

Official Rules for the First Responder UAS Endurance Challenge

INTRODUCTION

Join us for this exciting drone (aka unmanned aircraft system or UAS) prize competition using your ingenuity and hardware build expertise to create a concept for a drone prototype. The result of the First Responder UAS Endurance Challenge (UAS Challenge) will support the public safety community and its stakeholders.

Vertical take-off and landing (VTOL) UASs provide many different mission capabilities, but their flight time is limited. The payload capacity, energy source and flight time are linked through design trade-offs that can be optimized for efficiency and flexibility. This challenge is designed to keep a UAS and its payload airborne for the longest time possible to support first responders on the ground while they conduct their mission. The advancement of UAS research achieved through this challenge will help support the development and operation of UAS that are intended to host critical tools for public safety missions, such as wireless communications systems.

The National Institute of Standards and Technology (NIST) Public Safety Communications Research Division (PSCR) is hosting a 4-stage challenge, with prize awards up to \$552,000 for the top designs. There are no fees or qualifications needed to enter the first stage. The most outstanding Stage 1 conceptual designs will be eligible to participate in the remaining stages of the competition (see Official Rules).

You can make a difference! Continue reading to learn about challenge stages and details. To enter for Stage 1, submit your [entry](#) by April 30, 2020. For entry as a Walk-on in Stage 3, submit your [entry](#) by December 28, 2020 (revised from December 18, 2020).

Challenge Background:

The National Institute of Standards and Technology Public Safety Communications Research Division has established the Innovation Accelerator (IA) to spearhead the research that supports the development and deployment of the Nationwide Public Safety Broadband Network (NPSBN). PSCR's Open Innovation team engages public safety entities, government, academia, and industry to identify innovation opportunities and foster technology advancements for public safety communications through Prize Competitions and Challenges.

Challenge Goals and Objectives:

The purpose of this Challenge is to advance UAS technologies by building and flying drones designed to support first responders. One of the barriers for the public safety community is having access to drones that can fly for long periods of time, ninety minutes or greater, while

carrying a heavy payload. Emergency responders can accomplish their mission more efficiently and effectively if the drone flight time for a known payload is maximized. Since the payload capacity, energy source, flight characteristics, and flight time are linked together through design trade-offs, PSCR is exploring ways to optimize drones for increased flight endurance while making it more efficient and flexible for use by public safety.

In pursuit of that goal, PSCR is investigating options to enable state and local first responders the ability to deploy drones for law enforcement, firefighting, and other emergency services needing broadband connectivity and services. In a typical search-and-rescue scenario, a team of one or two first responders may be dispatched to a location where broadband LTE communications are unavailable. To maintain communications, first responders might deploy an LTE system using a drone to provide communications to first responders on the ground and extend coverage to an area that is remote from where the drone initially launched. Some key features and capabilities of interest to public safety include:

- The drone and supporting system equipment can be stored in the cargo space of an SUV or pickup truck.
- The drone should be light in weight (one-person setup), easy to set up, capable of Vertical Take Off and Landing (VTOL) and not require special tools.
- The drone may be required to move between different locations in order to maintain communications coverage.
- The drone needs to continuously fly as long as possible, be easily recovered, stored and readied for the next mission.

PSCR is aware that various organizations have, or are developing, drones with higher payload capacities and long endurance; however, these drones typically cost more than what a local public safety department might be able to afford. Additionally, they may not be practical due to the difficulty of transporting large equipment and/or the need for specialized training to operate it, both of which can be difficult for city/state agencies with limited staff and resources. Therefore, PSCR is hosting this 4-stage challenge to design, develop, and demonstrate drones with extended flight time and other capabilities that support first responders to help advance the research and push the boundaries of UAS technology for public safety.

UAS Challenge Stages

Stage	Contest Description	Review Criteria Summary	Number of Contestants Eligible to Compete
1	Concept Papers	Strategic Alignment & Technical Outcome; Feasibility & Team	Open to all eligible Contestants
2	Design, Prototyping, & Hardware Build	Preliminary Design Review Critical Design Review	Up to 20 Contestants invited from Stage 1
3	Video Test & Safety Evaluation	Video Test & Evaluation Walk-on's Evaluated for entry	Up to 20 Contestants from Stage 2 who meet the required performance standards Walk-on Contestants evaluated for Stage 4 eligibility
4	Live Test & Evaluation	Drone specification and safety review Static Capability Assessment Technical Flight Evaluations Endurance Flight	Up to 15 Contestants invited from Stage 3

Awards and Funding

NIST Public Safety Communications Research program is hosting a 4-stage challenge, with development funds, travel, and prize awards listed in the following table.

Award Ranking	Number of Awards	Award Value
Stage 1	Up to 10	\$10,000 (each), up to \$100,000 total
Stage 2	Up to 15	Achieving Milestone 1: \$5,000 (each), up to \$75,000 total Achieving Milestone 2: \$5,000 (each), up to \$75,000 total
Stage 3	Up to 15	\$6,000 (each), up to \$90,000 total in travel prize awards for Contestants to compete in Stage 4, Live Test & Evaluation
Stage 4		
Travel Funds	Up to 3	\$4,000 (each), up to \$12,000 total in travel prize awards for First, Second and Third Place Contestants to

		attend and present at the 2021 PSCR Conference
Best-In-Class Award	Up to 6	\$5,000 (each), up to \$30,000 total
First Responder's Choice Award	Up to 2	\$5,000 (each), up to \$10,000 total
Third Place	1	\$20,000
Second Place	1	\$40,000
First Place	1	\$100,000

NOTE: This table only describes prize awards; additional Contestants may be invited to participate in challenge stages but not receive prize awards. All Stage 4 Contestants are eligible to compete for all Stage 4 prizes.

Program Email Address

Questions about the Challenge should be directed to jshapiro@capconcorp.com.

Table A - Summary of Important Dates

Date	Event
April 1, 2020	UAS Challenge is open for proposal submissions through website
April 30, 2020	UAS Challenge is closed for proposal submissions
June 1, 2020	Stage 1 Winners announced; begin Stage 2
August 3 to 7, 2020	Preliminary Design Review conducted with eligible Stage 2 Contestants
Revised dates: October 19 to 23, 2020	Critical Design Review conducted with eligible Stage 2 Contestants
December 4, 2020	Stage 2 Contestants who meet all standards will be invited to continue; begin Stage 3 Contestants will receive instructions on how to demonstrate capabilities using the Safety Readiness Review standard Walk-on Contestant submission period opens
Revised date: December 28, 2020	Walk-on Contestant submission period closes
Revised date: December 28, 2020 to January 29, 2021	Stage 3 Contestants will make adjustments to UAS prototypes in preparation for stage deliverables Safety Readiness Review conducted with eligible Contestants (both Stage 3 and Walk-on Contestants)
February 17, 2021	Stage 3 Winners announced Contestants will receive instructions on Live Test and Evaluation
April 5 to 9, 2021	The Live Test and Evaluation Contest is a live competition to include UAS Capability Demonstrations
April 30, 2021	Stage 4 Final Winners announced

NOTE: NIST reserves the right to revise the dates at any time.

Official Rules

This document outlines the official rules for the First Responder UAS Endurance Challenge. Nothing within this document or in any supporting documents shall be construed as obligating the Department of Commerce, NIST or any other Federal agency or instrumentality to any expenditure of appropriated funds, or any obligation or expenditure of funds in excess of or in advance of available appropriations.

SUMMARY OF CHALLENGE

The following is a summary of each contest. For more information, please review the full terms and conditions for each contest as provided throughout this document.

STAGE 1: Concept Paper Contest

The Concept Paper Contest invites all eligible Contestants to complete a concept paper outlining their knowledge, skills, capabilities and approach for this challenge. Contestants' concept papers will be reviewed by a panel of subject matter experts and judges who will select those Contestants to be invited to the challenge kickoff webinar. Contestants selected by the Judging panel will be eligible to move forward to Stage 2: Design, Prototyping, & Hardware Build Contest.

- Up to 20 Contestants will be invited to advance to Stage 2: Design, Prototyping, & Hardware Build Contest. Of the selected Contestants up to 10 Contestants will receive prize awards. The remaining 10 Contestants will be invited to advance and will not receive prize awards.

STAGE 2: Design, Prototyping, Hardware Build Contest

In this contest, the Contestants will purchase or create the hardware necessary to implement the design approach outlined within their concept paper. Contestants will purchase or create (for example: using 3D printing or machining) the hardware or parts necessary to build their prototype drone to the specifications and required safety standards. Contestants will take part in a series of design reviews to demonstrate progress towards achieving the teams' proposed designs.

- Milestone 1: Up to 15 Contestants will be selected to receive prize awards following the Preliminary Design Review (PDR); the five other Contestants may be invited to advance to Critical Design Review (CDR).
- Milestone 2: Up to 15 Contestants will be selected to receive prize awards following the Critical Design Review; the five other Contestants may be invited to advance to Stage 3. (All Contestants invited to advance to Stage 3 are considered "winning Contestants" from Stage 2.)

Stage 3: Video Test & Safety Evaluation Contest

Once the UAS prototype build is complete, winning Contestants from Stage 2 will be required to complete a series of Video Test & Safety Evaluation flights designed to ensure the UAS completes minimum requirements for safety, hardware configuration, flight time, and payload with their prototype drone.

Walk-on Teams: Video Test & Safety Evaluation Contest

In addition to the winning Contestants from Stage 2, Contestants who did not participate in Stage 1 or Stage 2 may enter the Challenge at Stage 3 as “Walk-on Contestants”. As part of Stage 3, Walk-on Contestant entries will be evaluated for eligibility and performance with an opportunity to advance to Stage 4.

- Up to 15 Contestants (which may include any Stage 3 Contestants or Walk-on Contestants) will advance to Stage 4: Live Test & Evaluation Contest and receive invitational travel prize awards.

STAGE 4: Live Test & Evaluation Contest

The Live Test & Evaluation Contest is the final stage of the challenge. All Contestants will complete a series of static tests and live test flights to demonstrate their prototype drones’ capabilities. Contestants completing at least the minimum standards will be ranked and, based on those rankings, may receive prize awards. In addition, invitational travel prize awards for each team of Contestants or Contestant who placed first, second, or third place will be awarded to attend and present their UAS solution at the PSCR Annual Stakeholders Meeting in June 2021.

Drone Design Specification

Drones entered will be subject to the requirements and limitations defined in the Drone Design Specification (outlined in the table below). Drones must not be a completely unaltered commercial, off-the-shelf UAS as the intent of the challenge is to design a UAS that is customized for the specific flight time and payload requirements of the challenge. The following table describes the design requirements for the UAS Challenge. The “Requirement Title” is the nomenclature used to refer to the Requirement. The “Requirement Definition” describes the meaning of the specific requirement. The “Challenge Requirement” represents mandatory capabilities of the drone and minimum acceptable values for the specific requirement. The “Challenge Objective” provides guidance where higher standards are expected. Each Challenge Requirement or Challenge Objective applies to all Stages of the UAS Challenge unless any deviation is noted in [Table B](#) - Drone Design Specification.

Table B - Drone Design Specification

Requirement Title	Requirement Definition	Challenge Requirement	Challenge Objective
Endurance	Endurance is the maximum length of time that a drone at All Up Weight can safely spend in continuous flight.	The drone shall have an Endurance greater than or equal to 60 minutes. NOTE; Endurance shall be conducted and or calculated at AUW NOTE: Minimum actual endurance for Stage 3 contestants is 30 minutes. Minimum actual endurance time must be 60 minutes to achieve points in Stage 4.	Contestants will be evaluated on a scale where 60 minutes is the minimum requirement. Greater points will be awarded for contestants whose flight times exceed 60 minutes. Contestants will receive scores for flight times in excess of 60 minutes with more points for greater endurance.
All Up Weight	All Up Weight (AUW) is the maximum allowable take-off weight for the drone. This includes the weight of the drone with airframe, engines, operating equipment, payload, and fuel, with the exception of the Flight Termination System (FTS).	The drone shall have an AUW not to exceed 100 pounds*. *NOTE: Drones that exceed the FAA's 55 pounds weight restriction under 14 CFR Part 107 shall provide the appropriate FAA approved waiver No Later Than the Safety Assessment but prior to any flights that would require the waiver. Waivers are the sole responsibility of the Contestants to acquire from the FAA.	Contestants will be evaluated on a scale where 100 pounds is the minimum requirement. Greater points will be awarded for contestants whose All Up Weight is less.
VTOL (Vertical Take-off and Landing)	Vertical take-off and landing (VTOL) is the ability to take off and land vertically.	The drone shall be capable of vertical take-off and landing (VTOL).	
Loiter	Loiter is the ability of the drone to fly over some small region on the ground while maintaining a certain distance and altitude relative to a defined position in the air.	The drone shall be able to loiter within a small defined airspace centered around a defined position and altitude.	Greater points will be awarded for contestants who can maintain a smaller loiter area.
Level of Autonomy	Level of Autonomy refers to the spectrum of independence that the drone can operate.	The drone shall be capable of operating at levels 0, 1, and 2.	Contestants will be evaluated on a scale where greater Levels of Autonomy such as 3 and 4

	<p>Level 0 is manual operation</p> <p>Level 1 is the drone controls 1 vital function</p> <p>Level 2 is the drone controls heading and altitude</p> <p>Level 3 is the drone performs all key functions</p> <p>Level 4 the drone has back-up systems</p> <p>Level 5 is fully autonomous operation</p>		<p>will receive greater points. These may include (but are not limited to) pre-programmed flight paths, obstacle avoidance, and automatic orbits.</p>
Total System Weight	Total System Weight is the weight of the entire system (to include drone, Ground Control Station, spares, fuel, and storage).	Total System Weight shall not exceed 120 pounds.	<p>Contestants will be evaluated on a scale where 120 pounds is the minimum requirement. Greater points will be awarded for contestants whose Total System Weight is less.</p>
System Volume	System Volume is the amount of space that the system occupies in a stored configuration.	The System Volume shall not exceed 72 cubic feet and must fit within a 3 ft X 4 ft X 6 ft space.	<p>Contestants will be evaluated on a scale where 72 cubic feet of volume is the minimum requirement. Greater points will be awarded for contestants whose System Volume is less.</p>
Payload	The payload is the mission specific capability carried by the drone.	The drone shall carry a payload weight of 10 pounds, which will be provided by NIST.	
Payload Mount	The payload mount is the mechanism used to attach the payload to the drone.	The drone shall be equipped with the mounting mechanism referenced in Appendix (Sketch Up Files), which will be provided to them by NIST.	
Component Weight	Component weight is the weight of a single component of the entire system.	No single component of the system shall weigh greater than 50 pounds.	<p>Contestants will be evaluated on a scale where 50 pounds is the minimum requirement. Greater points will be awarded for contestants whose Component Weights are less.</p>
Set Up Time	The total amount of time required to place a system into an operational state from the stored configuration in the back of a vehicle	Beginning from a stored configuration in the back of a vehicle, the drone shall be capable of being setup to be in an operational state, ready	<p>Contestants will be evaluated on a scale where greater points will be awarded for contestants whose Set Up Time is less.</p>

		to fly in 20 minutes or less.	
Real Time Video	Real time video is the ability to provide full motion video to the ground control station during anticipated mission operations.	The drone shall provide real time full motion video to the ground control station at a minimum resolution of 1280 X 720 progressive (720p).	
Gimbal Camera	The drone shall be equipped with a camera mounted on a stabilized gimbal that is capable of pan and tilt (2 axis), at a minimum.	The drone shall be equipped with a camera mounted on a stabilized gimbal that is capable of pan and tilt (2 axis), at a minimum.	
GPS	GPS is a global navigation satellite system (GNSS) providing geolocation and time information to a GPS receiver.	The drone shall be equipped with a Global Position System.	
RTK-GPS	A real-time kinematic (RTK) GPS enhances the accuracy of satellite-based positioning using corrections broadcast in real-time to a roving GPS receiver from a ground-based stable GPS receiver.	The drone shall be equipped with a real-time kinematic (RTK) global positioning system (GPS) and a stable ground station that is broadcasting the differential GPS corrections shall be included with the system.	
Flight Termination System	An FTS operates independently of the drone's, radios and ground control station and is able to immediately cut power to all of the drone's motors at once when activated.	Flight Termination System (FTS) - The system shall be equipped with an independent FTS (i.e., a Kill Switch) that when activated cuts power to all motors instantaneously. *NOTE, an "ARM/DISARM" type function is not an acceptable FTS.	
Tethers	A tether is a physical connection between the drone and the ground that can provide power and communications and/or can be used to simply attach the drone to the ground.	The system shall not have any Tethers and must be free flying.	
Radio Controller	The drone shall be capable of operating in the presence of other radio signals that could interfere with the wireless connection. Therefore, contestants shall use radios	The drone shall be capable of operating in the presence of other radio signals that could interfere with the wireless connection. Therefore, contestants shall use radios	

	based on FHSS (Frequency Hopping Spread Spectrum).	based on FHSS (Frequency Hopping Spread Spectrum).	
System Cost	System cost is the total cost of all components of a system to include (software, hardware, spares, and custom-made items), with exception of the Flight Termination System (FTS). All components are listed in the Bill of Materials (BOM).	The system cost shall not exceed \$30,000.	Contestants will be evaluated on a scale where \$30,000 is the minimum requirement. Greater points will be awarded for contestants whose System Cost is less.
FAA	The system shall comply with all FAA laws and regulations	The system shall comply with all FAA laws and regulations	
Pilot	Part 107 is the FAA's remote pilot certification for use by certified drone pilots.	The team shall have one (1) FAA certified Part 107 pilot NOTE: Additional pilots are recommended.	
Drone Insurance	Drone liability insurance covers damage to third party property and injury to other people.	The team shall have Drone (liability) insurance with a minimum coverage of \$1M prior to conducting any flights outside of an enclosed test facility.	
FCC	The system shall comply with all FCC laws and regulations.	The system shall comply with all FCC laws and regulations.	

Safety Specific Requirements:

All flights shall comply with local, state, and federal laws and regulations.

All flights shall occur at authorized drone flying areas.

All pilots shall be Part 107 certified and covered by drone insurance.

Drone energy sources must be safely integrated into the flight systems (battery, liquid fuel, etc.)

Any design that is deemed to pose a significant risk may be disqualified or not selected to advance.

Official Rules of Stage 1: Concept Paper

Introduction:

The Concept Paper Contest invites all eligible Contestants to complete a concept paper outlining their knowledge, skills, capabilities and approach for this challenge. Contestants' concept papers will be reviewed by a panel of subject matter experts and judges who will select those Contestants to be invited to the challenge kickoff webinar. Contestants selected by the Judging

panel will be eligible to move forward to Stage 2: Design, Prototyping, & Hardware Build Contest. All eligible Contestants are encouraged to submit completed concept papers for review.

Important Dates:

[Table A](#) - Summary of Important Dates as previously listed.

Drone Design Specification:

Please refer to [Table B](#) - Drone Design Specification for all UAS design requirements and a glossary of terms used in throughout these contest rules.

How to Enter:

Visit the Challenge website [<https://www.firstresponderuaschallenge.org>], to review the challenge stages in the First Responder UAS Endurance Challenge.

- Visit Challenge.gov, to review the series of contests in the First Responder UAS Endurance Challenge.
- Complete the submission requirements for the Concept Paper Contest, submit the required concept paper and summary slide via the Challenge website [<https://www.firstresponderuaschallenge.org>].
- Additional information on how to complete a Contestant entry is available at: [<https://www.firstresponderuaschallenge.org>]

Operational Use Case (for reference only):

The operational use case provides contextual, user centric, design information. This is not intended as development requirements, rather to help focus the team on the contextual aspects of the Drone Design Specification.

Imagine being sent out to support a team conducting a Search and Rescue (SAR) mission in a remote region. Your role is to provide a drone that will carry a 10-pound cellular network system to those conducting the search to enable command and coordination. The drone will be stored in the back of your vehicle, so the system should be as compact as possible, yet simple and easy to set up. With no one to help you, the system should also be light and easy to unpack. Since remote regions typically have unimproved roads and dirt trails, the capability of the drone to have Vertical Take Off and Landing (VTOL) is a must. The drone must be able to carry the communications equipment in the air for as long as possible. During an incident, the situation can change quickly, and first responder teams are reliant upon constant communications. When the UAS and LTE system is airborne, you may have to coordinate with other public safety teams supporting the Search and Rescue event, so the drone should be capable of some level of autonomy that will allow you to monitor the drone without having to provide constant flight commands. When the drone runs low on power and needs to land on the ground, the process to replenish power should be simple and fast, enabling the drone to quickly resume flight.

The innovative design your team develops is the key to your success.

Design Approach Overview (for reference only):

The following aspects of UAS prototype development are anticipated.

- A methodical, systems engineering approach that identifies the requirements, a conceptual design that meets those requirements, and successful tests confirming that the actual system meets the requirements in practice;
- An elegant and efficient design solution, supported by an appropriate depth of analysis;
- Innovation in the approach that solves the engineering challenges;
- An appreciation for the practical design constraints and development of sound design principles that are essential for a successful, robust and reliable prototype; e.g. adequate strength and stiffness of key structural components, consideration to maintenance, ease of repair in the field, modular design for integration of future capacities, intuitive design, interface, and controls;
- Good planning and team-work; organizing the team to divide up roles and responsibilities. Good communication and planning will be essential to achieve a successful, competitive entry that meets the timeline of the challenge with a UAS that's properly tested prior to flight demonstrations.

The Contestants design shall adhere to the Drone Design Specification.

Concept Paper Content Requirements:

The concept paper will be created and submitted by all registered users using an online form available through [<https://www.firstresponderuaschallenge.org>].

Section	Word/Page Limit	Description
Cover Page and Abstract (required)	Form Fields & 500 words	<p>Include the following:</p> <ul style="list-style-type: none">• Contestant name (Individual, Team, Organization, Company).• Application title.• Technical and business points of contact.• Estimated Endurance• Energy source of the drone <p>Describe succinctly (500-word MAXIMUM):</p> <ul style="list-style-type: none">• Conceptual Description of the UAS• The unique aspects of the Contestant's approach and the potential impact that the proposed approach could have in achieving the goals of the challenge.
Project Description (required)	Form Fields & 2,000 words	<p>Addressing the requirements should be your primary objective, therefore, create your concept paper to address the evaluation criteria. Below are a few options to consider:</p>

		<ul style="list-style-type: none"> • The competitive advantage offered by the Contestant's approach or solution. • The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, costs, and challenges and how the proposed project will overcome the shortcomings, limitations, and challenges relevant to the goals of the challenge. • High-level vision for performance metrics. Describe what will be produced, when it will be produced, and how it will be verified. Start by defining the baseline capability and end project performance metric in quantifiable and verifiable terms. Include interim performance metrics which will be closely reviewed for flight feasibility and endurance. <p>Technical Performance Measures (TPM) should reflect estimates of key requirements for the Contestants system and should include:</p> <ul style="list-style-type: none"> • Endurance in minutes (at AUW) • System weight in pounds (to include a 10-pound payload) • Drone weight in pounds • Estimated set up time in minutes (from unpacking the drone from its storage configuration to take off) • Total volume of system in storage configuration in cubic feet
Resume Information for Key Team Members (required)	1,000 words	<ul style="list-style-type: none"> • The key team members and why they are well suited to accomplish the project, with resume information to support their qualifications.
Summary Slide (required)	1 page uploaded	<ul style="list-style-type: none"> • Contestants are encouraged to provide a single slide summarizing the proposed project. The recommended format can be found at www.firstresponderuaschallenge.org link.
Letters of Support (required)	1 page max. per Letter of Support uploaded	<ul style="list-style-type: none"> • You may attach up to 3 letters of support from external entities (1-page maximum per letter). Multi-page Letters of Support are not allowed, any extra pages will not be reviewed.
Bill of Materials (required)	1 page uploaded	<ul style="list-style-type: none"> • Submissions shall include a Bill of Materials (BOM) that represents the key components of the drone.
Technical Performance Measure Calculation (required)	As Required	<ul style="list-style-type: none"> • Submissions should include the estimation process used to establish estimates for Technical Performance Measures.

NOTE: Submission(s) must not use NIST's logo or official seal and must not claim NIST endorsement.

Evaluation Criteria and Judging:

NIST will not review or consider ineligible Concept Paper submissions. NIST makes an independent assessment of each Concept Paper based on the evaluation criteria. During the review, each subject matter expert reviewer will review entire concept papers to which they are assigned. The review is not done in sections with different reviewers responsible for different assigned sections. Therefore, it is not necessary to repeat information in every part of the concept paper. Do not include sensitive materials in the concept paper, for example personally identifiable information such as social security numbers or business sensitive information such as tax id numbers, etc.

Criterion 1: Strategic Alignment & Technical Outcome (50%)

This criterion involves consideration of the following factors:

- Strategic Alignment – The extent to which the proposed approach meets the objectives listed in the goals of the challenge; the responsiveness to the public safety scenarios; the likelihood that successful implementation of the proposed solution will have a significant real-world impact.
- Technical Outcome – Extent to which the proposed approach will result in significant improvement in commercially available technology and will potentially result in a technical outcome which enables considerable progress toward the challenge goals. Contestants will be evaluated on the extent to which their proposed approach demonstrates the potential to meet the Challenge Objectives listed in [Table B](#) - Drone Design Specification.

Criterion 2: Feasibility & Team (50%)

This criterion involves consideration of the following factors:

- Team – The extent to which the capability of the Contestant(s) can address all aspects of the proposed project with a high chance of success, including, but not limited to, qualifications, relevant expertise, and time commitment of the Contestants. Reviewers will evaluate: (a) The relevance of the qualifications and experience of the key staff, leadership, and technical experts. (b) The extent of the Contestants' prior experience and the quality of the results achieved in leading programs similar in nature to the purpose, scope, etc.
- Plan – Contestant(s) plan to manage the limited schedule, resources, project risks and other challenges, and produce high quality project outcomes, in pursuit of the challenge goals.

Concept Papers will be evaluated based on Criteria 1 and 2 above. Each Concept Paper will be reviewed by at least two expert reviewers and be assigned a score on a scale of 1 to 10 for each criterion based on the merit and potential of success of the proposal. Reviewers scores will be averaged for each Concept Paper. The specific scores will not be released publicly or provided to the Contestant.

Official Rules of Stage 2: Design, Prototyping, & Hardware Build Contest

Introduction:

In this stage of the contest, the Contestants will implement the approach outlined within their concept paper by completing the detailed design and estimating Technical Performance Measures to demonstrate compliance with the requirements. Contestants will then implement their designs to build the system. Contestants will purchase or create (e.g., using 3D printing or machining) the hardware or parts necessary to build their prototype drone to meet the Drone Design Specification and Safety Specific Requirements.

Contestants will take part in two design reviews to demonstrate progress toward achieving the team's proposed design. During the design reviews, contestants will present information about their design and status of their design toward the goals defined in the Concept Paper. The first design review is a Preliminary Design Review (PDR) where Contestants will present details of the planned design, TPM estimates, estimated Bill of Materials, and a status of the project schedule. Contestants selected by the Judging panel may receive award funding and will be eligible to move forward to the second design review. During the second design review, the Critical Design Review (CDR), Contestants will present the implemented actual design, actual values for key TPMs and updated estimates for any remaining TPMs, Bill of Materials with actuals, a status of the project schedule, and, where applicable, the status of any component or system level testing. Contestants selected by the Judging panel may receive prize awards and will be eligible to move forward to the Stage 3: Video Test & Safety Evaluation Contest.

Contestants are limited to those selected from the Concept Paper Contest. The Stage 1 Winners shall provide proof of drone liability insurance prior to receiving the Stage 1 prize award. All other Stage 2 Contestants shall provide proof of drone liability insurance prior to receiving a prize award in Stage 2.

Important Dates:

[Table A](#) - Summary of Important Dates as previously listed.

Drone Design Specification:

Please refer to [Table B](#) - Drone Design Specification for all UAS design requirements.

How to Enter:

- Once contestants are selected from the Concept Paper Contest, they will be required to participate in an introduction and Stage 2 challenge webinar.
- Contestants will review the terms and conditions of participation and accept the terms and conditions for entry.

- Contestants will complete their prototyping and hardware build process and be required to hold check-in meetings once every two weeks with the NIST team to report on progress.
- Contestants are not permitted to spend more than \$30,000 on the total cost of all components of their system, which includes software, hardware, spares and custom-made items. The cost of spare parts (that are not included as part of the system that the first responders would be expected to buy) is not included in the \$30,000 maximum.
- Contestants must keep records of all hardware and software purchased or created for the prototype in the form of a Bill of Materials (BOM) to ensure their entry is compliant. Records (the BOM) must show that all components included in the build are acquired appropriately, accounted for, and reported correctly for review. The BOM shall include;
 - Each item in the system, a part number, link or URL of where to procure the item, unit cost, quantity, and total cost.
 - Custom-made items shall have the unit cost estimated, their fabrication source defined, and material and material volume estimated.
- Reporting requirements are similar to a build list, acquisition list, or Bill of Materials. A Challenge staff member will review and verify the Contestants' BOMs to ensure that system cost is within the maximum budget allowed for each contestant. This hardware budget is in place to ensure that all contestants have the same resources to enable their creativity. Contestants who violate this critical requirement will be removed from the competition and no longer be eligible for future contests as part of this challenge.

Preliminary Design Review Content Requirements:

Design review content must conform to the following requirements. Do not include proprietary or sensitive information in the design review. The PDR briefing will be created and submitted by all registered users using an online form available through [<https://www.firstresponderuaschallenge.org>].

Section	Page Limit	Description
Cover Page (required)	1 Slide	Includes: <ul style="list-style-type: none"> ● Contestant (Individual, Team, Organization, Company) name. ● Application title. ● Technical and business points of contact. ● Conceptual Description of the UAS
Project Description (required)	10 Slides	How the design will fulfill the requirements is the objective of the PDR. Below are a few options to consider: <ul style="list-style-type: none"> ● Overview or conceptual description of the system with

		<p>callouts indicating the key components, estimated endurance, and energy source.</p> <ul style="list-style-type: none"> • Details of key components, how they enable the contestants to achieve the requirements in the design specification. • Schematics or drawings <p>Technical Performance Measures (TPM) should reflect estimates of key requirements for the Contestants system and should include:</p> <ul style="list-style-type: none"> • Endurance in minutes (at AUW) • System weight in pounds (to include a 10-pound payload) • All Up Weight in pounds • Estimated set up time in minutes (from unpacking the drone from its storage configuration to take off) • Total volume of system in storage configuration in cubic feet • System Cost <p>Contestant Schedule with tasks and task status</p>
Bill of Materials (required)	As Required	<ul style="list-style-type: none"> • Reviews shall include a Bill of Materials (BOM) that estimates the entire design. • The BOM can be a separate document delivered with the review slides. • Items that are not fully defined can be estimated (note, estimated elements of the design should not include key components in the propulsion or power systems)
Technical Performance Measure Calculation (required)	As Required	<ul style="list-style-type: none"> • Submissions should include the estimation process used to establish estimates for Technical Performance Measures

NOTE: Submission(s) must not use NIST's logo or official seal and must not claim NIST endorsement.

Critical Design Review Content Requirements:

Design review content must conform to the following content requirements. Do not include proprietary or sensitive information in the design review. The CDR briefing will be created and submitted by all registered users using an online form available through [<https://www.firstresponderuaschallenge.org>].

Section	Page Limit	Description
Cover Page (required)	1 Slide	<p>Includes:</p> <ul style="list-style-type: none"> • Contestant name (Individual, Team, Organization,

		Company). <ul style="list-style-type: none"> • Application title. • Technical and business points of contact. • Conceptual or Actual View of the Drone
Project Description (required)	15 Slides	How the design will fulfill the requirements is the objective of the CDR. Below are a few options to consider: <ul style="list-style-type: none"> • Actual image of the system (or key components) with callouts indicating the key components, estimated endurance, and energy source. • Details of actual key components, how they enable the contestants to achieve the requirements in the design specification. Status and outcomes of Actual Component and System level testing. Technical Performance Measures (TPM) should reflect actual demonstrations of key requirements and estimates for: <ul style="list-style-type: none"> • Endurance in minutes (at AUW) • System weight in pounds (to include a 10-pound payload) • All Up Weight in pounds • Estimated set up time in minutes (from unpacking the drone from its storage configuration to take off) • Total volume of system in storage configuration in cubic feet • System Cost Contestant Schedule with tasks and task status
Bill of Materials (required)	As Required	<ul style="list-style-type: none"> • Reviews shall include a complete Bill of Materials (BOM) that represents the entire design. • The BOM can be a separate document delivered with the review slides. • Items that are not fully defined can be estimated (note, estimated elements of the design should not include key components in the propulsion or power systems)
Technical Performance Measure Calculation (required)	As Required	<ul style="list-style-type: none"> • Submissions should include the estimation process used to establish estimates for Technical Performance Measures

NOTE: Submission(s) must not use NIST's logo or official seal and must not claim NIST endorsement.

Evaluation Criteria and Judging:

NIST will review each contestant entry in the Design Reviews. A submission that fails to meet the compliance criteria will be disqualified and will be ineligible to compete in this contest. Submissions that pass the initial compliance review will be evaluated and scored by a panel of judges. An evaluation of a submission by a panel of judges does not constitute NIST's final determination of contestant or submission eligibility. Submissions will be judged according to the criteria below:

Preliminary Design Review

Criterion 1: Strategic Alignment (75%)

This criterion involves consideration of the Strategic Alignment. The extent to which the proposed approach demonstrates the potential to meet the Challenge Objectives listed in [Table B - Drone Design Specification](#).

Criterion 2: Plan (25%)

The Contestant's plan to manage schedule, resources, and other challenges associated with developing the capability in pursuit of the challenge goals.

Contestant's will be evaluated using a point system to evaluate Criterion 1 (note: specific scores will not be announced or provided to Contestants). Points will be given for demonstrating the potential to meet each Challenge Requirement from Table B - Drone Design Specification for this Stage, and additional points will be given for each Challenge Requirement for this Stage exceeded. Contestants with the highest aggregate score across all the Criteria in PDR will be awarded prizes.

Critical Design Review**Criterion 1: Bill of Materials (pass/fail)**

Review the contestants' estimated system Bill of Materials, to ensure it is complete with actual or estimated commercial and custom-made components with a capability for each requirement listed in the Drone Design Specification totaling less than \$30,000. The complete list of components, their costs, and sources, as well as a list of custom-made parts, their fabrication source, material, and material volume must be provided and verified. Interchangeable and spare parts that are an exact duplicate of primary parts within the drone, will not count as part of the \$30,000 hardware budget (unless these are provided as part of the "system" that a first responder would buy). During the competition, drone components may be damaged or malfunction. It is in the contestant's best interest to ensure that they have the spare parts required for safe flight and continued operation. Spare parts that are acquired for the purposes of the continued operations during the competition and that are not intended to be part of the system do not count toward the \$30,000 maximum.

Criterion 2: Strategic Alignment (75%)

This criterion involves consideration of the Strategic Alignment. The extent to which the proposed approach demonstrates the potential to meet the Challenge Objectives listed in the Drone Design Specification.

Criterion 3: Plan (25%)

The Contestant's plan to manage schedule, resources, and other challenges associated with developing the capability in pursuit of the challenge goals

Contestants will be evaluated using a point system to evaluate Criterion 2 (note: specific scores will not be announced or provided to Contestants). Points will be given for demonstrating the potential to meet each Challenge Requirement from Table B - Drone Design Specification for this Stage, and additional points will be given for each Challenge Requirement exceeded, and only if all Challenge Requirements for this Stage are met. Contestants with the highest aggregate score across all the Criteria will be awarded prizes.

Official Rules of Stage 3: Video Test & Safety Evaluation Contest

Introduction:

In this stage of the contest, Contestants will be required to finalize the build of their aircraft system. Once the system is complete, Contestants will conduct a series of Video Test & Evaluation flights. The Video Test & Evaluation flights are designed to ensure the Contestants complete minimum requirements for safety, hardware configuration, flight time, and payload with their prototype drone. Contestants will be evaluated on the performance of their system with respect to the Drone Design Specification ([Table B](#)). Contestants who successfully complete this stage will receive an invitation to the flight test facility and travel prize awards to attend the final Live Test & Evaluation contest.

OFFICIAL RULES FOR CONTESTANTS SELECTED FROM THE DESIGN, PROTOTYPING, & HARDWARE BUILD CONTEST

Important Dates:

[Table A](#) - Summary of Important Dates as previously listed.

Drone Design Specification:

Please refer to [Table B](#) - Drone Design Specification for all UAS design requirements.

How to Enter:

- Contestants will be required to participate in the Stage 3 challenge webinar.
- Contestants will review the terms and conditions of participation and accept the terms and conditions for entry.
- Contestants will complete their prototyping and hardware build process and be required to hold check-in meetings once every two weeks with the NIST team to report on progress.

- Contestants are not permitted to spend more than \$30,000 on the total cost of all components of their system, which includes software, hardware, spares, and custom-made items. The cost of spare parts (that are not included as part of the system that the first responders would be expected to buy) is not included in the \$30,000 maximum.
- Contestants must keep records of all hardware and software purchased or created for the prototype in the form of a Bill of Materials (BOM) to ensure their entry is compliant. The BOM must show that all components included in the build are acquired appropriately, accounted for, and reported correctly for review. The BOM shall include:
 - Each item in the system, a part number, link or URL of where to procure the item, unit cost, quantity, and total cost.
 - Custom or make items shall have the unit cost estimated, their fabrication source defined, material, and material volume estimated.
- Reporting requirements are similar to a build list, acquisition list, or Bill of Materials. The Challenge staff member can review and verify to ensure that the hardware assembled is within the hardware budget allowed for each contestant. This hardware budget is in place to ensure that all contestants have the same resources to enable their creativity. Contestants who violate this critical requirement will be removed from the competition and no longer be eligible for future contests as part of this challenge.
- Contestants will complete a series of video recorded flights. Each flight will begin with a safety check which meets Challenge safety check standards, then the contestant will place the drone in a safe test flight location. The contestant(s) will complete a series of standardized tests (which will be provided at a later date) to ensure the drone can be safely operated and achieve basic performance requirements.
- All contestants will provide their test flight video to NIST via secure file transfer for review and verification prior to the contest closing date. The test flight video must have a minimum resolution of 1,280 x 720 pixels. The test flight video should include the view of the drone in the air from the moment of take-off to the moment of landing, a view from a camera onboard the drone looking straight down, a view of the controller(s) for the drone, and a view of a clock with at least a one (1) second resolution. The four (4) views should be clearly visible in the same video image simultaneously. This may be accomplished by strategically positioning the video camera relative to the drone, controller(s), and clock such that these three (3) components are visible to the camera; or by feeding live video from several cameras pointed at the drone, controller(s), and clock, respectively, into a video Multiview processor that can combine multiple inputs into one video output.

Safety Requirements:

All aircraft and ground-based equipment will undergo rigorous safety evaluations leading up to the First Responder UAS Endurance Challenge. Physical inspections will take place before each flight that occurs as part of the video and Live Test and Evaluation competitions. These

inspections must be passed before the aircraft will be permitted to fly. All decisions by NIST in relation to airworthiness are final. Safety inspections will include (but not be limited to) the following:

- Structural verification of the aircraft to ensure structural integrity including,
 - Components adequately secured and fasteners tightened
 - Propeller structure and attachment integrity
 - General inspection of electronic wiring
 - Payload general integrity
- UAS autonomous flight mode manual override;
- Radio spectrum frequency compliance;
- Radio range checks with motor off and on;
- Flight termination system or “kill switch” test;
- Aircraft will be weighed at All Up Weight to ensure they fall within the weight restrictions;
- Video evidence and flight logs of previous flight tests demonstrating safe operations;
- Proficiency of team members with respect to operation of UAS software & equipment, communications and procedures.
- All operators or pilots must be 107 FAA certified or under the supervision of a certified pilot who is a member of the contestant’s team.

Video Test & Safety Evaluation Content Requirements:

All contestants will provide their test flight video to NIST via secure file transfer for review and verification prior to the contest closing date in accordance with the video requirements listed in the “How to Enter” section. The test flight video should clearly depict all components of the system and the drone when in flight. The video submission shall include the content listed below. The Video Test & Safety Video will be created and submitted by all registered Contestants using an online form available through [<https://www.firstresponderuaschallenge.org>].

Section	Time Limit	Description
System Overview	10 minutes	Video overview of all major components of system design with narration (system in powered off state) <ul style="list-style-type: none">● System weight (all components on scale)● Drone All Up Weight (on scale)
System Operation	60 minutes	Video of contestant conducting; <ul style="list-style-type: none">● System set-up and preflight checks● System safety checks● Flight Termination System test (while on ground)● Take off● Manual flight, fly drone at AUW within a small

		<ul style="list-style-type: none"> area for 5-minute flight over the take off point • Land • Disarm drone • Prepare drone for next flight • System safety checks • Autonomous flight, fly drone at AUV within a small area for 30 continuous minutes • Land • Disarm drone • Video complete
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Evaluation Criteria and Judging:

NIST will review each contestant entry into the Video Test & Safety Evaluation Contest. A submission that fails to meet the compliance criteria will be provided with a list of items to be addressed and a re-evaluation date. On the re-evaluation date, contestants shall submit the new video using an online form available on the challenge website. Contestants failing to meet the compliance criteria during the re-evaluation will be disqualified and will be ineligible to compete in this contest. Submissions that pass the initial compliance review will be evaluated and scored by a panel of judges. An evaluation of a submission by a panel of judges does not constitute NIST's final determination of contestant or submission eligibility. Submissions will be judged according to the criteria below:

Criterion 1: UAS Safety Review (pass/fail)

Review the contestants' prototype drone, video, and contest deliverables to ensure that the UAS is compliant with the Drone Design Specification and Safety Specific Requirements. Full compliance is required.

Criterion 2: Strategic Alignment (75%)

This criterion involves consideration of the Strategic Alignment. The extent to which the proposed approach meets the Challenge Objectives listed in the Drone Design Specification.

Criterion 3: Plan (25%)

The Contestant's plan to manage schedule, resources, and other challenges associated with developing the capability in pursuit of the challenge goals.

Contestants will be evaluated using a point system to evaluate Criterion 2 (note: specific scores will not be announced or provided to Contestants). Points will be given for each Challenge Requirement met from [Table B - Drone Design Specification](#) for this Stage and the UAS Safety Review is successfully completed by earning a "pass." Contestants with the highest aggregate score across all the Criteria will be awarded prizes and invited to compete in Stage 4.

Official Rules for Walk-on Teams: Video Test & Evaluation Contest

Introduction:

Walk-on Contestants are Contestants who meet all eligibility and technical requirements that were defined in Stage 1 and 2, and have a fully compliant UAS, but who did not participate in both Stages 1 and 2. Walk-on Contestants will submit a Bill of Materials for their system and the same test flight videos required for the Video Test & Safety Evaluation Contest. Upon evaluation of the Bill of Materials and video for the requirements defined below, Walk-on Contestants may be invited to participate in Stage 4: Live Test & Evaluation stage.

Contestants are limited to those selected from the Walk-on Call for Submissions.

Walk-on Contestants are not eligible to receive prize awards associated with Stages 1 and 2. Walk-on Contestants are eligible for and may receive travel prize awards to attend the Live Test & Evaluation Contest. Walk-on Contestants that are selected to take part in Stage 4: Live Test & Evaluation Contest may compete for final prizes in Stage 4.

Important Dates:

[Table A](#) - Summary of Important Dates as previously listed.

Drone Design Specification:

Please refer to [Table B](#) - Drone Design Specification for all UAS design requirements.

How to Enter:

- Contestants will review the terms and conditions of participation and accept the terms and conditions for entry. Walk-on Contestants shall provide proof of drone liability insurance at the time of accepting the terms and conditions for entry.
- Contestants are not permitted to spend more than \$30,000 on the total cost of all components of their system, which includes software, hardware, spares, and custom-made items. The cost of spare parts (that are not included as part of the system that the first responders would be expected to buy) is not included in the \$30,000 maximum.
- Contestants must submit records of all hardware and software purchased or created for the prototype in the form of a Bill of Materials (BOM) to ensure their entry is compliant. The BOM must show that all components included in the build are acquired appropriately, accounted for, and reported correctly for review. The BOM shall include:
 - Each item in the system, a part number, link or URL of where to procure the item, unit cost, quantity, and total cost.
 - Custom or make items shall have the unit cost estimated, their fabrication source defined, material, and material volume estimated.

- Reporting requirements are similar to a build list, acquisition list, or Bill of Materials. The Challenge staff member can review and verify to ensure that the hardware assembled is within the hardware budget allowed for each contestant. This hardware budget is in place to ensure that all contestants have the same resources to enable their creativity. Contestants who violate this critical requirement will be removed from the competition and no longer be eligible for future contests as part of this challenge.
- Contestants will complete a series of video recorded flights. Each flight will begin with a safety check which meets Challenge safety check standards, then the contestant will place the drone in a safe test flight location. The contestant(s) will complete a series of standardized tests to ensure the drone can be safely operated and achieve basic performance requirements.
- All contestants will provide their test flight video to NIST via secure file transfer for review and verification prior to the contest closing date. The test flight video must have a minimum resolution of 1,280 x720 pixels. The test flight video should include the view of the drone in the air from the moment of take-off to the moment of landing, a view from a camera onboard the drone looking straight down, a view of the controller(s) for the drone, and a view of a clock with at least a one (1) second resolution. The four (4) views should be clearly visible in the same video image simultaneously. This may be accomplished by strategically positioning the video camera relative to the drone, controller(s), and clock such that these three (3) components are visible to the camera; or by feeding live video from several cameras pointed at the drone, controller(s), and clock, respectively, into a video Multiview processor that can combine multiple inputs into one video output.

Safety Requirements:

All aircraft and ground-based equipment will undergo rigorous safety evaluations leading up to the First Responder UAS Endurance Challenge. Physical inspections will take place before each flight that occurs as part of the video and Live Test & Evaluation competitions. These inspections must be passed before the aircraft will be permitted to fly. All decisions by NIST in relation to airworthiness are final. Safety inspections will include (but not be limited to) the following:

- Structural verification of the aircraft to ensure structural integrity including:
 - Components adequately secured and fasteners tightened
 - Propeller structure and attachment integrity
 - General inspection of electronic wiring
 - Payload general integrity
- UAS autonomous flight mode manual override
- Radio spectrum frequency compliance
- Radio range checks with motor off and on
- Flight termination system or “kill switch” test

- Aircraft will be weighed at All Up Weight to ensure they fall within the weight restrictions
- Video evidence and flight logs of previous flight tests demonstrating safe operations
- Proficiency of team members with respect to operation of UAS software & equipment, communications and procedures
- All operators or pilots must be 107 FAA certified or under the supervision of a certified pilot who is a member of the contestant's team

Walk-On Video Test & Safety Evaluation Content Requirements:

All contestants will provide their test flight video to NIST via secure file transfer for review and verification prior to the contest closing date in accordance with the video requirements listed in the “How to Enter” section. The test flight video should clearly depict all components of the system and the drone when in flight. The video submission shall include the following content. The Walk-On Video Test & Safety Video will be created and submitted by all registered users using an online form available through [<https://www.firstresponderuaschallenge.org>].

Section	Time Limit	Description
System Overview	10 minutes	Video overview of all major components of system design with narration (system in powered off state): <ul style="list-style-type: none"> ● System weight (all components on scale) ● Drone All Up Weight (on scale)
System Operation	60 minutes	Video of contestant conducting; <ul style="list-style-type: none"> ● System set-up and preflight checks ● System safety checks ● Flight Termination System test (while on ground) ● Take off ● Manual flight, fly drone at AUW within a 100-foot area for 5-minute flight within a small area over the take off point ● Land ● Disarm drone ● Prepare drone for next flight ● System safety checks ● Autonomous flight, fly drone at AUW within a 100-foot area for 30 continuous minutes ● Land ● Disarm drone ● Video complete

Evaluation Criteria and Judging:

NIST will review each contestant entry into the Video Test & Safety Evaluation Contest. A submission that fails to meet the compliance criteria will be provided with a list of items to be addressed and a re-evaluation date. On the re-evaluation date, contestants shall submit the new video using an online form available on the challenge website. Contestants failing to meet the compliance criteria during the re-evaluation will be disqualified and will be ineligible to compete in this contest. Submissions that pass the initial compliance review will be evaluated and scored by a panel of judges. An evaluation of a submission by a panel of judges does not constitute the NIST's final determination of contestant or submission eligibility. Submissions will be judged according to the criteria below:

Criterion 1: Bill of Materials (pass/fail)

Review the contestants' estimated system Bill of Materials, to ensure it is complete with actual or estimated commercial and custom-made components with a capability for each requirement listed in the Drone Development Specification totaling less than \$30,000. The complete list of components, their costs, and source as well as a list of custom-made parts, their fabrication source, material, and material volume must be provided and verified. Interchangeable and spare parts that are an exact duplicate of primary parts within the drone, will not count as part of the \$30,000 hardware budget. As part of the competition, drone components may be damaged or malfunction. It is in the contestant's best interest to ensure they have the spare parts required for safe flight and continued operation.

Criterion 2: UAS Safety Review (pass/fail)

Review the contestants' prototype drone, video, and contest deliverables to ensure that the UAS is compliant with the Drone Design Specification and Safety Specific Requirements. Full compliance is required.

Criterion 3: Strategic Alignment (75%)

This criterion involves consideration of the Strategic Alignment. The extent to which the proposed approach meets the Challenge Objectives listed in the Drone Design Specification.

Criterion 4: Plan (25%)

The Contestants plan to manage schedule, resources, and other challenges associated with developing the capability in pursuit of the challenge goals.

Contestants will be evaluated using a point system to evaluate Criterion 2 (note: specific scores will not be announced or provided to Contestants). Points will be given for each Challenge Requirement met from [Table B](#) - Drone Design Specification for this Stage. Contestants with the highest aggregate score across all the Criteria will be invited to compete in Stage 4.

Official Rules of Stage 4: Live Test & Evaluation Contest

Introduction:

The Live Test & Evaluation Contest is the final contest of the series. The event will take place at a flight-testing facility (specific location will be announced at a later date). Contestants will complete a series of static tests and live test flights to demonstrate their prototype's capabilities. All Contestants will be tested and evaluated. Contestants meeting at least the minimum standards will be ranked and, based on those rankings, may be awarded a prize.

Important Dates:

[Table A](#) - Summary of Important Dates as previously listed.

Drone Design Specification:

Please refer to [Table B](#) - Drone Design Specification for all UAS design requirements.

How to Enter:

- Stage 3 Winners (all Contestants from Stage 3, whether selected from the Design, Prototyping, & Hardware Build contest or as a Walk-on Contestants, that were invited to Stage 4 are considered "Stage 3 Winners") should be prepared to complete a similar series of safety checks on day one of the Live Test & Evaluation Contest. All contestants will be required to complete these safety checks prior to any contest flights.
- Once contestants are selected from the Video Test & Safety Evaluation Contest and Walk-on Contest, they will be required to participate in the Stage 4 webinar.
- All operators or pilots must be 107 FAA certified or under the supervision of a certified pilot who is a member of the Contestant's team.
- Contest flights will be conducted in an outdoor environment. Each contestant will be assigned a flight area to complete their preflight safety checks and full test flight. Each flight area will be bordered by a safety zone. The drone will need to follow defined flight paths at assigned altitudes, navigate to assigned positions, and take-off and land safely.
- Contestants will be assigned a start time to demonstrate their prototype drone capabilities in a series of static tests and contest flights.
- Static checks will evaluate fixed attributes of the system such as cost, weight and volume.
- Technical flights will evaluate system capabilities and fundamental flight performance, such as VTOL, manual and autonomous flight modes, and loiter ability in a series of structured flights.
- Operational flights will evaluate the usability and additional system capabilities in a simulated operational flight.
- Last Drone Standing flight will evaluate the endurance of the drone.

- After all the contest flights, the Judging panel will convene and discuss each of the contestants' performance and give their final scores in accordance with the review criteria.

Evaluation Criteria and Judging:

NIST will review each contestant entry in the Live Test & Evaluation Contest. A submission that fails to meet the criteria specified in Criterion 1: Drone Safety Review will be provided with a list of items to be addressed and a re-evaluation date. On the re-evaluation date, contestants shall submit the new video using an online form available on the challenge website. Contestants failing to meet the compliance criteria during the re-evaluation will be disqualified and will be ineligible to compete in this contest. Submissions that pass the Drone Safety Review will be evaluated and scored by a panel of judges. An evaluation of a submission by a panel of judges does not constitute the NIST's final determination of contestant or submission eligibility. Submissions will be judged according to the criteria below:

Criterion 1: Drone Safety Review (pass/fail)

Review the Contestants' prototype UAS to ensure it is compliant with the features required and that contestants properly complete safety checks. Full compliance is required.

Criterion 2: Static Tests and Evaluations (25%)

Evaluation of the fixed attributes of the drone: Systems will be measured and awarded points based upon the specific attributes associated with the Challenge Objectives listed in the Drone Design Specification. These include (but are not limited to) the following:

- System Cost
- All Up Weight
- Individual Component Weight
- System Weight
- System Volume

Contestants will be evaluated using a point system to evaluate Criterion 2 (note: specific scores may not be announced or provided to Contestants). At the discretion of the judges, points will be given for each Challenge Requirement met from [Table B](#) - Drone Design Specification for this Criterion, and additional points will be given for each Challenge Requirement exceeded, and only if all Challenge Requirements for this Criterion are met.

Criterion 3: Technical Flight Evaluations (25%)

Evaluation of technical attributes of the drone during flight: Contestants will be provided with a flight plan and will fly the defined route and complete a series of tasks. During the flight the system will be evaluated and awarded points based upon performance associated with the Challenge Requirements and Challenge Objectives listed in the Drone Design Specification. These include (but are not limited to) the following:

- VTOL
- System Control
- Loiter
- Location Accuracy

Contestants will be evaluated using a point system to evaluate Criterion 3 (note: specific scores may not be announced or provided to Contestants). At the discretion of the judges, points will be given for each Challenge Requirement met from [Table B](#) - Drone Design Specification for this Criterion. Additional points will be given for each Challenge Requirement exceeded, but only if all Challenge Requirements for this Criterion are met.

Criterion 4: Operational Flight Evaluations (25%)

Evaluation of technical and operational attributes of the drone during a simulated operational mission: Contestants will put their system into operation from a stored, packaged state and fly their drone to a pre-defined airspace. During the simulated operational mission, contestants and the system will be evaluated and awarded points based upon performance associated with Challenge Requirements and Challenge Objectives listed in the Drone Design Specification.

These include (but are not limited to) the following:

- Set-up Time
- System Control
- VTOL
- Loiter

Contestants will be evaluated using a point system to evaluate Criterion 4 (note: specific scores may not be announced or provided to Contestants). At the discretion of the judges, points will be given for each Challenge Requirement met from [Table B](#) - Drone Design Specification for this Criterion. Additional points will be given for each Challenge Requirement exceeded, but only if all Challenge Requirements for this Criterion are met.

Criterion 5: Last Drone Standing Flight Evaluations (25%)

The Last Drone Standing flight evaluates the Endurance of the drone. All Contestants will take part in the Last Drone Standing event simultaneously. Contestants will be assigned a take-off/landing location and a defined airspace. When the start command is given all Contestants will unpack and setup their drones and then vertically take-off and enter into their respective airspace. The drone must maintain a location within the defined three-dimensional airspace to be awarded points. Contestants' drones must remain within the three-dimensional airspace for as long as possible. Once the drone has achieved its maximum Endurance, it must safely land at the assigned landing location to complete the event and be awarded points.

Contestants will be evaluated using a point system to evaluate Criterion 2 (note: specific scores may not be announced or provided to Contestants). At the discretion of the judges, points will be given for each Challenge Requirement met from [Table B](#) - Drone Design Specification for this Criterion. Additional points will be given for each Challenge Requirement exceeded, but only if all Challenge Requirements for this Criterion are met. The Last Drone Standing event will end when the last drone safely lands or after four hours, whichever comes first.

Criterion 6: Best-In-Class Award Evaluations

Best-In-Class awards recognize Contestants in specific requirements for outstanding achievement or contribution to advancing the challenge goals. All Contestants in Stage 4 who pass Criterion 1: Drone Safety Review are eligible for Best-In-Class awards. Contestants will be evaluated at-large and up to six \$5,000 prize awards are anticipated to be awarded. All Stage 4 Contestants are eligible to win Best-In-Class award(s) and one of the First, Second and Third Place prize awards.

Each award is based on one of the requirements (e.g., performance metrics) outlined in Stage 4's Criteria 2 through 5. The Contestant is not required to obtain a score in all of Stage 4's Criteria 2 through 5 to be eligible for the Best-In-Class awards. For each Best-In-Class award, points are awarded based upon the defined evaluation criterion associated with each Best-In-Class award. Judges have the discretion to award up to 2 additional points to a Contestant's score. The Judging panel will vote on all eligible Contestants and use a simple majority to select a winner for each Best-In-Class award.

All Contestants are eligible for the following Best-In-Class awards:

1. Best in Class Endurance (Criterion 5)
2. Best in Class Innovation (Criteria 2 through 5)
3. Best in Class Cost Effectiveness (Lowest System Cost, Criterion 2)
4. Best in Class Weight (Lightest All Up Weight, Criterion 2)
5. Best in Class Autonomy (Criteria 3 through 4)
6. Best in Class Ease-of-Use (Criteria 2 and 4)

The number of awards may vary; NIST reserves the right to decline to make awards or make fewer awards than anticipated.

Criterion 7: First Responder's Choice Award Evaluations

The First Responder's Choice award will recognize a Contestant for their responsiveness to the needs and expectations of the public safety sector. This evaluation will consider the specialized features, user interfaces, user design elements, and mission-enabling capabilities created by the Contestant that make their entry well-suited for use by public safety. All Contestants in Stage 4 are eligible for a First Responder's Choice award. Contestants will be evaluated at-large and up

to two \$5,000 prize awards are anticipated to be awarded. All Stage 4 Contestants are eligible to win the First Responder's Choice award(s), the Best-In-Class award(s) and one of the First, Second and Third Place prize awards.

The Contestant is not required to obtain a score in all of Stage 4's criteria to be eligible for a First Responder's Choice award. Specifically, a Judging panel will evaluate the votes received from first responders in attendance at the Live Test & Evaluation Contest and award the First Responder's Choice award(s) based upon a simple majority.

The number of awards may vary; NIST reserves the right to decline to make awards or make fewer awards than anticipated.

Final Prize Award Evaluation

For the First, Second and Third Place awards, Contestants will be evaluated using a point system (note: specific scores may not be announced or provided to Contestants). Contestants who pass Criterion 1: Drone Safety Review and have the highest aggregate score across Criteria 2 through 5 will be ranked; the highest three scoring Contestants may receive the First, Second and Third Place prizes and travel prizes to present their UAS solution at the 2021 PSCR Stakeholder Conference.

Terms and Conditions Submission Requirements

In order for submissions to be eligible for review, recognition and award, Contestants must meet the following requirements:

- **Deadline** - The submission must be available for evaluation by the end date noted in the "Important Dates" section of these rules.
- **No NIST logo** - submission(s) and participant(s) must not use NIST's logo or official seal and must not claim NIST endorsement.
- Each submission must be original, the work of the Contestant, and must not infringe, misappropriate or otherwise violate any intellectual property rights, privacy rights, or any other rights of any person or entity.
- It is an express condition of submission and eligibility that each Contestant warrants and represents that the Contestant's submission is solely owned by the Contestant, that the submission is wholly original with the Contestant, and that no other party has any ownership rights or ownership interest in the submission. The Participant must disclose if they are subject to any obligation to assign intellectual property rights to parties other than the contest Participant, if the Participant is licensing or, through any other legal instrument, utilizing intellectual property of another party
- Each Contestant further represents and warrants to NIST that the submission, and any use thereof by NIST shall not: (i) be defamatory or libelous in any manner toward any person, (ii) constitute or result in any misappropriation or other violation of any person's publicity rights or right of privacy, or (iii) infringe, misappropriate or otherwise violate any intellectual property rights, privacy rights or any other rights of any person or entity.
- Each submission must be in English.
- Submissions will not be accepted, evaluated, or considered for award if they contain any matter that, in the sole discretion of NIST, is indecent, obscene, defamatory, libelous, in bad taste, demonstrates a lack of respect for public morals or conduct, promotes discrimination in any form, or which adversely affects the reputation of NIST. NIST shall have the right to remove any content from the Event Website in its sole discretion at any time and for any reason, including, but not limited to, any online comment or posting related to the Challenge.
- If NIST, in its sole discretion, finds any submission to be unacceptable, then such submission shall be deemed disqualified.

Judging Panel

The submissions will be judged by a qualified panel of expert(s) selected by the Director of NIST. The panel consists of Department of Commerce, National Institute of Standards and Technology and non-Department of Commerce, National Institute of Standards and Technology experts who will judge the submissions using the judging criteria identified above and will select

winners. Judges will not (A) have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered Contestant in a challenge; or (B) have a familial or financial relationship with an individual who is a registered Contestant.

The decisions of the Judging panel for the challenge will be announced in accordance with the dates noted in the "Important Dates" section of these rules. NIST PSCR will not make contestants' evaluation results from the Judging panel available to contestants or the public.

Verification of Winners

ALL CONTEST WINNERS WILL BE SUBJECT TO VERIFICATION OF IDENTITY, QUALIFICATIONS AND ROLE IN THE CREATION OF THE SUBMISSION BY THE DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.

Participants must comply with all terms and conditions of the Official Rules. Winning a prize is contingent upon fulfilling all requirements contained herein. The potential winners will be notified by email, telephone, or mail after the date of winning results. Each potential winner of monetary or non-monetary award, will be required to sign and return to the Department of Commerce, National Institute of Standards and Technology, within ten (10) calendar days of the date the notice is sent, an ACH Vendor/Miscellaneous Enrollment Form (OMB NO. 1510-0056) and a Contestant Eligibility Verification form in order to claim the prize.

In the sole discretion of the Department of Commerce, National Institute of Standards and Technology, a potential winner will be deemed ineligible to win if: (i) the person/entity cannot be contacted; (ii) the person/entity fails to sign and return an ACH Vendor/Miscellaneous Enrollment Form (OMB NO. 1510-0056) and a Contestant Eligibility Verification form within the required time period; (iii) the prize or prize notification is returned as undeliverable; or (iv) the submission or person/entity is disqualified for any other reason. In the event that a potential, or announced winner, is found to be ineligible or is disqualified for any reason, the Department of Commerce, National Institute of Standards and Technology, in their sole discretion, may award the prize to another Contestant.

Eligibility Requirements:

A Contestant (whether an individual, team, or legal entity) must have registered to participate and complied with all of the requirements under section 3719 of title 15, United States Code as contained herein. At the time of entry, the Official Representative (individual or team lead, in the case of a group project) must be age 18 or older and a U.S. citizen or permanent resident of the United States or its territories. In the case of a private entity, the business shall be incorporated in and maintain a place of business in the United States or its territories.

Contestants may not be a Federal entity or Federal employee acting within the scope of their employment. Former NIST PSCR Federal employee or Associates are not eligible to compete in a prize challenge within one year from their exit date. NIST Associates are eligible to enter but may not utilize NIST funding for competing in this challenge, nor are they eligible to receive a cash prize award. Individuals currently receiving PSCR funding through a grant or cooperative agreement are eligible to compete but may not utilize the previous NIST funding for competing in this challenge. Previous and current PSCR prize challenge contestants are eligible to compete. Non-NIST Federal employees acting in their personal capacities should consult with their respective agency ethics officials to determine whether their participation in this competition is permissible. A Participant shall not be deemed ineligible because the Participant consulted with Federal employees or used Federal facilities in preparing its entry to the Challenge if the Federal employees and facilities are made available to all Participants on an equitable basis.

Contestants, including individuals and private entities, must not have been convicted of a felony criminal violation under any Federal law within the preceding 24 months and must not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. Contestants must not be suspended, debarred, or otherwise excluded from doing business with the Federal Government.

Multiple individuals and/or legal entities may collaborate as a group to submit a single entry and a single individual from the group must be designated as an Official Representative for each entry. That designated individual will be responsible for meeting all entry and evaluation requirements.

Teams:

Challenge submissions can be from an individual, a team or a group of teams who submit a solution to the Challenge. If a team of individuals, a corporation, or an organization is selected as a prize winner, NIST will award a single dollar amount to the Official Representative. The Official Representative is solely responsible for allocating any prize amount among its member Contestants as they deem appropriate. NIST will not arbitrate, intervene, advise on, or resolve any matters between entrant members. It will be up to the winning team(s) to reallocate the prize money among its member Contestants, if they deem it appropriate.

Submission Rights:

Any applicable intellectual property rights to a submission will remain with the Contestant. By participating in the competition, the Contestant is not granting any rights in any patents, pending patent applications, or copyrights related to the technology described in the entry. However, by

submitting a challenge submission, the Contestant is granting the Department of Commerce, National Institute of Standards and Technology certain limited rights as set forth herein.

- The Contestant grants to the Department of Commerce, National Institute of Standards and Technology the right to review the submission, to describe the submission in any materials created in connection with this competition, and to screen and evaluate the submission, and to have the Judges, Challenge administrators, and the designees of any of them, review the submission. The Department of Commerce, National Institute of Standards and Technology, and any Challenge Co-Sponsors, will also have the right to publicize Contestant's name and, as applicable, the names of Contestant's team members and/or organization which participated in the submission following the conclusion of the competition.
- As part of its submission, the contestant must provide written consent granting the Department of Commerce, National Institute of Standards and Technology, a royalty-free, non-exclusive, irrevocable, worldwide license to display publicly and use for promotional purposes the contestant's entry ("demonstration license"). This demonstration license includes utilizing the contestant's entry for future research purposes and posting or linking to the contestant's entry on the Department of Commerce, National Institute of Standards and Technology websites, including the competition website and inclusion of the contestant's submission in any other media, worldwide.

Warranties:

By submitting an entry, each Contestant represents and warrants that the Contestant is the sole author and copyright owner of the submission; that the submission is an original work of the Contestant and that the Contestant has acquired sufficient rights to use and to authorize others, including the Department of Commerce, National Institute of Standards and Technology, to use the submission, as specified throughout the Official Rules, that the submission does not infringe upon any copyright or upon any other third party rights of which the Contestant is aware; and that the submission is free of malware.

By submitting an entry, the Contestant represents and warrants that all information submitted is true and complete to the best of the Contestant's knowledge, that the Contestant has the right and authority to submit the entry on the Contestant's own behalf or on behalf of the persons and entities that the Contestant specifies within the entry, and that the entry (both the information and materials submitted in the entry and the underlying technology/method/idea/treatment protocol/solution described in the entry):

- is the Contestant's own original work, or is submitted by permission with full and proper credit given within the entry;
- does not contain proprietary or confidential information or trade secrets (the Contestant's or anyone else's);

- does not knowingly violate or infringe upon the patent rights, industrial design rights, copyrights, trademarks, rights in technical data, rights of privacy, publicity or other intellectual property or other rights of any person or entity;
- does not contain malicious code, such as viruses, malware, timebombs, cancelbots, worms, Trojan horses or other potentially harmful programs or other material or information;
- does not and will not violate any applicable law, statute, ordinance, rule or regulation, including, without limitation, United States export laws and regulations, including but not limited to, the International Traffic in Arms Regulations and the Department of Commerce Export Regulations; and
- does not trigger any reporting or royalty or other obligation to any third party.

By making a submission to this prize competition, each Contestant agrees that no part of its submission includes any trade secret information, ideas or products, including but not limited to information, ideas or products within the scope of the Trade Secrets Act, 18 U.S.C. § 1905. All submissions to this prize competition are deemed non-proprietary. Since NIST does not wish to receive or hold any submitted materials “in confidence” it is agreed that, with respect to the Contestant’s entry, no confidential or fiduciary relationship or obligation of secrecy is established between NIST and the Contestant, the Contestant’s team, or the company or institution the Contestant represents when submitting an entry, or any other person or entity associated with any part of the Contestant’s entry.

Additional Terms and Conditions

This document outlines the Official Rules for the *First Responder UAS Endurance Challenge*. Nothing within this document or in any documents supporting the *First Responder UAS Endurance Challenge* shall be construed as obligating the Department of Commerce, NIST or any other Federal agency or instrumentality to any expenditure of appropriated funds, or any obligation or expenditure of funds in excess of or in advance of available appropriations.

Challenge Subject to Applicable Law

All challenge phases are subject to all applicable federal laws and regulations. Participation constitutes each Contestant's full and unconditional agreement to these Official Rules and administrative decisions, which are final and binding in all matters related to the challenge. Eligibility for a prize award is contingent upon fulfilling all requirements set forth herein. This notice is not an obligation of funds; the final award of prizes is contingent upon the availability of appropriations.

Participation is subject to all U.S. federal, state and local laws and regulations. Contestants are responsible for checking applicable laws and regulations in their jurisdiction(s) before participating in the prize competition to ensure that their participation is legal. The Department

of Commerce, National Institute of Standards and Technology shall not, by virtue of conducting this prize competition, be responsible for compliance by Contestants in the prize competition with Federal Law including licensing, export control, and nonproliferation laws, and related regulations. Individuals entering on behalf of or representing a company, institution or other legal entity are responsible for confirming that their entry does not violate any policies of that company, institution or legal entity.

Resolution of Disputes

The Department of Commerce, National Institute of Standards and Technology is solely responsible for administrative decisions, which are final and binding in all matters related to the challenge.

In the event of a dispute as to any registration, the authorized account holder of the email address used to register will be deemed to be the Contestant. The "authorized account holder" is the natural person or legal entity assigned an email address by an Internet access provider, online service provider or other organization responsible for assigning email addresses for the domain associated with the submitted address. Contestants and potential winners may be required to show proof of being the authorized account holder.

Publicity

The winners of these prizes (collectively, "Winners") will be featured on the Department of Commerce, National Institute of Standards and Technology website, newsletters, social media, and other outreach materials.

Except where prohibited, participation in the Challenge constitutes each winner's consent to the Department of Commerce, National Institute of Standards and Technology's, its agents', and any Challenge Co-Sponsors' use of each winner's name, likeness, photograph, voice, opinions, and/or hometown and state information for promotional purposes through any form of media, worldwide, without further permission, payment or consideration.

Payments

The prize competition winners will be paid prizes directly from the Department of Commerce, National Institute of Standards and Technology. Prior to payment, winners will be required to verify eligibility. The verification process with the agency includes providing the full legal name, tax identification number or social security number, routing number and banking account to which the prize money can be deposited directly.

All cash prizes awarded to Participants by the Department of Commerce, National Institute of Standards and Technology are subject to tax liabilities, and no withholding will be assessed by

the Department of Commerce National Institute of Standards and Technology on behalf of the Participant claiming a cash prize.

Liability and Insurance

Any and all information provided by or obtained from the Federal Government is without any warranty or representation whatsoever, including but not limited to its suitability for any particular purpose. Upon registration, all Contestants agree to assume and, thereby, have assumed any and all risks of injury or loss in connection with or in any way arising from participation in this challenge, development of any application or the use of any application by the Contestants or any third-party. Upon registration, except in the case of willful misconduct, all Contestants agree to and, thereby, do waive and release any and all claims or causes of action against the Federal Government and its officers, employees and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential and whether foreseeable or not), arising from their participation in the challenge, whether the claim or cause of action arises under contract or tort. Upon registration, all Contestants agree to and, thereby, shall indemnify and hold harmless the Federal Government and its officers, employees and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential and whether foreseeable or not), including but not limited to any damage that may result from a virus, malware, etc., to Government computer systems or data, or to the systems or data of end-users of the software and/or application(s) which results, in whole or in part, from the fault, negligence, or wrongful act or omission of the Contestants or Contestants' officers, employees or agents.

Contestants are required to demonstrate Drone (liability) insurance with a minimum coverage of \$1M prior to conducting any flights outside of an enclosed test facility for claims by a third party for death, bodily injury, or property damage, or loss resulting from an activity carried out in connection with participation in this Challenge and for claims by the Federal Government for damage or loss to Government property resulting from such an activity. The Federal Government shall be named as an additional insured under the contestant's insurance policy. Depending on the site for phase 4 of the Challenge, the flight-testing facility may also be a required named additional insured under the contestant's insurance policy.

Records Retention and FOIA

All materials submitted to the Department of Commerce, National Institute of Standards and Technology as part of a submission become official records and cannot be returned. Any confidential commercial information contained in a submission should be designated at the time of submission. Submitters will be notified of any Freedom of Information Act requests for their submissions in accordance with 29 C.F.R. § 70.26.

508 Compliance

Contestants should keep in mind that the Department of Commerce, National Institute of Standards and Technology considers universal accessibility to information a priority for all individuals, including individuals with disabilities. The Department is strongly committed to meeting its compliance obligations under Section 508 of the Rehabilitation Act of 1973, as amended, to ensure the accessibility of its programs and activities to individuals with disabilities. This obligation includes acquiring accessible electronic and information technology. When evaluating submissions for this challenge, the extent to which a submission complies with the requirements for accessible technology required by Section 508 will be considered.

General Conditions

This prize competition shall be performed in accordance with the America COMPETES Reauthorization Act of 2010, Pub. Law 111-358, title I, § 105(a), Jan. 4, 2011, codified at 15 U.S.C. § 3719 and amended by the American Innovation and Competitiveness Act of 2016 (Pub. L. No. 114-329) (hereinafter “America COMPETES Act”).

The Department of Commerce, National Institute of Standards and Technology reserves the right to cancel, suspend, and/or modify the challenge, or any part of it, if any fraud, technical failures, or any other factor beyond the Department of Commerce, National Institute of Standards and Technology's reasonable control impairs the integrity or proper functioning of the challenge, as determined by the Department of Commerce, National Institute of Standards and Technology in its sole discretion. The Department of Commerce, National Institute of Standards and Technology is not responsible for, nor is it required to count, incomplete, late, misdirected, damaged, unlawful, or illicit votes, including those secured through payment or achieved through automated means.

NIST reserves the right in its sole discretion to extend or modify the dates of the Challenge, and to change the terms set forth herein governing any phases taking place after the effective date of any such change. By entering, you agree to the terms set forth herein and to all decisions of NIST and/or all of their respective agents, which are final and binding in all respects.

ALL DECISIONS BY the Department of Commerce, National Institute of Standards and Technology ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CHALLENGE.

Glossary

Subject matter expert (SME): an expert in their respective field, either from NIST or from a collaborating entity. SMEs will conduct independent reviews of the submissions received from the Challenge. SMEs are not members of the Judging panel and, as such, will provide recommendations based on the evaluation criteria to the Judging panel and will not make any award determinations.

NIST PSCR will select members from the public safety industry, first responders, and PSCR to test and evaluate the submissions for the Challenge. The Judging panel will take SMEs' recommendations into consideration when evaluating Contestants' submissions. The Judging panel will make the final determination of awards for the Challenge.