02/05/2021

Project Proposal Ideas

- Make a universal mounting system for search and rescue (SAR) equipment for small unmanned aircraft systems (sUAS)
- Gene mutation device for editing the genes of a person with a dangerous condition
- COVID-19 affordable, reusable mask that effectively provides protection against the virus, while being comfortable and breathable

Final Project Proposal

- Make a universal mounting system for search and rescue (SAR) equipment for small unmanned aircraft systems (sUAS)

Current Universal Attachment Systems

- Our definition: A modular system that can be used to temporarily attach a tool to a larger piece of equipment.
- Existing examples:
    - XT60 Connector: attachment system for batteries
    - Picatinny rail
    - velcro

02/08/2021

Existing SAR Drones:

- SAR drone DJI
- the value of the drones for search and rescue teams really shows in three main areas: responding quickly at a low cost, allowing the use of sensors such as thermal imaging and zoom cameras, and providing automated search coverage of a precise grid.
    - DJI Matrice M210 drone: Dual system with both a visible camera and thermal sensor; using a gimbal system.
    - Cost: $10k - $25k
    - This drone has a system where it can connect both the camera and sensor equipment, based on our plan, we hope to make a system that is not limited to only those two equipment, but would be able to switch out and attach any piece of equipment
    - Our design is more versatile and allows more freedom of using different cameras and sensors

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    - DJI Inspire 1
    - One visible camera; uses gimbal design
    - Cost: $2k +

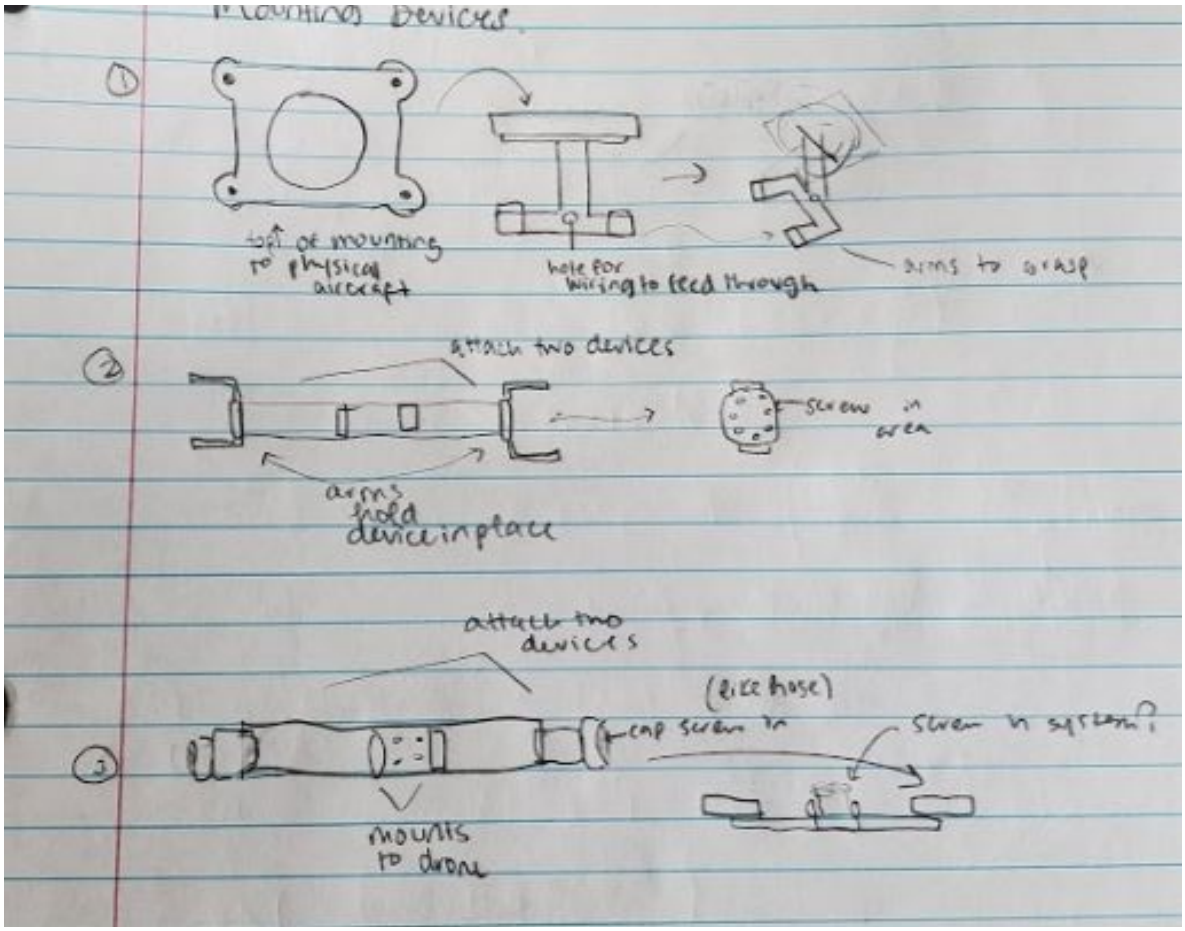
Slide-On Systems:

- Weaver Rail:
    - Used for small arm weapons

- Picatinny Rail:
    - Used with North Atlantic Treaty Organization (NATO) small arms weapons.

02/09/2021

Possible Idea Sketches:



Design 1:

- Gimbal design with square base plate. The has two pieces, one that attaches to the drone and one that attaches to the device (camera/sensor).
- Device is inserted into the clamp area and held together (possibly) by a strap, for extra support
- Use screws to connect the pieces together.
- Middle circle is to reduce weight, or add a ball for more rotation of the gimbal

Design 2:

- Rod-like design with two attachment points for yaw (moving side to side) With a claw -like design to attach the equipment to

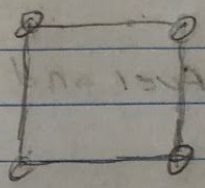
Design 3:

- Rod-like design, equipment attaches via twisting/screwing in equipment to main attachment bar piece.

3 sketches
- decision matrix

1

2 board



bolt bolt

DJI mount

bolt

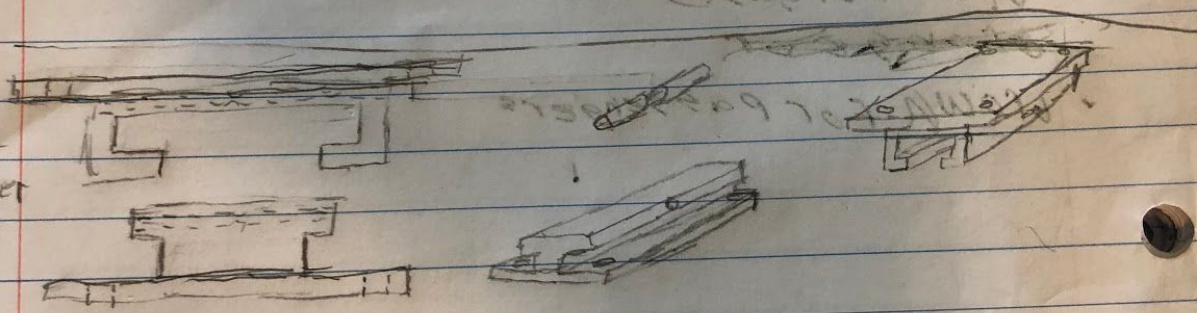
upper plate

electrical contact

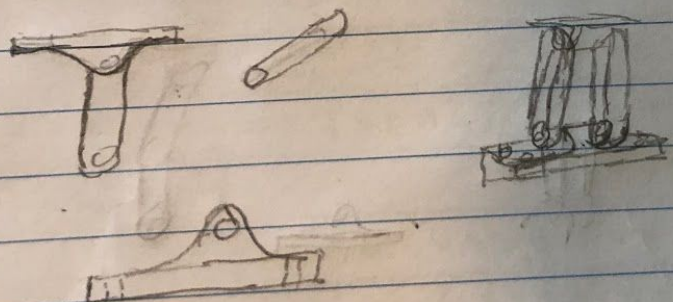
lower plate

wing nuts

wing nuts



2 slider rail



3 wing frame

Design 1:

- Two boards that would be fastened with something like bolts and wingnuts

Design 2

- Rail system secured by pin

Design 3

- Crane design fastened by pin - would allow for further development into a gimbal

Problem Statement:

- **What**..Exactly is the problem?
- **Who**..Says there is a problem?
- **Where**..Exactly is the problem happening?
- **When**..Is it happening? How long?
- **How Many People**.. Does the problem impact? Statistics?
- **How..**do you plan on solving the problem

- Problem Statement: Describe the problem you plan to address
    - What: SAR drones need a widespread universal system for mounting different equipment and payloads
        - Currently small Search and Rescue (SAR) drones (think small four rotor drones) need a widespread universal system for Attaching different equipment and payloads.
        - There are many drones on the market that have sensors, such as thermal imaging and zoom cameras (DJI Matrice M210), however they lack the universal system of interchangeably being able to switch out the different equipment onto SAR drones.
        -
    - Who: Many Search And Rescue Agencies are looking to open sUAS (small Unmanned Aircraft Systems) programs and are looking for potential tasks for drones to fill. Many of these ideas require a drone to carry something other than a basic camera. Proposed payloads include, infrared cameras and radio direction finders.
    - Many SAR and disaster relief organizations have adapted fledgling sUAS (small Unmanned Aircraft Systems) programs and are looking for missions that a drone can fulfil, however before the drone can fulfill the task it needs the right equipment.

- Idea: What will you make? How will you solve the problem?
    - We will make a universal mounting (attachment) system that will allow for different cameras, IR sensors, radio direction finding equipment or any other sensor or equipment to be mounted to an existing UAS platform.

- Plan: How will you bring your idea to life? (What will your prototype/working illusion be?)

- Our prototype will feature some way to connect any camera or piece of equipment (within reason, of course) to any drone that already uses this system.

- Our working illusion will be a system to represent a gimbal that would allow for pitch and yaw controls of a camera.

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[Presentation Slides]

- Create + Edit Slides
- Record Presentation proposal

Existing Gimbal Designs:







02/19/2021

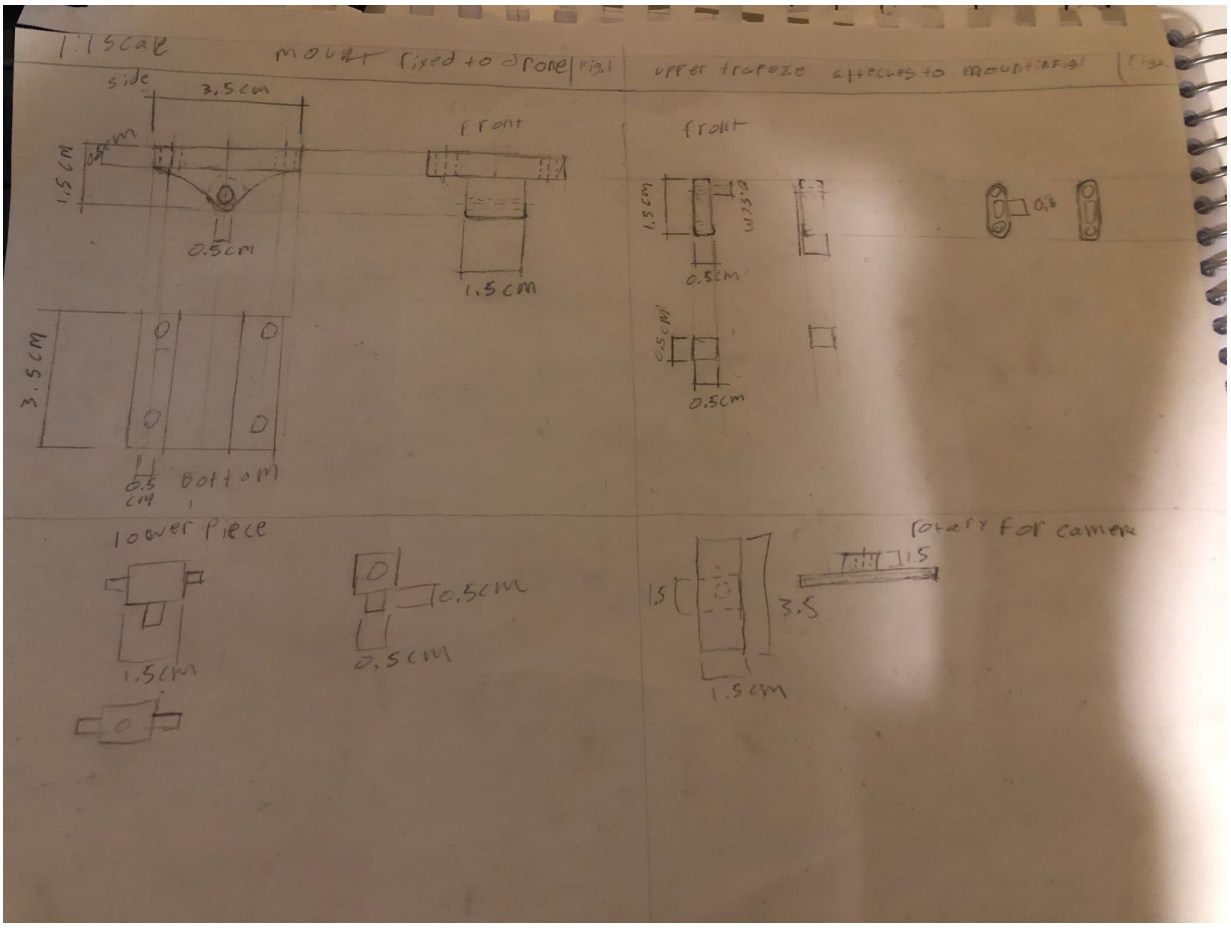
IC District Feedback:

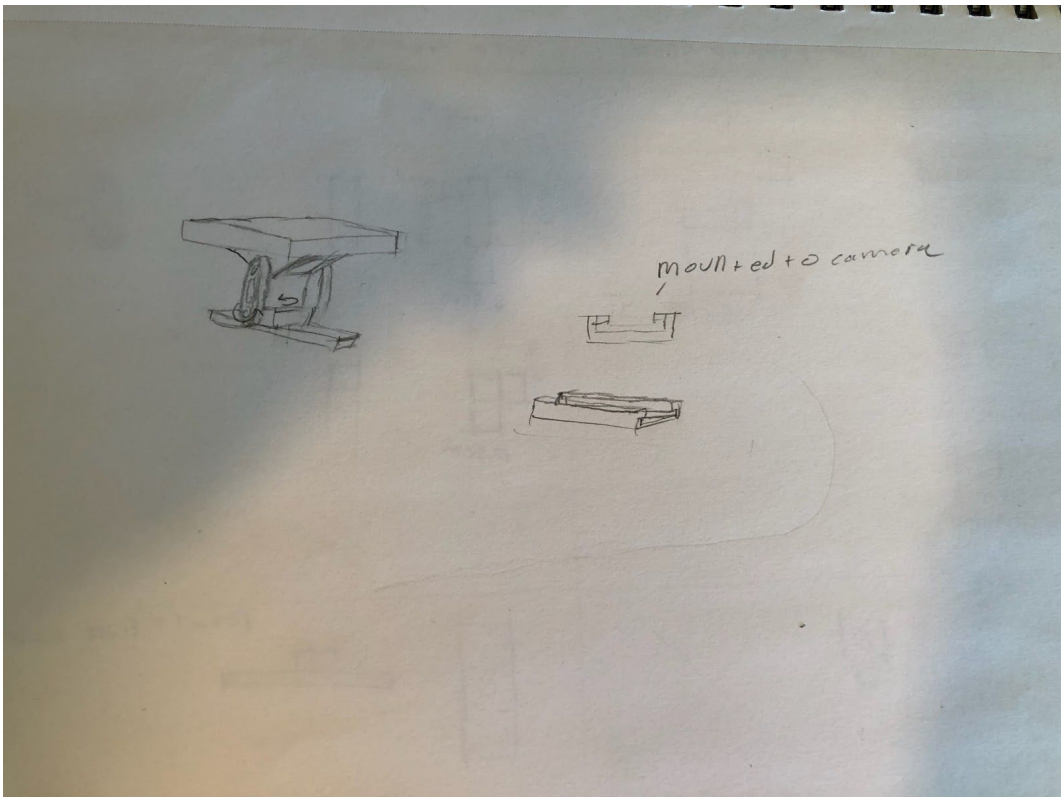
- Good images of existing universal attachment systems. Good coverage of existing solutions. This helps us better understand the problem.
- Focus more on SAR needs. What specific needs are there? What equipment do they need? Most drones in use are much much larger with higher payload capacity - how can you make the case for a smaller, lighter drone use and how your innovation will be better than what's out there
- The problem set-up is weak. You seem to be looking for new solutions, but what is the problem for SAR? How will drones play a role?
- What's wrong with what already exists? I see that you shared current solutions but I don't see how these are very problematic.
- Keep in mind weight constraints.
- What will your first prototype look like? How will you test it? Wood is HEAVY.
- Remember your time limits - 2 minutes!

Improvements/Plans (via feedback):

- SAR needs a drone that can universally attach multiple components for usage in a variety of situations.
- By adding an interchangeable system, this will reduce weight, since drones with both cameras and sensors weigh a lot more - this means less weight = safer flight
    - Lighter drones are better for safer flight for those in the environment
- The issue with existing ideas is that they are not universal

Final Sketch:





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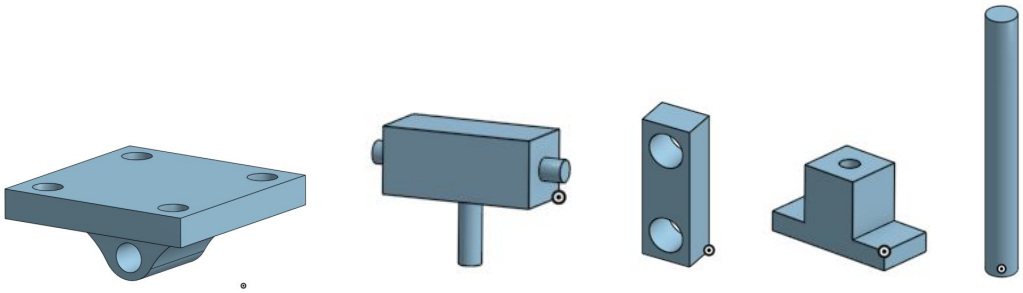
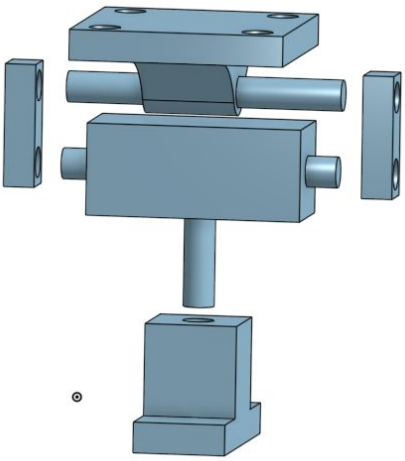
Onshape Progress:

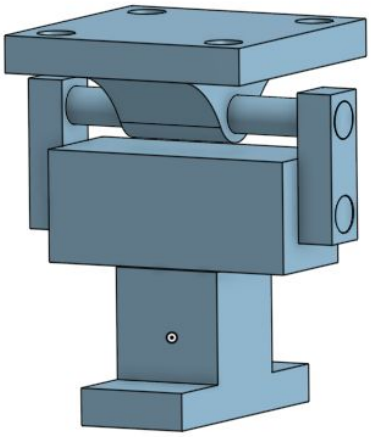
- Parts



- Detached system

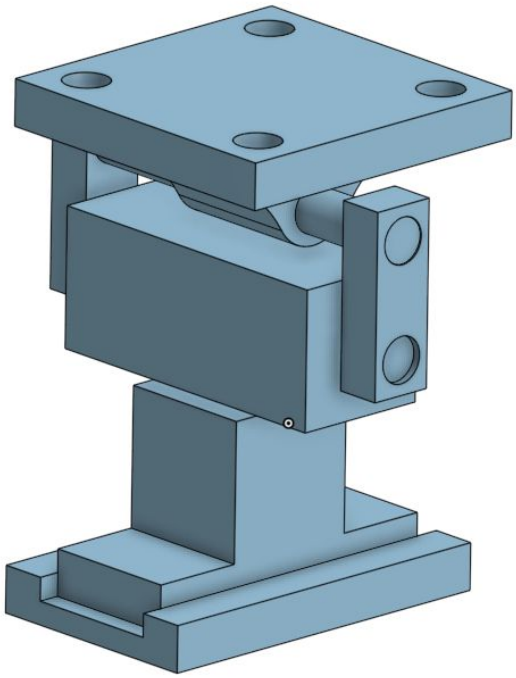


- Final Design Draft 1



- Modifications to Onshape Design/Ways to improve
    - Rail/Slide that would attach to the camera

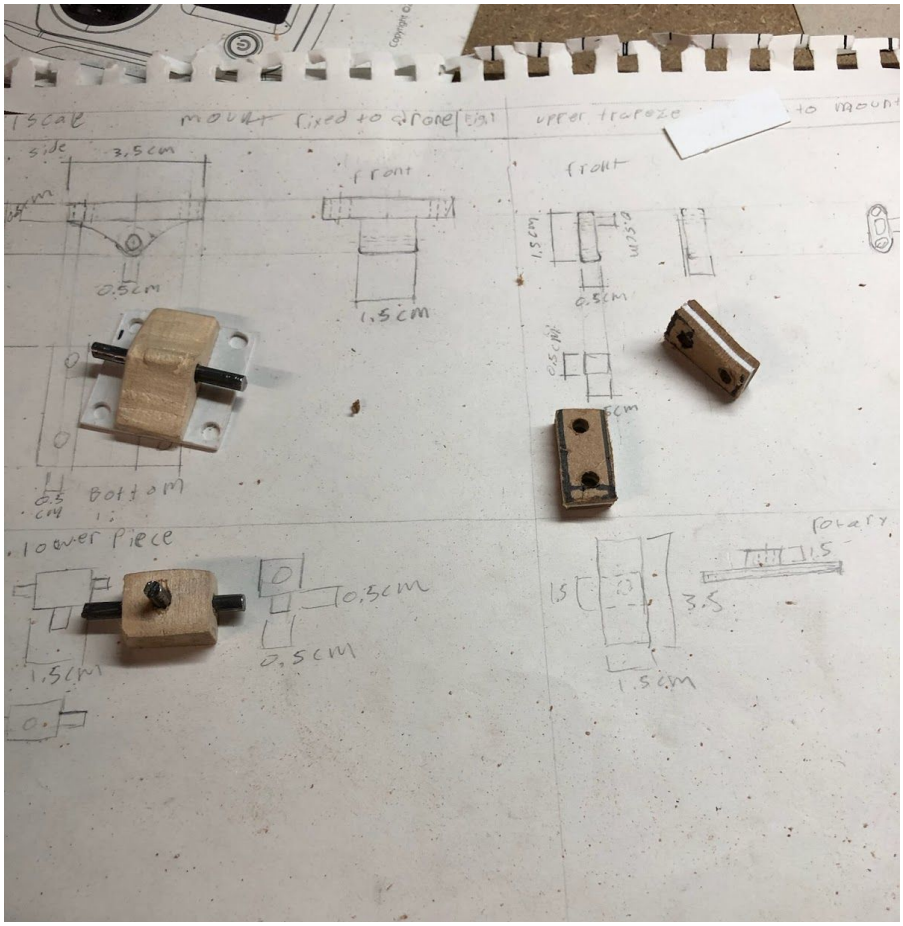
Final Design (2)



Prototype Process:

Here are 3 of the finished parts before assembly. They are made out of a basswood, polystyrene, steel rod, and a composite material made from

polystyrene and high-density cardboard.



Here is a picture of the composite under pressure

Here is the lower rail being made by hammer and chisel

finally, here is the assembled prototype

Materials

- Our current prototype is made out of wood and steel rods
- Actual product would be made out of ABS plastic

02/21/2021

Marketing:

- Market of Drones - Overview and Trends
- SAR drones are on the rise
- Will save costs by eliminating the need for a specialised drone for each piece of equipment.

Social Value:

- SAR drones on the rise being used for critical conditions and natural disasters
    - Fire emergencies (require basic camera)
    - Floods
    - Earthquakes
    - Drownings/Large body of water issues (in ocean searches)
    - After avalanches (require sensor - infrared camera)
    - Exploring forest

- SAR drones
    - Becoming more and more popular. Advancements and technology created for aid in more efficiency in critical situations will always be needed.
    - Are useful for difficult terrain.
    - “Drone have helped to save the lives of thousands of migrants in the Mediterranean Sea and UAVs have played an important part on aid and relief programs created after earthquakes struck places such as Nepal and Ecuador.” (Commercial UAV news)
    - Compared to our universal attachment system current SAR drones are lacking the interchangeability component. Being able to have a range of components that you can attach for each situation.