ASTM E54.09 Homeland Security Applications; Response Robots Committee Update

Version 2022A

STARTS AT 10:00 AM EST
WASHINGTON, DC TIME

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

Email
RobotTestMethods@nist.gov

Call To Order

Committee Update

- Reminder that electronic recording of ASTM meetings is prohibited.
- Meeting will run in accordance with the ASTM Antitrust Statement.

Antitrust Statement (also in meeting minutes)

ASTM International is a not-for-profit organization and developer of voluntary consensus standards. ASTM's leadership in international standards development is driven by the contributions of its members: more than 30,000 technical experts and business professionals representing 135 countries.

The purpose of antitrust laws is to preserve economic competition in the marketplace by prohibiting, among other things, unreasonable restraints of trade. In ASTM activities, it is important to recognize that participants often represent competitive interests. Antitrust laws require that all competition be open and unrestricted.

It is ASTM's policy, and the policy of each of its committees and subcommittees, to conduct all business and activity in full compliance with international, federal and state antitrust and competition laws. The ASTM Board of Directors has adopted an antitrust policy which is found in Section 19 of ASTM Regulations Governing Technical Committees. All members need to be aware of and compliant with this policy. The Regulations are accessible on the ASTM website (http://www.astm.org/COMMIT/Regs.pdf) and copies of the antitrust policy are available at the registration desk. ***For a complete list of standards, see:*** *http://www.astm.org/COMMIT/SUBCOMMIT/E5409.htm*

Ground Test Day Agenda

Committee Update

.

10:00 am EST Introduction, Committee Overview, Events

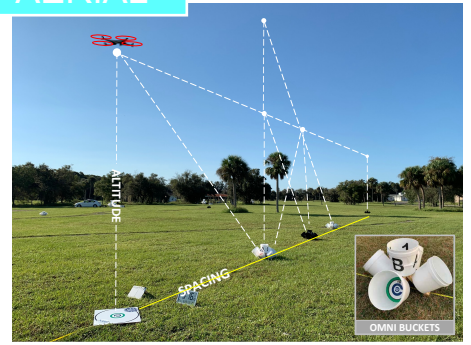
11:00 am EST Maneuvering and Mobility

12:00 pm EST Dexterity and C-IED/EOD Tasks

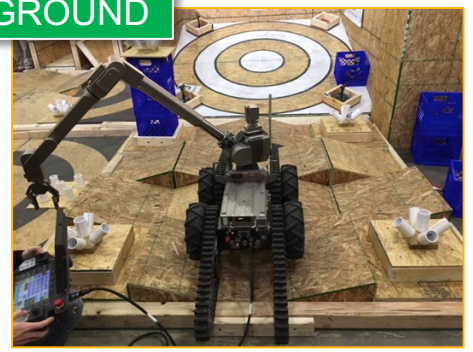
1:00 pm EST Mapping, Sensing and Radio Comms

2:00 pm EST Open Discussion

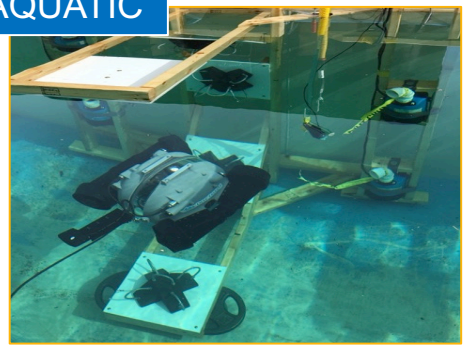
AERIAL



GROUND



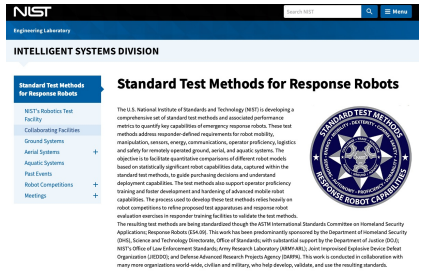
AQUATIC



Previous Meeting Minutes

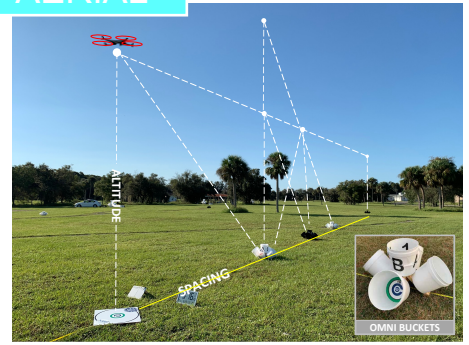
Committee Update

RobotTestMethods.nist.gov

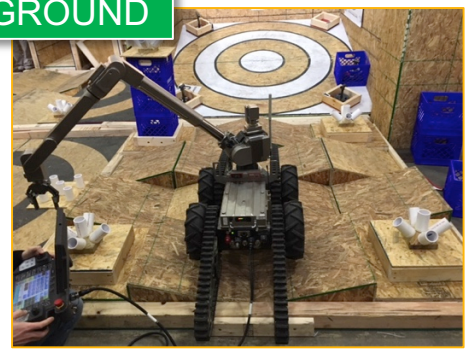


- [ASTM E54.09 Aerial Test Methods Introduction (2021A)]
- [ASTM E54.09 Aerial Test Methods Sensing and Radio Comms (2021A)]
- [ASTM E54.09 Aerial Test Methods Use Case Examples (2021A)]
- [ASTM E54.09 Aquatic Tests Introduction (v2021A)]
- [ASTM E54.09 Ground Test Methods Introduction (2021A)]
- [ASTM E54.09 Ground Test Methods Dexterity and Strength (2021A)]
- [ASTM E54.09 Ground Test Methods Maneuvering and Mobility (2021A)]
- [ASTM E54.09 Ground Test Methods Sensors and Radio Comms (2021A)]

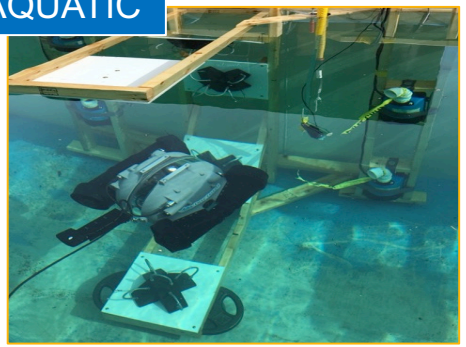
AERIAL



GROUND



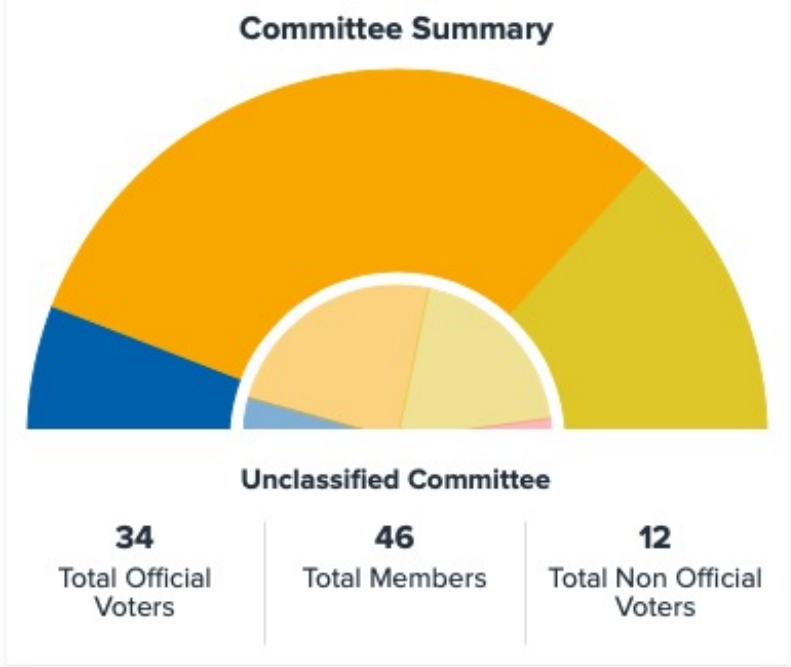
AQUATIC



Membership

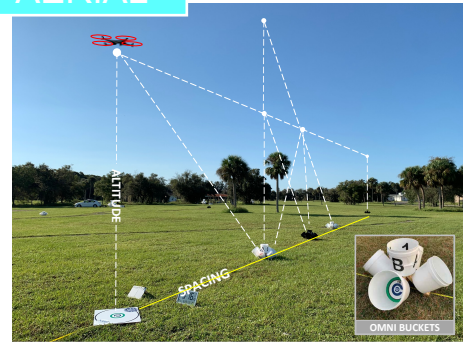
Committee Update

46 MEMBERS

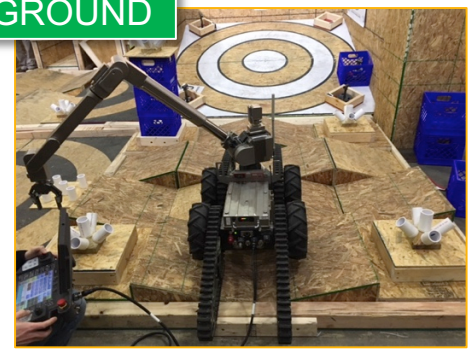


Classifications	Official	Non Official	Total
Producer	4	0	4
User	21	1	22
Consumer	0	0	0
General Interest	9	9	18
Unclassified	0	2	2

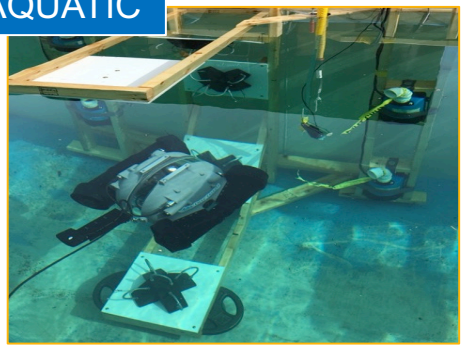
AERIAL



GROUND



AQUATIC



Recent Ballot Activity

Committee Update

<u>Still Being Balloted:</u>

E2853-2021 Human-System Interaction: Search Tasks: Random Mazes with Complex Terrain

<u>Successfully Balloted:</u>

E3310-2021 Mobility: Parallel Rail Obstacles

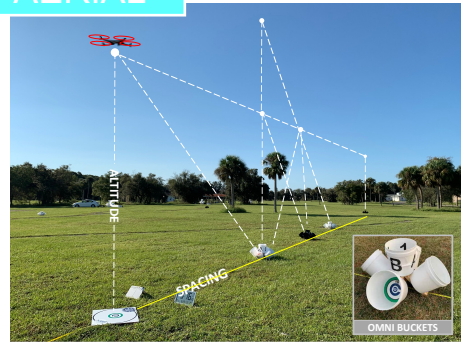
E2802 2021 Mobility: Variable Hurdle Obstacles

E3311-2021 Mobility: Variable Diagonal Rail Obstacles

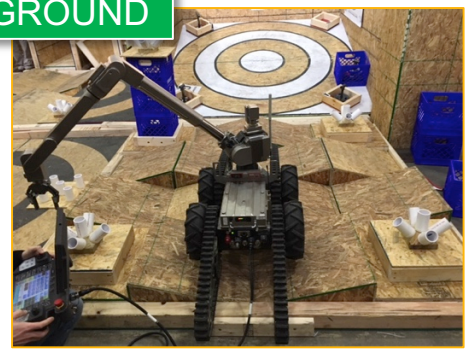
E2854-2021 Radio Comms: Line-of-Sight Range

E2855-2021 Radio Comms: Non-Line-of-Sight Range

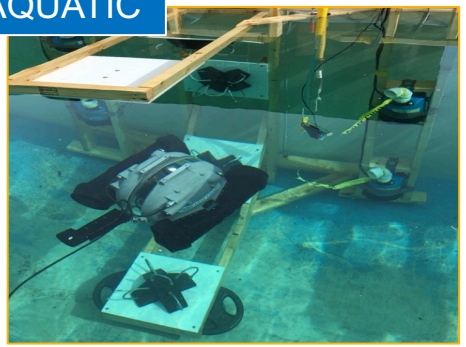
AERIAL



GROUND



AQUATIC



Overdue Standards (5-8 Years Old)

Committee Update

Need to be Updated and Re-Balloted:

E2991-17 Mobility: Traverse Gravel Terrain

E2992-17 Mobility: Traverse Sand Terrain

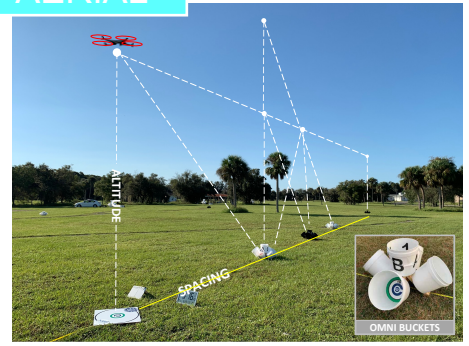
E2566-17 Sensing: Visual Acuity

E2592-16 Logistics: Packaging for US&R Task Force Equipment Caches

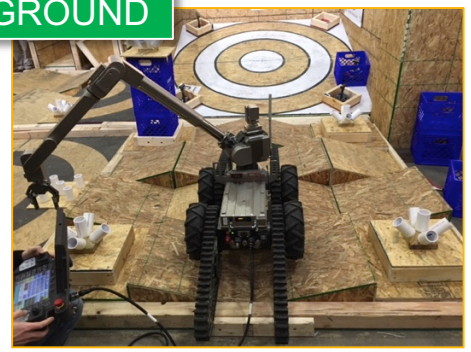
E3132-17 Logistics: System Configuration Identification

E2521-16 Terminology for Evaluating Response Robot Capabilities

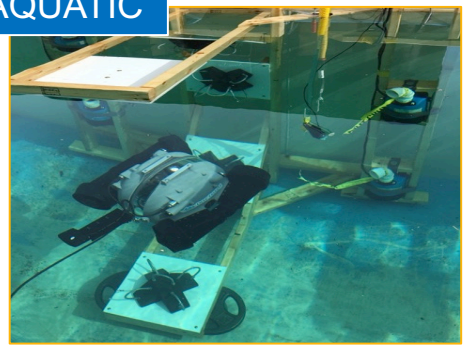
AERIAL



GROUND



AQUATIC



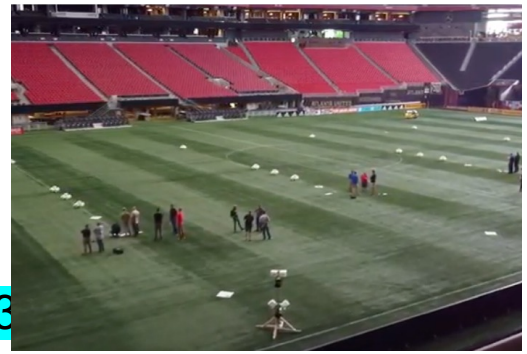
Validation Exercises

Committee Update

Color Key: Ground Aerial Aquatic Multiple Standards

- 2021.10 Unmanned Tactical Applications Conference, Guardian Center, Georgia (3 day
- 2021.10 Law Enforcement Drone Association Conference, Bend, Oregon (3 days)
- 2020.09 DHS sUAS Assessement, Ft. Meyers, FL (5 days)
- 2021.08 FAA Safety Team Online Course (1 hour, quiz, certificate)
- 2021.08 AUVSI Xponential with DroneResponders Fly-In at Merceded Benz Stadium (3
- 2021.08 Civil Air Patrol Advanced Training, Ft. Atterbury, Indiana (3 days)
- 2021.08 Eastern Regional Robot Rodeo, NAVEODTECHDIV, Indianhead, MD (3 days)
- 2021.06 RoboCupRescue Robot Competition – Remote Video Trials (months)

2021.06 ASTM E54.09 Response Robots Meeting, Online Only



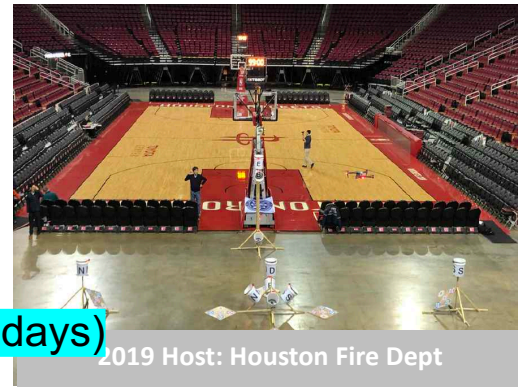
Validation Exercises

Committee Update

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)

2020.02 ASTM E54.09 Response Robots Meeting, Atlanta, GA (3 days)



2019 Host: Houston Fire Dept

2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

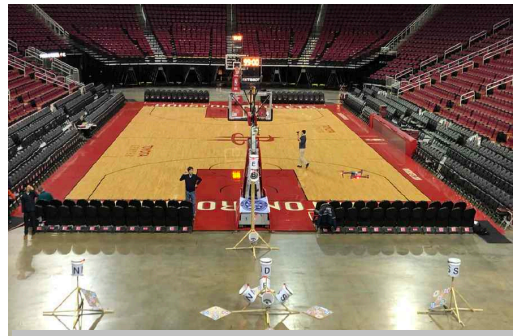
Validation Exercises

Committee Update

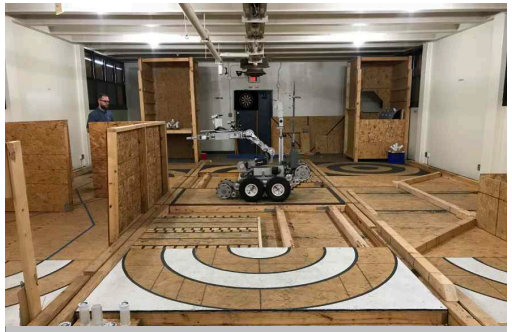
Color Key: Ground Aerial Aquatic Multiple Standards

- 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)

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



2019 Host: Houston Fire Dept



2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

Validation Exercises

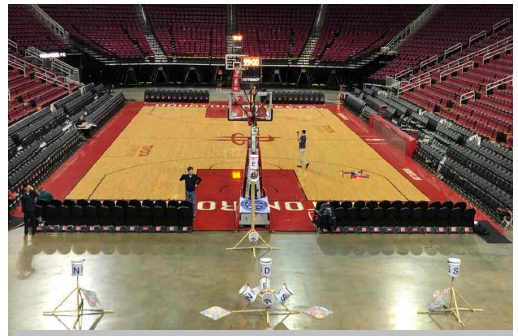
Committee Update

Color Key: Ground Aerial Aquatic Multiple Standards

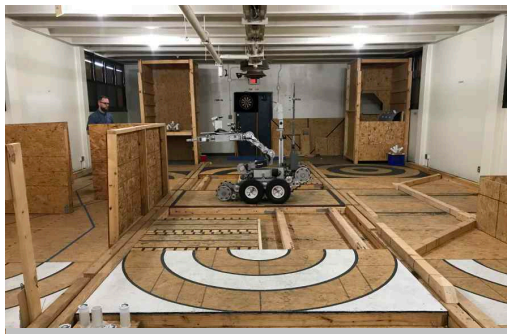
- 2019.05 Western Regional Robot Rodeo, Sandia/Kirtland, Albuquerque, NM (5 days)
- 2019.05 Canadian Police College Training Exercise, London, ON Canada (7 days)
- 2019.04 Thermite RS2 firefighting robot capabilities evaluation (1 day)
- 2019.04 Army Tank Automotive Research and Development facility 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)

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



2019 Host: Houston Fire Dept



2018 Host: San Diego Fire Dept

2017 Host: Canadian CETA

Eastern National Robot Rodeo

Example Use Cases

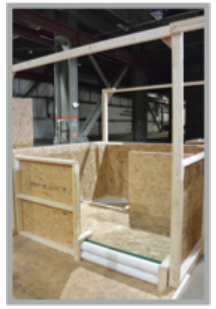
Lead Agency
Navy NAVEODTECHDIV
(2021.08)

Location:
Indianhead, MD

Outcomes:

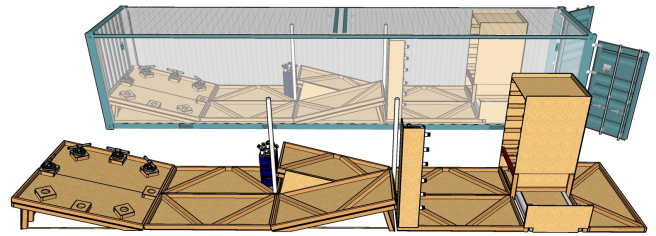
- Implemented Maneuvering, Mobility, Dexterity tests to host a training rodeo.
- Set up new indoor facility plus three shipping container sequential scenario.
- No pictures/video allowed!

Open Doors



Surmount Hurdle

Ascend/Descend Stairs



Air Force Large Robot Purchase

Example Use Cases

Lead Agency
Air Force Civil Engineer Center (AFCEC/CXAE)
2021.01

Primary Location:
Tyndall Air Force Base
Panama Beach, FL USA

Outcomes:

- Implemented Maneuvering, Dexterity, Sensing, and Radio Comms tests to capture comparable data across a roster of large C-IED/EOD robots.
- $70M total funding

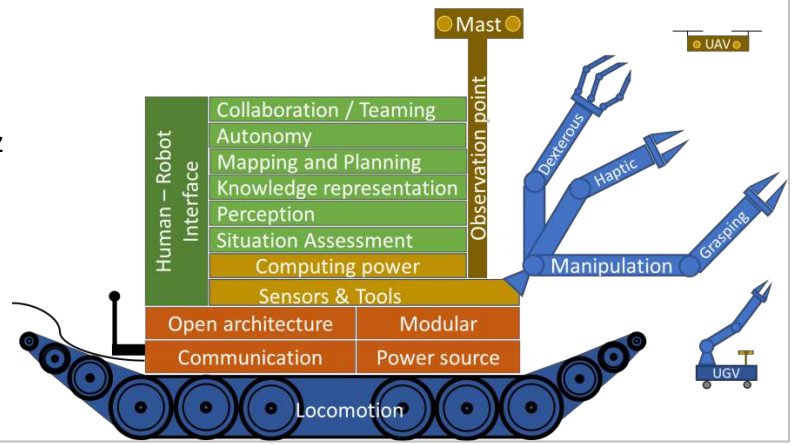
NATO SCI-342 Research Task Group

Example Use Cases

- Adopting and extending our tests to measure robot dexterity and remote operator proficiency necessary to perform explosive ordinance disposal (EOD) missions from remote standoff distances.
- Will replicate the modular dexterity tests in several collaborating NATO countries, including the NATO Center of Excellence for C-EOD Operations in Slovakia.
- Adam Jacoff leads the Subgroup 4 Evaluation (Testing & Metrics)
- The charter will be active 2020-2023

Subgroup 4 Evaluation (Testing & Metrics)

- Adam Jacoff
- Aurélie Lepoil
- André Volk
- Johannes Pellenz
- Eric den Breejen

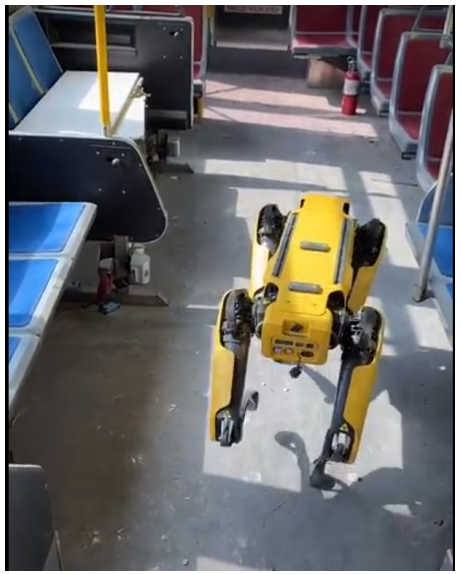


Canadian CETA and CERRA Training/Credentialing

Example Use Cases

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.

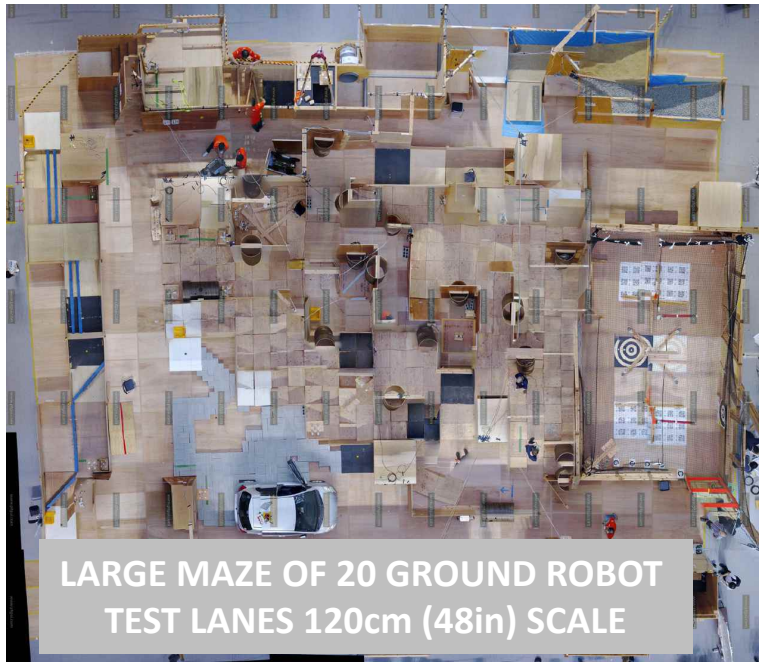
CERRA
Spring 2020 established with focus on the public safety deployment of ground, air, water based robotics. Membership is open to any current or former public safety member or agency or any supporting government agency with an interest in response robots.

RoboCupRescue Robot League (2000-present)

Example Use Cases

- 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

RoboCupRescue Robot League (Remote 2021)

Example Use Cases

100’S OF SELF SCORED VIDEO SUBMISSIONS IN TESTS

TASK DETAIL

ROBOT VIEW

SHOW AS MUCH DETAILOF THE TASK AS POSSIBLE

SHOW THE OPERATOR IN THE BACKGROUND WITH BACK TOWARD THE APPARATUS

OVERVIEW OF ROBOT & OPERATOR

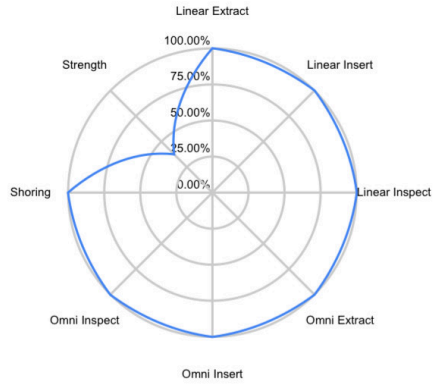
ALL OPERATOR ACTIONS

SAVE SCREEN TO VIDEO OR ZOOM IN WITH CAMERA AS SHOWN HERE

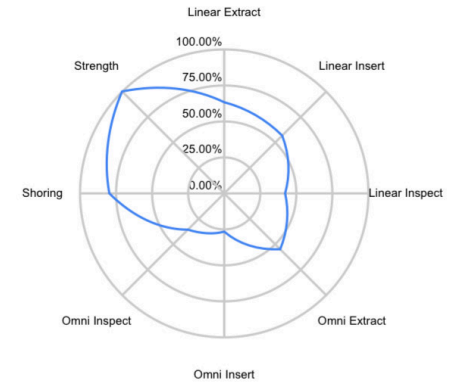
SHOW EASILY READABLE TIMESTAMP, PRINTED TRIAL INFO, AND ALL OPERATOR ACTIONS

BEST IN CLASS RESULTS

Shinobi



Hector-DRZ



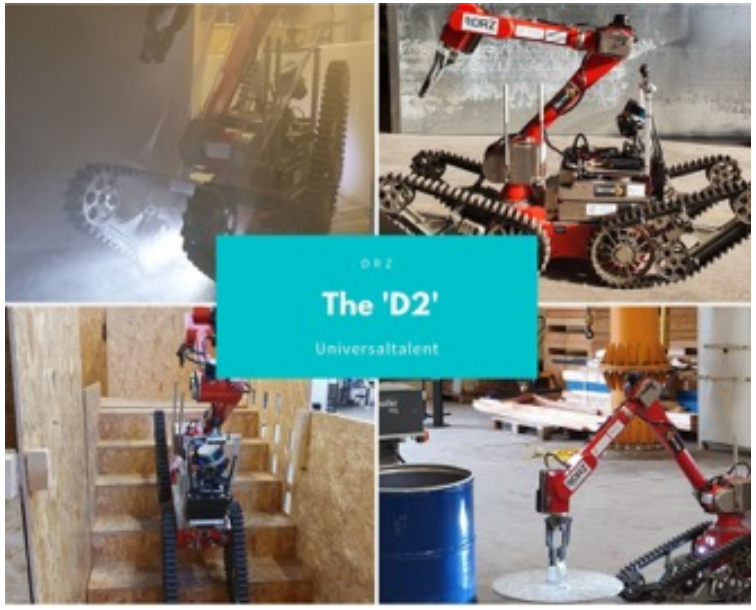
New Test Facility in Germany

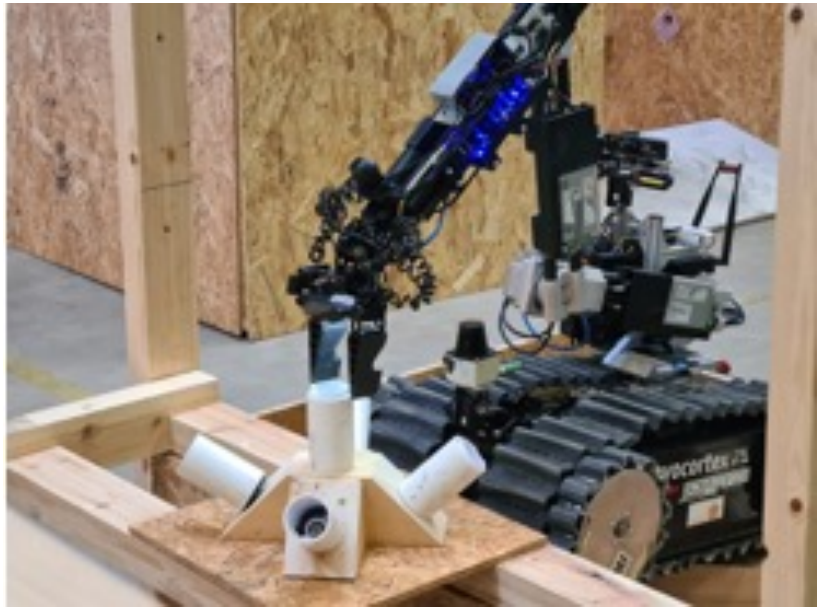
Example Use Cases

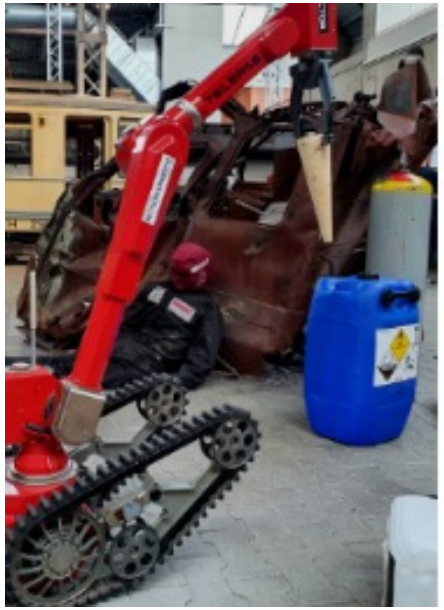
Host of the 2021 RoboCupRescue German Open Robot Competition

DRZ
DEUTSCHES RETTUNGSROBOTIK ZENTRUM

Dortmond, Germany Opened 2021.10







Test Facility in Brisbane, Australia

Example Use Cases

EPE MILTECS
Military Training | Evaluation | Certification | Systems Assurance

Modular, fork-liftable, and stowable apparatuses set into a lane containment perimeter.

Unmanned Systems (Terrain Park , NIST Test)
Proving Centre 1 , CSIRO Pullenvale

CIED Detection & Training Lanes (Mounted / Dismounted
Proving Centre 2 , CSIRO Pullenvale

Threat Mitigation
Proving Centre 3 , Helidon

Unmanned Systems and Sensor Integration Lab
Test Lab 1 , EPE HQ Spring Hill

CBRNe and CIED Sensors Assurance Lab
Test Lab 2 , EPE HQ Spring Hill

CBRNe and CIED Sensor Library Development Lab
Test Lab 3 , EPE HQ Spring Hill

World Robot Summit (2018-2020)

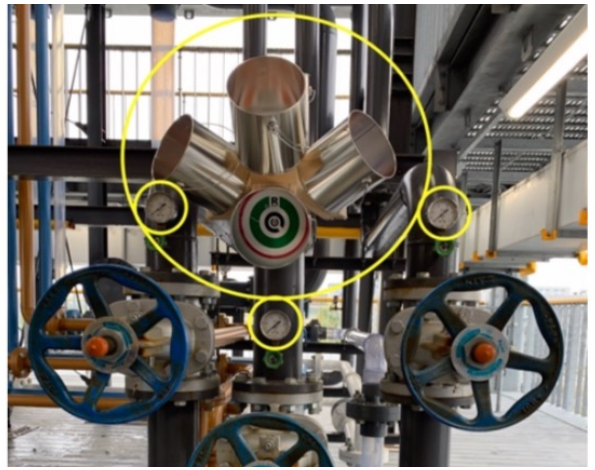
Example Use Cases

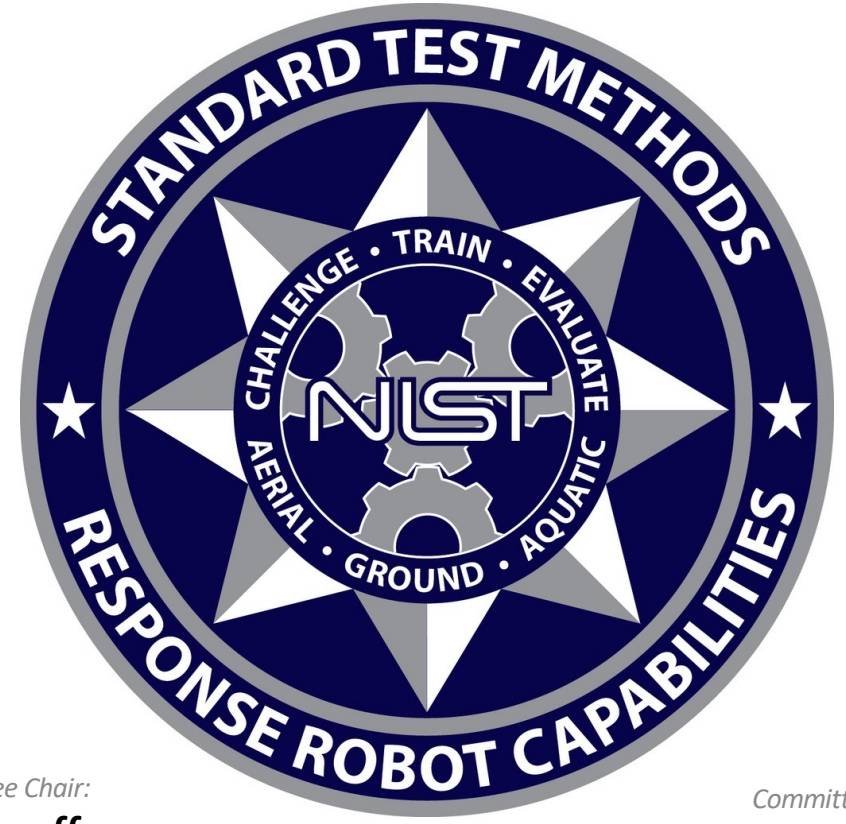
Standard Disaster Robotics Category, Fukushima Robot Test Field, Fukushima, Japan











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

Email
RobotTestMethods@nist.gov