

FIFTY SHADES OF TRADE-OFFS: FROM ATC TO ANAESTHESIA

Trade-offs are a universal feature of all aspects of human work, safety-critical activities.

Ludovic Mieusset, François Jaulin and Sébastien Follet provide examples from ATC and healthcare, and consider how we might better share experience on the reality of trade-offs

KEY POINTS

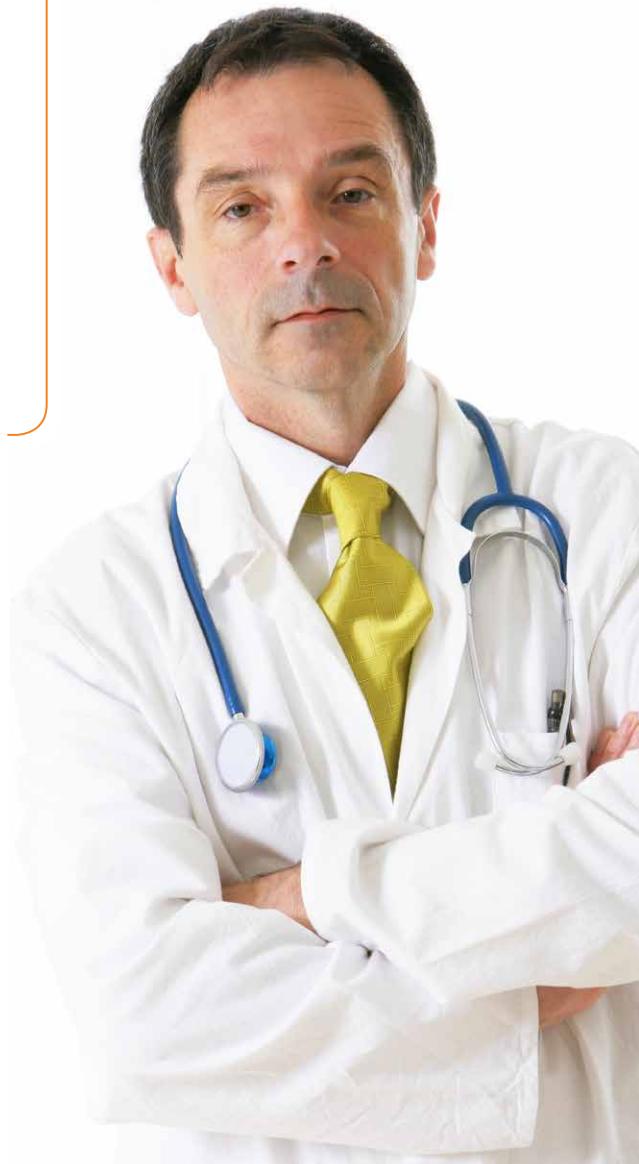
- A trade-off involves least dissatisfaction balance between two or more goals.
- When there are two or more opposing choices, a trade-off involves internal factors, such as personality, self-confidence, and feelings, and external factors such as rules, time available, and support. Experience helps to weigh these up and make a decision.
- Sharing experience is key: it helps furnish a personal situation library, used as references in a trade-off decision
- As front-line practitioners in aviation and healthcare, we routinely make trade-off decisions. But some trade-offs bring feelings of uneasiness. Here are some examples, from the tower and the hospital, which show some of the parallels in these very different environments.

The tower

It's a busy evening here in my regional airport. As the Tower Supervisor, I am still struggling with slots, parking congestion, aircraft queuing at the holding point or being vectored to land. The pressure is easing up when I answer a phone call from the en-route centre: a flight linking the UK to Spain is having hydraulic problems. The aircraft is overflying the ocean at FL310 when the crew radio a PAN-PAN-PAN and asks for a diversion to my airport. I relay the information to my colleagues, and we apply the appropriate procedures up to a point: when do we stop all runway operations to help ensure the diverting aircraft will land safely?

On one hand, the problem is serious enough to push the crew to divert to the closest eligible airport. In my experience, hydraulics problems can be serious (handling problems, flaps/slats settings, undercarriage position and steering issues on landing roll). So, the runway must be available well ahead of the arrival of the aircraft to help the crew to cope with the incident.

On the other hand, the aircraft won't land for 20 minutes. It does not seem appropriate to block all departing or arriving so far ahead of time: the situation may become tricky, with slots



missed, overcrowded aprons, and fuel minimums looming. And what may happen if some hydraulic fluid spills on the runway or the aircraft blocks it?

Finally, I have to decide. It's not easy, considering the pressure of the airport services and the ATCOs working that night (each with their own perception of the situation). No rule exists for this situation. No procedure is in place. I'm on my own. And whatever the decision is, it won't be completely satisfying.

The hospital

It's a typical day at this town hospital. Many patients are waiting for operations, and the surgical team is falling behind schedule. Patients are getting tired and unhappy, and pressure is growing for

the operating team to try to keep up the pace. At one point, the team must take a difficult decision.

Should they carry out scheduled interventions during the on-call period (during the night), taking the risk of not being fully available for a vital emergency (team fatigue and operating room availability)? Or should they postpone the remaining scheduled interventions to be fully available for an emergency that may not occur during the night (leaving an unoccupied operating room unused, and facing dissatisfied patients who have been fasting all day)? Once again, whatever decision the team takes is not a satisfying one.

Often seen as a 'forced' compromise, the situation raises safety issues in terms of available human resources and team fatigue and performance. The management of patient flows and their harmonious distribution in the operating room also plays a role. The regulator of the operating room is akin to an

air traffic controller having to have three aircraft take off with only one runway available. In this context, two elements to be considered in the compromise:

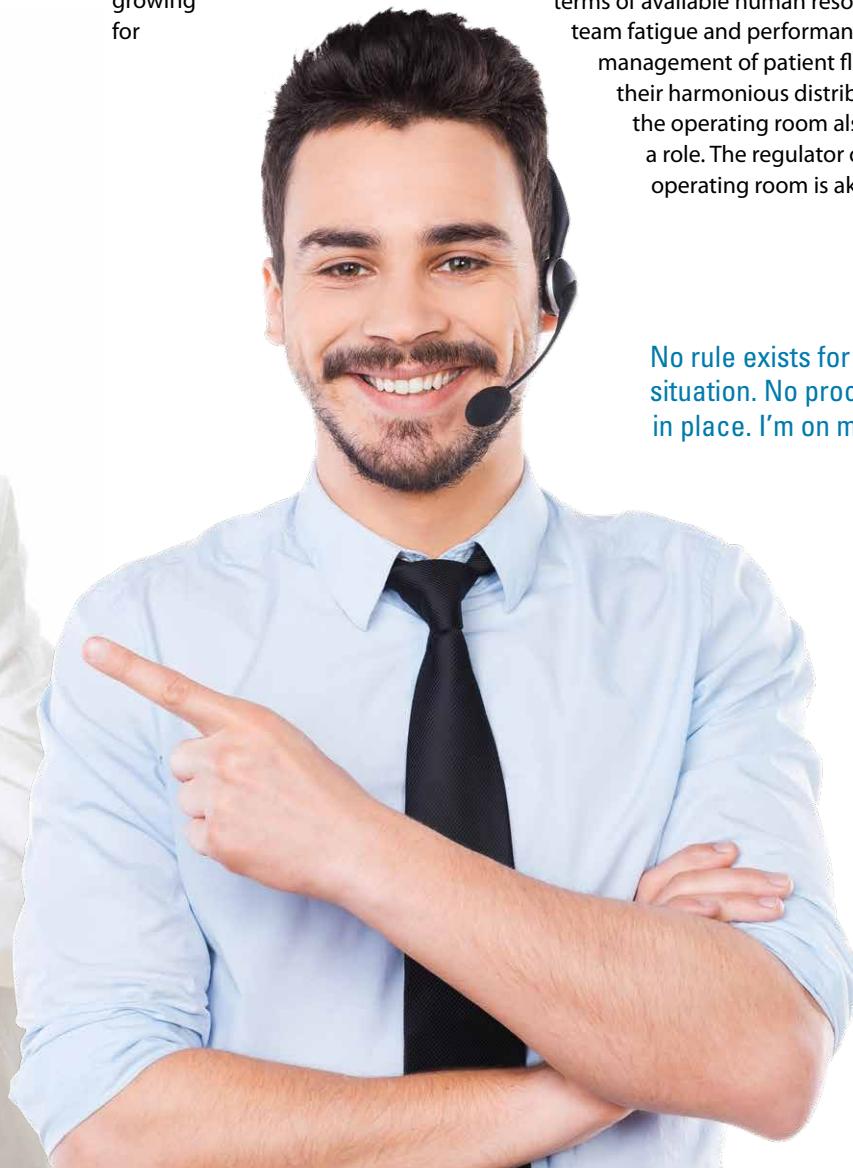
- the weight of the rules: the operating room code and recommendations of learned societies;
- the 'human', ethical, and medical arguments that introduce many considerations into the decision to proceed: the experience of a patient left fasting for hours on a stretcher (pain, suffering, anger, resignation), medical consequences related to cancellation (worsening of condition), delay in crucial treatment (e.g., chemotherapy), difficulty in rescheduling the surgical procedure, and more.

Resolving such trade-offs is not an easy task in the medical field. The 'no-go' is not as clear-cut as in other high-risk industries: not only because the consequences directly affect human life, but also due to the history of resilience, risk-taking and experimentation in healthcare. Indeed, the current state of medicine is a balancing act between trade-offs and the necessity to help everyone possible.

Back to the tower

Had the pilot declared a MAYDAY, no trade-off was possible: all traffic would have been stopped with landing priority. But with a PAN-PAN call, there are fifty shades of emergency. A tower manager is not a mechanic. His or her decisions are based on an understanding of the plane systems and whatever elements have been communicated. And determining the level of emergency for a PAN-PAN case is challenging.

Some hints may help handle the situation: pilot voice, rate of descent, trajectory, for example. Better radio communication will help the controller fully understand the situation: pilots should tell ATCOs what they need and what to expect (see Mieusset and Follet, 2018, *HindSight 27*). Also, brief instructions, encompassing information about the degree of seriousness and what to expect, should be developed.



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Trade-offs rely heavily on experience. Unless a controller has faced a hydraulic failure leading to a nose wheel steering problem, he or she may not imagine that such an incident can lead to a runway excursion or a blocked runway. However, since this situation happens regularly, every ATCO should have heard about it.

Luckily, I knew what could happen when an aircraft has a hydraulic problem. One of my co-workers shared his technical memos leftover from his military controller career with me. He even implemented them as a manager in a regional airport. So, with my knowledge, my personal experience, these memos, I decided to stop all the traffic when the PAN-PAN plane flew below FL80. I also asked airport services to be ready to perform a runway inspection in order to open the runway as quickly as possible. This decision was the least dissatisfying one in this case. Finally, the plane landed and taxied to its stand uneventfully. When all things

were settled, we took time to discuss and share our experience with all the parties involved. I hope that this will help us to face the next trade-off with the same success.

Learning from trade-offs

Both examples are high-level trade-offs where safety is at stake, and perhaps show how we can and should learn from different industries. As operators, we are all eventually faced with such decisions, and there is no system dictating the right answer. You are surrounded by people with different priorities, so it is your responsibility to consider the pros and cons and make the final decision, unsatisfactory as it may be.

When there are two or more opposing choices, a trade-off involves reaching a compromise that influences the probability of an unwanted event occurring, or the consequences, or both. This will involve internal factors, such as personality, self-confidence, and

feelings, as well as external factors such as rules, time available, and support. Your experience helps you to weigh these up and make the decision.

Such events show how important it is to share experience to learn how to act when facing trade-off decisions. There are two main ways of sharing experience. The first is direct conversation. This is efficient, and benefits from greater trust, but remains local. The second is large-scale exchange, at an organisational level. This is more global but less efficient, and suffers from lower trust. We need to be able to talk about trade-offs and share information, not only at a local level. So as a starting point, we have to acknowledge the reality of trade-offs. S

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