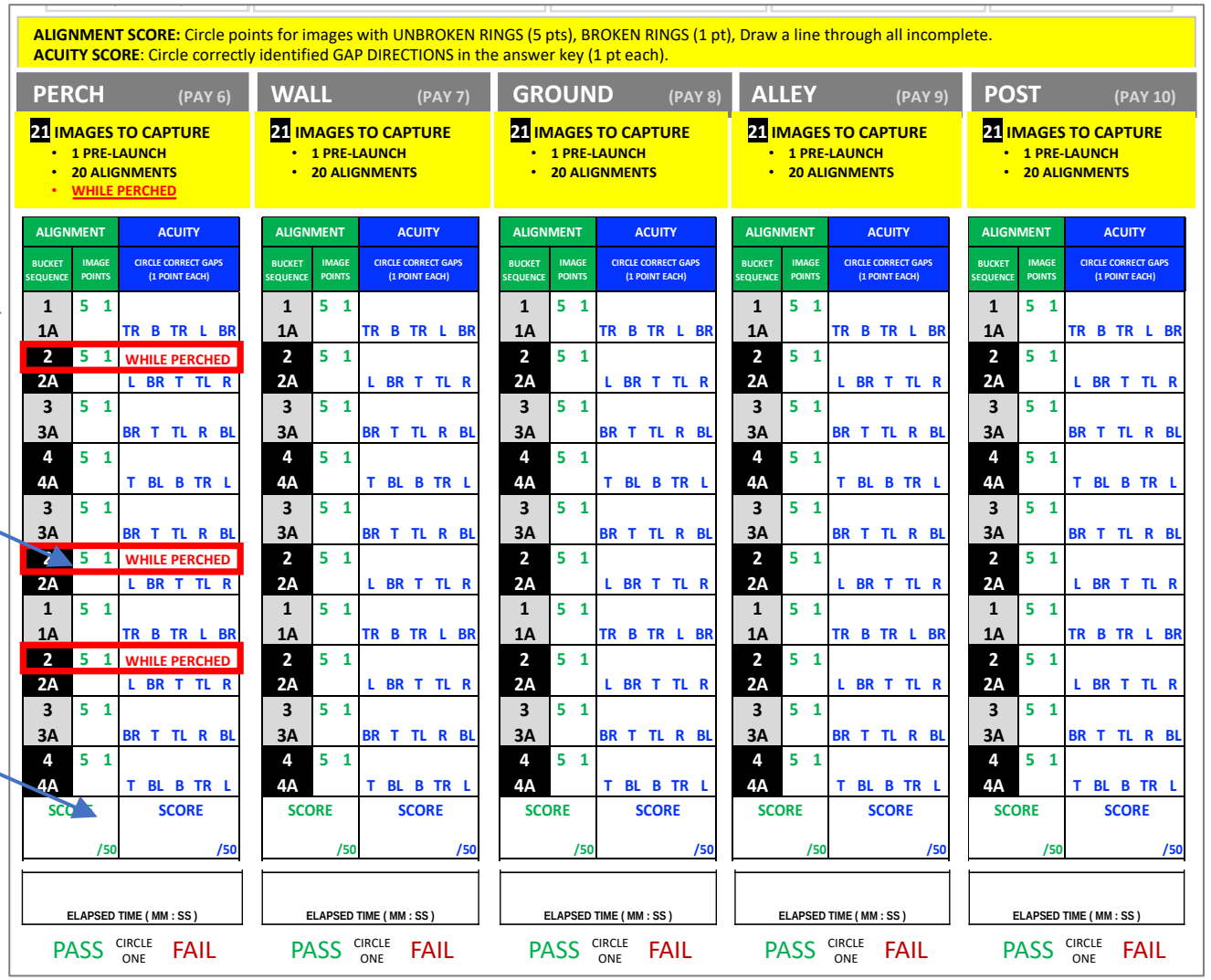
White and black bucket shading.

SCORE WHILE PERCHED.

Circle alignment points when declared by the pilot with verification of images during or after the trial.

Separate totals for ALIGNMENT and ACUITY points (50 points each).

Any organization can select their own passing score.



ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt), Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 pt each).

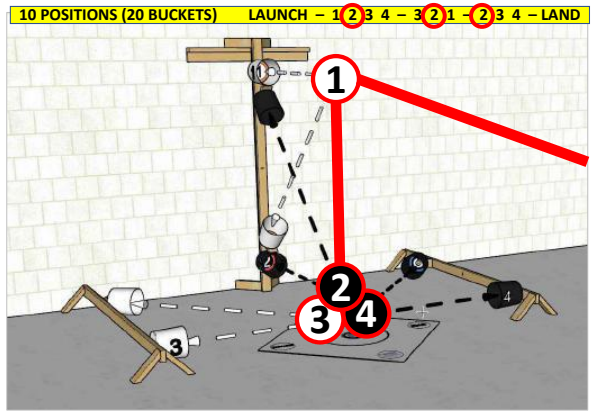
PERCH (PAY 6)	WALL (PAY 7)	GROUND (PAY 8)	ALLEY (PAY 9)	POST (PAY 10)
21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS • WHILE PERCHED	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS

ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1		1	5 1		1	5 1		1	5 1		1	5 1	
1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
4	5 1		4	5 1		4	5 1		4	5 1		4	5 1	
4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
1	5 1		1	5 1		1	5 1		1	5 1		1	5 1	
1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
4	5 1		4	5 1		4	5 1		4	5 1		4	5 1	
4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L
SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50
ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)		
PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL		

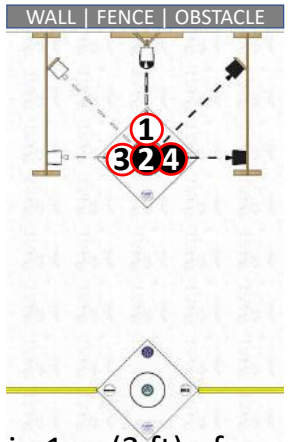
Perch (PAY 6)

Confined Test Lane

#2 ALIGNMENT WHILE PERCHED



TOP VIEW



- Fly near the ground and perch within 1 m (3 ft) of a wall or obstacle in front of the aircraft with ground obstacles on both sides.
- Inspect vertical and horizontal object features upward, downward, leftward and rightward.
- BUCKET #2 MUST BE ALIGNED WHILE PERCHED, but all others can be aligned/identified either while perched or hovering as if inspecting underbody objects of interest.

SCORING

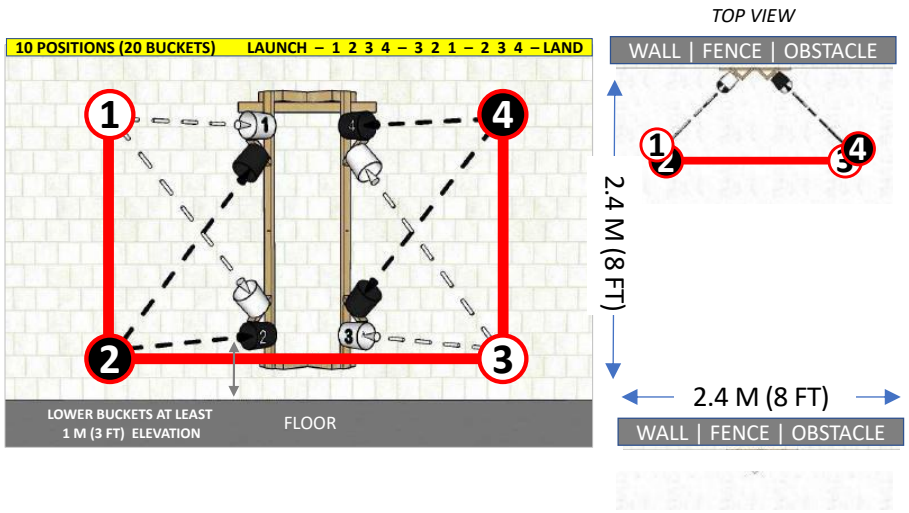
Alignment Points in Perpendicular Buckets (50 Total):
Align with each perpendicular bucket to CAPTURE A SINGLE IMAGE OF THE ALIGNMENT RING for scoring during or after the trial.

Acuity Points in Angled Buckets (50 Total):
Align with each angled bucket to IDENTIFY ACUITY GAPS through the pilot interface. Images are optional for documentation but use the answer key for scoring..

CONFINED | PERCH	BUCKETS	ALIGNMENT	ACUITY
START TIMER	NUMBER	IMAGE POINTS (5 OR 1 POINT)	CIRCLE GAPS (1 POINT EACH)
1 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
2 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
3 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	WHILE PERCHED
4 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
5 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
6 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
7 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
8 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
9 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
10 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
11 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	WHILE PERCHED
12 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
13 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
14 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
15 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	WHILE PERCHED
16 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
17 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
18 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
19 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
20 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
ELASPED TIME: (MM:SS)	SCORES	/50	/50

Wall (PAY 7)

Confined Test Lane



- Place the Wall apparatus in a 2.4m (8 ft) cubic space with ceiling (or shipping container) with the vertical tasks at 1m (3ft) and 2m (6 ft) elevations.
- Fly within 1 m (3 ft) to perform the alignments with the wall at 45 degrees from forward of the aircraft.
- Inspect vertical objects upward and downward.

SCORING

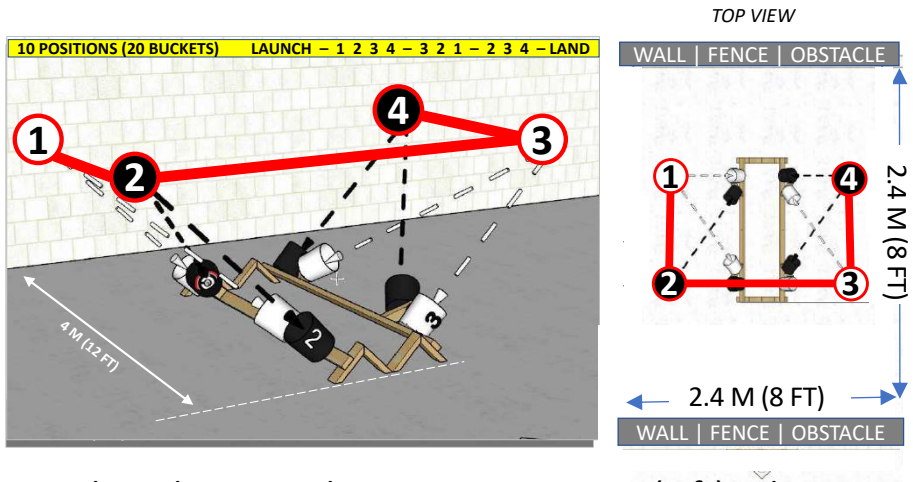
Alignment Points in Perpendicular Buckets (50 Total):
Align with each perpendicular bucket to CAPTURE A SINGLE IMAGE OF THE ALIGNMENT RING for scoring during or after the trial.

Acuity Points in Angled Buckets (50 Total):
Align with each angled bucket to IDENTIFY ACUITY GAPS through the pilot interface. Images are optional for documentation but use the answer key for scoring.

CONFINED | WALL	BUCKETS	ALIGNMENT	ACUITY
START TIMER	NUMBER	IMAGE POINTS (5 OR 1 POINT)	CIRCLE GAPS (1 POINT EACH)
1 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
2 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
3 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
4 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
5 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
6 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
7 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
8 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
9 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
10 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
11 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
12 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
13 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
14 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
15 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
16 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
17 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
18 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
19 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
20 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
ELASPED TIME: (MM:SS)	SCORES	/50	/50

Ground (PAY 8)

Confined Test Lane



- Place the Ground apparatus in a 2.4m (8 ft) cubic space with ceiling (or shipping container) with the horizontal tasks centered between the side walls.
- Fly within 1 m (3 ft) to perform the alignments with the walls at 90 degrees from forward of the aircraft.
- Inspect horizontal objects leftward and rightward.

SCORING

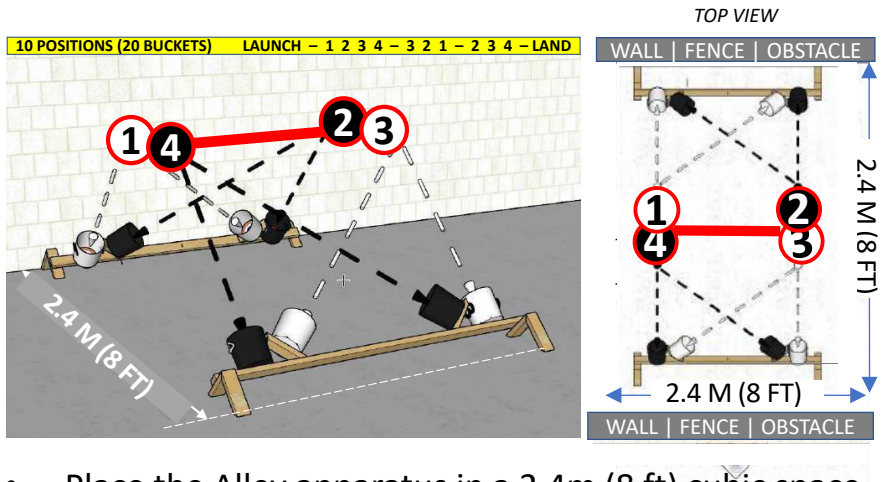
Alignment Points in Perpendicular Buckets (50 Total):
Align with each perpendicular bucket to CAPTURE A SINGLE IMAGE OF THE ALIGNMENT RING for scoring during or after the trial.

Acuity Points in Angled Buckets (50 Total):
Align with each angled bucket to IDENTIFY ACUITY GAPS through the pilot interface. Images are optional for documentation but use the answer key for scoring.

CONFINED | GROUND	BUCKETS	ALIGNMENT	ACUITY
START TIMER	NUMBER	IMAGE POINTS (5 OR 1 POINT)	CIRCLE GAPS (1 POINT EACH)
1 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
2 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
3 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
4 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
5 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
6 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
7 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
8 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
9 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
10 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
11 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
12 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
13 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
14 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
15 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
16 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
17 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
18 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
19 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
20 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
ELASPED TIME: (MM:SS)	SCORES	/50	/50

Alley (PAY 9)

Confined Test Lane



- Place the Alley apparatus in a 2.4m (8 ft) cubic space with ceiling (or shipping container) with the horizontal tasks centered along opposing side walls.
- Fly within 1 m (3 ft) to perform the alignments with the walls in front of the aircraft (0 degrees) and behind the aircraft (180 degrees).
- Inspect horizontal objects leftward and rightward.

SCORING

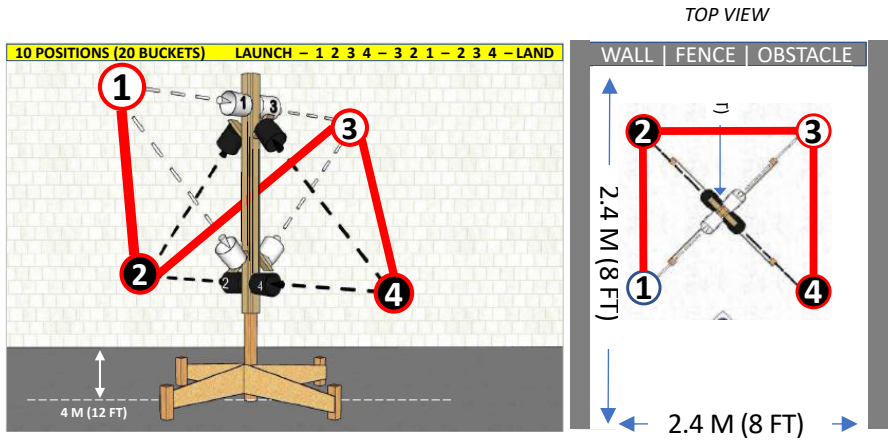
Alignment Points in Perpendicular Buckets (50 Total):
Align with each perpendicular bucket to CAPTURE A SINGLE IMAGE OF THE ALIGNMENT RING for scoring during or after the trial.

Acuity Points in Angled Buckets (50 Total):
Align with each angled bucket to IDENTIFY ACUITY GAPS through the pilot interface. Images are optional for documentation but use the answer key for scoring.

CONFINED | ALLEY	BUCKETS	ALIGNMENT	ACUITY
START TIMER	NUMBER	IMAGE POINTS (5 OR 1 POINT)	CIRCLE GAPS (1 POINT EACH)
1 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
2 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
3 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
4 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
5 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
6 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
7 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
8 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
9 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
10 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
11 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
12 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
13 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
14 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
15 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
16 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
17 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
18 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
19 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
20 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
ELASPED TIME: (MM:SS)	SCORES	/50	/50

Post (PAY 10)

Confined Test Lane



- Center the Post apparatus in a 2.4m (8 ft) cubic space or shipping container with the vertical task elevations at 1m (3ft) and 2m (6 ft) above the ground.
- Fly within 1 m (3 ft) of the post to inspect vertical object features upward and downward.
- Pass between the post and walls throughout.

SCORING

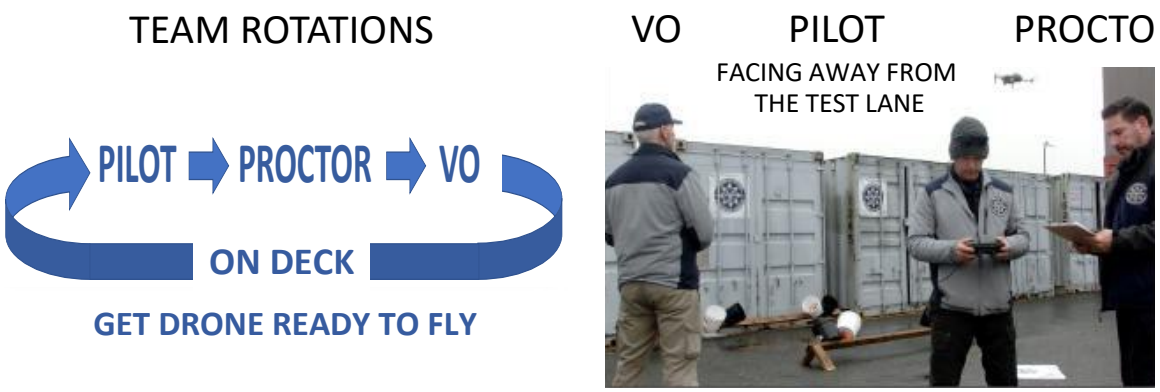
Alignment Points in Perpendicular Buckets (50 Total):
Align with each perpendicular bucket to CAPTURE A SINGLE IMAGE OF THE ALIGNMENT RING for scoring during or after the trial.

Acuity Points in Angled Buckets (50 Total):
Align with each angled bucket to IDENTIFY ACUITY GAPS through the pilot interface. Images are optional for documentation but use the answer key for scoring.

CONFINED | POST	BUCKETS	ALIGNMENT	ACUITY
START TIMER	NUMBER	IMAGE POINTS (5 OR 1 POINT)	CIRCLE GAPS (1 POINT EACH)
1 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
2 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
3 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
4 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
5 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
6 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
7 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
8 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
9 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
10 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
11 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
12 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
13 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	1	5 1 0	
14 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	1A		TR B TR L BR
15 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	2	5 1 0	
16 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	2A		L BR T TL R
17 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	3	5 1 0	
18 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	3A		BR T TL R BL
19 *PERPENDICULAR BUCKET*: ALIGN AND CAPTURE IMAGE	4	5 1 0	
20 *ANGLED BUCKET:* CALL OUT ACUITY GAP DIRECTIONS	4A		T BL B TR L
ELASPED TIME: (MM:SS)	SCORES	/50	/50

Teams Rotate Through Each Role

Each Pilot flies a 5-minute trial with help from othe
A 3-4 person team completes all 5 tests in 2 hours.



Four person teams always have one person getting their aircraft ready to launch right after the previous lands.

Three person teams work too, but require some time between each rotation to prepare the next aircraft.

PILOT

- Maintain control of the aircraft.
- Call out each intention of movement before doing so.
- Call out each bucket alignment and acuity target gap.

PROCTOR

- Fill in the form header.
- Read the test procedures to the Pilot.
- Confirm, record, and attest to scoring after the trial.

VISUAL OBSERVER (VO)

- Maintain sight with the aircraft and surroundings.
- Repeat the Pilot's intention of movement to confirm.
- Call out corrections and warnings as necessary.

Metrics to Track Over Time

Measure System Capabilities and Pilot Proficiency

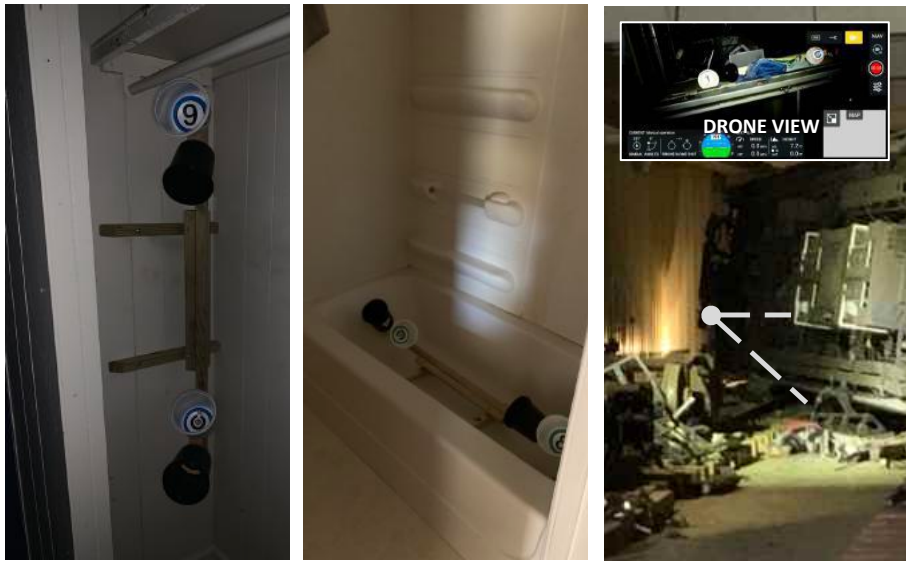
Completeness: Align with every bucket in the sequence and land accurately according to the procedure. The objective is scoring ALL points possible for your aircraft without making mistakes.

Score: For complete trials, track your scores over time. The average of your last five trials is an excellent measure of your proficiency on the aircraft and interface used.

Efficiency (Optional): For complete trials with maximum scores for a particular aircraft, the elapsed time can help identify the most efficient systems and techniques. Time limited trials can be used across multiple tests to maintain a schedule and similarly fatigue novices and experts.

Indoor and Outdoor Scenarios

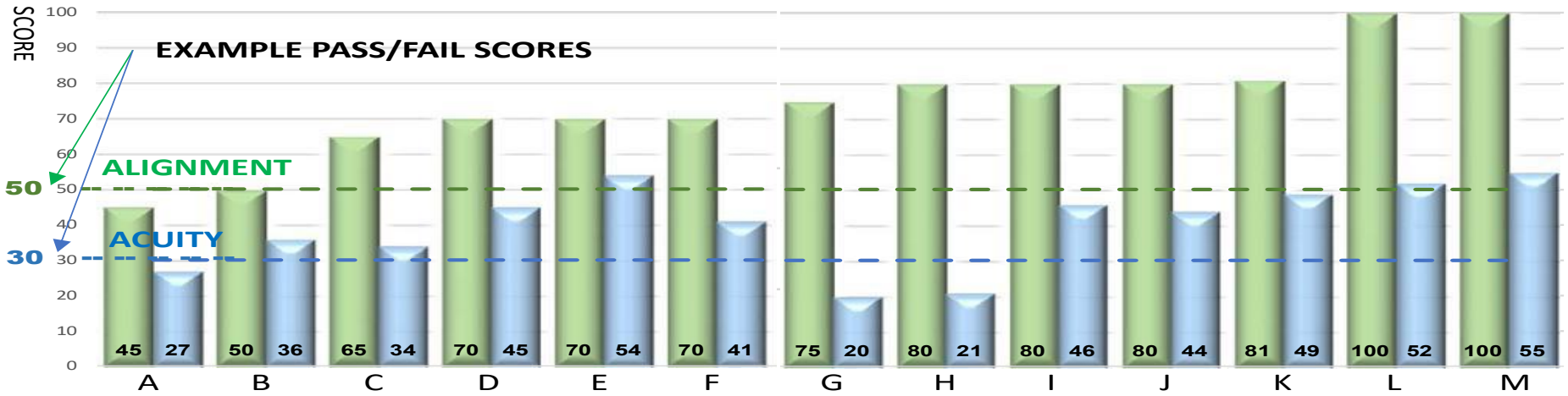
Evaluate using repeatable search/inspect tasks



The WALL and ALLEY test shown embedded in a room-to-room search scenario closet and bath tub. The pairs of of white and black buckets require exposure control to discern details. Also shown is a more complex overturned subway rail car disaster. All such scenarios get embedded with scoring tasks totaling 100 points.

Separate Scores: ALIGNMENT and ACUITY

Track and Compare Scores Using the Same Drone



Level 5 Confined Lane Proctoring

Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

10 ALIGNMENT RINGS TOTAL 50 POINTS

CAPTURE IMAGES OF THE INSCRIBED RINGS AND LAND ACCURATELY.

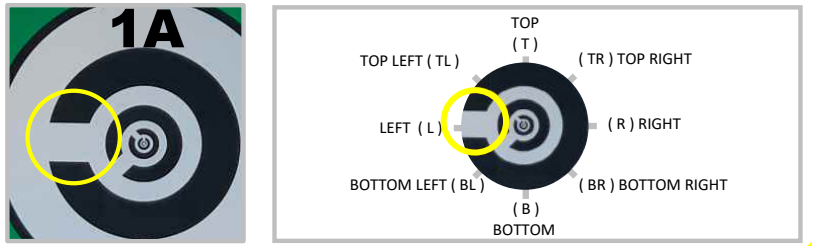
- First align with each PERPENDICULAR BUCKET to capture a SINGLE ALIGNMENT IMAGE of the inscribed ring.
- Score captured images with
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Accurate landings are not scored.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

Scoring Acuity Points

Identify increasingly small visual acuity targets

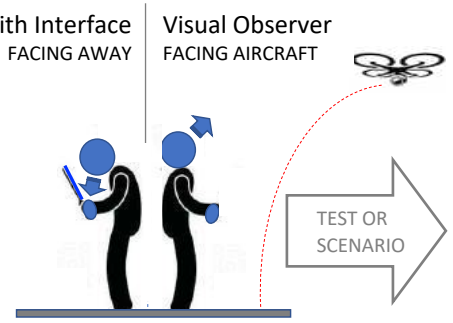
ALIGN THEN CONTROL ZOOM AND EXPOSURE

10 ACUITY TARGETS TOTAL 50 POINTS



REPORT GAP DIRECTIONS RELATIVE TO THE BUCKET NUMBER (TOP)

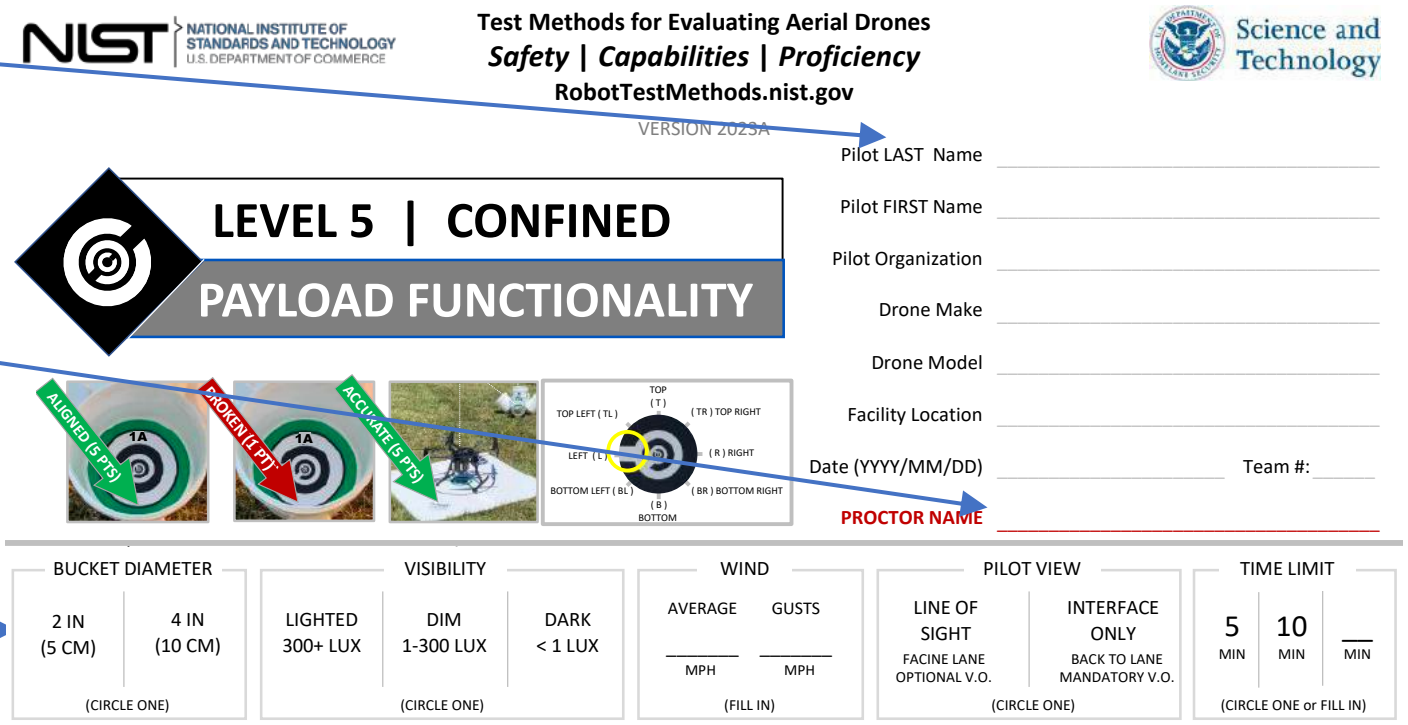
- Then align with each ANGLED BUCKET to IDENTIFY ACUITY TARGETS using camera zoom and exposure controls.
- Call out as many of the Concentric C gap directions as possible (1 pt each).
- Fly facing away from the test lane or scenario with a Visual Observer to evaluate flying interface only as if beyond visual line of sight.



Level 5 Confined Lane

Payload Functionality Trials

- Fill in the header information completely!
- PROCTOR ATTESTATION
  (The Proctor's printed name)
- <u>Bucket Size</u>
- Lighting
- Wind
- Pilot view
- Time limit



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Science and Technology

LEVEL 5 | CONFINED
PAYLOAD FUNCTIONALITY

ALIGNED (5 PTS) · BROKEN (1 PT) · ACCURATE (5 PTS)

TOP (T) · TOP LEFT (TL) · (TR) TOP RIGHT · LEFT (L) · (R) RIGHT · BOTTOM LEFT (BL) · (BR) BOTTOM RIGHT · (B) BOTTOM

Pilot LAST Name _____
Pilot FIRST Name _____
Pilot Organization _____
Drone Make _____
Drone Model _____
Facility Location _____
Date (YYYY/MM/DD) _____ Team #: _____
PROCTOR NAME _____

BUCKET DIAMETER		VISIBILITY			WIND		PILOT VIEW		TIME LIMIT		
2 IN (5 CM)	4 IN (10 CM)	LIGHTED 300+ LUX	DIM 1-300 LUX	DARK < 1 LUX	AVERAGE _____ MPH	GUSTS _____ MPH	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN
(CIRCLE ONE)		(CIRCLE ONE)			(FILL IN)		(CIRCLE ONE)		(CIRCLE ONE or FILL IN)		

23

Level 5 Confined Lane

Payload Functionality Trials

Brief reminders.

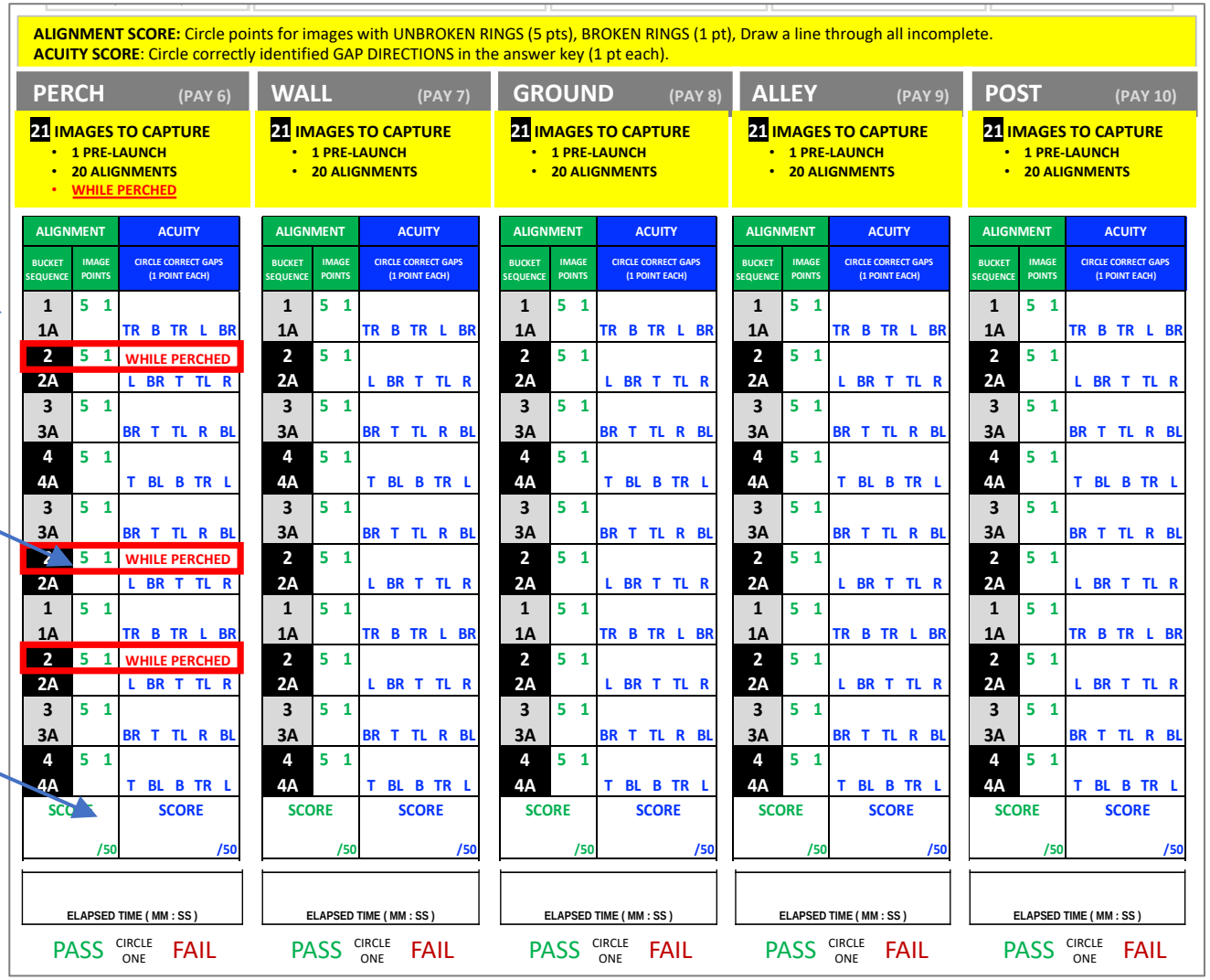
White and black bucket shading.

SCORE WHILE PERCHED.

Circle alignment points when declared by the pilot with verification of images during or after the trial.

Separate totals for ALIGNMENT and ACUITY points (50 points each).

Any organization can select their own passing score.



ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt), Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 pt each).

PERCH (PAY 6)	WALL (PAY 7)	GROUND (PAY 8)	ALLEY (PAY 9)	POST (PAY 10)
21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS • WHILE PERCHED	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS	21 IMAGES TO CAPTURE • 1 PRE-LAUNCH • 20 ALIGNMENTS

ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY	ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)	BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1		1	5 1		1	5 1		1	5 1		1	5 1	
1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
4	5 1		4	5 1		4	5 1		4	5 1		4	5 1	
4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
1	5 1		1	5 1		1	5 1		1	5 1		1	5 1	
1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR	1A		TR B TR L BR
2	5 1	WHILE PERCHED	2	5 1		2	5 1		2	5 1		2	5 1	
2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R	2A		L BR T TL R
3	5 1		3	5 1		3	5 1		3	5 1		3	5 1	
3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL	3A		BR T TL R BL
4	5 1		4	5 1		4	5 1		4	5 1		4	5 1	
4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L	4A		T BL B TR L
SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50	SCORE	/50	SCORE /50
ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)			ELAPSED TIME (MM : SS)		
PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL			PASS CIRCLE ONE FAIL		

Level 5 Confined Scenarios

Confined Vehicle Inspection Scenarios

Day and Night Trials

USE SETS OF 5 “INLINE” DUAL BUCKET RAILS

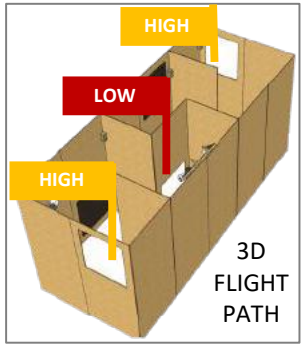
DISTRIBUTED THROUGHOUT THE SCENARIO

Confined Room-to-Room Labyrinth

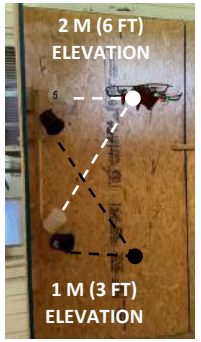
Search tasks with 1 m (3ft) minimum clearances

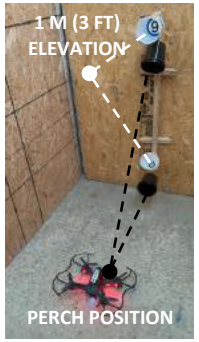
USE SETS OF 5 “INLINE” DUAL BUCKET RAILS

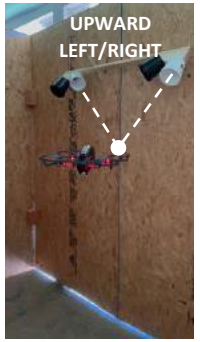
HORIZONTALS FOR LEFTWARD/RIGHTWARD INSPECTIONS



VERTICALS FOR UPWARD/DOWNWARD INSPECTIONS







- Fabricated room-to-room search scenario with inspect tasks that can be replicated to track and compare scores.
- Self-standing plywood corner walls define 1.2m (4 ft) switchback hallways with a blackout tarp ceiling over top at 2.4m (8ft). Fits inside a 6m (20ft) shipping container.
- Square access ”windows” measuring 1m (3ft) square provide entry/exit and interior high/low pass throughs.

Level 1-5 Quiz Review

Standards Enable Credentialing of Proctors and Remote Pilots

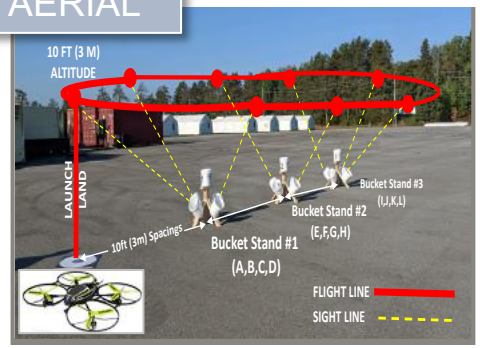
Safety | Capabilities | Proficiency

NIST Develops and Validates Test Methods

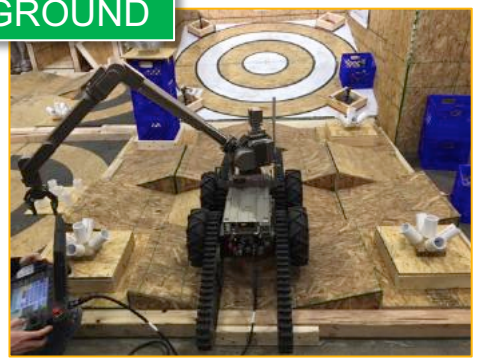
- ***Apparatus*** that can be reproducible by others.
- ***Procedures*** that are repeatable to conduct test trials.
- ***Performance Metrics*** that are quantitative and can be compared over time, across locations and internationally
- ***Evaluate Systems*** using expert pilots conducting complete trials
- ***Operator proficiency*** is compared with similar systems on the same lane spacing in similar environmental conditions with either complete or time limited trials

  Compare time limited trials that are incomplete by total points for similar elapsed times or calculate and compare the scoring rate as points per minute for different elapsed times

AERIAL



GROUND



AQUATIC

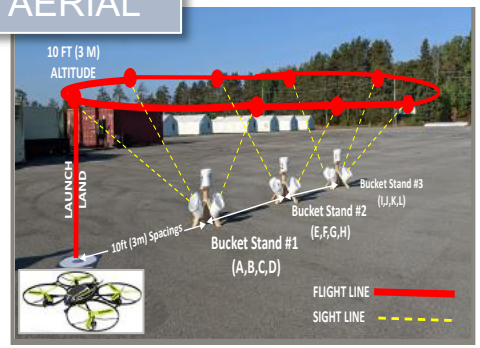
Standards Enable Credentialing of Proctors and Remote Pilots

Safety | Capabilities | Proficiency

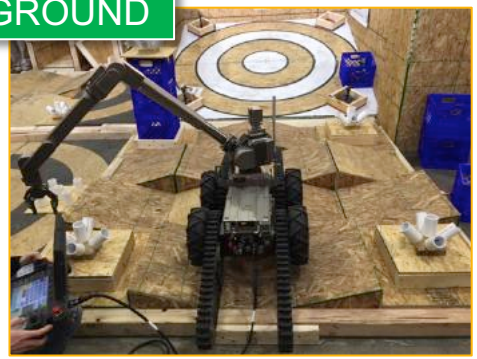
When conducting evaluations with these Test Methods the results should only be compared to similar environmental conditions.

Night or dark trials can be conducted with white or red headlamps illuminating the white buckets or only using the lights and sensors onboard the drone.

AERIAL



GROUND



AQUATIC

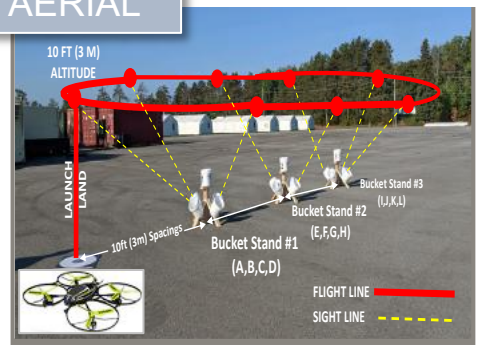
Standards Enable Credentialing of Proctors and Remote Pilots

Safety | Capabilities | Proficiency

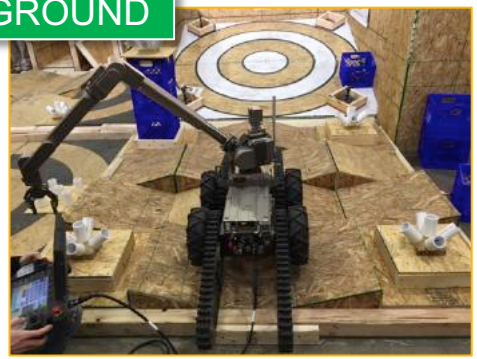
When Credentialing operators an organization can;

- Set their own pass/fail scoring threshold
- Adopt a pass/fail scoring threshold set by a regional or national association with which the organization collaborates
- Adopt a pass/fail scoring threshold set by a similar organization

AERIAL



GROUND



AQUATIC

Choose Appropriate Lane Spacing Based on Optics and Safety

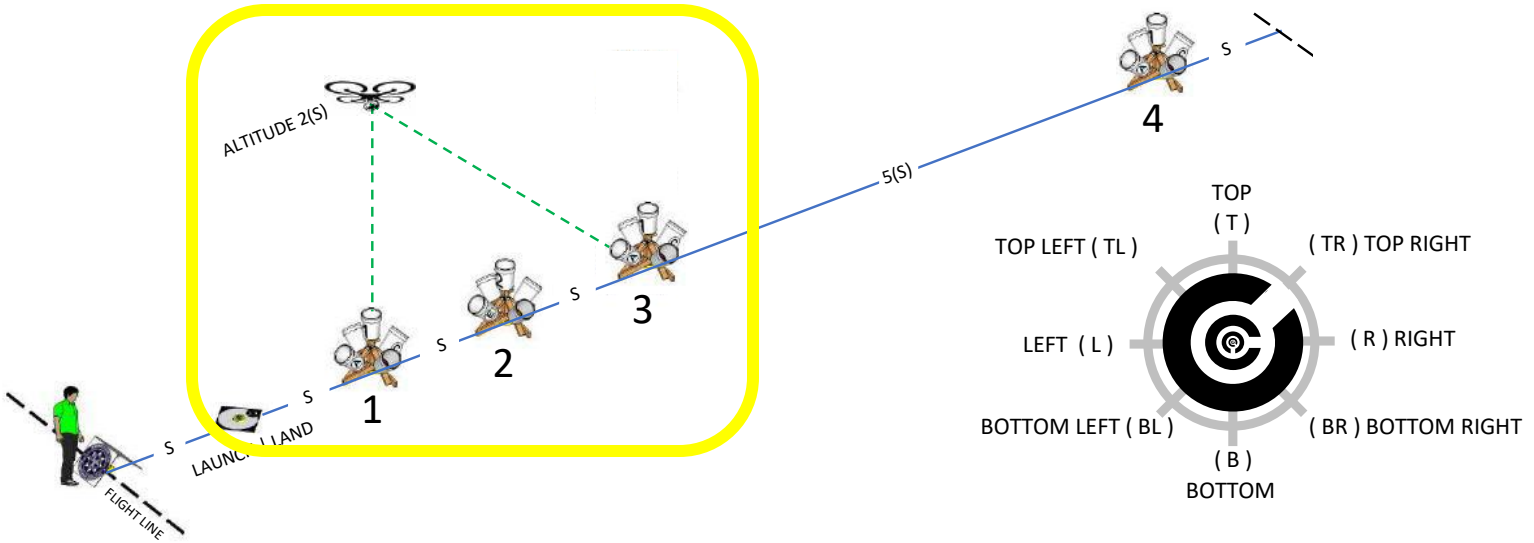
Open Test Lane

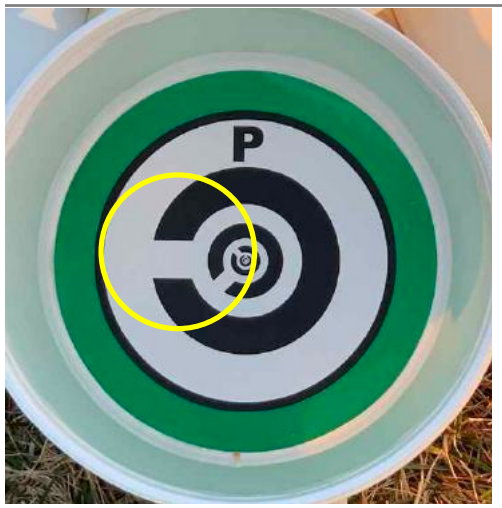
ALWAYS:

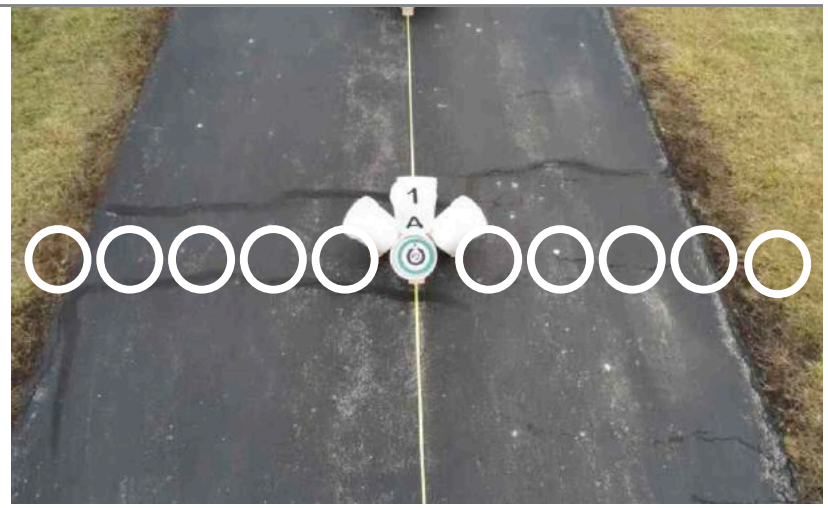
- Acuity from 2(S) so the targets must be visible

INDOORS:

- Lane Length = 10(S)
- Lane Width = 6(S)
- Elevation = 2(S)
  PLUS SAFETY MARGIN







Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

20 ALIGNMENTS TOTAL UP TO 100 POINTS

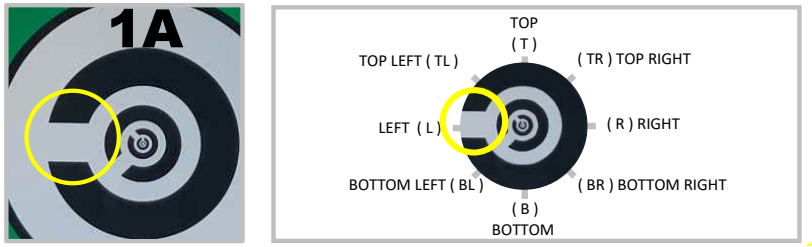
- Align with each bucket to capture a SINGLE IMAGE of the inscribed alignment ring. Only the first image is scored.
- Score captured images as:
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Score accurate landings as:
  - CENTERED (5 pts) with the aircraft center point inside the 60 cm (24 in) diameter circle.
  - OFFSET (1 pts) with at least one propeller motor inside the circle.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

Scoring Acuity Points

Identify increasingly small visual acuity targets

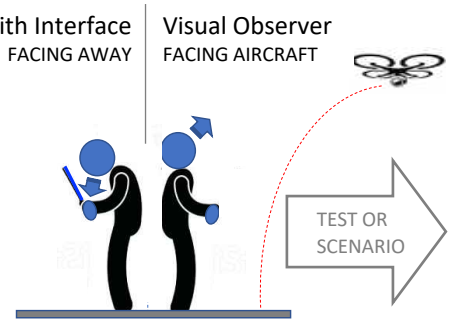
ALIGN THEN CONTROL ZOOM AND EXPOSURE

20 TARGETS TOTAL UP TO 100 POINTS



REPORT GAP DIRECTIONS RELATIVE TO THE BUCKET NUMBER (TOP)

- While aligned with each bucket, IDENTIFY ACUITY TARGETS using camera zoom and exposure controls.
- Verbally call out as many of the Concentric C gap directions as possible (1 pt each) with a Proctor.
- Fly facing away from the test lane or scenario (with a Visual Observer) to evaluate flying interface only as if beyond visual line of sight (BVLOS).

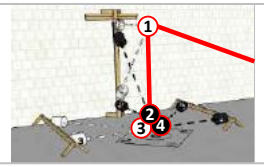


LEVEL 4 | OBSTRUCTED
PAYLOAD FUNCTIONALITY

Perform 5 different flight paths to triangulate around the dual bucket rails. Each flight path includes alignments with perpendicular buckets then angled buckets using zoom and exposure control to identify recessed targets.

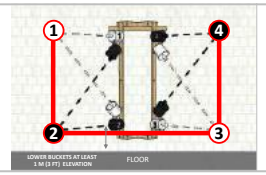
- All sequences have 10 positions with 20 buckets to score: **1 2 3 4 – 3 2 1 – 2 3 4** *(forward–reverse–forward)*
- Score ALIGNMENT POINTS by capturing a SINGLE IMAGE of the inscribed rings to verify alignments during or after the trial: UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt).
- Score ACUITY POINTS by calling out the 5 increasingly small VISUAL ACUITY TARGET GAPS (1 pt each).
- Start timer at launch and end after the last task is completed. Trial time limits are typically 5 minutes each (25 minutes to complete all 5 tests) although organizations may set their own trial time limits and passing scores.
- Extreme deviations from the intended flight path, or contact with any object, ends the trial to ensure safety.

PERCH
PAY 6



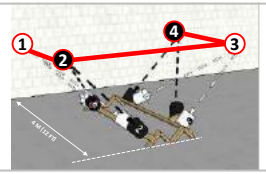
- Land or hover just above the ground within proximity to a wall or obstacle with additional ground obstacles on both sides. Launch and land repeatedly if necessary to score all buckets in the sequence of perch tasks.
- Inspect **vertical** and **horizontal** object features **all around the aircraft**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

WALL
PAY 7



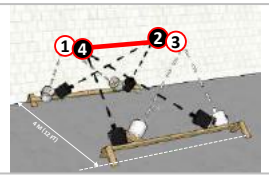
- Fly within proximity to a wall or obstacle at **45 degrees from forward** of the aircraft.
- Inspect **vertical** object features **upward** and **downward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

GROUND
PAY 8



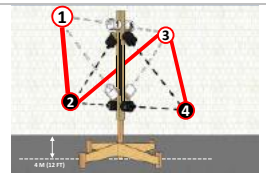
- Fly within proximity to a wall or obstacles at **90 degrees from forward** of the aircraft.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

ALLEY
PAY 9



- Fly within proximity to a wall or obstacle in **front of the aircraft (0 degrees)** and **behind the aircraft (180 degrees)**.
- Inspect **horizontal** object features **leftward** and **rightward**.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

POST
PAY 10



- Fly within proximity to a post and wall or obstacle and pass between the post and the wall.
- Inspect **vertical** object features **upward** and **downward** all around the post.
- **Complete 10 positions to score up to 50 Alignment points and 50 Acuity points.**

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LEVEL 4 | OBSTRUCTED
PAYLOAD FUNCTIONALITY

Pilot LAST Name _____

Pilot FIRST Name _____

Pilot Organization _____

Drone Make _____

Drone Model _____

Facility Location _____

Date (YYYY/MM/DD) _____ Team #: _____

PROCTOR NAME _____

BUCKET DIAMETER		VISIBILITY			WIND		PILOT VIEW		TIME LIMIT		
4 IN (10 CM)	8 IN (20 CM)	LIGHTED 300+ LUX	DIM 1-300 LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACINE LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	5 MIN	10 MIN	___ MIN
(CIRCLE ONE)		(CIRCLE ONE)			MPH	MPH (FILL IN)	(CIRCLE ONE)		(CIRCLE ONE or FILL IN)		

ALIGNMENT SCORE: Circle points for images with UNBROKEN RINGS (5 pts), BROKEN RINGS (1 pt), Draw a line through all incomplete.
ACUITY SCORE: Circle correctly identified GAP DIRECTIONS in the answer key (1 pt each).

PERCH (PAY 6)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS
- WHILE PERCHED

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	WHILE PERCHED
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	WHILE PERCHED
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

WALL (PAY 7)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

GROUND (PAY 8)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

ALLEY (PAY 9)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

POST (PAY 10)

21 IMAGES TO CAPTURE
- 1 PRE-LAUNCH
- 20 ALIGNMENTS

ALIGNMENT		ACUITY
BUCKET SEQUENCE	IMAGE POINTS	CIRCLE CORRECT GAPS (1 POINT EACH)
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
3	5 1	
3A		BR T TL R BL
2	5 1	
2A		L BR T TL R
1	5 1	
1A		TR B TR L BR
2	5 1	
2A		L BR T TL R
3	5 1	
3A		BR T TL R BL
4	5 1	
4A		T BL B TR L
SCORE	/50	SCORE /50

ELAPSED TIME (MM : SS)

PASS CIRCLE ONE FAIL

Scoring Alignment Points

Capture images of alignment rings to verify

ALIGN WITH BUCKETS AND LAND ACURATELY

10 ALIGNMENT RINGS TOTAL 50 POINTS

CAPTURE IMAGES OF THE INSCRIBED RINGS AND LAND ACCURATELY.

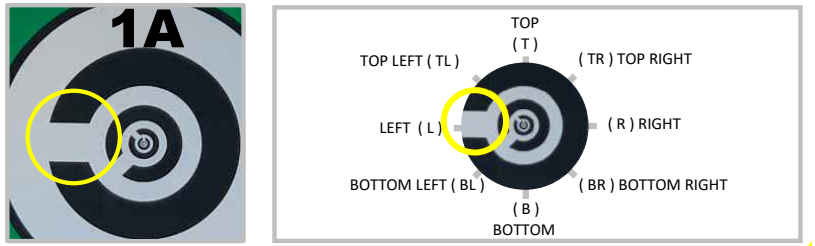
- First align with each PERPENDICULAR BUCKET to capture a SINGLE ALIGNMENT IMAGE of the inscribed ring.
- Score captured images with
  - UNBROKEN RINGS (5 points)
  - BROKEN RINGS (1 point)
  - NO RINGS (0 points, strike through line)
- Accurate landings are not scored.
- Verification of captured alignment images can be during the trial when obvious or after the trial to eliminate discussions during the trial. Images can also be stored for documentation.

Scoring Acuity Points

Identify increasingly small visual acuity targets

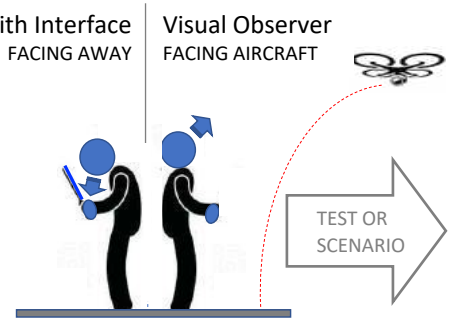
ALIGN THEN CONTROL ZOOM AND EXPOSURE

10 ACUITY TARGETS TOTAL 50 POINTS



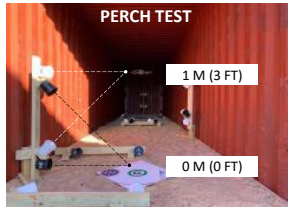
REPORT GAP DIRECTIONS RELATIVE TO THE BUCKET NUMBER (TOP)

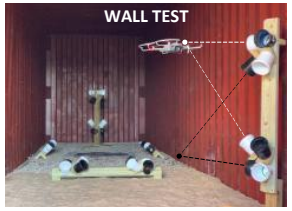
- Then align with each ANGLED BUCKET to IDENTIFY ACUITY TARGETS using camera zoom and exposure controls.
- Call out as many of the Concentric C gap directions as possible (1 pt each).
- Fly facing away from the test lane or scenario with a Visual Observer to evaluate flying interface only as if beyond visual line of sight.



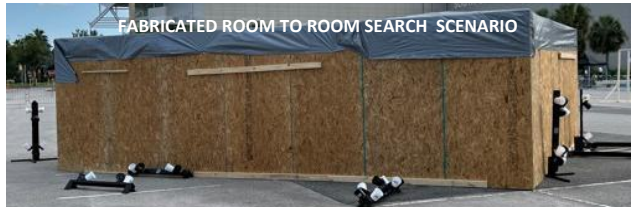
Confined Tests and Scorable Scenarios

Evaluate safety, capabilities, and proficiency





The Confined tests and scorable scenarios enable remote pilots to perform safe and repeatable flight paths indoors room-to-room or in any confined space to inspect objects from very close proximity. There are 5 different tests that guide remote pilots through various standoff positions, orientations, and perches at about 1 m (3 ft) from objects. These tests can be performed indoors to control lighting, weather, and access to GPS or outdoors as appropriate.

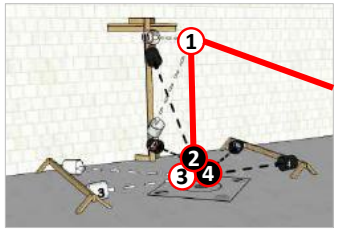


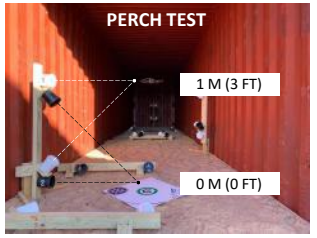
Bucket Alignments Define Flight Paths

Designated altitudes, positions, and orientations

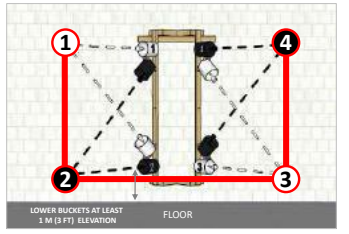
Science and Technology

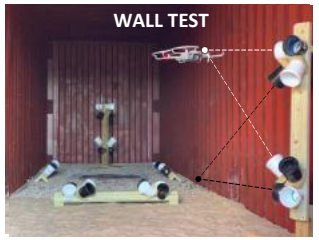
PERCH
PAY 6



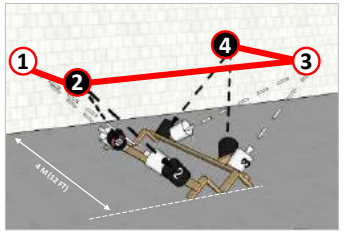


WALL
PAY 7

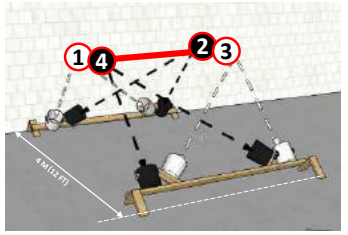




GROUND
PAY 8



ALLEY
PAY 9



POST
PAY 10