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Design and Fabrication of Dropship Rover Marine and Terrestrial (DRMAT) Vehicle

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ABSTRACT: Drones have long been described as optimally suited to perform the “3-D” missions, often described as dirty, dull, and dangerous. They can provide needed aerial data in areas considered too hazardous for people on the ground or for manned aircraft operation, such as sites with nuclear radiation contamination or in close proximity to wildfires. Drones can also deliver needed supplies and relay Wi-Fi and cellular phone service when communications are needed the most. This paper will discuss how drones and the aerial data they collect can be used before, during, and after a disaster. It includes an overview of potential solutions and deployment models, as well as, recommendations on removing regulatory barriers to their use. This research propounds why the proposed model: DRMAT is the simple and clear answer to many technological, environmental and public issues, as this is easily modifiable and made compatible to new software and hardware changes. This paper describes how we could stay up to date with latest technology while saving costs, decreasing investments and fighting the need for completely changing the base structure of drop ship rovers.

KEYWORDS: Drones, Rover, Aircraft, Hexa-copter, Efficiency.

I. INTRODUCTION

DRMAT has a base of Hexa-copter and body of a rover. A Hexa-copter is a multi-rotor aerial and vertical takeoff vehicle. This aircraft is powered by six basic motors. A Hexa-copter is classified as a rotorcraft, as opposed to fixed wing aircraft since it derives its power from the six motors. The Hexa-copter has a sophisticated flight control system to eliminate inherent instability by the minor differences in thrust and reaction torques exerted by motors.

In Hexa-copter unlike other helicopter model or multi- rotorcraft models, strikes the perfect balance of great thrust and lucid moment in aerial activity. This is done by the complicated flight system controls as well as the interchangeable propeller lengths, which can be used for different applications. Unlike traditional multi-rotor crafts, every rotor plays a role in direction and balance of the vehicle as well as lift. The Hexa-copter thus can easily lift large weights and have great maneuverability at a lower power loss, without overheating. This setup allows the carrying of tanks, which are capable of carrying agricultural pesticides, fertilizers, herbicides, fungicides. These are harmful chemicals, which may cause damage to the health of the farmers, which can be avoided by the use of the proposed DRMAT.

The rover has an arm attached to it, with a good range and sensors of high accuracy are incorporated. This rover has a base of a water ski and the electronics are completely water proofed with the help of ‘OLEG Rust Proof’, which uses Nanotechnology. This allows the rover to act completely as an amphibious vehicle thus countering the damage caused to the vehicle during floods and heavy rains.

II. LITERATURE REVIEW

The inspiration for DRMAT was the *Curiosity dropship* of NASA, which was launched on 2004 to reach mars and Star Tiger project dropship quadcopter, which gently lowers a rover onto a safe patch of the rocky Martian surface.

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Star Tiger's Dropter project was tasked with developing and demonstrating a European precision-landing capability for Mars and other targets. The Sky crane that lowered NASA's Curiosity rover onto Mars showed the potential of this approach, precisely delivering rovers to their science targets while avoiding rock fields, slopes and other hazards.

Research was conducted for one year by a company called 3d Robotics. They flew drones on farms and got input from farmers about what they wanted to get out of a drone. They learned that there will probably need to be specialized programs for different types of crops and livestock because every plant and livestock has its own individual needs. They also learned about what would be convenient to the farmers. Drones that can take off and land anywhere are ideal since very few farms have the space for a landing strip. An app android or iPhone would be ideal so farmers do not have drag computers out to their fields. Having drones go on "auto missions" rather than farmers having to control them would also be ideal. Many farmers want the ability to capture video as well as stills and they want something that is time efficient. Many of these points will have to be further researched and developed before the ideal drones can be created.

Aerial drones are one of the most promising and powerful new technologies to improve disaster response and relief operations. Drones naturally complement traditional manned relief operations by helping to ensure that operations can be conducted safer, faster, and more efficiently.

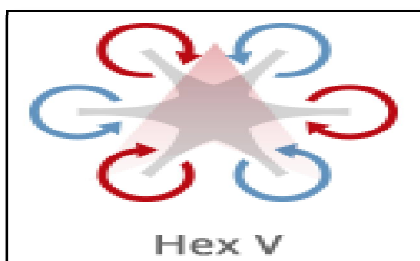
When a disaster occurs, drones may be used to provide relief workers with better situational awareness, locate survivors amidst the rubble, perform structural analysis of damaged infrastructure, deliver needed supplies and equipment, evacuate casualties, and help extinguish fires—among many other potential applications.

In advance of an emergency, drones are able to assist with risk assessment, mapping, and planning. When individuals, businesses, and communities are able to understand and manage risks and plan effectively, they reduce overall damage and losses. Rebuilding and recovery are then able to begin more quickly and ultimately strengthening the resiliency of communities.

III. DESIGN OF HEXACOPTER

Design Methodology: Design includes the following.

- Co-axial Hex copter with open propellers and Hexa V design
- For different applications different materials will be used as in case of Electrical applications a casing of mu metals will be used
- For different purposes different propellers will be used



(a)



(b)

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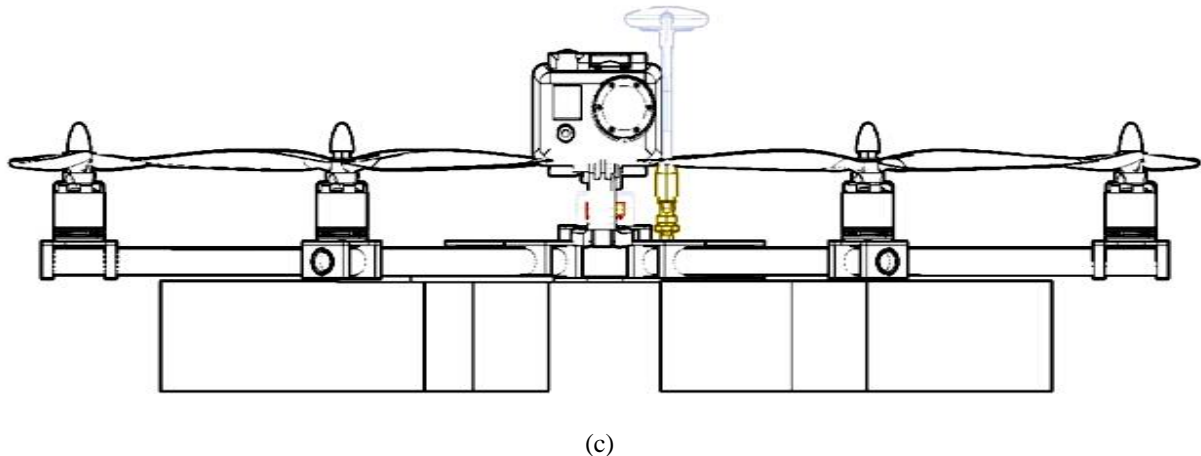


Fig. 1. Design of the Hexa-structured DRMAT(a) General Design of hexa-copter (b)CAD design of DRMAT (c) CAD side view for Agricultural applications of DRMAT

Electronic System Design and Specifications

The KK 5.5 electronic speed control system as it is easy to modify to access the complex microprocessor, which we are using to control hex-copter and the varying propellers used for the different applications of DRMAT.

Motors: In multi rotorcrafts, usually the motors, which are used, give a thrust of about 400 grams per motor, but due to the high amount of payload we carry, we use motors and propeller combinations varying from 800 grams to 3.3 kgs and with an rpm varying from 5500 to 6700 at 100% power. We use motors of 400 kV dc out runner type motors, which use the simple principle of attraction and repulsion cycles with a sensor in built. In addition, for rover we use servomotors and for arm, we use high thrust motors.

Propellers: DRMAT utilizes different propellers for different applications; in case of agricultural applications, DRMAT utilizes 17*5 CF blades, which produce a thrust of 3.3 kgs and rpm of 6000, which gives high stability and ability to carry large payloads. In the case of Electrical applications, we use 16*5 CF, which gives maneuverability, and carry enough payloads and in the case of Natural calamities, we use a 15*5 CF, which gives high maneuverability and great torque during heavy winds.

Power Supply: The multi rotorcrafts usually use 2000mah batteries with 15C C ratings, which bumps up the power to 30AH, which gives up to varying from 5 -10 minutes of flight time for our configuration of motors. We use two 16000mah 6S LiPo batteries connected in parallel with 15C rating, which bumps up the total battery capacity to 480 Ah, which gives a flight time of about 60 to 81 minutes.

Microcontroller: DRMAT utilizes the micro controller Raspberry pi model b with 1 MHz clock speed this boosts up the computing capacity and further more is done by octa core processor this used for speech inter face and hd video signaling between the machine and user, Arduino sensory board with teensy board is used for the sensory operations of DRMAT. We are using google gps mapping with grid system algorithm to cover an area land.

Automation: Following pre-designed accessories are required for the automation of DRMAT

GPS: The rating of GPS is depends on the accuracy of the equipment

Altimeter: used to measure the height of the copter at particular location

Speedometer: Pitot tube is used for this purpose.

Gyroscopes: will be used for finding and correcting the attitude of the DRMAT

Accelerometer: Will be used to find acceleration, Velocity and displacement.

Pesticide Tank: Pesticide tank and spray nozzles with servo opening system.

The frame: carbon fibers with epoxy resin in tubular form

The Propeller: Aerodynamic thrust generation and proper balancing capable propellers

Electronic Speed Controller: This will be acquired as per our requirements

Field Testing: To be carried out to assess the intelligence and proper automation of work.

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IV. APPLICATIONS OF DRMAT

Applications of DRMAT: Electrical domain

For heat zones in the transmission lines, we are still using the same climb and replace methods of old days we need new automated technology in this field, as those old methods are highly uneconomical and dangerous.

Electrical burns are associated with significant morbidity and mortality, which are usually preventable with simple safety measures. An observational retrospective study of non-lightening electrocution deaths was conducted in Lucknow, India between 2008 and 2012. Out of 83 deaths, 71 investigated were accidental and the rest were suicidal. The age range was 11 months to 75 years with a mean age of 28.9 ± 12.5 years.

Deaths were caused most frequently by touching an electrical wire (35 cases, 41.9%). There was an increase in electrocution deaths in the months of July–September (32 cases, 39%). About 50 cases (60.7%) were dead at the scene of the accident and 33 cases (31.9%) were dead on arrival at the hospital. The unique findings of this study include 12 cases (14.4%) of suicidal electrocution and a high rate of work-related accidental electrocution. Death rates from electrocution among all medico-legal deaths were found to be lower in this study than in previous reports, most of them were work-related and preventable. Workers and their employers should be educated to avoid such accidents with safety measures.

To monitor the running conditions and find out the damages of the power grids, the robotic technologies have been applied to conduct the inspection tasks of power transmission lines (PTLs) instead of worker or helicopter. Supported by the national high technology research and development program of China from 2002, the state key laboratory of robotics, Shenyang institute of automation, Chinese academy of sciences (SIACAS), has been focusing on the development of the inspection robot for 500kV extra high voltage (EHV) PTLs. Up to now, three generations of the inspection robot prototypes have been developed. In this paper, an overview of the research for these prototypes by SIACAS is given. Then, two latest developments, which include a PTLs inspection robot and an insulator detection robot, are introduced respectively. The key technologies such as mechanism, control system, and operation modes, are described in detail. Field experimental results show that the robot prototypes can carry out the practical inspection tasks for 500kV EHV PTLs.

Applications of DRMAT: Agricultural domain

Experts believe that chronic low-level pesticide exposure is associated with a broad range of nervous system symptoms such as headache, fatigue, dizziness, tension, anger, depression, and impaired memory, Parkinson's disease, and Alzheimer's disease, among others.

Pesticides are used extensively throughout the world in agriculture and in pest control as well as for community health purposes. Organophosphate (OP) pesticide self-poisoning is an important clinical problem in rural regions of the developing world that kills an estimated 200,000 people every year. Unintentional poisoning kills far fewer people but is an apparent problem in places where highly toxic OP pesticides are available. Neurologic dysfunction is the best documented health effect of pesticide exposure. High-level exposure has both acute and long-term neurologic signs and symptoms, and adverse effects have been reported in most type of pesticides, including organophosphate (OP), carbamate, organochlorine, and pyrethroid insecticides, herbicides, fungicides, and fumigants. Acute OP pesticide exposure can involve in wide range of both central and peripheral neurologic symptoms. Increased neurologic symptom prevalence may provide early evidence of neurologic dysfunctions, before clinically measurable signs are evident.

In this study, we analyzed the cross-sectional data on neurologic signs and symptoms from 225 rural children, both males ($n = 132$) and females ($n = 93$) who were occupationally and para occupationally exposed to methyl OPs (dichlorvos, fenthion, malathion, methyl parathion) and ethyl OPs (chlorpyrifos, diazinon, ethyl parathion) as they belonged to agricultural families handling, mixing, and spraying the OP pesticides. The children completed a specially designed questionnaire (Q16) on neurologic symptoms associated with pesticide exposure with their parental help. A suitable reference group consisting of rural children ($n = 50$) never involved in pesticide handling (neither outdoor nor indoor) belonging to similar socioeconomic strata included in the study to compare the prevalence of various neurologic symptoms between the two groups.

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Among all the neurologic self-reported symptoms, headache, watering in eyes, and burning sensation in eye/face were the most important clinical manifestations attributed to OP pesticide exposure. These symptoms could probably be the consequence of chronic effects of most pesticides on the central nervous system. The muscarinic symptoms reported the maximum prevalence of salivation (18.22%), whereas lacrimation was observed in 17.33% cases, followed by diarrhea in 9.33% cases. The nicotinic clinical manifestations of acute OP poisoning revealed excessive sweating in 13.78% cases and tremors in 9.3% cases followed by mydriasis in 8.4% exposed children. Both male and female exposed children also reported the characteristic cholinergic symptoms, such as insomnia, headache, muscle cramps, weakness, and anorexia. The high frequency of neurologic symptoms observed in the study may be due to parasympathetic hyperactivity due to the accumulated ACh resulting from AChE inhibition.

The pesticides and insecticides cause respiratory problems to the farmers and their families and mental illness to their children, but with the help of DRMAT we can combat this problem with the process of Aerial spraying using this hexa-copter.

Applications of DRMAT: Disaster Management and Military

During natural calamities, the NDRF and many volunteers of NGOs respond but are not effectively receiving the information regarding the remote areas. The Government of India has launched separate platforms for communication between these groups, which solves 50% of the problem, but there is a huge lag in reconnaissance of these areas, which causes the increasing death tolls, and also loss of huge amounts of property and total failure of response. There are many unwanted and unwarranted deaths of volunteers due to their bravery during natural calamities, just keep the information flowing. DRMAT will completely reduce the number of volunteer's human sacrifices for gathering information through aerial supervision of calamity stricken areas. Unlike regular drones, this has an interactive system, which helps in interacting with the victims.

DRMAT is not only completely reliable during heavy rains but also possesses capability of water landing during adverse conditions such as Tsunamis due to complete water proofing and possessing a base in the shape of a water ski. In Military applications like bomb detection, this possesses a comprehensive high power radar system, which detects and displays any kind of metallic objects and displays in three-dimensional (3D). The arm on the rover possesses powerful sensors, which are capable of detecting even the minute movements and temperature changes.

V. CONCLUSION

DRMAT has proven to be an efficient model, which can completely isolate the potential threat posed by the chemicals through complete auto machine of the drone this not only saves the danger caused by these chemicals to the farmers but also reduces the time required to spray. Since DRMAT is completely insulated with a material called MUW metal, which is completely nonmagnetic material, it is better in efficacy. This also insulates the electrical parts of the drone from eddy currents and mutual induction of motors and completely disrupting the system with this there is no need for a Helicopter management and human endangerment because it can simply spray over the high tension lines from hot zones. As DRMAT completely reduces the human sacrifices for gathering information through aerial supervision of calamity stricken areas, it is concluded that DRMAT could be one of the most sophisticated and sought for model in the near future, with betterments possible to be made to its structure that helps enhance its performance characteristics.

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ANNEXTURE I

Table. 1. List of Major Natural Calamities since 2000.

Sl.No.	Name of Event	Year	State & Area	Fatalities
1.	Sikkim Earthquake	2011	North Eastern India with epicenter near Nepal Border and Sikkim	Most recent disaster
2.	Cloudburst	2010	Leh, Ladakh in J&K	
3.	Drought	2009	252 Districts in 10 States	-----
4.	Floods	2009	Andhra Pradesh, Karnataka, Orissa, Kerala, Delhi, Maharashtra	300 people died
5.	Kosi Floods	2008	North Bihar	527 deaths, 19,323 livestock perished, 2,23,000 houses damaged, 3.3 million persons affected
6.	Cyclone Nisha	2008	Tamil Nadu	204 deaths
7.	Maharashtra Floods	2005	Maharashtra State	1094 deaths 167 injured 54 missing
8.	Kashmir	2005	Mostly Pakistan, Partially Kashmir	1400 deaths in Kashmir (86,000 deaths in total)
9.	Tsunami	2004	Coastline of Tamil Nadu, Kerala, Andhra Pradesh, Pondicherry and Andaman and Nicobar Islands of India	10,749 deaths 5,640 persons missing 2.79 million people affected 11,827 hectares of crops damaged 300,000 fisher folk lost their livelihood
10.	Gujarat Earthquake	2001	Rapar, Bhuj, Bhachau, Anjar, Ahmedabad and Surat in Gujarat State	13,805 deaths 6.3 million people affected

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ANNEXTURE II

Table. 1. List of Major Terrorist Incidents/Bomb Blasts since 2000.

Date	Incident	Location	Fatalities	Injured	Status of case (Arrests made/ Cracked/ Verdict given)
May 13, 2002	<u>2002 Jaunpur train crash</u>	N/A	12	80	
December 21, 2002	<u>Kurnool train crash</u>	Andhra Pradesh	20	80	
September 10, 2002	<u>Rafiganj train disaster</u>	<u>Bihar</u>	130	300	
July 28, 2005	<u>2005 Jaunpur train bombing</u>	N/A	13	50	
May 13, 2008	<u>Jaipur bombings: 9 bomb blasts along 6 areas in Jaipur</u>	<u>Jaipur</u>	63	200	
July 26, 2008	<u>2008 Ahmedabad blasts: 17 serial bomb blasts in Ahmedabad</u>	<u>Gujarat</u>	29	110	arrests made
September 13, 2008	<u>13 September 2008 Delhi bombings: 5 bomb blasts in Delhi markets</u>	<u>Delhi</u>	33	130	
September 29, 2008	<u>29 September 2008 western India bombings: 10 killed and 80 injured in bombings in Maharashtra (including Malegaon) and Gujarat bomb blasts</u>	<u>Maharashtra</u>	10	80	
October 1, 2008	<u>2008 Agartala bombings</u>	<u>Agartala</u>	4	100	
October 30, 2008	<u>2008 Assam bombings</u>	<u>Assam</u>	77	300	
November 26, 2008	<u>2008 Mumbai attacks</u>	<u>Mumbai</u>	171	239	verdict given
February 13, 2010	<u>2010 Pune bombing</u>	<u>Pune</u>	17	60	
July 13, 2011	<u>2011 Mumbai bombings</u>	<u>Mumbai</u>	26	130	
September 7, 2011	<u>2011 Delhi bombing</u>	<u>Delhi</u>	19	76	
February 21, 2013	<u>2013 Hyderabad blasts</u>	<u>Hyderabad</u>	16	119	

REFERENCES

1. PIC Microcontroller Projects in C, Second Edition: Basic to Advanced ISBN-13: 978-0080999241
2. Drone University by John Glover ASIN: B00NOGSQPS

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(A High Impact Factor & UGC Approved Journal)

Website: www.ijirset.com

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3. Ridding the world of pops: a guide to the Stockholm convention on persistent organic pollutants, United Nations Environment Programme, April 2005
4. Pesticides the impacts of pesticide exposure by Margarita stoychevo ISBN : 978-353-307531-0
5. Gibbs guide to lithium polymer batteries by Andrew Gibbs
6. Design and Analysis of modern tracking system by Samuel Blackman and Robert Popoli ISBN : 978-1580530064
7. Wave form design and diversity for advanced radar systems by AntonnioDemayo, Fulviogini, Lee patton ISBN : 978-1849192651
8. The beginners guide to FPV by Alex proto Gerellis ISBN : 978-1300820000
9. Building multi-copter video drones. By Ty Audronis ISBN : 978-1782175438