



FIRST RESPONDER UAS INDOOR CHALLENGE

5.0 Live Event Safety Plan

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First Responder UAS 3D Mapping Challenge

Live Event Safety Plan

Overview

The Live Event Safety Plan creates a common language and standardizes requirements and protocols for use during the First Responder UAS 3D Mapping Challenge Live Event. This overarching plan addresses safety during specific procedures, tasks, and events throughout the live event.

All staff and contestants shall comply with the words and spirit of this safety plan. All judgments and decisions shall be made with safe operations in mind.

Safety Plan Objectives

The ultimate objective of this plan is to instill a safety culture and to create a safe environment for those involved with the live event. The safety plan aims to:

- Safely execute flight operations in a timely and cautious manner.
- Identify, evaluate, and eliminate hazards or reduce any associated risks to a level acceptable to the Safety Officer.
- Prioritize the reduction of dangers throughout flight evaluations.
- Creating an overarching safe event for spectators attending or participating in the live event.

Live Event Schedule

The following schedule (Table 1) defines the key events and planned tasks associated with the live event. The products developed to support the live event will be iteratively refined over time. The final delivery will occur on or about 45 days before the start of the Live Event.

Date	Task / Event
09 Apr 2024	Safety Tests
09 Apr 2024	Static Test and Technical Evaluations
09 Apr 2024	Additional Preferred Capabilities Evaluation
10 Apr 2024	Technical Evaluations
10 Apr 2024	Additional Preferred Capabilities Evaluation
10 Apr 2024	Simulated Indoor Mission Evaluations
11 Apr 2024	Simulated Indoor Mission Evaluations
11 Apr 2024	Award Ceremony

Table 1- Live Event Schedule

Roles and Responsibilities

Each member of the staff team has specific roles and responsibilities, as highlighted below:

Mission Commander – Directs and oversees the live event, including ground and flight events. Responsible for establishing, maintaining, and enforcing the live event policies.

Safety Officer – Responsible for implementing and verifying the safety protocols and managing risks before and during the live event.

Test Administrator – Conducts and oversees event criteria testing. Records all required criteria scoring on the scorecard.

Scorer – Collects event criteria scoring taken by the Test Administrators and compiles scores into the overall score tracker.

Runner – Collects scorecards from the Test Administrators and delivers them to the Scorers in the command center.

Admin/SME/Judges - Oversees the live event, takes notes as needed to inform judge's decisions better, and participates in competition remediation as needed.

Event Staff – Responsible for the overall logistics of the competition. Duties may include:

- Registration
- Badging
- Providing event instructions
- Managing access control
- Operations area logistics
- Food/Water
- Set up and tear down

Risk Management

Before any participant can fly, the Safety Officer will assess flight risk using a Flight Risk Analysis Tool (FRAT) (see Appendix A). A FRAT aims to identify potential hazards, their effect on mission outcomes, and mitigations that might help lessen those potential hazards. The FRAT will be provided to the Safety Officer as a paper form for record-keeping and reference.

Communication Equipment

Event staff will have radios to communicate with the Mission Commander, Safety Officer, and Test Administrators. The Mission Commander and/or the Safety Officer will have access to a P.A. system to loudly communicate instructions and directions in the event of an emergency to all people attending the live event.

Access Control

Access control protocols streamline access into certain event areas according to need, role, or responsibility.

- Access Control Points (ACP) will govern proper access to the spectator area, restricted areas, and the operations area. Event staff will manage ACPs by monitoring access badges.
- Access control badges will be provided at a designated welcome and check-in area (outside controlled areas).
- Government-issued identification, such as a state-issued driver's license or student identification card, must be presented to receive a badge.

- Badges will be of sufficient size and color to enable easy identification and determination of appropriate access.
- Color will be used to denote access levels as described in Table 2.

Access Title	Badge Color	Issued to	Access Areas
Event Staff	Purple	Airport Staff & Event Staff with TSA training	All Access
Event Staff	Blue	Event staff, NIST, & CCC	All Access Except Ramp Access
Judge	Blue	Judges	All Access Except Ramp Access
Subject Matter Expert	Blue	Subject Matter Experts	All Access Except Ramp Access
First Responder	Green	First Responder Spectators	Staging, Testing Area, and Other Areas With Escort
Contestant	Green	TBD	Staging, Testing Area, and Other Areas With Escort
VIP/News/Media	Yellow	VIP / News / Media Teams	College Center Conference Room; 509 Room 100; Other Areas With Escort
Spectator	Yellow	Attendees Viewing the Live Event	College Center Conference Room; 509 Room 100; Other Areas With Escort

Table 2 - Notional table defining badges and levels of access

Event Command Center

An event command center will be established and staffed each day of the event. The command center will:

- Be located in a manner that enables the best view to see most aspects of the live event.
- Be always staffed by Mission Commander or designee.
- Have access to call emergency services
- Be equipped with medical supplies

Briefings

Before entering the live event, all staff, participants, press, and VIPs must receive the appropriate briefing(s) listed below. The Mission Commander and Safety Officer will provide a briefing at the beginning of each day. Event staff and participants must attend this briefing. Additional briefings to spectators, media, and VIPs will be provided as needed by event staff.

NOTE: Each day, a colored sticker will be applied to attendee badges to identify that they have attended the day's briefings.

Staff and Challenge Teams will receive the following:

- Event overview
- Schedule
- Operations briefing
- Safety briefing

News/Media/VIPs will receive:

- Operations briefing
- Safety briefing

Spectators will receive a safety briefing.

Use Area & Hazards

Multiple locations will be in use during the 3D Mapping UAS evaluations. These areas are depicted in the Facility Maps below. The potential hazards/risks and protection method(s) are also noted below. Refer to the Access Control section for information regarding enforcement and controls for area access.

NOTE: Any area used for flight operations is thoroughly marked with signage. Most flight areas are contained within designated rooms or spaces, but if held in an open area they will also be marked with caution tape, traffic cones, and floor tape. These areas are referred to as “flight boxes,” contained within each of the designated flight areas. UAS that are in flight are not permitted outside the flight boxes and people are not permitted in these areas while flights are in process. See the following area descriptions and Operations sections for further information about flight boxes.

- College Center
 - Conference Room
 - Meeting place for teams
 - Announcements/briefings
 - Awards Ceremony
 - No UAS flights in this building
 - Teams may power on UAS only if all propellers are removed
 - Charging Station
 - Charging batteries will be under observation by event staff at all times
 - Fire extinguisher and first aid station are co-located in this area in the event of a battery fire
 - Stephan’s Board Room – Meeting Place for SMEs/Judges
- Hangar 509
 - Safety Check (Room 119)
 - Access control methods and event staff will enforce access to this area
 - UAS propellers will be removed, with no risk of projectile
 - Static Tests/Specifications (Room 117)
 - Access control methods and event staff will enforce access to this area
 - UAS propellers will be removed in static testing, with no risk of projectile
 - 3D Mapping/Human Detection Test Lane (Rooms 103-104,128)
 - Access control methods; event staff will enforce access to this area
 - Risk of projectile and impact from UAS while in use
 - No entry or person(s) present while UAS is in operation
 - Teams will enter this space directly from the Hangar space on the North side
 - Room 103 will be available for teams to set up their GCS, and for post-processing.
 - Evaluation and coordination will occur in room 104

- Room 105 will be in the middle of the test lane, and may only be accessed by event staff while the test lane is not in use
 - The test lane flight occurs in hallway 128
 - No entry from 107 into 128 unless in an emergency (one-way flow of traffic within congested hallway)
 - Auto Flip/Audio Test (Room 113)
 - Teams will set up their GCS in room 100 (hangar space)
 - Access control methods; event staff will enforce access to this area
 - Risk of projectile and impact from UAS while in use
 - No entry or person(s) present while UAS is in operation
 - If capable of auto flip, teams will place their drone in room 113 and execute the maneuver
 - If capable of audio, teams will proceed to the audio test in the same room
 - Audio Logistics in room 112; designated staff only
 - Designated Practice areas: North portion of room 100 (hangar space); room 115, 116, 202, and 209
 - DroneResponders: South portion of room 100 (hangar space); rooms 106-111, 200, 203-204 (Note: If DroneResponders only doing a booth, the south portion of room 100 may be used for contestant test flights)
- Building 939: Event Scenario
 - NOTE: NO ON-LOCATION PUBLIC SPECTATOR AREA
 - Access control via the South walk-in gate; event staff will enforce access to this area
 - Teams will only enter building 939 through the middle door on the West
 - Event staff will enforce access to this area and alternative entrances
 - Teams will operate and enter the scenario from room 205
 - A staging and post-processing area is available in the adjacent space, room 204
 - Risk of projectile and impact from UAS while in use
 - No entry or person(s) present while UAS is in operation
 - All restrooms within the building are out of order; external restrooms provided
- TSA Restricted Access Areas
 - No entry will be allowed to these areas
 - Airport staff, event staff, and TSA staff will routinely check these areas during the event
 - Egress/ingress access points will be monitored, and locked daily after all participants and staff depart
 - Outdoor areas near building 939 will be marked with caution tape

Building 939 Monitoring Area Policy

The monitoring area within Building 939 is designed for monitoring the live scenario, including for scoring and evaluation. Only designated personnel are allowed within the monitoring area; access will be strictly enforced.

- The monitoring area has a dedicated entry door; no contestants will be allowed within this entrance. This also allows swift egress in an emergency
- Personnel may enter the flight operations area from the monitoring area if required.

Control Station Operations Area Policy

Discipline to safety is critical while live flight operations are being conducted. The policies below are designed to protect the aircrews and UAS participating in the event.

- The Operations Areas are designated in green on the event maps.
- All personnel with operations area access must receive an operations briefing before entering the access-controlled area.
- The operations area will have an access control point; every individual entering will be checked and must display an appropriate badge and daily briefing sticker.
- All staff and challenge participants must keep the operations area clear of clutter.
- While flying, no one may talk with the pilot other than the participant's crew, the Test Administrator, the Safety Officer, or the Mission Commander.

Flight Operations

Indoor Airspace Management

- Areas utilized for flight activities occur immediately within and adjacent to Operations Areas. Most flight activities have designated, enclosed spaces, but some are within open, shared indoor areas. These flight box areas are marked with caution tape, floor tape, and cones. Flight boxes are contained within physically separated access restricted and/or blocked-off areas.
- Access controls are in place to prevent unauthorized personnel from entering the flight areas. Participants and spectators are not authorized to enter the flight areas and other restricted access areas unless escorted.
- Flight operations areas for specific events are defined and clearly marked.
- Unless otherwise specified, only one UAS team may operate within a flight operations area at a time.
- Within each flight operations area, a landing/takeoff zone is designated and clearly marked. This is the area from which all UAS must take off and land (unless an emergency landing is required).
- No personnel may enter the flight operations areas when a UAS is in flight.

The following locations contain flight operations areas, see the Event Maps for visual approximations:

- Hangar 509
 - Technical Flight Evaluations: Hallway 128
 - Additional Preferred Capabilities: Room 113
 - Room 100 (Hangar space): Practice Area/DroneResponders
- Building 939
 - Scenario Takeoff/Land: Room 205
 - Event Scenario: All rooms except 203-205

NOTE: If unforeseen encroachment into a flight operation area occurs, the Test Administrator must immediately halt flights until the matter can be resolved. The Test Administrator shall determine the most appropriate method to terminate the flight and immediately inform the Mission Commander and Safety Officer of the issue and status.

Aircraft Inspections

Each pilot is responsible for the safe maintenance and inspection of the UAS that they will fly. However, to reduce risk, each aircraft must pass the safety inspection and Flight Risk Analysis before the flight.

Flights

During live flights, the items below must be followed:

- Flight crews will follow all directions from the Mission Commander, Safety Officer, or Test Administrator without delay or question.
- A Test Administrator will be present during all participant flights.
- The Test Administrator will survey the local area and flight area to ensure it is safe for flight operations.
- At no time shall any UAS operate outside of a flight operations area.
- Any malfunctioning UAS shall land immediately in a safe area.

NOTE: If the Mission Commander, Safety Officer, or Test Administrator identifies an unsafe condition, the flight must be immediately stopped until the matter can be resolved. The Test Administrator shall determine the most appropriate method to terminate the flight and immediately inform the Mission Commander and Safety Officer of the issue and status.

Recharging Stations

Power outlets will be available in the staging area during the live event for charging batteries. If additional capacity is needed, a second location will be provided to challenge participants. A fire extinguisher is co-located at the recharging area. Batteries undergoing charging will be monitored by event staff at all times.

Incident Response Plan

Incident Response

The most critical component of an incident is to prepare in advance and clearly communicate how such events are handled. The Safety Officer will cover these procedures within the Safety Briefing.

If any incident occurs, the Safety Officer will direct and coordinate the overall incident response and notify appropriate emergency response agencies as required.

UAS Crash and Recovery

In the event of a UAS crash, the process below shall be followed:

- The Test Administrator will tell the pilot to initiate the 'kill switch.'
- The Test Administrator will notify the Mission Commander and Safety Officer of a crash or unplanned landing.
- If someone is injured or there is an immediate threat (e.g., fire), the Test Administrator will provide that information to the Mission Commander and Safety Officer and provide aid.
- The Test Administrator will attend to a patient if first aid is needed until incident response personnel arrive.

- The Safety Officer will evaluate the crash site and determine if further action is required before recovery.
- If cleared, the Safety Officer will direct event staff to recover the UAS.

NOTE: If the Mission Commander, Safety Officer, or any Test Administrator observes a UAS not responding appropriately to commands and deems it a threat to safety, will immediately direct the UAS team to initiate the 'kill switch.'

Fire

In the event of a fire, all personnel will be directed to exit the building via the nearest exit. The safety officer will assess the situation and take appropriate action.

- The safety officer will sound a portable air horn to signal fire in Building 939.
- Everyone will be instructed to meet at the main parking lot in front of the building, away from the path of smoke.
- If the nearest exit point was within the airport fence, make your way toward an area directly next to the parking lot and wait for further instructions.
- It is very important not to leave the area until all personnel are accounted for.
- Fire extinguisher locations are called out on the facilities maps.
- Buckets of sand will also be available to smother small, localized fires.
- If there is a fire at all flight locations (Hangar 509 or Building 939), the airport fire department will be contacted.
- If a fire occurs at the College Center Conference Room, the local fire department will be contacted.

NOTE: If anyone observes indications of fire following a crash, notify the Mission Commander or Safety officer immediately. The Safety Officer will direct all teams to land their aircraft immediately and lead an evacuation to the predetermined safe location outside. The local or airport fire department will be contacted. No one will be allowed reentry until the appropriate authorities give the all-clear.

Medical Services

The Safety Officer will contact the appropriate local emergency services if these services are needed. The Safety Officer may direct other Event Staff to use on-site medical kits to tend to a patient until medical services arrive.

Personal protective equipment (PPE), such as gloves and hearing protection, will be provided upon request.

Severe Weather

The Safety Officer will monitor the local weather for adverse conditions (i.e., severe storms, tornados, etc.). Upon notification of impending severe weather, the Safety Officer may elect to postpone the event or notify all present for the live event to move to safe areas until the weather passes.

If possible to reach these areas during a tornado, the Safety Officer may direct everyone to areas such as the following:

- Hangar 509: Office 109, including the closet below the stairs if accessible.
- Building 939: Room 127, down the stairs, around the corner to the right.

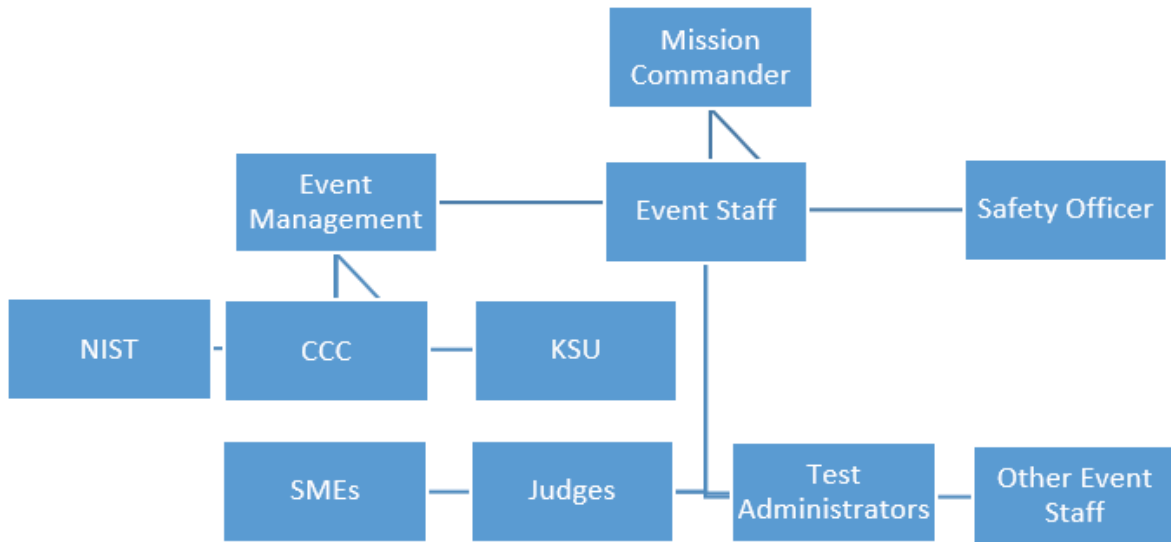
Appendix A: Flight Risk Assessment Tool (FRAT)

Instructions: The safety officer will use the FRAT below to fill out a holistic risk assessment for the day. This includes all participants and staff. If mitigation is in question, the higher risk value must be used.

NIST 3D Mapping Challenge FRAT						
	Date Modified: 03/21/2023			Pre-Mitigation #	Mitigation Strategy	Post Mitigation Sign-Off
Environmental	Current Weather	Clear	1			
		Low-Med Risk Storms	2			
		High Risk Storms	3			
	Forecast Weather	Clear	1			
		Low-Med Risk Storms	2			
		High Risk Storms	3			
	Temperature Inside	50°F-80°F	1			
		(20°F-49°F)(81°F-100°F)	2			
		(< 20°F)(>100°F)	3			
	Emergency Egress	Checked and free of obstructions	1			
Not checked or obstructed		50				
Equipment	Passed Tech Inspection	Complete by all Teams	1			
		Partially Complete	2			
		Not Complete	3			
		Not Complete	3			
	Daily Safety Briefing	Complete	1			
		Not Complete	50			
	First Aid	Available and stocked	1			
		Not available or not stocked	50			
	Fresh Water	Available and stocked	1			
		Not available or not stocked	2			
Access Control	In place and inspected	1				
	Not inspected	50				
Fire Extinguishers	Available and in green arc	1				
	Not available or not in green arc	50				
Staff	Safety Officer Hours of Sleep	> 8	1			
		7-5	2			
		< 4	3			
	Safety Officer Distractions (Stress)	None-Mild	1			
		Mild-Moderate	2			
		Extreme	3			
	Mission Commander Hours of Sleep	> 8	1			
		7-5	2			
		< 4	3			
	Mission Commander Distractions (Stress)	None-Mild	1			
Mild-Moderate		2				
Extreme		3				
Staffing	All positions staffed	1				
	- 1 position staffed	2				
	- 2 positions staffed	3				
	- 3 or more positions staffed	5				
Pre-Mitigation Total					Post Mitigation Total	

Pre-Mitigation Totals			
< 20	Good to fly		
21 - 24	Requires Self Mitigation		
> 25 < 30	Requires Mitigation and Mission Commander Signature	Signature:	
> 30	Requires Mitigation + Executive Director Signature	Signature:	

Appendix B: Operational Structure

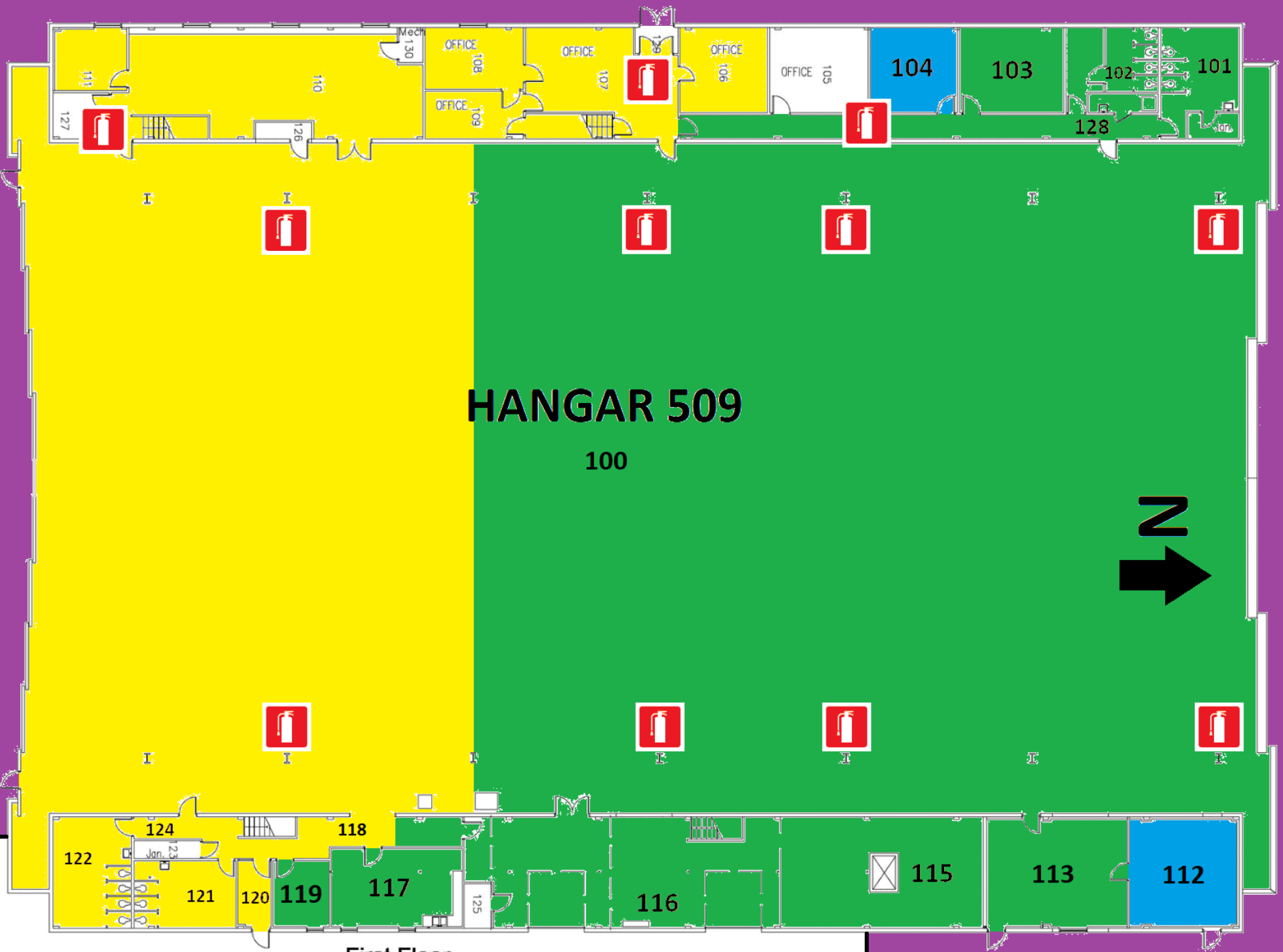


The operational structure of the live event reflects a program hierarchy and communication paths. All those responsible for the safety and execution of the Live Event will report to the Mission Commander.

TSA AREA

TSA AREA

TSA AREA



TSA AREA

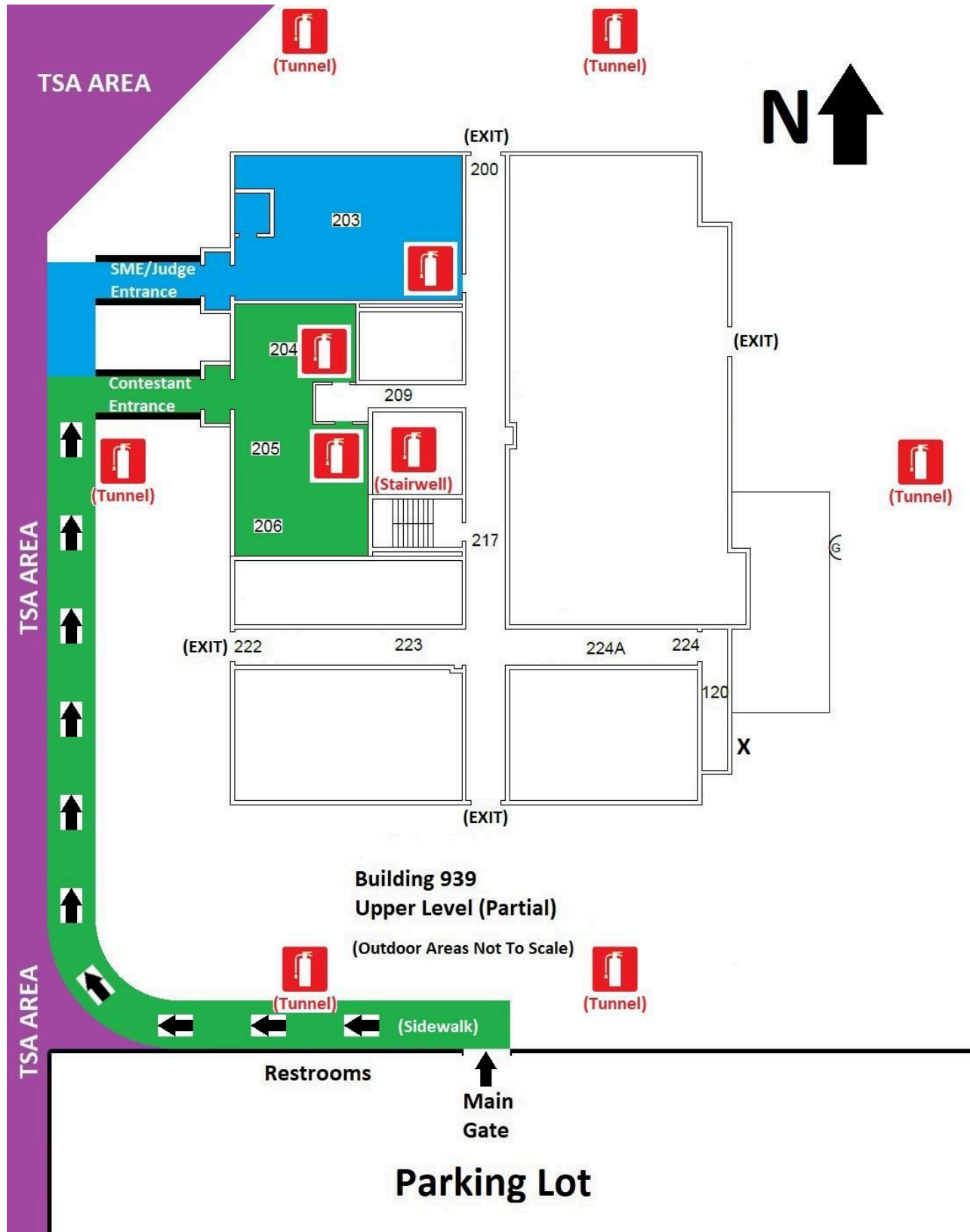
First Floor

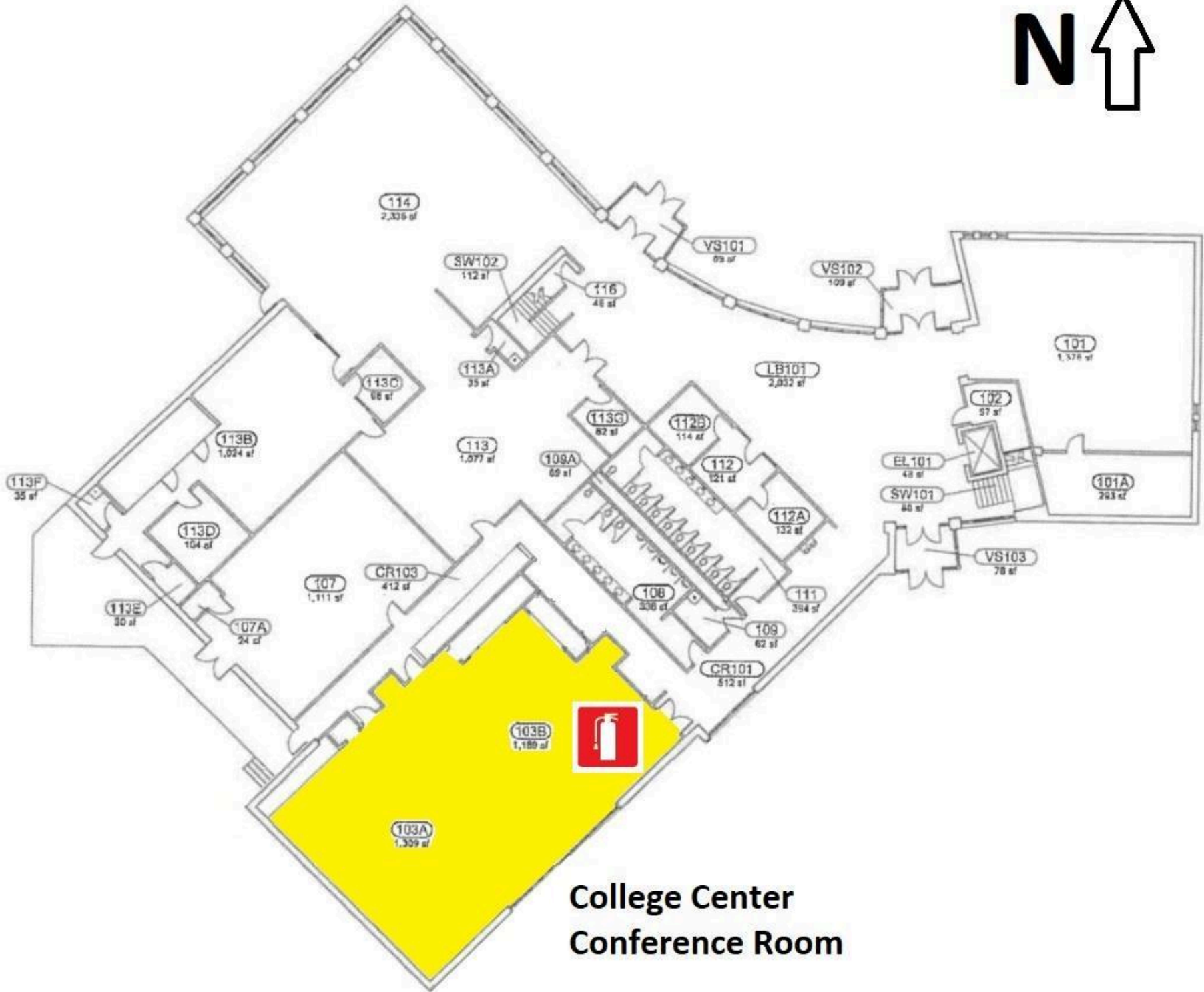
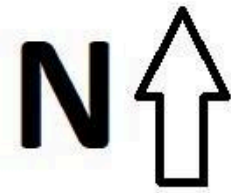
Parking Lot

TSA AREA



Second Floor





**College Center
Conference Room**