Operational Impact of Multiple UAV Operations

Zaryab Arif[1] and Noman Sohaib Qureshi[2]

[1,2]University of Engineering and Technology, Lahore, Pakistan

***Abstract*– This paper describes the functionalities of Unmanned Aerial Vehicle (UAV). The birth of UAV began in 1959 when United States air force (USAF) officers, concerned about losing pilots. UAV are supervised military robots which are used from air. UAV's were known by different names drones, robot planes, pilotless aircraft, remotely pilotless vehicle (RPV). Later federal aviation administration implemented a generic class name for them Unmanned Aircraft System (UAS). UAS also comprise a data link, control systems, ground stations and other related support equipment. Generally, they are known as UAV. In this paper, we discuss UAV applications and its uses in different fields.**

***Keywords*– UAV, USAF, RPV, UAS and TPDU**

I. INTRODUCTION

UAV are powered, aerial vehicle without onboard human operator. UAV can be flown by pilot at a ground control station or can fly through pre-programmed flight plans. They should not confused by missiles. Actually, missiles are weapons but UAV carry weapons not itself. UAVs are small planes that can be held by a person. UAVs are selected as the function of type, weight and power requirement of sensor system. We will further discuss different fields. In history, they were mostly used in the area of intelligence surveillance and reconnaissance. Now a days using in remote sensing, search and rescue, armed attacks and lots of other areas will be described in this paper.

II. RELATED WORK

UAV research is becoming popular globally. This research includes the evolution of various enabling technologies composing vehicle and all the processes used in its design [1]. Advancement in performance and overall functionality of the small UAV is being continued. New mission will be enabled by the technology advancements like power storage technology, material and design methodology [2].

Today, when we look into the world of technology, we get amazed by seeing its progress. Apart from that, the hatred, wars etc are causing destruction in this world. Manned aircrafts and UAVs are the warfighters in this hour of need. Both are employing the combat power but UAVs seem more attractive because of its intellectual powers and other capabilities like surveillance, reconnaissance etc. In the near future, it's expected that UAVs will decrease the void between intelligence requirements and data collection capability [3].

In 2001 Aerobotics Group at Monash University was established who aimed on medium electrically powered flight. Special attention is given to safety of flight including its termination. Its latest aircrafts are computerized so need little abilities or completely autonomous [4]. Its flight control system setup is standard for other systems. Special attention is given to training and operation of members. As a whole UAV research provides motivating projects to post and under graduates of CS and EE [5]. Its main goal is to provide platform to students for their research need. UAV help in their research.

UAV has played very limited role in military action right through their history [6]. For all that, UAV are sustaining notable growth in the aerospace industry with the arrival of information warfare. UAVs have created a great deal of interest from US Military according to a firm analysis of a defense and aerospace market. UAVs were used for surveillance, intelligence, and reconnaissance, but currently they are being used for other missions. UAV expanses are imagined to increase above next 10 years from 3.4 to 7.4 billon according to the study of teal group. Europe occupies the second largest market for high-tech UAV technologies and accounts for roughly 20% of global total research followed by Asia-Pacific, The Middle-East, Africa and Americas. Civil market represents another potential market for UAVs and is believed to emerge about the next 10 years starting with organizations like border patrol and coast guard that require surveillance systems [7].

There has been a rapid growth in the gaining and development of UAVs. Approximately 80 countries have

[1]Research Scholar (Computer Networks & Telecommunication), University of Engineering & Technology Lahore (Gujranwala Campus-RCET)

[2]Lecturer Department of Computer Science & Engineering, University of Engineering & Technology Lahore (Gujranwala Campus-RCET)

UAVs, of which fewer than a dozen operate systems that can be armed, according to the Ministry of Defense [8].

Interest in unmanned aerial vehicles has persisted sporadically ever since the first experiments of the mating of aerodynamic, light-weighted engine and radio technologies was first attempted in 1917 while the result of these initial tentative steps are of the interest to serious historians our focus shift to the era of development since early sixties when the United State began to deploy unmanned platforms operationally in the reconnaissance role [9].

In this Section the mainly focus on working of transport layer. Our actual data receives at Application Layer at sending side. Then after some processing data is transferred to the layer 4 which is Transport layer. At Application Layer we attach sequence number and trailer with data. Then this payload sends to the transport layer.

At Transport layer when we receive payload from Application layer we divide this payload into some parts and attach Socket number and Port number with each part. Individual part is called TPDU. At each Socket number we attach a service of UAV which will be performed by selecting specified Socket number. We also trailer with each TPDU. These TPDUs send to the layer 3 which is Network layer.

Following algorithm will illustrate the working of transport layer protocol.

Algorithm: for transport layer data has been received from application layer.

Begin

Create Socket Number

Attach to Port Number

Attach Payload

While (1)

{

Read request from user for service

Select Choice

If (Choice==Case)

{

Response of request

Show the service of selected socket number

}

Else

Wrong Socket Number

Exit

}

End

In this protocol Programmer 1st specify Socket number for each service. Then ask from user for choice. If selected choice of user match with any one case which has been specified in protocol. Then that case will be selected match the socket number and perform the specified service. If choice does not match with any case then simply show the message of wrong socket number.

When these TPDUs received at Network layer, this layer combines TPDUs and allots IP address and Destination address. Combination of TPDUs calls Packet. These packets pass to layer 2 which is Data Link Layer. Layer 2 convert this packet into small frames and pass to layer 1 which is physical layer. Layer 1 converts these frames into binary form and send to receiving side.

At receiving side physical layer received data and convert it again to decimal form and send to layer 2. Layer 2 detaches its own data which has been attached at sending time and send back to layer 3. Layer 3 detaches IP address and Destination address from frames and make packet of receiving frames of layer 2. And then these packets sent to layer 4. Finally layer 4 which is transport layer dissemble socket number and data send back to the Application layer. Application layer perform services at receiver side.

This protocol has been executed give exact output and successfully performs services.

III. FUNCTIONS

UAV use in different fields and perform different operations. We will discuss operational impact of multiple UAV operations.

A) Remote Sensing

It provides combining information from different sensors which is used for different purposes. It includes electromagnetic sensors, biological sensors, gamma ray sensors and chemical sensors.

Table 1: Shows Functionality of Remote Sensing

000000	Electromagnetic Sensor
000001	Gamma Ray Sensor
000010	Chemical Sensor
000011	Biological Sensor

Above those binary numbers are allocated to services when user select one of them corresponding functionality will be performed.

Electromagnetic sensor used infrared camera just like radar system shown in Fig. 1. Gamma ray sensor is like detector use ultraviolet waves. Chemical sensor is used to analyze concentration of each element in air. Biological sensors are used in detecting the microorganisms.

Fig. 1: A Thermal Imaging Gimbal Pod Camera

B) Scientific Research

UAVs are especially useful in penetrating areas. Used in measurements which are far closer to the water surface. Now a days UAVs are used in construction and artwork.

Table 2: The Functionality of Scientific Research

000100	Construction
000101	Artwork

In this Fig. 2 you can see that it is detecting an underground facility.

Fig. 2: A UAV Detecting an Underground Facility

C) Commercial Aerial and Surveillance

In this field UAV technology is expanding rapidly with increased development of automated object detection approaches.

Table 3: Functionality of Commercial Aerial and Surveillance

000110	Livestock Monitoring
000111	Wildfire Mapping
001000	Pipeline Security
001001	Home Security
001010	Road Petrol
001011	Anti-Piracy

D) Earth Science

UAVs are selected as a function of the type, weight and power requirements of sensor systems. These services are the latest requirements for UAVs.

Table 4: Functionality of Earth Science

001100	Climate Change
001101	Atmospheric Sampling
001110	Glacier Dynamics
001111	Volcanic Activity

E) Search and Rescue

UAVs will likely play an important role in search and rescue. Microwave UAVs, like AERYON SCOUT have been used to perform Search and Rescue activities at smaller scale, like search for missing person.

Table 5: Functionality of Search and Rescue

010000	Find missing person
010001	Damage Assessment
010010	Photographic
010011	Rescue Activities
010100	Storm Tracking

F) Armed Attacks

In armed forces UAVs are used for different purposes, as following services.

Table 6: Functionality of Armed Attacks

010101	Target Killing
010110	Drone Attacks
010111	Events Security

In different fields UAVs services explain in this table.

Table 7: Functionality of ports

011000	Traffic Monitoring
011001	Pollution Monitoring
011010	Disaster Relief
011011	Detection of forest fire
011100	Domestic Police work
011101	Production Activities
011110	Transport Medicines
011111	Agriculture applications

IV. CONCLUSION

Nowadays UAVs have been involved almost every field. UAVs are less wait and portable. When compared to Manned Aerial Vehicle, UAVs give benefits they are cost effective and reduce the risk to pilot's life. However, accident rates in today's UAVs are over 100 times than that of manned aircrafts. Therefore, improved safety and reliability are still required.

REFFERENCES

[1]. Merchant, M.P., and Miller, L.S., "Propeller Performance Measurement for Low Reynolds Number UAV Applications" A1AA 2006-1127, 2006.

[2]. Reid, Concha; Manzo, Michelle; Logan, Michael J.; "Performance Characterization of a Lithium-Ion Gel Polymer Battery Power Supply System for an Unmanned Aerial Vehicle", SAE Paper 2004-01-3166, Power Systems Conference, November 2004, Reno, NV, USA.

[3]. US Department of research, joint publication 3-55.1 joint Tactics, Techniques, and Procedures for Unmanned Aerial Vehicles, Washington, 1993.

[4]. Munson, Kenneth (Editor). Jane's Unmanned Aerial Vehicles and Target, Surrey, UK, Jane's Information Group.

[5]. Cornall, T. and Egan, G. K., " Measuring Horizon Angle from Video Onboard a UAV", Proceedings of the IEEE International Conference on Auto nous Robots and Agents, 13 – 15 December , Palmerston North, New Zealand.

[6]. Micro pilot MP2028 Installation and Operation, Micro pilot, Stony Mountain, Manitoba, Canada , October 2003.

[7]. Goodman, Glenn W.Jr. "Flying High: Air Force Finally Embraces Unmanned Aerial Vehicles", Armed Forces Journal International, Oct. 95, p: 18.

[8]. Hazeldene, A, Sloan, A, Wilkin, C, and Price, A., "In-Flight Orientation, Object Identification and Landing Support for an Unmanned Air Vehicle", Proceedings of the IEEE International Conference on Autonomous Robots and Agents, 13-15 December, Palmerston North, New Zealand.

[9]. Senate Armed Services Committee, "Statement of Mr. Charles E. Heber, Jr. Director, Defense Advanced Research projects Agency(DARPA)High Altitude Endurance Unmanned Aerial Vehicles(HAEUAV)Program Office Before the Subcommittee on Unmanned Aerial Vehicles,9April 1997", (Washington D.C., SASC, April 1997)

[10]. Needham, Jeffrey L., "Proper Course of RQ-3A Darkastar, Unmanned Aerial Vehicle. Integration in the United State Air Force," Air Command and staff College, Air University, April 1999.