Now where was I?

The sterile cockpit rule is a useful safety tool that is expanding from commercial aviation into surgery and critical-care medicine. But despite being good practice it’s not the complete answer to the problem of interruption.

The FAA’s sterile cockpit rule dates from 1981. It was a response, in part, to one crash when a near-new airliner flew into a swamp while the crew was preoccupied with what turned out to be a blown light bulb, and another airline crash when an instrument approach went disastrously wrong after the crew spent much of their time looking for a nearby amusement park. By banning non-flight-related conversation from the flight deck below 10,000 feet the sterile cockpit rule aims to remove one possible source of error.

The sterile cockpit rule

US FAR 121.542/135.100, says: ‘No certificate holder shall require, nor may any flight crewmember perform, any duties during a critical phase of flight except those duties required for the safe operation of the aircraft. Duties such as company-required calls made for such non-safety related purposes as ordering galley supplies and confirming passenger connections, announcements made to passengers promoting the air carrier or pointing out sights of interest, and filling out company payroll and related records are not required for the safe operation of the aircraft.

- No flight crewmember may engage in, nor may any pilot in command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft.

The FAA defines critical phases of flight as ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, except cruise flight.

However, in practice, the sterile cockpit rule has one embarrassing aspect. Some of the most exemplary pilots in civil aviation are on the record as breaking it at least technically, if not substantially.

The cockpit voice recorder of United Airlines flight 232, which suffered total hydraulic failure in 1989, records pilots Al Haynes and Denny Fitch joking briefly about having a beer when it was all over. And before the birdstrike that made US Airways flight 1549, which ditched in the Hudson River, famous, pilot Chesley Sullenberger remarked briefly on the ‘beautiful view of the Hudson today’.

First officer (and pilot flying) Jeffrey Skiles, perhaps aware of the rule, replied with a noncommittal, ‘yeah’.

These are clearly different from the many minutes of non-operational conversation that preceded accidents such as Colgan Air flight 3407, the Dash 8 that stalled and crashed over Buffalo, New York. The sterile cockpit is not a monastic vow of silence that can be shattered by a single utterance, but a way of thinking, an acknowledgement that now is the time to be particularly devoted to the task of flying. The difference comes down to a vague but essential concept – airmanship.

There have also been occasions when cabin crew members have not informed the flight crew about serious safety problems for fear of breaching the sterile cockpit rule.

web: www.casa.gov.au/fsa   email: fsa@casa.gov.au
Airbus’s operational training material has this to say on the sterile cockpit rule:

The sterile cockpit rule should be implemented with good common sense in order not to break the communication line between flight crew members or between cabin crew and flight crew.

Adherence to the sterile cockpit rule should not affect:

- use of good CRM practices by flight crew, and,
- communication of emergency or safety-related information by cabin crew.

Unlike the FAA, CASA does not mandate sterile cockpits, although the practice is in the operations manuals of many commercial operators, including Qantas and Virgin Australia.

Medicine is adopting the sterile cockpit concept from aviation, Professor Enrico Coiera, of the University of NSW, says.

‘For drawing up intravenous medicines, or administering pills, there is a high risk to the patient from error. One promising solution is to wear a bright yellow jacket that becomes code for “don’t talk to me unless it’s important”. These are now being tested in trials.’

Considering that most general aviation aircraft are single-pilot, and rarely fly above 10,000 feet the sterile cockpit might seem redundant in this area of aviation. But its principles can be very useful in training or charter operations.

CASA flight operations inspectors recommend that the concept be emphasised to passengers before start-up – especially when a passenger is occupying a control seat. Some aeroplanes are fitted with an intercom isolation switch, which can isolate the pilots from conversations taking place in the back seats, muting non-essential chatter, and preserving the sterility of the cockpit.

‘It’s also worth considering telling the passenger occupying the control seat that during the take-off, until top of climb, and before top of descent you won’t be talking and will need to focus on the flight’, says CASA flying operations inspector Danial Martin.

‘Instruct passengers to keep their hands and feet clear of the controls and brief them on your requirements for a sterile cockpit for take-off, landings and other times of intense workload.’

Martin also suggests it is wise to introduce the sterile cockpit concept, as a habit, from a student’s earliest lessons.

**The enemies of focus**

Keeping a task-focused sterile cockpit is good practice but research has shown it’s not enough. A sterile cockpit might cut down on distractions, but it does not address all interruptions – they still happen, even on flight decks where small talk is banned.

A distraction focuses attention on something irrelevant to the flight – such as the amusement park that the crew of Eastern Airlines flight 212 was trying to spot from the air on their disastrous approach to Charlotte, North Carolina, in 1974. An interruption may be relevant to the flight, an ATC message, for example – but it still has the potential to disrupt checklists and tasks and to reduce situational awareness.

In 2008, during the after-start checklist, the captain of Spanair flight 5022 asked the first officer to call the tower for permission to taxi. This request took the place of a vital checklist action – setting the flaps and slats on their McDonnell Douglas MD-82 to take-off position. A few minutes – and two more checklists –
later they, and 154 passengers, died as the inevitable happened. The elegant, efficient, stiletto-like wings of the MD-82 do not generate enough lift for flight at take-off speed, unless the flaps and slats are extended. There were only 18 survivors, all severely injured.

Valerie Barnes and William Monan (1990) studied aviation incident reports in the ten years after the sterile cockpit rule and found the largest category of interruptions came from events central to safe flight. These accounted for 65 per cent of interruptions in the flight reports they studied. Interruptions for events peripheral to safe flight accounted for 35 per cent of interruptions. Only 5 per cent of interruptions were for social or personal matters.

The US Flight Safety Foundation categorises three types of interruptions/distractions:

- Communication (such as receiving final weights while taxiing, or a flight attendant entering the flight deck)
- Head-down work (e.g. reading the approach chart or programming the flight management system)
- Responding to an abnormal condition or to an unexpected situation (e.g. system malfunction or traffic alert and collision avoidance system [TCAS] traffic advisory [TA] or resolution advisory [RA]).

In a research project in 1996, Kara Latorella studied interruptions using experienced pilots in a Boeing 737 simulator.

Among her conclusions she wrote: ‘In a relatively realistic task context, even simple, routine interruptions significantly and operationally degrade performance of an ongoing procedure’.

In the past 20 years, psychology has looked intensively at the relationship between interruption and error. Broadly, it has concluded that interruptions are dangerous because they force people to rely on prospective memory, which is not always reliable.

NASA’s human factors specialist, R. Key Dismukes, notes that the number of scientific papers on prospective memory expanded from a handful in 1990 to more than 400 in 2009.

Dismukes elegantly defines prospective memory as ‘remembrance of things future’, the act of ‘remembering to remember’. Remembering to return a library book on time is an everyday example of prospective memory. Dismukes emphasises that even the most conscientious of skilled pilots sometimes forget intended tasks of great importance.

He says, ‘My colleagues and I have read many incident reports from pilots, which I generalize as: “I have been an airline captain for many years and have never before had an incident like this. My peers all regard me as an able pilot and a stickler for following procedures exactly. I cannot understand why I forgot to call for flaps to be set, but I will be ever more vigilant against making this error again”.’

Dismukes says: A crucial aspect of prospective memory distinguishing it from most other forms of memory is that no external agent explicitly informs the individual when it is time to stop performing the ongoing task and to retrieve the stored intention from memory – he or she must ‘remember to remember’.

Countermeasures against prospective memory failure involve creating the missing ‘explicit agent’ that Dismukes describes. One example would be a pilot’s thumb marking the last completed item on a checklist.

Professor Coiera has studied interruption as a trigger for medical error for more than a decade.

One of his studies identified more than a third of all communications with emergency room doctors as interruptions. This amounted to more than 11 interruptions per person each hour.
'Interruption can cause two things. One is to forget what you are doing or are about to do,’ he says. ‘The second is inefficiency, because switching tasks slows you down.’

Coiera notes that interruptions are most disruptive when they occur during simple repetitive tasks, such as going through a long checklist, or torquing a series of bolts.

‘If tasks are very similar it is more likely that interruptions will be negative.

Another dangerous category is post-completion errors. ‘You’ve accomplished your primary goal but not carried out the clean-up steps. If you get interrupted towards the end of a sequence it’s more likely you’ll make an error – the classic example is taking your money but leaving your card in the ATM.’

Coiera acknowledges that interruption can never be eliminated. ‘Yes, we can identify certain tasks where do-not-interrupt is a practical solution but we can’t imagine a world where everyone wears those yellow jackets all the time – work wouldn’t happen.

‘The question then is what do you do to make the environment interruption-tolerant? Psychology says people appear to do well when they can resume the previous task with lots of cues about where they were up to.

‘The solution is to give people cues that are always visible. The second thing is to give people tools to capture context.’

Coiera says it is possible for doctors, nurses and, by implication, aircrew to mentally prepare for interruption. ‘When you’re walking down the corridor and you see someone approaching, you can make a note in your mind of what you were thinking of or doing. It’s when you’re interrupted without preparation time that you’re most at risk.

‘The other side of the coin is that if you do have to interrupt someone, give them a moment if you can to collect their thoughts. That small window of a second or two can help. Saying “I’m sorry to interrupt, but …” provides your listener with both a time to collect thoughts and a cue. It’s not just a technical thing; even simple skills help.’

**Dealing with interruptions**

As part of its approach and landing accident reduction toolkit (ALAR) the Flight Safety Foundation has this to say about managing interruption:

Some interruptions and distractions are subtle and potentially difficult to detect. The first priority, therefore, must be to recognize that a disruption has, in fact, occurred. Once you are aware that the normal flow of activities has been interrupted, the second priority is to re-establish situational awareness. This is accomplished through the following steps:

- **Identify** – What was I doing?
- **Ask** – Where was I interrupted?
- **Decide/act** – What decision or action shall I take to get ‘back on track’?
When deciding on an action:

- Use the clear guidelines in operations golden rules – aviate, navigate, communicate, administrate (manage systems) (ANCA) in that order.
- Plan all activities. Be willing to postpone some actions until time and conditions are more conducive.
- Ask for more time (e.g. from ATC or from another crew member) to prevent being rushed. ‘Take time to make time’.
- Follow SOPs to verify that any postponed action(s) have been accomplished.

If a disruption interrupts the course of any checklist, an explicit hold should be verbalised to mark the pause in the checklist, and an explicit command should be used for resuming it.

Further information


www.skybrary.aero/bookshelf/books/853.pdf

www.skybrary.aero/bookshelf/books/886.pdf

‘Managing the risks of interruptions and distractions during safety critical maintenance’ Rick Sellers