

# Have we gone too far in translating ideas from aviation to patient safety?

**James Rogers** thinks that attempts to learn from aviation are ignoring fundamental factors in healthcare, but **David Gaba** argues that much more could be done

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**YES** Why are doctors constantly told to adopt aviation safety practices? My own specialty of anaesthesia is particularly vulnerable, based on the dubious analogy that giving an anaesthetic is similar to flying an aircraft. Although initiatives such as the World Health Organization's surgical safety checklist are generally welcome, the aviation model has only a limited place in medicine because there are fundamental differences between the ways in which doctors and pilots work.

Using a checklist should never detract from the priorities of flying an aircraft or looking after a patient safely. Immediate actions should be committed to memory, followed by reference to a concise aide memoire. Crucially, a checklist is distinct from a briefing, which is normally given at two specific times during a flight—before departure and before descent. A briefing deals with all the “what ifs?” (where to divert to in bad weather, what to do if an engine fails on take-off) and deliberately takes place at a time in flight when workload is relatively low. In the operating theatre the checklist and briefing have merged untidily—team introductions, discussions, and concerns are integral to a briefing but shouldn't feature on a checklist.

A proper checklist prompts a “challenge-response” dialogue that is conducted in a rapid, efficient way. This works well on the flight deck with only two people involved, both of whom are suitably qualified and alternating between flying and non-flying pilot roles. Standard operating procedures have defined these roles clearly, allowing a captain and first officer who have not previously met to fly a route, both confident of each other's actions and responsibilities. Such standardisation is an unrealistic aspiration in the operating theatre, where there are more people, a varied skill mix, and a constant to-ing and fro-ing. The person reading the checklist often responds to his or her own challenge, thus losing the element of cross checking of items with another team member and negating the value, and there are more likely to be “authority gradients,” discouraging junior team members from questioning their seniors. Crew resource management programmes have enabled airlines to reduce such behaviour on the flight deck, but overbearing personalities are still widespread in medicine.

## Value of experience

Emergency drills and checklists don't take experience into account. Pilots train for events they may never encounter, but doctors deal with emergencies frequently and develop judgment. For

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reviewed journals on these topics, and typically the analogous practices in aviation long pre-date their incorporation into healthcare.

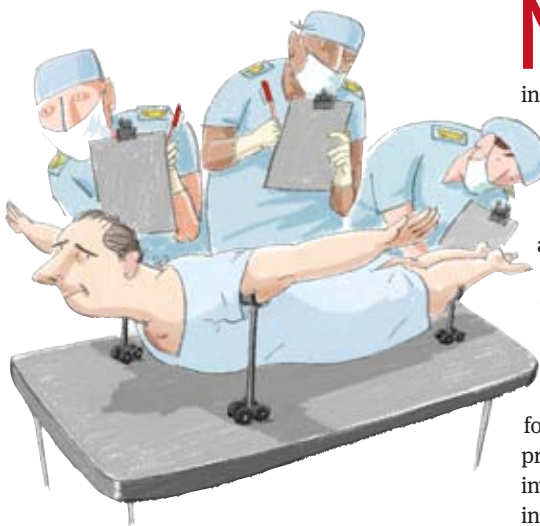
**NO** Analogies between medicine and aviation have been made on two levels: human factors and industry or institutional. Neither has gone too far. The human factors addressed include dynamic decision making in critical situations, team management and teamwork in acute care teams, management of fatigue, use of cognitive aids (such as presurgical checklists, equipment checkouts, and emergency procedures), optimising the physical and electronic work environment (data displays, user interfaces, alarms, etc), and safety culture.<sup>1-4</sup>

The analogies have worked particularly well for aspects of healthcare that mirror the cognitive profile of aviation pilots and controllers—those involving sick patients with rapid clinical change, interleaving of diagnosis and treatment, invasive procedures, and heavy use of technology. Thus in specialties such as anaesthesia, intensive care, emergency medicine, surgery, endovascular interventions, and neonatology the translation of ideas from aviation has been successful because it relates to fundamental human challenges of work that is cognitively similar between domains.<sup>1-4</sup> There is extensive literature in healthcare peer

## Further potential

It is true that concepts and practices from one domain cannot be transferred directly to another; translation or adaptation is needed to ensure that the fundamental characteristics of healthcare are considered properly. Such translation has been successful for many concepts in many domains of healthcare, but not all attempts will work; nor will they work for every healthcare setting or every problem of patient safety.

Nonetheless, if we accept that some concepts have been reasonably translated from aviation to healthcare, how far have we gone in actually implementing those practices? We haven't gone very far, surely not far enough, and by no means have we gone too far. Examples are legion. Checklists are widespread and mandatory in aviation; the notion of a simple checklist before surgery is beginning to be implemented but adoption is still extremely variable. Pilots are under strict limits for work hours. In the United States, we impose limits on work hours for medical trainees (mild limits by European standards), but we have no limits for experienced staff. Simulation is a regular part of training and assessment for airline pilots. While it is beginning to become commonplace for medical



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example, only a few patients with postoperative airway obstruction require re-intubation, but you need to have seen a fair number to decide which they are. In addition, pilots aren't often faced with having to diagnose—the computerised monitoring systems will display not only exactly what is wrong but also the relevant actions to take. Even with this degree of automation, human confirmation of a problem at the initial stage is useful—as long as it's correct. In the Kegworth disaster, the crew declared an engine failure on the right rather than the left and went on to mistakenly shut down the good engine.

Are checklists and emergency drills infallible in aviation? Not necessarily—but that's usually apparent only with the wisdom of hindsight. For example, in the Concorde disaster in Paris, should the pilot have made a snap decision to abort the take-off even after having passed “V1,” the “must go” airspeed, contrary to established procedures? Would the outcome have been better if his burning aircraft had overshot the runway but come to a halt, rather than taking to the air?

### Risk management

The expectation in aviation is that everything should go smoothly; equipment is standardised and pilots fly only aircraft on which they have been trained. Even variables such as weather are

trainees, the number of practising doctors—let alone teams of doctors and nurses—who have participated in an intensive simulation remains tiny. In aviation, best practices determined by regulators and individual companies are uniformly adopted by pilots and controllers. In healthcare even widely accepted evidence based best practices are often not adopted uniformly.

Moreover, I would argue that we have been too superficial in our approaches. Take fatigue. No one seriously believes that it is wise for clinicians to be dead tired when they perform potentially dangerous work on patients. Healthcare has superficially grafted fixes to the problem of sleepy clinicians without seriously redesigning clinical work processes or the structure of the clinical workforce. Is it any surprise that putting a sticking plaster on a large wound doesn't work very well? What is really needed for this, and many other problems, is fundamental reconsideration of how clinical work is organised rather than arguing about the source of ideas for change.

### Wider comparisons

The second level of analogy concerns larger issues of aviation versus healthcare as industries.<sup>5-7</sup> Both aviation and many parts of healthcare are of high intrinsic hazard. Evolution certainly didn't intend for human beings to be

dealt with—there are strict minimum conditions that must be met before starting an approach to land. In contrast, ill patients come in all shapes and sizes, and diseases follow different courses, even before allowing for the fickleness of human behaviour. Unsurprisingly, the mindset of pilots and doctors is different—in medicine not only do we tackle situations that are inherently dangerous, such as operating on the moribund patient, but we are also obliged to outline the risk and obtain consent to proceed. This doesn't happen in commercial aviation; if something—equipment, weather, runway condition—doesn't meet standards, you simply don't fly (and you don't consult the passengers in reaching that decision).

The evolution of simulators in aviation has been financially driven. Yes, it helps that emergency situations can be reproduced and drills practised, but using a simulator instead of an empty aircraft for conversion training represents a massive saving. Pilots are able to fly a new aircraft type for the first time on a routine passenger flight (albeit alongside an experienced training captain and extra pilot), such is the quality of their preceding simulator experience. Simulators in medicine don't offer the same degree of realism, or such obvious value for money.

up in the air. Many endeavours in healthcare—anaesthesia being one obvious example—are equally unnatural and likely to cause harm if not controlled carefully. The unmatched safety of commercial aviation (for US airlines scheduled service 2000-9: 0-1 fatal accidents a year or 0-0.017 per 100 000 departures a year) is testament to the effort that has gone into making what is fundamentally dangerous into something that is incredibly safe. Healthcare is nowhere near to achieving such results, even for elective care.

Clearly though, there are limits to the comparison of aviation and patient safety. It is important to distinguish the intrinsic differences between these arenas from the differences that are due only to traditional structures and practices. One fundamental difference is that unlike aeroplanes, we don't design and build human beings; we don't even receive the instruction manual. Another fundamental difference is that for commercial aviation many lives are at risk in each flight, whereas in medicine we typically have only one. Thus, airline accidents are highly public whereas most iatrogenic adverse events remain private. Conversely, many differences are not fundamental but are contingent solely on historical factors of organisation, such as the job types of “doctor,” “nurse,” and their scopes of practice, or what degree of standardisation is realistic in healthcare.

### Safety culture

What would transfer well to medicine? Firstly, the established Confidential Human Factors Incident Reporting Programme (CHIRP), for self reporting near misses and human errors—for example, being distracted and not following an important air traffic clearance. The National Patient Safety Agency operates a similar scheme but, unlike CHIRP, does not publish the original firsthand accounts of incidents. Secondly, a recommended procedure in an emergency situation is given by the mnemonic “DODAR”—diagnosis, options, decision, assign tasks, and review. This offers a structured framework for decision making and using resources to best effect. In particular, “review” encourages situational awareness—do my original assessment and actions still fit the overall picture?

Doctors need to understand why certain practices work well in aviation but not necessarily in medicine. We should not be seduced by the polished image of flying or introduce unsuitable systems into a different environment. After all, pilots enjoy their job without feeling the need to mimic doctors.

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Yes, for every programme there are costs and benefits as well as unintended consequences to consider. These should be analysed for any intervention whether it is translated from another industry or comes directly from a healthcare source. Healthcare will never be the same as aviation. It can't be. Patients are indeed not aeroplanes. But our pendulum of safety management is so far from that of aviation that we surely don't need to make healthcare exactly like aviation, and no credible source has ever suggested that we should. Instead, those of us who have advocated learning lessons from aviation have sought a middle ground, recognising and adapting appropriate concepts and practices and implementing them sensibly into healthcare. The process of finding those concepts and practices has not finished, and the implementation of those practices that seem most likely to be beneficial has barely scratched the surface.

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