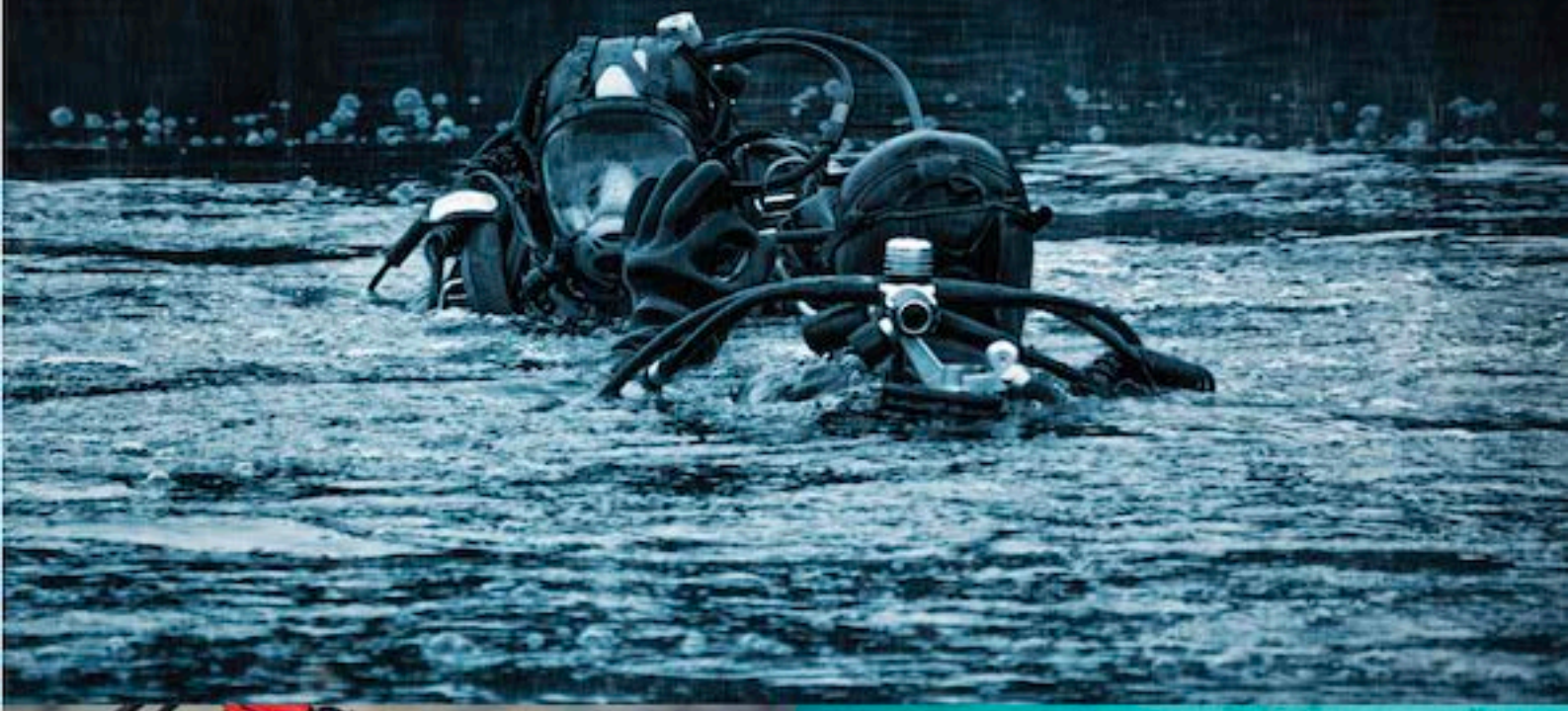
# Diving Crew Resource Management







The practical application of human factors, non-technical skills, and psychological safety to occupational and commercial diving

**the human diver**
be **better** than yesterday

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FOREWORD

# Nobody Comes to Work to Get It Wrong

*Gareth Lock — Founder, The Human Diver and Human in the System*

Every person involved in a serious diving incident — every diver, every supervisor, every operations manager, every dive centre owner — began their working day intending to do a good job. That is not a naive assertion. It is a foundational one. If you do not begin from that premise, everything that follows in incident investigation, in team development, in leadership, and in safety culture will be distorted by the assumption that the problem is people who do not care enough, try hard enough, or follow the rules carefully enough. That assumption is wrong. And it is expensive.

I came to human factors through aviation. Two and a half thousand hours on Hercules transport aircraft, flying tactical low-level operations in support of deployed forces, gave me an education in what it means to operate in a dynamic, high-consequence environment as part of a crew. When something went wrong — and things went wrong — the question was never simply who made a mistake. The question was what conditions were present, what information was available, what pressures shaped the decisions that were made, and what the team and the organisation could do differently to make those decisions better next time. That framing did not come naturally to military culture. It had to be built, deliberately and persistently, into the way crews were trained and the way incidents were reviewed.

I started diving later — drawn in by the same curiosity about complex environments and human performance that aviation had first sparked. What I found in the diving world was a community with extraordinary technical knowledge, deep passion for the underwater environment, and almost no structured framework for thinking about the human side of performance. Incidents were analysed in terms of equipment failure and procedural deviation. The deeper questions — how did it make sense for people to do what they did, what system conditions made the outcome possible, and what would need to change to prevent the next one — were rarely asked.

That gap is the reason The Human Diver exists. The gap between what we know about human performance in high-consequence environments and what the diving community routinely applies. Between the maturity of the aviation, healthcare, and offshore energy industries in treating the human element as a designed-for component of safety, and the diving industry's persistent tendency to treat it as an afterthought when everything else has been addressed.

This book is an attempt to close part of that gap for the occupational and military diving community. It draws on research and frameworks developed across aviation, healthcare, the military, and nuclear operations — tested and translated through training programmes delivered to commercial divers, military clearance divers, explosive ordnance disposal teams, port and harbour inspection divers, and search and rescue technicians. The people in those programmes brought the same operational seriousness, the same depth of technical experience, and the same genuine commitment to getting better that I first encountered in aviation. They also brought the same blind spots — about the limits of individual performance under pressure, about the cost of silence in hierarchical teams, about the gap between the procedure as written and the operation as it actually unfolds.

What changed, in programme after programme, was not technical knowledge. What changed was the language people had available for talking about the human dimension of their work. Before training, the language was thin: good diver, bad decision, should have known better. After

training, it was richer and more accurate: what was the task loading at that point, what performance influencing factors were present, what did the team's situation awareness look like from the supervisor's position, what would challenger safety have required of the team leader in that moment. Richer language produces richer analysis. Richer analysis produces better learning. Better learning produces better outcomes.

The seven chapters that follow cover the non-technical skill domains that matter most in occupational diving: decision making, situation awareness, communication, teamwork, leadership and followership, performance influencing factors, and the psychological safety and just culture conditions that determine whether any of the other six actually function. Each chapter is grounded in research. Each is translated into the operational diving context. Each closes with practical material designed to be used in team briefings and debriefs — not as compliance exercises, but as genuine invitations to think.

A few things this book is not. It is not a criticism of technical training. Technical competence is necessary. This book argues that it is not sufficient — that the conditions which turn technical competence into operational excellence are in the non-technical domain, and that those conditions can be built deliberately and systematically. It is not a collection of rules to follow. Rules describe expected conditions. Operations produce unexpected ones. What non-technical skills give you is the capacity to manage the gap between the two. And it is not a quick fix. The habits described here are built through repetition, through honest debriefs, through leadership that models what it is asking for, and through organisational cultures that treat learning as more valuable than blame.

The diving industry has produced remarkable people. It has produced technical competence of the highest order, operational innovation under extraordinary constraint, and teams capable of working with precision in some of the most demanding environments on earth. What it has not yet done, systematically, is invest in the non-technical layer that would make those capabilities more robust, more transferable, and more resilient when things do not go according to plan.

That investment starts with reading. It continues with conversation — honest, structured, curiosity-driven conversation about what actually happens in diving operations, what makes it harder or easier than it should be, and what we can do differently. This book is an invitation to start that conversation.

*Nobody comes to work to get it wrong. The question is not whether people care. It is whether the conditions we build — in our teams, our organisations, and our culture — make it more or less likely that caring translates into the outcome we all want.*

***Be better than yesterday.***

**Gareth Lock**

*Founder, The Human Diver and Human in the System*

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Malmesbury, Wiltshire, 2026

FOREWORD FROM THE FIELD

# A View from Commercial and Defence Diving Operations

*Esteban Marrufo, Director — Commercial and Defence Auditing Solutions (CDAS)*

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This material provides a strong and accessible introduction to human factors and diving crew resource management — one that bridges the gap between academic theory and the practical realities of diving operations. The structure reflects the sequence in which performance actually unfolds in operational environments, and that is not an accident.

From my perspective working within commercial and defence diving operations, everything addressed here resonates with what is seen in practice. Technical competence across the industry is generally high. The incidents that still occur are rarely the result of a single technical failure. More often they arise from a breakdown in coordination, communication, or shared understanding between the people managing the operation.

What this material establishes clearly is that non-technical skills are not an optional enhancement to technical training — they are the mechanism through which technical skill becomes operational effectiveness. Diving operations are inherently distributed systems: the diver underwater holds one part of the picture, the supervisor holds another, the standby diver and tenders hold more. The effectiveness of the operation depends on how well those perspectives are integrated, and the frameworks here provide practical ways to build that integration through briefing, communication, and honest reflection.

These concepts are already visible in well-functioning teams. Supervisors who verbalise their thinking. Divers who communicate changes early. Teams that debrief honestly and treat what they learn as more valuable than protecting what they already believed. This material gives those behaviours a common language and places them within a framework that can be taught and deliberately developed.

*The technical foundations of diving operations are well established. The next step is strengthening the human systems that operate within those frameworks. The more the industry develops a shared language around human performance, the better positioned teams will be to recognise emerging risks, adapt to changing conditions, and learn effectively from experience. I am fully supportive of this work and commend it to everyone with responsibility for the performance and safety of diving teams.*

INTRODUCTION

# Why Human Factors Matters in Diving

*Technical competence is necessary. It is not sufficient.*

Occupational diving has an established and mature framework for technical competence. Qualification standards, equipment requirements, depth and gas management protocols, and operational procedures have been developed over decades, informed by hard experience, codified in regulation and industry standards, and implemented through training programmes that place enormous emphasis on the practical skills required to work safely underwater.

And yet incidents continue to happen. Not primarily because divers lack technical skill. Not primarily because equipment fails. They happen because the conditions that allow technical skill to produce good outcomes — clear communication, sound decision-making, coherent team functioning, awareness of the situation as it actually is rather than as it was planned to be — are not present in the same measure as the technical skills they are meant to support.

This is not a new observation. Aviation reached the same conclusion in the late 1970s after a series of fatal accidents that investigators traced not to pilot incompetence or mechanical failure, but to failures of crew coordination, communication, and decision-making. The response was the development of Crew Resource Management — a structured approach to the non-technical skills that determine how effectively technical capability is deployed. Commercial aviation's subsequent safety record is, in significant part, a product of that investment.

Occupational diving is at an equivalent inflection point. The technical standards are in place. The gap — increasingly visible in incident analyses, and increasingly named in the professional literature — is in the non-technical domain. This book is a contribution to closing that gap.

## What the Standards Already Recognise

The inclusion of Annex M on Human Factors in Diving in CSA Z275.2 — the Canadian standard for occupational diving operations — represents a significant moment of formal recognition. The terms occupational and commercial are similar. They are used interchangeably in this book as the applicability of the concepts is international. Commercial diving standards have historically focused on technical and procedural requirements: equipment specifications, qualification levels, operational limits, emergency procedures. The explicit acknowledgement that human factors are a distinct and necessary domain of competence, and that they belong in the regulatory framework alongside technical standards, reflects the growing weight of evidence from incident analysis and applied research.

The United Kingdom's Health and Safety Executive guidance for commercial diving operations, and the increasingly human-factors-aware framing of diving safety management systems in the offshore energy sector, point in the same direction. The industry is recognising what aviation, nuclear operations, offshore oil and gas, and military aviation have already established: that managing the human element of high-hazard operations is not supplementary to safety management. It is central to it.

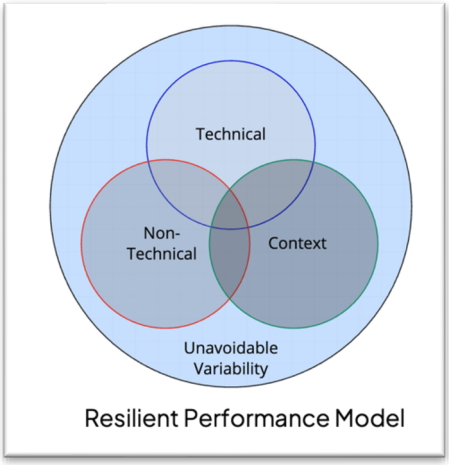
What the standards do not yet do — and what this book attempts to do — is provide the operational community with accessible, practically grounded material that translates the principles into the language and context of commercial and military diving work. The frameworks and concepts in these pages are not academic. They are drawn from research conducted with

and validated by occupational diving communities, from incident analyses of commercial and military diving accidents, and from structured training programmes delivered to commercial saturation divers, military clearance divers, port inspection teams, explosive ordnance disposal divers, and search and rescue technicians.

Operational reflection: In commercial and defence diving operations, incident analysis rarely points to a lack of technical competence — most divers are trained and capable, but only within the limits of their qualifications. What repeatedly emerges instead is breakdowns in coordination between the diver, supervisor and the surrounding team — essentially, information that exists in the system fails to reach the person who needs it. The human system is distributed across the team; failure is rarely at the individual level but across the interface between roles. Something as simple as a long reporting chain from the tender at the umbilical to the supervisor in dive control illustrates this: insert two people between them and the information will change. The answer is direct two-way communication — for example, radios direct to the supervisor.

## The Resilient Performance Model

Understanding why non-technical skills matter requires a clear picture of how performance outcomes are actually generated. The Resilient Performance Model, developed by The Human Diver, provides that picture in a form that is both theoretically grounded and immediately applicable to operational diving contexts.



Resilient Performance Model

The model identifies three components whose interaction determines the quality and reliability of performance outcomes. Technical skills are the practical competencies required to execute the task — gas management, buoyancy control, tool use, umbilical management, emergency procedures. Context encompasses the full operational environment: the physical conditions, the equipment, the organisational culture, the regulatory framework, the external pressures, and all the performance influencing factors that shape how difficult the task actually is. Non-technical skills are the cognitive and social behaviours — decision-making, situation awareness, communication, teamwork, leadership, and performance management — that determine how effectively technical skills are applied within that context.

The model's central insight is that resilient performance — the capacity to produce consistently good outcomes and to absorb unexpected events without catastrophic failure — is only achieved when all three components are strong and aligned. When any one is weak, the system is brittle. It may function adequately in familiar conditions, but it lacks the redundancy and adaptive capacity to manage the unexpected.

| Configuration | What it produces | Diving example |
|---|---|---|
| T only 'Brittle excellence' | High technical competence in a weak context with poor NTS. Outcomes depend entirely on nothing going wrong. | Excellent buoyancy and gas management, no shared plan, poor team communication. Any deviation from expected conditions becomes high risk. |
| C only 'Safe on paper' | Strong procedures and systems, but individually weak operators who cannot interpret or apply them under pressure. | Excellent SOPs, well-maintained equipment, detailed emergency plans — staffed by divers who have never practised the emergency procedures they would need. |
| T + C only 'Latent accident conditions' | The classic configuration: good people, good systems, no explicit NTS. Rare but severe failures become plausible when something unexpected happens. | Well-trained divers in a well-resourced operation, with no briefing discipline, no cross-checking culture, no habit of raising concerns. One unexpected event reveals the gap. |
| T + N + C 'Resilient performance zone' | Technical skills, non-technical skills, and context all strong and aligned. The system can absorb disturbances and still produce good outcomes. | A team that is technically proficient, briefs and debriefs deliberately, maintains shared situational awareness, communicates concerns early, and operates within a context that supports all of this. |

The model also acknowledges what it calls unavoidable variability — the chance events that no amount of preparation can eliminate entirely. A sudden equipment failure with no prior indication. An unexpected down-current. A rare physiological reaction. These events can push any configuration toward a bad outcome. What the T-N-C configuration determines is not whether such events occur, but whether the team has the capacity to manage them when they do. A resilient team in the resilient performance zone is not immune to the unexpected. It is better equipped to survive it.

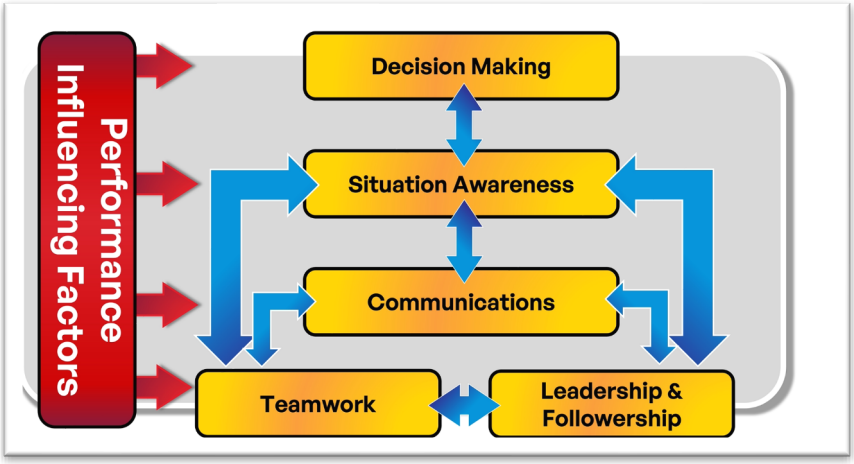
In diving operations, the interaction between technical skill, context and non-technical skills becomes particularly visible during abnormal events such as equipment faults, loss of visibility, or unexpected physiological issues in the diver. Teams that rely purely on technical competence often cope well when the task unfolds exactly as planned but struggle to adapt when the environment changes. For example, a technically proficient diver operating in poor visibility may still complete the task safely if the supervisor maintains strong situational awareness and communication discipline. Without that coordination, the same technical capability becomes fragile when conditions change. Experienced divers often use the phrase 'every finger is an eye' — to an inexperienced team this sends a chill; to an experienced dive team, it is a statement of comfort and trust.

## Non-Technical Skills and Diving Crew Resource Management

Non-technical skills are the cognitive and social behaviours that support safe and effective performance but are not captured by technical competence assessments. The term originated in aviation, where the parallel concept — crew resource management — was developed in response to accident investigation findings that consistently identified breakdowns in communication, decision-making, and team coordination as causal factors in technically avoidable accidents.

Diving Crew Resource Management applies the same principle to the occupational diving context. It recognises that a diving team is a crew — a collection of people whose individual performance is interdependent, whose shared situation awareness determines collective decision quality, whose communication behaviours shape what information reaches the people who need it, and whose team dynamics either amplify or suppress the individual competence within the team.

The non-technical skills addressed in this book are not peripheral to safe diving. They are the mechanisms through which technical skill becomes operational effectiveness. A diver who is technically excellent but makes poor decisions under pressure is a risk to themselves and their team. A supervisor with deep experience but no habit of inviting challenge is building a team that will fall silent precisely when speaking up matters most. An organisation with rigorous written procedures but a culture that punishes honest reporting will accumulate risk silently until the consequences become visible.




The seven chapters that follow address each NTS domain in turn: Decision Making, Situation Awareness, Communication, Teamwork, Leadership and Followership, Performance Influencing Factors, and Psychological Safety and Just Culture. Each chapter provides the theoretical foundation, examines how the domain operates specifically in occupational diving contexts, and closes with a practical application section designed for use in team briefings and debriefs.

## How Outcomes Emerge

A useful framing for understanding the role of non-technical skills sits in how outcomes are actually produced in complex operational systems. Performance outcomes in occupational diving are a function of four interacting elements: the technical skills brought to bear on the task; the context and environment in which the task is performed, including all the performance influencing factors; the degree to which randomness — genuine unpredictability — affects the result; and the non-technical skills that determine how effectively the human system navigates the first three.

This framing has a direct implication for how incidents are understood and how learning is organised. If technical skills are strong but NTS are weak, the team will manage routine operations adequately and struggle when they deviate from routine. If context is poor — high performance influencing factor load, weak organisational culture, inadequate resources — strong NTS partially compensate, but the team is working harder than it should have to against conditions that could be improved. If randomness produces an event for which no preparation

was possible, the team's resilience — its capacity to absorb the unexpected — is what determines whether the event becomes an incident or a managed deviation.

No combination of competences eliminates risk entirely. The goal is not a risk-free operation. It is an operation where the team's technical and non-technical capabilities, combined with the quality of the context they are working within, give them the best realistic chance of producing good outcomes — and of failing safely when something goes wrong despite their best efforts.

## How to Use This Book

This book is designed for commercial and military diving professionals: supervisors, lead divers, dive managers, instructors, and anyone with responsibility for the safety and performance of diving operations. It assumes technical competence. It does not address technical diving procedures, equipment operation, or decompression management. Those subjects are covered in depth by established qualification frameworks and operator procedures.

What it provides is the conceptual foundation and practical language for the non-technical dimension of occupational diving performance. Each chapter can be read independently and used as a standalone reference for team discussion. The practical application sections at the end of each chapter are designed to be used before or after dives — as a prompt for structured reflection rather than a compliance checklist.

The scenarios used throughout the book are constructed from composite real-world situations encountered in commercial and military diving operations. They are designed to be recognisable, to surface genuine tensions, and to resist simple resolution. The goal of the discussion questions is not to arrive at a single correct answer, but to develop the team's shared language for talking about the human dimension of their work — before the pressure is on, when that conversation is still possible.

**THE CASE IN ONE PARAGRAPH**

*The diving industry has invested heavily in making divers technically capable. That investment has produced significant improvements in outcome quality over several decades. The incidents that continue to occur — in commercial saturation operations, in military diving programmes, in occupational port and harbour work — are not, in the main, produced by technical failure. They are produced by the conditions that surround technical performance: teams that do not communicate clearly, supervisors who do not invite challenge, organisations that punish honesty and reward compliance, and individuals whose decision-making under pressure is not supported by the habits, tools, and cultural permission that make good decisions more likely. Non-technical skills training does not replace technical training. It completes it.*

***Be better than yesterday.*** *That is the organising principle behind everything in this book. Not perfection. Not compliance. A genuine, deliberate, evidence-informed commitment to understanding human performance — and to building the teams, the habits, and the environments that make better performance more likely.*

CHAPTER 1

# Decision Making

*How we choose a course of action under pressure, uncertainty, and time constraints*

Every dive involves a continuous stream of decisions. Most are made quickly and without conscious deliberation — a small adjustment in buoyancy, a choice to continue to depth, a judgement about whether conditions are within limits. The fact that most of these decisions go well is not evidence that they are being made perfectly. It is evidence that experienced people, operating in familiar environments, have built up a library of patterns that allow them to act quickly and usually correctly.

The problem emerges at the edges: when the situation is unfamiliar, when information is incomplete, when time is short, or when the consequences of the wrong call are irreversible. In those moments, the same mental efficiency that serves divers well in routine conditions can become a liability. Understanding how decisions are actually made — rather than how we assume they should be made — is what this chapter is about.

## Two Ways of Thinking

Cognitive science draws a well-established distinction between two modes of thinking, often called System 1 and System 2. System 1 operates automatically, quickly, and without conscious effort, pattern-matching against prior experience and generating responses that feel immediate and intuitive. System 2 is slow, deliberate, and effortful. It works through problems step by step, considers alternatives, and checks its own reasoning.

Both are essential. A diver who had to consciously reason through every buoyancy adjustment would be paralysed. The automation of routine actions is not a weakness — it is what creates the cognitive space to monitor the environment, communicate with teammates, and manage the unexpected. The difficulty arises when System 1 is operating in conditions it was not calibrated for, generating confident responses to situations that actually require careful analysis.

The transition between the two is rarely conscious. A diver does not decide to stop thinking carefully and start relying on habit. The shift is driven by workload, time pressure, familiarity with the situation, and confidence in the pattern being matched. High task loading, stress, and fatigue all reduce the likelihood of System 2 engagement — precisely the conditions under which careful reasoning is most needed.

## How Experts Actually Decide

Research into how experienced professionals make decisions in time-pressured, high-stakes situations — military commanders, firefighters, intensive care nurses, ship captains — consistently shows that experts rarely evaluate multiple options and choose the best one. They recognise the situation as familiar, retrieve a course of action from memory, run a brief mental simulation to check whether it will work, and act. If the simulation reveals a problem, they modify the action or retrieve a different one.

This process, known as recognition-primed decision-making, explains why experience matters so much in occupational diving. A supervisor who has managed dozens of decompression

extensions in varying conditions does not need to work through the logic from scratch each time. The situation matches a known pattern, and a workable response is immediately available. The same supervisor, placed in a genuinely novel situation — a new equipment configuration, an unfamiliar site, an unexpected physiological presentation in the diver — is suddenly operating with a much smaller library of patterns to draw from, and the speed advantage of experience evaporates.

Diving supervisors are trained to follow procedure — and rightly so. But the most effective supervisors also develop something beyond procedural compliance: a finely tuned instinctive response to the diver in the water. Changes in breathing rate, a shift in personality, delays in response, unwarranted blame directed at equipment or the tender — these are the signals that a capable supervisor reads in real time. When the supervisor-diver bond is built correctly, it becomes contagious. It spreads across the team and fuses them together. That does not happen instantly. But when it does, it is durable.

This has a direct implication for training. The depth of a diver's decision-making library depends not just on hours in the water, but on the variety and difficulty of the situations encountered, and — critically — on whether those situations were reflected on and debriefed. Experience that goes unexamined does not necessarily become wisdom. It can equally become a collection of reinforced habits that feel right but have never been tested at the edges.

## Rules, Context, and Knowing When to Depart

Rules and procedures exist because they encode hard-won knowledge about how to manage known hazards. A diver who understands why a rule exists — not just what the rule says — is in a fundamentally stronger position than one who can only recite it. The rule is a guide derived from a particular context. When that context changes, the rule may no longer apply in the same way.

This is not an argument for abandoning procedures. It is an argument for understanding them deeply enough to recognise the rare situation in which they need to be modified, and to do so with full awareness of the risk being taken and explicit communication to the team. The diver who quietly deviates from a procedure because it feels right is in a different position from the one who says to their supervisor: the plan says X, but I am seeing Y — I think we need to reconsider. The first is a hidden risk. The second is system resilience in action.

Competent operators in all high-hazard domains work this way. Procedures represent the organisation's best current understanding of safe practice. Experienced practitioners represent the real-world intelligence about where those procedures work and where they create problems. Both are needed. The goal is not compliance for its own sake, but performance — and sometimes those are not the same thing.

## Normalisation of Deviance/Risk

One of the most consistently documented precursors to serious incidents in high-hazard environments is the social process by which small departures from standard practice come to be regarded as normal. A checklist step routinely skipped. A no-decompression limit regularly pushed to the maximum or exceeded by a few minutes. A pre-dive brief conducted in a perfunctory way because everyone already knows the plan. Each of these, individually, rarely leads to harm. And that is the problem.

When departures from procedure are repeated without negative consequence, they stop feeling like departures. They become the local working norm — the way things are actually done here, as distinct from the way they are written down. The original purpose of the procedure fades from awareness. The risk it was designed to manage becomes invisible.

Normalisation of deviance is not recklessness. It is a predictable outcome of operating in a system where small rule deviations are systematically rewarded with nothing bad happening. Reversing it requires more than reminding people that rules exist. It requires creating the kind of environment where deviations can be named, discussed, and understood without triggering blame — which is the subject of the chapter on psychological safety and just culture.

## Decision Traps: Biases Worth Knowing

Several well-documented cognitive biases are particularly relevant in diving operations. Recognising them does not make a person immune to them — they are features of human cognition that affect all of us, regardless of experience or intelligence. What recognition does provide is the ability to build checks into team behaviour that catch errors before they become incidents.

| Bias | What it looks like in practice |
|---|---|
| Anchoring | The first piece of information received — a forecast, a briefing, a plan — disproportionately shapes all subsequent interpretation. New information that contradicts the anchor is discounted or ignored. |
| Confirmation bias | Once a diagnosis or plan is formed, attention shifts to information that supports it. Contradictory information receives less weight. The plan feels more certain than it should. |
| Groupthink | In a cohesive team, the shared desire to maintain harmony and avoid conflict suppresses individual doubts. Concerns that are felt are not voiced. The group proceeds on false consensus. |
| Plan continuation | Once underway, there is a strong pull to continue with the original plan despite accumulating evidence that conditions have changed. Sunk cost, momentum, and goal orientation all reinforce the pull. |
| Overconfidence | Past success in similar situations inflates confidence in the current one. The gap between what is known and what is assumed narrows without justification. |

The most effective counter to these biases is not willpower but structure. Pre-dive briefs that explicitly invite challenge. Agreed abort criteria established before the dive rather than re-evaluated under pressure. An observer who is outside the team's shared assumptions and whose role is to ask the questions no one else is asking. These are design features, not personality requirements.

## Practical Tools for Better Decisions

Three tools are worth incorporating into team and supervisory practice in commercial and military diving operations.

**Pre-mortems.** Before a complex dive or operation, the team asks: assume this dive goes badly wrong — what happened? Working backwards from an imagined failure surfaces risks and failure modes that forward planning tends to miss. Research suggests pre-mortems can increase the identification of potential failure points by around thirty percent. The technique works precisely because it bypasses the optimism bias built into conventional planning.

**Constructive dissent.** Teams that perform consistently well in high-stakes environments share a common feature: individuals voice concerns, and those concerns are taken seriously. This does not happen naturally in hierarchical organisations. It requires explicit permission and a consistent response from leaders that demonstrates the concern was heard. The PACE model — Probe, Alert, Challenge, Emergency — provides a structured escalation pathway that gives individuals a language for raising concerns proportional to the urgency they perceive.

**Agreed abort criteria.** Decisions about whether to continue a dive are harder to make in the water, under load, with invested effort and a team watching, than they are on the surface before the dive begins. Defining specific, observable conditions that will trigger a turn-around — gas pressure, time, visibility, equipment state, physiological signs — and agreeing them as a team before entry removes much of the cognitive and social pressure from the in-water decision. The abort criterion has already been made. Executing it requires only recognition, not negotiation.

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**PRACTICAL APPLICATION — DECISION MAKING**

**Scenario**

A two-diver working team has been tasked with a hull inspection in a commercial port. The original brief called for surface-supplied diving in 6m of water with 4m visibility. On arrival, visibility has dropped to under 1m following overnight sediment disturbance. The supervisor is under pressure to complete the job — the vessel sails in four hours. One diver has done this site before and says it will be fine once they are on the hull. The other diver says nothing.

**Discussion points**

- What biases are likely to be active in this situation? Consider anchoring (the original plan), plan continuation (the four-hour window), and groupthink (the silent diver).
- What would need to be true for the experienced diver's confidence to be justified? What would need to be true for it to be dangerously misplaced?
- Were abort criteria agreed before departure? If not, who decides whether to enter the water, on what basis, and at what point does the time pressure override the visibility concern?
- What should the silent diver do? What does the PACE model suggest? What cultural or organisational conditions would need to exist for that escalation to happen?

**Supervisor prompts — before the dive**

- What are our pre-agreed abort criteria for this task? Are they specific, observable, and agreed by the whole team?
- What has changed since the plan was made? What information are we discounting, and why?
- Have I explicitly asked the quieter members of the team what they think? Not 'any questions?' but a direct invitation to challenge the plan.
- If this dive goes badly — what most likely caused it? Use that answer to shape what you check before you enter the water.

**Key principle:** *Good decisions are rarely the product of individual brilliance under pressure. They are the product of teams that have built habits — structured briefs, agreed criteria, explicit permission to challenge — that make good decisions easier to arrive at and bad ones easier to catch before they matter.*

CHAPTER 2

# Situation Awareness

*Understanding what is happening, what it means, and what is likely to happen next*

A diving supervisor watches the tender line go slack for a moment, then tighten. Nothing else has changed. The diver has not called. The instruments are reading normally. But something shifts in the supervisor's attention — not alarm, not certainty, just a heightened readiness. That quiet signal, processed almost below conscious awareness, is situation awareness at work.

Situation awareness is often described as knowing what is going on. That is accurate but incomplete. It is knowing what is going on, understanding what it means in the current context, and forming a working picture of what is likely to happen next. These are not three separate acts of cognition. They happen in an integrated loop, continuously updated, drawing on everything the operator knows about the environment, the task, the team, and the inherent variability of the system they are managing.

When situation awareness is strong, people act with purpose and proportion. When it is weak — or when it is strong but pointed at the wrong picture — people act confidently in a direction that makes the situation worse. The challenge is that both feel identical from the inside.

## The Three Levels

Endsley's model of situation awareness, developed from research into military aviation, describes three levels that build on each other. Understanding the levels helps practitioners diagnose what has gone wrong after an incident — and, more usefully, build practices that strengthen each level before it matters.

| Level | What it involves | In the diving context |
|---|---|---|
| Level 1<br>Notice | Perceiving elements in the environment through the senses: sounds, instrument readings, diver behaviour, equipment state. | Observing changes in diver breathing rate on voice comms, noticing that a depth gauge reading has not changed in two minutes, hearing a change in compressor tone, seeing a diver's buoyancy behaviour shift. |
| Level 2<br>Think | Comprehending what the perceived elements mean — not just what they are, but what they indicate about the current state of the system. | Recognising that the unchanged depth gauge reading means the diver has stopped moving, not that the instrument has failed. Understanding that a change in breathing pattern may indicate exertion, stress, or a gas supply issue. |
| Level 3<br>Anticipate | Projecting the current state forward in time. Using knowledge of how the system typically evolves to predict what will happen next if nothing changes — and what will happen if specific actions are taken. | Recognising that a diver who is working much harder than planned likely needs to be replaced earlier than schedule and therefore alerts the next dive team accordingly. Anticipating that the incoming tide will change task conditions within the current dive window. |

The three levels are interdependent. A missed perception at Level 1 corrupts everything that follows — you cannot correctly understand or anticipate a situation you have not accurately perceived. A correct perception that is misinterpreted at Level 2 leads to the wrong anticipation at Level 3 even though the incoming data was accurate. And a correct understanding that is not projected forward leaves the operator permanently reactive, responding to situations rather than preparing for them.

## The Wrong Picture — Not No Awareness, But Misplaced Awareness

It is tempting to describe serious incidents as cases where someone 'lost' situation awareness. The phrase is misleading. People do not stop being aware of their situation. They are always constructing a mental model of what is happening — the question is whether that model matches reality.

A diver who believes they are on the correct heading, when they are not, has situation awareness. It is simply the wrong situation awareness. They are acting purposefully and confidently on the basis of a mental model that has drifted away from the actual state of the environment. The confidence itself becomes a problem: it reduces the likelihood that incoming information contradicting the model will be noticed, weighted appropriately, or acted on.

This matters for how we talk about incidents. Saying a diver lacked situation awareness explains nothing useful. The more productive question is: what were they paying attention to, and what in the situation, the team, or the task design made it likely that their attention would be directed there rather than toward the information that would have made a difference? That question points toward the conditions that can be changed — not the individual who can be blamed.

## What Degrades Situation Awareness

Situation awareness is not a fixed capacity. It varies with conditions, and some of those conditions are predictable and manageable. Understanding what degrades it is the first step toward designing teams and operations that maintain it under load.

| Threat | How it operates in practice |
|---|---|
| Task fixation | Intense focus on a single task — removing an obstruction, managing a decompression complication — consumes the cognitive bandwidth needed to monitor the wider picture. The diver or supervisor becomes 'heads down' precisely when awareness of the surrounding situation is most important. |
| High cognitive load | When working memory is saturated, the processing required for Level 2 and Level 3 awareness suffers first. The operator continues to perceive, but the capacity to interpret and project forward is reduced. Complexity, novelty, and time pressure all increase cognitive load. |
| Fatigue | Fatigue degrades every aspect of perception and cognition. It reduces the breadth of attention, slows the recognition of patterns, and — critically — impairs the meta-cognitive ability to notice that one's own awareness has degraded. Fatigued people feel more capable than they are. |
| Expectation | When we strongly expect the situation to be a certain way, we are more likely to perceive it that way. Routine dives in familiar sites build strong expectations that can suppress the noticing of genuine deviations. The site |

| | |
|---|---|
| | that has always been safe shapes perception of the site that is currently different. |
| Stress | Moderate stress can sharpen attention. High stress narrows it. In a genuinely threatening situation, attention tunnels toward the most immediately salient cue — which may or may not be the most important one. A supervisor who is anxious about a diver's slow return may miss the indication on the panel that the standby diver's equipment has a fault. |
| Poor team communication | Individual situation awareness in a diving team is always partial. The supervisor sees the panel. The diver feels the conditions. The standby diver observes the surface picture. When those partial pictures are not shared and integrated, the team's collective awareness is less than the sum of its parts — and decisions are made on incomplete composite pictures. |

## Building and Maintaining Situation Awareness

Situation awareness is not just a personal skill to be developed. It is a team property to be designed for. The practices below operate at both levels.

**Structured briefings as shared mental model construction.** A brief that establishes not just the plan but the anticipated conditions, the potential deviations, and the agreed response to key events creates a common operating picture before the dive begins. When everyone on the team has the same expectations, anomalies are noticed faster — any team member can recognise when reality has diverged from the shared model, not just the person with the most experience.

**Active information seeking.** Strong situation awareness in experienced operators is characterised by deliberate, proactive scanning — not just responding to what presents itself, but systematically checking the sources of information that might reveal developing problems. Supervisors who routinely scan instruments, monitor tender line behaviour, check in with standby divers, and periodically verbalise their picture of what is happening maintain awareness at a higher level than those who wait for information to arrive.

**Communicating the mental model.** When an experienced diver or supervisor verbalises what they think is happening — not just issuing instructions but sharing their read of the situation — two things happen. First, the team's awareness is raised collectively. Second, the act of verbalising forces a degree of System 2 processing that can surface inconsistencies in the mental model before they become consequential. 'I think the diver is at around 25m, gas is looking tight, and the tide is about to turn' is a more useful communication than 'continue the dive'.

**Anticipating the next critical moment.** Teams with strong collective awareness do not just monitor the present state. They identify in advance the moments when awareness will be most demanding — the transition to decompression, the point of tool handover, the deployment of a lift bag in current — and ensure that attention and communication are directed toward those moments before they arrive, not as a reactive response when they do.

**The debrief as awareness repair.** A genuine debrief — one that explores what people noticed, what they understood it to mean, and what they expected to happen next — is the most effective tool available for identifying gaps in situation awareness retrospectively and correcting them prospectively. Asking 'what did you think was happening at that point?' is a different question from 'why did you do that?' and it generates different, more useful answers.

## Experience, Expertise, and the Limits of Both

Experience builds the pattern libraries that make Level 2 and Level 3 awareness possible. An experienced diving supervisor can correctly interpret a change in tender line behaviour that a novice would not even register as significant. This is not mysterious — it is the product of having encountered similar patterns before, and having connected them to their consequences.

But experience also introduces the risks described in the previous chapter. Strong pattern libraries can make experienced operators less likely to notice situations that do not match any familiar pattern, and more likely to force an unfamiliar situation into a familiar frame. The diver who has always been fine with this gas consumption rate, in this site, in these conditions, may miss the combination of factors that makes today different — not because they are less skilled, but because their competence has created confidence that outpaces the evidence.

This is why the question 'what has changed since the last time we did this?' deserves a place in every pre-dive brief. Not as a bureaucratic prompt, but as a genuine attempt to surface the differences that experience is most likely to smooth over.

In commercial diving, the supervisor, diver, standby diver and tenders each hold only part of the operational picture. Situation awareness is only effective when it is actively shared — and people are often protective of their positional knowledge by nature. What degrades SA is task pressure, task fixation, and pressure from hierarchy. What repairs it is communication — across the board. The mechanism is effective toolbox talks and a supervisor willing to extend their awareness through the team, having first understood where each person's strengths and weaknesses lie.

The gap between experience and expertise is often formed at the point of procedure design. Hierarchy creates layers of protection around individuals. Effective communication becomes genuinely human when the person with formal sign-off authority acknowledges the experience of those actually doing the task, and when that experience in turn accepts that the given process and procedures meet a legitimate standard. The answer is sharing the task from start to end — not gatekeeping its sections. The UK MOD is beginning to explore this more actively, though organisational boundaries and assurance structures can still create barriers to truly shared situational awareness.

**PRACTICAL APPLICATION — SITUATION AWARENESS**

**Scenario**

A diving supervisor is managing a two-diver working team carrying out ship's hull maintenance in a busy commercial port. It is the third consecutive day of diving on the same vessel. The team has a well-established routine. Forty minutes into the dive, the supervisor notices that one diver's gas consumption is slightly higher than usual, but both divers are responding normally to comms checks and the work is progressing well. The supervisor does not mention the consumption figure to the standby diver. Twenty minutes later, the diver calls an unplanned ascent due to headache and nausea. The standby diver, who has been managing their own equipment checks, is not immediately ready to deploy. Upon exiting the water, the diver is showing obvious signs of hypercapnia. Inspection of the helmet reveals the oral nasal mushroom valve is missing, which is later found on the deck. Pre dive check procedures were skipped as "nothing had changed from yesterday" when the equipment was stowed for the night.

**Discussion points**

- The supervisor noticed the anomalous gas consumption — Level 1 awareness was intact. What happened at Level 2 and Level 3? What interpretation did they apply, and what did they fail to project forward?
- What role did familiarity — three days on the same site, the same team, the same routine — play in shaping what the supervisor expected, and therefore what they were likely to notice or dismiss?
- The standby diver's readiness was a critical element of the system's capacity to fail safely. How should the supervisor's developing picture of the situation have been shared — and when?
- What would a strong collective situation awareness look like in this team at the forty-minute mark? What communications, checks, or practices would have distributed the emerging picture across all three people?

**Supervisor prompts — during the dive**

- What is my current picture of the dive — depth, gas state, diver behaviour, environment — and when did I last actively verify each element rather than assume continuity from the last check?
- What has changed since the brief? What anomalies am I aware of, and have I shared them with the full team?
- What is the next critical moment in this dive? Am I — and is the standby diver — prepared for it before it arrives?
- What would I expect to be seeing right now if everything were going to plan? Is that what I am actually seeing?

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**Key principle:** *Situation awareness is not a personal trait that some divers have and others lack. It is a team capability, shaped by communication, briefing quality, task design, and the willingness to share an evolving picture of what is happening — even when that picture is uncertain, incomplete, or uncomfortable to voice.*

CHAPTER 3

# Communication

*Sharing information with enough clarity, specificity, and timing to enable coordinated action*

Communication is perhaps the most discussed non-technical skill in high-hazard industries, and the one most frequently cited as a contributing factor when things go wrong. That combination — widely valued, widely cited in failure — suggests that the problem is not one of awareness. Divers, supervisors, and diving contractors know that communication matters. The problem is that what people mean by 'good communication' is often vague, and the gap between sending a message and ensuring it has been correctly received and understood is routinely underestimated.

Diving presents some of the most demanding communication environments in any occupational setting. The diver and the surface team are physically separated, often with limited or degraded audio links. Non-verbal cues — the body language and facial expressions that carry a significant portion of meaning in face-to-face conversation — are either absent or heavily filtered. Time pressure, cognitive load, and environmental stress all reduce the bandwidth available for careful, complete communication. And the consequences of misunderstanding in this environment can be severe and rapid.

Dive sites and procedural paperwork occupy different worlds. The paperwork encourages effective communication; the site often fights it. It falls to the collective team to establish that every role carries equal importance — and once that is understood, the quality of communication becomes the cornerstone of everything. Without it, the team has nothing. A simple rule that works: if the supervisor is talking, listen. If the diver is talking, listen. If the tender is talking, listen. Attention is the first act of communication.

This chapter addresses the mechanics of effective communication, the specific failure modes that recur in diving operations, and the practical tools and habits that consistently improve communicative performance under operational conditions.

## One-Way and Two-Way Communication

The most basic and consequential distinction in communication is between one-way and two-way exchange. One-way communication delivers a message. Two-way communication confirms that the message has been received, interpreted, and understood correctly. In calm conditions with a simple message and a familiar team, one-way communication is often sufficient. In conditions of noise, workload, stress, or where the message is complex or consequential, it almost never is.

The difference is not about courtesy or thoroughness. It is about function. A message that has been sent but not confirmed received offers only the illusion of coordination. If the recipient did not hear it, misheard it, interpreted it differently, or received it but could not act on it in their current state, the sender's confidence that communication has occurred is actively dangerous — it suppresses the sender's motivation to check, and it allows the gap between what was intended and what was understood to persist until it matters.

In diving operations, the habit of confirmation — repeating back specific, actionable information rather than a generic acknowledgement — is one of the highest-value communication practices

available. The difference between 'understood' and 'changing to reserve, coming up now' is not trivial. One tells the supervisor that a sound was received. The other confirms that the correct interpretation was made and the correct action initiated.

## The Specificity Problem

A recurring failure mode in operational communications — documented across aviation, emergency medicine, military operations, and diving — is the gap between the message that was intended and the message that was understood, caused not by transmission failure but by insufficient specificity in the original message.

Consider the difference between ‘battery is low’ and ‘change N1 now.’ Both convey concern about a battery. Only the second tells the recipient what to do, when, and which specific item is involved. In a high-load environment where the recipient is simultaneously managing multiple tasks, the generic message creates cognitive work at exactly the wrong moment. The recipient must interpret the message, determine which battery is meant, assess what ‘low’ means in this context, and decide what action to take — all while managing everything else. The specific message eliminates that processing burden. The action is named. The urgency is clear. The response can be immediate.

The same principle applies to any operational communication that is intended to trigger an action. Vague communications in high-stakes environments are not just inefficient — they are a failure mode. They create interpretation variability between senders and receivers, and in teams where hierarchy or social pressure suppresses clarifying questions, that variability goes uncorrected.

## Closed-Loop Communication

Closed-loop communication is the practice of completing every significant communication exchange through three steps: the sender initiates, the receiver reads back the key content, and the sender confirms or corrects. It is the standard in aviation for all critical readbacks, in surgical teams for medication handovers, in nuclear operations for procedure steps, and in military radio communications for orders.

Its value in diving is identical. When a supervisor calls a depth change, an ascent instruction, or an abort, the confirmation is not a formality. It is the mechanism by which the supervisor knows that the message arrived correctly, that the diver's understanding matches the intent, and that the diver is in a position to act on it. Without that confirmation, the supervisor's confidence that the instruction was received is an assumption — one that has contributed to fatalities in occupational diving when the diver was unable to hear, was task-fixated, or interpreted the message differently from the intent.

Closed-loop communication requires discipline to maintain under load, precisely because it feels unnecessary when everything is going well. Teams that practise it only in emergencies will find it unavailable as a reliable tool when they need it — because it has not been built as a consistent habit. The value of the practice is not in the individual exchange. It is in the habit that makes the individual exchange automatic.

## Escalating Concern: The PACE Model

One of the most consistent findings in incident investigations across high-hazard domains is that

someone in the team knew, or suspected, that something was wrong before the incident occurred. They did not say so — or they said so in a way that was not heard, not taken seriously, or not escalated when the initial attempt was not acted upon. The PACE model provides a structured four-step escalation pathway for raising concerns proportional to the urgency perceived.

| Level | Action | Language example | When to use |
|---|---|---|---|
| P - Probe | Ask a question to gather information or surface a concern indirectly. | 'What's your current gas reading?' 'How are you finding conditions down there?' | When you notice something that may or may not be significant — you want to understand more before escalating. |
| A - Alert | Directly name the concern. State what you have observed and why it is a concern. | 'I'm noticing your gas consumption is higher than we planned for this point in the dive.' | When the probe has not resolved the concern, or when the concern is clear enough to name directly. |
| C - Challenge | Explicitly challenge the current course of action. State the risk. Advocate for a change. | 'I think we need to reconsider the plan. At this rate you will not have enough resources for this task.' | When the alert has not produced a response, or when the risk is immediate enough to require direct advocacy. |
| E - Emergency | Take or demand immediate action. Override normal deference to authority or plan if necessary. | 'Abort the dive now. Come up immediately.' | When the challenge has not produced action and the risk to life requires overriding normal communication hierarchy. |

PACE is not a ladder to be climbed reluctantly. It is a permission structure. It gives individuals at any level of the team a language and a framework for raising concerns, and it gives leaders a shared reference point for responding to those concerns in a way that does not shut down future communication. A supervisor who responds to a Probe or Alert by dismissing or belittling the concern is not just managing that individual exchange poorly — they are sending a signal to the entire team about the cost of speaking up.

The model also helps address a specific failure pattern in hierarchical organisations: the team member who notices a problem, decides it is probably nothing, says nothing at the Probe level, and then — when the situation deteriorates — escalates directly to Emergency. The intermediate steps, used early, can resolve concerns while they are still manageable and prevent the escalation from ever becoming necessary.

## Active Listening

Communication is often treated as a problem of transmission — of getting the right message out clearly. It is equally a problem of reception. Active listening is the practice of giving full attention to incoming communication in a way that maximises the accuracy and completeness of what is received and understood.

In operational diving environments, where ambient noise, competing tasks, and the physical demands of the work environment all compete for attention, active listening requires deliberate effort. It means resisting the tendency to formulate a response while the other person is still speaking. It means checking comprehension by reflecting back what was heard and inviting correction. It means asking open questions when the meaning is ambiguous rather than filling the gap with assumption.

For supervisors, active listening has an additional dimension. The diver on the bottom is often the person with the most accurate, current information about conditions, task progress, and emerging hazards. A supervisor who is primarily a transmitter — issuing instructions, checking in on a fixed schedule, processing surface-side information — may miss critical intelligence from the person who is actually in the environment. Building in moments of genuine inquiry rather than purely confirmatory contact creates a richer information flow across the dive team.

## Barriers Specific to Diving Operations

| Barrier | Implication for practice |
|---|---|
| Degraded audio links | Establish communication protocols before the dive that assume partial intelligibility. Agree specific, short, unambiguous signals for critical messages. Do not assume that a partial acknowledgement constitutes confirmed understanding. |
| Hierarchy and authority gradient | Experienced supervisors and senior divers create an authority gradient that suppresses questions and concerns from less experienced team members. Explicitly inviting challenge — naming it as a professional expectation, not a personal option — is the most effective counter. |
| Assumed shared understanding | Teams that have worked together for a long time develop shorthand that feels efficient but can be misinterpreted by newer members or in novel situations. Briefings that assume shared understanding are a common failure point in mixed-experience teams. |
| Non-verbal loss | Underwater and surface-to-diver communication strips out tone, facial expression, and body language — the cues that modify meaning and convey urgency or reassurance in face-to-face conversation. Messages that carry implicit emotional content need to be made explicit. |
| Information overload at transition points | Handovers, shift changes, and task transitions are the points at which critical information is most frequently lost or distorted. Structured handover protocols — covering current status, outstanding tasks, known anomalies, and planned actions — reduce the risk of gaps. |
| Post-incident communication collapse | When an incident begins to unfold, communication often deteriorates precisely when it is most needed. High stress, task fixation, and emotional load all reduce communicative output and receptiveness. Practising communications under simulated stress is the most effective preparation. |

## Building Communication as a Team Habit

Communication quality in a team is not primarily a function of individual skill. It is a function of the habits, norms, and permission structures that the team has built together. An individual with excellent communication skills in one team may become communicatively passive in another — because the cultural signal they receive is that contribution is not welcome, that challenges are unwanted, or that the cost of speaking up outweighs the benefit.

This has a direct implication for supervisors and dive leaders. The communication culture of a team is disproportionately shaped by the person at the top of the hierarchy. A supervisor who closes down questions, dismisses concerns, or responds to challenges with frustration will get less information, fewer early warnings, and a team that becomes progressively less capable of managing the unexpected. A supervisor who models the behaviours they want to see — confirmatory read-backs, explicit invitation to challenge, open acknowledgement of their own uncertainty — creates the conditions in which communication functions as a genuine safety tool.

The debrief is the single most powerful mechanism for improving team communication over time. Not a retrospective critique of who said what, but a structured conversation that asks: at which points did communication support safe performance, and at which points did it fall short? What did we assume that we should have confirmed? What did we notice but not say? What communication habits do we want to reinforce for the next operation?

**PRACTICAL APPLICATION — COMMUNICATION**

**Scenario**

A surface-supplied diver is working at 18m on an underwater pipeline inspection. The audio link is functioning but ambient noise on the surface is significant — a nearby vessel has just started its engines. The diver calls up: 'I'm seeing something on the flange — might be worth a closer look.' The supervisor acknowledges with 'Roger that, carry on.' The diver spends the next twelve minutes investigating what turns out to be a significant corrosion defect. The supervisor, believing the diver is continuing with the standard inspection, does not log the deviation from the planned route or flag it at the end-of-dive debrief. The defect is not escalated to the client until the following day.

**Discussion points**

- Where did the communication loop break down? The diver transmitted. The supervisor acknowledged. What was missing, and why does a generic acknowledgement not constitute closed-loop communication?
- What did the diver's message actually communicate? What did it fail to communicate? What would a more specific transmission have sounded like?
- How did the ambient noise environment change the risk profile of this exchange? What protocols might have been agreed in the brief to manage exactly this kind of degraded-audio, significant-finding situation?
- The defect was not escalated until the following day. Trace the chain of communication failures — diver to supervisor, supervisor to log, log to debrief — that produced that outcome. At which point was the gap most recoverable?

**Supervisor prompts — during and after the dive**

- When the diver reports something unexpected, does my response confirm what I understood them to mean — or does it just confirm that a sound was received?
- Have I briefed what specific language I expect if the diver finds something significant, needs more time, or wants to deviate from the planned route?
- In the debrief: at which points did we assume we understood each other? Were there moments when a clarifying question would have changed what happened?
- Does my team know that PACE exists and that escalating a concern — even to the Challenge level — is a professional expectation, not an act of insubordination?

**Key principle:** *Effective communication in diving is not about talking more. It is about ensuring that what is transmitted is specific enough to act on, that receipt and understanding are confirmed rather than assumed, and that the team has built the habits and the permission to raise concerns before they become emergencies.*

CHAPTER 4

# Teamwork

*How groups of individuals become capable of more than the sum of their parts*

There is an assumption embedded in the way diving teams are often assembled and managed: that placing technically competent individuals together on a task will produce competent teamwork. This assumption is understandable and almost always wrong. Technical competence is a necessary condition for effective team performance. It is not a sufficient one. The ability to work well together — to coordinate, to share a picture of what is happening, to back each other up, to communicate clearly under load, and to maintain trust across an operation — is a distinct capability, and one that does not emerge automatically from the presence of skilled individuals.

The consequences of this misunderstanding are visible in incident databases across commercial and military diving. Equipment failures, physiological emergencies, and environmental surprises are rarely the whole story. What allowed a manageable problem to become a fatal one was frequently a team that could not coordinate effectively when it mattered — not because the individuals were incompetent, but because the team, as a functioning unit, had never been built.

This chapter examines what teamwork actually requires, the specific friction points that recur in diving teams, and the practices that consistently distinguish teams that perform reliably under pressure from those that do not.

## What a Team Actually Is

A team is not simply a group of people doing work in the same place at the same time. The distinction matters. A group shares a location and perhaps a general objective. A team is characterised by mutual dependence, shared accountability, and a working relationship that shapes how each member's performance affects the others.

In diving operations, the mutual dependence is structural. The diver depends on the supervisor's situational awareness and decision-making. The supervisor depends on the diver's reporting. The standby diver depends on clear communication from both. The team's capacity to manage the unexpected is a product of how well those dependencies are understood and maintained — not just technically, but relationally.

Researcher Eduardo Salas describes a team as a group of two or more people who work interdependently, adaptively, and dynamically toward a shared and valued goal. Each element of that definition carries weight. Interdependently — each person's performance affects the others, and they know it. Adaptively — the team adjusts to changing conditions rather than executing a fixed plan regardless of what develops. Dynamically — the team's composition, roles, and working relationships evolve across the operation and across time. A team that only operates as a team when conditions are normal is not a team in any meaningful sense. It is a collection of individuals who have not yet needed each other.

## Five Foundations of Effective Teams

Research consistently identifies five structural elements that characterise teams that perform

reliably under pressure. These are not personality traits or leadership styles. They are features of how the team is organised and how it works — and they can be deliberately built.

| Foundation | What it means in practice |
|---|---|
| **Complementary skills** | The team covers the range of technical, operational, and interpersonal capabilities the task requires. No single individual needs to be excellent at everything — but the team as a whole must be. This requires honest assessment of individual strengths and gaps, and task design that places people in roles that match their actual capability, not just their formal qualification. |
| **Role clarity** | Every team member knows their own role, knows the roles of others, and knows where the boundaries of those roles lie. Unclear roles produce gaps — tasks that everyone assumes someone else is responsible for — and overlaps — conflicts and friction when two people are trying to manage the same decision. In diving operations, role ambiguity at transition points (handovers, equipment changeovers, emergency responses) is a consistent contributor to incidents. |
| **Common purpose** | The team shares an understanding of the goal — not just the task, but the reason the task matters. When individuals understand the purpose behind what they are doing, they make better autonomous decisions in the gaps between explicit instructions, and they are more likely to raise concerns when they see the purpose being compromised. |
| **Performance-based goals** | The team has clear, specific, agreed standards for what good performance looks like — not just completing the task, but completing it safely, within defined parameters, in a way that supports learning and improvement. Vague goals produce vague performance. Specific, discussable goals create the basis for genuine debriefs. |
| **Mutual accountability** | Team members hold each other to the agreed standards — not through surveillance or blame, but through the shared expectation that everyone's contribution matters and that shortfalls will be named and addressed. Mutual accountability is not the same as mutual criticism. It is the willingness to say, respectfully and directly, that something was not done to the standard we agreed, and to work together to understand why. |

## Trust: The Non-Negotiable Foundation

Underpinning all five foundations is trust. Simon Sinek's formulation is blunt and accurate: a team is a group of people who trust each other. Without trust, mutual accountability becomes surveillance. Role clarity becomes territorial defence. Common purpose becomes an aspiration that nobody acts on when it is uncomfortable to do so.

In the context of operational diving, trust has two distinct dimensions. The first is competence trust — confidence that the other person can do their job. The second is relational trust — confidence that the other person will behave consistently, communicate honestly, and act in the interest of the team rather than their own reputation. Both are necessary. High competence trust with low relational trust produces a team that is individually capable but collectively fragile — individuals who perform well in isolation but do not communicate concerns, do not back each other up, and do not function as a unit when conditions deteriorate.

Trust is built through demonstrated behaviour over time. It is damaged far more quickly than it is built. A single incident in which a team member's concern was dismissed, or in which a failure was attributed to an individual rather than understood systemically, can suppress the willingness to speak up across an entire team for months. Leaders who understand this invest disproportionately in how they respond to the first concern raised, the first mistake

acknowledged, and the first near-miss reported — because those responses set the template for everything that follows.

## How Teams Develop Over Time

Newly assembled teams are not immediately capable of the kind of adaptive, integrated performance that high-hazard operations require. Team development follows a recognisable trajectory, and understanding it helps supervisors and team leaders manage the transition from a group of individuals to a functioning unit without forcing it — or assuming it has happened before it has.

In the forming stage, team members are feeling out their roles, assessing each other's competence and intentions, and deferring to formal authority in the absence of established working relationships. Communication tends to be polite but shallow. Concerns are rarely voiced. The team looks functional on the surface and is often fragile beneath it.

Storming is the necessary and often uncomfortable process by which the team begins to establish genuine working relationships. Roles are contested. Differences in approach and expectation surface. If this stage is suppressed — by a leader who mistakes conflict for dysfunction — the team remains in a permanent forming state, polite and unreliable. If it is managed well, the team moves toward norming: a settled set of working agreements, established communication patterns, and a growing confidence in each other's reliability.

Performing is the stage at which the team is genuinely adaptive — capable of adjusting to changing conditions, absorbing unexpected events, and maintaining effective coordination without explicit instruction at every step. This is the goal. It is also not permanent. Changes in team composition, significant incidents, and extended periods without shared operation can all return a team to earlier stages. The question for supervisors is not whether the team has achieved this stage, but whether it is currently operating at it — and what is needed to get it there or keep it there.

## Friction Points in Diving Teams

Several recurring friction points are specific to the way diving teams are typically organised and operated. Recognising them is the first step toward designing around them.

| Friction point | What it produces and what helps |
|---|---|
| Hierarchy and experience gradients | When significant differences in experience or formal authority exist within the team, communication flows predominantly downward. Concerns from less experienced members are suppressed not by explicit instruction but by the social reading that challenge is unwelcome. Supervisors who explicitly invite challenge — not once, but consistently — partially offset this. Teams that have practised escalation protocols such as PACE have a structural mechanism that reduces the social cost of raising concerns. |
| Competing goals | Commercial and military diving operations routinely create competing pressures: schedule against safety, task completion against conservative gas management, client expectation against environmental conditions. When these pressures are not explicitly named and resolved in the team's decision-making, they are resolved implicitly — usually in favour of the |

| | |
|---|---|
| | more visible, immediate pressure. Teams that name the tension explicitly are better positioned to manage it explicitly. |
| Short-notice team assembly | Diving teams are frequently assembled from individuals who have not worked together before, or who have worked together infrequently. The team's development stage at the point of water entry may be significantly earlier than the task demands. Structured briefings that include explicit discussion of roles, working norms, and communication expectations partially compensate — but cannot fully substitute for the trust that is built through shared experience over time. |
| Diffuse accountability | In teams where nobody is clearly accountable for a given outcome, accountability tends to fall to nobody. The psychological mechanism is well documented: in groups, each individual's felt responsibility for a task or outcome is diluted by the presence of others. Explicit role assignment and named accountability — who is responsible for what, stated in the brief and confirmed by the person named — is the most reliable counter. |
| Post-incident cohesion damage | When something goes wrong, the social dynamics of a team can change rapidly and lastingly. If the incident is handled in a way that assigns blame, that suppresses honest discussion, or that creates a sense that reporting is professionally dangerous, the team's communicative openness deteriorates. The debrief and the incident response are not just learning mechanisms — they are trust maintenance mechanisms. |

## Backup Behaviour: Watching Each Other's Backs

One of the most distinctive characteristics of high-performing teams in high-hazard environments is the practice of backup behaviour — the proactive monitoring of teammates' performance and the willingness to intervene when a teammate is overloaded, has missed something, or is heading toward an error.

Backup behaviour requires three things. First, awareness of what teammates are doing — which requires the kind of shared situational awareness discussed in the previous chapter. Second, the confidence to intervene without being asked — which requires a level of trust and relational safety that does not exist in teams that have not built it. Third, the skill to intervene in a way that supports rather than undermines — offering assistance rather than taking over, flagging a missed step without making it a public failure.

In commercial and military diving, backup behaviour is most critical at transition points — when the working diver hands over to a relief, when the standby diver's role changes from observational to active, when a supervisor is managing multiple simultaneous tasks. These are the moments when individual cognitive bandwidth is most likely to be exceeded and when a teammate's attention can most valuably compensate for a gap.

**PRACTICAL APPLICATION — TEAMWORK**

**Scenario**

A five-person diving team has been assembled for a week-long marine construction support contract. Two of the divers have worked together extensively. The other two are new to the team — one recently qualified, one an experienced diver from a different contractor with different working norms. On day two, the experienced newcomer begins to deviate from the agreed gas management protocol, using a more conservative approach from his previous company. He does not mention this deviation in the

brief or the debrief. The newer diver observes this and says nothing, assuming the experienced diver knows best. On day three, the supervisor notices that planned dive durations are consistently shorter than expected but does not investigate. By mid-week, there are two distinct informal working practices within the same team.

**Discussion points**

- At what stage of team development is this group operating by mid-week? What are the visible signs, and what would need to happen to move the team toward genuine norming?
- The experienced newcomer's deviation may be technically sound — his previous company's protocol may be better. Or it may not be. What is the problem with an undisclosed deviation regardless of its technical merit?
- The newer diver deferred to the experienced one's apparent confidence. What does this tell us about how authority and competence are being read within this team? What would backup behaviour look like in this situation?
- The supervisor noticed shorter dive durations but did not investigate. At what point does this become a leadership failure rather than a situational oversight? What would mutual accountability look like here — from the supervisor toward the team, and within the team toward the supervisor?

**Supervisor prompts — during operations**

- Do all team members know each other's roles clearly enough to identify when a role boundary is not being covered — and confident enough to name it?
- When I notice a deviation from the agreed plan, do I investigate it — or do I assume a competent person has a good reason and say nothing?
- Have I explicitly established in the brief that deviations from agreed protocols are to be named and discussed — not hidden out of deference to experience or to avoid conflict?
- In the debrief: does everyone contribute, or do the same voices dominate? What am I doing to create genuine space for the quieter or less experienced members to report what they have seen?

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**Key principle:** *Assembling technically competent individuals does not create a team. A team is built through shared purpose, clear roles, mutual trust, and the consistent practice of holding each other to agreed standards. In high-hazard diving environments, that investment is not a nicety — it is the structure that allows a group of people to manage the unexpected together, rather than in parallel.*

CHAPTER 5

# Leadership and Followership

*Setting the conditions for safe performance — and the active role of every member of the team*

Leadership in occupational diving is often understood as a positional quality — something that belongs to the supervisor, the lead diver, or the most experienced person on the team. This understanding is both accurate and incomplete. Positional authority matters: clear lines of responsibility are essential in high-hazard environments, and ambiguity about who is in charge at a critical moment is itself a risk factor. But the behaviours that most consistently distinguish safe, high-performing diving operations from those that accumulate risk quietly over time are not confined to the person at the top of the hierarchy. They are distributed across the team.

This chapter examines leadership in its operational sense — not as a personality trait or a rank, but as a set of behaviours that shape how a team functions, how information flows, and how well the team can manage the unexpected. It also examines followership: the active, skilled, and often undervalued contribution of the team member who is not in charge but whose competence, attentiveness, and willingness to speak up is frequently the most important safety resource available.

## What Leadership Actually Does

The most useful way to understand leadership in an operational context is through its effects. Good leadership does not just direct — it creates conditions. Specifically, it creates the conditions in which the people around the leader can perform to their capability, communicate what they know, raise what they doubt, and act with confidence in the spaces between explicit instructions.

John Adair's task-team-individual framework remains one of the most practically useful models for operational leaders. Every leader, in every situation, is simultaneously managing three sets of needs: the demands of the task itself, the functioning of the team as a unit, and the needs of the individual members. Neglect the task and the operation fails. Neglect the team and coordination deteriorates, trust erodes, and the team's capacity to manage complexity diminishes. Neglect the individual and motivation drops, concerns go unexpressed, and the people who most need development stagnate.

The insight is not that leaders must give equal attention to all three at all times — the weighting shifts with circumstances. In an emergency, task needs dominate. In a stable operational period, individual development and team cohesion may deserve more attention. The failure mode is the leader who attends exclusively to task demands across all circumstances, treating the team and the individual as instruments rather than as the human system through which the task is actually accomplished.

## Leadership Styles and When Each Fits

No single leadership style is effective across all situations. The leader who is appropriately directive during an emergency may be actively damaging to team development if they apply the same approach during a calm planning phase. Understanding when to shift styles — and being

able to make that shift deliberately rather than defaulting to a single mode regardless of context — is one of the most practically important leadership capabilities in occupational diving.

| Style | Characteristics | When it serves the team |
|---|---|---|
| Directive / Autocratic | Clear, unambiguous instruction. Decision-making centralised at the leader. Minimal consultation. Fast execution. | Genuine emergencies, time-critical decisions, situations where the team lacks the experience to contribute usefully to the decision. Use briefly and transition out of it as soon as conditions allow. |
| Consultative / Democratic | Leader gathers input before deciding. Team members' perspectives are actively sought and considered. Decision authority remains with the leader. | Complex planning, novel situations, tasks where team members have specific knowledge the leader needs. Creates investment in the outcome and surfaces information the leader may not have. |
| Supportive / Coaching | Leader focuses on developing team members' capability. Questions more than directs. Creates space for individuals to solve problems themselves, with support. | Training environments, developmental dives, periods between operations. Builds the team's long-term capability and resilience. |
| Delegating | Leader assigns responsibility to team members with the capability to exercise it. Oversight without micromanagement. | Experienced, high-trust teams operating within their established competence. Frees the leader to focus on higher-level monitoring and contingency management. |

The key question is not which style a leader prefers, but which the situation requires. A leader who cannot move between styles is not a flexible leader — they are a limited one. The team will eventually find itself in a situation that their leader's default style is ill-equipped to manage.

## Trust Over Competence: A Counterintuitive Finding

Research into high-performing military teams, most extensively documented in studies of US Navy SEAL units, produces a finding that consistently surprises people encountering it for the first time: when given the choice between a highly competent team member who is low in trust and a moderately competent team member who is high in trust, experienced operational leaders consistently prefer the latter.

The reasoning is not about accepting lower standards. It is about what happens under pressure. A highly competent individual who is low in relational trust — who does not communicate honestly, who prioritises their own performance metrics over team outcomes, who cannot be relied upon to raise concerns or admit uncertainty — introduces unpredictability into the team's functioning at precisely the moments when predictability matters most. The moderately competent team member who is trusted is a known quantity. Their limitations are visible and can be managed. Their behaviour under stress can be anticipated. Their willingness to communicate means the team has more information, not less, when things start to go wrong.

This has a direct implication for how leaders evaluate and develop their teams. Technical proficiency is easier to assess and easier to develop than trust. It is also more immediately visible. Leaders who focus exclusively on technical capability — because it is measurable,

because it maps to qualification frameworks, because it is the basis on which most formal assessment takes place — may be building teams that look excellent on paper and are fragile under operational load.

## Setting and Holding Standards

One of the most direct expressions of leadership in any operational environment is the standard that the leader allows to exist. Lieutenant General David Morrison's observation that the standard you walk past is the standard you accept has become a frequently cited formulation of a principle that is easy to state and difficult to apply consistently.

In diving operations, the standards that matter most are rarely the dramatic ones. They are the pre-dive brief that everyone knows is perfunctory, but nobody challenges. The checklist step that is always skipped because it has never caused a problem. The debrief that concludes with 'good dive' regardless of what happened. The diver who consistently pushes gas limits and is never questioned because they always make it back fine. Each of these, individually, is manageable. Cumulatively, they define the actual safety culture of the operation — not the written procedures, not the training records, but the set of behaviours that the leadership permits to become normal.

Holding standards is not the same as enforcing rules. Rules can be applied rigidly, without understanding, by someone who has no connection to the purpose behind them. Holding standards requires understanding why the standard exists, communicating that purpose to the team, and addressing departures in a way that reinforces the understanding rather than just the compliance. A supervisor who responds to a skipped checklist step by explaining why that step exists and what it is designed to catch is building a team that understands safety. One who responds only with the requirement to comply is building a team that performs safely when supervised and differently when not.

The question of how we select supervisors matters as much as how we train them. Faced with two equally experienced candidates for a senior supervisor role — both ready on paper — one question separated them: '*Why do you want this role*?'

> Candidate one: '*Because it is the next step in my career and I want to lead*.'
>
> Candidate two: *'I feel a duty to ensure my team are safe and leave work as healthy as they arrived*.'

Both answers have merit. The choice was clear. What followed was a team that respected hierarchy and found its own voice within it — not afraid to speak up, confident that the supervisor would hear them. Consider what that culture makes possible in terms of performance influencing factors. A team that trusts their supervisor can name fatigue without consequences. They can flag weather concerns, task complexity, schedule pressure — not as complaints, but as operational intelligence. That is the practical value of team-focused leadership.

## Destructive Goal Pursuit

A specific and recurring leadership failure mode in high-hazard operations deserves direct attention: the tendency for goal orientation — the drive to complete the task, meet the schedule, deliver for the client — to displace safety considerations in the leader's decision-making, often without the leader being consciously aware that this displacement is occurring.

Destructive goal pursuit is not recklessness. It does not feel like it from the inside. It feels like focus, like professionalism, like delivering on commitments. The external pressure — the vessel waiting, the client expectation, the commercial contract, the unit's reputation — is real. What makes it destructive is when that pressure is absorbed by the leader and transmitted to the team as an implicit or explicit signal that the goal matters more than the concerns being raised.

The warning signs are identifiable in retrospect, and often visible in real time to team members who are not under the same goal pressure as the leader: questions about conditions that are answered with reassurance rather than genuine engagement; abort criteria that shift under schedule pressure; team members who stop raising concerns because they have learned that the answer will be a justification for continuing. When a team stops pushing back, it is not always because there is nothing to push back about. Sometimes it is because they have learned that pushing back does not work.

## Followership: The Active Half of the Equation

Followership receives very little attention in safety training, and the gap is significant. The implicit model in most training contexts is that safety depends on leaders making good decisions and followers executing them competently. This model is not wrong, but it is incomplete in a way that matters.

In practice, the person most likely to notice an emerging problem in a diving operation is not always the supervisor. It is often the diver who is in the water, the standby diver who is watching the surface picture, or the less experienced team member whose attention is not yet filtered by the confidence that everything is probably fine. That observation is only useful if the person making it has the skills, the language, and the permission to communicate it to someone who can act on it.

Effective followership is not passive compliance. It is the active, skilled practice of contributing to the team's performance from a non-leadership position. It includes maintaining personal situation awareness and contributing it to the shared picture; raising concerns through the appropriate channel — including escalating them when initial attempts are not acted upon; executing instructions with understanding rather than blind compliance; and recognising when a situation has changed enough that the original instructions no longer apply and communication with the leader is required.

The distinction between active followership and insubordination is not always comfortable, but it is important. The diver who continues with a plan they believe to be unsafe because they were told to is not practising followership. They are practising compliance — and compliance without understanding is a fragile safety mechanism. The diver who raises a concern, uses the PACE escalation pathway when the concern is not addressed, and — in genuine extremis — exercises stop-work authority is demonstrating exactly the kind of active followership that distinguishes genuinely safe operations from those that are only safe when nothing goes wrong.

## The Leader's Role in Enabling Followership

Active followership does not emerge spontaneously in teams that have not created the conditions for it. The willingness to raise concerns, to challenge plans, and to escalate when necessary is directly proportional to the team member's confidence that doing so will be taken seriously and will not carry a personal cost. That confidence is built or destroyed by the leader's responses to the first few times it is attempted.

A leader who responds to a concern with engagement — even if they ultimately decide to continue with the original plan — sends a signal that the concern was worth raising. A leader who responds with dismissal, irritation, or the implicit message that the team member should trust the plan sends a signal that is far more durable: that the cost of speaking up is greater than the benefit. That signal does not have to be delivered loudly to be received clearly.

Building the conditions for effective followership is therefore not a soft skill or a supplementary aspiration. It is a core leadership function in any high-hazard environment. The leader who has created a team in which every member will speak up clearly and early when something is wrong has built a more robust safety system than any procedure manual can provide.

### PRACTICAL APPLICATION — LEADERSHIP AND FOLLOWERSHIP

#### Scenario

A diving supervisor is managing the final day of a five-day offshore construction contract. The project has run slightly behind schedule and there is pressure from the client to complete the last task before the vessel is released. The planned dive involves two divers working at 28m on a structural connection. Weather conditions have deteriorated since the morning brief — current has increased and visibility has dropped. The standby diver mentions this to the supervisor before the dive. The supervisor acknowledges it and says conditions are within limits. The working diver, once in the water, finds the task significantly harder than planned due to current. He calls up to report difficulty but continues working when the supervisor responds that they are nearly done and to push through. Forty minutes later he surfaces exhausted, having exceeded his planned bottom time by fifteen minutes.

#### Discussion points

- Identify the signs of destructive goal pursuit in this scenario. At what point did the supervisor's goal orientation begin to displace genuine engagement with the team's concerns? What would the Adair task-team-individual framework say about the balance being struck here?
- The standby diver raised a concern before the dive. The supervisor acknowledged it and continued. What did the supervisor's response communicate to the standby diver about the value of raising concerns? What is the likely effect on the standby diver's communication behaviour in future operations with this supervisor?
- The working diver reported difficulty but continued when told to push through. Was this active followership or compliance? At what point, if any, does the diver have both the right and the responsibility to make a different decision?
- What leadership style was the supervisor using in this situation? Was it the right one? What style — and what specific behaviours — would have produced a better outcome without necessarily abandoning the goal of completing the task?

#### Supervisor prompts — before and during the dive

- Am I currently under external pressure that is affecting how I am weighing my team's concerns? If I were not under this pressure, would I be making the same decision?
- When a team member raises a concern, do I engage with the substance of it — or do I manage the person? These are different responses and they produce different teams.
- Have I made it explicitly clear — in the brief, by name — that any team member has both the right and the responsibility to call a stop if they believe the situation has moved outside the agreed parameters?
- What standard am I walking past today? And what does walking past it tell my team about the standard I actually accept?

**Key principle:** *Leadership in diving operations is not about authority — it is about the conditions a leader creates. The most important of those conditions is a team in which every member is willing and able to speak up clearly and early when something is wrong. That condition is built through consistent, visible responses to the concerns people actually raise — and it is destroyed, quickly and quietly, the first time a leader makes raising a concern feel like a mistake.*

CHAPTER 6

# Performance Influencing Factors

*Understanding the conditions that shape how people actually perform — before anyone makes a mistake*

When something goes wrong in a diving operation, the immediate question is usually about the individual: what did they do, what did they miss, what should they have done differently? It is an understandable instinct — the person is visible, the action is visible, and the connection between them is easy to draw. What is harder to see, but consistently more important for understanding why things go wrong and for preventing recurrence, is the set of conditions that were present before, during, and after the event that shaped the individual's capacity to perform.

Performance influencing factors — sometimes called error precursors or performance shaping factors — are the conditions that make errors more or less likely. They do not cause errors by themselves. A specific action or decision must occur within those conditions for performance to be affected. But they change the probability landscape in ways that are predictable, discussable, and — crucially — often manageable if they are identified before a dive rather than discovered in a post-incident investigation.

The WITH framework — Work environment, Individual characteristics, Task demands, Human nature — provides a structured lens for making those conditions visible. This chapter examines each quadrant in the context of occupational diving, explains why the combination of conditions across quadrants matters more than any single factor, and sets out how the framework can be used practically as a pre-task briefing tool, an incident analysis tool, and a team learning mechanism.

## The Key Principle: Conditions Before Judgements

Traditional safety thinking — and a great deal of everyday organisational language — reaches for judgements about people when performance falls short. They were careless. They should have known better. They cut corners. These phrases feel explanatory. They are not. They describe the conclusion without examining the conditions that produced the behaviour being judged.

The WITH framework takes a deliberately different starting point. Before asking whether an individual's behaviour was acceptable, it asks what conditions were present that any competent professional would have found challenging. The answer to that question is almost always more informative, more generative of genuine improvement, and more honest about how performance actually works in complex systems.

This is not an argument for removing individual accountability. People remain responsible for their actions. What WITH does is ensure that accountability is appropriately distributed — that teams, supervisors, and organisations are held responsible for the conditions they create and maintain, not just individuals for the actions they take within those conditions.

## The WITH Framework in the Diving Context

| | |
|---|---|
| **W — Work Environment**<br>The physical and organisational conditions surrounding the task: visibility, current, thermal stress, noise, equipment layout, vessel movement, site familiarity, time of day, working norms, and the cultural signals about what is acceptable practice. The environment shapes behaviour before anyone touches anything.<br>*It is a condition, not an excuse.* | **I — Individual Characteristics**<br>The diver or supervisor's current state: currency with this task or configuration, fatigue, physiological condition, stress or emotional load, relevant knowledge and mental models, experience with this specific site or equipment. These are factors to understand and account for — not traits to blame.<br>*Design for the person as they are, not as you wish they were.* |
| **T — Task Demands**<br>The cognitive and physical requirements of the work itself: time pressure, simultaneous or sequential actions, memory burden, irreversibility of key steps, ambiguous instructions, repetitive elements that invite routine drift, steps requiring significant interpretation under load.<br>*People are not careless. They are responding to demands.* | **H — Human Nature**<br>The shared features of human cognition that affect everyone regardless of experience or skill: habit and automatic behaviour, assumption-making under uncertainty, complacency after repeated success, mental shortcuts (heuristics), limited working memory, inaccurate risk perception under stress.<br>*Managing these is a system design challenge, not a willpower problem.* |

## Each Quadrant in Practice

**Work Environment.** Occupational diving is among the most demanding work environments for this quadrant. Limited visibility removes visual information that surface workers take for granted. Current imposes physical and cognitive load simultaneously. Thermal stress — in both directions — degrades manual dexterity, accelerates fatigue, and compresses the cognitive window available for monitoring. Equipment that behaves differently at depth than on the surface creates a systematic mismatch between mental models built during surface familiarisation and the actual task environment. Vessel movement at the surface affects standby diver readiness and supervisor focus. Night diving removes the visual redundancy that daytime operations provide.

**Individual Characteristics.** Currency is one of the most consistently underweighted individual factors in diving. A diver who has not used a specific configuration in several weeks is in a meaningfully different position from one who used it yesterday — regardless of their formal qualification level. The same applies to site familiarity: a diver's first dive on a particular wreck or structure carries different cognitive demands from their tenth. Fatigue deserves particular attention in multi-day offshore operations, where cumulative sleep deficit, travel, thermal exposure, and physical exertion combine in ways that are rarely captured in pre-dive assessments. HALT — Hungry or thirsty, Anxious or angry, Late or lonely, Tired — provides a simple self-assessment prompt that surfaces individual state factors before the dive rather than after the incident.

**Task Demands.** Complex underwater tasks regularly combine multiple high-demand actions within a single dive: navigation, tool use, buoyancy management, team coordination, gas monitoring, and time-on-stop management may all be required simultaneously. Each individually is manageable. In combination, and against a backdrop of environmental stressors, they can exceed the cognitive bandwidth available even to experienced divers. Irreversible steps — gas switches, valve manipulations, lift bag deployments, disconnection of umbilicals —

deserve particular attention during briefing and particular deliberateness during execution, because the cost of error at these points is highest.

**Human Nature.** Two aspects of the H quadrant deserve special attention in diving operations. The first is complacency following repeated success — the mechanism by which familiarity with a task or site progressively reduces the vigilance applied to it. The CAF training serial that informed this book surfaced a stark example: a rebreather head-up display that permanently indicated a warning state, with the result that divers had learned to ignore it entirely. The warning system had been rendered invisible not by a single act of carelessness but by repeated exposure without consequence. The second is the tendency to assume continuity — to project yesterday's conditions onto today without actively checking whether that projection is accurate. Strong routines and established patterns, which are genuine assets in normal conditions, become specific vulnerabilities when conditions change.

## The Compounding Effect

A single WITH factor is manageable. Experienced practitioners routinely work with one or two adverse conditions and perform safely, because their skill, the redundancy in the system, and their own heightened vigilance are sufficient compensation. The risk profile changes substantially when multiple factors accumulate — particularly when they accumulate across quadrants.

Consider a diver conducting their first dive in a new offshore location, after two days of travel and disrupted sleep, on a complex task with several irreversible steps, in conditions of reduced visibility. Each element — new site, fatigue, task complexity, visibility — is a manageable single factor. Together, they constitute a fundamentally different risk environment than any one of them alone. The diver's mental models are less reliable because the site is unfamiliar. Their vigilance is reduced because they are tired. Their cognitive reserve for managing the unexpected is compressed because the task itself is demanding. And their ability to visually verify their position and the state of their work is limited by conditions. The compounding is not additive — it is multiplicative.

This has a direct implication for how pre-dive briefs should be conducted. Listing hazards and proceeding is not the same as mapping the combination of conditions that are simultaneously present and asking whether the team's capacity to manage them is adequate. The brief should surface not just individual factors but the degree to which multiple factors are converging on a single task — and what that convergence demands in terms of controls, contingency planning, or a decision to pause.

## Using WITH Across the Operation

| When | How WITH supports safe performance |
|---|---|
| Before the task | Walk through each quadrant as a team. Name the factors present. Ask whether any single quadrant contains multiple adverse conditions, and whether factors are compounding across quadrants. Assign specific controls or contingencies to identified factors. Establish at what point additional conditions would change the go/no-go decision. |

| | |
|---|---|
| During the dive | The supervisor maintains awareness of changing conditions in the W quadrant — weather, vessel movement, visibility changes — and the I quadrant, monitoring diver communication and behaviour for signs of increasing load or fatigue. If a W or T factor changes unexpectedly during the dive, the pre-briefed response is: pause, reassess, communicate before continuing. |
| After an incident or near miss | Map the WITH factors that were present — not who erred. This is the most generative question available in incident analysis because it points toward conditions that can be changed. AcciMap and LEODSI analyses consistently find that factors in all four quadrants are present in serious incidents, and that the incident was survivable at multiple earlier points where a WITH-informed intervention could have changed the trajectory. |
| In team learning reviews | Ask what combination of conditions was present, and what would need to change so that the same combination does not recur. This is different from asking what the individual should have done differently — it is asking what the system, the organisation, and the team can change to make good performance more likely under similar conditions in future. |

## Changing the Language

One of the most immediate practical contributions WITH makes to a team's safety culture is the language it provides for talking about performance and failure. The old-view phrases that routinely appear in incident reports and post-event conversations are not neutral — they close down inquiry and locate the problem in the individual rather than the system.

| Instead of saying... | Try asking... |
|---|---|
| They were complacent | What repeated-success pattern reduced their perceived risk in this situation? |
| They should have known better | What in their mental model did not match the actual system state, and how did that gap develop? |
| They were careless | At what point did the combined task demands exceed the cognitive capacity available to them? |
| They cut corners | Where had work-as-done diverged from work-as-imagined, and for how long had that divergence been normalised? |
| They were distracted | What in the work environment created competition for attention at that critical moment? |
| They lacked proficiency | What specific aspect of the task exceeded their current skill level for that context — and was that gap visible before the dive? |

These are not softer questions. They are harder ones — because they require honest examination of organisational conditions, training quality, briefing practice, and leadership behaviour, not just individual action. They are also the questions that produce the answers most likely to prevent the next incident.

**PRACTICAL APPLICATION — PERFORMANCE INFLUENCING FACTORS**

### Scenario

A military diving team is conducting a short-notice maintenance dive on an unfamiliar vessel in a busy harbour. The task involves a valve inspection at 12m, which is routine for this team in familiar conditions. However: two of the three divers arrived from a week-long exercise the previous evening and had limited sleep; the third is the most experienced but has not dived in this specific configuration for six weeks; harbour visibility is around 1m due to recent vessel traffic; the task brief was conducted quickly due to time pressure; and the task itself requires three sequential, irreversible valve manipulations that must be performed in the correct order. The dive proceeds. One valve is operated in the wrong sequence. A minor flooding incident results, which is contained. In the debrief, the team lead says: 'We need to be more careful with the sequence next time.'

### Discussion points

- Map the WITH factors present in this scenario. How many factors are active in each quadrant? At what point, if named in the brief, might the combination have triggered a different decision about how to proceed?
- The team lead's debrief conclusion — 'be more careful next time' — is an old-view response. Rewrite it using the WITH language. What specifically would the team, the supervisor, and the organisation do differently?
- The task involves three irreversible sequential steps in 1m visibility with fatigued divers. Which specific controls — a written checklist, a surface observer, a different diver assignment — would have directly addressed the highest-risk combination of factors?
- The incident was contained. Does the absence of serious harm change the lesson that should be taken from this event? What does 'getting away with it' do to the team's future risk perception — and which quadrant of the WITH model is most relevant to that effect?

### Supervisor prompts — before the dive

- Walk through each WITH quadrant explicitly before this dive. Name the factors present. Ask: are any quadrants carrying multiple adverse conditions simultaneously?
- Ask each team member directly: how are you feeling today? Not as a formality, but as a genuine assessment of the I quadrant — fatigue, stress, currency, readiness.
- For every irreversible step in today's task: what specific control am I putting in place to reduce the probability of an error at that point? Is it a checklist, a verbal confirmation, a reduced pace, a different role assignment?
- What combination of factors, if they emerged during the dive, would trigger a reassessment? Name them now, before the task begins, so the threshold is agreed rather than negotiated under pressure.

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**Key principle:** *Error precursors are not excuses — they are explanations. Identifying them does not reduce individual responsibility; it extends responsibility appropriately to the teams, supervisors, and organisations that create and manage the conditions in which people work. A dive team that uses WITH before every task is not being overcautious. It is being professionally aware of the conditions that will shape performance before the point where changing them becomes impossible.*

CHAPTER 7

# Psychological Safety and Just Culture

*The organisational conditions that determine whether the other six chapters work*

Every chapter in this book has described a capability that depends, ultimately, on people being willing to speak. Situation awareness requires team members to share what they notice. Communication requires concern to be raised rather than swallowed. Decision making improves when challenge is genuinely welcomed. Teamwork depends on mutual accountability that can be voiced. Leadership is only as good as the information it receives. Performance influencing factors only become manageable when the conditions that create them can be named openly.

None of these capabilities exist in a vacuum. They exist — or fail to exist — inside a social environment that either makes speaking up feel safe or makes it feel costly. That environment is what psychological safety describes, and it is what just culture attempts to create at the organisational level. Together, they represent the conditions without which the technical content of this book remains aspirational rather than operational.

In the context of operational diving, psychological safety is not a soft concept or a cultural preference — it is a functional requirement for operational resilience. Diving operations rely on distributed awareness: each part of the team holds a piece of the picture, and that picture only becomes useful when those pieces are actively shared.

This chapter is not about making people feel comfortable. It is about building the conditions in which accurate, complete, and timely information flows to the people who need it — before a dive, during an operation, and in its aftermath. That information flow is the most important safety mechanism in any high-hazard system, and it is the one most reliably suppressed by cultures that punish honesty.

## What Psychological Safety Actually Is

Psychological safety, as defined by Amy Edmondson at Harvard Business School, is the shared belief that the team is safe for interpersonal risk-taking. It is not comfort, niceness, or the absence of challenge. It is the specific confidence that speaking up — asking a question, raising a concern, admitting a mistake, disagreeing with the plan — will not result in punishment, humiliation, or exclusion.

The distinction matters because psychological safety is frequently misunderstood as softness. High-performing teams in demanding environments are not soft. They are direct, rigorous, and capable of genuine challenge. What they share is the confidence that challenging the plan is a professional act, not a social risk. That confidence changes everything about how information flows. When it is present, problems surface early, when they are still manageable. When it is absent, they surface late — in incident reports, coroners' inquests, and post-incident investigations that ask how nobody noticed.

Research across more than 3,600 employees in multiple industries, including construction and engineering, reveals that the willingness to speak up drops sharply as you move down the hierarchy. At junior level, 54% of employees feel guarded in formal meetings — compared to 26% of senior managers. One in six junior employees expects to be punished for raising a safety concern. And critically, only 35% of junior employees believe that those senior to them genuinely listen when ways of working are challenged — while their seniors report listening in 87 to 95% of

cases. That gap between experienced and perceived reality is not a communications problem. It is a culture problem.

Incident analysis across the commercial and defence diving industry consistently shows that events rarely occur without earlier signals being present somewhere in the system. Often those signals were noticed — a diver sensing conditions deteriorating, a standby diver recognising a change in behaviour, a supervisor noting an anomaly. The determining factor is whether that information was voiced, heard, and acted upon. Psychological safety is therefore not about comfort; it is about enabling the flow of operational intelligence.

## Four Stages: Building Psychological Safety

Timothy Clark's model describes psychological safety not as a single condition but as a progression through four stages, each of which must be established before the next becomes possible. In operational diving teams, understanding the stages helps leaders diagnose where their team currently sits — and what is needed to move it forward.

| Stage | What the team member needs to feel, and what it takes to build it |
|---|---|
| **1 Inclusion Safety** | The foundational stage. The individual needs to feel that they belong — that their presence is valued and that they are regarded as a legitimate member of the team, not an outsider to be tolerated. Leaders build this through consistent, early, low-threshold acts: introducing themselves proactively, responding to messages promptly, asking about challenges without waiting to be approached, and never hiding behind rank or title. Without inclusion safety, no other stage is accessible. |
| **2 Learner Safety** | The confidence that it is safe to learn — to ask questions, make mistakes, admit ignorance, and try new things without the attempt being used against you. Leaders build this by sharing their own mistakes openly, admitting what they do not know, and responding to errors with curiosity rather than blame. In diving teams, learner safety is what determines whether a diver will ask a question during the brief that might reveal a knowledge gap — or stay silent and take the gap underwater. |
| **3 Contributor Safety** | The confidence that one's knowledge, ideas, and effort are genuinely valued — that contributing will be met with recognition rather than dismissal. Leaders build this by asking rather than telling, recognising contribution quickly and specifically, and avoiding shutdown statements ('nice try', 'we've always done it this way') that signal contribution is unwelcome. Without contributor safety, team members have knowledge the leader needs but no reason to share it. |
| **4 Challenger Safety** | The highest and most fragile stage: the confidence that challenging the plan, questioning a decision, or naming a concern is not only permitted but expected. Leaders build this by explicitly assigning dissent — naming individuals whose role it is to find problems with the plan — weighing in last rather than first, and visibly rewarding the person who raises a concern that improves an outcome. Challenger safety is what allows the PACE model to function. Without it, the model is a framework without fuel. |

The stages are sequential and cannot be skipped. A team member who does not yet feel included will not risk admitting a knowledge gap. A team member who has not seen mistakes treated with curiosity will not contribute ideas that might expose their reasoning. The team member whose contributions have been dismissed will not risk the vulnerability of challenging the supervisor's plan. Leaders who want challenger safety but have not built the three preceding stages are asking for a behaviour that the environment has not made available.

## The Speak-Up Problem in Diving Organisations

In occupational diving, the people with the most direct and current information about operational risk are typically those with the least positional power: the working diver, the most recently qualified team member, the standby diver watching conditions change at the surface. The research confirms what many practitioners already sense: willingness to speak up is a function of perceived consequences, and perceived consequences are shaped almost entirely by the behaviour of the immediate supervisor.

The single strongest predictor of whether someone will raise a concern is not their personality, their training, or their organisation's reporting policy. It is their relationship with their immediate line manager. When team members perceive their supervisor as unapproachable — or when they have seen previous concerns met with dismissal, irritation, or marginalisation — the calculation they make is rational: the cost of speaking outweighs the benefit. The information is suppressed. The risk accumulates invisibly.

A persistent finding in this research is what might be called the superiority illusion: senior leaders consistently believe they listen better, and that speaking up is easier, than junior employees report. This gap is not simply a disagreement about style. It represents a fundamental disconnect between the safety environment that leaders believe they have created and the one that actually exists for the people most exposed to operational risk. Until that gap is named and measured — not through anonymous surveys, but through genuine structured inquiry — it will persist.

## Just Culture: Fairness at the Organisational Level

Psychological safety operates at the team level. Just culture operates at the organisational level. It addresses the same fundamental question — what happens when something goes wrong? — but from the perspective of how the organisation responds to the humans involved, and what that response signals to everyone who witnesses it.

Just culture is not a no-blame culture. The two are frequently confused, and the confusion is damaging in both directions. A no-blame culture implies that all behaviour is equivalent regardless of intent, care, or recklessness — which is neither fair nor accurate. Just culture makes a deliberate and important distinction between categories of behaviour, each of which warrants a different organisational response.

| Behaviour type | Description | Appropriate organisational response |
|---|---|---|
| Human error | An unintentional action or decision — the wrong thing done without intending to do the wrong thing. A slip, lapse, or honest mistake made by a competent person under normal conditions. | Console. Support. Investigate the systemic conditions that allowed the error to have consequences. Do not punish. |
| At-risk behaviour | A choice that drifts from safe practice, often without full awareness of the risk — shortcut-taking, rule erosion, normalisation of deviation. The person did not intend harm, but the behaviour involved a degree of unmanaged risk. | Coach. Understand the system pressures that made the at-risk behaviour rational. Redesign the conditions rather than simply reminding the individual of the rule. |

| | | |
|---|---|---|
| Reckless behaviour | A conscious choice to take a substantial and unjustified risk — taking actions known to be unsafe, ignoring explicit warnings, overriding established controls without justification. | Hold accountable. This is the behaviour that just culture permits and requires a firm response to, precisely because distinguishing it from error protects the people who make honest mistakes. |

The practical difficulty is that these distinctions can only be applied rigorously if the investigation that follows an incident is genuinely systemic — if it looks at what conditions were present before asking what individual choices were made. A reckless act does not become at-risk behaviour because conditions were adverse. But at-risk behaviour that looks reckless in hindsight — because the outcome was severe — must not be treated as recklessness simply because something went wrong. Outcome bias is one of the most consistent distortions in incident response, and it is one of the most corrosive to the information flow that just culture is designed to protect.

## What Just Culture Is Not

A significant proportion of divers and diving professionals, when introduced to the term just culture, interpret it as meaning a culture of 'just doing it' — getting the dive done, accepting the risk, getting on with it. This is the opposite of what it means, and the misunderstanding has real consequences.

Just culture is a systematic attempt to create the conditions in which honest accounts of what actually happened can be obtained and learned from. Its primary purpose is organisational learning, not individual absolution. It works by guaranteeing that the person who reports accurately will not be punished for the honesty of their account — while maintaining clear accountability for behaviour that was genuinely reckless. Remove the guarantee, and honest reporting disappears. Remove the accountability, and the culture becomes permissive rather than just.

The version that enables learning is careful, deliberate, and genuinely difficult to implement. It requires leaders and organisations to resist the social and legal pressures that push toward assigning blame rapidly, to conduct investigations that look at system conditions before individual actions, and to respond to honest reports in ways that reinforce rather than suppress the next one. When a team member reports a near-miss and the organisational response is supportive — when the story gets told, the conditions get examined, and changes get made — the message sent to the entire team is: this is how we learn. When the response is punitive, the message is equally clear: this is how we silence.

## Restorative Just Culture: After Something Goes Wrong

Sidney Dekker's work on restorative just culture adds a dimension that purely procedural approaches to just culture frequently miss: the relational dimension. When a serious incident occurs, the professional relationships within the team are damaged — by the event itself, and often by the investigation that follows. Blame, whether formally assigned or informally expressed, fractures trust. Individuals become guarded. Teams stop functioning as units. The information that would support learning is precisely what becomes hardest to access.

A restorative approach asks three different questions from a retributive one. Rather than who is responsible and what do they deserve, it asks who has been affected, what do they need, and

how can those involved contribute to repairing the harm? This is not softness. It is a different theory of what investigation is for. Experience from healthcare systems and from US forest service incident reviews suggests that restorative approaches — which include the families of those harmed in the learning process rather than excluding them from it — produce better learning outcomes, better relationships with those affected, and, in some cases, significantly lower litigation costs. The retributive impulse that drives many incident investigations produces accountability for its own sake, often at the cost of the learning that would prevent the next incident.

## Investigation Frameworks: LEODSI and PETTEOT

Just culture and psychological safety create the conditions for honest reporting. Structured investigation frameworks ensure that what is reported is examined in a way that generates genuine learning rather than a narrative of individual failure.

LEODSI — Learning from Emergent Outcomes in Diving System Interactions — is a systemic investigation framework developed specifically for the diving context. It starts from the premise that diving incidents emerge from the interaction of multiple system elements rather than from individual error, and it provides a structured method for mapping those interactions rather than working backwards from the outcome to the nearest person.

The system elements that LEODSI examines are captured in the PETTEOT framework: Person, Environment, Tools and Technology, Tasks, External Influences, Organisation, and Time. Each element is examined not in isolation but in terms of how it interacted with the others to produce the conditions in which the incident became possible. Time is included as a distinct element because it is consistently underweighted in conventional investigations — the gap between how long a task was planned to take and how long it actually takes under operational conditions shapes decisions and safety margins in ways that are invisible unless explicitly examined.

Together, LEODSI and PETTEOT provide the investigative architecture that makes just culture operationally real. Without a structured systemic method, the social and cognitive pressures of incident investigation consistently produce person-focused narratives regardless of what investigators intend. The framework makes it harder to stop at the individual and easier to keep asking what conditions were present at each layer of the system — the person, the environment, the tools, the task, the organisation — until the conditions that made the incident possible are genuinely understood.

**PRACTICAL APPLICATION — PSYCHOLOGICAL SAFETY AND JUST CULTURE**

### Scenario

A diver on a commercial team surfaces from a working dive and privately tells a colleague that during the dive he operated a valve in the wrong sequence — the same task as in the Chapter 6 scenario — and corrected it before any consequence. He does not report it formally because three months earlier, a team member who reported a similar near-miss was publicly questioned about their competence in front of the broader team by the operations manager. Nothing is formally recorded. Two weeks later, a different diver on the same team makes the same error in different conditions. This time, the consequence is a minor flooding incident that takes four hours to resolve and nearly results in an injury.

### Discussion points

- The operations manager's response three months earlier was a single act. Trace its consequences through this scenario. At what Clark stage did the team's psychological safety collapse — and what was the cost of that collapse in operational terms?
- The diver who made the first error made a rational calculation. Using the Reitz and Higgins research findings, describe the calculation he made. What would have needed to be true about his environment for the calculation to come out differently?
- When the flooding incident occurs two weeks later, the operations manager's first instinct is to investigate what the second diver did wrong. Using the just culture behaviour framework, what questions should be asked first — and what would a PETTEOT analysis of the original near-miss have surfaced that might have prevented this incident?
- The operations manager now wants to rebuild a reporting culture. What would a restorative rather than retributive response to the flooding incident look like? What signals would need to be sent — to whom, in what form, and how consistently — to make future near-miss reporting feel safe again?

### Supervisor and organisational prompts

- When was the last time someone on this team reported a near-miss or an error voluntarily? If the answer is 'rarely' or 'never', that is information about the culture — not about the absence of near-misses.
- Think about the last time a concern was raised. What was your response? What signal did that response send to everyone who witnessed it — including those who did not raise a concern but were watching to see what happened to the person who did?
- In a post-incident review: do you map the system conditions before examining individual actions? If the investigation concludes with an individual's name as its primary finding, it has not been completed.
- Does your team know the difference between human error, at-risk behaviour, and recklessness — and do they trust that your organisation will apply that distinction fairly when something goes wrong?

**Key principle:** *Psychological safety and just culture are not cultural aspirations — they are operational requirements. The information that prevents the next incident exists somewhere in your team right now. Whether it reaches the people who can act on it depends almost entirely on whether the environment you have created makes sharing it feel safe, fair, and worth the risk.*

CONCLUSION

# Closing the Gap

*Between what the procedure says should happen, and what actually needs to happen*

Procedures do not dive. Checklists do not make decisions. Standards do not notice when something has quietly changed from the plan. The people do.

This is not a criticism of procedures, checklists, or standards. They are essential. They encode accumulated knowledge about how to manage known hazards, distil hard-won operational wisdom into repeatable practice, and create the shared expectations that allow teams to coordinate without having to renegotiate everything from scratch on every dive. The case for rigorous technical standards in occupational diving is strong, and it has been made compellingly by the evidence of what happens when they are absent or poorly enforced.

But procedures are written for the world as imagined. Operations happen in the world as it is. Those two worlds are rarely identical, and in high-hazard, dynamic environments the gap between them is where most serious incidents find their origin. Equipment behaves unexpectedly. Conditions change faster than the plan anticipated. A team member's capacity is not what it was at the time the plan was made. The information available in the moment differs from the information on which the brief was based. In every one of these situations, the procedure provides the baseline. It is the human — their awareness, their judgement, their communication, their willingness to act on what they are seeing — who determines whether the gap between the baseline and the reality is managed safely or allowed to widen until it can no longer be bridged.

## The Limits of Compliance

A compliance-based approach to safety asks one question: was the procedure followed? It is a necessary question. It is not a sufficient one. Compliance tells you whether the work resembled the plan. It tells you very little about whether the team had the situational awareness to notice when the plan no longer matched reality, the communication habits to share that divergence, the decision-making framework to respond proportionally, or the cultural permission to say stop when stopping was the right call.

The incident record in occupational diving — and in every other high-hazard industry that has studied it systematically — shows that compliance and safety are not the same thing. Procedures can be followed to the letter while the conditions that make a dive genuinely dangerous accumulate unnoticed. The team that performs every checklist step correctly but has no habit of genuine pre-dive challenge, no shared understanding of the abort criteria, and no cultural permission for the standby diver to name what they are seeing — that team is procedurally compliant and operationally fragile.

The inverse is equally important. Non-compliance is not automatically unsafe. Experienced practitioners regularly make informed, competent adaptations to procedures when conditions require it. The difference between an adaptation that improves safety and one that erodes it is not the act of deviation — it is the quality of the awareness, judgement, and communication that surrounds it. That quality is precisely what non-technical skills training develops.

## Dynamic, Uncertain, and Complex: The Real Operating Environment

The concept of a simple system — one where cause and effect are clear, where procedures reliably produce the predicted outcome, where expertise accumulates linearly and transfers directly — describes almost nothing in occupational diving. Diving is conducted in environments that change continuously, in teams whose composition and readiness vary, with equipment whose behaviour under load is never entirely predictable, under organisational and commercial pressures that shape decisions in ways that are rarely explicitly acknowledged.

In complex systems — systems characterised by non-linear interactions, emergent behaviour, and the irreducible unpredictability of human beings operating under pressure — the response to variability cannot be fully prescribed in advance. Procedures can describe what to do when the anticipated things happen. They cannot prescribe adaptive responses to every combination of conditions that a complex environment can generate. The only resource available for managing that variability, in real time, with the information actually available in the moment, is the human being — their awareness, their training, their judgement, and their team.

This is what non-technical skills are for. Not as a replacement for technical competence or procedural discipline, but as the adaptive layer that sits between the plan and the reality — the human capacity to notice when the two have diverged, to understand what the divergence means, to communicate it to the people who need to know, and to act on it proportionally before it becomes consequential. Safety, in complex systems, is not a property of the procedure. It is a dynamic achievement, continuously produced by people who are paying attention, thinking clearly, communicating honestly, and working together effectively.

## What the Seven Chapters Establish

Each chapter in this book has addressed one domain of the non-technical capability that occupational diving teams need to develop and maintain. Together, they describe a system — interdependent, mutually reinforcing, and only fully functional when all elements are present.

| Chapter | The core contribution to safe, effective diving performance |
|---|---|
| **Decision Making** | How people actually choose a course of action under pressure, uncertainty, and time constraints — and the tools that make better decisions more likely before they are needed. |
| **Situation Awareness** | Not just noticing, but understanding what is happening and projecting it forward. A team capability, not a personal trait — built through communication, briefing quality, and the deliberate sharing of an evolving picture. |
| **Communication** | Specificity, confirmation, and the cultural permission to escalate. The difference between a message sent and a message understood — and why that difference is where most communication-related incidents originate. |
| **Teamwork** | Why competent individuals do not automatically produce competent teams, and what the structural elements are — role clarity, shared purpose, trust, mutual accountability — that close that gap. |
| **Leadership and Followership** | Leadership as the conditions a leader creates, not just the decisions they make. Followership as an active, skilled contribution — and the leader's direct responsibility for enabling or suppressing it. |

| | |
|---|---|
| **Performance Influencing Factors** | The WITH framework: the conditions that make errors more likely, visible before the dive rather than discovered after the incident. Conditions before judgements. Explanations before accountability. |
| **Psychological Safety and Just Culture** | The enabling layer. The organisational conditions that determine whether accurate information flows to the people who need it — before a dive, during an operation, and in its aftermath. |

The chapters are ordered to build from individual cognition outward to organisational culture. But the causal direction in practice runs both ways. A psychologically safe organisation enables honest communication. Honest communication supports shared situational awareness. Shared situational awareness enables better decisions. Better decisions, communicated clearly within a well-functioning team, led by someone who has created the conditions for challenge, and informed by an honest reading of the performance influencing factors present — that is what resilient performance looks like in practice.

## The Human in the System

Every system that operates in a high-hazard environment is, ultimately, a human system. The equipment was designed by humans, with assumptions about how it would be used and in what conditions. The procedures were written by humans, from a particular vantage point, at a particular time, with particular knowledge of what had gone wrong before. The organisations that deploy the system were built by humans, carry the accumulated culture of every decision and response that has happened within them, and reflect the values — stated and actual — of the people who lead them.

The human is not the weakest link in this system. That framing, which dominated safety thinking for most of the twentieth century, has been comprehensively challenged by the evidence. Humans are the system's most adaptive component — the element capable of noticing that something has changed and responding in a way that was not written into any procedure, because it could not have been. The goal of non-technical skills training is not to make humans more machine-like, more rule-bound, or more compliant. It is to make humans more capable of doing what humans uniquely can do: read a situation, exercise judgement, communicate with others, adapt to what is actually happening, and act with both skill and awareness.

What limits that capacity is not a lack of care or commitment. The people who have been involved in serious diving incidents were, in the overwhelming majority of cases, experienced, motivated professionals who came to work intending to do a good job. What limited them was the conditions they were operating in — conditions that made it hard to notice, hard to speak up, hard to decide well, hard to function as a team. Those conditions are changeable. That is the whole point.

Compliance gets you to the baseline. Technical skill gets you through the familiar. It is non-technical skill — the awareness, the judgement, the communication, the team cohesion, the cultural permission to speak and to learn — that closes the gap between what the procedure says should happen and what actually needs to happen in the dynamic, uncertain, and complex environments where occupational diving takes place.

**That gap is closed by humans. Build them accordingly.**

**Three questions to carry forward from this book**

*What does the last time something went wrong in your operation tell you — not about the individual involved, but about the conditions that were present?*

*Does your team have the habits, the language, and the permission to close the gap between the plan and the reality — in real time, under load, before it matters?*

*And what would need to change — in the brief, in the debrief, in the culture, in your own behaviour as a leader — for the answer to that question to be yes?*

***Be better than yesterday.***

GLOSSARY

# Key Terms and Definitions

*Terms used in this book, defined for occupational diving contexts*

*Where a term has a specific technical meaning in the human factors or safety science literature that differs from common usage, the technical meaning is given. Definitions are written for practitioner use, not academic precision.*

## A

**Accountability.** In a just culture context, the appropriate organisational response to behaviour based on its nature — error, at-risk behaviour, or recklessness. Accountability is not synonymous with punishment. Punishing human error produces silence, not learning.

**Active Listening.** A communication behaviour in which the listener gives full attention, reflects content back to confirm understanding, and asks open questions to develop shared meaning. Distinct from passive hearing.

**Adaptive Capacity.** The ability of a team or system to adjust performance in response to changing or unexpected conditions while still producing safe outcomes. Adaptive capacity is what resilient teams have that brittle ones lack.

**Anchoring Bias.** The cognitive tendency to give disproportionate weight to the first piece of information received when making a decision. In diving, anchoring to the original dive plan when conditions have changed is a common manifestation.

**At-Risk Behaviour.** In just culture: a choice that drifts from safe practice, often without full awareness of the risk taken. Typically involves normalisation of deviance or shortcuts under pressure. The appropriate response is coaching and system redesign, not punishment.

## B

**Behavioural Marker.** An observable, specific behaviour that indicates the presence or absence of a non-technical skill. Behavioural markers allow NTS to be assessed and debriefed using concrete examples rather than general impressions.

**Brittle Performance.** Performance that is adequate when conditions match the plan, but degrades rapidly when the unexpected occurs. A feature of systems where technical skill is strong but non-technical skills or context is weak. Contrast with resilient performance.

## C

**Challenger Safety.** The fourth and highest stage of psychological safety (Clark): the confidence that questioning a decision, challenging the plan, or naming a concern is not only permitted but expected. The condition under which the PACE model can actually function.

**Closed-Loop Communication.** A communication technique in which the receiver confirms receipt of a message by repeating it back, and the sender confirms the repeat-back is correct before acting. Reduces misunderstanding in high-noise or high-stakes environments.

**Cognitive Bias.** A systematic pattern of deviation from rational judgement that results from the brain's use of mental shortcuts (heuristics). Biases are not personal failings; they are features of how human cognition works under uncertainty and time pressure.

**Complex System.** A system characterised by non-linear interactions between components, emergent behaviour that cannot be fully predicted from the properties of individual parts, and sensitivity to initial conditions. Diving operations involving humans, equipment, environment, and organisation are complex systems.

**Confirmation Bias.** The tendency to seek, interpret, and remember information in ways that confirm an existing belief or hypothesis. A significant risk during dive planning and during the execution of a dive when early decisions have already shaped the mental model.

**Constructive Dissent.** The practice of explicitly welcoming challenge to a plan or decision before execution. A deliberate technique for surfacing problems that social pressure or hierarchy would otherwise suppress.

**Context.** In the Resilient Performance Model: the full operational environment — physical conditions, equipment, organisational culture, regulatory framework, commercial pressures, and all performance influencing factors — within which technical and non-technical skills are applied.

**Contributor Safety.** The third stage of psychological safety (Clark): the confidence that one's knowledge, ideas, and effort are genuinely valued — that contributing will be met with recognition rather than dismissal.

## D

**DCRM (Diving Crew Resource Management).** The application of crew resource management principles — originally developed in aviation — to occupational diving operations. A structured approach to non-technical skills development for diving teams.

**DEBrIEF Model.** The structured debrief framework developed by The Human Diver: Define, Example, Background, Review execution, Internal performance, External performance, Follow-up/File. Designed to produce learning rather than critique. See www.thehumandiver.com/debrief.

**Destructive Goal Pursuit.** Total focus on task completion without regard for the implications — for safety, for team members, or for the wider system. Often ego-driven; characteristically suppresses challenge and questioning from team members.

## E

**Error.** See Human Error.

## F

**Followership.** The active, skilled contribution of team members who are not in the designated leadership role. Effective followership includes maintaining independent situation awareness, raising concerns proactively, and supporting the leader's decisions once made through legitimate challenge processes.

**Fundamental Attribution Error.** The tendency to over-attribute the cause of behaviour to individual character (they are incompetent, careless, or reckless) and under-attribute it to situational and systemic factors. A primary source of distortion in post-incident investigations.

## G

**Groupthink.** The tendency for cohesive groups to prioritise consensus over critical analysis, suppressing dissent and independent thinking in the interest of group harmony. Increases in proportion to group cohesion, time pressure, and the perceived costs of disagreement.

## H

**HALT.** A self-check for performance influencing factors: Hungry or thirsty, Anxious or angry, Late or lonely, Tired. Used as a pre-dive readiness assessment at the individual level within the WITH framework.

**Heuristic.** A mental shortcut used to make decisions quickly under conditions of uncertainty or time pressure. Heuristics are efficient and often effective; they are also the source of systematic cognitive biases. See also: Anchoring Bias, Confirmation Bias, Normalisation of Deviance.

**Hindsight Bias.** The tendency, after an outcome is known, to believe that the outcome was more predictable than it actually was at the time. A major source of unfairness in incident investigations:

actions that were reasonable given the information available at the time appear obviously wrong in retrospect.

**Human Error.** An unintentional action or decision — the wrong thing done without intending to do the wrong thing. Human error is normal; it is a feature of human cognition in complex systems, not a personal failing. The appropriate organisational response is to console and to understand the system conditions that allowed the error to have consequences.

**Human Factors.** The scientific discipline concerned with understanding how humans interact with systems, environments, and each other — and applying that understanding to improve performance, safety, and wellbeing. In occupational diving, human factors encompasses the full range of non-technical skills, performance influencing factors, and organisational conditions that shape outcomes.

## I

**Inclusion Safety.** The first and foundational stage of psychological safety (Clark): the belief that one belongs — that one's presence is valued and that the team is a genuinely inclusive environment. Without inclusion safety, no higher stage of psychological safety is accessible.

## J

**Johari Window.** A model of self-awareness and interpersonal communication describing four areas of knowledge: what both self and others know (open), what only the individual knows (hidden), what only others know (blind spot), and what neither knows (unknown). Used in leadership development to explore the limits of self-perception.

**Just Culture.** An organisational approach to safety that distinguishes between human error, at-risk behaviour, and reckless behaviour — applying appropriate responses to each — and that creates conditions in which honest, complete accounts of what happened can be obtained and learned from. Not a no-blame culture.

## L

**Latent Accident Condition.** In the Resilient Performance Model: the configuration where technical skills and context are strong but non-technical skills are absent. The system appears safe under normal conditions; rare or unexpected events reveal the gap.

**Learner Safety.** The second stage of psychological safety (Clark): the confidence that it is safe to ask questions, admit ignorance, make mistakes, and try new approaches without being penalised for the attempt.

**LEODSI (Learning from Emergent Outcomes in Diving System Interactions).** A systemic incident investigation framework developed by The Human Diver for the diving context. Examines how outcomes emerge from interactions between system elements (PETTEOT) rather than from individual error.

## M

**Mental Model.** An internal representation of how a system, situation, or process works. Mental models are used to make sense of information and generate predictions about what will happen next. Shared mental models within a team are essential for effective situation awareness.

## N

**Non-Technical Skills (NTS).** The cognitive and social behaviours that support safe and effective performance but are not captured by technical competence assessments. In occupational diving, NTS includes decision making, situation awareness, communication, teamwork, leadership and followership, and performance management.

**Normalisation of Deviance.** The gradual social acceptance, within a team or organisation, of behaviour that deviates from established norms — particularly when early deviations produce no apparent negative consequence. Over time, the deviation becomes the new normal, and the safety margin it has eroded becomes invisible.

## O

**Outcome Bias.** The tendency to judge the quality of a decision by its outcome rather than by the quality of the reasoning that produced it. A primary source of unfair investigation outcomes: a decision that was reasonable given available information at the time is judged reckless because the outcome was severe.

## P

**PACE Model.** A structured escalation model for raising concerns: Probe (gather information), Alert (name the concern), Challenge (make it explicit), Emergency (stop the operation). Requires challenger safety to function in practice.

**Performance Influencing Factors (PIFs).** The conditions — individual, environmental, task-based, organisational — that make errors more or less likely and that shape the difficulty of the work. PIFs are not excuses; they are diagnostic information about where the system needs attention. See also: WITH Model, HALT.

**PETTEOT.** The seven system elements examined in LEODSI analysis: Person, Environment, Tools and Technology, Tasks, External Influences, Organisation, and Time. Used to map the full system context of an incident rather than stopping at individual behaviour.

**Pre-Mortem.** A structured decision-making tool in which a team imagines that a plan has failed — before it is executed — and works backwards to identify what might have caused the failure. Research suggests pre-mortems improve identification of fail-points by approximately 30%.

**Psychological Safety.** The shared belief that the team is safe for interpersonal risk-taking — that speaking up, asking questions, admitting mistakes, and challenging decisions will not result in punishment, humiliation, or exclusion. A team-level condition, not an individual trait.

## R

**Reckless Behaviour.** In just culture: a conscious choice to take a substantial and unjustified risk, overriding established controls without justification and in the knowledge that the behaviour is unsafe. The appropriate organisational response is accountability. Distinct from human error and at-risk behaviour.

**Recognition-Primed Decision Making (RPDM).** A model of expert decision-making under time pressure (Klein): a situation activates cues that match a pattern in long-term memory, which retrieves a familiar action script, which is mentally simulated before execution. RPDM is fast and largely non-conscious; its reliability depends entirely on the quality of the pattern library built through experience.

**Red Teaming.** A structured technique in which a designated individual or group is assigned to actively challenge a plan, find its weaknesses, and argue for its failure. Used to counter groupthink and confirmation bias in high-stakes planning contexts.

**Resilient Performance.** The capacity of a team or system to produce consistently good outcomes across varying and unexpected conditions — to absorb disturbances and adapt without catastrophic failure. Achieved in the Resilient Performance Model when technical skills, non-technical skills, and context are all strong and aligned.

**Restorative Just Culture.** An approach to post-incident response (Dekker) that asks who has been harmed, what they need, and how those involved can contribute to repairing the harm — rather than who is to blame and what they deserve. Produces better learning outcomes and better relationships with those affected than retributive approaches.

## S

**Safety-I.** The traditional model of safety: safety is the absence of accidents; the task of safety management is to count failures and prevent their recurrence. Focuses on what goes wrong.

**Safety-II.** The contemporary model of safety (Hollnagel): safety is the presence of adaptive capacity — the ability to produce good outcomes across varying conditions. Focuses on understanding how things go right as the basis for understanding why they sometimes go wrong.

**Situation Awareness (SA).** The perception of the elements of the environment (Level 1), the comprehension of their meaning (Level 2), and the projection of their future state (Level 3) — Endsley's three-level model. SA is both an individual cognitive state and a team property that must be actively maintained through communication.

**Speak-Up Culture.** An organisational environment in which team members at all levels feel able to raise concerns, offer ideas, admit mistakes, and challenge decisions — not because they are required to, but because the environment makes doing so feel safe, respected, and worthwhile.

**Superiority Illusion.** The systematic tendency of individuals — particularly those with positional power — to believe they listen better, that speaking up is easier for their team, and that consequences of raising concerns are fairer than junior employees actually experience. A primary driver of the perception gap in speak-up culture research.

**System 1 / System 2 Thinking.** Kahneman's dual-process model: System 1 is fast, automatic, associative, and largely non-conscious; System 2 is slow, deliberate, effortful, and explicit. Under pressure and time constraint, System 1 dominates. Most cognitive biases are features of System 1 processing.

## T

**Task Fixation.** The state of being so focused on one element of the task that other important information is no longer being processed. A sign of degraded situation awareness; associated with loss of the broader picture during high workload operations.

**T-N-C Framework.** The three-component model underlying the Resilient Performance Model: Technical Skills (T), Non-Technical Skills (N), and Context (C). Resilient performance requires all three to be strong and aligned.

## U

**UNITED Briefing Framework.** A structured briefing model developed by The Human Diver: Understand the task, goals and objectives; Notify team of roles; Identify resources, risks, and dependencies; Test the plan using constructive dissent and go/no-go criteria; Establish emergency contingencies; Determine time and place of debrief; Check understanding.

## W

**WITH Model.** A performance influencing factor framework: Work Environment, Individual Capability, Task Demands, Human Nature. Provides a structured method for identifying the conditions that shape task difficulty before a dive, and for understanding the context of unwanted outcomes after one.

**Work as Done (WaD).** What people actually do — the adaptations, workarounds, and adjustments that experienced practitioners make to get the job done under real-world conditions. Often differs substantially from Work as Imagined.

**Work as Imagined (WaI).** What those who design procedures, training, and standards imagine people do — the idealised version of task performance. Gaps between WaI and WaD are where most interesting (and instructive) things happen in diving operations.

FURTHER READING AND RESOURCES

# Going Deeper

*The books, research, frameworks, and online resources that underpin this book — and where to go next*

The material in this book draws on several decades of applied research across aviation, healthcare, nuclear operations, offshore energy, and the military — translated and tested in the specific context of occupational diving. What follows is a curated guide to the primary sources, the key books, and the online resources that will allow you to take any of these ideas further. It is not exhaustive. It is deliberately selective: these are the materials most likely to repay the investment of time for diving professionals who want to move beyond the introductory level.

## Books

### Under Pressure: Diving Deeper with Human Factors

*Gareth Lock (2019)*

The foundational text for human factors in recreational and occupational diving. Covers non-technical skills, decision-making, teamwork, and just culture through the lens of diving incidents. The companion volume to this book.

### Safety Differently

*Sidney Dekker (2014)*

Dekker's accessible argument for moving from Safety-I (counting failures) to Safety-II (understanding success). Challenges the deficit model of human performance and makes the systemic case compellingly.

### The Checklist Manifesto: How to Get Things Right

*Atul Gawande (2009)*

A surgeon's investigation into why complex systems need checklists — and why checklists alone are not enough. The research on the WHO surgical safety checklist underpins the communications and teamwork chapters directly.

### The Field Guide to Understanding Human Error

*Sidney Dekker (2014)*

A practical investigation framework that starts from the question 'how did it make sense for people to do what they did?' The methodological companion to just culture thinking; essential for anyone conducting or reviewing diving incident investigations.

### The Fearless Organisation

*Amy C. Edmondson (2018)*

The definitive practical guide to psychological safety, grounded in Edmondson's two decades of research across hospitals, manufacturing, and technology firms. Essential reading for any leader responsible for a diving team.

### Thinking, Fast and Slow

*Daniel Kahneman (2011)*

The foundational text on System 1 and System 2 thinking, cognitive biases, and the heuristics that shape every decision under pressure. Indispensable background for the decision-making and situation awareness chapters.

### Team of Teams: New Rules of Engagement for a Complex World

*General Stanley McChrystal (2015)*

How the US military rebuilt itself to operate in complex, unpredictable environments by prioritising shared consciousness, distributed authority, and trust across teams. Directly applicable to multi-team diving operations.

### Being Mortal: Medicine and What Matters in the End

*Atul Gawande (2014)*

Broader than its subject suggests: a rigorous examination of what it means to allow human judgement and dignity to operate within institutional systems. Gawande on the relationship between autonomy, safety, and good outcomes.

### Extreme Ownership: How US Navy SEALs Lead and Win

*Jocko Willink & Leif Babin (2015), St Martin's Press*

A direct, operational account of leadership and followership under genuine pressure. The chapters on decentralised command and cover-and-move map directly onto dive team leadership concepts.

### Leaders Eat Last

*Simon Sinek (2014)*

The biological and organisational case for leadership as the creation of safety for others. Sinek's trust-competence matrix — and his argument that low trust defeats high competence — is used directly in the leadership chapter.

### The Five Dysfunctions of a Team

*Patrick Lencioni (2002)*

A model-driven account of why trust is foundational to team function, and what its absence produces at each successive level — from inattention to results back down to absence of trust. Directly applicable to the teamwork chapter.

### Normal Accidents: Living with High-Risk Technologies

*Charles Perrow (1984)*

The original systemic analysis of why accidents in complex, tightly coupled systems are, in a meaningful sense, normal — and what the structural properties of such systems are. Theoretical background for the complex systems framing.

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## Online Resources

### The Human Diver

**www.thehumandiver.com** — The primary resource hub for human factors in diving. Courses, blogs, incident analyses, podcast episodes, and the DEBrIEF model download.

**HFiD: Essentials** — The foundational self-paced online course covering all NTS domains in depth, with case studies and exercises.

**HFiD: Applied Skills** — Two-day classroom and simulation programme. Team-based exercises, scenario debriefs, and NTS behavioural marker scheme practice.

**DEBrIEF Model** — Free download of the full DEBrIEF framework with facilitator guidance. The structured debrief model used throughout this book.

**The Human Diver Podcast** — Regular episodes applying human factors, systems thinking, and just culture to diving incidents and operational practice.

**InDepth Magazine — Human Factors articles** — Peer-reviewed technical diving content. Gareth Lock's regular column on human factors, incident analysis, and NTS in the diving context.

### Human in the System (HITS)

**www.humaninthesystem.co.uk** — Human factors, non-technical skills, and safety culture programmes for high-risk industries beyond diving: construction, energy, aviation, emergency services.

### Research and Academic Resources

**Megan Reitz — Speaking Truth to Power research** — Full access to the Hult Ashridge research on speak-up culture, the listening gap, and hierarchy effects.

**Safety Differently — Sidney Dekker** — Articles, video, and resources on Safety-II, human error, and systemic investigation from one of the field's leading thinkers.

**Skybrary — Crew Resource Management** — Aviation's primary CRM knowledge base. A comprehensive reference for the NTS concepts that transferred from aviation to occupational diving.

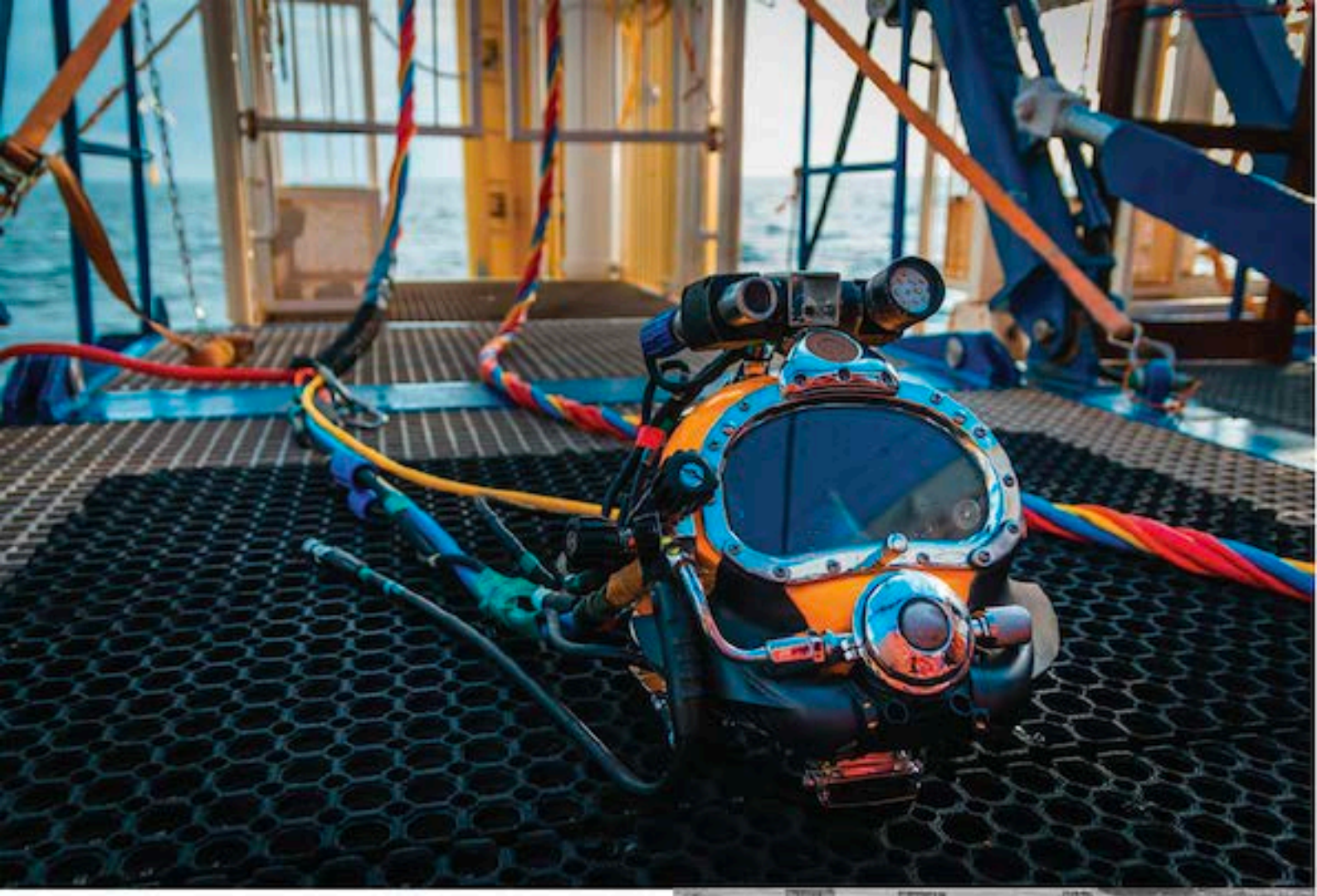
### Bringing This Training to Your Organisation

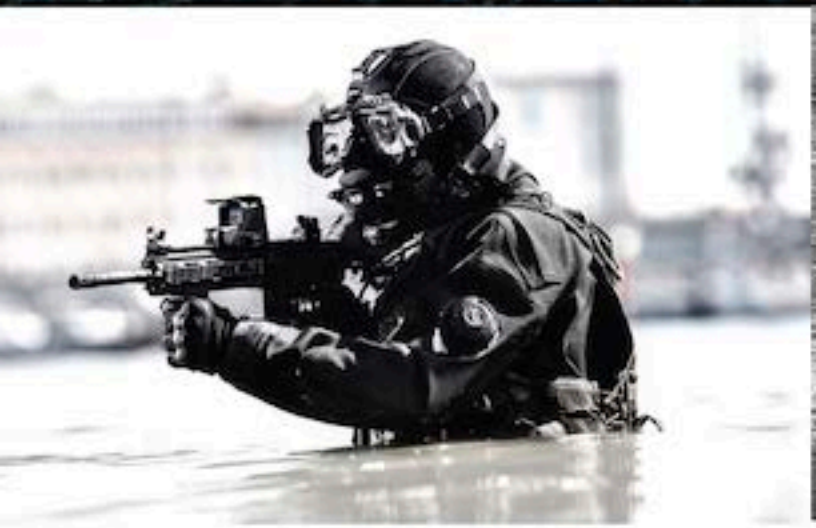
The Human Diver delivers human factors and non-technical skills training across commercial diving, military diving, and occupational diving operations globally. Programmes range from self-paced online learning through to multi-day simulation-based team training and train-the-trainer certification. Human in the System (HITS) delivers the same capabilities to construction, energy, aviation, and emergency services.

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