Deliverable C - Design Criteria and Target Specifications

GNG 1103D

Group #9

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Problem statement: The JAMZ developers need an emergency beacon that transmits accurate and quick location information about the drone to the operator in live time by interpreting the data received from the sensors.

The JAMZ developers had clearly identified the required needs for the emergency beacon. These needs will be translated into design criteria, which will then be used as specifications for technical benchmarking with similar products. Additionally, user perceptions will be used to identify other design criteria.. Finally, all the aforementioned data will be summarized into one table containing the target specifications for the emergency beacon.

Table 1- Emergency Beacon Design Criteria Based on the Identified Needs

Need	Design Criteria
Emergency beacon must relay accurate information about the location of the drone to the operator.	Transmitter.
The emergency beacon should alert the operator if the drone goes off-course.	GPS and transmitter.
The emergency beacon should relay the information as quickly as possible.	Speed.
The beacon must be able to interpret information with the impact and/or altitude sensors to trigger the beacon.	Microcontroller, on-board computer or transceiver (Arduino or raspberry pie for example).
The beacon must run until the operator arrives.	Battery and power usage (power-saving mode).
The beacon should not overheat or get too cold.	Weatherproofing.
The beacon should be as light and compact as possible.	Size.

This table translates the most important identified needs into design criteria. These components will be used in the next section as specifications for technical benchmarking.

Table 2-Technical Benchmarking Based on Identified Design Criteria

Specifications	Elsa	Jacob	Karen	Sandeep
Product and company	Eureka Products: Marco Polo - Ultralight Single Drone Recovery System	Loc8tor	sMRT AU10-HT	Flytrex

Transmitter and Range	Attach the receiver tag on your drone and use a hand-held monitor to track the location. Includes a hand-held locator, a transceiver tag, plug-in charger and cable for locator and transceiver tag recharging. The range of the locator is up to 2 m for line of sight, .5 to 1 mile for open terrain, rolling hills with few obstructions and 2,000 ft for dense suburban areas.	Product can pinpoint exact location but flight data still required to find general location. The locator system has a range of 122 m.	Sea range: 8 miles. Air range: 75 miles. In case of an emergency, it can alert the operator within 2-5 seconds.	Product can navigate and ping location to operator via standardized GPS and motion sensors once it reaches its location.
GPS and transmitter.	Tag receiver and locator together will locate the drone.	Lightweight homing tags accurate within 2.5cm	Indicates GPS position via AIS	Onboard GPS, cannot transmit to operator
Speed.	Live data.	Live data.	Every minute.	Onboard navigation, no information is relayed to the operator.
Microcontroller, on-board computer or transceiver (Arduino or raspberry pie for example)	Uses Radio Frequency to track the drone (Frequency Hopping SPread Spectrum method).	Uses audio or visual clues opposed to traditional GPS.	Uses AIS (Automatic Identification System) which uses transreceivers on ships.	Has motion sensors to detect if it is too close to an obstacle, otherwise the onboard gps takes care of the flying
Battery and power usage (power-saving mode).	The locator has a rechargeable Li•ion battery. It lasts for 3 days in continuous tracking mode, 8 hours in searching mode and 3 days in monitor mode. The tag transceiver has a rechargeable lithium polymer battery. It lasts 15 days in idle mode, 3 days in tracking mode and 45 days in monitor mode.	Battery life of up to 1 year.	Does not say but it seems like it is self charged and it fixes itself.	30 minutes.

Weatherproofing	The locator should only be used in light rain and the tag transceiver should work any time.	Not specified.	Not specified.	Not specified.
Size.	Locator: Height: 6 in. (152 mm) Width: 3.5 in. (90 mm)- Depth: 1.5 in. (44 mm)- Weight: 7.8 oz. (221 g) Tag transceiver: Height: 2 in. (51 mm) -Width: .86 in. (22 mm)- Depth: .45 in. (11.5 mm) - Weight: .42 oz. (12 g)	Weighs 6 grams 32mm by 6 mm by approx 1 mm	The actual measurement could not be found but it looks small.	Weighs 1250 grams 470mm by 710mm
Cost	$219.95 (does not specify if US or CAD)	30-100 on website CAD	$765 (website shows euros)	$649 (does not specify if US or CAD)
Extra	It does not interfere with your drone's radios. Only transmits when it's in search mod.			

Table 3- Customer Reviews of Similar Products

Name of product	Customer's reviews
Marco Polo	- Many customers lost their control with their control while they were controlling the drones, leading to the inability of tracking their drones. There were cases of drones being stuck at a tangle of brambles, very dense vegetation, underbrush, and trees. - By using radio frequency vs cellular or gps, even when Marco Polo is used in very spotty or no cellular coverage areas, it is still able to work incredibly well. - Marco Polo helps tracking the lost drones in long distances faster which it should take hours to find theoretically. - It is tiny, portable but still able to provide a strong enough signal.
Loc8tor	- It is fun and easy to use. - The battery life in both tag and the hand unit really can live in 8-month length as declared. - Sometimes Loc8tor can not spot a person being hidden in a place isolating radio waves. - Many cases of losing cats were reported and thanks to the Loc8tor tag, they could easily find their cats no matter where they were hiding.

Flytrex sky internet drone	- Flytrex Sky has a powerful GPS system which allows itself to navigate the skies, as well as update you on its position and areas it has discovered independently. - Flytrex Sky can fly further than any other drones we have ever seen as long as the internet connection remains continuously to the cloud technology. - It is a dual-mode flying which means you can control your Sky drone using a RC controller and GSM connection. - It is so easy for any customers to set up and use it because there are no extra parts or installations necessarily needed. - The compatibility of the product is also a remarkable feature of Flytrex Sky. It is included with a GoPro docking bay, as well as dual batteries; this allowed the drone to endure continuously a 30-minute flight.
sMRT AU10-HT	- The instant activation speed when immersed in water and then an alert will be sent on the international search. - Just 2 seconds after the immersion in water, the smart AU 10HT will automatically start the transmission on full power. - The rescue team will be able to locate the wearer's position precisely.

Using the specified design criteria in the first table, the following products were used for technical benchmarking: Marco Polo- Ultralight SIngle Drone Recovery System, Loc8tor, sMRT AU10-HT and finally the Flytrex. The user perceptions were used to put a weight factor on design criteria.

Table 4 -Rank Legend

Legend	Green	Blue	Yellow	Red
Grade	4	3	2	1

Table 5- Ranks of Technical Benchmarking Based on Importance

Product and company	Importance (weight)	Eureka Products: Marco Polo - Ultralight Single Drone Recovery System	Loc8tor	sMRT AU10-HT	Flytrex
Transmitter/ GPS	4	4	3	2	1
Battery and power usage	2	4	3	2	1
Size	1	3	4	1	2
Speed	3	4	3	2	1
Cost	2	3	4	1	2
Range	3	3	2	4	1
Total		21	19	12	8
Weighted Total		54	45	33	18

For each specification, the products were ranked from 1 to 4, with 4 being the best out of the 4 products. Then, the specification was given an importance weight from 1-4, with 4 being the most important, based on our client needs. The score from 1 to 4 was multiplied by the importance value for each specification and added all together for each product. The best product from highest to lowest was Marco Polo - Ultralight SIngle Drone Recovery System, Loc8tor, sMRT AU10-HT and finally the Flytrex.

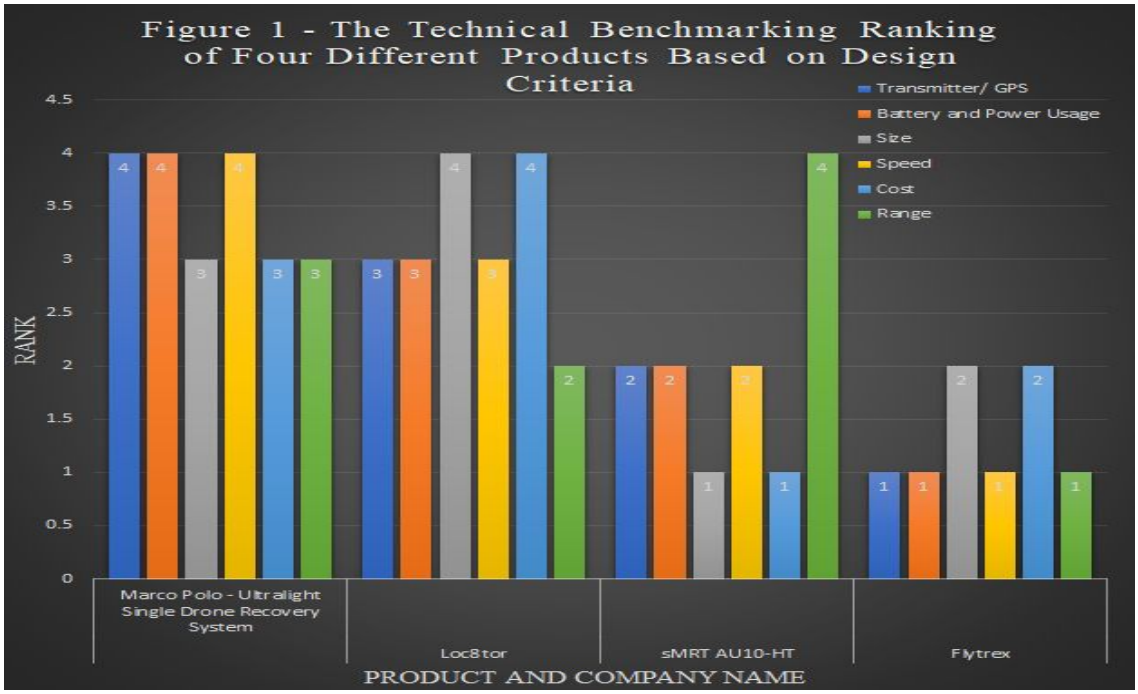


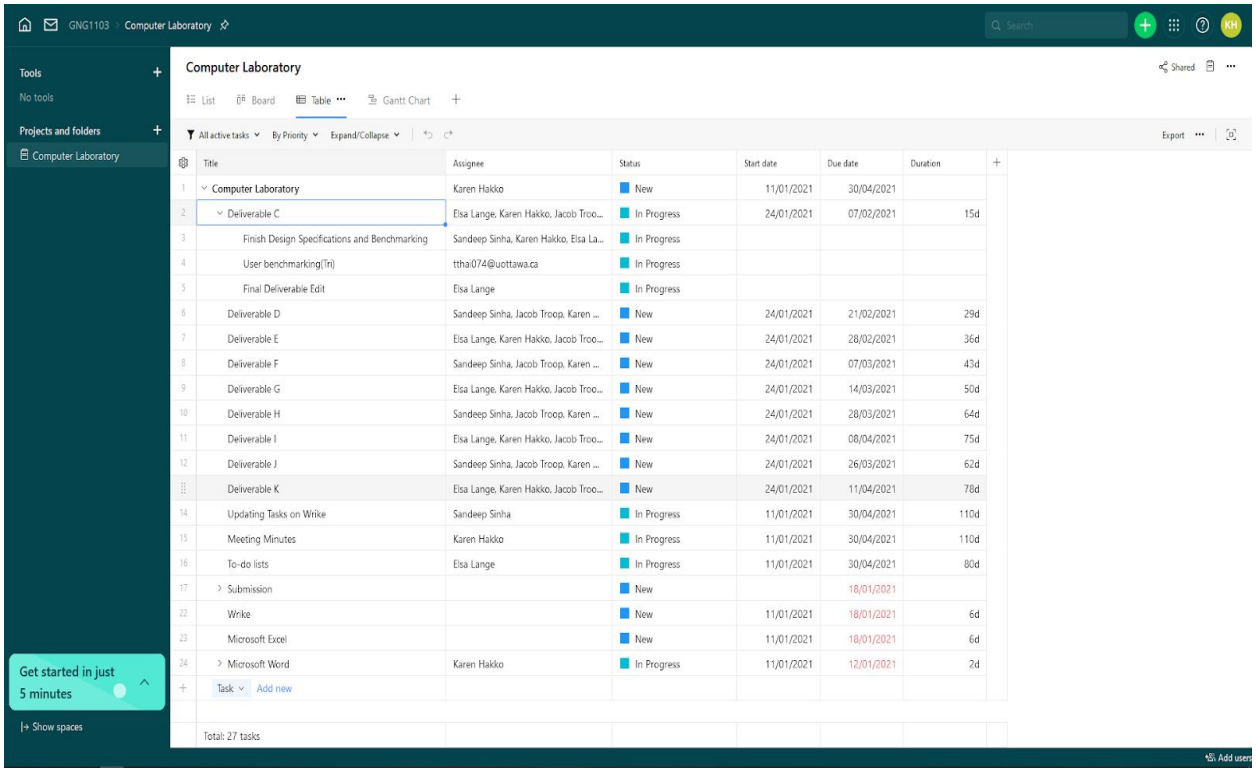
Table 6- Emergency Beacon Target Specifications

Design Specifications	Relation (=, < or >)	Value	Units	Verification Method
Functional Requirements				
Transmitter/GPS	=	Accuracy ± 10	m	Testing
Range	>	1	km	Testing
Speed	=	Live	n/a	Testing
Constraints				
Cost	<	250	CAD	Estimation
Battery/power life	>	18	hours	Testing
Non-functional Requirements				
Volume	<	100000	mm^3	Analysis, final test
Mass	<	500	g	Analysis, final test

These target specifications were created using the client needs as well as comparing the products from our technical benchmarking.

In conclusion, using client needs and the method of technical benchmarking, the target specifications for the function and non-functional requirements as well as the constraints were created. The functional requirements were transmitter/GPS, range and speed while the non-functional were the volume and mass. Finally, the constraints were the cost and battery life.

Wrike update



	Title	Assignee	Status	Start date	Due date	Duration
1	Computer Laboratory	Karen Hakko	New	11/01/2021	30/04/2021	
2	Deliverable C	Elsa Lange, Karen Hakko, Jacob Troo...	In Progress	24/01/2021	07/02/2021	15d
3	Finish Design Specifications and Benchmarking	Sandeep Sinha, Karen Hakko, Elsa La...	In Progress			
4	User benchmarking(Tri)	ttha074@uottawa.ca	In Progress			
5	Final Deliverable Edit	Elsa Lange	In Progress			
6	Deliverable D	Sandeep Sinha, Jacob Troop, Karen ...	New	24/01/2021	21/02/2021	29d
7	Deliverable E	Elsa Lange, Karen Hakko, Jacob Troo...	New	24/01/2021	28/02/2021	36d
8	Deliverable F	Sandeep Sinha, Jacob Troop, Karen ...	New	24/01/2021	07/03/2021	43d
9	Deliverable G	Elsa Lange, Karen Hakko, Jacob Troo...	New	24/01/2021	14/03/2021	50d
10	Deliverable H	Sandeep Sinha, Jacob Troop, Karen ...	New	24/01/2021	28/03/2021	64d
11	Deliverable I	Elsa Lange, Karen Hakko, Jacob Troo...	New	24/01/2021	08/04/2021	75d
12	Deliverable J	Sandeep Sinha, Jacob Troop, Karen ...	New	24/01/2021	26/03/2021	62d
	Deliverable K	Elsa Lange, Karen Hakko, Jacob Troo...	New	24/01/2021	11/04/2021	78d
14	Updating Tasks on Wrike	Sandeep Sinha	In Progress	11/01/2021	30/04/2021	110d
15	Meeting Minutes	Karen Hakko	In Progress	11/01/2021	30/04/2021	110d
16	To-do lists	Elsa Lange	In Progress	11/01/2021	30/04/2021	80d
17	Submission		New		18/01/2021	
22	Wrike		New	11/01/2021	18/01/2021	6d
23	Microsoft Excel		New	11/01/2021	18/01/2021	6d
24	Microsoft Word	Karen Hakko	In Progress	11/01/2021	12/01/2021	2d

References

"Ultralight Single Drone Recovery System: Marco Polo: Tracking and Recovery Solutions." *Marco Polo | Tracking and Recovery Solutions*, eurekaproducts.com/product/ultralight-single-drone-recovery-system/.

"Loc8tor Finder Tracker." *Loc8tor*, loc8tor.co.uk/.

Solutions, Eye Web. *SMRT AU10-HT PLB - Marine Rescue Technologies*, www.mrtsos.com/products/personal-locator-beacons/smrt-au10-ht.

"Flytrex Sky - Internet Drone: Flytrex Shop." *Flytrex*, x.flytrex.com/shop/flytrex-sky-internet-drone/.