VIRGINIA FLIGHT SCHOOL SAFETY ARTICLES – NO 0205/07

SITUATIONAL AWARENESS – HAVE YOU GOT THE PICTURE?

80% of occurrences reported so far in 2007 at VFS involve what is known as AIRPROX Incidents. The acronym AIRPROX stands for an incident in the ***air*** that involved two aircraft in too close a ***proximity*** to each other which could potentially have resulted in a mid air collision. Air Traffic Controllers play a vita role in ensuring safe aircraft separation but once again at the end of the day it is ultimately the pilot's responsibility to ensure the safety of the aircraft and it's occupants. A critical factor in this is having a broader picture of what is going on in the airspce in which you are flying – Situational Awareness. The topic of situational awareness has been discussed at one of the VFS Safety Meetings during 2006. I am repeating an article of mine on the subject which was published in *World Airnews* a few years ago.

A LETTER HOME

Dear Dad,

"You asked about the dangers of flying and the number of mishaps that occur over here that result in fatal injuries. Relatively few of our aircraft are destroyed by enemy action. I would say that complacency or a false sense of adequacy causes more crashes than any other factor. Aviators attempt unauthorized manoeuvres, run out of fuel, become disorientated or lost, fly low level and crash into obstacles or attempt take offs or landings that are not within the capability of their aircraft. The craft that we fly are relatively safe and in most cases prior planning and professional competence normally result in a safe landing if a mechanical malfunction occurs. The loss of aircraft to the enemy is an accepted risk and is the nature of war, but at times it's difficult to understand why, with the inherent risks of combat always present, our aviators make such stupid, that is the only way to describe them, stupid mistakes. I imagine that as long as man experiences the exhilaration and the freedom of flight, and the need to foolishly exhibit his manhood and mastery of his machine, accidents will continue. A competent aviator must realize both his own and his aircraft's capabilities and limitations. To better answer your question, no, it not dangerous to fly; our machines are adequate. It is the human who is dangerous.

The above letter was written in spring of 1918 by an American aviator flying in France.

There are many ways in which the pilot can make him or her self less "dangerous". One of them is having a good sense of situational awareness and specifically a good mental picture of what is going on immediately around you whilst airborne. It will enhance your level of safety and professionalism and help avoid making "silly mistakes".

The two key words in this theme are situation and awareness. A situation can be considered to be a position with regard to conditions and attendant circumstances; a combination of circumstances at a given moment or a critical or problematic combination of circumstances. During flying we more often than not find ourselves in the latter set of circumstances but mostly don't realize this. Fortunately mostly no dire consequences are suffered as a result. Awareness is knowing something either by perception or by means of information; synonym: alert: stresses both knowledge and capability of swift, apt response. This is most fitting to the flying environment. Pilots must know about the current circumstances in which they find themselves and be capable of swift, apt responses to those circumstances, based on sound knowledge.

The closing sentence in the American aviators letter stated quite rightly that "it is the human being who is dangerous" and up until the early nineties approximately 80% of aircraft accidents were put down to "pilot error".

Vast sums of money, reputations of huge organizations and even governments could be on the line with a major aircraft disaster.

As a result scapegoats were sought to apportion blame to for these events. The preservation of integrity and minimal financial loss to the major role players was of prime importance. What easier way to do this than to blame a single individual or possibly two or three individuals that might make up a flight crew – pilot error.

Recent advancements in accident investigation have brought to light that rarely is a single person responsible for an accident but that a chain of events takes place where many individuals are involved that result in an accident. Hence the currently accepted term - human error. These events can range from mechanical malfunction due to poor maintenance, "pirate parts" fitted to aircraft to financial strain from whatever cause. However at the end of the day it is the person sitting at the controls or in a multi crew environment the persons on the flight deck that must ensure the flight being undertaken is hazard free and conducted with optimum safety. There is only one VIP on board and that is you the pilot!

In order to conduct a flight with optimum safety the pilot must have a complete picture of the environment in which he finds himself at any one particular time – that is to say - have a high level of situational awareness! This does not simply mean being aware of the fact that you are in the air vs. on the ground but means having a complete mental picture or map on which is plotted things like your current position, intentions and possible alternates. To complete the picture an awareness of other users sharing that particular environment at that time as well as their relevant positions and intentions is also essential.

Consider a VFR situation in controlled airspace around an airport where a high concentration of traffic is most probable. In this environment you have to have the picture. Now VFR flight as the name implies is flight conducted in conditions where minimum visibility limits are set, thereby enabling the pilot to control the flight with reference to external visual inputs. The main human sense used to obtain relevant inputs for this is the eye where up to 90% of sensory inputs are derived from. How effective are these visual inputs in a potentially critical situation such as aviating in a congested airspace?

Information is received and processed by the human being in various ways thereby enabling the person to react aptly according to the specific circumstances at that time. Man is able to process physical and social stimuli. A stimulus is any form of energy activating a human receptor – putting it into operation in order to conduct an impulse to the brain. The processing of stimuli is

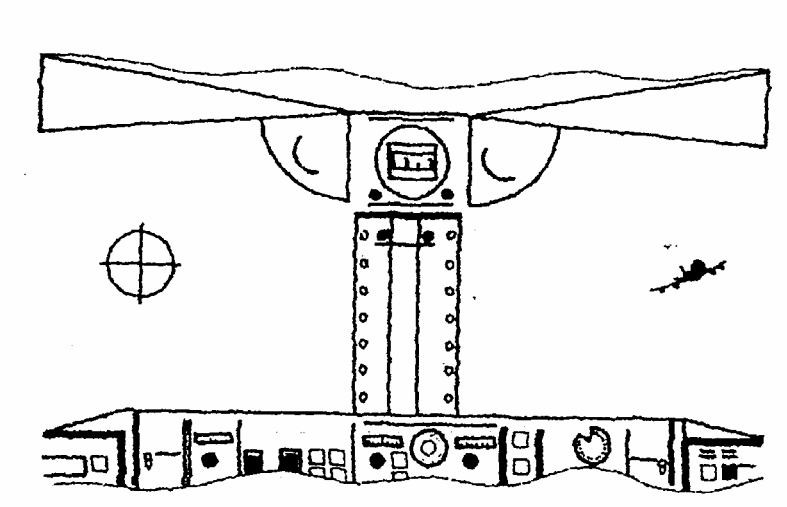
an active process through which the individual does something with the information he receives. The most basic kind of processing is perception. Perception involves recognition, appraisal and interpretation.

From this observation the following two main points can be concluded viz. that human beings have certain receptors enabling them to receive and experience stimuli and; an individual has the ability to process stimuli; i.e. to regulate, change, structure, interpret and store inputs for future reference.

Is our perception of what we see always a true reflection of the actual events taking place? Let's consider firstly the eye and some of its shortcomings in enabling us to form a true three-dimensional picture of the environment around us and locate objects in it. We are unfortunately not endowed with a virtual 360^0 focused field of vision such as birds are. The human visual perception is divided into two modes viz. the ambient and the foveal. The ambient mode relies on the stimulation of the peripheral vision by a large stimulus such as a horizon. This method of orientation is instinctive and image quality is of lesser importance such as attitude orientation of an aircraft during VFR flight. The foveal mode relies on the perception of a relatively small object. Here the pilot has to interpret symbolic information lacking the customary familiarity and hence the impact of familiar external cues.

The eyes naturally tend to focus on a point 1,2 meters ahead of the body when relaxed. In the air, this means that in a natural relaxed state, anything outside that range will be out of focus and not readily "seen". With peripheral vision a person can detect an object or movement but not necessarily identify it. To do that the eyes or head have to be turned in the desired direction for focus and identification. In addition, interpretation of what is seen has to take place by matching it up with some familiar reference in the mental data bank. In other words a pilot has to recognize what is seen at the point of focus to be able to respond timeously to any given situation. This recognition must be almost instantaneous when in congested airspace in the interests of safety. So human beings are definitely impaired in the visual process by the physical ability of the eye as well as being in a not so familiar environment – the air.

In addition the eye has what is known as a blind spot where the nerve fibres leave the retina and form the optic fibres leading to the brain. Here nothing is seen but we do not see a "black spot" in our vision as the brain automatically fills in the gap in the visual field. However at some stage you will not see an object. This can be demonstrated through a technique first described by E. Mariotte in 1668. Hold your head directly in front of the drawing of the cockpit on the next page , as it appears on your computer screen, at arm's length. Close your left eye and look at the cross with your right eye, bringing the photograph slowly towards your face. The aircraft at some distance on the right of the picture will disappear at some stage (blind spot), later reappearing. This can happen to you while flying resulting in you not seeing another aircraft or object when it passes through the blind spot. You might miss a vital visual input through no fault of your own thereby possibly jeopardizing the safety of your flight.



In addition to the physical deficiencies of the eye there are two psychological errors which can curtail the forming of a complete picture. Fixation occurs when a pilot concentrates on one specific object and involuntary ignores or forgets other stimuli. Expectancy error occurs when the pilot is expecting certain things to happen and is manipulating his environment to fit his expectations.

There are however some simple methods and procedures that every pilot can apply, especially when starting out, to increase the level of situational awareness. The following points are by no means all that can be done to increase the level of situational awareness but will greatly contribute to reduced risk and a safer flying environment.

Know your limitations. The starting point here is obviously what type of flying qualifications you have and the currency thereof. Don't attempt any type of flight for which you have not been trained. Apart from the formal abilities as per rating, each person will inherently know what he is capable of and not. Be realistic and realize these capabilities and fly within these limits.

Do thorough pre-planning. Although this is stating what some might regard as the obvious, it is surprising how many pilots get themselves into a situation that becomes unmanageable due to a lack of planning. This becomes especially apparent as experience is gained and the "need" for planning falls by the wayside. Beware of this complacency! Each aspect of your intended flight must be planned to the last detail. You should then fly the flight in your mind with the use of your maps, log cards, etc. When you get into your aircraft and start flying it should feel as though you have already flown this route before, so familiar should you be with your flight due to your planning. Pay attention to the aircraft type you are flying and bear in mind the possibility of precedence you might be allocated when entering controlled airspace. If you are in a light aircraft precedence might be allocated to a scheduled airline flight. You might be asked to deviate from your intended course to accommodate this heavier traffic. If you have considered these possibilities the event will not be a surprise to you and you will handle it with confidence and efficiency. So pose the "what ifs" to yourself when going through the flight in your planning phase.

Be aware of where you are. Your planning should have been thorough so you will be able to follow your progress along your flight. When you enter controlled airspace around your destination airfield you have to form a mental picture of your position. This picture should not only be of where you are but of where other airspace users are as well. Major airfields are situated around cities and the visibility is notoriously poor due to pollution, especially on the highveld during winter. Added to this are your visual limitations as described earlier. Your primary source of information input could now change from the eye to the ear. To form this picture you have to sensitize yourself not only to be responsive to ATC instructions to you but also to listen to all radio communications at that time. Sensitize yourself to be aware of aircraft that are on similar flight paths to you or in your vicinity.

You will quickly be able to discriminate between radio communication that will be useful to you to provide you with a good mental picture and that which is of lesser importance or irrelevant.

Be aware of where you are and what you are going into. This point ties up with the above one in that it is an extension of the your immediate picture. When you have the picture of where you and your co-users of the airspace are and you keep abreast of movements it is a simple matter to anticipate what is coming up next. It also ties in with your planning in that you will be prepared for the next move and not have to meet it with trepidation when it comes. You will find that more times than not events will pan out as anticipated if you keep up with the current picture and predict the changes that could occur to that picture.

Finally be aware of any changes in circumstances. An emergency might arise. Are you able to comfortably cope with it while still piloting your aircraft through congested airspace? Prompt and apt interpretation and response to these types of changes in circumstances must then be made.

In concluding we can say that there are definite human physical limits with regard to visual inputs during flight which could pose a risk and jeopardize flight safety. However we can mostly compensate for this by good planning, heightened mental awareness and utilizing our audio receptors. Your situational awareness will be enhanced and you will *HAVE THE PICTURE!*

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