Usability test of a prototype UAS (Unmanned Aircraft Systems) awareness interface for public users

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UTM is being designed to allocate active management of aircraft to automation (with human involvement by exception).

Experience from manned aviation indicates a non-partisan traffic management system is necessary.

More support from automation will be needed to meet demand (airspace capacity).

Operators and stakeholders will collaboratively run the system.

UTM is focused on safely enabling small UAS (less than 55lbs) operations in low altitude airspace (Class G, <400ft).

Acronyms
sUAS = small Unmanned Aerial System
UAV = Unmanned Aerial Vehicle
How could the public find out about sUAS?

• The unmanned aircraft fleet of sUAS is forecast to reach 35 times that of manned aircraft in 2020

• The public will be recipients of, and therefore benefit from, sUAS services

• Focus groups indicated, with so many different services, the public would like to be able to find out about low altitude operations

• What do the public want to know about sUAS and how would they like to see that information?

From UTM Conops report v1.0 by the FAA (2018)
Suggested features of a public portal

- Map view
- City of operation, location within city
- Start and end time of flight, date
- Make and model of vehicle
- Position of vehicle*
- Mission / purpose/ kind of operation
- Emergency vehicles
- Live flight tracks with altitude, speed, location*
- Unique ID
- Payload
  - If a camera payload, the camera capabilities
- Ability to ask for more information
- How to contact the operator
- Vehicle is physically labelled
- Indication of a valid operation
- Data logging for later review & analysis (with delay)
- Marked high risk areas

* Many operators disagree that exact vehicle position should be shown to anyone outside their crew
A view into sUAS activity

Situation Display
- Map
- Operational volume
- Data tag
- Position of sUAS

Table
A prototype public portal tool

Map
Data
tag
Operational
volume
Position
of sUAS
Table
Drop down
of detailed
information
Study method

- Aim: to obtain the public’s opinions about the information, features and functions they would want in a public portal tool that shows sUAS activity.

- The scenario involved 83 sUAS flights in the SF Bay Area
- Discussion prompts:
  - 19 questions asking participants to find items of information in the scenario
    - 15 questions had definite answers, 4 were subjective
- 11 participants,
  - aged 21 to 70, 6 male & 5 female
- Minimal training, on purpose
- Participants watched the scenario & answered the 19 questions, commenting aloud if they were able
- They completed the SUS and a short survey
- Whole experience took approximately 1 hour
Drivers for 19 questions

• Reflect actions of a “typical user”
  • Finding information SfUAS flights in the SF Bay Area
• Have to go to all sources of information: map, data tag, table and drop-down table

• Use all of the search features: filtering, search by word, ordering, color coding
• 5 questions focused on San Francisco, 5 on Fremont and 5 on Oakland (2) and San Jose (3)
• Known frustrations: no “clear” function, have to back out of searches
87.8% of responses were correct
<10% of the incorrect responses were given for the first 5 questions
>60% of the incorrect responses were given for the last 5 questions
• On average, participants completed all 19 tasks in 23 min & 9 sec
• The quickest took under 14 minutes and the slowest nearly 40 minutes
• On average, the 15 non-subjective tasks took 71.3 seconds each
• The FRE tasks took longer ($\bar{x} = 100.3$ seconds) to complete than SFO ($\bar{x} = 59.2$ sec) or Oakland/San Jose ($\bar{x} = 54.3$ sec) tasks
• Why the difference? SFO tasks required fewer steps to complete, OAK/SJC had a task that repeated
Participant assessment of system usability

• Mean SUS score = 76.36
• Participants disagreed with negative items and agreed with positive items
Discussion findings

• Participants reported they were:
  – “satisfied” with the public portal tool ($\bar{x} = 5.7$ out of 7)
  – “rarely” had any difficulties finding information ($\bar{x} = 2.6$ out of 7)
  – the ability to identify UAS operations was “reasonably important” ($\bar{x} = 4.7$ out of 7)

• Distractions: no “clear all” feature, snap-to feature didn’t work
• Use terms laymen know
  • E.g., “payload” was not understood by all
• Note that sUAS operations aren’t taking place over cities right now
  • Participants had to project their opinions
• Personal privacy & data security
  • Greatest concern but applies to both operators and the public
  • No resolution reached
Summary

- 11 participants took part in a usability test of a prototype public portal tool
  - Looked for information on the interface (as answers to “typical” questions)

- Participants had an 87% success rate, completing the tasks in less than 30 mins

- Participants gave favorable ratings of the public portal tool

- Improvements in some functions and terminology required

- Amount of information could possibly be reduced
  - Which may help to address the issues of privacy
Thank you

Questions?

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