Design Process

Initial Questions

- The drones will be deployed from cutters and shore-side stations, where will the operators operate from?

- Based on the 'tasks' our liaisons will access and interview users 'in the field' without access to internet? Is this true of their consistent work environment?

- What technology do they have access to in their operation station?

- Do they sit as teams, individuals?

- Are they always outdoors without internet connectivity?

- Are they near their captain that receives there information or do they land their drones and have to go to a station and plug in to send their packets to the captain?

- How do they convey the information to the captain (what technology does he have to view the information)?

- If they are working on cutters and in SAR stations, I would assume bandwidth will be an issue along with satellite signals for GPS navigation?

- The 'Operator' needs a clean, simple interface due to 'other tasks and concerns in their environment'. It depends on what these tasks/concerns are as to how we design, is the environment loud, dark, are they constantly viewing other things for information in their environment, is it comfortable, are they at sea on a rough sea facing rain/storms and outdoor environments?

- Are the teams shift workers where an operator may need to save information about an Area of Interest (AoI) or other relevant information for a teammate?

- It says 'Although Operators will receive training for this app it may be 6-12 months before they use it so they might forget? Why? Can we work with stakeholders to find out why this is and how can we fix it?

- Are we locked in to both the Samsung and the DJI remote?

- According to the technology, the DJI remote has 2 programmable buttons, are they toggle/trigger buttons or 5D buttons? Where are these buttons located on the DJI controller?

- It also says the drone will be custom built, but, the hardware and capabilities are already largely set, what are those capabilities so I can understand what to ask for if we might need some other capability within reason?

Research

USER PROFILES

This was only a design exercise, therefore the research has been minimal, but, in reality, the development of user profiles is a very important factor in starting the design process, so I included two here. The two main user categories based on the information given are the operator (using the application and drone) and the captain (using the information provided to take action). The liaison/customer would provide some of the information to form the end user profiles.

James

FUNCTION: Operator
LOCATION: San Francisco, USA
GENERATION: Y, Digital Native

BEHAVIOR/CHARACTERISTICS
· Experienced GEOINT Analyst
· Video Gamer
· Multi-tasker
· Experienced Video Editor
· Loves Tech and Gadgets

NEEDS/GOALS
· Clean, simple interface
· Being able to overview camera settings
· Map overlays for precision
· Joystick and gesture control

CHALLENGES/FRUSTRATIONS
· Clutter/too many unused features/options
· Overly complex steps in app
· No opportunity to review report before sending

WHAT THIS APP SHOULD OFFER
· Ability to measure from point to point
· AI to help determine sweep widths for land
  rescue and probability of detection values
· Notification and chat with team members
· Drawing or defining areas quickly
· Rugged design for environmental factors

SKILLS
Analyst   Drone Operator
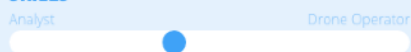
«I'm looking for an interface that
decreases time to action.»

Mary

FUNCTION: Captain
LOCATION: Boston, USA
GENERATION: Y, Digital Native

BEHAVIOR/CHARACTERISTICS
· Task Leader
· Works on several, time-critical projects
· Focus on process/procedure
· Microsoft Office Expert
· Detail oriented

NEEDS/GOALS
· Precision information
· Ability to quickly analyze and share information
· Visuals rather than endless data
· Quickly compare multiple reports

CHALLENGES/FRUSTRATIONS
· Disorganized, inconsistent data/reports
· Download times for reports take too long
· Dissemination of data takes too long

WHAT THIS APP SHOULD OFFER
· Quick addition of notes
· More visual cues
· Minimum data to get the job done AND the
  ability to dig deeper into report as needed
· Faster comm lines from the field to organizer
· Live feed of information to organizer

SKILLS
Data Mining   GEOINT
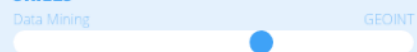
«The reports I currently receive do not
concentrate on relevant data.»

Research (continued)

In the brief time spent looking into this subject, I decided several things needed to be answered.

USER ENVIRONMENT (LIAISON/CUSTOMER/ACCESSIBLE USER QUESTIONS)

- What is the environment for the operator?

- What is the environment for the captain?

- The drones will be deployed from cutters and shore-side stations, where will the operators operate from?

- From the previous question, it sounds like the use will be only for ocean/sea/nautical SAR, are there cases where land based SAR would be necessary?

- Based on the 'tasks' our liaisons will access and interview users 'in the field' without access to internet?

  - Is this true of the operators consistent work environment?

  - If true, are we looking at rugged design, transport

- What technology do operators have access to in their operation station (if they have one)?

- Do operators sit as teams, individuals?

- Are operators near their captain that receives the information?

- I assume we have access to some secure comms to send the report directly from the app?

- How do they convey the information to the captain (what technology does he have to view the information)?

- If they are working on cutters and in SAR stations, I would assume bandwidth will be an issue along with satellite signals for GPS navigation?

- The 'Operator' needs a clean, simple interface due to 'other tasks and concerns in their environment'. It depends on what these tasks/concerns are as to how we design, is the environment loud, dark, are they constantly viewing other devices for information in their environment, is it comfortable, are they at sea on a rough sea facing rain/storms and outdoor environments?

Research (continued)

- Are the teams shift workers where an operator may need to save information about an Area of Interest (AoI) or other relevant information for a teammate and possibly share it with other members of the team?

- It says 'Although Operators will receive training for this app it may be 6-12 months before they use it so they might forget'? Why? Can we work with stakeholders to find out why this is and how can we fix it?

DRONE AND DJI REMOTE

Research of the technology available to the application and features that may be useful was another part of my research.

- According to the technology, the DJI remote has 2 programmable buttons, are they toggle/trigger buttons or 5D buttons? Where are these buttons located on the DJI controller?

I also looked at what the drone offers that may be a functionality we may want to send to the application, things like:

- Omnidirectional Obstacle sensing

- Circle an object, waypoints and course lock are also features we should consider, giving the operator more freedom to focus on the imagery/video

- Task Library (allows operator to save flight paths for later flying over the same area, and possibly providing that info to the captain)

- Active Track 2.0 for tracking a target

- It also says the drone will be custom built, but, the hardware and capabilities are already largely set, what are those capabilities so I can understand what to ask for if we might need some other capability within reason?

- There are goggles available: https://store.dji.com/shop/dji-goggles-series?from=menu_products is that something we want to consider for the application? A gesture based interface?

Research (continued)

SOFTWARE AND SAMSUNG 9+

Research of industry competitors to determine some of their software looks like and some of the functionality they offer and then comparing that to the DJI controller and the features the Mavic Drone and competitors offer so we can understand if there are possible features we may want to include based on user feedback in the commercial industry. In a regular case, I would spend quite a bit of time looking at feedback from drone users to determine successes and pain points from different applications.

I looked at possible improvements that could be made on the performance of the software for the task and the controllers in general, things like:

• How can we use voice controls to remove interface elements on the screen?

• Are there other ways to remove interface elements on the screen (gyro/tilt functionality?)

• How does the screen perform in direct sunlight?

• Set up time (time to action)

• Can the user replay footage and edit it?

• Can an SD card be used for extra memory?

• How would you move footage from the phone to the captain?

• What would be more efficient to mark areas on the screen, finger or one of the programmable buttons?

• What does an operator created marker look like on the screen, how would that best transfer to a printed report for the captain?

• What does the data look like being transferred from the drone to the application, and how would we format it for a concise visual report?

• What is the best way to keep the user oriented, and orient the information sent to the captain?

• What are industry standard interfaces for things like yaw/pitch/roll, elevation, speed, latitude/longitude?

• What are industry standard interfaces for photography?

Research (continued)

LIAISON/CUSTOMER

I would also speak to the liaisons who have experience in the field to see if this will replace an application, if so, what were things they liked about the application and what they did not like about the application.

• What do they feel is more important, screen size or portability (tablet or mobile device)?

• How long does an average operation take (battery power, replacement batteries/devices)

• Is it better to have an interface on a laptop to set up your drone and controller so you do not have to use space in the mobile app for those items, or are their other items that were missing and need to be in the application, OR in the application and unnecessary

• What information would best inform the captain of how to approach the mission, what is the most critical information?

• What is the minimal set of tools an operator needs to perform their task?

• We currently have operators and captains, are there other users we need to consider?

• Do we need to have developers build APIs to allow other dev teams access this information for other uses?

• Who is responsible for the training and training material and what is the best method of delivery?
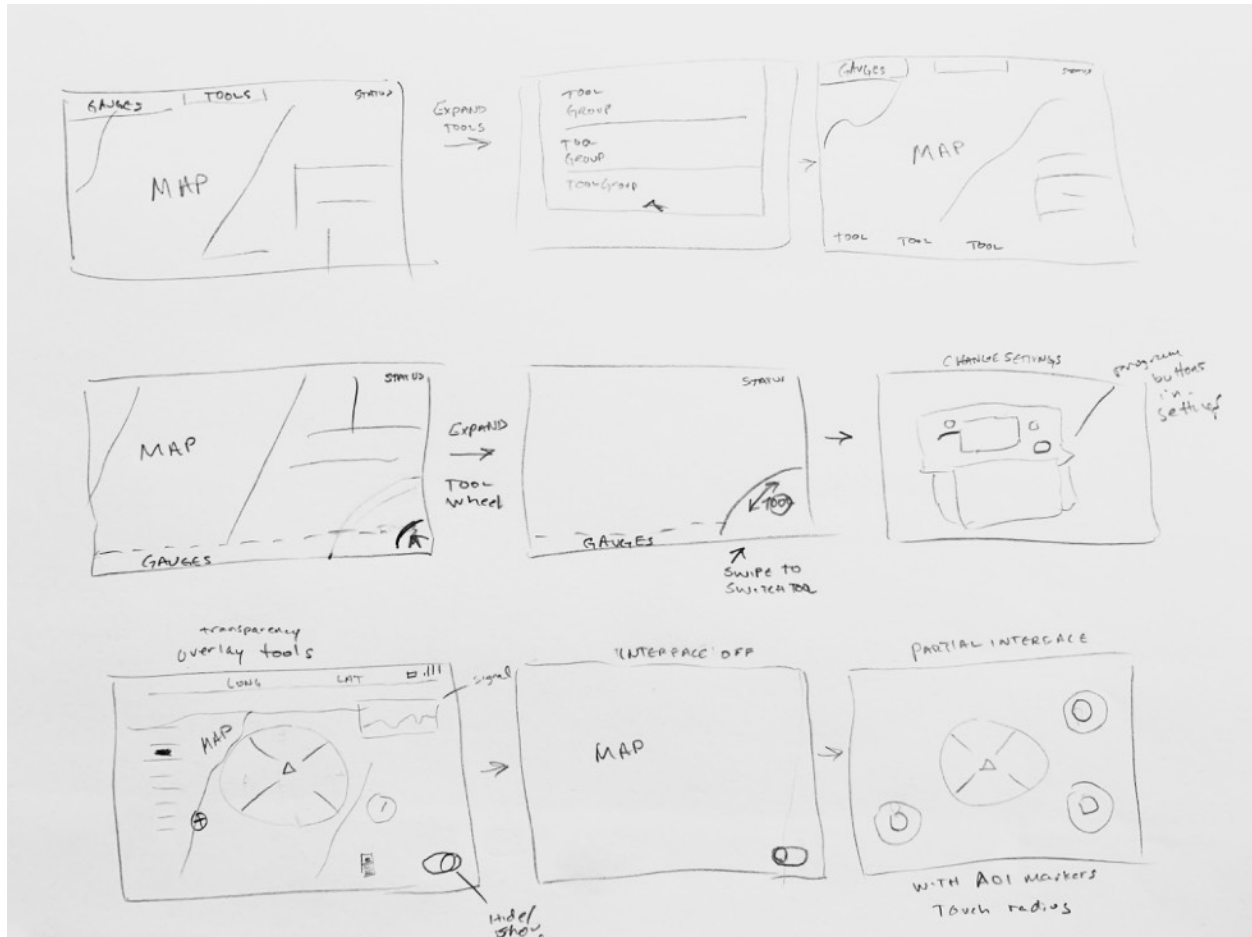
Concepts

Before starting to sketch concepts, I reviewed specs for the devices. I looked into specs for the Galaxy S9+ to determine what real estate I would have, and also looked at the DJI remote and how it connects to the phone to see if there is any lost real estate or blind spots created by the cradle for the device. I also was interested in looking at the video recording capabilities for the drone and the mobile device. I won't post the details, but found them here:

Samsung Galaxy S9+ Specs: https://www.samsung.com/us/smartphones/galaxy-s9/specs/

Mavic Pro: https://www.dji.com/mavic/info#specs

DJI controller: https://www.dji.com/mavic/info

Initial sketches, interface with hidden panels, interface with panel.

My initial concepts, having tool available to choose from a panel and those tools would stay available. Having tools available in a tool wheel that would allow the user to swipe to change tools, maybe when they swipe to a tool, an overlay of those tools would be available across the bottom, or have an overlay of tools over the entire interface that the user could select tools to appear with a limit on number to show.

Later, concepts developed to have necessary tools available, but in hidden tabs. I believe this concept will allow the user to choose. The more I looked at the interface, the more I decided there was too much, even hiding panels when not in use, there is too many areas to recall, where each tool is. This would be a good probe area, what tools are used 90% of the time, can we have those available and a single panel with organized items? How would the user/operator expect things to be organized?
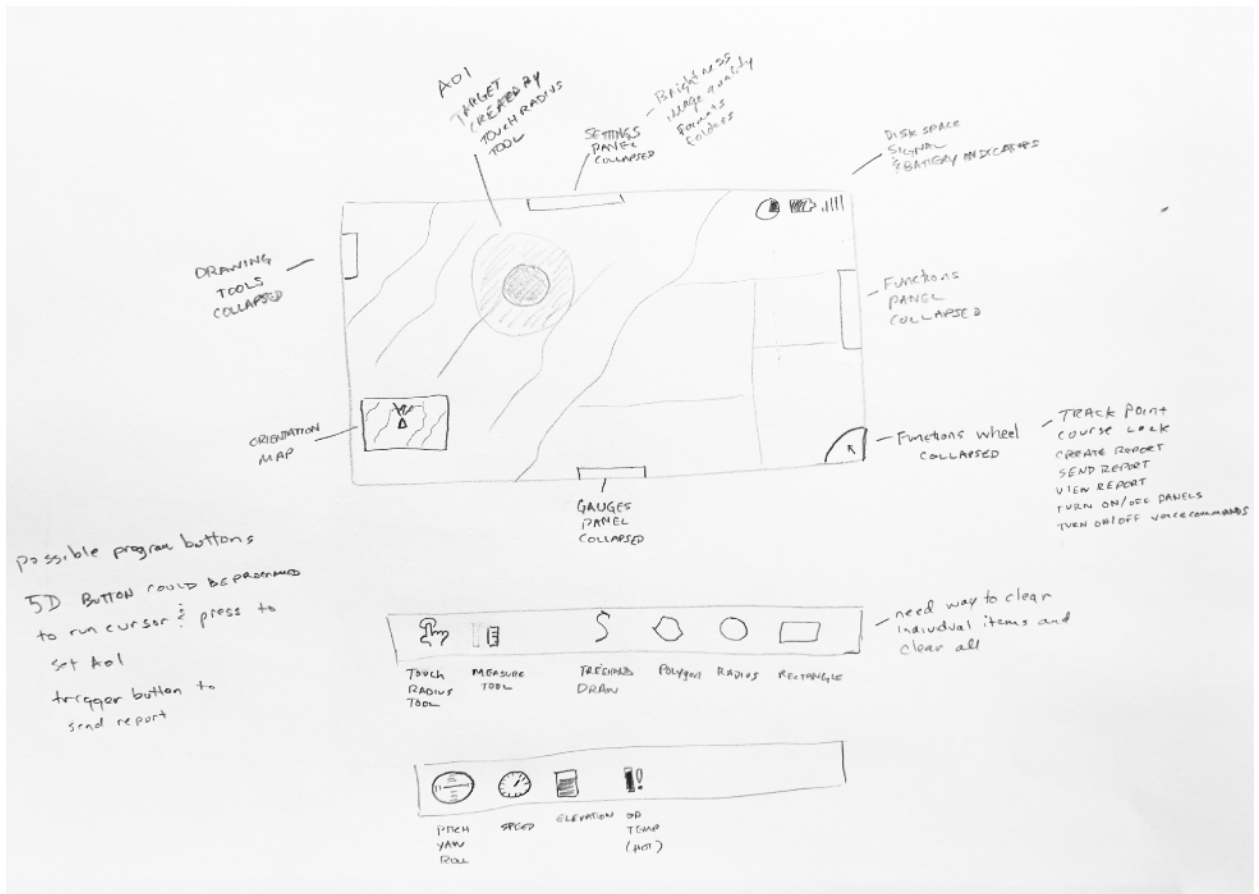
Concepts (continued)
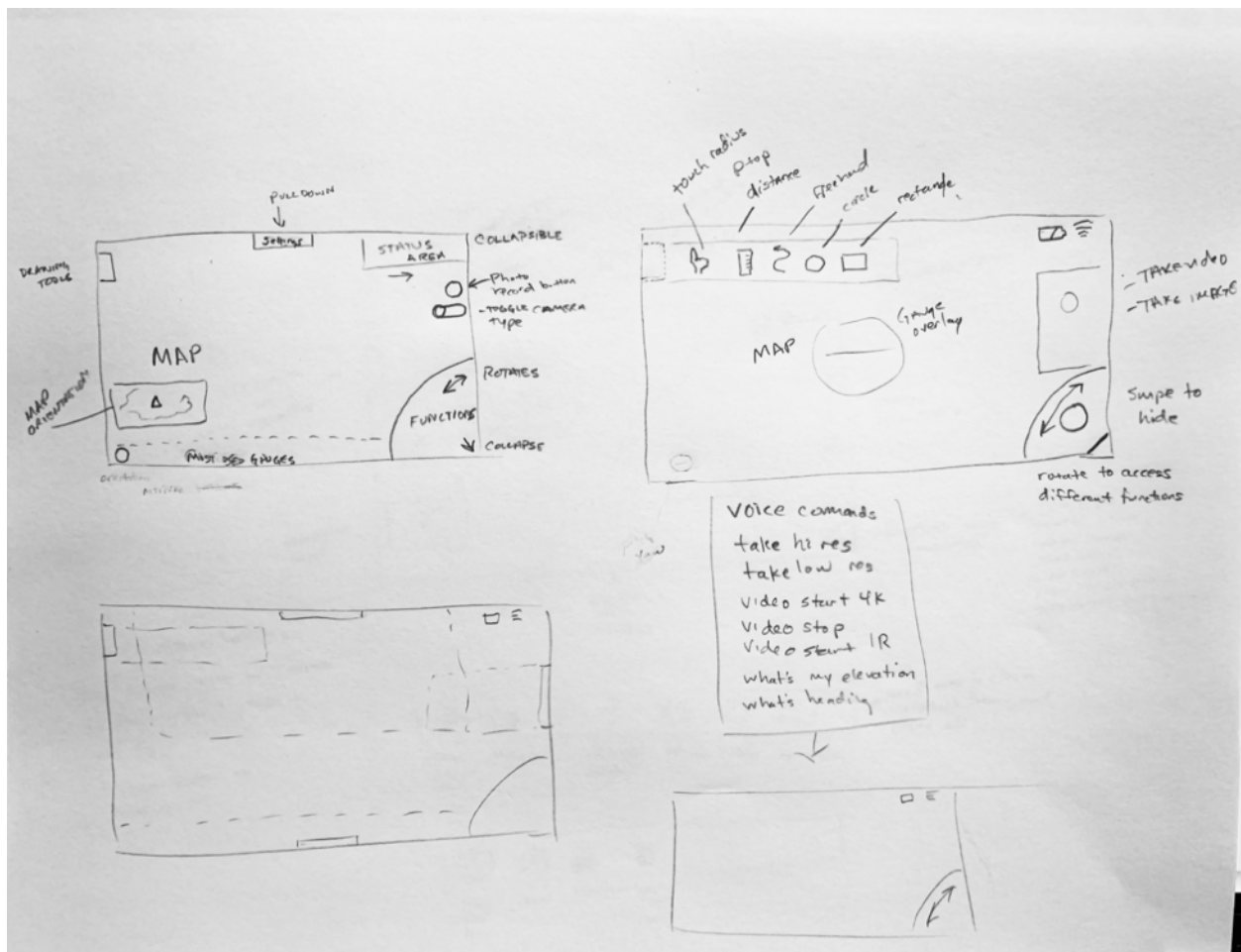
What about using voice commands, to remove all distractions from the interface and allow the user to concentrate on the map/image/subject? Is the environment friendly for voice commands (noisy, windy)? How many voice commands would be too many? Maybe a combination most common commands by voice and others in the interface?
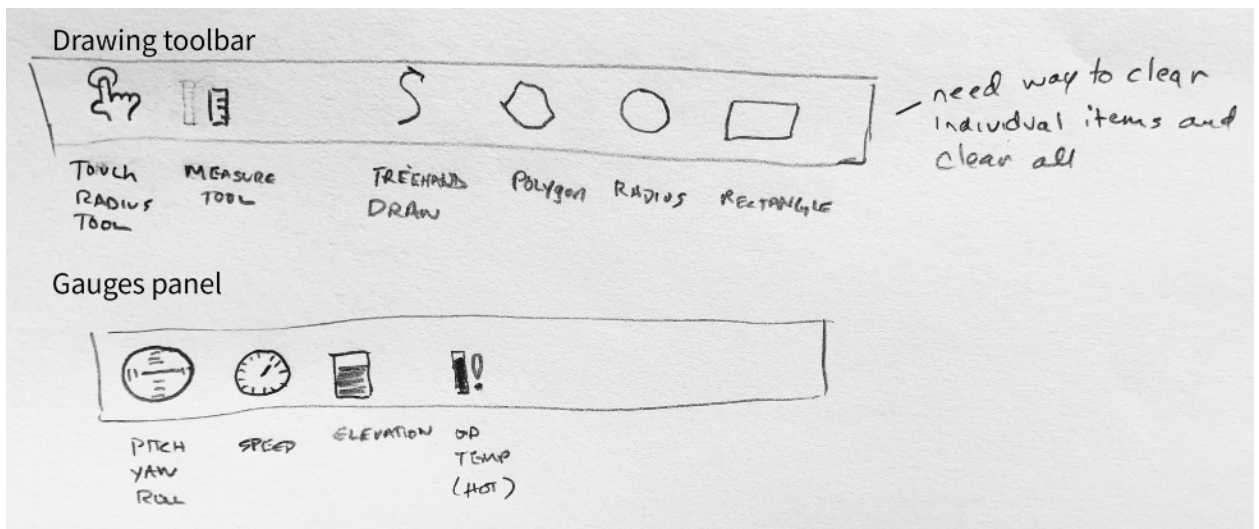
So a second sketch with a little more detail ensued. Thinking now about what tools might be important, what information about the drone does the user need to know to succeed. I was also reminded about having two programmable buttons in the controller, so, we might be able to use those for some of the functionality, allowing us to remove more clutter from the interface and today's users tend to be more digitally adept and used to the video game controller methods of using interfaces.

I was also beginning to think of tools that would allow the operator to add information (draw information) on the screen to provide detail for the captain.

Concepts (continued)

Detail

Drawing toolbar

Touch Radius Tool • Measure Tool • Freehand Draw • Polygon • Radius • Rectangle

need way to clear individual items and clear all

Gauges panel

Pitch Yaw Roll • Speed • Elevation • OP Temp (hot)

Concepts (continued)

At this point, I decided to move toward a medium fidelity design and start concentrating a little more on the probe.

When I started the design, I began to think about combining some of the elements, allowing the user to customize the UI, and save multiple UIs with the ability to switch between UIs for different scenarios. That is how I came to the final rendering of the design.