HETL ACCESSORIES:
IMPORTANT SAFETY & DETECTION AIDS

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A FEW CRITICAL BENEFITS

- All information of the aircraft being flown at the fingertips of the Pilot.
- Quick and accurate calculations in the air.
- Easy to carry or fix anywhere suitable in the cockpit.
- Guide the pilot about obstacles in the aircraft path at night or in zero visibility conditions.
- Bring the pilot and aircraft back home safely.
- Document flying parameters for study and debrief.
- Detection of anti-national elements in difficult terrain on Indian soil.

ELECTRONIC FLIGHT BAG (EFB)

The EFB is like a Flight manual in digital form. It can be extensively used for Pilot flight related application like, Jepson charts, Emergency drills, check lists and load calculation etc.

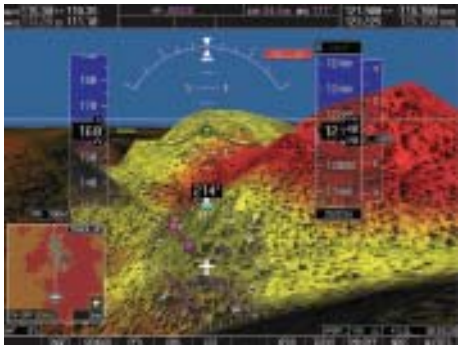
The EFB can be designed with wireless LAN facility wherein, the Pilot is accessible anytime and anywhere. Global broadcast messages like MET data or emergency messages can be made available to the Pilot.

In addition to these applications, the EFB is a friend in the case of an emergency landing since there is a facility to send and receive messages.

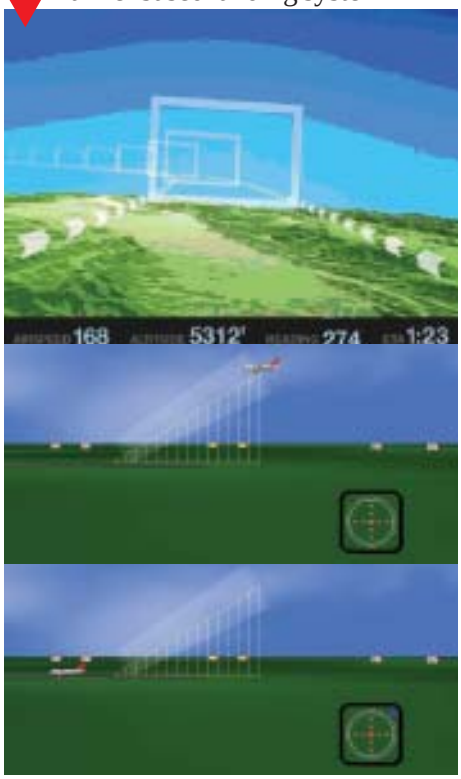
There is no limit to logical applications which can be thought of and applied in the EFB. This aid is mooted as a MUST HAVE, in every military aircraft cockpit. The EFB can be 'knee strapped on' and the software will be 'aircraft type specific'.

HAL-Edgewood, Bangalore is focussed on the avionics design and development domain. HAL-Edgewood is a joint venture of HAL, pioneers of avionics and systems industry in Asia, Edge Tech India and Edgewood Ventures, LLC USA an investor in major projects in the areas of Semi-conductors, Satellite Based Systems, Wireless, Aerospace and Defense.

Database collision detection & Tunnel based landing



Tunnel based landing system



The synthetic display is the new era in the Glass Cockpit display system wherein the situational awareness display can be depicted in 3D accelerated method. The layered approach in the graphical system opens up the virtual 3D system in the cockpit, giving the Pilot 3D cues about his surroundings. In the example of such display placed below, Digital Elevation Data has been super imposed on the display along with the primary flight data, giving the pilot the extra edge in flying.

The synthetic display method can be used to enhance the SA for the Pilot. There are two new ideas conceptualised as follows:-

Databased collision detection system/Whisker probe

The basic idea behind this approach is on the digital terrain database available in the system. The DETD can be procured and made available in the cockpit system. Using this database, we can create a virtual cylinder - of a size that can be set by the Pilot, based on his requirements in the cockpit/type of aircraft being flown.

The virtual cylinder will be a projected distance either ahead of the aircraft fly path but can also be selected to either side of the fly path, above and below. The size of the virtual cylinder can vary to any distance required by the Pilot. To further amplify, the aircraft being flown can be made available either in the centre of the cylinder or anywhere within the cylinder.

This will help the pilot to visualize, with respect to the cylinder his PVT, i.e position, velocity and time and how the surrounding is placed around him. The algorithm shall work in such a way that, the static collision details can be highlighted and provide an aural warning too, if required. The algorithm is capable of placing other aircraft in the cylinder vicinity to indicate their position within the cylinder.

Tunnel based landing system

With the synthetic display entering the cockpit, the power of the 3D display can be maximized. The basic concept is – Imagine that if someone creates a forward moving tunnel in the sky with twice or thrice the wing span of an aircraft as also a marker guide at every 20msec, the pilot can be guided/ steered within the tunnel (up & down, left or right) in such a fashion from a known rejoin point to the touch down point for a safe landing.

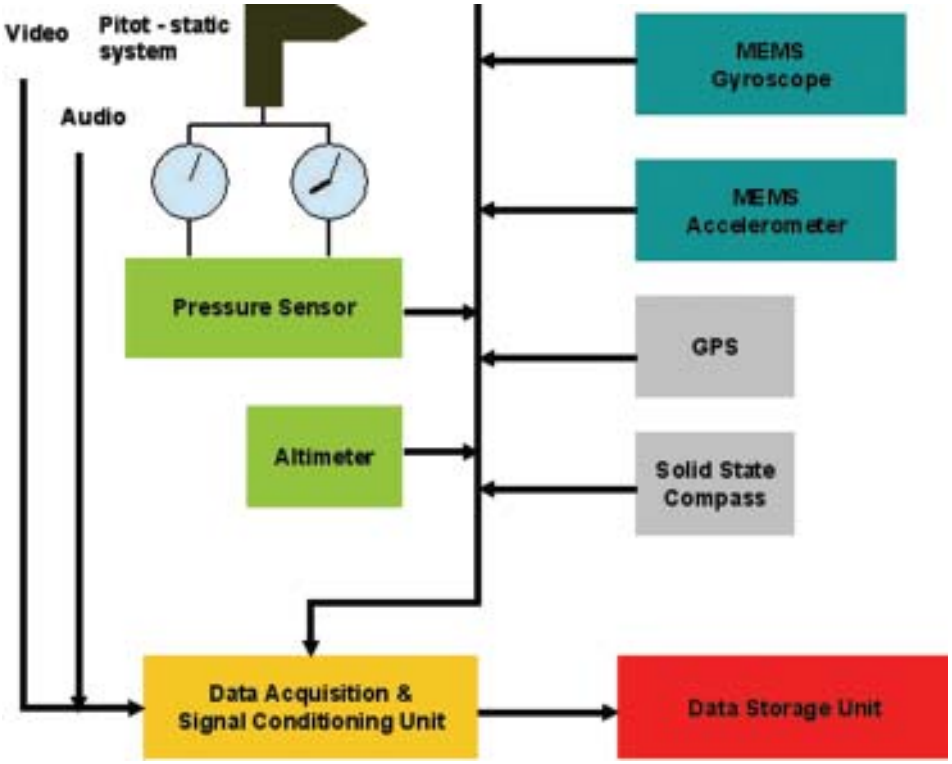
This concept can also be used to guide a pilot from an IP to the target/weapon release point. The main advantage of such an aid is, that an aircraft can be brought home safe whether it is day or night, bad or good weather. Creating a virtual tunnel in the sky involves lots of algorithms to convert space co-ordinates into aircraft and vice -versa. This can be realized with the virtual terrain system creating a tunnel in the sky and geo-synchronizing the run way of the airfield, mixing the DETD Data and creating a live-wire tool for the Pilot for landing. Illustrations of this concept are shown below.

The Algorithm can be written in such a way that all safety measures are taken care of and the SW/HW is of design assurance level A. The model of the HW is shown here and can be designed for NVG compliance and defence standards.

FLIGHT DATA RECORDER (FDR)

The FDR is a critical requirement in all types of Aircraft. The FDR that we are portraying is of a unique nature – fully designed using the MEMS – Micro electrical Mechanical principle. The MEMS based FDR is a very small unit and can be hooked to the Aircraft system in the cockpit. It needs only one input from the static and dynamic air point (Pitot head). The FDR is capable of taking one video and one audio input alongwith other MEMS based Gyros and accelerometers.

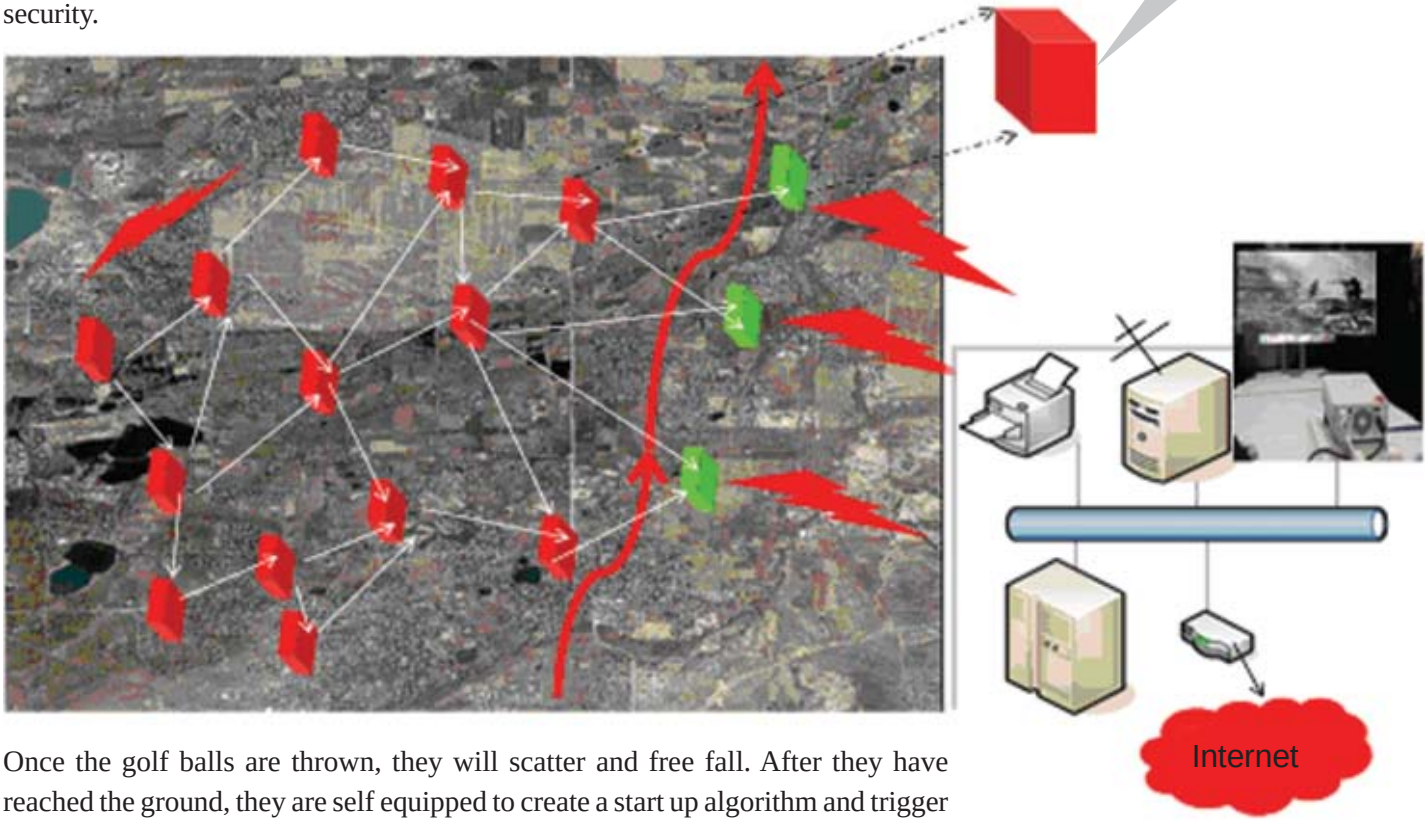
The basic principle is outlined in the figure below: The data capture rate is 20 msec and can hook on to the Avionics BUS also, if required. The data can be captured in the secured device (SD) drive upto 8/16 GB. If the data captured on the FDR is required to be transmitted to a server on landing, it can be easily done via wireless LAN. Also, the captured data can be removed by the Pilot after mission completion. The application SW will be capable of reconstructing the flight for the purpose of flight review and debriefing. A picture of the FDR model which can be housed inside the cockpit is placed below.



SELF ALIGNED GROUND BASED DETECTION NETWORK

The self aligned system comprises of golf ball sized circular objects which can be easily deployed and will monitor through video and audio, an area of interest. Primarily, this detection system should be used on own side of the border. The golf ball sized model containing the digital camera, audio extraction, GPS, small quantity of TNT, smart antenna, FLASH and self aligned intelligent node and many other application oriented gadgets can be used for spying the area of interest.

A set of golf balls, preferably 10 to 12 in number can be thrown in any required area from the air or fired by a motor from the ground. The focus here is to detect the presence and movements of extremists/spies who pose a threat to the nation's security.



Once the golf balls are thrown, they will scatter and free fall. After they have reached the ground, they are self equipped to create a start up algorithm and trigger each golf ball into action. The golf balls then send enquiries to their neighbours and are intelligent enough to realize who are the neighbours and what is their IP address. This detection system will require a main server in the vicinity of the scattered golf balls with at least one golf ball in contact with the ground based server.

On connection to the server, the server will know who are present and their IP address. At this stage, the server will provide a new alignment table indicating the neighbours and how they should communicate. Once the set up is complete, each golf ball will transmit the present position – GPS data, video and audio frames regularly. The server can pre-select the area of interest and can switch off those golf balls which do not need to be ON.

Each golf ball will be capable of working in the day light using solar cells and its own battery (with limited life) during the night. The server will be capable of sending signals to other required locations. The method used to throw the golf balls in a particular area will generally decide the scatter pattern and the total area which will be covered.

Until specific trials are carried out, it is opined, that the distance between each golf ball could probably be a 100 to 150 meters with at least one golf ball at a maximum distance of 200 meters from the server. The Detection Network is conceptualized specifically for tracking extremists in hilly terrain/perimeter security for static and mobile units.

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