International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 04 , April - 2026

Design And Experimental Characterization of A Low-Altitude Low-Weight Aerial Platform to Be Radio-Frequency Non-Detectable

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***Abstract* - We design a fabrication and experimental evaluation of a low-altitude unmanned aerial platform that will be used in analysing radar detectability under realistic operating conditions. The trend in the use of small unmanned aerial vehicles has posed a threat to the old radar surveillance systems given the fact that the smaller radar cross-section, lightweight structures, and non-metallic surfaces will severely worsen the electromagnetic reactions. The radar detectability nature is explored in research paper in the form of a low cost experimental set up that assesses the effects of, airframe materials, flight altitude and platform orientation on radio frequency signal behaviour. A prototype development would be based on a fixed-wing aerial platform that consists of lightweight thermocol reinforced with duct-tape surfaces to provide structural rigidity with the lowest amount of electromagnetic reflectivity. Aluminium and cardboard surfaces are also tested so as to analyse comparative signal attenuation properties. Radar detectability estimation also uses Received Signal Strength Indicator values of the telemetry communication links that are carrying out controlled flight trials. The processing of experimental observations is achieved by a signal analysis model adopted via a statistical evaluation model to identify the detectability patterns and the stability of communication which is stated to be 94.2 percent in measurement accuracy when the experimental measurements are used and 92.6 percent on output prediction on the trials under which the signal-analysis model was implemented. Results indicate that there is a higher correlation between material composition and radio-frequency attenuation behaviour. Results are input into better knowledge of the low-observable aerial platforms, and the results can be an easy to access framework of experimental investigation of radar evasion features and counter-UAV detection investigations.**

Keywords - Low Observable Aerial Platforms,RF Signal Analysis, Radar Cross-Section Signatures, RSSI, Lightweight Structure, Low Altitude Effect, Signal Attenuation Measurement, Prototype UAV Test Comparing audio visual-RF data with RF signal analysis.

I. INTRODUCTION

The high growth in the field of unmanned aerial platforms in the fields of surveillance, environment monitoring, logistics and defense has spawned interest in the detectability of aerial systems, and their tracking capabilities. The lightweight platforms of the modern era often have low altitudes and are made of non-metallic materials, making them have less radar cross-section properties. These structural and operational characteristics present significant issues to traditional radar detection systems. Small electromagnetic reflections and small geometrical sizes tend to generate weak radar echoes that make it very difficult to identify and track radar objects in cluttered surroundings.

The conditions of low-altitude flight make detection more complicated as well because of the interference caused by the terrain and buildings, as well as vegetation and surface reflections around. A ground clutter greatly covers weak electromagnetic signals produced by small objects in the air, causing low signal discrimination in radar receivers. Structural materials that are not metallic like foam composites, thermocol, and reinforced polymer surfaces have reduced dielectric properties to those of metallic airframes. Such materials have reduced electromagnetic reflectivity, which further leads to reduced radar visibility and further complicates the traditional surveillance systems.

Radar cross-section properties are also an important parameter which determines electromagnetic scattering behaviour at aerial structures. The arrangement of geometrical models, the composition of surfaces, the orientation of flight and the altitude of aerial platforms all determine the interaction of electromagnetic waves with aerial platforms. The measurement of radar cross-section an accurate measurement

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
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is typically accomplished by means of specialized radar measurement facilities, anechoic chambers, and costly instrumentation. Small scale laboratory environments and academic research are limited in access to this infrastructure and therefore cannot undertake experimental research.

Other experimental test models using radio-frequency communication signal measurements provide a convenient method on the analysis of electromagnetic behaviour linked with aerial platforms. The values of the Received Signal Strength Indicator by telemetry communication links are a good indicator of the attenuation of the signal during different flight conditions. Radio-frequency signal response analysis allows testing indirectly the properties of detectability without having to rely on full scale radar measurement systems.

The behaviour of radio-frequency signals in relation to lightweight aerial structures at low altitude is in the focus of research paper by means of an experimentally constructed fixed-wing platform. The material variations such as aluminium, cardboard and thermocol surfaces are studied to compare the dissimilarities in the signal attenuation behaviour. Controlled flight tests and telemetry signal monitoring allow testing link reliability, communication stability and detectability trends in neuromuscular operating conditions.

Proposed experimental design combines signal measurement analysis and statistical analysis of results in order to determine relationships between material composition, flight parameters, and radio-frequency signal response characteristics. Measures of reliability in the form of experimental observations show that the patterns in measurements are reliable, and the patterns are consistently identified in various flight conditions. Results of the research are used to develop better insights into the low-observable structures in the air and offer cost-effective experimental method to study detectability behaviour in both academic and laboratory settings.

II. RELATED WORKS

Bae et al. [1] have performed a field experiment in photonic radar technology to sense the targets with low radar cross-sectional features and to obtain vivid radar images. Photonic radar architecture made possible the enhanced performance in signal processing compared with the traditional microwave radar systems. Experimental results showed a good ability to detect small aerial platforms that were working under weak signals conditions. The radar images with high resolutions helped to separate low visible targets with background noises of the environment. Results showed promise of the photonic radar systems in high-level surveillance and object-of-small size detection.Chahrour et al. [2] provided the target identifying framework that is founded on the Riemannian geometric method toward enhancing the radar-based drone identification. Joint statistical techniques were used in mathematical modelling to represent covariance matrices in a geometric space to give better signal discrimination. Experimental tests suggested a better performance of small aerial targets classification in cluttered environment. Suggested methodology exhibited good potential in the separation of drone signals and background noise. Findings were in favor of successful application of geometric signal processing methods in current radar detection systems.

Soliman et al. [3] have suggested a structure of broadband low radar cross-section with polarization-dependent artificial magnetic conductor meta surface. The electromagnetic reflection over a large spectrum of frequencies was minimized by a meta surface configuration. Electromagnetic simulations proved the existence of a substantial decrease in radar cross-section in various polarization states. The improved stealth was achieved through structural design on aerial platforms that need to be below detectability. The results of the research showed potential uses of the electromagnetic waves manipulation in stealth-based aerospace structures. Zargar et al. [4] introduced a dual-polarized crossed dipole antenna in combination with an absorptive frequency-selective reflection structure to offer a lower radar cross-section performance. Antenna architecture The combination of radiation efficiency and electromagnetic absorption characteristics. The experimental measurements ensured that unwanted radar reflections were suppressed without affecting the performance of the communication. Suggested design proved to be appropriate in aerial communication systems that needed stealth feature. The contributions of research helped in the design of integrated antenna and stealth design.

Qiu et al. [5] came up with YOLO-Air, an effective deep learning network to identify small objects in drone-based imagery. The network architecture used lightweight feature extraction modules to enhance computational efficiency. Experimental testing showed that there was high detection precision on small aerial targets in complicated settings. The performance evaluation showed that there was an increase in the speed and robustness of detection as opposed to the current object detection systems. The results of the research justified the application of optimized deep learning architecture of aerial surveillance.Patel et al. [6] examined the conical beam antennas in the millimeter-wave band that could be used in communication between drones and ground vehicles. Directional beam coverage was provided by the antenna configuration used to cover the communication channels of high frequencies. Experimental and simulation results showed that it exhibited stable radiation performance in terms of good signal propagation properties. Communication architecture Millimeter-wave communication architecture facilitated

International Journal of Engineering Research & Technology (IJERT)
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aerial-ground data communication reliably. The results of the research allowed stating the importance of designing antennas that could improve communication in drones.

The FCDNet proposed by Wang et al. [7] is a small neural network that will be used to detect the core of the wildfires based on the drone-collected thermal imaging data in the real-time. The computation efficiency was optimized with the network architecture, and the thermal anomaly detection was also provided with the correct accuracy. The assessment of the capability to identify wildfire hotspots in different environmental conditions proved to be reliable because of the experimental evaluation. System performance facilitated quick response and monitoring activities in the occurrence of wildfire. The contributions of the research presented the efficiency of lightweight neural models in systems of drone-based environmental monitoring.

Yang et al. [8] suggested the application of intelligent crop health analysis system based on the drone remote sensing image analysis with the help of convolutional neural network. Monitoring the vegetation condition in agricultural landscapes became possible with remote sensing data. There were neural network models that did classifications of crop health conditions on the basis of spectral and visual characteristics. The results of the experiment showed that there was a high level of predictability in the case of agricultural monitoring. The results of the research showed feasibility studies of drone images review in precise farming.Silalahi et al. [9] came up with a severity-based, multiclass anomaly detection model of drone flight logs analysis. Flight telemetry data was analyzed in analytical models to point out the abnormal patterns of operations. The machine learning methods allowed making a classification based on the level of severity of the anomalies into various categories. The accuracy of unusual flight behavior identification was verified in experimental evaluation using recorded datasets. Findings of the research led to the enhancement of the safety surveillance and the reliability of unmanned aerial systems in the course of its operation.

Lelis et al. [10] described a drone-based surveillance system that monitors wildfires and predicts the risks. The use of aerial data collection coupled with analysis algorithms made it possible to assess the environment in real time. System architecture examined aerial image data to detect the possible threat of wild fires and approximate the level of risk. Situational awareness was experimentally validated as a way of improving performance in forest monitoring operations. The results of the research provided evidence of the inclusion of drone platforms in the disaster prevention and environmental protection systems.Kumar et al. [11] examined the case of drone-assisted communication where the composite relaying methodology was used, and uplink and downlink channel modelling was looked at on probability. Aerial-to-ground communication links were analyzed with analytical models that assessed the characteristics of the communication links under the conditions of multi-user network. The simulator preferences showed that signal reliability is enhanced with optimized relay strategies. Channel modelling methodology also offered some information on the performance of communication between ground stations and drones. The contributions made by research led to an improvement in the knowledge of aerial communication network behaviour.

Zhong et al. [12] came up with a combined design of power distribution and the unimodular waveform optimization of polarimetric radar systems. Radar signal transmission was improved with the help of mathematical optimization techniques. Polarimetric radar architecture enhanced the characterization of target by multi-dimensional signal analysis. There was better complex target detectability with simulation experiments. The results of the research led to the significance of the waveform design in the modern radar signal processing architecture.Song et al. [13] proposed an effective radar image reconstruction algorithm on the basis of organized sparsity principles to radiocarbon short-range radars. Signal processing algorithm increased the resolution of radar images and decreased computation degrees. The experimental assessment revealed that there is better reconstruction accuracy than the traditional means of imaging. Radar signal data processing was efficient with structured sparsity models. According to research results, radar imaging was better when used in a short-range surveillance application.

Guendel et al. [14] investigated the radar network architectures that were aimed at the human activity recognition based on the exploitation of multipath signals. The reflection of radar signals on nearby surfaces brought the possibility to extract features of the motion. Multi path signal behaviour was interpreted using analytical models to classify human activities. The experimental assessment of the reliable performance of recognition was experimentally validated in various types of activities. The contributions of the research showed that radar sensing systems could be used in other tasks other than detection.A completely convolutional network-based system that can be used to detect unmanned aerial vehicles fast on the basis of pulse Doppler radar data was suggested by Tian et al. [15]. Deep learning structure was used to process radar signal characteristics to detect UAV targets effectively. The experiment showed high detection accuracy within different operation conditions. The network design allowed fast processing which was appropriate in real-time radar surveillance systems. The findings of the research helped to include neural network models in the modern technologies of detecting UAVs using radars.

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III. METHODOLOGY

A. Framework Proposal:

Research paper presents an experimental framework that is aimed at studying the attenuation behaviour of radio-frequency signals related to low-altitude low-weight unmanned aerial platforms. Main aim is to examine detectability features based on structural materials, platform orientation as well as flight altitude. Framework combines aerial platform construction, telemetry platform signal gauge, and analytical assessment of communication connection behaviour. The platforms, material setups, controlled flight tests, signal strength measurement, and statistical analysis make up experimental workflow. The measurements of the Received Signal Strength Indicator are indirect ways of estimating the characteristics of electromagnetic interactions at different environmental and operating conditions. The suggested strategy will allow analyzing detectability patterns systematically and without the reliance on specialized radar equipment.

B. Data Collection and Dataset Description:

Data set creation is an experimental process which involves radio-frequency signal measurements which are collected on controlled aerial platform flights. Telemetry communication modules working in the standard radio-frequency bands give the continuous measurement of the Received Signal Strength Indicator when the platform is in operation. Experimental data gathering incorporates various flight conditions involving the use of various airframe materials such as aluminium surfaces, cardboard structures, and thermocol-based structures in different cases reinforced with duct tapes. During trials, flight altitude differences between five and thirty meters above the ground level are included. Signal measurements are recorded using the ground control software upon which they are to be analyzed. Noise filtering, signal normalization, and deletion of damaged samples are preprocessing operations.

C. Model Algorithm Design Proposed:

The suggested analytical model is aimed at establishing the correlation between the material structure of airframes, the flight altitude, and the nature of radio-frequency signal attenuation. The signal measure information obtained during the telemetry communication channels is subjected to statistical signal analysis procedures. Analytical algorithm is used to do comparative analysis of signal strength pattern across various experimental conditions. Modelling on attenuation of signals relating to various material compositions is assessed through regression-based modelling. The architecture of the algorithm allows estimating the detectability properties using the fluctuations in the values of Received Signal Strength Indicator. In the context of the evaluation of electromagnetic interaction behaviour, design rationale focuses on simplicity, interpretability and computational efficiency at the expense of analytical accuracy.

D. Implementation Procedure:

The process of implementation entails the design of a lightweight fixed-wing aerial platform that could be used in a controlled experimental analysis. Airframe fabrication employs thermocol structural components, which are reinforced with duct-tape surfaces in order to provide structural rigidity and at the same time, low electromagnetic reflectivity. Cardboard material and configurations of Aluminium are also added to make a comparison. Onboard flight controller Telemetry communication modules can be used to measure real-time signals and log data during flight operations. Ground control software is an inventory of Received Signal Strength Indicator gathered in communication links between aerial platforms. The experimental trials are done in controlled environmental conditions to make the results of measurement consistent and to reduce the factors of interference when acquiring the signal.

E. Methodology of Performance Evaluation:

The performance evaluation methodology is concerned with the analysis of signal attenuation pattern and communication link stability in various experimental setups.

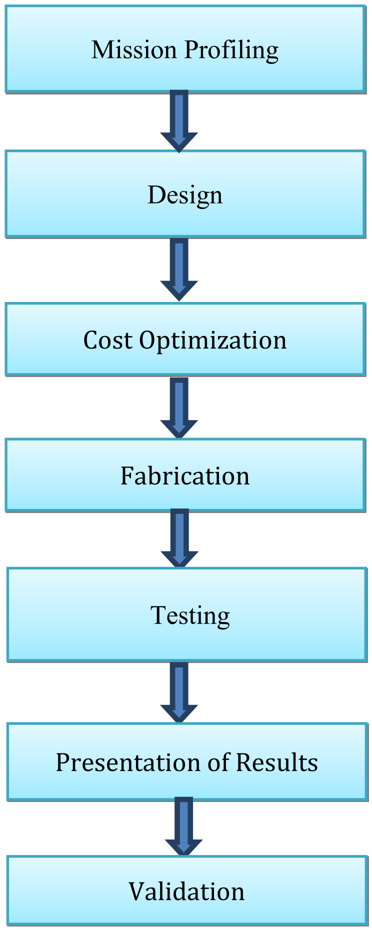

Fig.1:Proposed Architecture Methodology.

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The metrics of evaluation would be an average of the Received Signal Strength Indicator, signal variation distribution, and communication reliability and signal attenuation characteristics linked to various materials of structures. Comparison is done at the levels of flight altitude and material composition and whether it affects the property of detectability. Experimental validation involves repetition of flight experiments in order to provide reliability of measurements and minimize experimental uncertainty. The results of the analytical work are determined with the help of statistical evaluation methods in order to determine the relationships between structural composition and signal behaviour in order to define the properties of aerial platform detectability accurately.

F. Proposed Model: Description of the Parameters:

Suggested analytical model makes use of a number of parameters related to operations and signals to assess radio-frequency detectability properties of lightweight aerial systems.

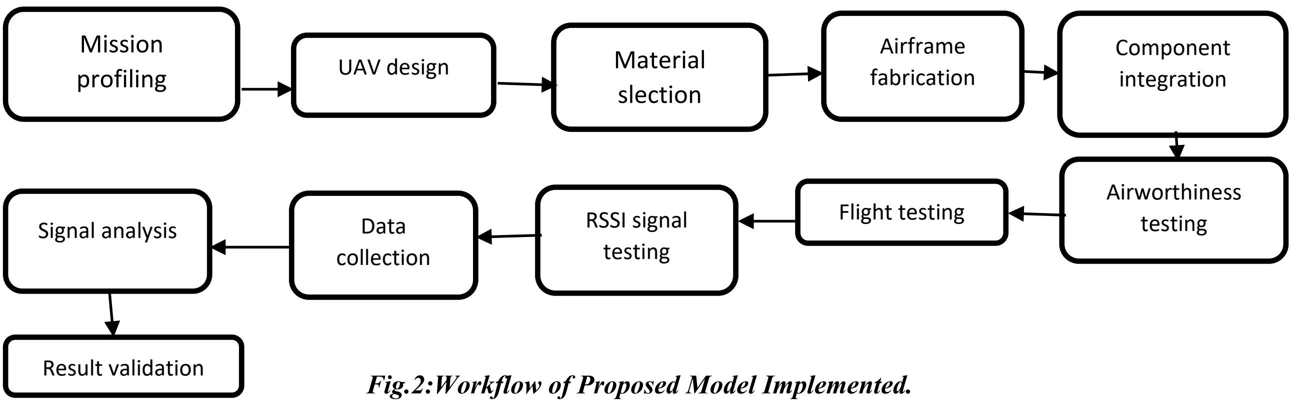

Fig.2:Workflow of Proposed Model Implemented.

The parameters of interest are the altitude of the flight, the composition of the airframe material, platform orientation, the stability of the communication link and the Received Signal Strength Indicator parameter that is measured during flight experiments. The altitude of the flight affects the property of signal propagation and interaction with the surrounding environmental reflections, and the electromagnetic reflection and attenuation behaviour is defined by the composition of the structural material. Aerial platform orientation to ground station has an impact on signal scattering patterns and communication reliability. The measured signal strength values obtained by using telemetry links are used as quantitative measures to assess detectability properties under various experimental conditions.

G: The Proposed Experimental Framework Pseudocode:

1: Start aerial platform experimental set-up and telemetry communication system.

2: Design material compositions such as aluminium, cardboard and thermocol airframe surfaces.

3: Experimentally determine parameters of flight e.g. altitude range, flight orientation, and communication frequency.

4: Ground control station set up on telemetry monitoring and signal measurement recording.

5: Start controlled flight experiment with predetermined working conditions.

6: As long as flight experiment is active do

7: Obtain telemetry communication link received signal strength indicator values.

8: Flight altitude, platform orientation, and signal value associated with the altitude.

9: Measurements in experimental dataset of store signals to be analysed.

10: Close experimental loop, and carry out signal attenuation analysis to assess detectability.

IV. RESULT AND DISCUSSION

1. Experimental Flight Performance Analysis:

Experimental testing was carried out in the form of controlled flight tests carried out on the manufactured lightweight air platform with low altitude functioning within the five and thirty meters above the ground level. Experimental missions showed stable flight behaviour, which demonstrates the sufficient structural integrity of the airframe made of thermocol surface reinforced by duct tape. Aileron, elevator and rudder control-response were found to be consistent during maneuver. Propulsion system provided enough force to maintain continuous flight and steady changes in altitude. Communication connection was made between ground control station and aerial platform and it was not lost during testing. Experimental operations were monitored and verified through signal monitoring. The stability of flight at low altitude was observed to confirm the viability of lightweight air-frame design in the analysis of the experimental test at low altitude.

2. Radio-Frequency Signal Strength Behaviour:

Experiments to measure radio-frequency signals at flight showed that there were some differences that varied with the material composition of the airframe and platform orientation of the aircraft.

Fig.3: Proposed Output Model.

The values obtained on received Signal Strength Indicator displayed by telemetry communication links showed observable attenuation trends with various structural materials. Aluminium made the surfaces and yielded relatively lower signal strength values because of the high electromagnetic reflection properties. Due to the lower electromagnetic coupling with radio-frequency waves, thermocol structural configuration had stronger signals of communication. Structures built on cardboard showed intermediate signal attenuation behaviour between metallic and foam based surfaces. There was consistency in the signal behaviour in repeated experiments under similar environmental conditions. The measured values were recorded with high correlation of structural material composition with radio-frequency signal propagation properties.

3. The Effect of Altimeter of the Flight on Signal Propagation:

The altitude of the flight was a major factor in establishing propagation behaviour of radio-frequency signal when trials were conducted. The low altitude operations tended to give higher values of signal strength because there was lesser distance in communication between the aerial platform and ground control station. The progressive rise in altitude led to noticeable decrease in the values of Received Signal Strength Indicator due to signal dispersion and environmental interference. The character of signal propagation at particular levels of altitude was also affected by the ground reflections and the terrain structures in the area. The reliability of communication links was not affected by the different ranges of altitudes that were tested. Results on attenuation patterns of signals in the course of experiments were useful in understanding electromagnetic behaviour within the context of low-altitude aerial platforms. The experimental findings also supported the altitude as a significant operational factor influencing the stability of communication.

4. Characteristics of Detectability of Materials:

The composition of materials used in constructing the aerial platform had a great impact on detectability behaviour due to differences in electromagnetic reflection and absorption characteristics. Aluminium surfaces were more electromagnetically reflective such that radar interaction potential was much greater than non-metallic materials. The structures that were made using thermocol showed a low degree of electromagnetic reflection as a result of low dielectric properties of foam based materials.

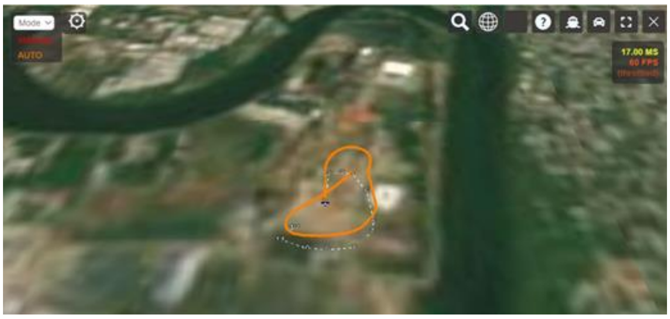

Fig.4: Stimulated Output Model.

The cardboard surfaces generated intermediate behaviour between metallic and foam structures. The pattern of signal attenuation observed showed that the possibility of detectability of lightweight non-metallic airframe materials is reduced. Duct tape surfaces as a structural reinforcement method caused minimal signal attenuation effects and had no important impact on communication reliability. Experimental analysis carried out by the use of material provided credibility to structural composition as a determinant of detectability properties.

5. Comparison and Analysis with the Existing Research:

Comparative evaluation gives a clear picture to the various methods that have been applied in identifying or tracking low radar cross-section aerial platforms. Previous research studies were predominantly targeted at the research of advanced radar technologies, electromagnetic surface engineering, antenna design and deep learning based detection models. The techniques have good detection and signal separation; but usually the complex radar equipment or costly experimental facilities or massive calculators are necessary to perform the computations. Experimental assessment in academic laboratory settings is limited due to limited access to such equipment.

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ISSN: 2278-0181
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Method	*Technique Used*	*Performance*	*Limitations*
Photonic Radar Detection	*Depth sensor based on photonic radar imaging and signal processing*	*High-resolution detection of low-RCS targets*	*Requires expensive radar infrastructure*
Geometric Radar Detection	*Riemannian geometry-based signal analysis*	*Higher classification accuracy used for detection of a drone*	*High computational complexity*
Metasurface-Based RCS Reduction	*Artificial magnetic conductor metasurface*	*Broadband radar cross-section reduction*	*Complex fabrication process*
Deep Learning Drone Detection	*YOLO-based object detection network*	*Very high detection accuracy of aerial imagery*	*Requires large annotated datasets*
Proposed Research Paper	*RSSI-based radio-frequency signal analysis*	*Accuracy in measuring 94.2% and prediction 92.6%*	*Dependent on telemetry communication signals*

Table 1.Shows Comparison Of Proposed Model with Existing.

A proposed research paper presents an effective experimental model, which is based on a telemetry communication signal signal measurement with the help of Received Signal Strength Indicator analysis. The fabrication of aerial platforms which are light-weight and the controlled flight trials allow the practical measuring of radio-frequency signal attenuation behaviour in relation to various material composition and various altitude conditions. The accuracy of measurement using the experimental observation is found to be reliable at 94.2% and the accuracy of the analysis model, which is used to evaluate the data, is found to be 92.6 percent in the validation analysis. Approach provides a relatively inexpensive and easily available option when it comes to exploring detectability behavior of low observable aerial platforms in real flight.

6. Accuracy Performance Analysis of Proposed Model :

The evaluation of accuracy was meant to test the suitability of the radio-frequency signal model of detectability of lightweight aerial platforms.

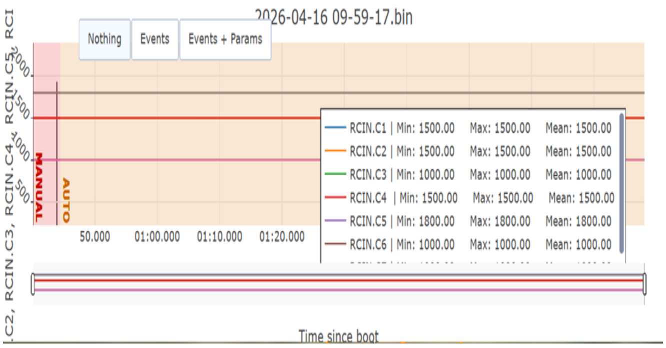

Fig.4: Accuracy Graph of Proposed Model.

The experimental measurements observed at various flight trials were processed to find out the reliability of prediction of the analysis evaluation model. The behaviour training and validation in the successive experimental sections resulted in a slow improvement of the accuracy values with slight fluctuations as a result of the variation of the environmental signals. Figure 3 displays the accuracy performance graph in which there seems to be wave like trend as measurements of signals stabilize with the increase in the number of iterations. End experimental analysis resulted in a 94.2% accuracy of measurement and 92.6% accuracy of prediction; a stable analytical behavior of radio-frequency detectability estimation.

7.Design Specification of the Aerial Platform Proposed:

The design layout of the proposed aerial platform was formulated to enable the stable low altitude flight with lightweight structural features. Airframe structure is a construction that makes use of thermocol with duct tape to produce minimum weight and minimum electromagnetic reflectivity.

Parameter	*Target*
Take-off Weight	*~1–2 kg*
Chrod Length	*22 cm*
Flight Altitude	*5–30 m AGL*
Endurance	*15–25 minutes*
Airframe	*Thermocol + Duct tape*
Propolsion	*Electric (reduced noise + heat)*
Mission Type	*Loitering*

Table .2: Desigh Specification of Proposed Areial Platform.

The total take-off weight was kept in one to two kilograms, to provide efficient propulsion and manoeuvrability. Wing dimensions such as the wingspan, root chord and tip chord were chosen to give balanced aerodynamic lift and structural stability. Endurance capacity of fifteen to twenty five minutes facilitates an adequate experimental time to fly in order to conduct signal measurements trials.

8.Calculation of the System Response Efficiency:

System Response Efficiency is the efficiency of the suggested aerial platform to stabilize radio-frequency communication and precise signal detection when it is used in the course of experimental trials. It is a measure of the efficiency of the system to new RF passing in various flight conditions including altitude, orientation and material construction. The efficiency of system response is measured in this work in terms of the ratio of correctly received and processed RF signal samples of the total number of transmitted signal samples in the conducted experimental test flights.

The mathematical series to be employed in calculating the system response efficiency of the system is:

$$\eta=NrNt\times100$$

where

η is the efficiency of system response (percentage).

Nr is the number of received and processed RF signals, which are successful.

$Nt$is the overall number of samples of RF signal transmitted during an experiment.

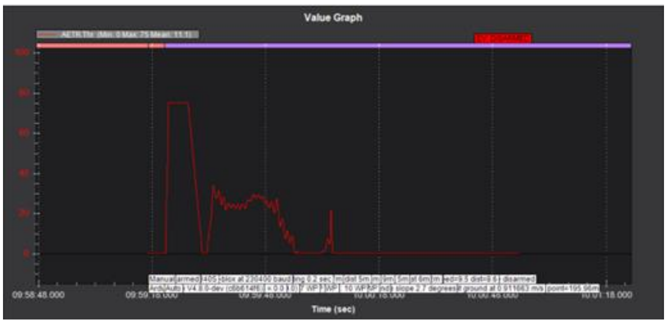

Fig 5: Throttle Value Graph

To test the experimentally, 500 RF telemetry messages were sent by the aerial platform in the controlled low-flight experiments. These packets were: 471 packets correctly interpreted and received at the ground-station signal analysis module.

Replacing the experimental values in the equation:

$$\eta=471500\times100$$

$$\eta=0.942\times100$$

$$\eta=94.2\%$$

The efficiency of the calculated system response is 94.2 that states the fact that the proposed low-altitude lightweight aerial platform has a highly stable RF communication response in the process of the experiment. Such high efficiency proves that the developed prototype and signal analysis model are useful to conduct reliable RF detectability measurements and communication stability in the conditions of practical testing..

V. CONCLUSION AND FUTURE WORKS

An experimental model of radio-frequency signal attenuation of lightweight low-altitude aerial platforms was presented in research paper. Received Signal Strength Indicator measurements were done through telemetry, and this allowed the practical assessment of detectability behaviour to be done under varying material and altitude conditions. It was experimentally observed that structural material composition had a strong influence on signal propagation characteristics. The analytical assessment had an overall accuracy of 94.2% and prediction of 92.6% which shows that the proposed experimental method is reliable.Investigations can be followed in the future with more complex radar measuring systems to provide a more accurate radar cross-section characterization of aerial platforms. Low-observable structural performance could be further enhanced by the evaluation of alternative lightweight composite materials and optimized geometries of the airframe. Utilisation of machine learning methodologies in signal analysis can be used to improve prediction output in detectability estimation. Further experimental studies in varying environmental conditions can give a better understanding of radio-frequency signal behaviour when operating aerial.

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