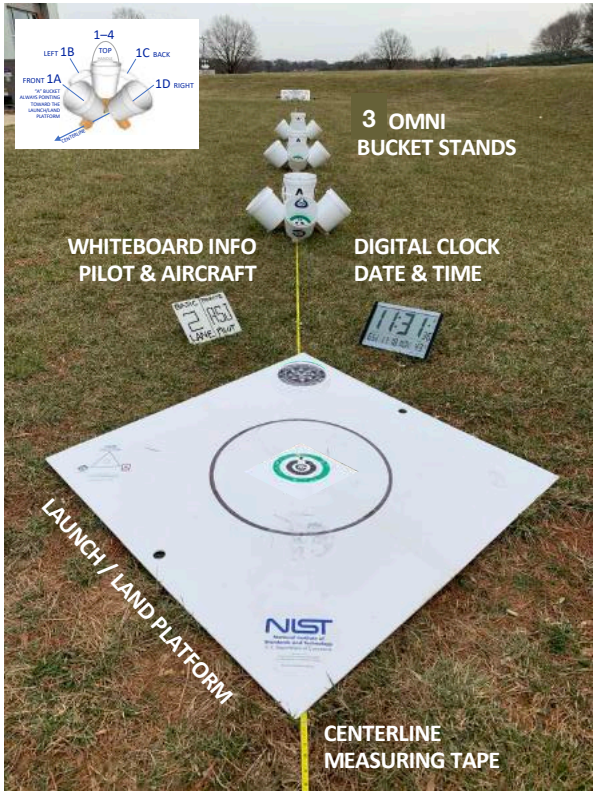
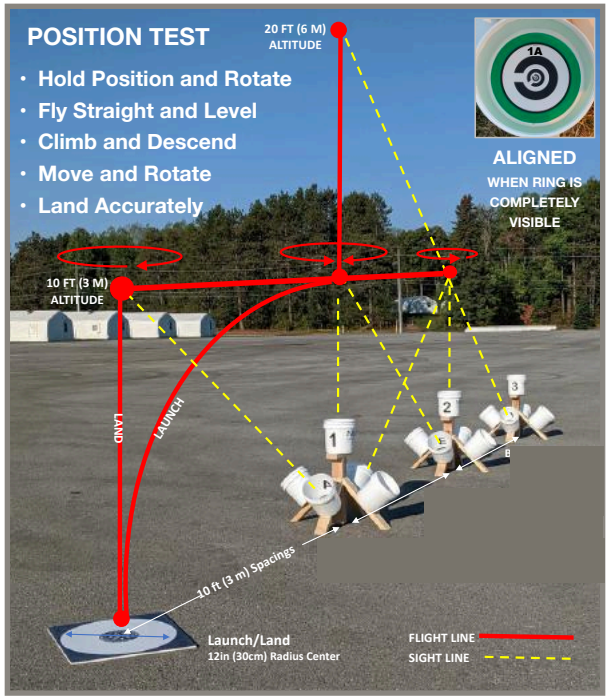
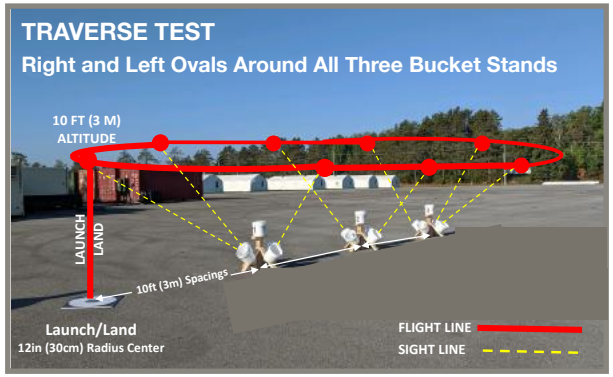
Purpose

These test methods for small unmanned aircraft systems can be used to quantitatively evaluate various system capabilities and remote pilot proficiency. They are being standardized through the *ASTM International Standards Committee on Homeland Security Applications; Response Robots (E54.09)*. They are also referenced as Job Performance Requirements in the *National Fire Protection Association Standard for Small Unmanned Aircraft Systems Used For Public Safety Operations (NFPA 2400).*

These test methods are primarily intended for vertical takeoff and landing systems with an onboard camera and remote pilot display.







Test Director

Adam Jacoff
Intelligent Systems Division
National Institute of Standards and Technology
U.S. Dept. of Commerce
Email: RobotTestMethods@nist.gov
Website: RobotTestMethods.nist.gov
Phone: 301-975-4235

Sponsor

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Standard Test Methods for Small Unmanned Aircraft Systems

Basic Proficiency Evaluation for Remote Pilots

Flying safely in our national air space requires knowledge and skill. The FAA's Part 107 written test ensures remote pilots understand air space restrictions and safety precautions. This brochure introduces a basic skills test for remote pilots to evaluate "positive aircraft control" at all times. More comprehensive tests are available online.

These standard test methods provide a reproducible way to train and measure remote pilot proficiency for professionals and recreational pilots. Organizations can establish their own minimum proficiency requirements to improve operations while reducing risk to ground personnel and manned aircraft in the area.

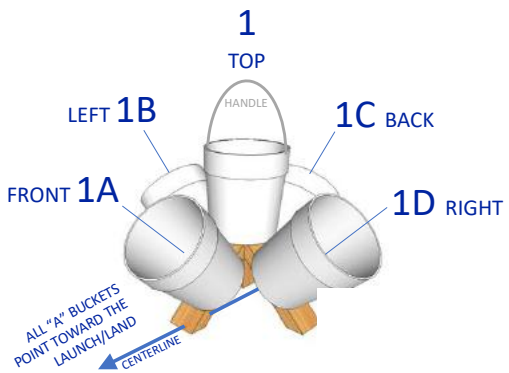
Website: RobotTestMethods.nist.gov

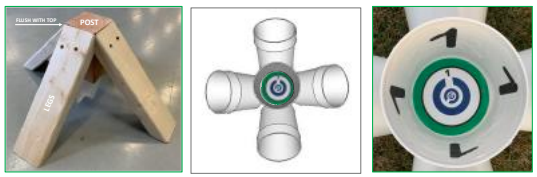
Version: 2020F

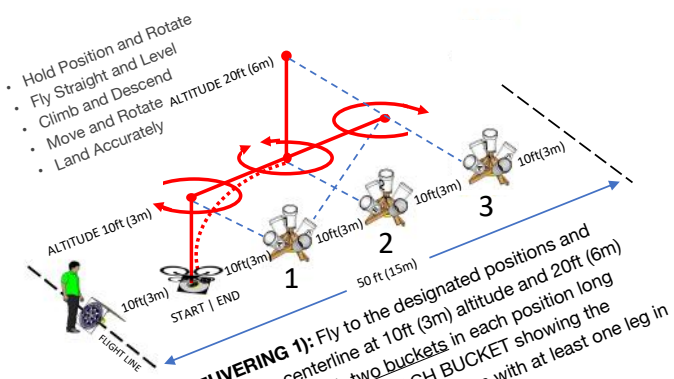
Summary of Tests

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.

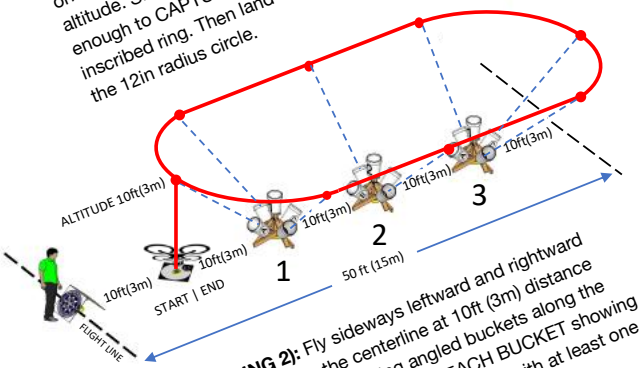
ALIGNED ALIGNED **NOT** ALIGNED







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.

Test Lane Fabrication

Omni Bucket Stands , Launch/Land Platform, Measuring Tape Centerline

- (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.

BASIC PROFICIENCY FORM (10 MINUTE TIME LIMIT)		
Pilot:		
Org:		
Email:		
Zip Code:	Date (MM/DD/YY):	
Make:	Model:	

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**		