Automated Drone Sanitization to control COVID-19 Spread

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Abstract— Spraying of sanitizer through Drones is prioritized for Hot spots and Containment areas identified and it is followed by Isolation areas, Quarantined areas, Shelter Homes and other places where manual spraying is difficult. The areas where Drones are to be deployed is decided across Bhopal Smart City, Chandigarh, Raipur. The Drone team first visits the area planned to be sanitized for the day and makes a quick visual survey of the terrain, buildings and surroundings and chalks out a flight path to be followed by the Drone.

Using Drones for spraying of Sanitizers reduces time and covers large area which in turn reduces the spread of virus and ensures safety measures for Humans in spread of Covid-19.

Risk of Humans who handles manual sanitization is completely waived because of Automated spraying system by Drones.

Index Terms— Disinfectant , Drones, sanitizer, Covid-19, Sodium Hypochlorite, Control

1 Introduction

Introduction

The recently emerged SARS-CoV-2 has become a major global health problem. SARS-CoV-2 infections are accelerating exponentially across the world and the COVID-19 pandemic is continuing to create a challenging test for humanity. The outbreak of COVID-19 and the ensuing crisis has brought together the community of scientists, researchers, academicians, health professionals, inventors, innovators, technologists, policy makers and so on of India on a single platform to pursue solutions for challenges thrown by the COVID-19. Government of India is taking all necessary steps and launching various funding schemes to support R&D laboratories, private and public research labs, universities and educational institutes, students, startups, SME's, incubators, entrepreneurs, businesses, industries to focus on the development of COVID-19 solutions. Government of India, through its various ministries, departments, and funding organizations, has invited Calls for Proposals (CFPs) and Expression of Interests (EoIs) to augment the research and development-related activities. Government of India actively launched and implemented multiple initiatives through its various ministries, departments, and funding organizations aimed at screening and early detection of SARS-CoV-2 infections accurately, and rapid drug repurposing, providing training to young microbiologists on COVID-19 diagnostics and developing drugs and vaccines. Many creative, low-cost and hi-tech innovative solutions and technologies have been developed and a number of projects are at research and validation stage.

Methodology:
The Drone is filled with the chemical solution consisting of 1% Sodium Hypochlorite, [NaOCl], the drones is then calibrated and set ready to fly. Drones are then flown using a remote-control device by the experienced Drone Pilots in the planned flight path, simultaneously spraying the Sanitizer through its four Nozzles.After every flight (lasting approximately 15 to 20 minutes) the Drones are called back for refilling the Chemical and replacing the battery pack. The Drones are then moved to the next location to resume the flying/spraying. The flight path of the drones and the area covered are controlled and recorded in a hand held device with GIS maps on the backend which is plugged to the remote controller. The vehicles used for Drone Operations are fitted with GPS and GSM based wireless cameras using which the entire movement of Drones and their operations are centrally monitored from the Kashi. Integrated Command and Control Centre, now converted to COVID

Figure 1. Drone operations in cities

Sanitization Process:
Step 1: Turn on Transmittor
Step 2: Turn on Aircraft
Step 3: Verify established connection
Step 4: Position antennas
Step 5: Verify display panel
Step 6:Calibrate Inertial Measurement Unit
Step 7: Calibrate Compass
Step 8: Verify Battery and fuel level
Step 9: GPS access
Step 10: Fill spray tank
Step 11: go spray

Results and discussion

The Characteristic of Disinfectant are as follows:

- Provide wide germicidal activity but are corrosive.
- Limited activity when in the presence of organic matter.
- Poor residual activity, low toxicity, but may stain surfaces.
- Not effective as sporocidal agents.
- Effective at low concentrations for disinfecting clean, small objects.

The sanitized areas have been mentioned below.

COVI-19 +VE Case on 19-04-2020 till 25-04-2020
Before Drone sanitization – 1118 Nos

COVI-19 +VE Case on 26-04-2020
After Drone sanitization – 1076 Nos

Table 1. Sanitized areas using drone in Chandigarh, Raipur & Bhopal

S.No	Sanitized Areas in Chandigarh	Area in Acre	Sanitized Areas in Raipur	Area in Acre	Sanitized Areas in Bhopal	Ar in Ac
1	Maloya Colony – A	01.23	Mekhara Hospital	15.82	Peer Gate	12
2	Maloya Colony – B	10.13	Officers Colony	15.32	Bhopal smart city corp.Ltd Building	6.
3	Sahibzada Ajit Singh Nagar	46.72	Devendar Nagar	19.02		
4	Bair Majra	10.62	Samta Colony-A	29.40		
5	Sector 45 – A	01.72	Samta Colony-B	12.60		
6	Sector 45 – A	01.72				
7	Mauli Jagran	75.36				
8	Vikas Na-gar	37.06				
9	Daria	37.06				
10	Buterla, Sector 41B	15.56				
11	Buterla, Sector 41B	42.25				
12	Sector 26 East	40.77				
13	Dhanas-A	22.23				
14	Dhanas-B	18.78				

Figure 2. Location - 1: Maloya Colony – A – 01.23 Acres

Figure 3. Location - 2: Maloya Colony – A – 10.13 Acres

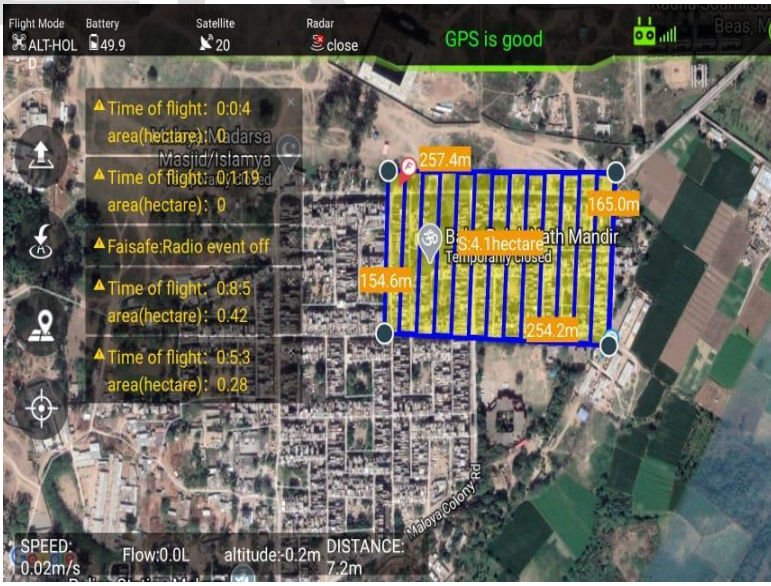

Figure 4. Location – 3: Sahibzada Ajit Singh Nagar - 46.70

Chandigarh Sanitization Disinfectant Used:

- Disinfectant used per acre – 2.ltrs

o Total Disinfectant Used – 394 X 2 = 788 ltrs

Figure 5. Location 4: Bair Majra – 10.62 Acres

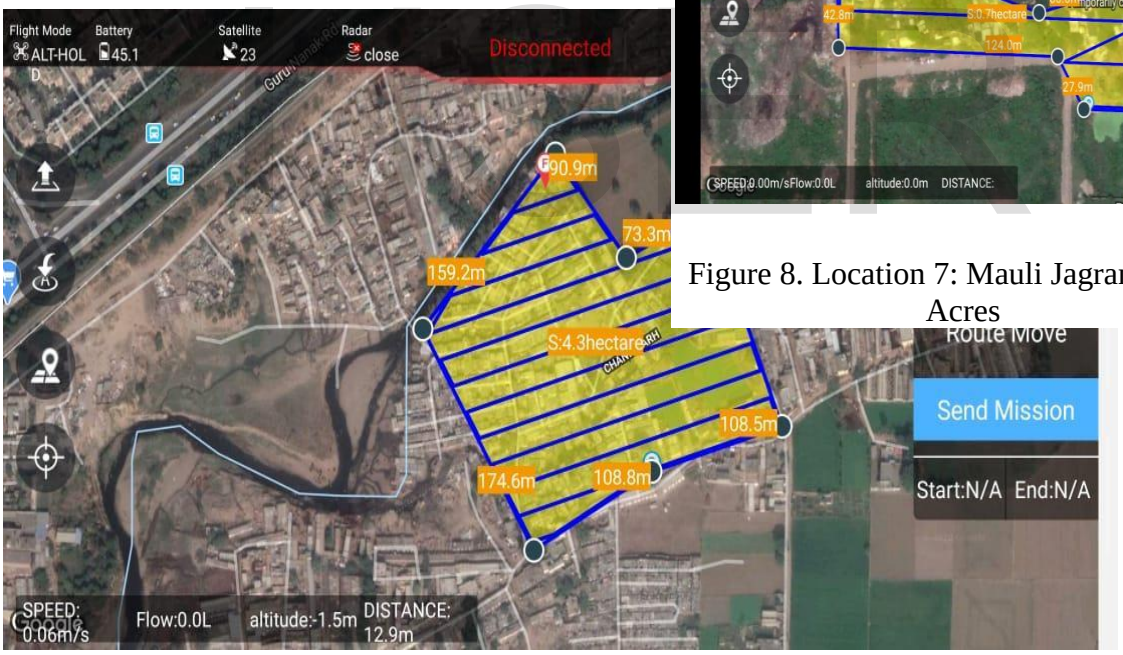

Figure 6. Location 5: Sector 45 – A – 01.72 Acres

Figure 7. Location 6: Sector 45 – B – 01.72 Acres

Figure 8. Location 7: Mauli Jagran – 75.36 Acres

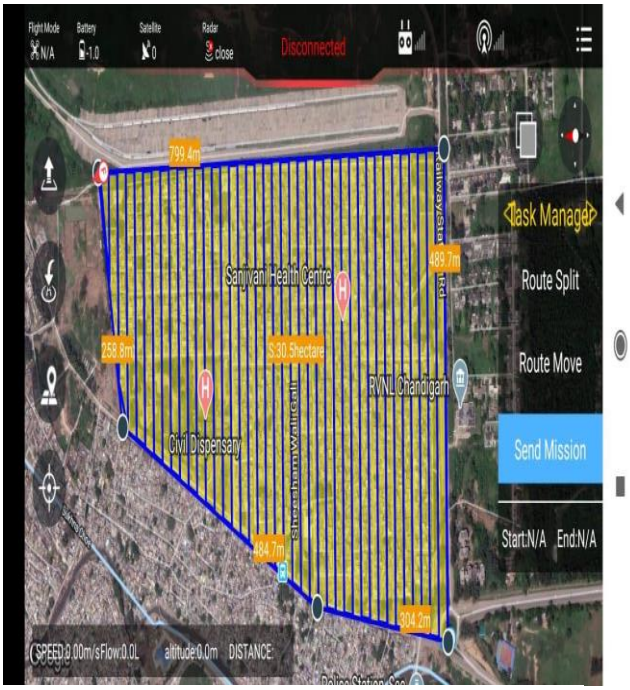

Figure 9. Location 8: Vikas Nagar – 37.06 Acres

Figure 10. Location 9: Daria – 37.06 Acres

Figure 11. Location 10: Buterla, Sector 41B – 15.56 Acres

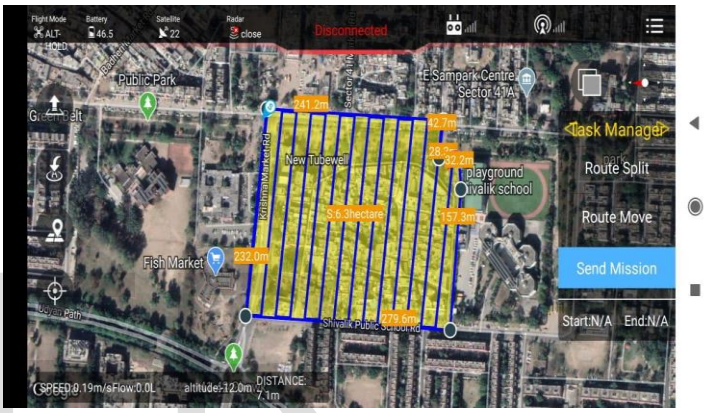

Figure 12. Location 11: Badheri Sector 41 – 42.25 Acres

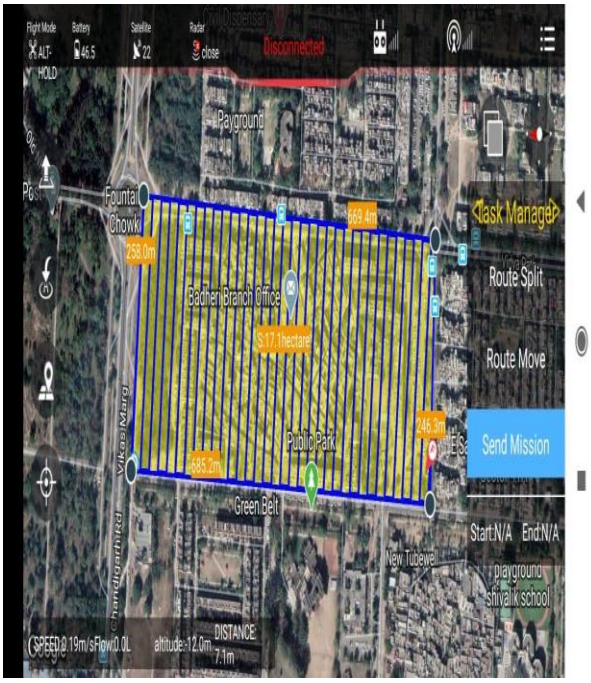

Figure 13. Location 12: Sector 26 East– 40.77 Acres

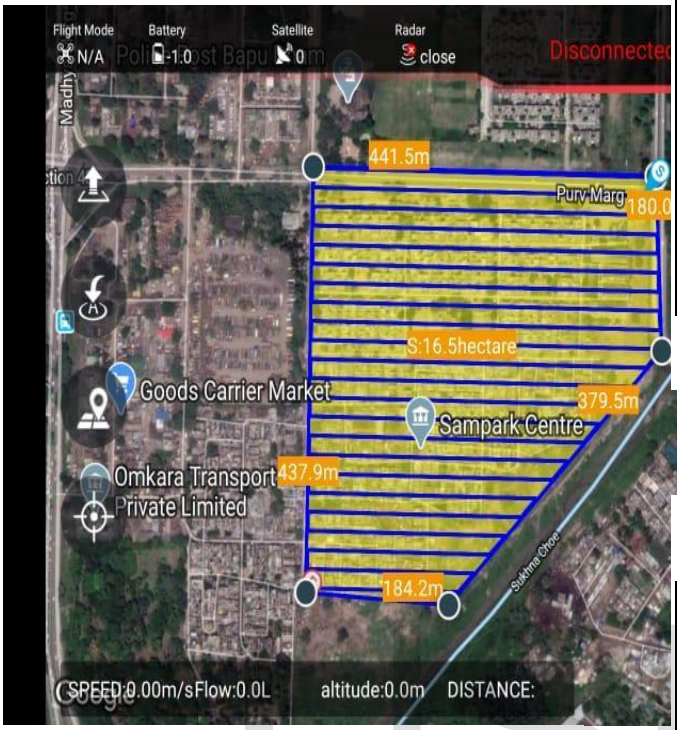

Figure 14. Location 13: Dhanas – A – 22.23 Acres

Figure 15. Location 14: Dhanas – B – 18.78 Acres

Table 2. Sanitized areas using drone in Raipur

Figure 16. Location - 1: Mekahara Hospital, Raipur - 15.82 Acres

Figure 17. Location - 2: Officers Colony - 15.32 Acres

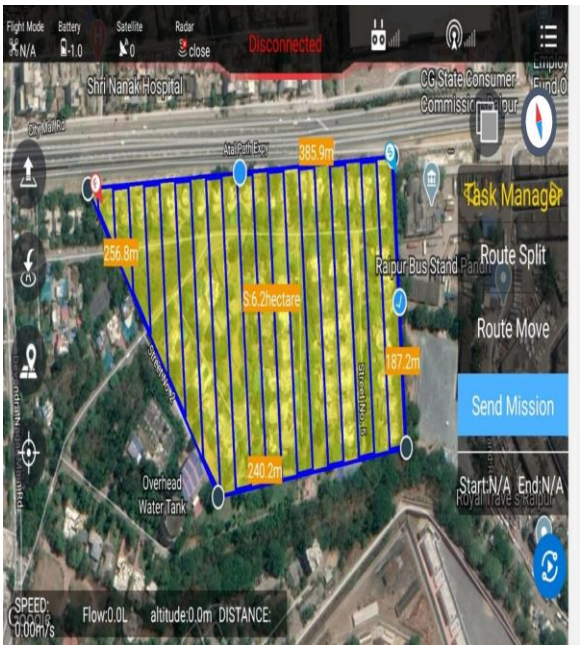

Figure 18. Location – 3: Devendar Nagar - 19.02 Acres

Figure 19. Location 4: Samta Colony: A – 29.40 Acres

Figure 20. B – 12.60 Acres

Table 4. Conditions during sanitization operation

	Bhopal	Chandigarh	Raipur
Temperature	41 °C	35 °C	40 °C
Humidity	11%	27%	19%
Wind Speed	10Km/h	10Km/h	20Km/h
Atmospheric Pressure	1007 Mb	1011 Mb	1009 Mb
Sedimentation rate of the Disinfect-	76.31 %	76.31%	76.31%

ant			
Diameter of Spray	10 to 15ft	10 to 15ft	10 to 15ft
Effective-ness Measure-ment Ratio Per.sqm of our Total Spraying	30 ml	30 ml	30 ml
Disinfect-ant using drone to Actual Dis-infectant reaching Ground	10 X Less-er time	10 X Less er time	10 X Lesser time
Effects of Different Dilution ratios On the Effec-tiveness % Ratio	1:10 Ratio	1:10 Ra-tio	1:10 Ratio
Effective-ness %	05 to 5.25 %	05 to 5.25 %	05 to 5.25%

Figure 21. Location 1: PreeGate – 122.3Acres

Figure 22. Location 2: Bhopal Smart City Corp.Ltd, Building – 6.6Acres

Bhopal Sanitization Disinfectant Used:

- Disinfectant used per acre – 2.ltrs
  o Total Disinfectant Used – 129 X 2 = 258.ltrs

COVID-19 +VE Case on 30-04-2020 Before Drone sanitization – 227 Nos

COVID-19 +VE Case on 31-04-2020 After Drone sanitization – 146 Nos

Based on Temperature, humidity & pressure prevailed , 75-87% success rate was achieved with a doubling time of 11 days.


भोपाल में पहली बार ड्रोन से सैनिटाइजेशन शुरू

एक बार में ड्रोन से पांच एकड़ में होता है छिड़काव

10 बड़ा निगम के सैनिटाइजेशन के काम लगे हैं

50 छत्तीसगढ़ नगर निगम के दे रहे हैं संकेत

गरुड़ एयरो स्पेस नामक एजेंसी को किया गया है अनुबंधित

जबलपुर से आई विशेषज्ञों की टीम कर रही ड्रोन से सैनिटाइजेशन का संचालन

Conclusion

From the above results it has been concluded that by employing drone based sanitization the number of positive cases has been reduced in Chandigarh with total area of 395

acres, Bhopal with total areas of 129 acres and Raipur with total areas of 92.16 acres and the positive cases has reduced from 1118 to 1076 in Chandigarh, 227 to 146 in Bhopal and in Raipur 1118 to 1076. Drone based Sanitization operations had a great impact in these above mentioned cities as this drone spray can be 50 times more efficient than people spraying.
Drone sanitization procedures under these circumstances will be mandatory all across india to ensure control of virus.
This will help to keep clean and neat India forever

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