HUMAN FACTORS NEWS

Issue 8 March 2014

INFORMATION ACQUISITION & PROCESSING

NEWS UPDATE

The start of 2014 has been a busy few months. We have just got back from Heli-Expo which saw about 20,000 helicopter operators, maintainers and manufacturers converge on Anaheim USA to discuss all things rotary.

We also held an incident investigation course in Brisbane in February, with attendees from industry, the regulator and military.

During the next quarter we will be focusing on providing refresher training so make sure incidents are being reported to the safety department so we can have some effective training strategies based on real events at your organisation.

This newsletter focuses on information acquisition and processing.

Heli-Expo 2014
Anaheim, USA

ACQUIRING AND PROCESSING INFORMATION AT THE OLYMPICS

Competing in the Olympic halfpipe snowboard event requires incredible athleticism. It also requires a finely honed ability to take in and process rapidly changing information.

The winner of the gold medal at Sochi, Iouri Podladtchikov, landed a Yolo (You Only Live Once). This includes a total of 1440 degrees of spin: two head-over-heels flips and two 360-degree turns. It is necessary to instantly assess your position and make adjustments just after completing the first flip if you want to make the landing.

Conditions in Sochi were not conducive to high performance. Boarders prefer icy walls but the warm temperatures and slushy snow limited the speed they could generate. This meant that competitors had to adjust the techniques they had been perfecting for several years.

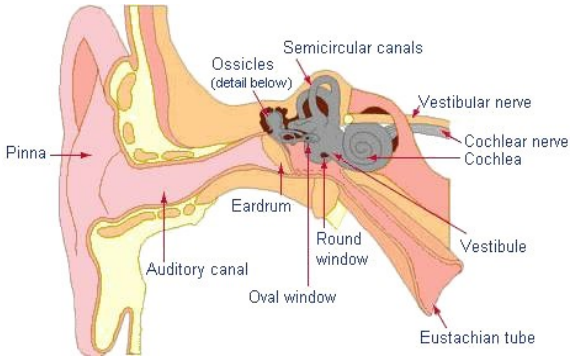
At elite levels of performance snowboarders like to be in the zone, reacting almost automatically during a trick. When conditions are unusual, such as in the Olympic final, they have to rely on their ability to perceive cues and instantly tweak their response.

VESTIBULAR ILLUSIONS

Up until very recently, human activities have been restricted to ground level. Our senses work well in this environment. We can see, hear, smell, touch and taste quite accurately and efficiently. Also, our ability to recognise acceleration and orientation is effective while on the ground.

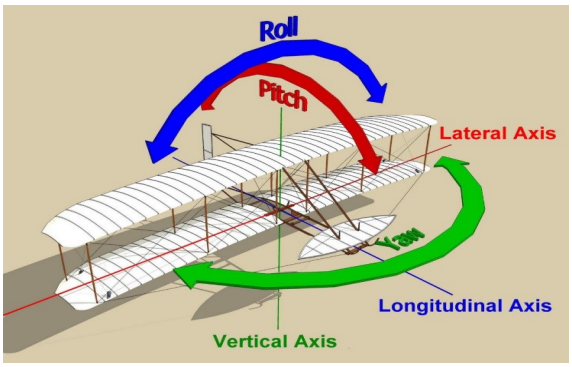
However, being able to use our senses in an aircraft is a different matter. For example, at 35,000 feet the conditions inside the cabin affects passengers' taste buds. In a 2010 study by Lufthansa it was discovered that the ability to taste salty or sweet flavours diminished by as much as 30%.

The real concern though is the effect on our ability to precisely sense position and motion in three dimensional space when not standing on the ground. Sensors in muscles, tendons and joints provide feedback to the brain which helps us establish which way is up. This is augmented by what we can see and touch. An extremely important sensor is our vestibular system which enables us to determine body orientation, sense direction and speed of movement, and maintain balance.



However, as this system is designed to work in a 1g environment, it can provide seriously disorienting information in an aircraft cockpit.

The semicircular canals are basically tubes full of fluid. They are arranged so that each one is at right angles to the other two and aligned with the lateral, vertical and longitudinal axes.



When movement in an axis occurs the fluid in that canal moves and triggers a signal to the brain. For example, if you change direction around the lateral axis your brain will sense pitching. However, this system is disrupted when the change of direction is slow (less than 2 degrees/second^2), is prolonged (more than 20 seconds), or is affected by changing g forces. The result is a scrambled message to the brain which can lead to deadly illusions such as the leans, graveyard spins and spirals, and the Coriolis effect. If you do not fully understand these illusions stop reading this newsletter now and do some research about them.

THEY CAN KILL YOU!

ASIANA AIRLINES FLIGHT 214

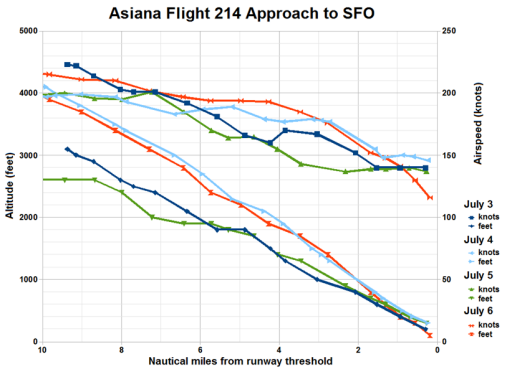
On Saturday 6th July 2013 Asiana Airlines Flight 214 was on final approach to San Francisco International Airport. The flight was cleared for a visual approach to runway 28L and told to maintain a speed of 180knots until 5 miles from the airport. The weather was very good with light wind, maximum visibility, no rain and no reports of wind shear.

The right hand seat was occupied by a captain with 12,387 hours including 3,220 on type. He filled the dual role of check/ instructor captain and pilot in command. Another captain was in the left hand seat receiving initial operating experience. He had 9,793 hours (43 on type) and was making his first 777 landing at San Francisco.

The pilots turned the autopilot off passing through 1,600 feet and hand flew the final approach. During the approach there were statements made in the cockpit first about being above the glide path, then about being on the glide path, then later reporting about being below the glide path. Approximately three seconds before impact a voice in the cockpit called for a go around. A different voice repeated the go around call shortly thereafter but the aircraft struck the seawall short of the runway and crashed.

Preliminary data from the flight data recorder indicated the plane's airspeed on final approach fell to 34 knots below its target approach speed of 137 knots.

The instructor pilot reported he had called for an increase in speed, but that the pilot flying had already advanced the throttles by the time he reached for them. The sound of the stick shaker could be heard on the cockpit voice recorder four seconds before impact. At impact the airspeed was 106 knots.



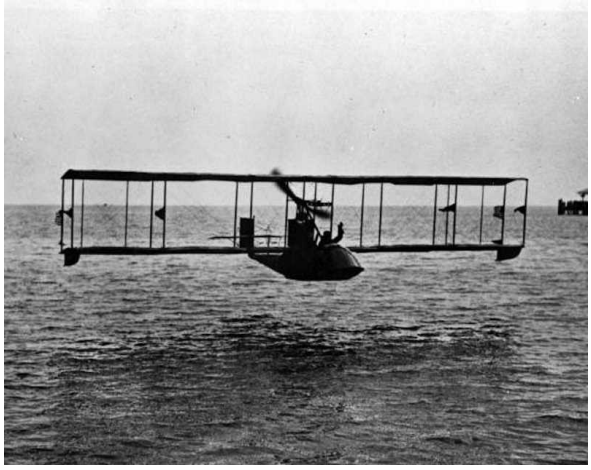
Asiana Flight 214 final approach glide paths on July 3rd, 4th, 5th and 6th 2013. All were Boeing 777 aircraft.

The final report on this crash is yet to be released. It will be interesting to find out why neither pilot realised their airspeed was up to 34 knots below the target airspeed at such a crucial part of the approach. As far as is known they had a fully functioning instrument panel, the PAPI was operating and they had clear visual conditions. Their failure to acquire and process the airspeed information led to a loss of situational awareness resulting in landing short of the threshold and impacting the seawall.

HAPPY 100th BIRTHDAY

On the 1st January 1914 Abram Pheil became the first commercial airline passenger when he crossed Tampa Bay, Florida. He paid $400.00 (about $9,400.00 in today's money) for the 23 minute flight.
Aviation, which began with one aircraft, one route and one passenger today transports around eight million people per day. More than three billion passengers will travel by air in 2014, along with 50 million tonnes of cargo.
You play an important part in an industry which re-unites loved ones, connects cultures, expands minds, opens markets, and fosters development.
Commercial flight has been one of the great achievements of the 20th century and one hundred years is a milestone well worth celebrating.

The inaugural flight of the St. Petersburg-Tampa Airboat Line on January 1st 1914



VIGILANCE

Early vigilance research was stimulated by the poor performance of British airborne radar observers while on patrol for enemy submarines during WWII. Despite extensive training and motivation, the observers often failed, over the course of a watch, to detect critical signals. This resulted in enemy submarines going undetected.

Norman Mackworth (1948) studied this by developing a simple test for vigilance which involved watching a black pointer which made small jumps around a blank-faced clock. Over a 2 hour period individuals had to look out for occasional larger jumps. He found that the accuracy of signal detections declined by about 10% to 15% after only about 30 min and then showed a more gradual decline over the remainder of the watch period.

This loss of vigilance was thought to be caused by a decline in arousal brought about by the under-stimulating nature of vigilance tasks. According to that view, the repetitious and monotonous aspects of vigilance tasks suppressed activity in brain systems necessary to maintain continued alertness.

However, more recent research has challenged that view. These studies indicate that sustained vigilance imposes substantial demands on the information processing resources of an observer and are highly stressful. Under especially demanding circumstances, declining performance can appear within the first few minutes of a watch.

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