Use Case Examples

Aerial Test Methods

Version 2021A

WEBSITE POINTER:
DOWNLOAD STICKER FILES, FORMS AND PRACTICE SCORING VIDEOS

WEBSITE POINTER:
WATCH FABRICATION VIDEOS AND FLIGHT PATH ANIMATIONS

Online Only Meeting
February 3, 2021
10:00am – 2:00pm EST

Sub Committee Chair:
Adam Jacoff
Intelligent Systems Division
National Institute of Standards and Technology
U.S. Department of Commerce

Committee Chair:
Phil Mattson
Science and Technology Directorate
U.S. Department of Homeland Security

Internet
RobotTestMethods.nist.gov

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RobotTestMethods@nist.gov

Aerial Test Methods

Use Case Examples

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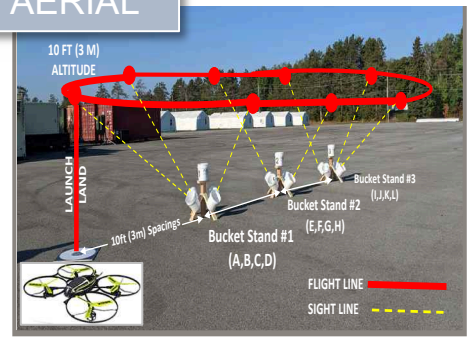
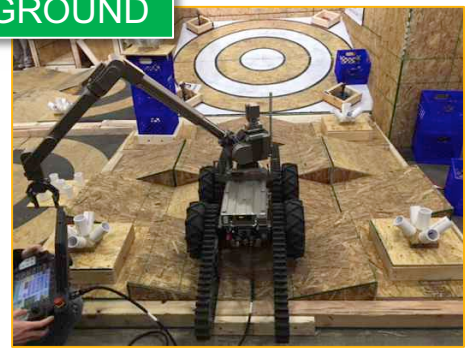
- Recent Validation Exercises
- DHS/DOJ procurement evaluations
- Japan Manned Space Systems Corp.
- CA: Los Angeles Fire Dept.
- CO: CoE for Advanced Technology Aerial Firefighting,
- TX: Dept. of Public Safety and Reveille Peak Ranch Test Facility
- NE: Omaha Police Dept.
- OH: Woodlawn Fire Dept.
- Canada: Canadian Emergency Response Robotics Assoc.
- APSA: ”Train the Trainer” class scheduled
- DroneResponders: Auditing for ASTM

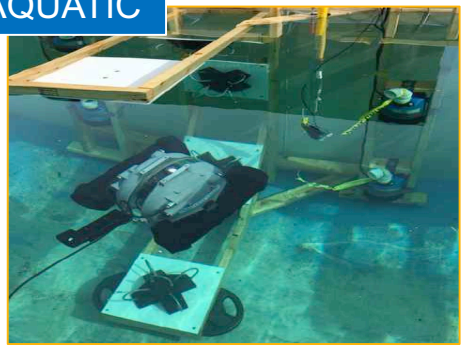
AERIAL



GROUND



AQUATIC

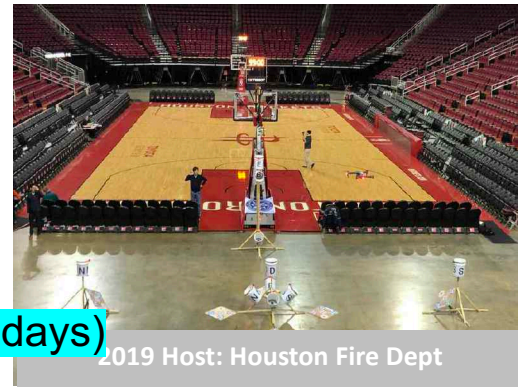


Validation Exercises

Use Case Examples

Color Key: Ground Aerial Aquatic Multiple Standards

- 2020.08 DHS/DOJ sUAS Procurement Testing ($35M), Montgomery County Police Facility, MD (1 days)
- 2020.10 Air Force Large Ground Robot Procurement ($70M), Tyndall AFB, FL (Weeks)
- 2020.08 DHS/DOJ sUAS Procurement Testing ($35M), Montgomery County Police Facility, MD (5 days)
- ~~2020.09 Canadian Fire Training Facility Opening Exercise, Toronto Airport, Ontario, Canada (4 days)~~
- ~~2020.08 World Robot Summit Disaster Response Championship, Fukushima, Japan (4 days)~~
- ~~2020.06 RoboCupRescue International Championship, Bordeaux, France (5 days)~~
- ~~2020.05 AUVSI Exponential Conference (netted aviary), Boston, MA (3 days)~~
- ~~2020.04 Fire Dept. International Conference (FDIC) Hands-On Training, Indianapolis, IN (3 days)~~
- ~~2020.03 UTAC UAS Conference, Guardian Center, Perry, GA (4 days)~~
- 2020.03 Public Safety UAS Conference Validation Exercise, Crozet, VA (5 days)



2019 Host: Houston Fire Dept

2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

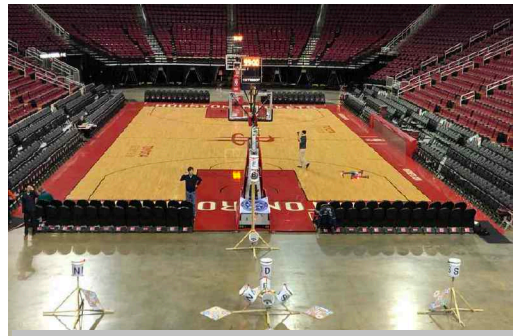
Validation Exercises

Use Case Examples

Color Key: Ground Aerial Aquatic Multiple Standards

2020.02 ASTM E54.09 Response Robots Meeting and Exercise, Atlanta, CO (3 days)

- 2020.01 Ohio Fire Training Facility Opening, Ohio (2 days)
- 2020.01 FDIC Fire/Rescue East, Daytona, FL (2 days)
- 2020.01 Los Angeles Fire Dept. Training, Los Angeles, CA (3 days)
- 2019.12 FAA Requirements Workshop for Fire Depts and Emergency Services, NIST (1 day)
- 2019.11 Atlantic Future Forum, UK HMS Queen Elizabeth, Annapolis, MD (2 days)
- 2019.11 DHS Familiarization Exercise, Army Camp Shelby, MS (5 days)
- 2019.10 World Robot Summit, Fukushima, Japan (5 days)
- 2019.09 NATO Aerial and Ground Exercise, Base Borden, Ontario, Canada (3 days)
- 2019.07 Aerial Validation Exercise at NIST (3 days)
- 2019.06 RoboCupRescue International Championship, Sydney, Australia (5 days)



2019 Host: Houston Fire Dept

2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

Validation Exercises

Use Case Examples

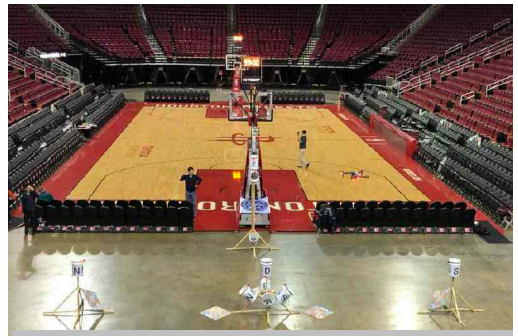
Color Key: Ground Aerial Aquatic Multiple Standards

2019.06 ASTM E54.09 Response Robots Meeting and Exercise, Denver, CO (5 days)

- 2019.05 Western Regional Robot Rodeo, Sandia/Kirtland, Albuquerque, NM (5 days)
- 2019.05 Canadian Police College Training Exercise, London, ON Canada (7 days)
- 2019.04 Thermite RS2 firefighting robot capabilities evaluation (1 day)
- 2019.04 Army Tank Automotive Research and Development facility fabrication (remote)
- 2019.04 Fire Dept Training Conference (FDIC), Indianapolis, IN (3 days)
- 2019.04 Guardian Center Training, Perry, GA (2 days remote)
- 2019.04 Reveille Ranch Calibration, Texas Dept of Public Safety, Burnet, TX (2 days)
- 2019.04 InstantEye UAS capabilities evaluation, NIST (3 days)

2019.03 ASTM F38 standard balloted referencing 6 of our aerial test methods

- 2019.03 Navy Explosive Ordinance Disposal Tech Division facility fabrication (remote)
- 2019.03 Virginia UAS Summit on Public Safety, Crozet, VA (3 days)



2019 Host: Houston Fire Dept

2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

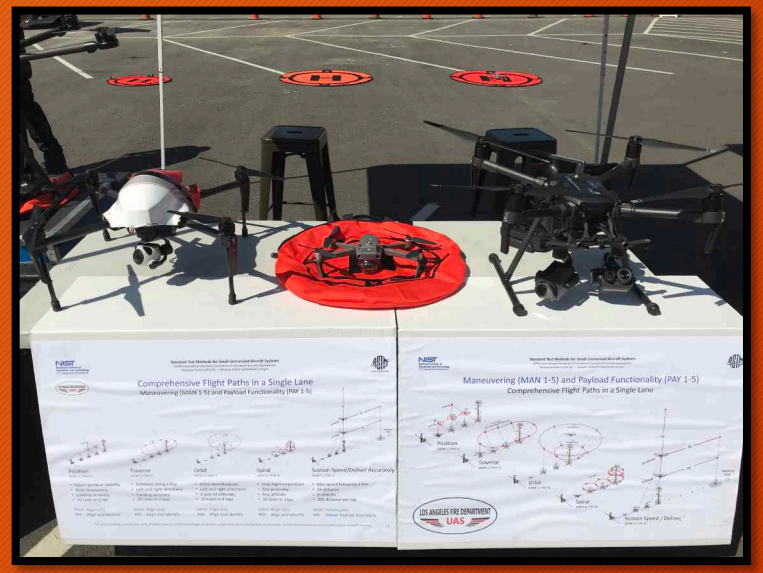
California: Los Angeles CITY Fire Dept.

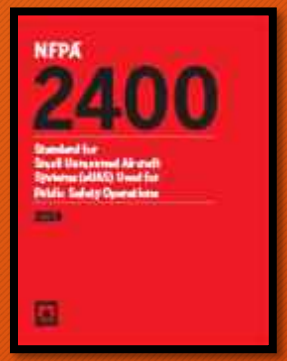
Use Case Examples

Los Angeles *CITY* Fire Department Unmanned Aerial System (UAS) Program

- UAS Program approved by LA City Council, 2017
- Established to fight fires, improve efficiency of training, respond to high risk incidents
- Developed UAS applications for:
  - Brush Area Hazards inspections
  - Brush Fire Mapping
  - Thermal Hotspot Identification - assisting firefighters to identify and extinguish active fires
  - HAZMAT, Urban Search and Rescue, and Swift Water Operations
  - Situational Awareness - video-streaming to Emergency Operations Center for large scale events

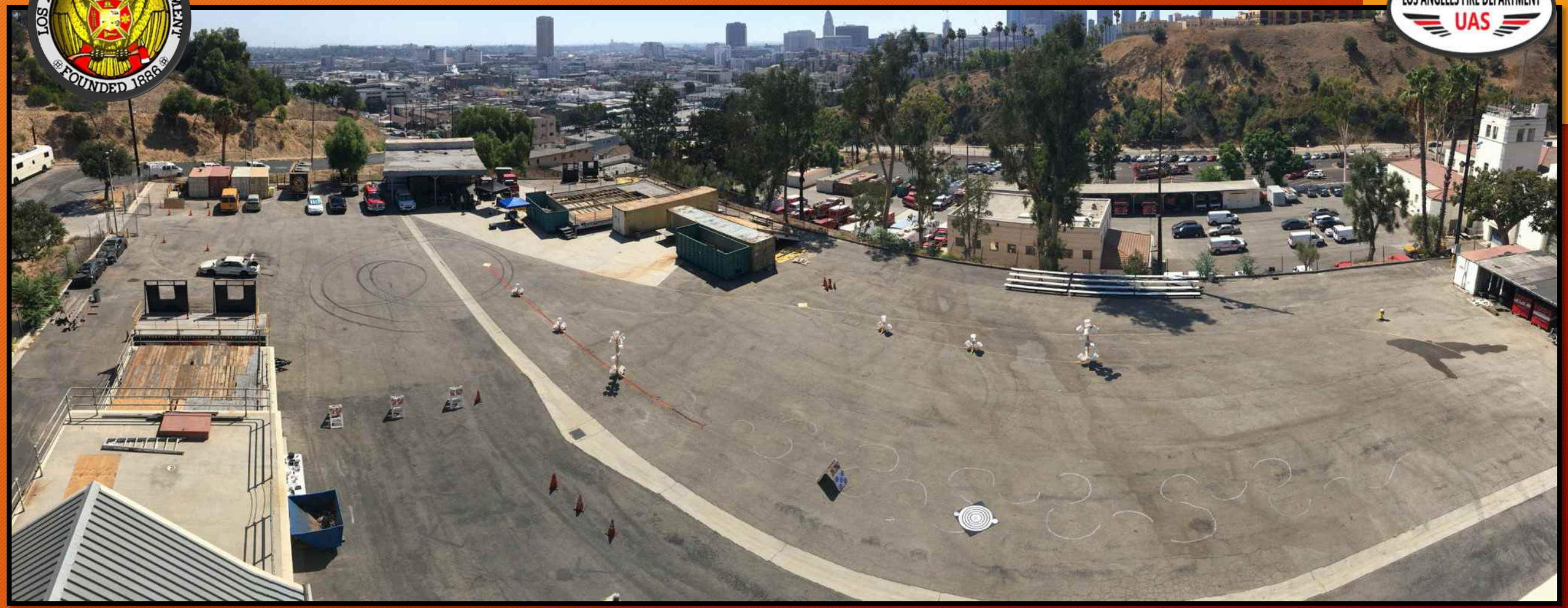
Public Safety UAS Standardization with NIST Aerial Test Methods





HOW LAFD uses NIST Aerial Test Methods:

- Basic Evaluation Standards to objectively certify LAFD Basic Remote Pilots
  - Recognized by FAA and NFPA as recommended evaluation tool
- Scalable to evaluate advanced procedures and application
- Practical to evaluate equipment and perform Functional Check Flights (FCF)


LOS ANGELES FIRE DEPARTMENT
FOUNDED 1886
LOS ANGELES FIRE DEPARTMENT
UAS

Japan: International Rescue System Institute

Use Case Examples

ASTM E54.09

Status report on sUAV-STM evaluation excersize in Japan

4th Feb. 2021

Purpose of this paper

To share the results of sUAV-STM evaluation exercose in Japan (Nagaoka, Niigata) held on 25th-26th Jan. 2021

Summary

Purpose : **To identify the issues on the application of NIST sUAV-STM in Japan**

Date : **Jan. 25 - 26th 2021**

Location : **Nagaoka / Niigata, Japan**

Participants : **Pilot 11 , Proctor 6**

Tasks : **Basic / Position & Traverse** (MAN only, 2-Lap each)

Lane : **4 lanes** (simultaneous flight)

For the COVID-19 countermeasure;

Reduced number of the on-site Participants by,

- ✓ YouTube Live distribution
- ✓ Independent 3-event repeated for 3 groups

	Day 1	Day2
9:30 -	Preparation	Group **B** (4 lanes) - Briefing - Exercise (1 hr.) - Flight - Debriefing
13:30 – -16:30	Group **A** (3 lanes) - Briefing - Exercise(1 hr.) - Flight - Debriefing	Group **C** (4 lanes) - Briefing - Exercise(1 hr.) - Flight - Debriefing
-19:00		Cleanup

Summary

■ **Open spaces for 4 lanes**

Total 11 pilots flew the sUAV without GPS on 4 lanes in 2 days.

Summary

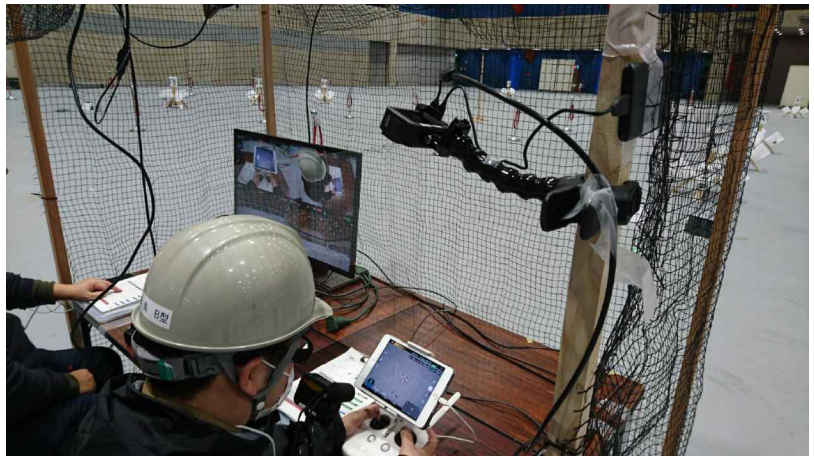
■ Safe Flight Booth

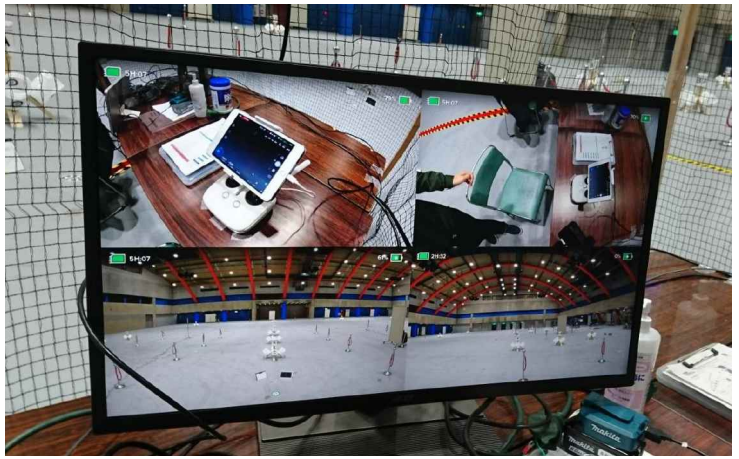
Left : Pilot with camera on his helmet for video distribution by YouTube.

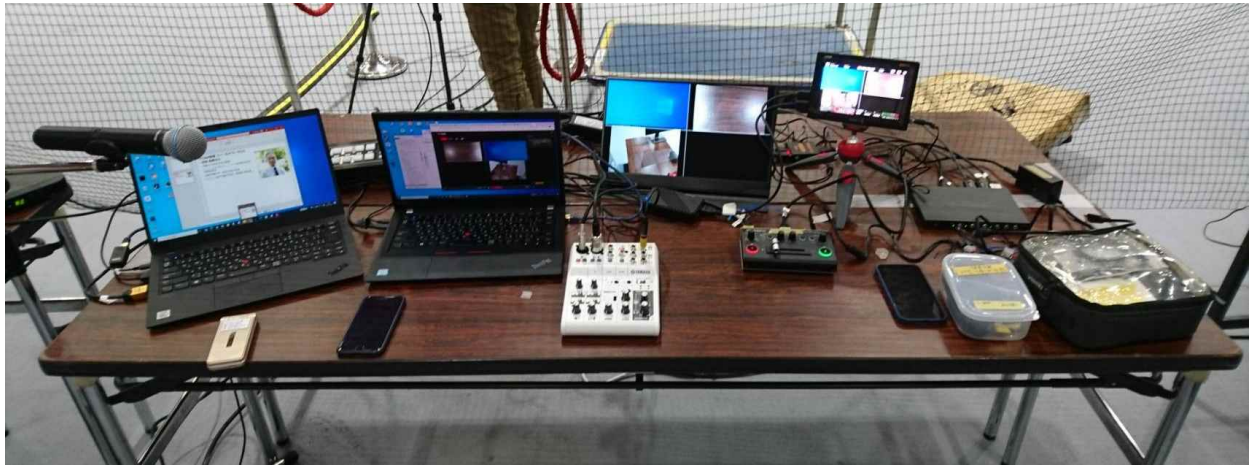
Right : Visual Observer watching the large monitor to keep the Social Distance with the pilot

Summary

■ Cameras and Video distribution system





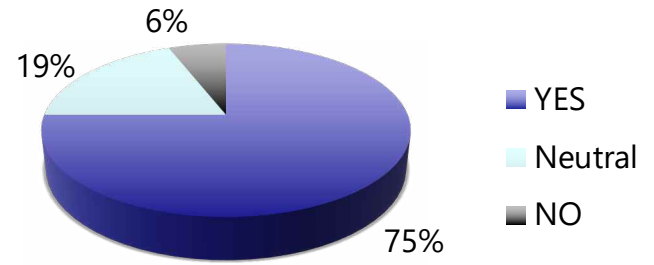


Results and analysis

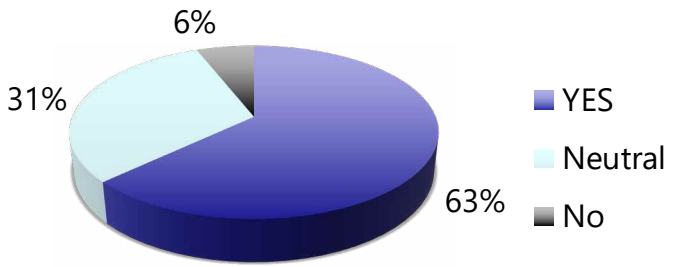
■ Major Results

Overall, the participants' comments are positive for applying the NIST sUAV-STM into Japan.

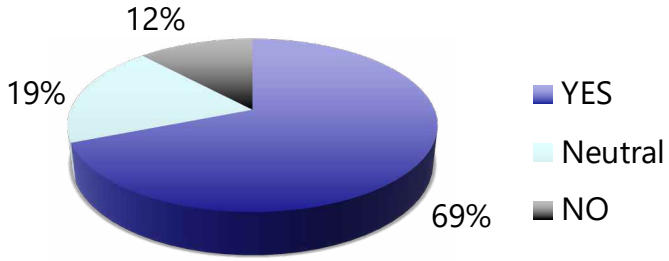
Q Is the sUAV-STM easy to understand ?



Q Is the sUAV-STM effective method for evaluating the PERFORMANCE OF sUAV?



Q Is the sUAV-STM effective method for evaluating the PERFORMANCE OF PILOTs?



Issues and analysis

■ Results

Major comments

The targets shown on the Monitor are too small to judge the alignment.
Larger monitors have advantages for getting better scores, which is not fair.

expected

actual

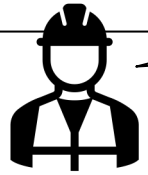
The size of monitor and/or the size of the targets shown on the monitor should be checked in advance.

Issues and analysis

■ Results

Major comments

It is important to record the detail of the sUAV specifications & pilots' experiences, since those "conditions" drives the results of "man-machine integrated performance.



Following information should be recorded on the evaluation form.

[Pilot info]
- Flight hours
- Type of sUAV business (surveyor etc.)
- BVLOS flight experiences
- Major operation is Auto or Manual
- STM experiences
- normally 1 person flight (both of maneuvering and camera operations) or 2-person operation (Camera operation is done by another person)

[sUAV info]
- Visual sensor On / Off (P-mode flight or A-mode flight etc.)
- with or without Camera Zoom
- Size of Monitor
- Size of Target view (Green Circle) shown on the monitor
- Velocity of Camera Tilt control
- Is the sUAV pilot's familiar vehicle or the one flew for the first time today.

Issues and analysis

■ Discussions

One of the major debriefing discussion is the “allowable navigation by proctor for the pilot during flight.”

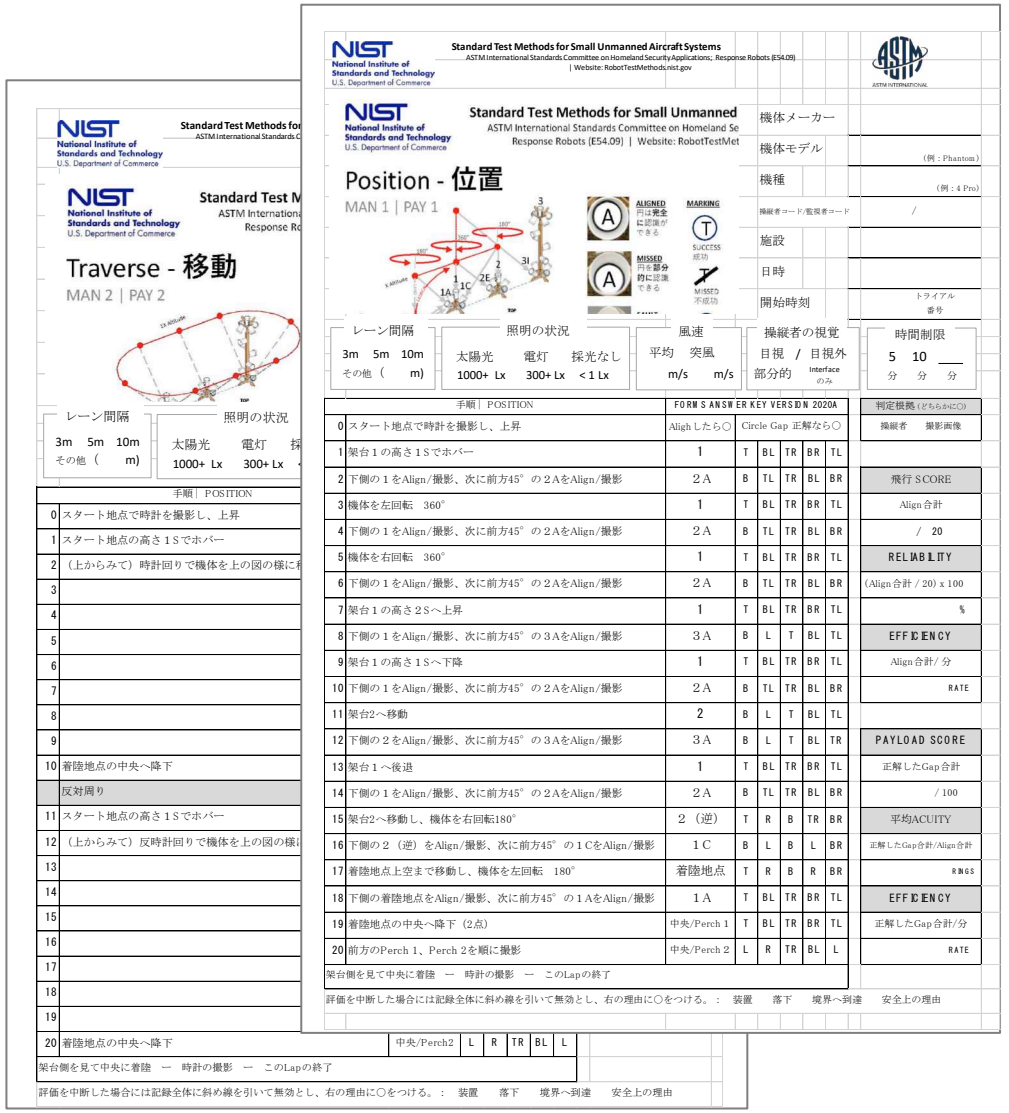
During our event, we allowed the proctors to give some “words of guide” such as “ next, go to 2, forward ” “next, camera tilt down for 2A” to the pilot. Some proctors gave the pilots a “ navigation for smooth flight and camera shooting” which may lead better score. On the other hand, some proctors might give some “waiting-time to the pilot” during recording on the form, which makes the pilots’ score worse.

These navigations should be standardized and proctors should be trained .

Issues and analysis

■ Other topics

For the better understanding of NIST Score Form, Japanese-version was used for participants temporarily.



Standard Test Methods for Small Unmanned Aircraft Systems
ASTM International Standards Committee on Homeland Security Applications; Response Robots (E54.09)
| Website: RobotTestMethods.nist.gov

Position - 位置
MAN 1 | PAY 1

Traverse - 移動
MAN 2 | PAY 2

	手順	POSITION	FORM S ANSWER KEY VERSION 2020A						
0	スタート地点で時計を撮影し、上昇		Aligh したら○	Circle Gap 正解なら○					
1	架台１の高さ１Ｓでホバー		1	T	BL	TR	BR	TL	
2	下側の１をAlign/撮影、次に前方45° の２AをAlign/撮影		２A	B	TL	TR	BL	BR	
3	機体を左回転　360°		1	T	BL	TR	BR	TL	
4	下側の１をAlign/撮影、次に前方45° の２AをAlign/撮影		２A	B	TL	TR	BL	BR	
5	機体を右回転　360°		1	T	BL	TR	BR	TL	
6	下側の１をAlign/撮影、次に前方45° の２AをAlign/撮影		２A	B	TL	TR	BL	BR	
7	架台１の高さ２Ｓへ上昇		1	T	BL	TR	BR	TL	
8	下側の１をAlign/撮影、次に前方45° の３AをAlign/撮影		３A	B	L	T	BL	TL	
9	架台１の高さ１Ｓへ下降		1	T	BL	TR	BR	TL	
10	下側の１をAlign/撮影、次に前方45° の２AをAlign/撮影		２A	B	TL	TR	BL	BR	
11	架台2へ移動		2	B	L	T	BL	TL	
12	下側の２をAlign/撮影、次に前方45° の３AをAlign/撮影		３A	B	L	T	BL	TR	
13	架台１へ後進		1	T	BL	TR	BR	TL	
14	下側の１をAlign/撮影、次に前方45° の２AをAlign/撮影		２A	B	TL	TR	BL	BR	
15	架台2へ移動し、機体を右回転180°		２（逆）	T	R	B	TR	BR	
16	下側の２（逆）をAlign/撮影、次に前方45° の１CをAlign/撮影		１C	B	L	B	L	BR	
17	着陸地点上空まで移動し、機体を左回転　180°		着陸地点	T	R	B	R	BR	
18	下側の着陸地点をAlign/撮影、次に前方45° の１AをAlign/撮影		１A	T	BL	TR	BR	TL	
19	着陸地点の中央へ降下（2点）		中央/Perch 1	T	BL	TR	BR	TL	
20	前方のPerch 1、Perch 2を順に撮影		中央/Perch 2	L	R	TR	BL	L	

架台側を見て中央に着陸　ー　時計の撮影　ー　このLapの終了

評価を中断した場合には記録全体に斜め線を引いて無効とし、右の理由に○をつける。：　装置　落下　境界へ到達　安全上の理由

Future Plan

■ Further study and trial for sUAV-STM in Japan

We are going to further study the appropriate application of NIST sUAV-STM method in Japan including following discussions,

✓ **Proctor and visual observer training program**

World Robot Summit (2018-2020)

Use Case Examples

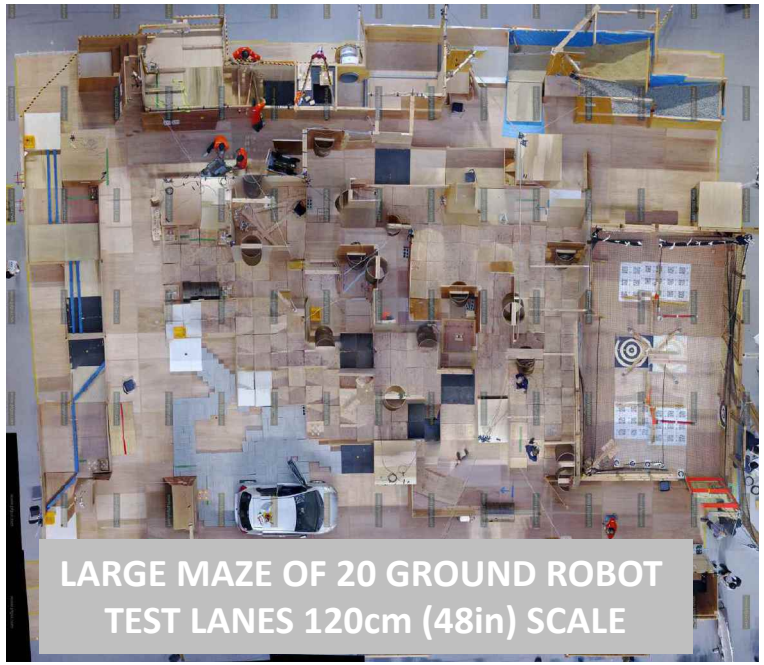
Standard Disaster Robotics Category, Fukushima Robot Test Field, Fukushima, Japan

RoboCupRescue Robot League (2000-present)

Use Case Examples

- We conduct annual international robotics research competitions, sometimes two a year.
- The RoboCupRescue Championships (shown below) use 20 ground robot tests set up in a large maze so they can be conducted individually as preliminaries then a comprehensive search mission for finals.
- These competition focus on autonomous behaviors vs. remote teleoperation using all three sizes of robot test lanes. Typically more than 30 teams participate.
- Most teams fabricate the test methods at their facilities to refine designs and practice.


NAGOYA, JAPAN


LARGE MAZE OF 20 GROUND ROBOT TEST LANES 120cm (48in) SCALE

RoboCupRescue Championships

2020 Bordeux, France
2019 Sydney, Australia
2018 Montreal, Canada
2017 Nagoya, Japan
2016 Leipzig, Germany
2015 Hefei, China
2014 Joao Pessoa, Brazil
2013 Eindhoven, Netherlanc
2012 Mexico City, Mexico
2011 Istanbul, Turkey
2010 Singapore, Singapore
2009 Graz, Austria
2008 Suzhou, China
2007 Atlanta, USA
2006 Bremen, Germany
2005 Osaka, Japan
2004 Lisbon, Portugal
2003 Padua, Italy
2002 Fukuoka, Japan
2001 Seattle, USA
2000 AAAI Conf, Austin, TX

Nebraska: Omaha Police Dept.

Use Case Examples

Texas Dept. of Public Safety and Reveille Peak Ranch Test Facility

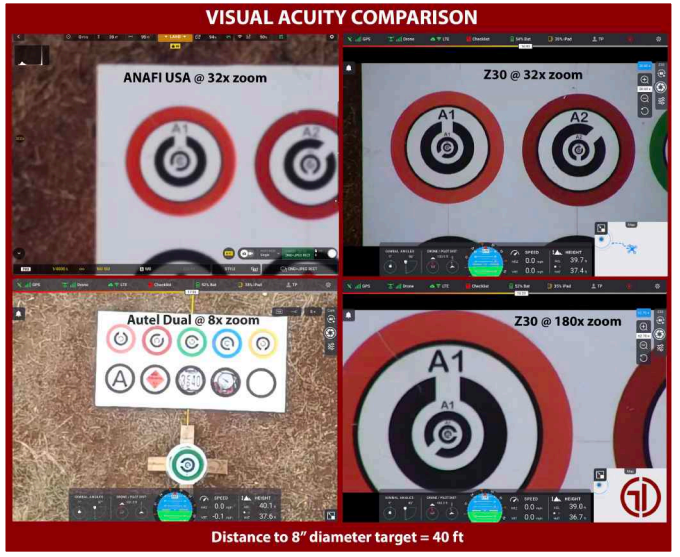
Use Case Examples

Texas Dept. of Public Safety Stats:

Pilots: 100+
Aircraft: 100+
Annual Flights: 10,000+
Main focus: Crash/crime scene reconstruction

News from Texas Legislature

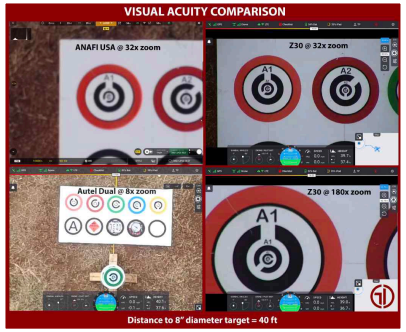
- Training
- Software
- Adoption of NIST tests



Reveille Peak Ranch Test Facility and Statewide Use Cases by Local Organizations (next pages)

Texas Dept. of Public Safety and Reveille Peak Ranch Test Facility

Use Case Examples



Texas Dept. of Public Safety and Reveille Peak Ranch Test Facility

Use Case Examples

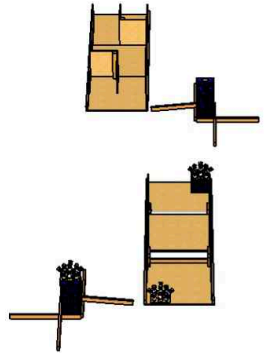
- North Texas Public Safety Unmanned Response Team (PSURT) PSURT Dallas/ Ft. Worth
- Camp Mabry in Austin Texas Granite Defense & Technologies hosted four of the 5 BLUE DIU approved drones for the Texas Air National Guard.
- Harris County (Houston area) Fire Marshal's Office
- Reveille Peak Ranch test facility evaluation
- Texas Department of Emergency Management (TEDM) pursuant to Texas HB2340

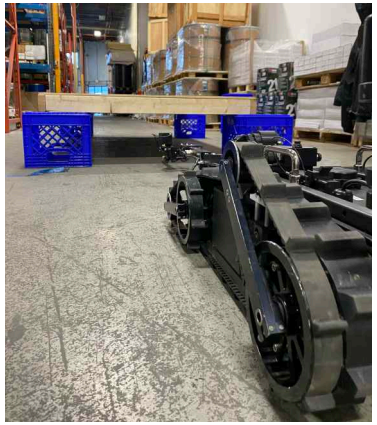
Canadian CETA and CERRA Training/Credentialing

Use Case Examples

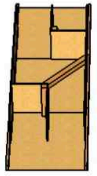
Lead Agencies;
CETA- Canadian Explosives Technicians Association
CERRA- Canadian Emergency Responders Robotics Association

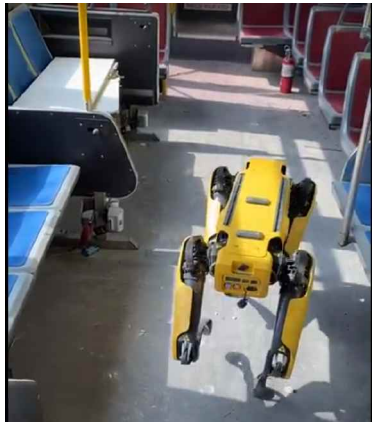
Primary Locations:
Pearson International Airport (Toronto Canada)
Grimsby Regional Training Centre (Grimsby, Ontario , Canada)





CETA
CETA is the national association for police/military/government agencies tasked with response to explosives , chemical, biological, and radiological incidents in Canada. Current projects include EOD Standard training methods for both robots and bomb techs deployed in bomb suits.





CERRA
Spring 2020 established with focus on the public safety deployment of ground, air, water based robotics. Membership is open to any current or former public safety member or agency or any supporting government agency with an interest in response robots.

Drone Responders Now Auditing for ASTM International Compliance

Use Case Examples

XXXXXXXXXXXXXXXXXXX

Safety | Capabilities | Proficiency

SLIDE TEMPLATE