

# Simulation of Infrasound Birds Deter to Avoid Bird Strikes in Airports

Vibisha Merphy.V.B<sup>1</sup>, Sathish.D<sup>2</sup>

U.G. Student, Department of Aerospace Engineering, Periyar Maniammai University, Vallam, Thanjavur, India<sup>1</sup>

Assistant Professor, Department of Aerospace Engineering, Periyar Maniammai University, Vallam, Thanjavur, India<sup>2</sup>

**ABSTRACT:** Bird strike possess a major hazard to aviation industry. Even though bird strikes are as old as aviation industry, its impact still remains the same. Bird strike possess risk to human life and also damages to the aircraft. Since 1988 these kind of collisions have resulted in loss of more than 200 human lives, civil and military aircrafts. Airport managers and other officials have taken significant steps to avoid aircraft collisions with wildlife. Numerous techniques are used to prevent bird strikes. Some techniques such as use of chemical repellents are harmful to birds and also it may result in fatal injuries to birds. Hence it is necessary to use techniques that does not possess any threat to birds. In this technique infrasound is generated to deter birds away from the airport. Normally infrasonic waves are generated during earthquake, birds find these waveforms as unstable weather conditions and move away from that particular place.

**KEYWORDS:** Bird strike, repellent technique, Infrasound.

## I. INTRODUCTION

A repellent technique has been developed to deter birds away from a particular place by generating infrasound. Sound can be classified into three types as (i) Infrasound, (ii) Audible sound, (iii) Ultrasound. The sound which can be heard by humans is called as audible sound and the frequency range is termed as human hearing range which is 20Hz – 20000Hz. Whereas Infrasound ranges from 0Hz – 20Hz and Ultrasound ranges above 20000Hz. If the deter techniques use audible frequency range it causes disturbance to human, therefore deter techniques used must be of inaudible form. Already dispersal techniques were developed using ultrasound and it is found it is not much effective. Some studies say infrasound can be detected by birds and it shows response. Infrasound, sometimes referred to as low-frequency sound, is a sound that is lower in frequency than 20 Hz or cycles per second. Hearing becomes gradually less sensitive as frequency decreases, so for humans to perceive infrasound, the sound pressure must be sufficiently high. The infrasound generator uses a source, an amplifier and a subwoofer through which the infrasonic waves are emitted. LM555CN IC is used as a source which is connected in astable mode along with an LM386 IC as an amplifier. The amplifier is connected to low pass filter and the output is delivered through the subwoofer. The subwoofer delivers the infrasonic waveforms which lies between 8-20 Hz. Repelling birds in critical areas can be safely achieved by broadcasting infrasonic signals, in addition to creating active bird-free zones. If infrasound is generated birds can be successfully repelled away from a particular area without harming birds.

## II. RELATED WORK

It is found that 96% of bird strikes occur during takeoff, landing and climbing, hence it is necessary to use this repellent technique in airport operational area to avoid collisions. Birds response to the repellent techniques varies depending upon the techniques such as for visual and auditory systems they feel a sense of fear while for other techniques such as chemical repellent techniques causes sickness to the birds. Therefore it is safer to use this kind of auditory technique which does not harm birds. The LM555CN which is a timer IC produces no stable state as it is connected in astable

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 3, March 2017

mode. The output varies between high and low without any intervention. Resistors and capacitors are used in this circuit.

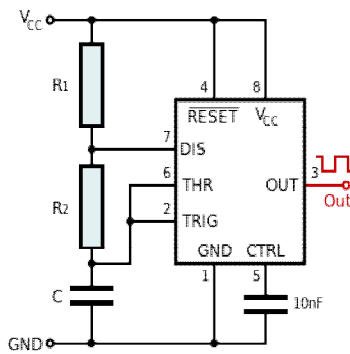


Fig. 1 Astable mode of operation in LM555CN IC.

The following are the components which are used in the model: Resistor – 100kΩ (2nos), 22kΩ (1nos), 10Ω (1nos), 150kΩ (1nos variable resistor) ; Capacitor – 0.22μF (1nos), 0.01μF (1nos), 0.47μF (1nos), 10μF (1nos Electrolytic Cap), 220μf (1 nos electrolytic cap); LM55CN-1; LM386-1; Subwoofer. The subwoofer is a 21” speaker with an enclosure.

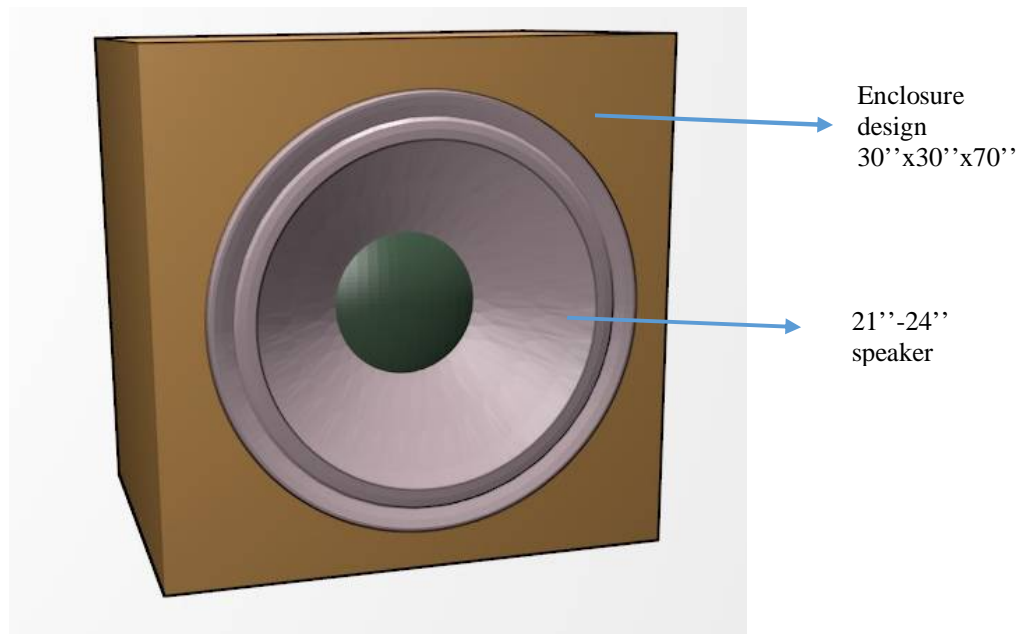


Fig 2 Subwoofer with enclosure design.

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 3, March 2017

## III. METHODOLOGY

The general block diagram of this device is shown below. The circuit is designed with the required components such as LM555CN, LM386, Resistor, Capacitor, Variable resistor in NI MULTISIM 14 student edition and the output frequency is measured.

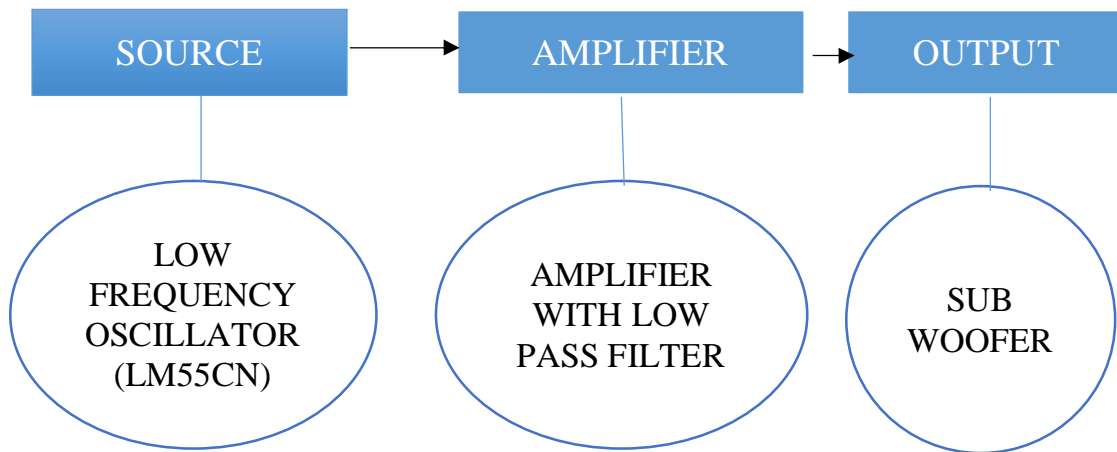


Fig 3 Block diagram

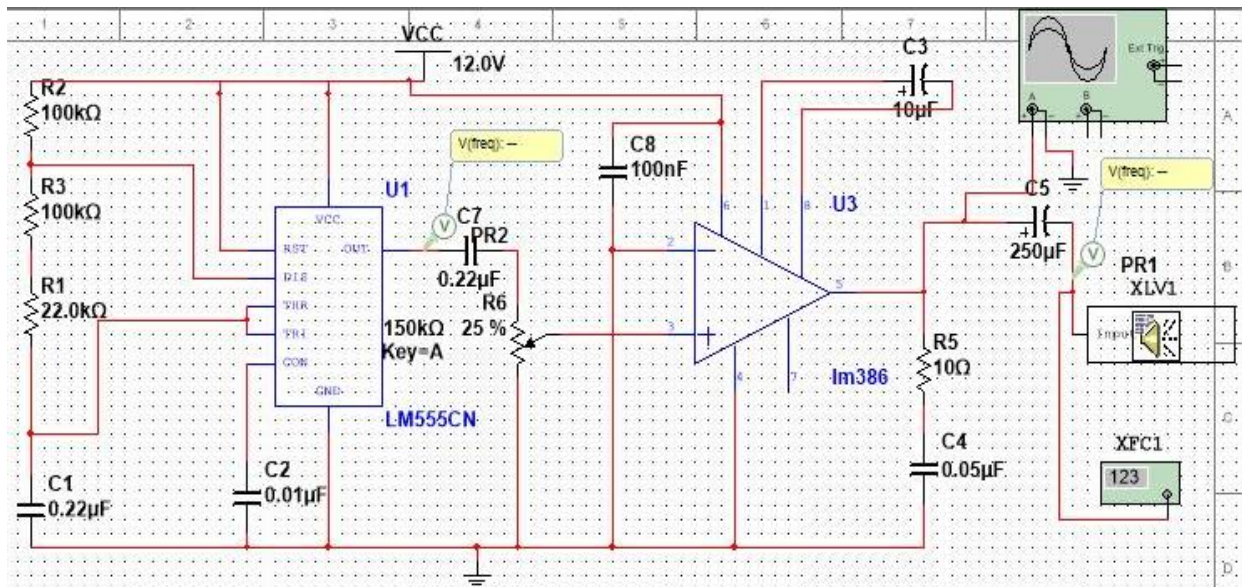


Fig 4 Circuit design

# International Journal of Innovative Research in Science, Engineering and Technology

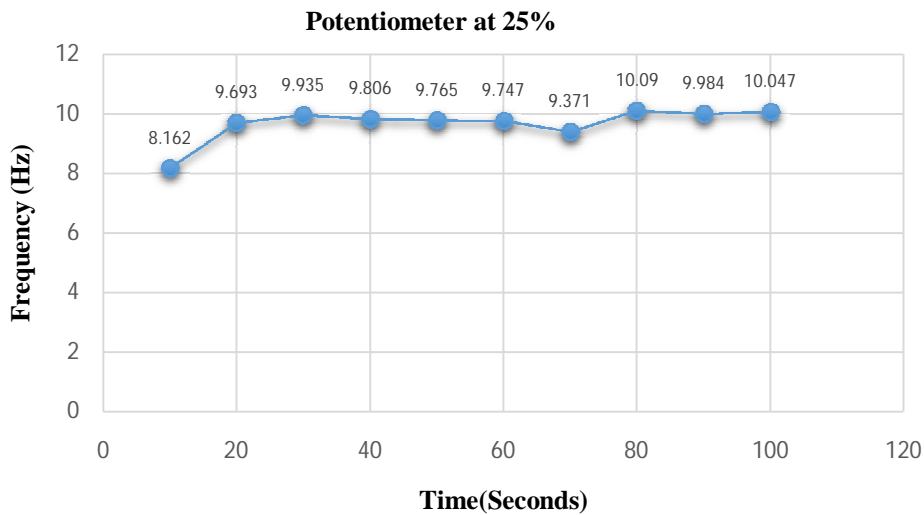
(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

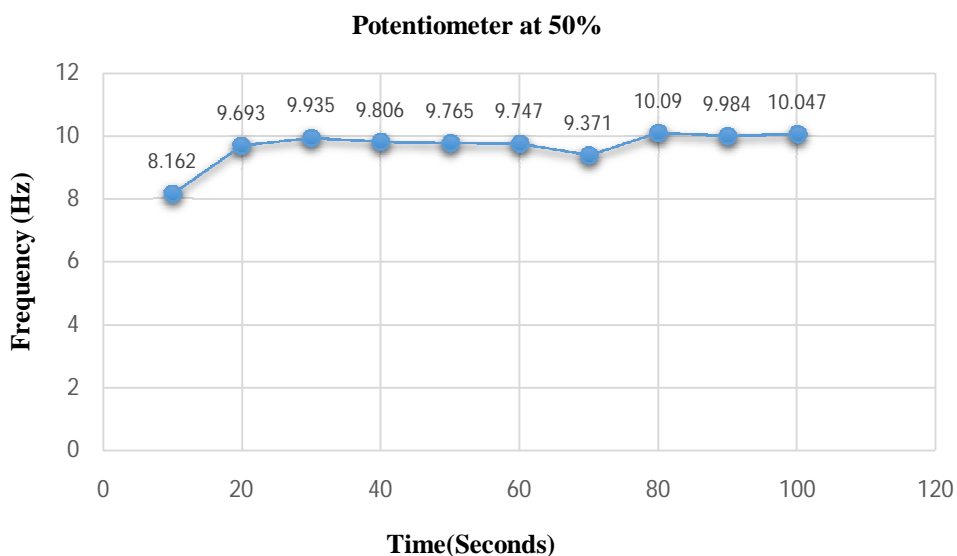
Vol. 6, Issue 3, March 2017

## IV. SIMULATION RESULTS

Graphs shows the simulation results of the circuit designed for infrasound birds deter. For various potentiometer adjustments the output frequency is observed and the graph is plotted. The graph given below is the Time vs Frequency plot for 100s simulation. The result plotted in the graph is obtained by having 150 kΩ variable resistor at 25%.



The graph given below is the Time vs Frequency plot for 100s simulation and the result plotted in the graph is obtained by having 150 kΩ variable resistor at 50%.



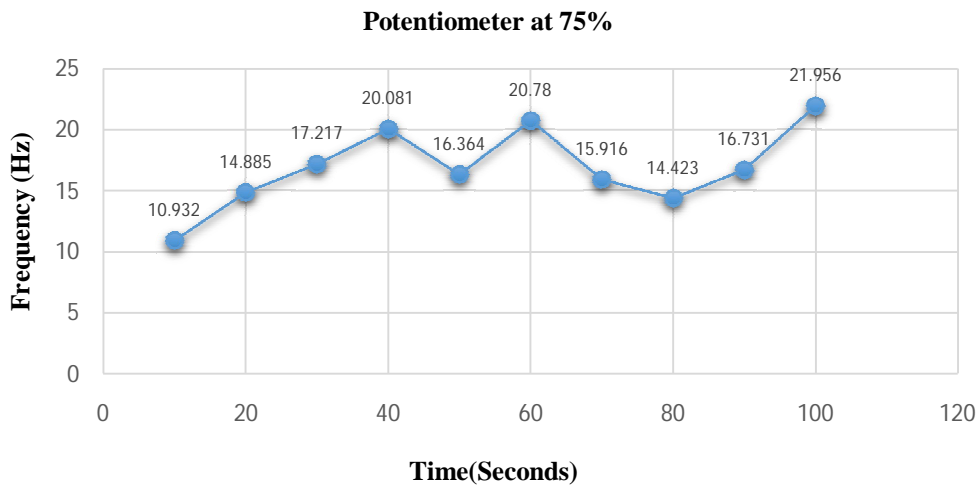
## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

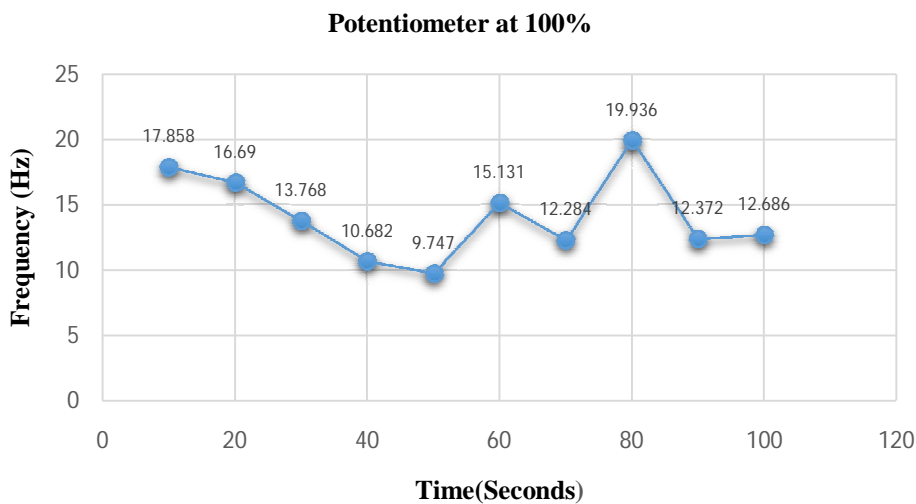
Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 3, March 2017

The graph given below is the Time vs Frequency plot for 100s simulation and the result plotted in the graph is obtained by having 150 kΩ variable resistor at 75%.



The graph given below is the Time vs Frequency plot for 100s simulation and the result plotted in the graph is obtained by having 150 kΩ variable resistor at 100%.



### V. CONCLUSION

Infrasound birds deter circuit has been designed and simulated using NI MULTISIM student version. The output frequencies are measured using frequency counter. The frequencies were found to be less than 20Hz which is infrasonic wave. The cost of this repellent technique would be less than Rs.25000 which is very less when compared to the rotary

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 3, March 2017

subwoofer. This works effectively as lower frequencies can travel longer distance and can travel without any intervention.

## REFERENCES

- [1] Neff, J.A. and R.T. Mitchell, "The Rope Firecracker—A Device to Protect Crops from Bird Damage", U.S. Bureau of Sport Fisheries and Wildlife Leaflet, Vol. 2, 1995
- [2] Mott, D.F. and F.L. Boyd, "A Review of Techniques for Preventing Cormorant Depredations at Aquaculture Facilities in the Southeastern United States," *Colonial Waterbirds*, Vol. 18, 1995.
- [3] Mott, D.F., "Dispersing Blackbirds and Starlings from Objectionable Roost Sites," In Proceedings of the 9th Vertebrate Pest Conference, Vol. 9, 1980, pp. 38–42.
- [4] Montoney, A.J. and H.C. Boggs, "Effects of a Bird Hazard Reduction Force on Reducing Bird/Aircraft Strike Hazards at the Atlantic City International Airport, NJ," In Eastern Wildlife Damage Control Conference, Vol. 6, 1995, pp. 59–66.
- [5] Nelms, C.O. and M.L. Avery, "Reducing Bird Repellent Application Rates by the Addition of Sensory Stimuli," *International Journal of Pest Management*, Vol. 43, No. 3, 1997, pp. 187–190.
- [6] Pearson, E.W., P.R. Skon, and G.W. Corner, "Dispersal of Urban Roosts with Records of Starling Distress Calls," *The Journal of Wildlife Management*, Vol. 31, No. 3, 1967, pp. 502–506.
- [7] Pochop, P.A., R.J. Johnson, D.A. Aguero, and K.M. Eskridge, "The Status of Lines in Bird Damage Control—A Review," In Proceedings of the 9th Vertebrate Pest Conference, Vol. 14, 1990, pp. 317–324.
- [8] Johnson, R.J., P.H. Cole, and W.W. Stroup, "Starling Response to Three Auditory Stimuli," *The Journal of Wildlife Management*, Vol. 49, No. 3, 1985, pp. 620–625.
- [9] Koehler, A.E., R.E. Marsh, and T.P. Salmon, "Frightening Methods and Devices/Stimuli to Prevent Mammal Damage—A Review," In Proceedings of the 9th Vertebrate Pest Conference, Vol. 14, 1990, pp. 168–173.
- [10] Lefebvre, P.W. and D.F. Mott, "Reducing Bird/Aircraft Hazards at Airports through Control of Bird Nesting, Roosting, Perching, and Feeding," US Fish and Wildlife Service, Denver Wildlife Research Center, Bird Damage Research Report, Vol. 390, 1987, p. 90.