

**IOT BASED SENSOR NETWORK APPLICATION FOR AIRBORNE  
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**Abstract** — Nowadays, in any airborne platform like Fighters, helicopter or a transport aircraft there are thousands of sensors which are used to measure various parameters (temperature, level, pressure, positions and more) and the results are then conveyed through the wires to the on board computers in the cockpit. Therefore, the interconnections of multiple sensors results in a great amount of cables (normally, hundreds of kilometers of cables are used), generating high complexity (both in design and production), high weight and high costs. The aim of this project is to design a concept on an airborne platform which will then be monitored through a mobile & a server on ground using IOT(Internet of Things). A pilot's ability to predict the performance of a helicopter is extremely important. It helps to determine how much weight the helicopter can carry before takeoff, if the helicopter can safely hover at a specific altitude and temperature, the distance required to climb above obstacles.

**Keywords-** IOT, Airborne, Temperature, etc...

**I. INTRODUCTION**

A pilot's ability to predict the performance of a helicopter is extremely important. It helps to determine how much weight the helicopter can carry before takeoff, if the helicopter can safely hover at a specific altitude and temperature, the distance required to climb above obstacles, and what the maximum climb rate will be.

A helicopter's performance is dependent on the power output of the engine and the lift produced by the rotors, whether it is the main rotor(s) or tail rotor. Any factor that affects engine and rotor efficiency affects performance. The three major factors that affect performance are density altitude, weight, and wind. According to the NTSB's U.S. General Aviation Accident Data 2007-2009, there were a total of 1,554 civil aviation accidents in 2009 out of which 276 were fatal, resulting in 535 fatalities. This is certified data just for one year and one can imagine similar patterns for other years. When flights meet disaster in the mid-air, the cause of the mishap is not known immediately. Teams are dispatched in difficult conditions to retrieve the flight data recorder also known as black box. Until the black box is found, the exact cause of the crash cannot be determined. Sometimes it may take years to find the black box.

**II. RELATED WORK**

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems.

Examples of properties of typically embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. CPU's with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from

general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

### III. EXISTING METHODOLOGY

In the existing system a black box is used for recording the parameters in an aircraft. A flight recorder, commonly known as a black box, although it is now orange-coloured, is an electronic recording device placed in an aircraft for the purpose of facilitating the investigation of aviation accidents and incidents. The flight data recorder (FDR) is a device that preserves the recent history of the flight through the recording of dozens of parameters collected several times per second. The cockpit voice recorder (CVR) preserves the recent history of the sounds in the cockpit including the conversation of the pilots. The two recorders give an accurate testimony, narrating the aircraft's flight history, to assist in any later investigation. Existing system consist of PIC16F877A which is a microcontroller, fire sensor is to sense the temperature range of the specified parameter, same follows for the pressure sensor to sense pressure in an aircraft components. UART does conversion between serial and parallel forms and usually does not directly generate or receive the external signal used between different items of equipment. Radar communication is the technology of using radio waves to carry information, systematically modulating properties of electromagnetic energy waves transmitted through space, such as their amplitude, frequency, phase, or pulse width. If a system which can give real time data's and store in a external server will be a compromising technique to reduce aircraft accidents. It has the following disadvantage, Black box provides data only after a Accident occurs. Finding Black box after an accident is a tedious process.

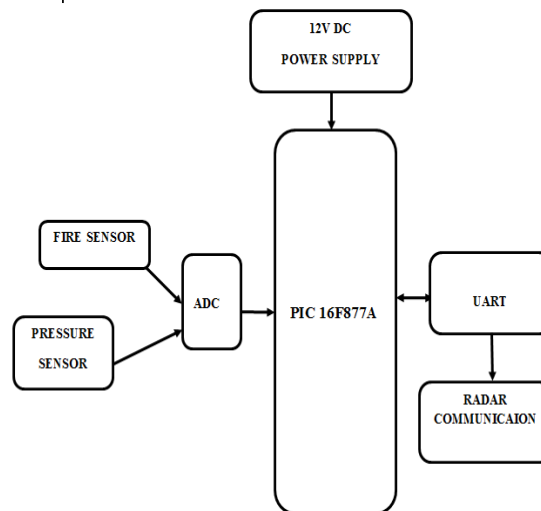


**Fig. 1. Existing Block diagram**

The new method of data transformation to the central monitoring server in the ground with IoT(Internet Of Things). Using IoT, the information gathered from each nodes (sensor) is conveyed to the on board computers in the cockpit. And also given to the central monitoring server in the ground. In this, we develop a website that would allow users to monitor and analyze the state of a sensor installed in an aircraft. To accomplish this, there is a need to link some essential components, such as a sensors and an internet connection, a server with the proper web services and finally a smart phone or pc. This section represents the general architecture of the proposed solution, showing the relationship between the various components. In short, the Internet of Things (IoT) can be summed up in one word: opportunity. By connecting devices and data, IoT presents opportunities for organizations to transform themselves, gain information from other devices. At the same time, it gives consumers new opportunities to enjoy exciting new user experiences and conveniences.

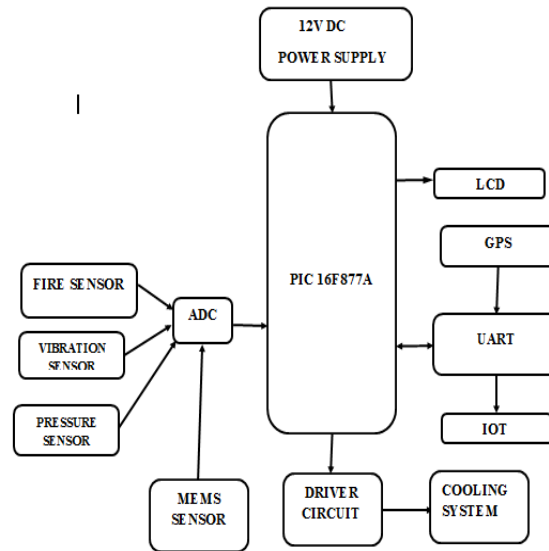


**Fig. 2. Proposed Block Diagram**

The IoT opportunities in exploiting black box parameters of a Aircraft vehicle which can be viewed in a webpage and mobile as well. Block diagram of proposed system shown in the figure 2. Proposed system consist of vibration sensor, LCD, MEMS sensor, fire sensor, UART, pressure sensor , PIC16F877A microcontroller, GPS, cooling system, IOT and driver circuit. The fire sensor senses the temperature of the aircraft and sends the signal to the ADC. Similarly, the pressure sensor senses the pressure applied on the aircraft and it sends the signal to the ADC to convert it to an digital signal for processing. In the same manner the MEMS sensor provide an interface that can sense and provides the direction flow in it. The vibration sensor is a piezoelectric sensor used to indicate the touch, vibration and shock measurement. Vibration sensor works whenever the aircraft experiences a sudden vibration in the aircraft LCD is used in order to display the values of the sensors in the cockpit. GPS helps to track the status condition and movement of the plane. The driver circuit is operated when the relay switch is ON, when the threshold value of the fire sensor exceeds, in order to maintain the temperature of the aircraft.

#### IV. EXPERIMENTAL RESULTS

The following figure shows the experimental result.

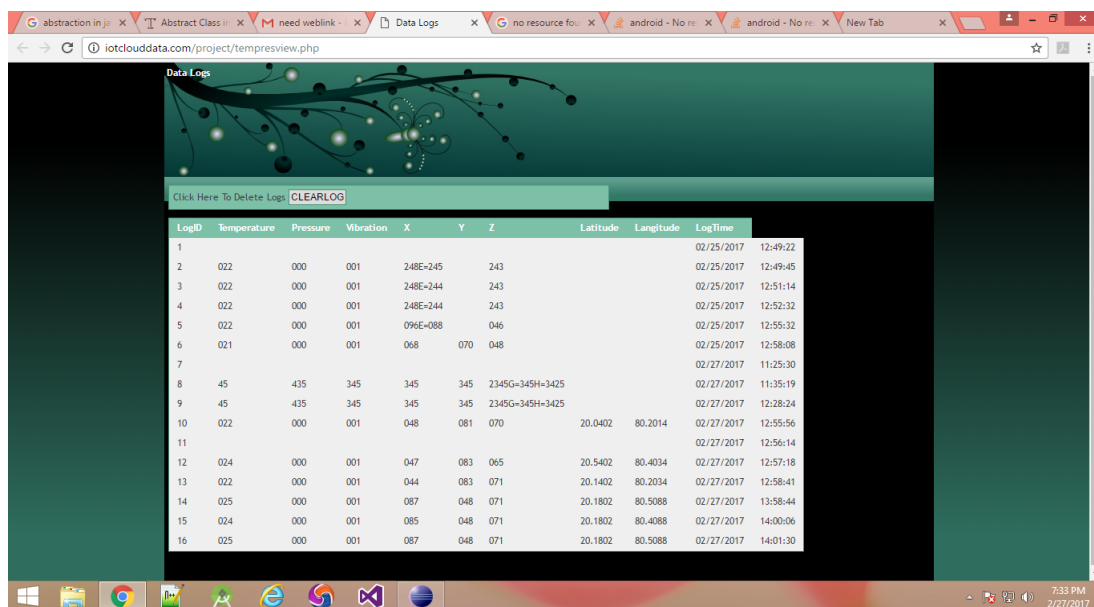


**Fig. 3. Experimental Result**

## **V. CONCLUSION**

The proposed solution to monitor the Sensor Networks on board an airborne platform through a IOT base application in a smart phone will provide vital information real-time which would be vital in determining the aircraft health. multi-sensor monitoring system utilizing sensor nodes and IoT represents a low cost and low power consumption method for detection of parameters in an airborne platform. The biggest advantage of the wireless sensors is that they can be housed easily in inaccessible areas and would efficiently give output. To this end, the placement of sensor nodes in an aircraft should be carefully based on the propagation loss, fading effects and multipath reflection from aircraft structures. Foremost, before implementing the WSN, the RF path loss model should be arrived as per the design of the aircraft. Since most of the equipment's as well as aircraft bulkheads are made of steel, the data delivery loss caused by the fading and multipath effect should be considered before the actual placement of sensor nodes.

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