

# Public Opinion of UAS Integration

## Abstract:

Recent innovations in both technology and regulations mean UAVs are rapidly moving forward and are expected to be introduced into communities for the delivery of goods and packages in the near future. The private sector is advancing UAV technology, and the public sector is preparing for its integration through new regulations and the determination of appropriate landing sites and other infrastructure needed for UAVs. However, prior research into the public opinion of the integration of this technology has been limited in depth and scope. As with any disruptive technology, public opinion is vital to UAVs successful integration. As a negative or positive public opinion of a project can massively influence the outcome of said projects, expanding this understanding will allow planners to know what engagement or education efforts can be made to aid the successful integration of vertiports. The purpose of this study is to gain a better understanding of the public opinion of the integration of UAVs in the Wasatch Front.

## Introduction:

The integration of UAV is dependant on infrastructure to facilitate ground-based interaction with UAV. If UAV succeed as a disruptive technology and blend themselves in with society, vertiports will become a necessary and commonly distributed element throughout our communities. Knowledge about the regulations, locations, benefits, and some impacts resultant of vertiports is rapidly developing in both the private and public realms. However, we have very limited ideas on the public perception of UAV, especially for widespread use in communities as an infrastructural transportation tool. Vertiports have even less research surrounding them because the concept as a realistic community element is a fairly new idea that has not spread far in public ideals. This study aims to understand the pre-existing negative or positive feelings in the general population. This is accomplished through a survey with 201 participants in the Wasatch front. The survey will collect a variety of base information to provide a basic idea of current public opinion and provide a launching point for further research. This survey will collect information regarding current knowledge regarding UAVs, uses for UAVs, locations for ground-based infrastructure, the number of drones that would be considered inappropriate, what people would use vertiports for, and baseline concerns and benefits of UAVs integration in the community through vertiports.

## Methods:

A survey was generated and distributed through Qualtrics. This survey was disseminated to 201 participants in zipcodes restricted to the boundaries of the Wasatch Front Metropolitan Planning Organization. The survey was restricted to the following quotas: Age: 20% 55+, 80% 18-55. Gender: 60% Female 40% Male, Income Up to 30% <50K, up to 55% 50-100k, up to 35% 100K+.

The complete survey is provided below. The question block for the maps is the same, so it is only listed once.

## Survey:

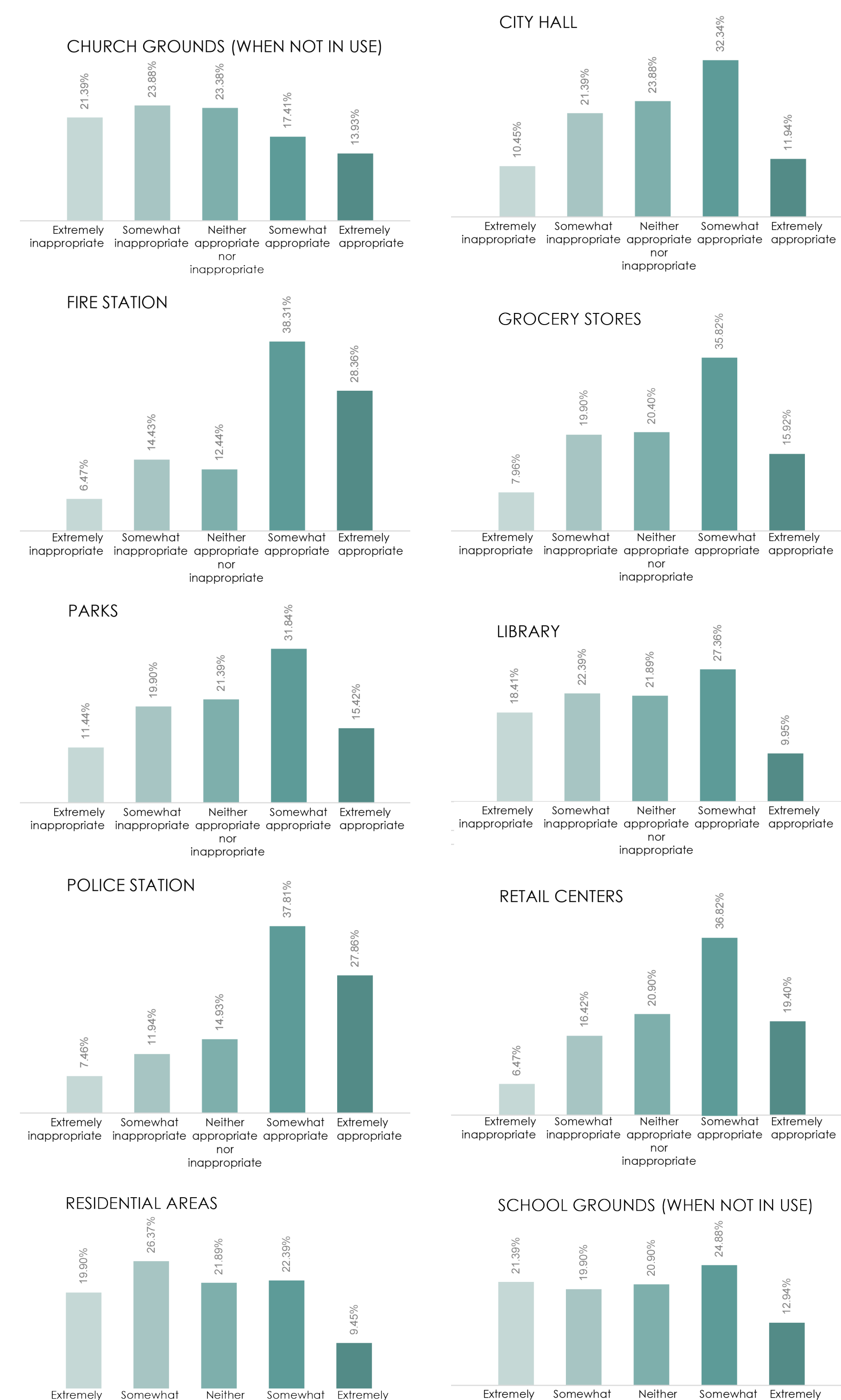
- Q1 What is your age?
- Q2 Please select your annual household income  
Less than \$50,000 / \$50,000 - \$99,999 / \$100,000+
- Q3 What is your gender identity?  
Man / Woman / Non-binary / Prefer to self-identify \_\_\_\_\_
- Q4 What is your zip code (five digits)?
- Q5 What race or races do you most identify with? (Check all that apply)
- American Indian/Alaska Native
  - Asian/Asian American
  - Black/African American
  - Native Hawaiian/Other Pacific Islander
  - White/Caucasian
  - Other (please describe)
  - Prefer not to answer
- Q6 What is the highest level of education you have completed?
- Did not complete High School
  - High School or High School Equivalent
  - Some College
  - Technical Certification(s)
  - Associate's Degree
  - Bachelor's Degree
  - Advanced Degree (Master's, Professional, Doctoral)
- Q7 Please describe your neighborhood.  
Rural / Urban / Suburban
- Q8 What type of house do you live in?  
Mobile Home  
Single Family Home (home not attached to another home)  
Townhouse/Duplex (home attached to one or more other homes)  
Apartment/Condo  
Other \_\_\_\_\_
- Q9 Do you know what drone (unmanned aerial vehicle) is?  
Yes / Maybe / No
- Q10 Have you seen a drone flying in public?  
Yes / Maybe / No
- Q11 Have you flown a drone?  
Yes (If Yes, What kind of drone was it? Toy drone (< \$300) Hobby Drone / Light Commercial (\$300 - \$3000) . Heavy Commercial (payload delivery, etc)  
No
- Q13 Have you ever owned a drone?  
Yes (If Yes, Please describe any drones you have owned)  
No

- What is a Drone?  
A drone is also known as a UAV, or an Unmanned Aerial Vehicle.  
You may have seen some UAV in your life already being flown by hobbyists or in a limited commercial usage, such as photography or maintenance.  
For the purposes of this study, we are focusing on commercial drones such as those used for package delivery. Imagine a drone to be about 3-5 feet across and as loud as a lawnmower or a leaf blower.
- Q14 For the purposes of this study, how loud are we considering a drone (select all that apply)?
- Garbage Disposal
  - Clothes Dryer
  - Leaf Blower
  - Lawnmower
- Q17 Which of the following would you consider appropriate uses for UAV? (select all that apply)
- Package Delivery
  - Food Delivery
  - Medical Supply Delivery (From Pharmacies)
  - Photography / Cinematography / Film
  - Hobby Flights
  - Emergency Support (Police, Ambulance, Fire)
  - Infrastructure Monitoring (Bridge & Powerline Inspection)
  - Entertainment (Light Shows)

- Q18 Many land use planning institutes are currently searching for the best way to support UAV for widespread commercial use.  
Vertiports will be one aspect of the new infrastructure developed for UAV.  
A vertiport is a center that gives UAV a place to safely land or take-off, and may provide some basic maintenance needs such as charging or shelter. There currently are no vertiports in Utah.  
For the purposes of this study:
- A vertiport is expected to be as small as a parking space, or as large as a tennis court
  - These vertiports will be used for residential package delivery.
  - The vertiport will not require an attendant.
- Q66 Please confirm, what is your zip code (five digits)?
- Q67 Please confirm your age

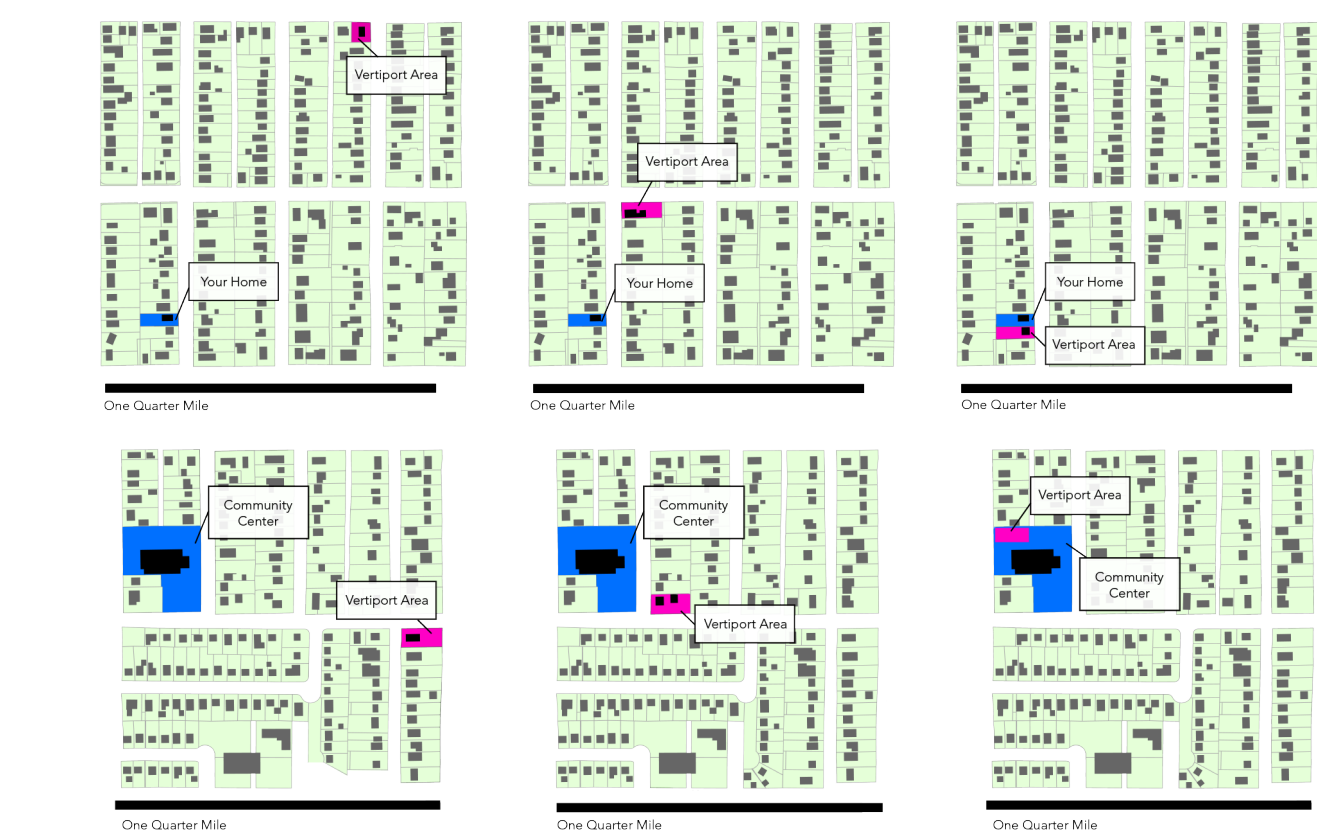
## Results:

Note: At the time of creation, this survey is still live. These results are pulled from raw data on April 9, 2021 that has not been checked for participant accuracy. As an entire analysis cannot be done at this time, specific datasets have been selected for presentation.



Q54 In your opinion, which of these is an appropriate location for a vertiport?

- Libraries
- Grocery Stores
- City Hall
- Police Station
- Fire Station
- Retail Centers
- Parks
- School Grounds (when not in use)
- Church Grounds (when not in use)
- Residential Areas (near housing)



- Why would you prefer so few drones use this vertiport?
- What are acceptable uses for this vertiport?
- Package You Receive
- Food Delivery
- Medicine You Receive
- Package You Ship
- How concerned are you about how close this vertiport is (to your home/ to this center)?
- A great deal
- A lot
- A moderate amount
- A little
- Not at all

- Q57 Please explain how concerned or comfortable you are with vertiports in your neighborhood? (On a 5 point scale from Extremely comfortable to Extremely concerned)
- Safety (Falling Drones)
  - Distractions (Drivers, Pedestrians)
  - Security (Privacy, Theft)
  - Visual Impact or Disruption to Community
  - Overall Concern

- Q58 How beneficial do you believe a vertiport could be in your neighborhood for these services? (On a 5 point scale from Extremely Beneficial to Not at all useful)
- Faster Delivery of Packages
  - Faster Delivery of Food
  - Faster Delivery of Medicine From the Pharmacy
  - Easily Ship Packages
  - Overall Benefit

## Appropriate Locations:

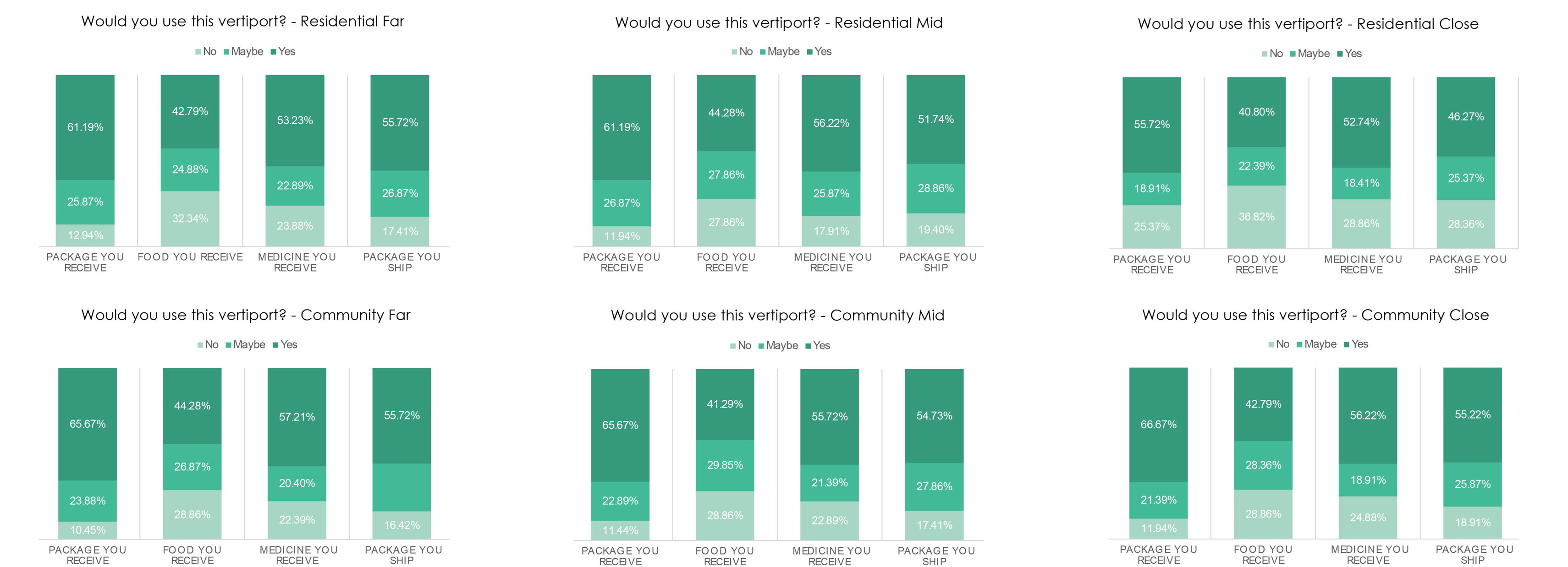
A sample of common community elements such as parks, retail centers, churches, and fire stations are presented as potential locations for vertiports. The participants are asked to rank these locations as either Extremely appropriate, Somewhat appropriate, Neither appropriate nor inappropriate, Somewhat inappropriate, or Extremely inappropriate. These results are then converted to a 5 point scale with Extremely appropriate equalling 5, and Extremely inappropriate equalling 1. The breakdown of the responses is provided to the left. Each chart is normalized to a 40% value. The larger the spike, the larger percentage of the community that feels that way. Answers with a large spike indicate a majority of the group feels a certain way, while fairly flat charts indicate that the potential use site would be met with contention if planned for construction.

Age Score: Libraries 2.88 Grocery Stores 3.32 City Hall 3.14 Police Station 3.66 Fire Station 3.67 Retail Centers 3.46 Parks 3.20 School Grounds (When not in use) 2.88 Church Grounds (When not in use) 2.77 Residential Areas 2.75

## Overall Benefits and Concerns:

To wrap up the survey the participants are asked to fill out two matrices. One matrix (shown on the right) rates the levels of concern about UAV and vertiports through safety, security, impact, and overall concern with a five-point system from extremely concerned to extremely comfortable. These graphs are all compared against a 45% baseline. Half of the participants have some concern with UAV overall, with the other half having no concern. Participants are mostly concerned with security from UAVs, a long-standing known concern. 62% of participants have some level of concern regarding the potential for driver and pedestrian distraction from these systems. 53% are concerned about the visual impact on their communities. Half of the participants have some level of concern regarding the safety of the systems.

The second matrix ranks the potential benefits from commonly expected residential uses of vertiports and UAVs. These are ranked on a scale from extreme benefit to not at all useful and are compared against a 30% baseline. 88.5% of participants expect some benefit from UAV integration. Medicine delivery is seen as the most beneficial use for residential-based vertiports. 80% of participants see some benefit from the delivery of food. Package shipping and delivery both see 10.45% of participants seeing no benefit from these systems whatsoever.

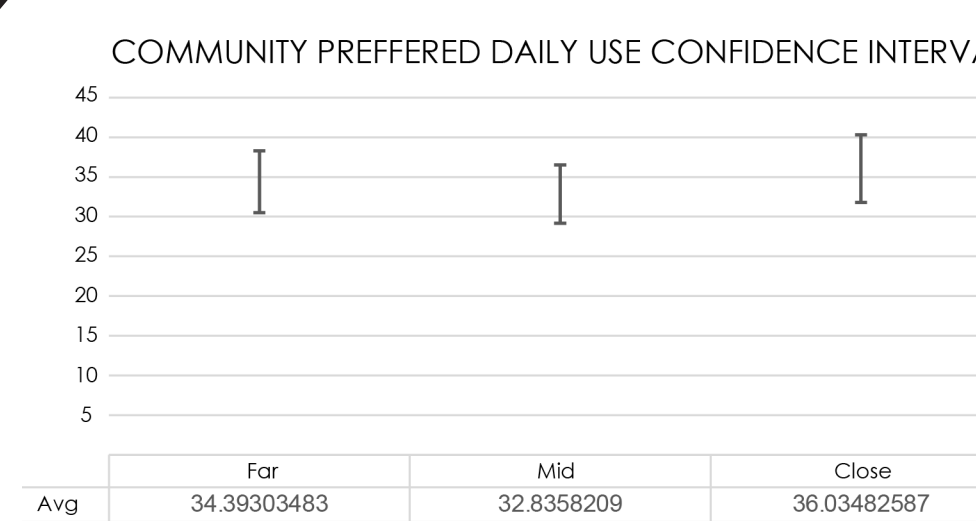
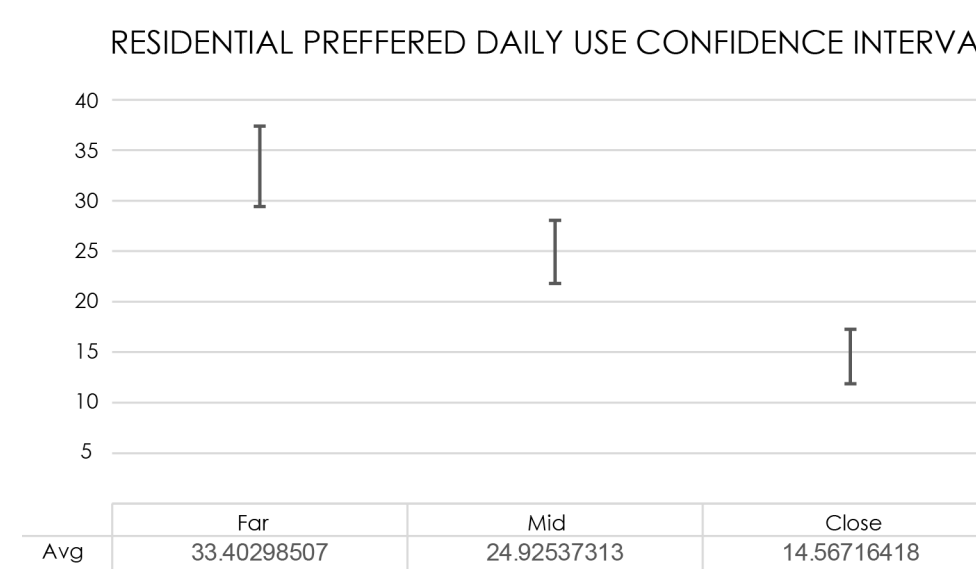


## Predicted Use:

Each map-based question block asked participants what would be an appropriate use for each vertiport, and their personal likelihood of use. The use types provided are package delivery, food delivery, medicine deliveries, and package shipping. Participants are asked to answer either yes, no, or maybe to each use type for each map. The breakdown of each result is shown above, with a deeper color indicating more positive feelings towards a vertiport. Residential vertiports saw a decline in "yes" answers based on distance. People found the use of the vertiport for many different uses to be more appropriate if they were further away from their house. Community center-based vertiports saw no significant change on use based on distance from the center.

## Preferred Daily Use:

Each map-based question block asked participants to use a slider from 0-100 to indicate how many drones should use the vertiport at the indicated site in their opinion. If a participant said five or fewer they were given the opportunity to explain their viewpoint. These responses will be analyzed at a later time. Using only the numeric values given, these scores were averaged against each other to get a base value. The confidence interval for the 201 responses was then found and graphed for the residential and community center based vertiports. The residential graph shows a clear decline in the number of UAV that should use a vertiport based on proximity to the participant's home in this study. Community based centers on the other hand showed no significant change in the number of drones using a vertiport based on distance. This indicates that NIMBY is clearly in effect here, as the decline in UAV is only seen in the residential use case.



## Participant Breakdown

Household Income	Gender
<\$50K	Men 40.79%
\$50-100K	35.82%
>\$100K	Women 59.21%

Ethnicity	Percentage
American Indian/Alaska Native	2.98%
Asian/Asian American	4.97%
Black	3.48%
Native Hawaiian/Pacific Islander	0.49%
White/Caucasian	86.07%
Other	0.49%
Prefer not to answer	0.99%

Education	Percentage
High school or equivalent	14.42%
Some College	26.36%
Technical Certification	2.98%
Associates	7.46%
Bachelors	26.86%
Advanced Degree	20.89%
Did not complete highschool	0.99%

Housing	Percentage
Rural	3.98%
Urban	22.88%
Suburban	72.63%
Single Family	71.14%
Townhome Duplex	6.46%
Apartment condo	19.90%
Other	1.49%
Mobile Home	0.99%

Participants that know what a drone is:  
Yes 89.5522%  
Maybe 3.9801%  
No 6.4677%

Participants that have seen a drone flying in public:  
Yes 79.10%  
Maybe 4.47%  
No 16.41%

31.34% of participants have flown a drone  
20.89% of participants have owned a drone

## Discussion:

There is a clear indication of NIMBYism (Not In My Back Yard) demonstrated in the limited analysis at this stage of the survey. Changing values based on proximity to the user's home, but not for community-based centers indicates that declining approval of UAV is based on the infringement on the participant's property and that in other cases UAV can provide a benefit to a community or to the participant. Future analysis of this data will further examine the answers provided to find other signifiers of NIMBYism or YIMBYism based on age groups, education, housing, zipcodes, race, and gender.

Common civic centers that are rarely used for general public use such as fire and police stations are the most popular potential site among those surveyed. Common centers already in communities such as churches and schools were some of the least popular potential vertiport sites. While the final decision on site location accounts for many factors such as regulatory restrictions, access to utilities, and existing elements these public opinions have an early chance to influence these future land use planning decisions as the participants' answers regarding potential uses and locations of UAV will feed into other studies being run by the author to site residential vertiports in the Wasatch Front.

While no easy confirmation was found, there is an indication that the mid-range community center distance was the least popular of the three distance locations. This warrants further study. One theory is that some participants value the ease of access, while others oppose the vertiport being close to the location in such a ratio to produce this effect on the mid-range site.

## Contact:

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more information.

