International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 11 Issue 10 ǁ October 2023 ǁ PP. 384-387

Why Are Flıght Data Recorders Used On Aırplanes

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ABSTRACT: *In this study, the operation of the electronic part of a flight data recorder that can be used in single-engine small airplanes is examined. FDRs (Flight Data Recorders) keep track of more than ninety parameters such as time, altitude, speed, direction, wing angle, which are constantly changing during the flight for the last 25 hours. According to the recording from FDR, a model of the flight can be revealed and possible accident causes can be examined in more detail. Although the purpose of the device is to record abnormal events that occur on the aircraft in case of accidents and crashes, it also provides a data source to the operators to improve flight performance, reduce fuel consumption and determine if there is a mistake made by flight personnel. In addition to the ability to reveal its underwater position for up to 30 days, which is activated in the event of FDR falling into water, it also has the ability to stay intact under 1100 degrees Celsius for thirty minutes.*
Key wors: *Cockpit Voice Recorders, Flight Data Recorders, Plane crash*

Date of Submission: 18-10-2023 Date of acceptance: 02-11-2023

I. INTRODUCTION

Today there are hundreds of plane flying around the world. Some of the Airports have hundreds ofplane landing in a very short span of time. Sometimes weather can be foggy or it can rain heavily making the runway slippery [1]. A flight data recorder, or FDR, is a device on a plane that records data about the flight. This includes readings from the plane's sensors, cockpit conversations and other important information[2]. Flight data recorders were first introduced in the 1950s. Many first-generation FDRs used metal foil as the recording medium. This metal foil was housed in a crash- survivable box installed in the aft end of an airplane[3]. In the aerospace industry, modern aircraft are typically equipped digital flight data recorders (FDRs) [4] and generate vast amounts of data in flight, such as altitude, pressure, acceleration, engine pressure, engine temperature, and so on. ACMS (aircraft condition monitoring systems) data and maintenance report data were used to predict failure modes in the aircraft [5]. Also, based on text mining approach, air safety report [6] and maintenance text message [7] were used to enrich information. July 28 2010 Time: 09:45Location: Islamabad, Pakistan 152 Fatalities. Thisis the 70th Worst Accident in aviation history [8]. The "pinger" signal emitted by FDRs at a frequency of 37.5 KHz enables vehicles to be found even at a depth of 14,000 feet (approximately 4300 meters). Flight Data Recorder (FDR) device used to record specific aircraft performance parameters. The purpose of an FDR is to collect and record data from a variety of aircraft sensors onto a medium designed to survive an accident. [9]. On May 2nd, 1953, a British Comet aircraft, with 43 people on board, crashed near the village of Jagalgori, less than 29 miles from Calcutta. There were no survivors and the investigation board made recommendations for some design changes to keep the aircraft operable although it was already the second fatal incident[10]. A year later, in 1954 another similar aircraft blew up near the island of Elba, after taking off from the airport in Rome. Although the aircraft was still considered well designed, it fell in the Mediterranean killing 35 people.

II. Historical development of FDRs

Flight data recorders were first introduced in the 1950s. Many first-generation FDRs used metal foil as the recording medium. This metal foil was housed in a crash- survivable box installed in the aft end of an airplane. Beginning in 1965, FDRs (commonly known as "black boxes") were required to be painted bright orange or bright yellow, making them easier to locate at a crash site. Second-generation FDRs were introduced in the 1970s as the requirement to record more data increased, but they were unable to process the larger amounts of incoming sensor data. The solution was development of the flight data acquisition unit (FDAU). The second-generation digital FDR (DFDR) uses tape similar to audio recording tape. The tape is 300 to 500 ft long and can record up to 25 hr of data. Most of these DFDRs can process up to 18 input parameters (signals). This requirement was based upon an airplane with four engines and a requirement to record 11 operational parameters for up to 25 hours.

The most modern FDR systems incorporate an Emergency Locator Transmitter (ELT) and some up-to-date recorders are also equipped with an Underwater Locator Beacon (ULB) to assist in locating in the event of an overwater accident. A device called a "pinger" is automatically activate when the recorder is immersed in water. It transmits an acoustic signal on a frequency of 37.5 KHz that can be detected with a suitable receiver. In

the case of the latest recorders, these transmissions are detectable at all but the most extreme oceanic depths but since they are battery-powered, their transmissions only continue for a limited period[11].

III. How do FDR(Flight Data Recorder (Black Box)) Work

A flight data recorder, often referred to as a "black box," is a device that collects data from an aircraft's systems. The data is recorded prior to, during and after a flight. This information can be used to help investigators determine the cause of a crash. There are two main types of flight data recorders: the cockpit voice recorder and the flight data recorder. The older model of the magnetic tape type cockpit voice recorder captures the last 30 minutes of conversation in the cockpit, and the modern digital static drive type records and preserves data of the last two hours of flight, as well as engine noise and other sounds. The recorder keeps overwriting old data and always preseves the last data[2]. FDR (Flight Data Recorder) system records hundreds of data during the flight of the aircraft. FDR consists of hundreds of valuable data such as altitude, speed, direction, blade angle, fuel flow depending on time. FDR normally starts recording data when a motor is running and continues until the motors stop. FDRs can generally record the last 25 hours of flight[14].

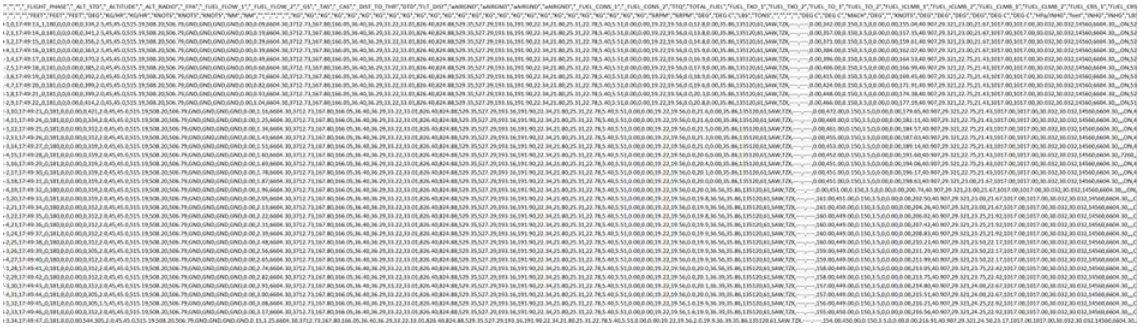

Figure 1. FDR Data Analysis and Visualization Simulator[14].

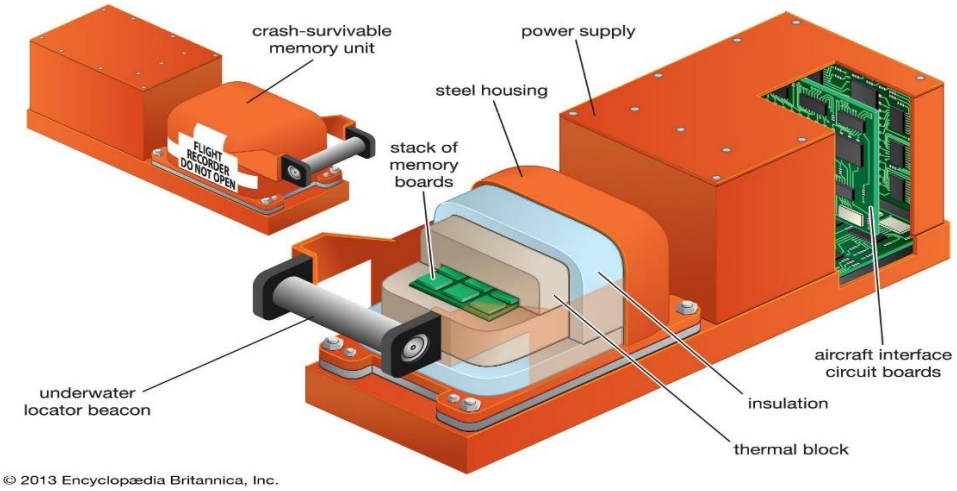

Figure 2. Structure of FDRs[15].

The CVR records verbal communication between crew members within the aircraft's cockpit as well as voice transmissions by radio. Aircraft sounds audible in the cockpit are also caught on the recorder. Flight recorders are commonly carried in the tail of the aircraft, which is usually the structure that is subject to the least impact in the event of a crash. In spite of the popular name black box, flight recorders are painted a highly visible vermilion colour known as "international orange."[15]

IV. Why is FDR Important

FDR (Flight Data Recorders) are a crucial part of aviation safety. They record and store data from the aircraft's systems, which can help investigators determine the cause of an accident. The data collected can include information such as the aircraft's speed, altitude and heading, as well as engine parameters and flight controls. This information can be used to develop better safety procedures and improve aviation safety overall[2].

Flight Data Recorder Specifications

Time recorded :25 hour continuous

Number of parameters :18 - 1000+

Impact tolerance :3400Gs / 6.5 ms
Fire resistance :1100 degC / 30 min
Water pressure resistance : submerged 20,000 ft
Underwater locator beacon : 37.5 KHz; battery has shelf life of 6 years or more, with 30-day operation capability upon activation[16].

Figure 3. A flight data recorder from a Sukhoi Su-24[13].

V. The Future of Flight Data Recorders

Will become smaller and lighter. See increased storage capacity. Will eventually show real-time activity through satellites with physical units as backups Flight data recorders are orange for easy retrieval within wreckage sites, though the term "Black Box" was coined due to the cryptic functionality of the FDR. When the Vickers 739A Viscount crashed onto the Nürnberg-München highway in 1968 Mr. Penny retrieved the company's recorder and pieced all of the data together bit by bit[12].

VI. Cockpit Voice Recorders (CVR)

Cockpit Voice Recorder (CVR), records radio transmissions and sounds in the cockpit, such as the pilot's voices and engine noises. Each recorder is equipped with an Underwater Locator Beacon (ULB) to assist in locating in the event of an overwater accident. The device called a "pinger", is activated when the recorder is immersed in water. It transmits an acoustical signal on 37.5 KHz that can be detected with a special receiver. The beacon can transmit from depths down to 14,000 feet[16].

Figure 4. Structure of the CVR device [16].

Operator concerns over existing airborne recording systems can be readily accommodated by a new architecture and software functionality, which provides incremental growth and the proposed Solid State Digital Data Recorder system[17].

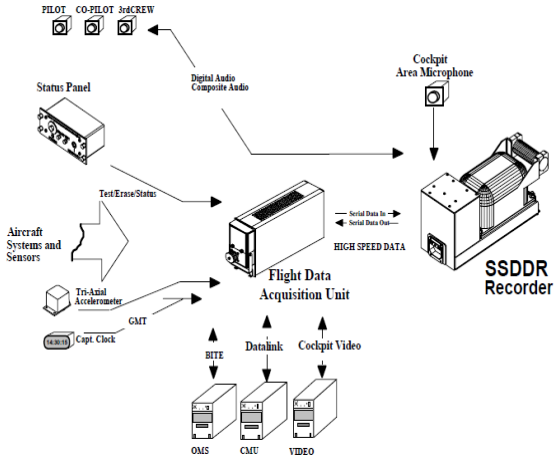

Figure 5 - Enhanced Airborne Recording System[17].

VII. Conclusion

The flight data recording system is an integrated system with many components and sensors. All elements in the system are in communication with each other and provide recording of many data such as altitude, temperature, speed, fuel consumption, given control movements. These data from various sources are recorded by FDR. FDR starts recording data when the aircraft's engines start and continues to record when the engines stop. Registration based on aircraft size can vary between 10 hours and 25 hours. Figure 5 shows the change of AC-DC sources according to time.

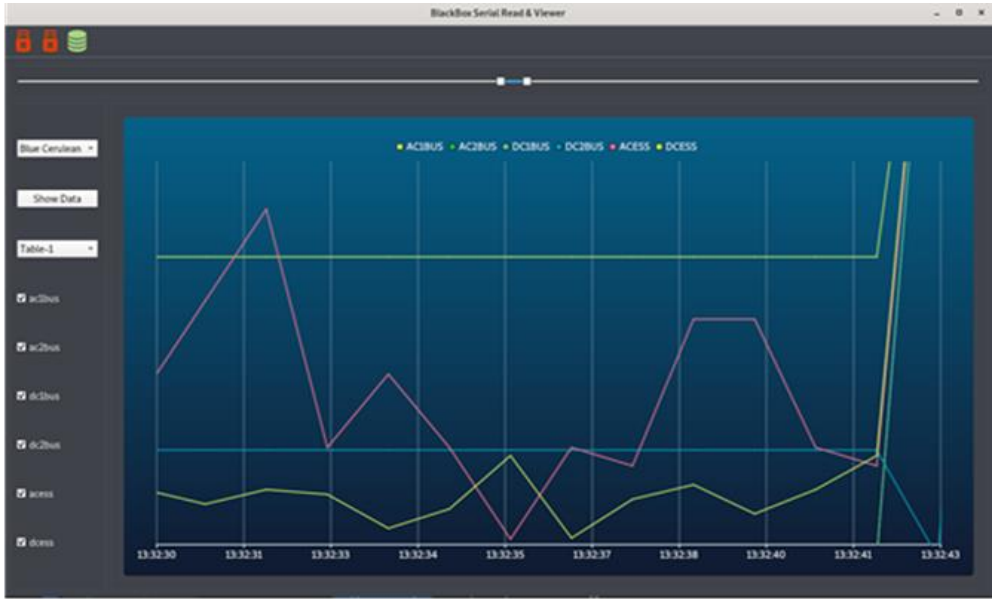

Figure 5 shows the change of AC-DC sources according to time.

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