5th SASTech
Iran | Mashhad
May 12 - 17 | 2011
5th Symposium on Advances in Science & Technology

Monitoring For Warlike's Biological Signal With Emphasized On Pilot

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ABSTRACT

In many of developed countries، military industry uses science and technology for more and better taking care human lives ،specially military force. It is quite clear that the internal defense centers in the country pay a lot of care to the health science and technology.One of the useful cases، is the use of technology for taking cazre of vital and mental dituation military force against different kinds of threats and menaces.

Among them، making and using different systems of vital signals registration of individuals are considered as a source of damage diagnosis for taking care and even treament.In the domain of care the individuals vital signals can be recognized and estimated from physiological and metal point of view.In this paper، the care system of pilot vital signals are provided.By this way، the physiological and metal conditions of pilot are provided in the base for taking care of the pilot life and the immunity of fighter and fligh.

Keywords: Air navigation physiology,vital signals registration, tele sensors, heart signals monitoring.

1- Introduction

Watching a human`s body is of great importance and in fact the development of science and technology is the goal for protecting human beings facing different threats. No doubt, it is essential to employ science and technology for fighting against various threats. War and battle for protection of one`s dignity and holiness is unavoidable. In this direction, Biomedical Engineering can play a major role among different sciences and technologies and have the greatest impact on the various approaches that will be followed. In the case of watching the pilot’s life. it is possible to record vital signals of pilot’s psycho- physiological-conditions to protect him appropriately during flight operation[3] .This is of great importance for military industries and organizations because it is a determinate fact in the quality of battle and the risk of revealing of the military secrets due

to crashing of the fighter on one hand and the matter of pilot`s health and security as an influential and experienced human being, on the other hand, is considered[6]. In this paper, in addition to studying the numerous factors involved in flight operations, a watch out system has been devised to protect the pilot through recording the vital signals of his psycho physiological conditions.

2- The unfavorable effects of aviation on the pilot

As human being elevate to higher heights when climbing mountains or by flight, knowing the impact of heights high pressure and low pressure of gases and also some other factors such as acceleration forces and weightlessness on the human being have been increasingly vitalized[1].

2-1- The effect of low pressure of oxygen on human body

The approximate pressure of atmosphere and Oxygen in different heights will be 76mm Hg in sea-level and in 3000 meter high is 523mm Hg and in1500 meter is87mm Hg. The main cause of all matters originated from hypoxia of Physiological changes in human being is of heights. As barometric pressure reduces the partial pressure of Oxygen reduces proportionally. In all cases it will remain lower than 21% of total barometric Pressure. The influence of berating pure Oxygen on the pressure of bubbled oxygen in different heights if any, one take in pure oxygen instead of air with most bubbled volume space formerly occupied by nitrogen. Now is occupied by oxygen so in heights, aviator can breathe pure oxygen with the bubbled oxygen pressure 139mm Hg instead of 18 mm Hg, note that up to height of 11700 meter. The amount of saturation will be above 90% and then reduces quickly and reach to almost 50% in 14100 meter high[2].

2-2-Severe effect of hypoxia

Some of the harsh effects of hypoxia in the heights about 3600 meter are dizziness-mental and physical exhaustion and sometimes headache and rarely nausea and occasionally joy. All these symptoms in heights higher than 5400 meter lead to muscular trembles in above level of 6900 meter do not accumulalized in the person. So he goes into comma. One of the most important sign of Hypoxia is the decreasing of mental power of person. So as he cannot manipulate memory operations and accurate movements[4]. The main drive for increasing the production of hemoglobin is hypoxia. In normal condition in the complete accumulation proportion of low oxygen pressure hematocrit from normal state of 40-45 to a medium number of 60, and along with the total density of the existing Hemoglobin in circulation increases .the increase in the hemoglobin and blood volume is done slowly and only after several months it will become complete.

2-3-The circulation of acclimatization

The heart output increases immediately after elevating to high positions up to 30%,but with the increase of blood hematocrit recovered so the amount of carried oxygen to tissues

remain s normal unless the highness reaches to a level that causes high hypoxia. This is called increased capillarity.

2-4-The effect of acceleration forces on the body in aviation physiology

Several acceleration forces affect the body during the flight due to the quick changes arises in speed and the direction of the airplane. At first plain linear acceleration and at the end of flight the speed slows down. When there is a turn in the plane, the egocentric force arises and is determined by the following formula:

$$F=m\ v^2/r \qquad (1)$$

According to this rule, as the speed increases the egocentric force along with the square root of the speed accelerates as well.

2-5-Measuring the accelerating force of G

When a person sits on a chair, the force which exerts on is derived from the gravity force and is equal with the person's weight. The velocity of force is +1 G and is equal with the gravity force exerted . This will be +5G when the plane is diving. When the plane is orbiting a vertical circle ,outside loop a negative G force is exerted[4].

3- The influence of the egocentric acceleration force (G+)on the body

3-1-The effects on the circulation

The most important influence of the egocentric acceleration force is on circulation because blood is fluid and moving and can alter the spot of the blood through egocentric forces. while the aviator exposed to +G his blood is driven to the lower part of his body. So the systolic pressure is 450 mm/ hg. Thus the more blood is accumulated in the lower part of body, the heart output will decrease. In the following figure ,the changes of the systolic and diastolic pressures in the upper part of the body is illustrated when an accelerating force of +3.3 G exerted on an individual. At first, both decrease to below 22 mm hg, but in 10 minutes or 15 the systolic and diastolic pressures return to 55mm hg and 20 mm hg respectively. This reaction is because of activating of the reflexives of pressure receivers. The acceleration higher than 4 or 6 G causes black out and comma in a few minutes afterwards[7].

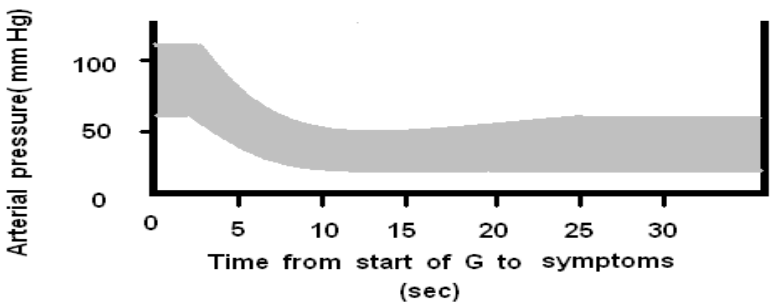

Fig 1: the changes of the systolic and diastolic pressures in the upper part of the body

3-2-The effect of the egocentric acceleration force on vertebrates

The extra egocentric acceleration force can cause to break vertebrates even in a proportion of a second. The amount of positive acceleration in a seated position that can be tolerated before any fracture is about 20G.

4- Noise and oscillation in Military aviation

Much noise in the plane is in two positions: revolving and stabled wing. This mechanical stimulus is a threat for pilot's health and the crew as well.

4-1- Low hearing

The most commonly occurred effect of noise is low hearing. Noises and extra trembles cause malfunctioning of limbs particularly when the there is a long noise.

4-2-the measurement of oscillation and sound

Sounds and the energy of trembles are measureable. The main measureable Characteristics are frequency, duration and density.

4-3-Frequency

Frequency is a physical feature that specifies up and down of sound. Movement or frequency or periodic kinetics is the number of oscillations of air pressure per second.

4-4-Human hearing and speech suffering

The human's ear is quite sensible and recognizes the range of frequencies between 200 to 6800 hertz.

4-5-The results of shakes

The human's body reflections to trembles are different and can cause vital effects in short times. The crew od planes and helicopters are expose to different trembles in a certain frequency.

5- Tele-sensors and put ons in biomedical engineering

A biosensor is made up of three basic parts including biological tracking system(bioceptors), transducer, and output system. There are three basic kinds of bioceptors which are distinguished on the basis of performance nature and biological and biochemical structure.

5-1-Tele-sensors in medicine

The purpose of representing these sensors, is the development of the decoration of trachea to monitor an display body functions and delivering them to medical centers. Inserting a chip of

medical tele-sensor on the top of the finger, make it possible to record some essential parameters and carrying to medical centers. The aim for using these sensors ,for the first time, was to monitor the vital signals of troops in war zones and sending them to a remote recording center. They will also enable us to send physiological information to a smart monitor fixed on the other soldier's hamlet through wireless radio to help him in emergencies in less time[7],[8].

5-2-The application of QASIC in medicine

The chip inserted on the top of your finger can measure body temperature, blood pressure ,and the level of oxygen just as pulse ox meter does. The application of medical tele-sensors in military uses play an important role[6].

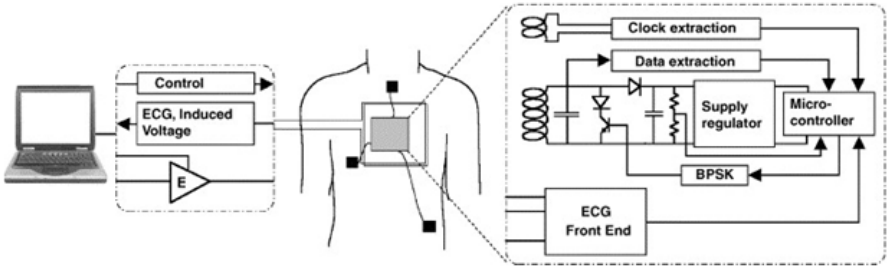

Fig 2: Recording of heart signals

6- Monitoring heart signals through textile

Regarding advances attained in new textiles for individual care systems, the trend is towards recording biological signals with high trust and ease of people. the application of recording of heart signals through certain textile has been displayed. This system works continuously to record signals even children. Sensors and antenna are inserted on clothes. It sends signals through wireless devices and its best advantages is its portability.so as the individual can take it on easily[11]. The special electrodes are called textrodes and are of dry kind with no discomfort as gel electrodes. All electronic pieces are placed on this textile[9].

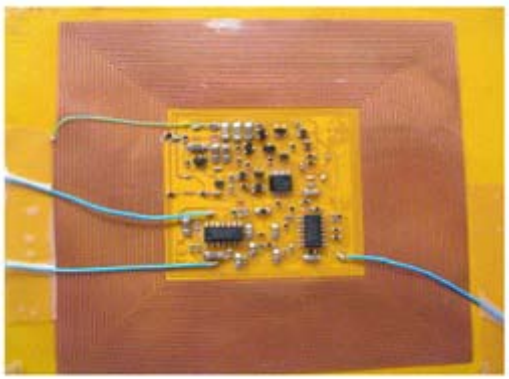

Fig 3: Integrated Circuit With Transmitter

6-1- Designing the recording system and optimized features

The system which has been devised is classified on the basis of vital signals of the pilot. Heart signals, temperature, birth rate, and blood pressure are measured and recorded. In this system, three important factors should be considered. The choice of place of recording is of great important . the best places are chest, on the left side. Levels of design including recording electrodes of metal panel; supporting level an isolated supporter, and analog – digital transducer are needed to acieve the optimized results[5],[10].

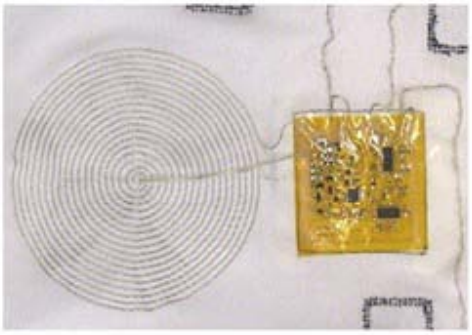

Fig 4: Integrated Circuit With textiles for individual care systems

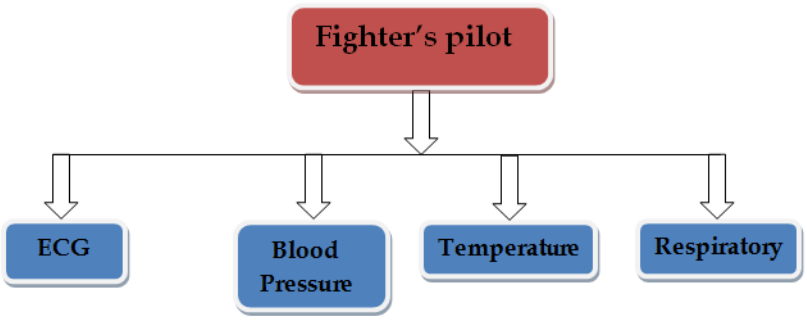

Fig 5: Recording system and optimized features

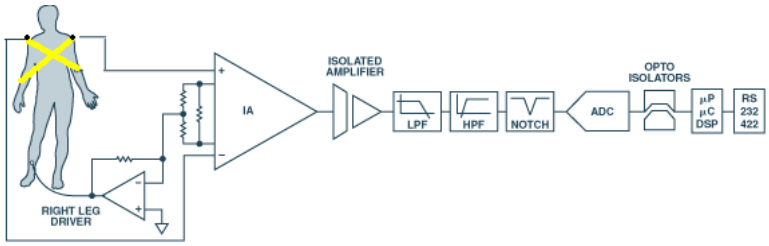

Fig 6: ECG recording system for Pilot

7- Results

There are several mobile recording devices available. Most recording vital signal systems of pilot record and send only heart signals. Recording devices must be able to show exact and

correct heart signals ia wide range .In transportation in general and in flight specifically , the recording devices must not interfere the pilot's freedom. So they must be quite flexible the mental and physiological conditions of the pilot is of great importance.

8- Conclusions and suggestions

The fighter an pilot in war zones can be taken care through smart systems which help to increase their efficiency and keep them in healthy conditions. Flight conditions exerted a high stress on pilot's body. Therefore the form of recording should be selected carefully. With the help of this system ,it is possible to check the pilot's status in any moment. In general by using a waist jacket under the pilot's uniform, we can control the psychic-physiological conditions of the pilot without any interference in his flight operations.

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