

Conceptualizing the Design and Use of Augmented Reality Within a Common Operating Picture for Incident Command Systems

Interim Report #2

March 14th, 2022

**For Indiana University Crisis Technologies Innovation Lab
and Director of User Experience, Sonny Kirkley**

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Executive Summary

To kick off the second phase of the project, Dale Rolfson invited the team to a tour of the Indianapolis Metro Police Department's incident command center. The tour provided insights that the team never imagined before. Allowing researchers to place themselves in the same environment as their user base gave a new perspective on workflows and the type of user to focus on. Dale has graciously offered another tour of a different facility soon.

Another interview took place on March 8th, 2022, with Kirk McKinzie, a retired firefighter and smart technology consultant. Kirk answered our team's questions with a focus on current location-based technologies and handed over an immense number of resources. Due to the interview being shared with other research groups, the team's time with Kirk was limited. Another interview has been set up for Phase 3 and our team will be focusing on more task-oriented questions to keep in line with Phase 3's overall goal.

The deliverables for Phase 2 went smoothly due to the knowledge obtained about what kind of users will be placed in the incident command role. Creating the affinity map, empathy map, and the personas provided us with a sharp focus on the users that will interact with AR technology. All three (3) deliverables were shared to enable future development teams to concentrate on the design and development of an AR product with a focus.

After all interviews are complete, results discussed, and project deliverables have been rendered, a second Interim Report was written and delivered to the project client demonstrating continued progress towards project objectives. Additionally, the personas, an empathy map, and an affinity map will be submitted as project artifacts. Upon feedback, the group will proceed with activities, as detailed in the Project Definition and Scope document.

The focus of the second phase was to gain a greater understanding of the users. Key findings and insights were gained about the different personalities of incident commanders as well as their goals, values and needs. An affinity map, empathy map, and two personas were created, helping to tighten the focus of the project. These artifacts are expected to guide the effort going forward by providing future design teams information about the users they are designing for.

For phase three, the team will be conducting an additional interview revolving around collecting information about all the different tasks incident commanders need to perform and how they go about performing them currently. This will eventually culminate into a Task Analysis Diagram that establishes the use cases for the system. An experience map will also be created, and it will visually illustrate the user's needs while including the steps the users will take to achieve their goals and satisfy needs.

A second interview will also be conducted with subject matter expert Kirk McKinzie on March 22nd to gain additional insights into the current knowledge and technological gaps for incident commanders and how AR can solve them. Storyboard and Scenarios will also be created to help future designers visualize a third interim report to provide an update on what was

achieved in the last few weeks. Finally, the team will produce how the intended users perform tasks so that future teams can gain important insight on how to help users achieve their goals efficiently.

Overview

In the second phase of the project, we completed the following activities:

- **Completed second interview with Subject Matter Expert (February 25)**
 - An interview was conducted with Dale Rolfson with the intent of defining specific traits about incident commanders (Appendix C and Appendix D). Such as their approach to work, their values, their needs, and their workflows. The expected outcome of this interview was to have enough qualitative data to begin steps to complete a persona document. (Appendix M and Appendix N)
- **Completed tour of facility with Subject Matter Expert (March 2)**
 - This interview was not defined in the project definition and scope document; the opportunity spontaneously arose via a connection with Dale Rolfson.
 - Tour of the Incident Command Center at the Indianapolis Metropolitan Police Department with Battalion Chief, Jacob Spence.
 - The tour elicited specific details about how AR technology could enhance commander current workflows. The hour-long tour was audio-recorded and later transcribed. Several photos of the command center were taken.
- **Created an Affinity Map (March 5)**
 - To code the qualitative data gathered from interviews and tours thus far, an affinity map was created. (Appendix F-K)
 - The map highlighted overarching themes about incident commander's personalities, approaches to work, needs, values, and goals as they relate to commanding emergency scenarios.
 - The affinity map would be later used to create an empathy map and persona document.
- **Completed third interview with Subject Matter Expert (March 8)**
 - The interview was with a retired firefighter Kirk McKinzie who provided information regarding his career.
 - Information was obtained about current technology used by first responders. Much of the discussion was focused on the future of firefighters and how AR can improve their current workflows. (Appendix E)
 - Due to the valuable information and discussion received, another interview is scheduled with Kirk for Phase 3
- **Created an Empathy Map (March 10)**
 - Served to gain further insight into incident commanders and what they may be thinking or feeling while performing their job (Appendix L)
 - Worked as a stepping stone for creating and fleshing out two personas

- **Created two (2) Personas (March 13)**
 - Our personas have established two main user groups: younger incident commanders who are willing and want to use advanced technology (“The New Guy”), and seasoned incident commanders who are competent with their current workflows and shy away from using advanced technology (“The Old Dog”) (Appendix M and Appendix N)
- **2nd Interim Report (March 13)**
 - The summary and overview were expanded to encompass what the team has learned and performed so far on the project.

What Was Learned

The focus of the second phase was to gain a greater understanding of the users. This was accomplished with two interviews with subject matter experts that have first-hand experience in incident command. Insight was gained into the different personalities of incident commanders as well as their goals, values and needs. The team was able to translate what was learned into an affinity map, an empathy map, and two personas. These deliverables helped to tighten the focus of the project and will guide the work going forward by providing future design teams information about the users they are designing for. The interview with our AR subject matter expert, Kirk McKinzie, allowed us to investigate and explore a different part of this project, dealing with the actual technology and its use in today's world. Kirk's interview has also given the team multiple opportunities to reach out to other industry professionals if needed. Since Kirk was a wonderful outside connection, the team hopes to continue with more interviews in the future due to his insights given thus far. The combination of the Indianapolis Fire Department and outside consultants like Kirk have allowed us to prepare for task analysis and experience mapping.

Dale Rolfson Interview (February 25)

We conducted a semi-structured interview with Battalion Chief, Dale Rolfson, with the goal of discovering the Firefighting Incident Commander's mindsets, motivations, and behaviors. Dale Rolfson has 34 years of experience serving as a firefighter and now holds the title of Chief Technology Officer at the Indianapolis Fire Department. We learned Dale has limited first hand experience commanding incidents, but was able to give a second-hand account of a typical command workflow. Our key findings include:

- The typical incident commander has 25+ years of experience serving as a firefighter and ranking up through several positions.
- There is a clear **hierarchy in the command chain** and it must be followed. For example, privates should not go to a chief directly, but rather the next in command.
- Commanders have a need for **open communication**. They are constantly taking in new data, verbally probing for details about a scenario, and giving commands.
- Communication among commanders and other team members happens face to face and with radios.
- Commanders are continually trying to **visualize** the details of a scenario to better direct resources.
- Commanders tend to hold a **calm, direct, and knowledgeable disposition**. These qualities are what enable them to lead to solutions in emergency scenarios.
- Incident Commanders utilize **benchmarks** to ensure they are hitting all previously established safety outcomes. Dale provided a copy of the benchmarking worksheet. This will help us better understand the Commander's priorities in a future task analysis.
- Augmented Reality would be most useful in commanding **large-scale incidents** that last longer than 3-4 hours, such as large fires, warehouse fires, apartment building fires, airplane crashes, etc. Dale referenced smaller incidents as "bread and butter fires" that might not necessitate more advanced tools.

Kirk McKinzie Interview (March 8)

Through our sponsor, our team was able to conduct a small interview with an augmented reality and smart technology subject matter expert, Kirk McKinzie. Kirk has over 32 years of boots-on-the-ground firefighter experience and has recently transitioned to smart technology consultation. The interview was conducted with 3 other teams, so our time was shared and questions to Kirk were brief. Our key findings include:

- Kirk was able to share a plethora of resources, names, and other avenues to pursue when dealing with augmented reality. There will be future opportunities to utilize these resources and contacts when conceptualizing a design system.
- Current incident command systems are **usually quite old and utilize legacy systems, such as phones, radios, and written records**. There is a **massive gap** in how commanders are able to **collaborate** with each other in the quickest way possible.
- Augmented reality has become mainstream for marketing purposes. Since AR is considered more **commonplace for consumer-level applications**, the usage and understanding of AR might be more relatable with incident commanders.
- Our team learned about an open source, **common operating picture focused software line called “TAK”**. This software can help assist the team in identifying concepts that have worked and are fielded. It also will help close the gap between the older command and control (C2) that incident command currently uses into more of a C5ISR model, proposed and adopted by the US military.
- **Incident command systems should not be voice-only** as they are today. Instead, the improvement of technology and interfaces can drive innovation and provide a much clearer idea of what is going on in an emergency response situation. Our strategy was updated to reflect that by **looking to provide a shared mental and visual model** for teams to understand the common operating picture at any given time.
- Due to the pandemic changing the way organizations worked, working with **multiple teams remotely** will also be a necessary problem to solve. Certain incidents in the past, including wildfires or civil unrest, required different locations to be used by different groups of responders.

In-Person Tour of the Incident Command Center at the Indianapolis Metropolitan Police Department (March 2)

A tour and unstructured interview with Battalion Chief and Director of the Emergency Management Division of the Metropolitan Emergency Services Agency, Jacob Spence, took place at the Indianapolis Metropolitan Police Department. In summary, the interview revealed the **highly visual** and **hands-on nature** of incident command through the identification of the tools commanders use, such as a large mapping table and dozens of monitors. Our key findings include:

- When managing large scale incidents, teams of commanders will **physically mark** obstacles and demonstrate directives on laminated maps using dry-erase markers.

- Several commanders will **collaborate** on the same map while verbally communicating with one another.
- Commanders will intake new data through several large monitors mounted on the wall that everyone in the room can see. **Situational data** will also be transferred from field workers to commanders through mobile texts, radios, and phone calls.
- Chief Spence described the complicated nature of required **continual communication**, citing time delays caused device failures and overlapping transmissions costing valuable seconds in triaging resources.

The large display of screens, the laminated map, and the complicated nature of continual communication revealed three major themes in Incident Command: Time is the most valuable resource, **collaboration** occurs through a **shared mental model** among commanders and field workers, and more precise situational data enhances commanders' mental models of scenarios, thereby improving their command strategy. **Time is of the essence**, and delays in communication could potentially be the cause for higher amounts of damage in an incident.

Affinity Map (March 5)

An affinity map was created by coding the qualitative data gathered from the interviews and in person tour with the goal of identifying key traits about incident commanders to support the creation of an empathy map and personas. In summary, the affinity map made the personality traits, values, goals, needs, and approaches to work of incident commanders more apparent. Our key findings include:

- Commander Personality Traits and Personal Qualities
 - Calm and collected disposition
 - Prefers consistency in workflow structure
 - Needs are not often recognized
- Commander Values in Incident Command
 - Respect for seniority and hierarchy
 - Polarized affect towards technology
- Commander Goals in Incident Command
 - Commanders aim to minimize harm as quickly as possible
 - They seek to gather as much situational awareness as possible
 - They are responsible for supporting large-scale events.
- Approach to work
 - They use various tools that support collaboration and shared awareness
 - They are process oriented
 - They collaborate with their team to coordinate and distribute resources
- Commander Needs in Incident Command
 - There is a need to form a unified mental model among remote commanders and field workers
 - **Communication** - there must always be an open line to communicate efficiently

- **Time** - time is a valuable resource. Actions should be completed as soon as humanly possible
- **Visuals** - Commanders rely on maps and other visual communication to inform their strategy
- **Data** - Commanders rely on data to inform their next command

Empathy Map (March 10)

To better understand the target users, we created an empathy map using information gathered from previous interviews as well as the affinity map. With this empathy map we were able to visualize what we know so far about the users in a way that prioritizes what they would be feeling or thinking during an incident command situation. It was broken up into the following categories:

- Think and feel
- See
- Hear
- Say and do

After completing the empathy map it was easy to see how much information incident commanders need to internalize and use to create actionable plans. They are continuously receiving feedback, communicating with members of the team using various means, and receiving information from numerous points of contact, all while carrying the burden of trying to save as many lives as possible. Considering all of these points, we were able to understand what the major pain points would be in an AR solution, as well as what users would gain. Our key findings include:

- **Pain Points**
 - Fear of using a new workflow
 - Misunderstanding new visuals, interfaces and systems
 - Training on the new system, especially with individuals who are not familiar with AR technology
 - Bureaucracy and cost
 - Digital ethics and public trust
- **Gains**
 - Ability to save more lives and property
 - Having a more up-to-date picture of an incident
 - Real-time location tracking
 - Ability to make decisions more quickly

The empathy map as a whole gave us a clearer picture of two main categories of users: the “New Guy” who has less experience but is more comfortable with technology, and the “Old Dog” who has many years of experience but might not be as comfortable with new technology. We were later able to use these insights to build out personas.

Personas (March 13)

Based on the two interviews we conducted with incident command subject matter experts, insight was gained into the different personalities of those on the job as well as their goals, values and needs. These interviews allowed us to establish clear insights into the target audience of AR Incident Command Technology and culminated into the we created. As a result, we established 2 main user groups. Our persona [Norm the “New Guy”](#) is representative of incident commanders who are new on the job, while our persona [Oliver the “Old Dog”](#) is representative of those who have worked in the field for an extensive amount of time.

Norm the “New Guy” is very flexible, thoughtful and strives for change. Being a young-upstart to the incident command world, he can see many areas in which he believes the procedures used in his job can be improved. He isn’t afraid of change and actively pushes for advancing technology in his workplace. As an incident commander, he respects the natural hierarchy of his workplace where more senior staff are respected amongst their peers, but he feels unheard often when they push away his desire for change. He is very driven to move up on the ladder in his workplace so he has more power to inspire change and other employees will listen to his ideas more. He needs ways of showing his superiors that AR technology will improve their responsiveness to help him save more lives.

Oliver the “Old Dog” is methodical, responsive and dislikes change. Having worked in his incident command job for many years, he resists the idea of changing any of their systems. He knows that bringing in fancy new technology will cost them time in learning how it works and as a result cost him lives. Not to mention, he isn’t convinced that newer technology would even be better than the systems they use now. If his workplace does switch to newer technology, he wants to be sure that he completely understands how to use it before he’s thrown into an emergency situation. He also wants to be guaranteed that when technology crashes, as it always does, the rookie members of his team will still be able to hold their own.

Both Norm the “New Guy” and Oliver the “Old Dog” are very caring and want to help first responders and those they’re trying to help as quickly and efficiently as possible. As we’ve discussed, quick and precise responses are what make or break an emergency situation. As a result, both the “New Guy” and “Old Dog” need a system which they know is reliable and timely. Both personas have a strong desire to help those in need, they simply have different mindsets on how this can be achieved. As a result, both personas need to be accounted for in order to ensure a successful integration of new AR Technology.

Next Steps

Date	Action	Goals	Deliverable
March 18	Complete an interview that will focus on task analysis	Define certain tasks an incident commander will partake in during an incident	Interview notes
March 22	Complete a second interview with Kirk McKinzie, talking about AR tech	Find out the gaps he believes are out there for incident commanders and how AR can solve them	Interview notes
March 22	Create a Task Analysis Diagram that is influenced by research and interviews done so far	Determine how users perform tasks to gain insight into how to help them achieve their goals efficiently	Task Analysis Diagram
March 25	Create scenarios and storyboards that help visualize and create a picture of the workflow for ICS in AR	To help designers visualize the use cases for the system	Scenarios Storyboards
March 27	Create an experience map to further visualize the end-to-end experience a user will go through to accomplish their goals	Visually illustrates the user's needs and as they take steps to achieve their goals and satisfy their needs.	Experience Map

April 4	Write up a third interim report to update project definition with scope	Provide status update of project objectives	3rd Interim Report
March 16 - April 6	Conduct a team meeting every Wednesday or Thursday evening and every Sunday evening	To collaborate on project advancement	N/A

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Appendix A: Interview 2 Protocol

Time and Date:

Friday, February 25th, 2022 at 4:00 pm

Participant:

Dale Rolfson - Chief Technology Officer for Indy Fire Department

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Goal of meeting:

Discover Firefighting Incident Commander's mindsets, motivations, and behaviors

Capture what Incident Commanders

- Say
- Do
- Think
- Feel

After this meeting we will be creating an affinity map of all of the qualitative data we have captured. That will allow us to generate an empathy map that will support the development of incident command personas.

Interview Structure:

Greet- Build rapport. Discuss weather, weekend plans, etc.

Ask Dale to describe scenarios where he has performed in an incident command chain or observed it. We should go very slow here and investigate what the incident commander is saying, doing, thinking, and feeling at critical moments in the incident command process. During this interview, we will also likely capture several workflows that will enable us to define common or overarching themes and derive generic "workflow steps" in performing Incident Command.

Define Demographics:

Age-

M/F-

Education level-

Technological familiarity-

Willingness to adopt new tech-

1.) Battalion chief- are there other tiers we would be designing for?

In terms of who will be using the technology or benefitting from it.

In your mind, who is using this technology? Are there different tiers?

- a. Is “Incident Commander” even a job title?
 - b. What do you call them, who might serve as an “incident commander” in an emergency?
- 2.) Do you have personal experience acting as a battalion chief in and performing incident command?
- a.) Have you observed someone else in this scenario?
- 3.) Can you recall that experience for me? Describe in detail each step- what were you thinking, feeling? What was important to you at that moment? What were your goals? What was the outcome of that scenario, how did that make you feel?
- 4.) We’ve done some research on what an incident commander’s priorities might be, such as:
- a.) Control the flow path in the structure.
 - b.) Remove occupants from endangered areas.
 - c.) Locate and extinguish the fire.
 - d.) Overhaul the fire.
 - e.) Conduct salvage work.
 - f.) How do you keep track of who goes into a building and shows out?
- 5.) Outside of an incident command scenario, what are your daily tasks- what are you motivated by when not in an emergency scenario.
- 6.) What do you feel the biggest impact of performing as a battalion chief is?
- 7.) How does your department collaborate with other police and medical departments during an incident? Is this something the incident commander manages or is focused on?
- 8.) More explanation on problems they encounter?
- a. More explanation on solutions they’ve found in the past?
- 9.) Why do you think AR Tech is a better solution than Motorola (digital flat screen interface) ?
- a. Incident command in the field potentially?

Appendix B: Interview 2 Notes

Time and Date:

Friday, February 25th, 2022 at 4:00 pm

Participant:

Dale Rolfson - Chief Technology Officer for Indy Fire Department

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1. Demographics
 - a. AGE Incident commander, 25+ years of experience
 - b. Chain of command
 - i. Privates
 - ii. Lieutenants
 - iii. Captains
 - iv. Battalion chief
 - v. Shift commander, division chiefs
 - vi. Deputy Chief
 - vii. Assistant Chief
 - viii. Actual Chief Chief
 - c. Need to follow chain of command, private should not go to chief directly
 - d. Standard fire apparatus (fire engine)
 - i. Engine, two lieutenants and a captain assigned
 - ii. A shift and b shift, lieutenants
 - iii. C shift, captain
 - iv. Captain is in charge of equipment
 - v. Officer rides out is in charge of apparatus
 - vi. Private will ride in officer seat if they have training
 - vii. First engine establishes command
 - viii. Monitor situation until first chief arrives, then chief takes control as incident commander
 - ix. If scene progresses, shift commander will take hold (they are highest ranking on shift)
 - x. Battalion chief will take operations or forward command
 - xi. First arriving apparatus in charge until chief gets there
 1. Must have 5 years experience before you can get promoted
 2. Lieutenant for 3 years before promotion to captain
 - xii. Appointed vs. merit
 1. Merit - you've gone through a process and that is your rank

- a. Can be demoted (rare)
 - 2. Appointed - chief appoints someone
 - 3. "Earned respect and given respect"
 - a. Given a title, but still need to earn it in the eyes of the people you work for / with
2. Communication
- a. Huge need for open communication
 - b. A lot of communication in an incident is face to face
 - c. Put as little on the radio as possible - need to keep the lines open
 - d. Generally the crew isn't going to be broken up
 - e. Two in two out rule
 - f. Captain / chief relays information to incident commander
 - g. IC - incident commander, usually just be called "command"
 - i. On a smaller incident might call them what their chief designation is
3. Scenario
- a. Address and call type – this can tell you how the building was constructed (based on location)
 - i. Gives an idea of how the fire will burn
 - ii. Can tell a lot about a fire by looking at the smoke
 - 1. Color, is it puffing, etc.
 - a. Brown = structural timbers burning
 - b. Black = contents burning - "stuff" (plastics / hydrocarbons)
 - 2. Tells what is burning
 - 3. Tells how long the fire has / will burn
 - iii. Has there been any ventilation done?
 - 1. Want to ventilate near the ? of the fire?
 - 2. Vertical ventilation - cut holes in the roofs so smoke rises out = better visibility
 - a. Better chance of survival for victims – most die from smoke not burning
 - b. Size up report – taking in a lot of information, on the way to the scene
 - c. People respond better to someone who is calm and direct & knowledgeable – these make the best chiefs
 - d. Highest level is usually the battalion chief of that district – just need to wait till they get there
 - i. If the safety chief gets there first, battalion chief might just let them run it – it depends
 - ii. Generally once a chief has taken command, they keep command, unless it escalates and a shift commander takes over
 - e. Chief location in relation to the fire – depends on who you are and their preferences
 - i. Some will be out on the yard, on the A side (address side) of the structure
 - ii. Goes clockwise, next side is B, back is C, other side is D side

- 1. These terms are used in communication with command
 - iii. Some will sit in their buggy somewhere nearby towards the front
- f. Boards
 - i. Used to make different assignments
 - 1. Roof ventilation, backup, water, primary search and utilities, etc.
 - ii. They have a roster to know who is assigned to each apparatus for that day – names of the firefighters
 - 1. PAR - personnel accountability report (via radio)
- g. What things are the IC doing?
 - i. Benchmarks - key things they look for in a fire incident (aka tactical worksheet)
 - 1. How long has the fire been burning
 - 2. Weather report - is the weather going to change soon? High winds? Rainstorm? Etc.
 - 3. Utilities being shut off
 - 4. Ventilation
 - 5. Primary search
 - 6. Secondary search
 - 7. Rehab setup
 - 8. Is TSU on the scene to replace air bottles?
 - ii. XO's role depends on the chief
 - iii. Computer
 - 1. Look at the time the run came out
 - 2. How the call came in - helps with the time factor
 - iv. Shift Commander - can come in and take command
 - 1. Won't do this w/o a face to face with the IC
 - 2. Announces this over the radio to dispatch (if they take over)
- h. AR - what does an IC need to see?
 - i. Doesn't know how much this would help on a bread and butter fire (room and contents fire, fire is out in 10 min)
 - ii. Sees it being helpful in major incidents
 - 1. Large fires, warehouse fires, apartment buildings, airplane crashes, etc.
 - 2. Major incident where they're there for hours
 - 3. Need to see atmospheric conditions
 - 4. Air conditions
 - 5. Individuals
 - a. Heart rate, core temp, breath sound?
 - 6. Be able to see the firefighters temps – thermal imaging cameras on their fire gear (this would also be useful on smaller fires)
 - 7. Can see faster how fires will spread and structural integrity / where the fire is etc.
 - iii. Be able to see where the other allies are (fire fighters)

1. Won't have time to click on each individual firefighter, but if an individual's bio markers are going bad (red), being able to see an alert for that would be helpful
- i. IC is visualizing what is going on, will know the floorplan, with their experience they can give commands to tell others what to do next
- j. 4 FF on every engine / ladder
 - i. Squad has 2
 - ii. Battalion chief has 2
 - iii. Safety chief is 1
 - iv. 20 just off a main fire apparatus
 - v. 26 FF min on a small room / contents fire
- k. Motorola right now –
 - i. Gives incident information
 - ii. What they see on fire trucks
 - iii. Minor customizations from agency to agency (v. minor)
 - iv. MD = medic
 - v. On the map, as you zoom in the letters all stay the same size
- l. Engine vs. ladder
 - i. Ladder truck – fire truck w/ big steel ladder on the top that can move around / extend (aerial ladder, most are 100 ft)
 1. Carry certain # of feet of ground ladders
 2. Don't have pumps
 - ii. Engine truck – carry hose & have a pump

Appendix C: Interview 3 Protocol and Notes

Time and Date:

Tuesday, March 8th, 2022 at 11:00 am

Participant:

Kirk McKinzie - President McKinzie Smart Technologies LLC

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[Download Kirk McKinzie Interview 1 - 03_08_2022.mp4](#)

- Thank you for your time ... etc
- I've watched some videos of your work and ideas on YouTube and it's great to see the evolution of the 911-GO system that you've placed a large effort on
- I'm mostly interested in what's been accomplished so far:
 - **Has the technology and ideas you've consulted on been implemented yet in the field in emergency situations? Or is it still in proof of concept stages?**
 - If so, what has been the reception towards the use of it? Were there any glaring issues or recommendations reported by users?
 - If not, is there a timeline to when federal or local departments are wanting to proceed with the plans?
 - **What have been the biggest challenges associated with the progress you've made so far?**
 - Is there much of an interest by private or public organizations to implement such technologies?
 - Any potential legal hurdles that have been encountered so far?
- ICS 100 -> ICS 800, levels within incident command systems used?
- Using 70s tech/tools to solve 2020 problems

Resources from Kirk (see video for full explanations):

- Using AR toolkits today:<https://www.linkedin.com/in/pedro-ramos-343482104/>
- <https://firescope.caloes.ca.gov/>
- <https://wwwара.com/>
- <https://www.youtube.com/watch?v=iSHFjqlkadQ>
- https://www.motorolasolutions.com/content/dam/msi/docs/dt/consensusforchange/Consensus_for_Change_Report_V13.pdf
- <https://www.goodsamapp.org/>

- San Antonio FD:
<https://www.sanantonio.gov/gpa/News/ArtMID/24373/ArticleID/19876/SAFD-implements-new-GoodSam-telemedicine-program>
- Fire Dept Chain of Command:
<https://www.cityofsantamaria.org/home/showdocument?id=8413>
- <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1191.pdf>
- <https://www.dhs.gov/publication/st-frg-audrey>
- <https://www.nasa.gov/feature/jpl/ai-could-be-a-firefighter-s-guardian-angel>
- <https://www.fireengineering.com/apparatus-equipment/artificial-intelligence-firefighting/#gref>
- <https://ccc.ca.gov/wp-content/uploads/2019/08/CCC-10-Standard-Orders-18-Watch-Outs.pdf>
- My talk at MIT on AR: <https://www.youtube.com/watch?v=RJtVklvLqO8>
- Next Gen Curriculum 2021:
https://docs.google.com/document/d/1heWdoiKhjywO6zKsUBPwLYqizJaqMqKfo_7z-7XdmQ/edit?usp=sharing
- <https://www.linkedin.com/in/andreas-aj-johansson-28334b51/>
- <https://www.youtube.com/watch?v=OXO1GWj05Vk>
- <https://www.linkedin.com/in/dave-zader-8a36a7b/>
- CRITICAL AND EMERGING TECHNOLOGIES LIST UPDATE - Feb 2022:
<https://www.whitehouse.gov/wp-content/uploads/2022/02/02-2022-Critical-and-Emerging-Technologies-List-Update.pdf>
- National Artificial Intelligence Research Resource Task Force:
<https://www.whitehouse.gov/ostp/news-updates/2021/06/10/the-biden-administration-launches-the-national-artificial-intelligence-research-resource-task-force/>
- Executive Order on AI: <https://trumpwhitehouse.archives.gov/ai/>
- National Science Foundation Convergence Accelerator:
https://www.nsf.gov/od/oya/convergence-accelerator/documents/Cohort%20Guide_Final.pdf
- Learning Environments with Augmentation and Robotics for Next-Gen Emergency Responders:
<https://www.nsf.gov/od/oya/convergence-accelerator/team-videos/video-pages/learner.jsp>
- Enhanced Dynamic Geo-Social Environment (EDGE) virtual training through DHS:
<https://www.dhs.gov/science-and-technology/EDGE>

Appendix D: Affinity Map “Personality” for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

Personality

Calm and collected disposition

calm and
direct &
knowledgeable
-

To avoid a
person
being overly
emotional

Prefers consistency in workflow structure

“Fire fighters
don’t like
change and they
hate the way
things are”

Needs are not often recognized

“Fire fighters
don’t like
change and they
hate the way
things are”

they finally
listened to us
enough over
the year or
whatever,

Appendix E: Affinity Map “Values” for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

Values

Respect for seniority and heirarchy



Polarized affect towards technology



Appendix F: Affinity Map “Goals” for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

Goals

Commanders aim to minimize harm as quickly as possible

save more lives and property

Faster mitigation of incident

better survival

Seeing what hazards there are

They seek to gather as much situational awareness as possible

Situational Awareness

don't know exactly where they are

They are responsible for supporting large events

20 to 30,000 attendance range is where we start to get into it,

large-scale incidents

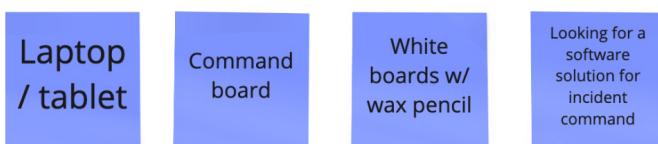
Incident command is really anything that goes beyond having one piece of apparatus there.

Appendix G: Affinity Map “Approach to Work” for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

Approach to Work

They use various tools that support collaboration and shared awareness



They are very process oriented



They collaborate with their team to coordinate and distribute resources



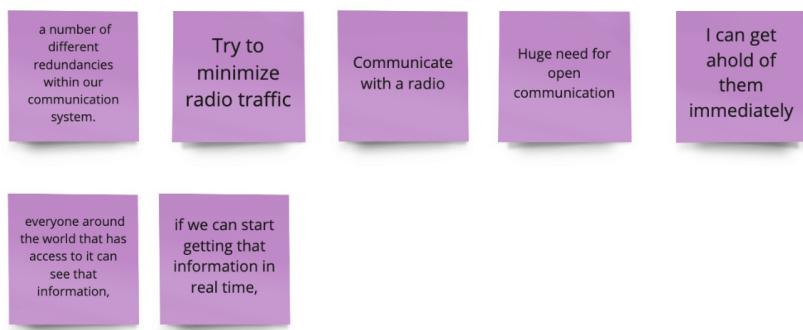
Appendix H: Affinity Map “Needs” (Part 1) for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

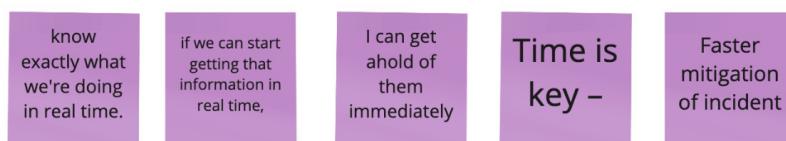
Needs

There is a need to form a unified mental model among remote commanders and field workers

Communication - there must always be an open line to communicate efficiently



Time - time is a valuable resource. Actions should be completed as soon as humanly possible



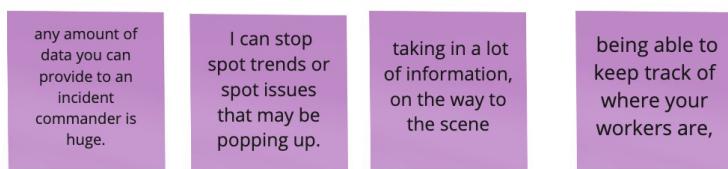
Appendix I: Affinity Map “Needs” (Part 2) for Incident Commanders

[Download Full Affinity Map \(AR in COP - Affinity Map - 03_03_2022.png\)](#)

Visuals - Commanders rely on maps and other visual communication to inform their strategy



Data - Commanders rely on data to inform their next decision



Appendix J: Empathy Map for Incident Commanders

[Download AR in COP - Empathy Map - 03_10_2022.png](#)



Appendix K: Persona “The New Guy” for Incident Commanders

[Download AR in COP - Persona - The New Guy - 03_13_2022.png](#)

Norm The “New Guy”



“How can we save lives if we don’t use the best technology? We need to update our systems!”

Age: 25 years old

Job Title: Incident Commander

Education: Bachelor's Degree

Experience: 6 months

Personality:

- Level-headed
- Lively
- Alert
- Serious
- Approachable
- Kind
- Innovative

Goals:

- Minimize harm among civilians
- Communicate effectively across departments
- Acquire optimum situational awareness
- Use resources as efficiently and effectively as possible

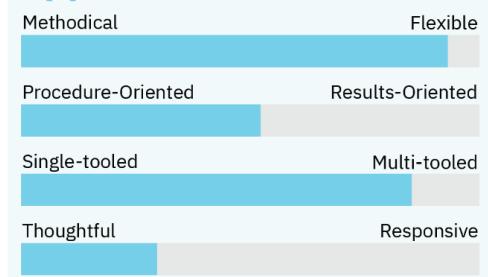
Motivations:

- Desires to grow their skills and advance in their career
- Wants to acquire advanced tools and technologies to better response time
- Using any means possible to save as many lives as possible

Frustrations:

- Does not always feel listened to by higher-ups
- Relies on radio communication to gain a clear picture of an emergency scenario
- Delays in communication hinder situational awareness

Approach to Work:



Needs:

- Advanced Technology - tools that utilize the latest technology to enhance situational awareness
- Open Communication - seconds wasted by an occupied radio can cost lives
- Responsiveness - optimize response times

Values:

- Respect those with greater tenure but wants to push them to achieve higher standards through technology
- Wants to have confidence in the fact that he is doing absolutely everything he can for the people he is trying to help

Appendix L: Persona “The Old Dog” for Incident Commanders

[Download AR in COP - Persona - The Old Dog - 03_13_2022.png](#)

Oliver The ”Old Dog”



“Technology reliance only causes problems. We’re better without it in the end”

Age: 57 years old

Job Title: Lead Commander

Education: High School

Experience: 27 years

Personality:

- Composed
- Stoic
- Decisive
- Parental
- Honest to a fault
- Reliable
- Respectful

Goals:

- Doesn’t want to be phased out before retirement
- Maintain confidence so they can continue to lead their team
- Passionate about saving lives and property

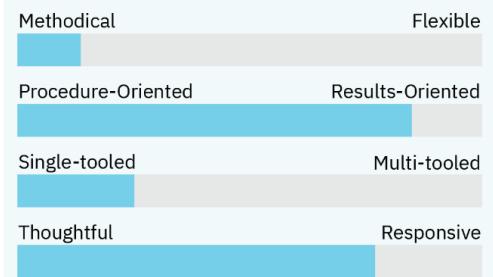
Motivations:

- Wants to ensure the safety of their team as they respond to incidents
- Wants their team to trust them and to appear as a strong confident leader
- Cares about saving lives and property within the community he serves

Frustrations:

- Thinks learning a new computer system will slow them down or cause harm if they make mistakes
- Doesn’t like new technology. Is not convinced it is accurate, stable, or reliable
- Worried that rookie commanders will not know how to function should the new technology crash

Approach to Work:



Needs:

- Intuitive usability – needs a system that works as quickly and reliably as their brain
- Education – learning how a new system works
- Comprehension – needs proof of improved outcomes
- Confidence – lack of system failure

Values:

- Proud of their past accomplishments, but never forgets the result of a poor call
- Honors the well-established procedures as they’ve proven successful
- Doing things the easy way versus trying to fix what isn’t broken

Appendix M: Annotated Bibliography

[Download Full Annotated Bibliography \(AR in COP - Annotated Bibliography.pdf\)](#)

Data Collected

Recorded Interview with Dale Rolfson - February 25th, 2022:

Dale Rolfson is the Chief Technology Officer for Indy Fire Department. This interview included questions that focused on walking through incident command scenarios with Dale and attempted to capture the details of those experiences from thoughts, feelings, and motivations. This was done to assist in creating an affinity map, develop an empathy map, and ultimately, generate two unique personas that capture the necessary users. A bonus to this interview was witnessing the current software the IFD uses daily when responding to incidents.

- [Watch on Kaltura](#)
- [Download Dale Rolfson Interview 2 - 02_25_2022.mp4](#)

Recorded Interview and Tour with Dale Rolfson and Jacob Spence at Indianapolis Metro Police Department Command Center - March 2nd, 2022:

Dale Rolfson is the Chief Technology Officer for Indy Fire Department and Jacob Spence is an active Battalion Chief for the Indy Fire Department. This interview included a direct placement of researchers in the same room and seats that the users are in. Dale was also able to include Jacob Spence, an active incident commander, who provided valuable insights from his career, including recent events such as the NCAA tournament in 2021. Our researchers were able to capture critical information and take photos of the command center the incident commanders have been using when responding to larger scale emergencies and events.

- [View Images](#)
- [Download IMPD Tour and Interview - Dale Rolfson & Jacob Spence - 03_02_2022.m4a](#)

Recorded Interview with Kirk McKinzie - March 8th, 2022:

Kirk McKenzie is a retired firefighter and is currently the president of McKinzie Smart Technologies LLC. This interview was a group effort of four different teams and the time was shared between all. Kirk explained the history, issues, and concerns of firefighters in different areas. He recounted his experience as an active firefighter and expectations for the future of first responders.

- [Watch on Kaltura](#)
- [Download Kirk McKinzie Interview 1 - 03_08_2022.mp4](#)

Wide Area Search Waypoint Data Directory Documentation - March 4th, 2022

A document containing information about visual icons and universal images that is used in emergency situations. The document also contains definitions about their use and when the images are implemented. The information contained within is also used internationally with other civilian service organizations. Dale passed this documentation to us as it dealt with common visualizations that should apply to all incident commanders.

- [Download USAR Data Dictionary.pdf](#)

Indianapolis Fire Department Standard Operating Procedure Documentation - March 4th, 2022

The document contains how certain first responders are required to account for their responsibilities depending on their role. These responsibilities include addressing immediate situations and the occupancy of other people's roles. Dale Rolfson provided this document and it allowed us to accurately picture responsibilities of our users in their roles.

- [Download IFD Accountability SOP.pdf](#)

Indianapolis Fire Department Tactical Worksheet - March 4th, 2022

Provided by Dale Rolfson, this worksheet details some of the things the incident commander in an emergency situation would cover and update. The document also represents the workflows incident commanders may encounter.

- [Download Tactical Worksheet - IFD - Version 4.31.xlsx](#)

Kirk McKinzie's Next Gen Curriculum Resource - March 8th, 2022

Kirk has graciously shared this with us and it contains a plethora of resources and links to continue investigating for research and inspiration.

- [Download McKinzie's Next Gen Curriculum 2021.pdf](#)

i-Axis Best Practices Guide - March 9th, 2022

An excellent resource detailing some best practices on navigational visuals for indoor mapping and tracking.

- [Download i-Axis Best Practices Guide to Indoor Mapping, Tracking, & Navigation.pdf](#)

References

Motorola Solutions. "Consensus For Change Transforming Safety Through Technology." n.d. Motorola Solutions.
https://www.motorolasolutions.com/content/dam/msi/docs/dt/consensusforchange/Consensus_for_Change_Report_V13.pdf

A document containing information on a study conducted by University of London detailing how the pandemic affected innovation and attitudes toward technology for public safety. Kirk McKinzie

- [**Direct Web Link**](#)
- [**Download Motorola's Consensus for Change Report V13.pdf**](#)

National Institute of Standards and Technology. "NIST Special Publication 1191: Research Roadmap for Smart Fire Fighting Summary Report." n.d.
[**https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1191.pdf**](https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1191.pdf)

A document detailing how new technologies have allowed for the collection of large amounts of information that can be used to enhance fire fighting and aid in public safety.

- [**Direct Web Link**](#)
- [**Download NIST Research Roadmap for Smart Fire Fighting.pdf**](#)

Appendix N: Project Definition and Scope

[Download Project Definition and Scope \(AR in COP - Project Definition and Scope.pdf\)](#)

Summary of Project

The Indiana University Crisis Technologies Innovation Lab (IUCTIL) is in the process of developing an augmented reality (AR) design system that assists both incident commanders and first responders in resolving emergency situations in an efficient manner. The future innovations and use of AR within heads-up displays (HUDs) have already proven to be a viable asset in many hands-on industries. Utilizing research and data from interviews, cognitive analysis, and other user experience design techniques, we are looking to uncover what most incident command operators are wanting in a futuristic environment that incorporates the use of AR. Features, workflows, client requirements, and proper contextual user-centered design will be at the forefront of recommendations to a design and development team that will create prototypes. The anticipated research and work from this project will impact the following:

- Demonstrate the value of precise location-tracking, asset management, and other necessary data within incident commander workflows
- Demonstrate the value of using AR in emergency scenarios to assist with situational awareness and decision making while saving more lives compared to conventional measures
- Generate user interface and experience design criteria and requirements for an augmented reality interface
- Recommend a standardized interface and design restraints from requirements set by incident commanders and first responders

Incident command personnel will be the focus of this project; specifically, commanders that work directly with first responders. Understanding their workflows, problems, and goals will be paramount to our research on using augmented reality when performing duties.

The Project Goals

To accurately conceptualize and recognize the user experience in augmented reality for incident commanders, five (5) main goals have been defined:

1. Understand the current workflow of incident commanders in emergencies

- a. The current toolsets being used, the steps taken to accomplish tasks, finding the data and information necessary to achieve goals, and other potential cognitive processes involved
- b. Understanding AR is secondary—this is not our focus when receiving user feedback
- c. Attempt to fix problems that incident commanders have when responding to emergencies and propose solutions

2. Learn what smart-tracking or indoor location-tracking interfaces and ideas would benefit incident commanders

- a. Investigate the data that is useful to the incident commander and determine how detailed it needs to be
- b. Discover the usefulness of their current toolset and how future effort can iterate and improve upon the incident commander's productivity and flow
- c. Explore what information is currently available for an incident commander during an emergency and uncover any unknown data points that would be beneficial

3. Investigate the use of location-tracking and other techniques to assist in workflow enhancement

- a. Demonstrate the value of highly accurate location-tracking in workflows
- b. Validate the use of AR in these settings to assist with situational awareness and decision making
- c. Research if AR can assist current incident commander workflow regarding role assignment, asset management, and resource allocation with a heavy emphasis on location-tracking

4. Research the benefits of augmented reality interfaces and controls when creating common operational pictures (COP)

- a. Identify current processes, designs, and tasks that COP applications utilize
- b. Explore tools that handle COP workflows and understand why or how they deliver experiences for their users
- c. Investigate the addition of AR within these interfaces and tools to verify advantages and disadvantages
- d. Discover if modern AR concepts have enhanced experiences for their userbases, particularly for indoor location-tracking, command and control, and other similar situations, such as emergency response

5. Gather enough ideas and concepts to easily hand-off user interface requirements to an external development team

- a. Prepare UX design criteria with AR techniques at the forefront
- b. Create workflows for designers and developers to build and materialize
- c. Deeply understand user workflows and how AR would best fit within them
- d. Design AR specific features and functionality at a prototyping level
- e. Find the high-value tasks in incident command workflows and capture them accurately for AR experience purposes

These outlined goals will keep our focus and priorities on client requirements while delivering detailed recommendations about our target user base.

Expected Activities and Deliverables

For each of our project goal's success, multiple activities and deliverables have been identified. The efforts will range from collecting various sets of data and research, conducting interviews with multiple subject matter experts, and developing documents that will help the next team understand what users will require in their workflows and tasks.

1. Interviews with subject matter experts

- a. Conduct seven (7) or more interviews
- b. Initial interview will assist in further defining the scope of the project
- c. Second interview will target our users' workflows and understanding their wants, needs, and problems
- d. Third interview will help define persona attributes, needs, wants, and problems
- e. Fourth interview will be explicitly about task-analysis and investigating what works well, what doesn't work well, and what can be improved
- f. The fifth interview will be about reviewing all effort completed with an expert and assist with creating suitable scenarios and storyboards
- g. Two (2) interviews will be conducted with a subject matter expert who is involved in the augmented reality space and has an understanding of how AR can help ICS; may also get more industry connections from these interviews as well
- h. All interviews will attempt to help understand workflows of emergency personnel, information that is necessary or beneficial for the actual user, and conceptualize modern interfaces that can use AR to enhance experiences
- i. Visit in-person the various facilities that today's incident commanders will use when responding to emergency situations or large events

2. Task analysis document

- a. A task analysis document will be created to understand how our users are affected by their environment and assess where their actions could be simplified.
- b. Identify areas of opportunity for AR to assist and innovate in their process
- c. Gain insightful information about tasks and outcomes currently in a user's workflow

3. Persona development

- a. Three (3) unique personas will be developed
- b. Each persona will be idealized as personnel on different command levels in an incident command system hierarchy
- c. These personas will help future developers understand the types of users that are envisioned to use this technology and help guide their team in the right direction

4. Affinity map

- a. Using an affinity map will help organize findings, ideas, and pursue concepts uncovered throughout the project

- b. The affinity map will assist in defining common themes through qualitative data gathered from the informal interviews conducted. This data will be used to help create personas that will enable designers to greater empathize with the future end users

5. Empathy map

- a. An empathy map will guide us through visualizing our target users' behaviors and create a deeper understanding of their mindset
- b. An empathy map will facilitate a shared understanding of the users' needs and perspectives among the design team and client

6. Experience map

- a. The experience of what the user goes through when accomplishing tasks and goals will need to be properly visualized through the use of an experience map
- b. The experience map will serve to illustrate the user's journey through an emergency scenario using AR technology. The map will be used by future designers to empathize with the users and recognize the key parts in the user's journey that are impacted by the design

7. Scenarios and storyboards

- a. Scenarios will help with predictions on user behavior while delivering potential experiences and interactions
- b. To help properly explain a journey (story) the user participates in, storyboards can give a visual representation. The story boards will be used to demonstrate the value of using AR technology to enhance situational awareness

8. Tree-testing

- a. A tree test will be prepared to discover any usability or findability issues within smaller pieces of an interface
- b. Evaluation of users performing tasks on mock navigations
- c. Explore different exploration outcomes that would benefit users in completing a task

9. Secondary literature review

- a. Reviewing previous research will uncover solutions and problems that other research teams have encountered. Some examples of this research include:
 - A framework for AR Usability Evaluation in the public safety communication research realm ([PSCR 2021: Augmented-Reality \(AR\) Usability Evaluation Framework for PSCR](#))
 - Presents grants and funding opportunities for AR in public safety communications research, as well as descriptions of ongoing projects ([PSIAP Augmented Reality \(AR\) Funding Opportunity](#))
 - Research portfolio for User Interface / User Experience work with the public safety community ([NIST User Interface/User Experience Research Portfolio](#))

- Description of the CHARIoT Challenge in which participants built AR interfaces or IoT data emulators for first responder communications ([2020 CHARIoT Challenge: Advancing First Responder Communications](#))
- A roadmap for planning public safety communications research ([Public Safety User Interface R&D Roadmap](#))

10. Work/activity models

- a. Demonstrate how the system would work in real life
- b. Help the development team clarify user requirements and define the system architecture

11. User Interface Requirements Document

- a. After analyzing tasks, feedback, and other requirements, a document will be created to help guide future development teams
- b. Various user interface designs that are proven necessary for the user will be recommended
- c. The document will contain research artifacts, such as the personas, empathy map, experience map, and more, to enable future designers to grasp the context for which they will be designing. In addition, the document will include an activity model to demonstrate the product's intended workflow and what features should be designed

The expected activities and deliverables will assist in developing a better understanding and thought process for the design and development team in their effort on creating viable features and prototypes.

The Project Timeline

Four Phases, January 31 – May 2

The expected timeline has been outlined for the next four months and broken out into individual phases. All actions and deliverables are tentative. If any changes or updates happen, the timeline will be refreshed accordingly.

PHASE 1 <i>January 31 – February 21</i>	
ACTIONS	DELIVERABLES
<ul style="list-style-type: none">● Continue reviewing secondary literature and researching applicable material● Perform interview with subject matter expert utilizing a developed protocol in collaboration with a different team● Update the project definition and scope from feedback given within interview and from client● Create the first interim report on success and failures for the project	<ul style="list-style-type: none">● January 31<ul style="list-style-type: none">○ Initial draft of Project Definition and Scope● February 11<ul style="list-style-type: none">○ Complete interview with Subject Matter Expert● February 21<ul style="list-style-type: none">○ Revised Project Definition and Scope● February 23<ul style="list-style-type: none">○ 1st Interim Report

PHASE 2

February 22 – March 15

ACTIONS	DELIVERABLES
<ul style="list-style-type: none">Pursue a second interview with a knowledgeable candidate that can help define our future persona attributes, wants, goals, and problemsInvited to a tour of the IMPD's incident command center to get a better understanding of our user's environmentDevelop an affinity map based off research and interview feedbackConnect with and interview with a leading expert in AR tech with an emphasis in incident command systemsDevelop two (2) unique personas that are representations of users within an incident command structureDevelop an empathy map for each persona that targets four main areas: what things they are saying, thinking, doing, and feelingProduce a second interim report and potentially update project definition and scope	<ul style="list-style-type: none">February 25<ul style="list-style-type: none">Complete interview with focus on building personasMarch 2<ul style="list-style-type: none">Tour of Incident Command CenterMarch 5<ul style="list-style-type: none">Affinity MapMarch 8<ul style="list-style-type: none">Interview with AR subject matter expertMarch 10<ul style="list-style-type: none">Empathy MapMarch 13<ul style="list-style-type: none">Personas DocumentMarch 14<ul style="list-style-type: none">2nd Interim Report

PHASE 3

March 16 – April 6

ACTIONS	DELIVERABLES
<ul style="list-style-type: none">● Complete an interview, based on questions about incident command task analysis● Complete the second interview with the AR subject matter expert on more specifics with what is being fielded today● Produce a diagram detailing our findings and examples when performing task analysis● Based off the last interview and research, produce scenarios and storyboards that help conceptualize the incident command workflow in AR● With scenarios and storyboarding in hand, develop an experience map that will assist in identifying major processes and problems that can occur during this workflow● Produce a third interim report and potentially update project definition and scope	<ul style="list-style-type: none">● March 18<ul style="list-style-type: none">○ Complete interview with focus on task analysis and scenarios● March 22<ul style="list-style-type: none">○ Complete second interview with AR subject matter expert● March 22<ul style="list-style-type: none">○ Task Analysis Diagram● March 25<ul style="list-style-type: none">○ Scenarios○ Storyboarding● March 27<ul style="list-style-type: none">○ Experience Map● April 4<ul style="list-style-type: none">○ 3rd Interim Report

PHASE 4

April 7 – May 2

ACTIONS	DELIVERABLES
<ul style="list-style-type: none">Using subject matter experts from previous interviews, complete a feedback session based on concept art and ideas produced by past groupsWith everything completed thus far, create a work/activity model document that pinpoints all the necessary flows and variables within an incident commander’s workflowProduce our fourth and final interim report with findings and updatesIn addition to the work/activity model, perform tree testing on prototypes, sketches, or wireframes. Depending on the results, research user feedback and create a document detailing pros and cons. This will be presented to a subject matter expert for testing purposesSince this research is being handed off to an external team, develop user interface requirements that will explain all visual and interactive experiences necessary for the incident commander. This effort will build on previous research and create/innovate where there are gapsPresent all the research, findings, and ideas in one final report and presentation	<ul style="list-style-type: none">April 8<ul style="list-style-type: none">Feedback session on concept art and ideasApril 14<ul style="list-style-type: none">Work/Activity Model DocumentApril 15<ul style="list-style-type: none">Tree-testing concepts and prototypesApril 25<ul style="list-style-type: none">4th Interim ReportApril 29<ul style="list-style-type: none">User Interface Requirements DocumentMay 2<ul style="list-style-type: none">Final Report and Presentation of Research

Conclusion

Our team is excited to explore the first responder's cognitive work flow during times of crisis to analyze how many enhancements can be completed regarding their situational awareness. First responders and other emergency personnel place their own lives on the line every day to assist the general public. Our belief is that augmented reality interfaces and controls can assist in streamlining their processes with innovative technology and utilizing modern concepts. We hope the future of our work results in saving the lives of many for generations to come.