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Proposal for Design a Helmet Mounted Display for Kfir C2 Aircraft

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Abstract

The Kfir (In Hebrew "The Lion Cub") is one of the supersonic multirole fighters made by Israel Aircraft Industries LTD in 1975. Currently approximately 125 aircraft are in service in United States, Colombia, Ecuador and Sri Lanka. Kfir added to Sri Lanka Air Force initially in 1996 with six kfir C2s and single TC2. Attempt to analysis the aircraft through its design and performance capabilities and propose a specially designed helmet with virtual display for the pilot will be the main expectation of this research. The major purpose of this project proposal is to introduce the digital helmet mounted display which is mapping with the aircraft capabilities. Also the study has done to find possibilities to do few modifications to the Avionics part of the aircraft and enhance the electronic limitations. Primarily I concerned the ADC of the aircraft with HUD and find possibilities to modify and make suitable conversions for them to design a helmet mounted display.

Keywords: *Kfir C2, Avionics, Air Data Computer(ADC), Head Up Display (HUD)*

1. Introduction

Avionics is one of the most valuable subjects in aeronautical studies. Many electronics theorems linked with advanced control systems have been used to develop lot of aircraft electronic systems. Head Up Display (HUD) is use to visualize the important data to pilot while flying by using graphical symbols and numerical methods. Reducing pilot fatigue and enhance his performances are major expectations of HUD. Helmet Mounted Display comes to play as the premiere development of Head Up Display (HUD). The respective technology is very popular in generation 4 fighter aircraft. Enemy target detecting system, weapon control system, night time flight control handling and IR/Normal camera control system are examples for developed systems through HMD. Proper combination with the air data computer and flight data recorder devices will be helped a lot to develop the accuracy of the HMD. Design and fabricate the specific visor screen for the helmet will be the most critical and challengeable part of the research. The purpose of this research project is to analyze the Kfir C2 aircraft avionics and propose a Helmet Mounted Display for the helmet currently in use.

Kfir is one of the most useful supersonic fighter jets currently service in No 10 attack squadron in SLAF. The aircraft is designed by Israel Aerospace Industry with the combination of US technologies. The original aircraft is developed in several versions and Kfir C2 aircraft has taken for this research. It is initially manufactured with some basic avionics and air frame designing features with a basic pilot helmet. By this research project author tried to analysis the entire aircraft with its avionics and propose some new modifications and develop specially designed Helmet with a visor video display for Kfir C2 fighter jet. Author checked on some possibilities of these proposals to be added to the original aircraft.

Table 1: Aircraft Specification

Type	Single seat , Multi role combat Supersonic aircraft
Operations	Air combat, Ground Attack
Design	Delta-Canard
Power plant	Electric J79 turbojet engine
INS(Internal Navigation System)	Enable
Wheel Base	3.2m
Track	4.87m
Height	4.55m
Length	15.65m
Wingspan	8.22m
Canard span	3.73m
Service ceiling	50000 ft
Cruising Speed Max (Vc)	750 Knots
Internal Fuel Capacity	3240 L
No of fuel tanks	3
MTOW	16200 Kg
Max Payload	5630 Kg
Armament	Two 30mm guns, Five Bombs, Two A/A IR missiles
Avionics	AC, Compared with 5 AC busses

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2. The pilot helmet currently use

The pilot helmet currently using in Kfir C2 aircraft is a second generation helmet which equipped with only basic systems such as pressurized Oxygen mask, Microphone, Earphone, Visor and outer protection for pilot in case of high impact.

2.1 M101/AIC microphone

This microphone is designed to use in high noisy conditions without having disturbances for communications. Dynamic type moving coil M101/AIC microphone is generally use in pressurized bounded helmets

2.2 In line Amplifier Headphone

In line amplified headphone in the pilot helmet provides the smooth and quality sound system through tiny small speakers. Generally Headphones Amplifiers are classified in several classes by its performances and qualities. In fighter pilot helmet the amplifiers are very small but faster in operation with small power consumption and portable too.

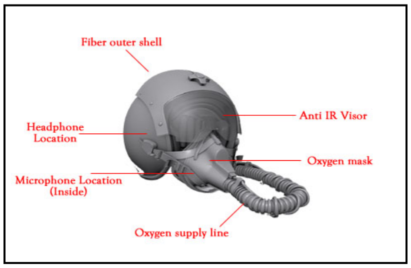
2.3 Nato Connectors

Nato connectors are using for provides the outer case and electronic linking device for the microphones and amplified headphones in the helmet. This nato connectors are made with corrosion resistance materials and it can be performed well in high temperatures too.

2.4 Connector Codes

Connector codes are connecting the helmet into the flight deck controls to allow the helmet to get the power and work properly. This cable is more flexible and high speed in current transforming capabilities. The helmet will get the power through this cable mainly from AC-1 bus.

Figure 1: Kfir C2 pilot helmet



3. Avionics of Kfir C2 aircraft

Kfir C2 avionics system is categorized under the EFIS aircraft which are fully or partially equipped with several electronic flight instruments and display systems. Since the Kfir is identified as a fighter jet it also included several digital devices and tools in build with it. Kfir C2 basically powered by dual-redundant electrical system which consists with two AC power sources and one DC power source as battery for emergency power supply purposes. There are two engine driven generators followed by CSD units with constant 8000 RPM and those alternators quipped with Voltage Regulators. In case of emergency the battery provides the DC power for operation through emergency AC inverter and the emergency AC bus.

Main power distribution system for every component is designed with 5 AC buses and 4 DC buses. Century. It should be in a bold font and in lower case with initial capitals.

Table 2: Power buses of Kfir C2 aircraft

AC Buses	DC Buses
AC-1 Bus	DC1-1 Bus
AC-2 Bus	DC1-2 Bus
Emergency AC Bus	DC -2 Bus
AC -1 Automatic Load Bus	Battery Bus
AC – 2 Automatic Load Bus	

In flight operations all the devices and systems working by AC power buses while DC1-1 and DC1-2 are separated by the Manual Load Reduct Relay. In case of emergency AC and DC cross power supply can be used by linking the buses together.

3.1 Digital Air Data Computer (DADC)

DADC is the device which is using to convert the electronic raw signals into the digital symbols and present it to the display generally to the HUD. DADC is powered by the AC1 bus of the aircraft. Raw air data such as Static pressure, density altitude, AOA and speed will be converted into the HUD through this DADC. This is the main device which is highly concern and developed in most aircraft which are using Helmet Mounted Display unit.

3.2 Head Up Display (HUD)

HUD of the Kfir C2 is located in the eye level of the pilot above the flight deck in the cockpit. It is the device which is projecting Altitude, Speed and armament controls data. The illumination of the critical data on the glass screen is complete by laser optics beams. The information displaying in the HUD can be divided into two major categories named Critical Information and Flying Status Information. Altitude and speed in given instant, density, Mach number variations and AoA variation with the airflow are identified as critical information since fuel capacity variation, ammunition, radar and other controls categorized as flying status information.

3.3 Video System

The Video Tape Recorder(VTR) and video camera for gun sight view are the main members in video system of Kfir C2 aircraft. As we mentioned earlier DC1-1 power bus supply the power for the VS. HUD provides the display facility for the video gun sight camera. The video gun sight camera transfers the HUD pictures to the VTR in black and white. Sometimes the recorded video pictures will be saturated in the HUD. To prevent this error manufacturer recommended keep the HUD intensity control knob not to exceed the 12 o'clock position.

The VTR box is located in the nose of the aircraft with VTR box inside. VTR Control switch is on the starboard side of the cockpit. General recording time of the VTR black and white cassette is 1hour and it is 8mm in dimensions. In the VTR control switch we can see three controls named OFF, AUTO and REC. VTR is in REC mode when it is recording and cassette cannot be opened or loaded in this situation. Cassette can be loaded when it is in AUTO control position. At OFF the VTR system is not powering by the buses. The VTR recording operation does not have the indication lights for it and the cassette can be removed after the engine shut down totally.

3.4 External Navigation Antennas

UHF "red" Radio antenna is the main antenna of the aircraft communication system located at the top of the vertical stabilizer. Control panel for this antenna is located at the right side of the cockpit. VHF "Green" antenna comes next and located at underneath the cockpit. Control box is on the left hand side inside the cockpit. VOR/ILS antennas located both top sides of the vertical stabilizer

4. Methodology

4.1 Solid modeling with Solid Works

Solid Works is a solid modeling computer-aided design (CAD) and computer-aided engineering (CAE) computer program that runs on Microsoft Windows. The Solid Works application is a mechanical design automation software package used to create parts, assemblies, and drawings. Designers can quickly sketch 2D and 3D concepts, create 3D parts and assemblies by using Solid Works.

4.2 Basic features of Solid Works

Solid Works model: It is consists of 3D solid geometry in a part or assembly document. SolidWorks features start with either a 2D or 3D sketch. Designer can either import a 2D or 3D sketch or can create the sketch in SolidWorks.

Features: Individual shapes like Lines, Circles, Rectangles, etc. can be created by Sketch. Some features originate as sketches; other features, such as shells or fillets, are created when we select the appropriate tool or menu command and define the dimensions or characteristics that we want.

Base sketch: The first sketch of a part is called the Base sketch. This is the foundation for the 3D model. In a 3D sketch, the Sketch Entities exist in 3D space. Sketch Entities do not need to be related to a specific Sketch plane.
Associatively: Associativity between parts, sub-assemblies, assemblies, and drawings assures that changes incorporated in one document or drawing view are automatically made to all other related documents and drawing views.

Drawings: Create 2D drawings of the 3D solid parts and assemblies which we design. Parts, assemblies, and drawings are linked documents. A drawing generally consists of several views generated from the model. Views can also be created from existing views.

Constraints: SolidWorks supports numerous constraints. Constraints are geometric relations such as: Perpendicular, Horizontal, Parallel, Vertical, Coincident, Concentric, etc.

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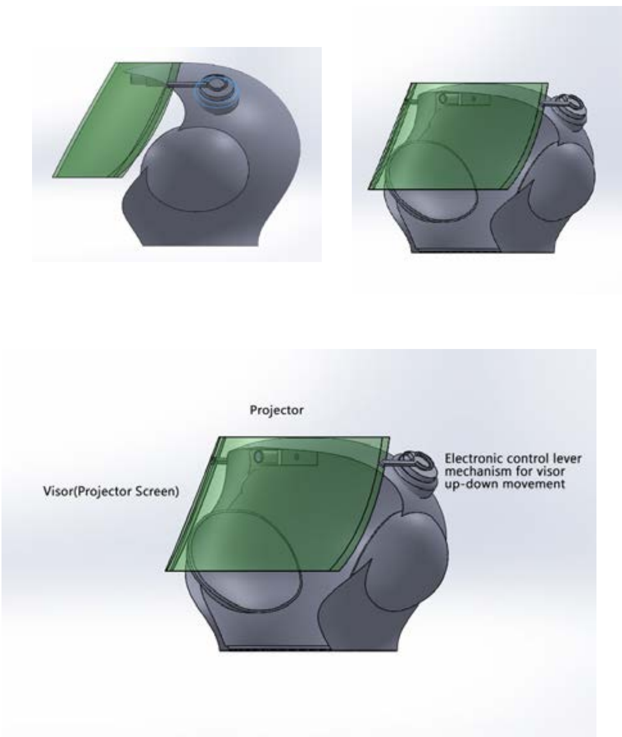
Apply equations to establish mathematical relationships between parameters. Insert equations and constraints to your model to capture and maintain design intent.

Figure 2: Solid Model of Proposed HMD



4.3 Electronic developments with Arduino Technology

ARDUINO is one of the latest micro programming technologies in the world. The uses of Arduino have not limited too few boundaries in electronic and mechanical concept. It is considered as Electro-Mechanical microchip interface which can be used to run functional progrmammes on it. Arduino is a electronic circuit board which consists of main microchip for programming loading and other electronic equipments such as capacitors, resistors and transistors. The multifunction capability of Arduino have achieved by using multiple operational ICs run parallel with the microchip inside. Arduino can be used with the interconnection of Raspberry Pi and ARM programming technologies.

Arduino IDE computer interface

Arduino IDE software must be used to upload the codes written to the respective function. Arduino programming language basically developed with the concepts of C# and Java languages. The IDE software is acting as the bridge in between the Arduino hardware and software interfaces. The user must be aware about the version of IDE software which is suitable for Arduino microchip board such as UNO nd MEGA. Accessory Arduino boards available too for run multi functional operations at one time. These additional boards called Arduino Extensions. These extensions will be used to develop high tech functions using Arduino basic microchip. Extensions will be worked as developing platform of basic technology and the results can be monitored using a computer interface.

4.4 Working method for proposed HMD

Generally the radio navigation and helmet communication devices are connect to the main AC1 bus of the Kfir aircraft. But for this HMD unit I have proposed the dual way power system for the unit input from AC1 and DC1-1 power bus of the Kfir C2 aircraft. Additionally there will be a small rechargeable battery which has 12V voltage limits mounted on the To- Left side of the HMD. This battery has control switch on it. Pilot can put ON the switch when he ejected the aircraft. This battery will provide the power to the entire HMD for maximum 30 minutes until pilot find out the safe location to land.

4.5 Features and characteristics of proposed HMD

The respective HMD to Kfir C2 will be designed with specified design features which are mapping with the aircraft. Followings are giving the picture about the proposed HMD system.

Dimensions - The outer fiber shell will be little bit larger than the current helmet. This is due to provide the space for include the optics circuits and laser beam components with signal transformers. Center of Gravity of the helmet should be monitored while designing with the entire weight of the helmet to avoid pilot uncomforting.

Microphones and Headphones - The M101/AIC microphone and Amplified headphone will be used for the helmet without changing from current designing. But I propose a Micro Amplifier system for headphones in the helmet to make it more and smoother and avoiding the time delaying in the signal receiving.

Oxygen Supply System - There are no any modifications or changing for the current oxygen supply system of the Kfir C2 aircraft.

Components of the HMD - The project unit, combiner and video generation computer are the three basic primary components contains with HUD system. The projection unit is an optical collimator setup which is contained with convex lens with a cathode ray tube. This setup provides images. A head unit for mounting the cathode ray tube (CRT) which projects the image on the assembled transparent display screen in front of the pilot.

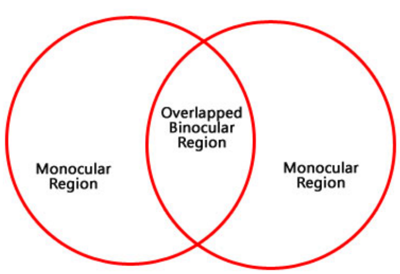
The transparent screen - called a combiner - that is a “holographic optical element of glass or plastic that reflects the projected image to the eyes of the pilot without interfering with the passage of ambient light. Combiner is an angled flat piece of glass which is located in front of the pilot. It is redirects to projected image by providing a way to see the field of view and the projected image at same time.

The computer to receive data from the aircraft and generate symbology display. It provides the interface between the projection unit and the data to be displayed by the projection unit. A control panel for the selection by the pilot of various display options and to enter data not received and integrated by computer from aircraft sensors. An annunciator panel provide status HUD and warnings.

4.6 Design perspective and technologies

Field of View (FOV) -Indicates the angle (s), as well as horizontally vertically, subtended at the pilot's eye, that 'displays combine the symbology in relation to the outside view. As an example the view of a runway from combiner can be taken some additional information beyond the perimeters of runway. Depending on technical limitations in the design process, HUD image is viewed by one or both eyes. That both eyes view is on same image which is called binocular field of view.

Figure 3: Overlapped FOV with monocular region



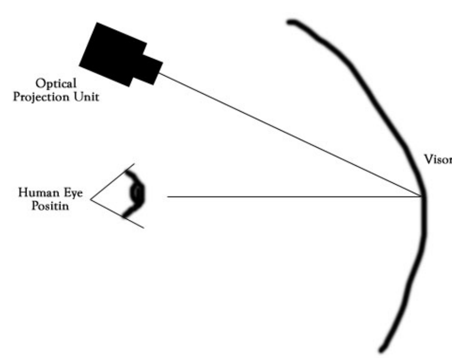
Collimation - The projected picture is collimated which makes the lights in parallel. Collimated image on the HUD are combined existing perceived as gold at near infinity optical. This means that pilot's eyes do not need to refocus to view the outside world and the HUD display the picture appears to be overlaid the outside world.

Eye Box – The optical collimator produces a parallel light so the display can be viewed only while the viewer's eyes are somewhere within that cylinder, a three-dimensional area called expired the head or eye motion box. Modern HUD eye boxes are usually about 5 laterals by 3 longitudinal vertical by 6 inches. This allows the viewer some freedom of head movement order movement too far up / down left / right will display the causes to vanish off the edge of the collimator and movement too far back because it will crop off to around the edge.

Bore sight - Aircraft HUD components are very accurately aligned with the aircraft's three axes - a process called Expired bore sighting - so that displayed data conforms to reality typically with an accuracy of mill radians and may vary across the HUD's FOV. In this case the word "accordance" means meeting, That is projected on the combine and the actual object is visible, they will align.. During the aircraft's building process bore sighting is done and can be performed in the field on many aircraft.

Scaling - The displayed image (flight path, pitch and yaw scaling, etc.), are measure of present to the pilot a Picture that overlays the outside world in an exact 1: 1 relationship. For example, objects (Such As a runway threshold) that are 3 degrees below the horizon as viewed from the cockpit must appear -3 degree at the index on the HUD display. Compatibility - HUD components are designed to be compliant with other avionics, displays, etc.

Figure 4: HMD visor projection method



5. Advantages and safety benefits

5.1 Vital information provided to pilot

Information can be displayed on a primary flight display. The original airspeed, altitude, location and glide slope can be joined by key derivative information on the energy status of the aircraft. This was followed by an airspeed, angle-of-attack indication and notional depiction of runways. And also have tail strike warning, unusual-attitude and wind shear detection and recovery guidance, stall margin indications and advisories. For the landing or rejected take off in low visibility, runway distance remaining and ground deceleration displays can be a crucial aid to preventing runway excursion.

Bore sight gold waterline symbol-is fixed on the display and shows where the nose of the aircraft is pointing actually. Flight path vector (FPV) or velocity vector symbol- shows where the aircraft is going actually, the sum of all force acting on the aircraft. When approach and landing, a pilot can fly the approach by keeping the FPV symbol at the desired descent angle and point of touchdown on the runway.

Acceleration indicator- typically to the left of the FPV symbol, it is above It if the aircraft is accelerating, and below the FPV symbol if decelerating. Angle indicator- shows the wing's angle relative to the airflow, often displayed as "α".

Navigation data and symbols-for approaches and touchdown, the guidance systems can provide visual cues based on navigation aids Such as an Instrument landing system or augmented global positioning system. Typically this is a circle qui fits inside the flight path vector symbol. Pilots can fly along the proper flight path by "flying to" the guidance cue.

Data to be displayed for both civil and military pilots;
- Primary flight info
- Navigation info
- Engine data
- Airframe data
- Warning data

Additional info available to military pilot;
- Infra-red imaging sensors
- Radar
- Tactical mission data
- Weapon aiming
- Threat warning

5.2 Safety Benefits

The 'applied' benefits of a HUD transportation to aircraft flight safety-have-been seen as the mainly enhancement of situational awareness for flight in limited (or night) visibility in the vicinity of visible soil, water, or ground-based obstacles other aircraft; Because this is possible, it is to maintain an external lookout without losing access to key aircraft instrumentation.

In an emergency case, if pilot wants to eject from the aircraft he may allow to eject with helmet by keeping communication with ground crew. And also pilot can get geographical data through GPS system and can identify enemy locations easily. Then pilot can decide the area where he needs to land the parachute.

Precision - the angular error between the line-of-sight and the derived mark. The location of the helmet is what is used to spot the missile; thus it must be calibrated and fit securely. The line between the pilot's eye and the reticle is on the visor known as the line of sight (LOS) between the aircraft and the target. The user's eye must stay aligned with the sight - in --other words, current HMDS cannot sense where the eye is looking, can aim up a "Piper" between the eye and the target.

6. Fabrication of proposed HMD

HMD manufacturing technology based on Head position sensing of the pilot. HMD designs must sense the elevation, azimuth and tilt angle of the pilot's head. Three basic methods have used in current HMD technology. Those are optical, electromagnetic and sonic. In here I have used optical tracking method for HMD.

6.1 Optical tracking method

Initially tracking systems provide a sensitive inertial measurement unit (IMU) and an optical sensor to provide reference to the aircraft and this system situate infrared emitters on the helmet infrared detectors in the flight deck, to identify the pilot's head position. The main limitations are restricted fields of regard and sensitivity to sunlight or other heat sources.

6.2 Use of optics

Traditional HMDs employ a compact cathode ray tube (CRT) situated in the helmet., Modern HMDs have modified with the CRT in favor of micro-displays such as Liquid Crystal on Silicon (LCOS) or Liquid Crystal Display (LCD) along with a LED illuminator to provide the displayed image. In here I have proposed to used Holographic Optical Elements (HOEs) for HMD.

6.3 Holographic Optical Elements (HOES)

Holographic Optical Elements (HOEs) advanced optical elements than conventional optics. HOEs can redirect images from a light source that is hidden from view. HOEs can also create full image through virtual image displays. Modern world HOE technology used for Head decoupled Displays, Head up Displays (HUD), Head and Helmet-mounted Displays (HMD), and high accurate gun sights. Holographic optical elements are interference patterns embedded onto a thin, clear photopolymer or other photosensitive film. The film can be pasted to a +surface and when a light source is projected on the film, the recorded interference patterns behave like a lens with optical power or a mirror that can capture and redirect the image. For maximum vision capability scientists include Substrate Guided Wave based Holograms (SGWH) in front, back and edges of HOEs. Substrate Guided Wave based Holograms (SGWH)

SGWH use as a substrate that acts as a wave guide to project a light beam to a specific location. Therefore one or two separate holograms situate on the same or opposite surfaces. Those are input hologram and output hologram. In the case of HMD it’s very near to eye. For that input hologram takes the diverging beam from a display and couple with it inside the substrate. So instead of passing through the substrate, the light guides inside of it and bounces, a phenomenon referred to as Total Internal Reflection (TIR). That light beam then passes to the output hologram which sends the image outside of the substrate and to the pilot’s eyes.

In HMD, the first Substrate Guided Wave-based Hologram captures a diverging light beam and sends it into the waveguide. The second hologram then captures that light and sends it straight to the viewer’s eye. Instead of passing through the glass, the input light bounces on the borders of the substrate where a second output hologram captures the image and projects it outward.

6.4 Systems to be included

The Joint Helmet Mounted Cueing System (JHMCS) use helmet that incorporates a visor-projected Head up Display (HUD) to cue weapons and sensors to the pilot. The system consists of magnetic transmitter unit and the magnetic field receiver. Magnetic transmitter fixed to the pilot's seat and a magnetic field probe fixed on the helmet to define helmet movement and positioning. A Helmet Vehicle Interface (HVI) interacts with the aircraft system bus to provide signal generation for the helmet display.

This system improves the performance in the Air to Air and Air to Ground missions. When engage with an enemy aircraft or to train targeting sensors on aenemy target, the pilot should maneuver his aircraft to align his radar or fixed HUD line-of-sight with that target. This System will allow the pilot to cue onboard systems with the movement of his head and display weapon system by symbols while reducing pilot fatigue by providing aircraft performance and maneuverability information without the need to deal with instrument panel. That information will now be projected where it will be continually in the pilot's view. Same time Target Forward Looking Infrared (ATFLIR) and Advanced Electronically Scanned Antenna (AESA) radar will increase reliability of guided munitions employment.

Above mention SGWH, LED light source/micro display can be kept positioned away from the pilot eyes. This film is virtually weightless and is fully see through, meaning it can be embedded to the visor of a helmet used in military aviation and display altitude, air speed, fuel levels and other critical flight data without the pilot having to look down at the control panel.

6.5 Power the proposed HMD

At the initial stage of introduce this HMD to the Kfir C2, it is must to be arranged a propoer power connecting method to power the HMD display and its symbol generator computer from the aircraft AC or DC power buses. Generally the Head Up Display of the Kfir C2 powered with the centralized AC power buses with DC bus1 which is powered the symbol generator and the air data computer itself. Make changes is not necessary for aircraft centralized AC power buses distribution system since this helmet can be shared the same amount of power as the current helmet required. The additional systems included with this proposed helmet are to be recognized as follows.

1. Power to be required activating the symbol, projector connected to the infrared visor of the helmet.
2. Power to be required powering the signal converter transformer which has converted the signals into digital symbols forwarded from the air data computer.
3. If the HMD connected with the head tracking transmitter and receiver then it must be powered by the AC power bus of the aircraft power distribution system.
4. I have proposed a simple power transmitting hub which is operating in between 10-15 A cdof voltage limit to distribute the overall power requirement to the HMD to be activated after the pilot connect his HMD. This hub will equipped with high frequency AC cable with a connector at the end which is to be connected to the main centralized power bus of the aircraft.

The lithium ion battery attached to the side of the helmet must be charged from the external power source before the flying. It is not connect to the power supply as it is operating separately when the pilot ejected from the aircraft.

7 Conclusion

7.1 Limitations

Several difficulties can be predicted as the avionics in Kfir C2 belongs to second generation which included basic signal generations into the digital symbols using CRT displays. So introduced such a third generation electronic equipment to this kind of aircraft will be created some electronic limitations. Those can be listed as follows.

(I). Kfir C2 HUD (Head Up Display) is working through a CRT symbol generator and mirror deflections using analogue signals powered by AC line from the main buses. When I tried to convert these signals into digital to facilitate the HMD feedings it will be generated some errors due to the errors in analogue to digital signals converting process. Most of current symbols can’t be even read by the digital binary signals.

(II). The GPS map loading facility of the proposed HMD need to be activated via the signal transponder and the receiver which are able to contact with the satellite signal receiving stations during flights. It will be hard to find a location on the original airframe to attach the above mentioned transponder and receiver antennas.

(III). Connecting external electronic devices which are proposed through this system will be made bulky wiring methods which may be not suitable in order to avoid the fire hazards.

(IV). Some signal converters and transmitters proposed to be used in this HMD are high cost in the market. Also few of them are complex to design. The helmet can be designed by modifying the current helmet of Kfir C2. But series of pre testing must be followed to avoid the inconvenience and health hazards to the pilot. Head tracking system transmitter, visor, projector, enhance microphone with oxygen system etc will be increased the total weight of the helmet. So concern about the materials to be used and the weight of the proposed gadgets must be under convenience level of the pilot.

(V). Screen mode changing facility proposed to be displayed on the HMD will be complex in design since I have found many difficulties when select a suitable system for that. Taking the mode changing button or scroll system into the hand gear lever is some but ok but it will be created a bulky wiring.

(VI). Through my proposals I have suggested an UHF (Ultimate High Frequency) secondary radar transponder and receiver which will help to develop the communication system to be supported to the HMD in case of make contacts with ground troops and UAVs. Data signals from UAVs should be live broadcast on the HMD display during flying. To achieve this purpose we proposed that high frequency secondary radar. Find a suitable place in the nose section or bottom of the fuselage to install this radar transponder and receiver will be difficult and sometimes it will be interrupted with the normal frequency channels which are used by the aircraft for operate ILS (Instrument Landing System) ,radio altimeter radar, VOR (VHF Oscillation Radar) and DME. To avoid these interferences we must use separate frequency channels for these specific operations.

7.2 Benefits

The main benefit of proposed HMD is to reduce the pilot fatigue and enhance the operational aims of the aircraft. Pilot will be received more flexible and user friendly viewing than using the HUD system already provided with the aircraft itself. HUD displays only basic flying information such as air speed, mach number, horizontal positioning, banking / turning angles, bearings etc. In this HMD system pilot will receive even UAV live feedings during flying. Since this entire system will be worked as the sequential logic method, the pilot will get the feedback from all the electronic transactions done via the HMD. External viewing camera will feed the pilot about the airframe and the enemy air movement during flying without moving his head physically.

By using the GPS feedings pilot make sure about the accuracy of his bombings and ground attacks. Also UAV feedings on the HMD will be provided the confirmation data of the attack to the pilot before his landing.

The proposed HMD will be the bridge to upgrade the Kfir C2 aircraft to the third generation through it's functions.

The better your paper looks, the better the Journal looks. Thanks for your cooperation and contribution.

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