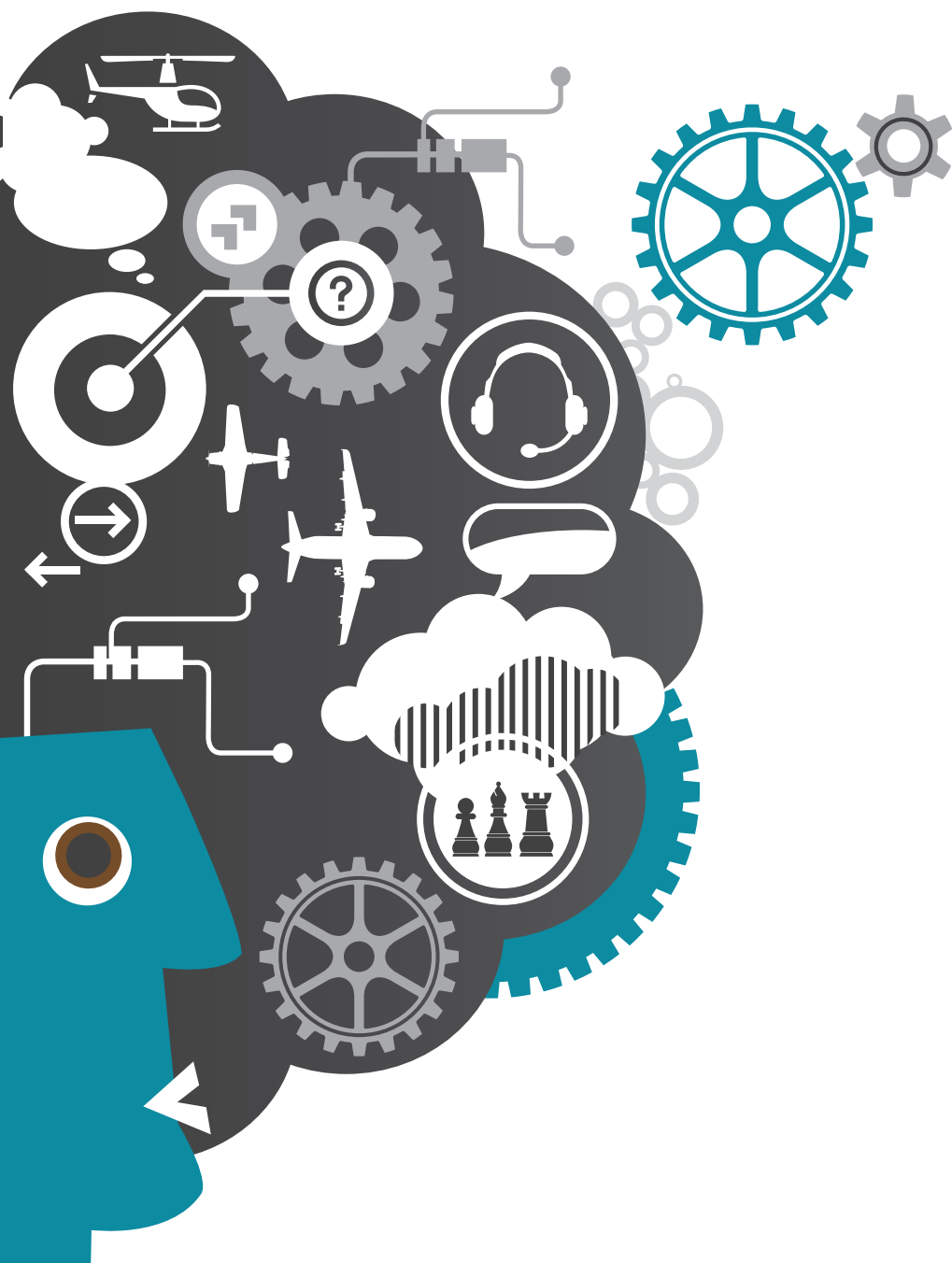




Australian Government
Civil Aviation Safety Authority

Safety behaviours: human factors for pilots 2nd edition

Resource booklet 2 Safety culture



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image: Adobe Stock | Alskiba

The beliefs, attitudes, norms and values that people within an organisation share are described as the organisational culture. Informally, you can describe culture as ‘the way we do things around here’.

Safety culture is an essential part of organisational culture: it affects the way the organisation manages safety and therefore, the ultimate effectiveness of its safety management system (SMS).

Every organisation has a safety culture, but some are better than others. Professor James Reason probably described it best. He said, ‘an ideal safety culture is the “engine” that drives the system towards the goal of sustaining the maximum resistance towards its operational hazards regardless of current commercial concerns or leadership style’.¹

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‘A great safety culture is when people continue to work safely and do the right things ... even when no-one is watching.’

Author unknown

Introduction

What does 'safety' mean? *The Oxford English Dictionary* defines it as 'the condition of being protected from, or unlikely to cause, danger, risk or injury'.² An organisation which has a good safety culture focuses on safety, to protect the workforce and the general public from danger, risk or injury. But how does that link to safety culture, and why does it matter?

Perhaps the concept becomes more real when we look at the number of people who lose their lives in fatal workplace accidents, or from work-related diseases.

The numbers from the International Labour Organization are staggering—more than 2.78 million deaths per year, which equates to about 6300 each day. There are also some 374 million non-fatal work-related injuries and illnesses each year.³

Closer to home, Safe Work Australia reported that in 2016, 182 work-related fatalities occurred from injuries caused by work-related activity (equating to a rate of 1.5 fatalities per 100,000 workers).⁴ Australian Transport Safety Bureau (ATSB) figures show that in 2016, 230 aircraft were involved in accidents, resulting in 21 deaths, while there were 291 serious incidents.⁵

People are more than a statistic

If safety is the condition of being protected from danger, risk or injury, by managing/minimising risk, then the fact that these people had a fatal accident means that somehow risk was not being managed effectively on the day of their accident. Investigations reveal that many factors contribute to accidents, but the safety culture of the organisations involved is key.

A watershed accident for safety culture was the 1988 explosion and fire on the Piper Alpha oil and gas production platform. In his inquiry into the Piper Alpha disaster, Lord Cullen found that the issue of culture was at the heart of the failings. 'I do not fault Occidental's (the company operating the platform) policy or organisation in relation to matters of safety. However, ... I have had to consider a number of shortcomings in what existed or took place on Piper. This calls in question the quality of Occidental's management of safety and in particular, whether the systems which they had for implementing the company's policy on safety were being operated in an effective manner.'



image: Civil Aviation Safety Authority

The Piper Alpha accident

Piper Alpha was an oil production platform located in the North Sea about 190 km north-east of Aberdeen, Scotland. On 6 July 1988, an explosion and the resulting oil and gas fires destroyed the platform, which had 226 people aboard.

The accident resulted in the deaths of 167 people, including two crewmen of a rescue vessel. Only 61 workers from the platform escaped and survived. It took almost three weeks for the fire to be brought under control, and the platform was destroyed.

In November 1988, the Cullen Inquiry began into the cause of the disaster. The inquiry went for 180 days and concluded that the initial condensate leak was the result of maintenance work being carried out simultaneously on a pump and related safety valve.

A lack of communication at a shift change meant staff were not aware that they should not use a key piece of pipework which had been sealed with a temporary cover and no safety valve. Gas leaked out and ignited, while firewalls that would have resisted fire on an oil platform failed to cope with the ensuing gas explosion.

The inquiry was extremely critical of Piper Alpha's operator, Occidental, which was found guilty of having inadequate maintenance and safety procedures. Lord Cullen was scathing about the operator's lack of safety practices, with just some of the findings being:

- a lack of emergency planning, as well as failings in the emergency procedures and equipment, which resulted in workers on the platform standing little chance of escape when the accident occurred.^{6,7}
- inadequate maintenance and safety procedures in use by the operator
- a failure of the permit-to-work (PTW) system which was based on 'informal and unsafe practice' and was 'knowingly and flagrantly flouted'
- a lack of hazard analysis at the design stage of constructing the platform
- complacency regarding compliance auditing

In all, Lord Cullen recommended 106 changes; all were accepted by the industry. A poignant quote from Sir Brian Appleton, who acted as a technical adviser during Lord Cullen's inquiry into the Piper Alpha disaster, brings us perhaps closer to the true meaning of safety:

Safety is not an intellectual exercise to keep us in work. It is a matter of life and death. It is the sum of our contributions to safety management that determines whether the people we work with live or die. On 6 July 1988, 167 people died.



image: Piper Alpha oil rig | PA/PA Wire/PA Images

Aviation safety

The International Civil Aviation Organization (ICAO) defines safety as 'the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management'.⁸

Ultimately, our aviation safety activities aim to eliminate aircraft accidents and serious incidents. However, because of the inherently dangerous nature of the aviation operational environment, the aviation system cannot be completely free of hazards and associated risks.

'Safe organisations'

The concept and practices of safety have evolved over the years from being simply a collection of processes and standards, to a systematic approach specific to safety. Unfortunately, this has occurred because of lessons from some catastrophic accidents and losses along the way.⁹

Safe organisations are said to have the following traits:

- they pursue safety as one of the objectives of the organisation and regard safety as a major contributor in achieving production goals
- they have developed appropriate risk management structures, which allow for an appropriate balance between managing productivity and risk
- they enjoy an open, good and healthy safety organisational culture
- they possess a structure which has been designed with a suitable degree of complexity
- they have standardised procedures and centralised decision making which is consistent with the objectives of the organisation and the characteristics of the surrounding environment
- they rely on internal responsibility rather than regulatory compliance to achieve safety objectives
- they respond to observed safety deficiencies with long-term measures in response to latent conditions as well as short-term, localised actions in response to active failures.

Bearing these traits in mind, the following case study is an example of an unsafe organisation, where safety and risk management was compromised in the extreme. Sadly, it took the deaths of nine people to learn the lessons and overhaul aviation oversight, safety and standards.



image: Civil Aviation Safety Authority

VH-SVQ en route to Lord Howe Island

On 2 October 1994, VH-SVQ, an Aero Commander 690B aircraft operated by Seaview Air, crashed into the Pacific Ocean, killing the nine people on board.

Given that an extensive search failed to locate the aircraft or its occupants, the direct cause of the accident could not be determined. However, several factors relating to the operation of the flight, the company's operation, and the oversight of that operation by the regulator, were identified in the investigation, including:

- Seaview was not licensed to operate regular public transport (RPT) services on the route in question
- there was little evidence of compliance with the recording and processing of defects
- evasion of regulations was common—as several previous chief pilots admitted.¹⁰

A Commission of Inquiry was held as well as the investigation. Mr John Sharp, then Minister for Transport and Regional Development, tabled the *Commission of Inquiry report into the Relations between the Civil Aviation Authority and Seaview Air* on 8 October 1996.

In his tabling statement to Parliament, Mr Sharp paid tribute to the nine people killed. His words demonstrate the magnitude to which safety was flaunted and the poor organisational/safety culture which existed at Seaview.¹¹

This inquiry highlights how a litany of lies and incompetence led to the deaths of nine people ... It reveals Seaview as an unsafe organisation, a slipshod and often wilfully non-compliant organisation in which breaches of regulations and unacceptable practices were commonplace ...

Aviation is not like any other industry. When operators break the rules and when those people entrusted by the public to keep the skies safe don't do their job properly, innocent people lose their lives. When Seaview's Aero Commander crashed into the Tasman Sea en route from Williamstown to Lord Howe Island—a flight which should never have been allowed—nine people lost their lives ...

Honeymooners Leeca and Anthony Atkinson were setting out on the first day of their new life together. Reg and Pam Drayton were setting out on what was for them a second honeymoon; Stephen and Carol Lake and two of their five children, Judith and Benjamin, were setting off on a family holiday. The report paints a picture of the young pilot, Paul Sheil, as also being a victim of this unsafe organisation. These are the tragic consequences of wanton operators ... They are not just statistics.

MANAGEMENT CONTRIBUTION TO SAFETY

Without being too prescriptive about management's role in safety, a few general principles apply across industries:^{1,12}

- **Management commitment:** Visible management drive and support for the implementation and ongoing operation of a company safety program is vital. It is a key feature of any high-reliability organisation.
- **Allocation of resources:** Simply, management's most obvious contribution to safety is in allocating adequate and necessary resources to achieve the production goals of the organisation safely.

- **Standard operating procedures:**

Management can make a major contribution to safety by developing, implementing, and ensuring adherence to, standardised operating procedures (SOPs). Conversely, the failure to conform to sound SOPs has been linked to numerous accidents and incidents.

However, the most influential role management plays in safety is helping to shape an organisation's safety culture, something that was a significant factor in the following case study.



image: Civil Aviation Safety Authority

Longford Gas Explosion, Victoria

On 25 September 1998, at Esso's Gas Plant 1 in Longford, Victoria, cold metal failure of one of the heat exchangers caused a series of explosions.

The incident killed two people, injured another eight, and cut Melbourne's gas supply for 19 days. The cost of the accident was estimated at \$1.3 billion.

The incident resulted in a Royal Commission, which concluded that the accident was not operator error, but instead inadequate operator training on the part of Esso.

The Royal Commission also discovered several operational and managerial factors which contributed to the accident including:

- inappropriate equipment design, such as a poor level control system and insufficient isolation system to reduce the severity of a fire
- inadequate operator training for personnel running a hazardous process
- excessive alarms. To achieve production targets the plant was required to operate in 'alarm mode'. Operators therefore became desensitised, as on average, they had to deal with 300–400 alarms a day.
- lack of onsite engineers and inadequate supervision
- poor shift communications and handover
- failure to identify hazards associated with low temperatures resulting from the loss of lean oil flow
- inconsistent safety reporting procedures
- Esso's safety culture. The Commission found that the *root cause of the accident was a deficiency in the safety culture of the management*. Management placed emphasis on developing the mindset of workers rather than on identifying hazards and risks.



image: Esso Longford Explosion and Fire | Ray Kennedy/Fairfax Syndication

The role of safety culture in influencing behaviour

High-risk and high-reliability operational processes are usually considered to be driven by a culture of safety.

Safety culture has been shown to be a key predictor of safety performance in many industries. It is personnel's attitudes to the company's approach to safety, their perceptions about the magnitude of the risks they face, and their beliefs in the necessity, practicality and effectiveness of measures to control risks. In this way, safety culture can be considered an enabler for safety.^{1,12,14}

How culture is built is perhaps best understood by the following story.

HOW IS CULTURE BUILT?

There's a story which first began to circulate in the 1960s about the way in which individuals adopt the culture of an organisation.

The fable, which seems to be based loosely on research in 1966¹⁵, goes like this:

A group of scientists put five monkeys in a cage. In the centre of the cage was a stepladder, with a banana hung at the top. As the monkeys climbed the ladder to retrieve the banana, the scientists sprayed them with freezing cold water to prevent them from reaching it. Each time they tried to climb the ladder they were sprayed, until they stopped trying.

The scientists then removed one of the monkeys and replaced it with a new one. The new monkey saw the banana and attempted to climb the ladder. The four original monkeys, afraid of being sprayed with water, assaulted the new monkey to prevent it from climbing the ladder. The new monkey had no idea why it was being assaulted but didn't climb the ladder again.

A second original monkey was removed and replaced, with the same result. The new monkey attempted to climb the ladder and was assaulted—except this time, the first new monkey participated in the beating of the newest monkey, without understanding why. This pattern continued until all the monkeys had been replaced. No monkey attempted to climb the ladder out of fear of being assaulted, not of being sprayed with cold water.¹⁶

What this story suggests is that individuals quickly become assimilated into an organisation without always knowing the reasons why a process or procedure is followed in the way that it is. Culture has a powerful influence on behaviour as people like to conform, to fit in, and not to be treated differently.

The bad news is that when a new individual joins an existing, often well-established team, there is an opportunity for bad habits or workarounds (seen as accepted practice by the team) to be passed on to the new employee.

The good news is that if the culture is set up correctly from the start and there is consistent reinforcement of standard operating procedures (SOPs), then the new person should also adopt the SOPs readily. Just as bad habits can be passed on, so can good ones!

Origin of the term 'safety culture'

Before the 1980's, the word *culture* was a term used to refer to people's nationalities, rather than to organisations. However, in the early '80's the term 'organisational culture' began to be used to describe an organisation's cultural characteristics. A strong culture was defined as one in which all levels of the organisation shared the same goals and values.¹⁴

The term *safety culture* came to prominence following the catastrophic Chernobyl nuclear power plant accident on 26 April 1986, in the northern Ukraine, then a part of the Union of Soviet Socialist Republics (USSR).

Chernobyl disaster

The Chernobyl disaster occurred during a late-night safety test. A team of nuclear workers prepared to test reactor 4 of the Chernobyl nuclear power plant as part of an otherwise routine shutdown. The exercise was to test a modified safety system and determine how long the reactor's steam turbines would continue to power the main coolant pumps following a loss of main electrical power supply.

To achieve the test conditions, automatic shutdown devices were inhibited, and the emergency core cooling system shut down. This was particularly high risk because the reactor design at the plant was unstable at the low power levels being tested. A previous shut-down attempt had failed, which may have heightened pressure to complete it on this attempt.

Unfortunately, inherent reactor design flaws and the reactor operators arranging the core in a manner contrary to the checklist for the test, eventually resulted in an uncontrolled reaction.

At 1.23 am on 26 April 1986, the number 4 reactor sustained a destructive steam explosion and a subsequent open-air graphite fire. The fire produced considerable updrafts which released huge quantities of fission products into the atmosphere. The reactor core was exposed and burned for nine days.

During this time, it was ejecting radioactive materials continuously into the atmosphere. Radioactive gas, dust and aerosols were carried by wind and contaminated much of the western Union of Soviet Socialist Republics (or the USSR, as it was then), spreading and contaminating central and southern Europe.

There was widespread panic when news of the accident was released a few days later.



image: Chernobyl Nuclear Reactor after the explosion | AP Photo/Volodymyr Repik

Chernobyl accident

Impact of the Chernobyl accident

The accident had devastating effects, with the consequences continuing to this day.

- The accident was classified as a level 7 event (the maximum classification) on the International Nuclear Event Scale.
- The localised accident quickly became a global issue with more than 170 tonnes of highly radioactive material released into the surrounding areas, and ultimately, into the atmosphere.
- The radioactive release was estimated to be more than 10 times bigger than the nuclear bomb released over Hiroshima, Japan in 1945. Radiation readings in the vicinity just after the accident were 60,000 times above normal levels.
- Two people were killed within the plant when the explosion occurred, with 134 others, including plant and emergency services personnel, hospitalised with acute radiation symptoms in the days that followed. Of these, 28 died in the days and months following from acute radiation syndrome and 14 more died from cancer-related conditions within 10 years.
- In the wider community, many other cancers (particularly in children) and other health issues caused by exposure to radiation have been documented.
- Reports from the International Atomic Energy Agency (IAEA), United Nations (UN) and World Health Organization (WHO) state that the Chernobyl accident is directly responsible for the deaths of 4000 people who received very high doses of ionising radiation.
- The same report says that a further 5000 people died later due to medium- to low-doses of radiation. A large percentage was linked to cancers associated with radiation exposure and with consumption of contaminated food.

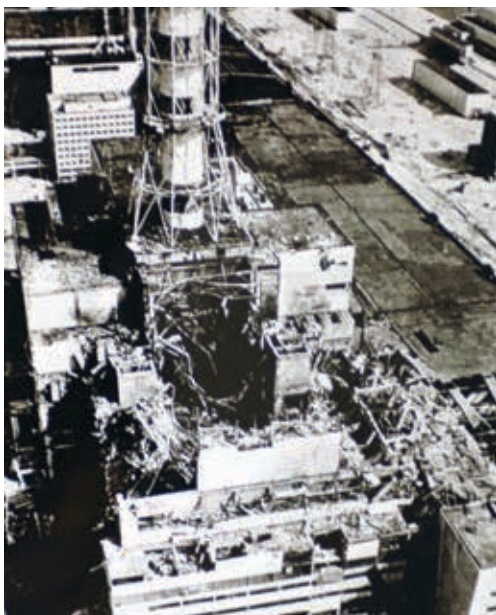


image: Chernobyl accident | 02790015 by USFCRFC



image: Chernobyl Ferris Wheel | spoilt.exile

It is expected that there will be many more deaths directly attributable to radiation exposure from Chernobyl.

- The day after the explosion more than 350,000 people in the 'nuclear exclusion zone' had to evacuate their homes.
- The Chernobyl site has been declared a permanent no-go zone and more than 100,000 square kilometres of land has been contaminated.
- More than seven million people were affected indirectly by the disaster.
- Decontamination of the surroundings has involved over 500,000 workers and cost an estimated \$A315 billion to date.
- While many emergency service vehicles which responded to the emergency have since been buried in huge trenches, many of the contaminated land vehicles and aircraft used in the clean-up operation remain in graveyards in the vast exclusion zone around the Chernobyl reactor. The largest of these graveyards is at Rassokha, approximately 25 kilometres south-west of the power plant.

The report into the accident by the IAEA's International Nuclear Safety Advisory Group (INSAG) used the term 'safety culture' to explain how the lack of knowledge of risk and the failure to act appropriately contributed to the Chernobyl accident.



image: Rows of vehicles and aircraft at the Rassokha Graveyard | AP Photo/Efrem Lukatsky

The INSAG report said the Chernobyl accident was caused by a 'deficient safety culture at Chernobyl and throughout the Soviet design, operating and regulatory organisations'. The report quoted 'a total lack of safety culture' and said the Chernobyl accident was 'a direct consequence of Cold War isolation and the resulting lack of any safety culture ...'

In the report, INSAG defined safety culture as:

That assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.¹⁹

While there were many contributing factors cited in the INSAG report, some of the factors identified in relation to poor safety culture included:

- a culture of ignoring safety due to lax regulations
- an emphasis on production over all other concerns
- an acceptance that safety would be traded off in the design of the inherently unstable reactor which optimised fuel economy and allowed the possibility of sudden uncontrollable power surges
- frequent violation of standard industry practice procedures and checklists by operators
- unapproved and untested modification of test conditions
- the lack of automatic safety mechanisms
- lack of formal training and incompetence of operators
- lack of learning from previous incidents.

Link to organisational accidents

The Chernobyl accident in 1986 fundamentally changed worldwide perspectives on the importance of safety regulation and safety culture. This was reinforced by findings following the Piper Alpha disaster two years later. Poor safety culture has been identified in many high-profile accident investigations since, including the Columbia space shuttle explosion in 2003 and the Texas City refinery explosion in 2005, and in numerous aviation accidents.

Examination of safety culture can provide a crucial insight into how multiple organisational barriers against such accidents can be simultaneously ineffective. Operators and regulators alike have recognised the importance of safety culture in safety performance.²⁴

With each disaster that occurs our knowledge of the factors which make organisations vulnerable to failures has grown. It has become clear that such vulnerability does not originate just from 'human error', chance environmental factors, or technological failures alone. Rather, it is the ingrained organisational policies and standards which have repeatedly been shown to predate the catastrophe ... many accidents are a result of both failures at an individual level (e.g. attitudes towards safety) and at a company level (policies and practices relating to safety).²⁵

Definitions of safety culture

The Chernobyl and Piper Alpha accidents stimulated a vast amount of work on safety culture. Because safety culture is a subset of overall company culture, it is not surprising that definitions of the term vary from organisation to organisation. The following are some examples:

- **Worksafe, QLD.** 'A safety culture is an organisational culture that places a high level of importance on safety beliefs, values and attitudes—and these are shared by the majority of people within the company or workplace. It can be characterised as "the way we do things around here".'²⁶
- **The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).** 'The shared basic assumptions, held by most members of an organisation, which create and reinforce group norms of thoughts, language and behaviour in relation to major accident event prevention.'¹³
- **NSW Roads and Maritime Services (RMS).** 'Safety culture reflects the values, beliefs and attitudes in the organisation that influence what people do and why they do it. A mature safety culture contributes to strong safety performance.'
- **Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).** 'The core values, beliefs and behaviours resulting from a collective commitment by leaders and individuals throughout an organisation that appropriately prioritise safety against other organisational goals to allow business objectives to be undertaken without undue risk.'²²



The International Civil Aviation Organization (ICAO) states:

- culture itself is characterised by the beliefs, values, biases and their resultant behaviour that are shared by members of a society, group or organisation; and
- a safety culture encompasses the commonly held perceptions and beliefs of an organisation's members pertaining to the public's safety and can be a determinant of the behaviour of the members.⁸

While there are many definitions of safety culture, they have two things in common.

1. Safety culture is about people's values, attitudes, beliefs and behaviours. In an organisation with a good safety culture, these focus on safety, which is considered a priority.
2. Safety culture is about the extent to which these values, attitudes, beliefs and behaviours pervade the organisation. In organisations with a good safety culture these values extend throughout—from the CEO/head of operations to line pilots and the hangar—and in everything everyone does in the organisation.²²

Characteristics of safety culture

Every organisation has common internal characteristics that we call its culture. These characteristics are often invisible to insiders because they are ingrained, but to an outsider may appear quite shocking.²⁸

Imagine coming from a highly regimented organisation where all incidents are reported, and which communicates safety lessons, to one where a heavy blame culture and a mantra from fellow workers that 'we don't report incidents or talk to management' prevent incident reporting.

Conversely, imagine coming from an organisation where safety comes a poor second to production, and where the process is never questioned if the outcome for the business is positive. It would be challenging to adapt to a more mature organisation where the emphasis on safety practices and processes takes priority over operational outcomes, such as meeting deadlines, whatever the cost.

Pressures on operators to keep to schedules can be difficult.

For many public transport operators, keeping to published or arranged schedules is an important indicator of success and effectiveness. In busy airports, missing your slot can result in big delays. In some industries, they publish on-time performance figures and sometimes issue fines for schedule-non-adherence.

Passenger expectations and demands can create insidious pressures on charter operators, also affecting industry reputation. The following case study refers to an accident where maintaining on-time running was the focus during normal operations.

Glenbrook rail accident, Blue Mountains

On the morning of 2 December 1999, the *Indian Pacific* (IP) tourist train and an inter-urban State Rail Authority (SRA) train were en route to Sydney travelling on the same track. The weather was fine, and both trains were controlled by automatic signals.

Near Glenbrook in the Blue Mountains, a power supply unit failed, resulting in the signals displaying a stop (red) indication. The *Indian Pacific* reached signal 41.6, which displayed a stop indication, and as per safe working procedures, the driver alighted from the train and attempted to use the signal box telephone to obtain authority to proceed.

This procedure took more than seven minutes because the signal telephone box was locked. This meant the driver had to return to the train cab to retrieve his key.

The *Indian Pacific* was given authority to proceed to signal 40.8 (displaying stop) and the driver attempted to contact the signaller, but could not get through.

Meanwhile, the SRA train travelling behind the *Indian Pacific* caught up. The SRA train driver was given authority to proceed to signal 40.8 after the driver asked the controller, 'I'm right to go past it am I mate?' to which the controller replied, 'Yeah, mate, you certainly are.'

The SRA driver assumed the track was clear and the signaller assumed that the *Indian Pacific* had proceeded ahead.

The SRA train, travelling at 50 km/h, rounded a bend and despite applying full emergency brakes, collided with the rear wagon of the *Indian Pacific*, resulting in seven fatalities and multiple passenger injuries.

Some of the key human factors issues contributing to the accident included:

- lack of communication protocols and standard phraseology
- poor training of signallers and drivers in communication skills and human factors concepts
- ignorance and confusion over operating and safe working procedures
- inadequate equipment for communicating safety critical information
- an organisational culture of on-time running
- lack of human factors analysis of operating procedures.²⁹

The accident inquiry found safety management deficiencies in the rail organisations involved. Employees were not properly trained, so they were not aware of the extra care required in the event of a signal failure to control the risk of collision properly.²⁹

The inquiry also found that in the absence of effective training and regular reinforcement of the message that safety was the highest priority, it was only to be expected that operational staff would be motivated by their normal goal of ensuring on-time running.



image: Aerial view of the Glenbrook Rail Accident Scene | Noel Kessel / Newspix

Characteristics of good and poor safety cultures

By default, every organisation has a safety culture. What distinguishes the good from the bad?

A good safety culture ensures that operations are as safe as possible because:

- everyone, from staff on the ground to managers, is involved
- everyone takes safety seriously, remains watchful and avoids compromises.

By contrast, in an organisation with a poor safety culture:

- not everyone takes safety seriously
- people are not watchful and compromise too readily
- some workers or operations may be at greater risk of incidents or accidents

- incidents, especially near misses, are not reported, communicated, or acted upon adequately
- instructions are not followed properly.

If incidents are not reported and lessons learned, they will continue to occur. It is therefore important that safety should be integrated into an organisation's operations.²²

A healthy safety culture relies on high levels of mutual trust and respect of workers and management. They must share values about the importance of safety and have confidence in the efficacy of preventative measures. Senior management support is vital to creating and supporting a good safety culture. The following Australian Army accident case study highlights the issue of safety culture and failure to learn from previous accidents. The army did not take preventative measures, and the organisation lost the trust and respect of those who advocated change.



image: Civil Aviation Safety Authority

Holsworthy troop carrier rollover

A trainee at Holsworthy Army Base was driving 17 peers in a Unimog (an open-top troop carrier) in bushland on 8 October 2012, when he lost control on a bend, causing the troop carrier to roll. The force of the crash threw many of the young men from the seven-tonne truck, along with their rifles, army packs and supplies. One person died and six were seriously injured.

The driver of the Unimog faced seven charges in the NSW District Court, including dangerous driving causing death, and dangerous driving occasioning grievous bodily harm, but was found not guilty in March 2017.

During the trial, there was considerable focus on the Army's safety culture:^{30,31}

- The driver's defence barrister argued the Army's training of the driver had been hopelessly inadequate and its supervision virtually non-existent. He told the jury that the then 20-year-old was the holder of a civilian learner's permit, had only 14 hours experience driving the seven-tonne Unimog truck, and had recently raised serious concerns after performing poorly in a driving test on suburban streets.
- An internal Defence Force commission of inquiry into the deadly accident noted that civilian licensing requirements were 'more onerous' than the Army's and recommended that the Army's requirements be 'better aligned' with its civilian equivalent.
- The trial revealed that in the 1990's, several reports were commissioned by Defence Force after a number of Australian soldiers were killed and injured during vehicle accidents. These reports warned the Army of poor safety standards.
- One of the reports into a previous accident which resulted in the deaths of five Australian soldiers in Malaysia, made several recommendations around driver training, accident investigation and vehicle safety. These included a 'graduated', civilian-style licensing system and installation of seatbelts and rollover protection in the Unimog troop carriers. However, a former Army sergeant who was the head of transport at the School of Military Engineering at the time of the accident, said key recommendations had not been implemented.
- Two of the survivors of the Malaysian accident said the recommendations of the board of inquiry into the accident—including that Army troop carriers be fitted with seatbelts and rollover protection—had been ignored by Defence. To this day, neither recommendation has been implemented.
- Survivors of the accident in Malaysia said the Holsworthy crash and Defence's ensuing failure to improve safety was an insult to the memory of their dead colleagues. For 15 years, they have been pushing for Defence to implement the recommendations from the board of inquiry into the accident.

Their sentiments and emotion are telling:

You think about the board of inquiry and the recommendations and you think your mates leave a legacy. That if they died, they didn't die for nothing. So, you think like OK, so they died, but they've saved a lot of lives in the process because we've gotten better vehicles, better equipment, all that sort of stuff. It makes it a little bit easier on yourself. Then when you see another truck rollover back at Holsworthy with no seatbelts, nothing like that. Yeah, it pisses you off, definitely ...

Unless there's a General that's killed one day in a rollover, nothing is going to be done. Because it's like a boys' club up that high, I think. So, they look after themselves and the diggers down below are told to do a certain job, but aren't given the right tools ...

This keeps happening: we see the same trends, we see the same investigations, the same recommendations, but it takes the leadership and the muscle and the commitment of true leadership to follow these things through.³⁰



image: The overturned Unimog at the Holsworthy Army Base | Craig Greenhill / Newspix

Characteristics of a positive safety culture

What are the characteristics of a good safety culture? ICAO advocates that in an organisation with a strong safety culture:²⁸

- senior management places a strong emphasis on safety as part of the strategy of controlling risk
- decision makers and operational personnel hold a realistic view of the short- and long-term hazards involved in the organisation's activities
- those in senior positions do not use their influence to force their views on others, or to avoid criticism
- those in senior positions create an organisational climate which is open to criticism, and fosters comments and feedback from all employees
- there is an awareness of the importance of communicating relevant safety information at all levels of the organisation (both internally and with outside entities)
- there is promotion of appropriate, realistic and workable rules relating to hazards, to safety and to potential sources of damage, with such rules being supported and endorsed throughout the organisation
- personnel are well trained and well educated and fully understand the consequences of unsafe acts.

Characteristics of a poor safety culture

Conversely, there are distinct symptoms of a poor safety culture. These are:

- the number of hazard reports is lower than expected
- the appointed safety executive does not take responsibility for the safety program
- there is active resistance to the safety program
- the number of high-risk safety incidents is not decreasing over time (or, is increasing)
- the number of workplace accidents is not decreasing over time (or, is increasing)
- there are management silos
- upper management does not actively support the safety program
- there is retaliation from managers or other employees against people who report safety issues
- there is a strong tendency for employees or management to focus on individual blame—to focus on the 'who' rather than the 'why' of an incident
- there is resistance to change
- safety information is not readily accessible
- safety managers do not communicate important safety concerns (effectively)
- there is a lack of safety budget
- there is a high number of repeat safety incidents.³²



image: Civil Aviation Safety Authority

Elements and types of safety culture

Professors James Reason and Patrick Hudson are recognised as experts who have done much to advance safety in many industries, including aviation. They describe how organisational cultures making safety a priority share common characteristics—five elements which can be defined and measured.^{1,12}

- **An informed culture**—those who manage and operate the system have current knowledge about the human, technical, organisational and environmental factors underpinning the safety of the system.
- **A reporting culture**—people are willing to report errors and near misses.

- **A just culture**—there is an atmosphere of trust, and people are encouraged or even rewarded for providing essential safety-related information, but there is also a clear line between acceptable and unacceptable behaviour (i.e. fair and just culture).
- **A flexible culture**—this can take different forms but is characterised as shifting from the conventional hierarchical mode to a flatter professional structure.
- **A learning culture**—has the willingness and the competence to draw the right conclusions from its safety information system, and the will to implement major reforms when necessary.

On the following page are some examples of positive safety performance indicators against each of the safety culture elements. While it is not an exhaustive list, it does provide organisations with some practical goals for measuring their safety culture maturity.

‘The five key ingredients of an effective safety culture’

James Reason’s model



Characteristics of safety culture from Reason (1997)	Sample goals and targets
Reporting culture	<ul style="list-style-type: none"> • Corrective actions completed within agreed timeframes. • Percentage of planned corrective actions which have been finalised. • Number and quality of safety hazards reported. • Percentage of near misses to incidents reported over a 12-month period. • Percentage of quality near misses assessed based on minimum standard reported over a 12-month period. • Actual number of safety observations/interactions completed compared with number planned. • Percentage of quality safety observations/interactions assessed based on minimum standard over a 12-month period. • Percentage of feedback provided to reportees on action taken within agreed maximum timeframes.
Learning culture	<ul style="list-style-type: none"> • Percentage of issues addressed from strategic reviews compared with total number. • Percentage of compliance with CASA or WHS audit actions/notices. • Quality assurance process in place to improve quality of incident investigations. • Evidence of process in place to identify repeat systemic factors from significant incidents.
Informed culture	<ul style="list-style-type: none"> • Safety briefings/toolbox talks completed to quality agreement based on 95 per cent target. • Number of risk assessments conducted against those planned. • Evidence that risk issues have been considered and mitigated as part of a major change project. • Number of new worker inductions conducted on site against number planned.
Flexible culture	<ul style="list-style-type: none"> • Percentage of operators trained against skills matrix. • Percentage of staff trained against skills matrix. • Evidence of emergency scenario training held. • Examples of succession plans for key roles. • Evidence of competency certificates in place.
Just culture	<ul style="list-style-type: none"> • Number of staff identified needing investigation training compared with actual number trained. • Evidence of a formal fair and just culture management review process applied consistently. • Evidence of a formal reward and recognition process applied consistently. • Evidence of formal communication of the outcomes from performance management decisions, particularly for breaches of safety critical rules.

Safety culture maturity

Patrick Hudson developed a five-stage model showing how a safety culture's maturity evolves, driven by increasing levels of information and trust. The stages move from organisations where there is an almost total disregard for safety (a pathological culture: caring less about safety than about not being caught) through to those where safety is pre-eminent (a generative culture, in which safe behaviour is fully integrated into everything the organisation does).¹²

These stages are:

- The *pathological* stage where safety is not a high priority for the organisation.
- The *reactive* stage where safety issues begin to acquire importance, often driven by both internal and external factors, and typically because of recurring safety incidents that may cause production delays. At this first stage the organisation is acquiring safety values, but its beliefs, methods and working practices are still quite basic. Senior management tend to believe accidents are mostly caused by their employees' stupidity, inattention or intentional rule breaking. The reactive organisation still sees safety as an 'add on'.
- The *calculative* stage where organisations recognise that safety needs to be taken more seriously. They 'calculate' safety; use quantitative risk assessment techniques and overt cost-benefit analyses to justify safety and measure the effectiveness of proposed measures. Despite what can become an impressive safety record, safety is still primarily an add-on, and a mechanical application of a safety management system (SMS). A true safety culture goes beyond this level.
- An effective safety culture can only be considered to have developed in the further *proactive* ('we work on the problems we still find') or *generative* ('safety is how we do business round here') stages of this evolution. There is genuine and well-founded belief that safety is worthwhile. A proactive organisation is beginning to take safety seriously, with deliberate procedures in place, but has not yet fully internalised safety values, its methods are still new, and individual beliefs generally lag behind corporate intentions.

In a true and effective safety culture, the value system and beliefs associated with safety and safe working must be fully internalised, almost being invisible, and the entire suite of approaches the organisation takes are safety-based. An effective safety culture can arise only in an organisation in which the necessary technical steps and procedures are in place.

The evolution of safety culture



The benefits of an effective safety culture

As well as meeting the moral and legal obligation to operate safely, for passengers and employees alike, many benefits flow from a positive safety culture. These include but are not limited to:¹

- **Return on investment.** A positive safety culture provides a much greater control over losses, in turn allowing an organisation to operate in inherently risky environments where the return on investment is the greatest and where lesser organisations often fear to go.
- **Trust.** A positive safety culture will generate trust on the part of other operators creating the potential to generate business through alliances.
- **Improved audits.** Rather than being an imposition and a potential threat, a positive safety culture will welcome audits as an important source of external information and/or confirmation about how well the organisation is doing. Audits will provide an external and independent avenue for the organisation's ongoing improvement.

Improving safety and economic viability

An effective safety culture not only improves safety for people (which is our primary goal), but from a business sense, is an investment with a high return over the long term. Could your organisation cope with, and survive, the personal, emotional, social, business and economic consequences of a major accident? Improving safety and safety culture does require energy and persistence but does not necessarily require a large budget.

There is a strong relationship between safety culture and a safety management system (SMS). An SMS defines minimum standards, but standards without an effective culture, as Piper Alpha demonstrated, are just words on paper.

Safety culture is the link between behaviour and the effectiveness of an SMS. An SMS will not be effective unless there is a positive safety culture, which in turn determines how people will contribute to the SMS and what they think about it.³³

Professors Hudson and Reason have some well-chosen final words:

*Sound systems, practices and procedures are not adequate if merely practised mechanically. They require an effective safety culture to flourish. Improvements in safety culture are needed to move off the plateau of performance.*¹²

Professor Patrick Hudson

*If you are convinced that your organisation has a good safety culture, you are almost certainly mistaken. A safety culture is strived for, but rarely attained. The process is more important than the product.*¹

Professor James Reason

Building a positive safety culture

How to build a positive safety culture

Derek is an experienced seaplane pilot and has worked for charter operators in Canada, Australia and New Zealand. In relocating his family to the Gold Coast, he sees an opportunity to take over a small charter business flying tourists using two five-passenger amphibious Cessna 206 aircraft.

The business employs five part-time pilots, two support/ground staff and one administration staff member who takes internet and phone bookings. Before buying the business, Derek does some background research and identifies these issues:

- Most of the pilots see their roles as temporary, as they are building their commercial flying hours with a view to securing a full-time RPT job. Derek knows, therefore, that pilot turnover is a challenge and he will need to engage the pilots about safety while they are flying for the business.
- The two support crew are part-time roles, filled by university students who will move on once they graduate. Again, the challenge is to engage with them about how their ground support roles play a critical role in safety and risk management and ensuring they are/feel part of one team.
- Maintenance on the aircraft is inconsistent because the company uses several service providers. Derek decides to formalise an agreement with a local maintenance firm to ensure a better ongoing relationship and more maintenance accountability.
- The office/administration role is largely reactive. There has not been much active marketing, the business has become a bit stale and the brand is not well advertised or known.
- While there is a safety management system, many of the staff are not aware of it, and vary in their views about what constitutes a 'reportable safety incident'. The current owner has no written policy setting out his/the company's safety expectations, values and beliefs.

Derek believes he can build a better business, but understands a good safety reputation will underpin both employee and customer confidence in his operation. He decides to improve his own safety knowledge and understanding of organisational behaviour and consults CASA's *SMS for Aviation: A Practical Guide* (2nd edition) resource kit for ideas.³³ He also undertakes a systemic incident investigation course to better understand accident and event causation.

Derek obtains the necessary approvals from CASA to take over the AOC and takes the opportunity to rebrand the business to *Golden Shores Seaplanes*.

He recruits an older retired ex-airline pilot, Martin, with recent Cessna 206 experience, to act as a mentor to the younger pilots. An added advantage is that Martin is also knowledgeable about human factors, having been a CRM facilitator in his airline career.

Derek and Martin understand that, while human error often precedes an accident or event, errors are facilitated by systems, equipment and other organisational factors. They engage with the pilots, support crew and administration staff to generate the understanding, commitment and buy-in required to launch *Golden Shores Seaplanes*. As part of this engagement, they adopt some simple strategies along each of the five elements of safety culture based on 14 simple actions.

How to build a positive safety culture

REPORTING CULTURE

- **Action 1: standardised incident and near miss reporting**
 - » They develop, implement and communicate an editable pdf template for standardised incident and near-miss reporting.
 - » They also modify the company's incident investigation process to incorporate human factors and contributing factors analysis techniques, and to require corrective actions linked to each investigation finding.
 - » They reinforce the fact that the purpose of an investigation is to prevent accidents and reduce risk, not to apportion blame, and that company investigations will look beyond simple human errors to include organisational factors.
- **Action 2: provide a simplified safety hazard reporting process**
 - » They develop and implement an editable pdf template to allow all staff to submit electronic safety hazard reports. They let staff know it is available, and how to use it.
- **Action 3: key performance indicators**
 - » They implement key performance indicators to provide confidence and assurance to all staff that feedback on all issues reported will be provided within 48 hours.

INFORMED CULTURE

- **Action 4: communicate company values**
 - » Derek issues a formal letter to staff members clearly outlining the behaviours, decisions and attitudes he,

as the company owner expects and values, based on an underlying 'safety is a key priority' theme.

Values. Our passengers' and your workmates' lives and wellbeing are important; people should go home in the same condition as they came to work. Doing the right thing is important.

Beliefs. Speaking up about safety won't threaten your job. If you do speak out, something will be done. If you don't act, you could be responsible if something happened.

Attitudes. My personal safety is more important than money.

- **Action 5: demonstrate company values**
 - » Derek and Martin communicate (and embed) these values through regular safety observations/engagements with staff. They reinforce company values through health and safety policy statements, safety material, and through any regular communication (email, social media, advertising) the company produces. These actions reinforce a corporate identity for *Golden Shores Seaplanes* of 'safety as a key priority'.

JUST CULTURE

- **Action 6: formal fair and just culture management review process**
 - » They develop, implement and communicate a formal fair and just culture policy based on CASA's *SMS for Aviation: A Practical Guide* (2nd edition) resource kit. This clearly outlines that unintended simple errors need to be understood and learned from, so that others do not repeat them, but willful violations are not acceptable.

- **Action 7: formal recognition process**

- » They develop, implement and communicate a simple 'above and beyond' program to allow fellow staff, customers and other stakeholders to recognise good behaviour.

LEARNING CULTURE

- **Action 8: internal website**

- » They develop a social media site accessible by staff to share industry news, safety information, and local issues to ensure everyone is kept up-to-date with relevant issues. They encourage staff to post on the site.

- **Action 9: 'better way'**

- » They develop a standard 'better way' form so that staff can suggest more efficient, practical or safer ways to do their job.

- **Action 10: incident investigation training**

- » Senior staff undertake incident investigation training and communicate the company's approach to incident investigation to all staff.

- **Action 11: incident investigation findings**

- » They publish findings and actions from any incident, near miss or hazard report investigation on the company's intranet site, so they are available to all personnel.

- **Action 12: quarterly breakfast BBQ**

- » Every quarter, they hold a free breakfast to update staff on company performance and direction. The first agenda item is safety: they present a summary of incidents, investigation findings, actions and closeout status, as well as any results from the 'better way' or recognition programs.

FLEXIBLE CULTURE

- **Action 13: skills matrix**

- » They develop a skills matrix to verify training compliance is up-to-date and staff are trained with the relevant and necessary skills.

- **Action 14: emergency scenario training**

- » Every quarter, as part of the breakfast BBQ, staff brainstorm a potential emergency scenario and how they would manage it.

The goal of the safety culture improvement program over time—'the way we do things around here'—is that *Golden Shores Seaplanes'* employees feel comfortable in reporting any hazards or errors they experience.

Derek works on the assumption that hazards and errors resulting in undesired outcomes reveal flaws in risk controls. So, they analyse events and their contributing factors, no matter how minor, and use them to improve hazard and risk controls.



Key points for professional pilots

An organisation with an established safety management system isn't necessarily a 'safe organisation'. Regulations, systems, procedures and rules alone do not guarantee safety.

Accident analysis shows that a breakdown in policies and procedures designed to maintain safety occurs when people do not believe in, or adhere to, these rules. To be effective, safety systems and processes must exist in a supportive organisational culture.

Systems are rational processes found in databases or on paper, tangible outputs which can be measured objectively in audits. However, it's not enough for them to be 'present' and ticked off on a to-do list; there's a big difference between 'present' and 'effective'.

The type of safety culture which exists in an organisation is a key predictor of safety performance. Not only do professional pilots need to follow company SOPs diligently to ensure standardisation, but they also need to be vigilant and endeavour to maintain a 'sense of chronic unease'—healthy scepticism and wariness—to avoid complacency.

Key points for charter operators

Charter operators have an advantage in being able to take the necessary steps to promote a safety culture more quickly, to be agile.

Large organisations suffer from many bureaucratic layers which can make it difficult to bring about change. Smaller organisations such as charter operators can be more agile, flexible and able to evolve their safety culture towards the generative goal.

The greatest barrier to success for smaller organisations is the belief that it is too hard. However, in the long term, it is more dangerous not to promote a safety culture. Adopting some simple strategies can have an immediate positive impact on your organisation's safety culture, and will demonstrate to the regulator that you are serious about continuous safety improvement.

Resources

KEY TERMS

aviation safety The state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level, through a continuing process of hazard identification and safety-risk management.

culture The shared behaviours, beliefs, attitudes, norms and values that people within a society, group or organisation share.

flexible culture A culture in which the organisation and the people in it can adapt effectively to changing demands.

high-reliability organisation (HRO) An organisation which is resistant to operational dangers and is operating successfully in hazardous conditions where the consequences of adverse events could be catastrophic.

informed culture A culture in which those who manage and operate the system have current knowledge about the human, technical, organisational and environmental factors that determine the safety of the system.

just culture A culture that does not seek to blame, where there is an atmosphere of trust, and where people are encouraged to report essential safety-related information, but where there is also a clear line between acceptable and unacceptable behaviour (i.e. fair and just culture).

learning culture A culture which has the willingness and competence to draw the right conclusions from its safety information system, and the will to implement major reforms when necessary.

organisational accidents Accidents which result largely from the actions/inactions of companies/organisations. According to Reason, organisational accidents have many causes involving many people operating at different levels of their respective companies.

organisational culture A system of shared assumptions, values and beliefs, which governs how people behave in organisations. These shared values have a strong influence on the people in the organisation and dictate how they act and perform their jobs.

organisational factors The underlying factors that provide the overall environment for work practices and affect performance in the workplace. They may include management decisions, processes and practices.

reporting culture A culture in which people are willing to report errors and near misses.

safety The condition of being protected from, or unlikely to cause, danger, risk, or injury.

safety culture The product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's safety management. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures.

safety management system (SMS)

A systematic approach to managing safety, including organisational structures, accountabilities, policies and procedures. An SMS is scalable: it can be tailored to the size and complexity of the organisation.

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