THREE ASPECTS OF AVIATION SAFETY

observations by Michael Darby

1 June 2008

Caproni airliner

Overcoming the skill shortage.
Reducing stresses on aircraft tyres.
Keeping passengers alive with rearward-facing seats.

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Shortage of pilots hits airline industry

Scott Rochfort
The Age October 13, 2007

THE shortage of pilots across Australia has become so acute some airlines are being forced to scour the former Eastern Bloc for recruits, while others are being forced to reduce the number of routes they fly.
After blaming Qantas, Jetstar and Virgin Blue for "raiding" regional airlines, flying schools and aviation businesses, the country's second-largest regional airline, Rex, became so desperate it sent its chief pilot to Ukraine in July to look for recruits.
"We did not have a lot of luck. We did have a problem with language," said the airline's chief of staff, Jim Davis, noting the airline would look for pilots in English-speaking countries.
With the shortage being blamed on the growth of airlines in Australia and Asia, some aviation businesses have closed.
Mr Davis said Rex had lost 20 per cent of its pilots in the past three months to larger airlines, compared to the 18 per cent that left last financial year. . ..

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Skill shortages

Apparently, only 380 airline pilot licences are granted each year in Australia, but Jim Davis of Rex predicts that 1800 airline pilots would be needed in the next two years to keep up with Australia's airline industry.

A chronic shortage of pilots must have an adverse effect on safety, from pressure to lower standards, from pilots staying in the industry when they should retire, from pilots not taking holidays, and from the engagement of pilots with language problems.

High schools should offer courses in simulator-based pilot training supported by appropriate academic studies. The aim is to have a growing pool of youngsters who are motivated to seek a career in aviation and who are already been tested in their potential capacity to face the challenges and responsibilities of flying an aircraft.

Following is a screen shot of a Microsoft PC-based flight simulator. The inset is a professional simulator used by the US Army, in this case for the UH-60 helicopter. I have great confidence that PC based simulators are already at a standard which can help youngsters take a big step towards a career in the air.

The same situation of threatened chronic shortage applies to Air Traffic Controllers. So let’s also have high school simulator courses in Air Traffic Control.

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Flight simulation

UH-60 simulator

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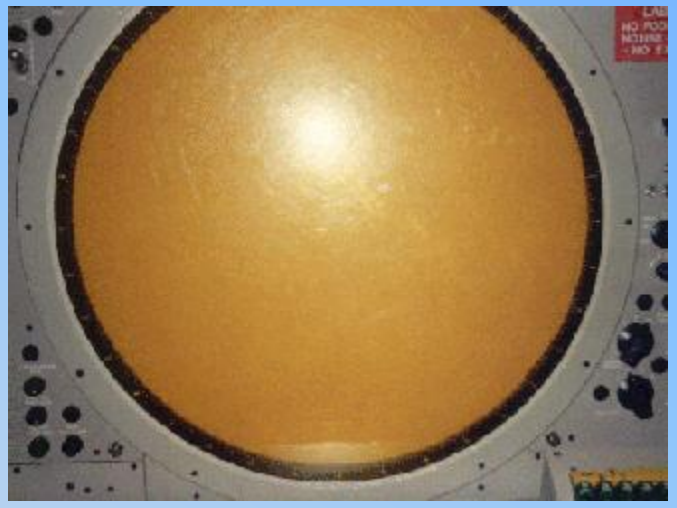
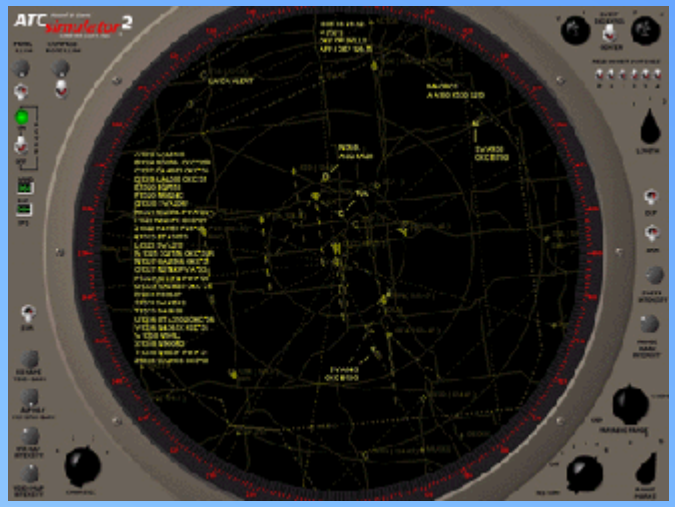
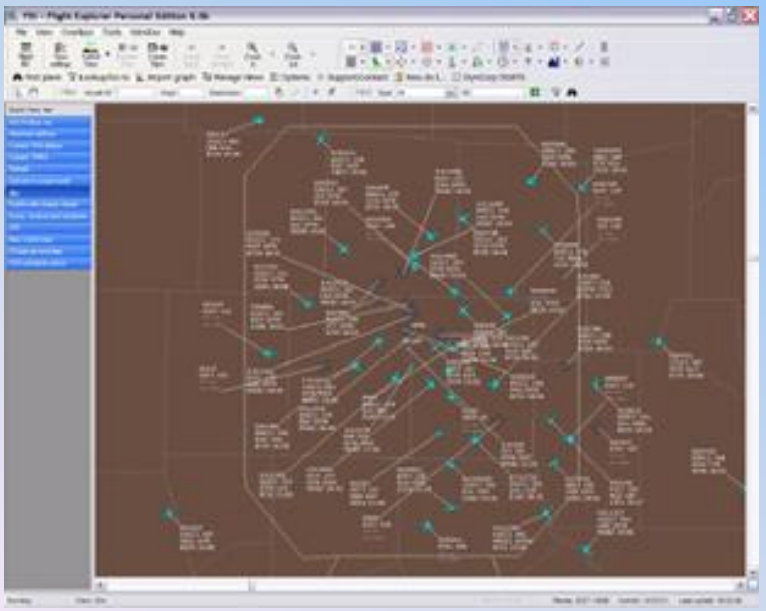
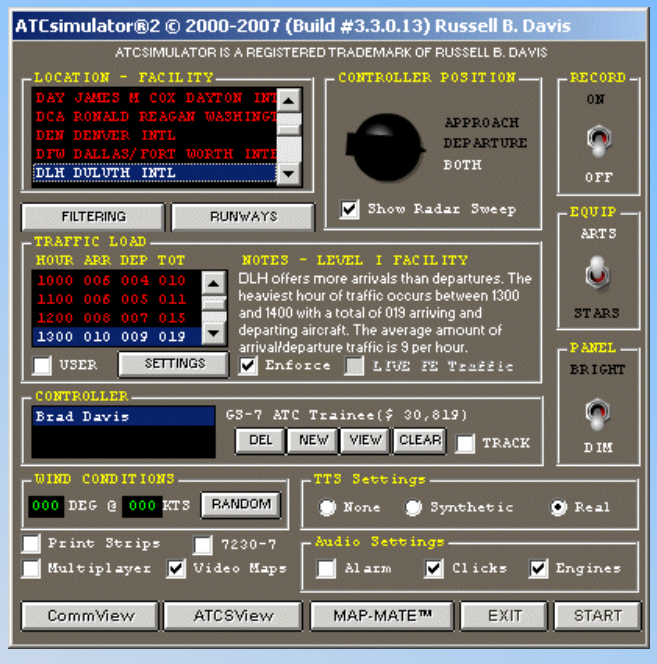
Air Traffic Control simulation









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Aircraft tyres

Pneumatic aviation tyres are susceptible to severe deformation during takeoffs and taxiing, but most of all during landing because of the inevitability of precipitate acceleration of the wheel from zero rpm to a speed consistent with the landing speed. That sudden acceleration also stresses the landing gear.

We need a system of spinning the wheels before touchdown to an appropriate velocity to match – within an acceptable margin – the landing speed.

This will reduce the harshness of the impact, prolonging the life of each tyre and also the life of the undercarriage. The anticipated weight of such a device may be offset by the opportunity of using a slightly less robust undercarriage with no reduction in safety.

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Tyre stress on landing

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Tyre stress on landing

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Tyre temperature still rising

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Tyre catches fire

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Skilful pilot holds the line

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Happy ending with no casualties

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Airline seat

On various airlines I've been shown different versions of what they call the "brace position." No, I do not believe the myth that airlines and their insurers want us to adopt the brace position because death through negligence costs less than injury through negligence. But the concept of a brace position is intrinsically ridiculous.

The majority of passengers are simply not athletic enough to grasp their ankles or even to put their heads between their knees.

The truth is that the logic of a brace position is to put the head as close as possible to the surface it is most likely to hit, and to reduce the likelihood of the legs breaking from being flung forward.

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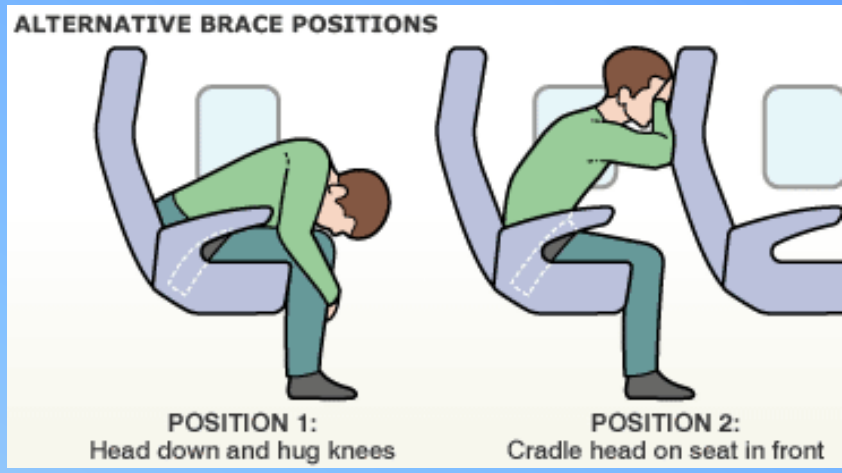
Airline seat

Both those goals are of course much more effectively pursued by facing the passenger in the opposite direction.

Obviously we are all in the business of minimising aviation accidents with the noble aim of eliminating aviation accidents entirely.

Sadly, we have to face the fact that overshoots, hard landings, crash landings and landings in water are all possible and are perhaps inevitable. All are survivable and our constant care must be to increase the percentage of survivors. It's a two phase strategy. Firstly to reduce the number of passengers who suffer any kind of injury, and secondly to reduce the severity of injuries so that passengers who are hurt are nevertheless able to make their way unassisted to emergency exits. On both counts rearward facing seats are the way to go.



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Quoting; source: http://history.nasa.gov/SP-4201/ch2-4.htm

Harald J. von Beckh of the Aeromedical Research Lab of the US Army is best known for his use of Keplerian parabolic trajectories to conduct the first weightlessness experiments in aircraft, and he also holds patents for enhancements to ejector seat safety. Dr von Beckh wrote in 1969:

> During the post decompression emergency descent of Multi Mach/High Altitude Aircraft the occupants will be subjected to deceleration-induced inertial loads in the direction of the flight path which will temporarily reach or exceed values of 0.5 G. Forward-facing passengers who have not been able to don the oxygen mask may lose consciousness for various periods of time and will assume positions which are unfavourable for the recovery from hypoxic stress. Aft-facing passengers - even if unconscious - would not lose contact with their seat and seatback and would assume a semi-supine position by the combined effect of the aircraft's negative attitude angle and the decelerative load. Recent research suggests that the semi-supine position is favourable for recovery from severe hypoxic exposures. A reassessment of the value of aft-facing versus forward-facing passenger seats for subject aircraft is suggested.

So there's a good reason for rearward facing seats, and we haven't even crashed yet.

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USAF Holloman Base research track

Quoting; source: http://history.nasa.gov/SP-4201/ch2-4.htm

Vital to our understanding of the stresses which aviation can impose on the human body are the rocket sled experiments conducted from December 1954 onwards by the USAF at its Holloman Air Force Base research track under the leadership of flight surgeon Lieutenant Colonel John P. Stapp of the Aeromedical Field Laboratory.

Those rocket sled experiments taught us what to expect when a pilot ejects from an aircraft at high speed, what the effect might be on astronauts when a space capsule hits the water, and what can happen to a passenger in a crashing aircraft.

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USAF Holloman Base research track

In May 1958, Captain Eli L. Beeding, seated upright and facing backward, experienced the highest deceleration peak yet recorded on a human being. This was 83 g for four hundredths of a second. Afterward Beeding, recovering from shock and various minor injuries, judged that 83 g represented about the limit of human tolerance for deceleration. This was more than twice the 37 g of deceleration which Colonel Stapp had been able to endure while facing forward.

Assessing these experiments, Colonel Stapp reasoned that a properly restrained, aft-facing human being could withstand a land impact of some 80 knots (135 feet per second) in a spacecraft if the g forces were applied transversely, or through the body, and if the spacecraft did not collapse on him.

We are entitled to extrapolate the conclusion that an aft-facing passenger has a better change of avoiding serious injury in any aircraft mishap

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Quoting; source: http://history.nasa.gov/SP-4201/ch2-4.htm

Safest facing aft

There is an internationally popular television program called Mythbusters, which uses genuine scientific method to conduct its experiments. In June 2005 the program used its famous dummy to discover what happens to passengers in aircraft accidents. The program concluded that passengers in business class are less likely to be injured than passengers in economy class, and that aft facing cabin crew on jump seats are less likely to be injured than business class passengers.

Let's get all the seats facing aft, except perhaps those of the pilots. Then instead of trying to teach a lot of gobbledegook about brace positions, all we have to teach people is: In an emergency, put your feet flat on the floor, rest your head back on the headrest and put the palms of your hands on your forehead.

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Buses, too

My comments on the enhanced safety of rearward-facing aircraft seats apply equally to bus and train seats. So let's start with school buses and get those seats facing the rear. A rearward facing bus seat with a head rest and a seatbelt is a safe place to be. More on bus safety soon.

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