By the author of the **New York Times** bestseller

The Power of Habit

Smarter Faster Better

The Secrets of ***Being Productive*** in ***Life*** and ***Business***

Charles Duhigg

SMARTER FASTER BETTER

The Eight Principles of Productivity

Charles Duhigg

1 Motivation

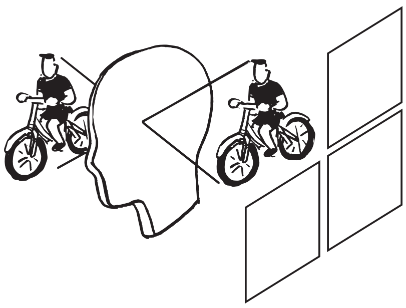
Turn a chore into a choice, and tie it to a bigger, more important goal.

2 Teams

Teams thrive when they achieve **psychological safety**, which occurs when everyone speaks equally and listens ostentatiously.

3 Focus

Learn to build **mental models**: Stories we tell ourselves about what's going on as it occurs.



4 Goal Setting

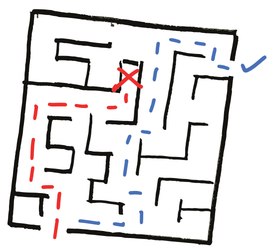
Your to-do list should **contain only a few items**, such as the most important tasks for today, tomorrow, and this month. Your list should help you **prioritize** rather than just remember.

5 Managing People

Push decision-making **to the person who is closest to a problem** and unlock their innovation, motivation and expertise.

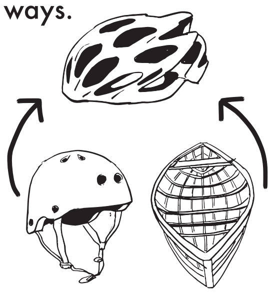
6 Decision Making

We train our instincts to make better decisions by exposing ourselves to both **successes and failures.**



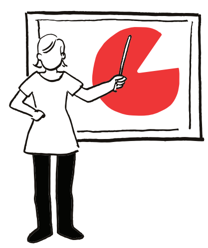
7 Innovation

Creativity comes from innovation brokers, people who collect old ideas and mix them in new ways.



8 Absorbing data

The best way to **absorb data is to use it**: When we explain an idea to someone else, when we calculate numbers instead of simply looking at them, we transform information into knowledge.



Chapter Three

Focus

Cognitive Tunneling, Air France Flight 447, and the Power of Mental Models

When they finally found the wreckage, it was clear that few of the victims had realized disaster was near even as it struck. There was no evidence of last-minute buckling of seatbelts or frenzied raising of food trays. Oxygen masks were firmly encased in ceiling panels. A submarine probing the wreckage at the bottom of the Atlantic Ocean found a whole row of seats upright in the sand, as if waiting to fly again.

It had taken almost two years to find the plane's data recorders and everyone hoped that once they were retrieved, the cause of the accident would become clear at last. Initially, however, the recorders offered few clues. None of the plane's computers had malfunctioned, according to the data. There was no indication of mechanical failure or electrical glitch. It wasn't until investigators listened to the cockpit voice recordings that they began to understand. This Airbus—one of the largest and most sophisticated aircraft ever built, a plane designed to be an error-proof model of automation—was at the bottom of the ocean not because of defect in machinery, but because of a failure of attention.

Twenty-three months earlier, on May 31, 2009, the night sky was clear as Air France Flight 447 pulled away from the gate in Rio de Janeiro with 228 people on board, bound for Paris. In the cabin were honeymooners and a former conductor for the Washington National Opera, a well-known arms control activist, and an eleven-year-old boy headed to boarding school. One of the plane's pilots had brought his wife to Rio so they could enjoy a three-day layover at the Copacabana Beach. Now she was in the back of the massive aircraft, while he and two colleagues were in the cockpit, flying them home.

As the plane began its ascent, there were a few radioed exchanges with air traffic control, the standard chatter that accompanies any takeoff. Four minutes after lifting from the runway, the pilot in the right seat—the junior position—activated the autopilot. For the next ten and a half hours, if all went according to plan, the plane would essentially fly itself.

Just two decades earlier, flying from Rio to Paris had been a much more taxing affair. Prior to the 1990s and advances in cockpit automation, pilots were responsible for calculating dozens of variables during a flight, including airspeed, fuel consumption, direction, and optimal cruising altitude, all while monitoring weather disturbances, discussions with air traffic control, and the plane's position in the sky. Such trips were so demanding that pilots often rotated responsibilities. They all knew the risks if vigilance waned. In 1987, a pilot in Detroit had become so overwhelmed during takeoff that he had forgotten to set the wing flaps. One hundred and fifty-four people died when the plane crashed after takeoff. Fifteen years before that, pilots flying near Miami had become fixated on a faulty landing gear light and had failed to notice that they were gradually descending. One hundred and one people were killed when the craft slammed into the Everglades. Before automated aviation systems were invented, it wasn't unheard of for more than a thousand people to die each year in airplane accidents, often because pilots' attention spans were stretched too thin, or other human errors.

The plane flying from Rio to Paris, however, had been designed to eliminate such mistakes by vastly reducing the number of decisions a pilot had to make. The Airbus A330 was so advanced that its computers could automatically intervene when problems arose, identify solutions, and then tell pilots, via on-screen instructions, where to direct their focus as they responded to computerized prompts. In optimal conditions, a human might fly for only about eight minutes per trip, during takeoff and landing. Planes like the A330 had fundamentally changed piloting from a proactive to a reactive profession. As a result, flying was easier. Accident rates went down, and airlines' productivity soared because more customers could travel with less crew. A transoceanic flight had once required as many as six pilots. By the time of Flight 447, thanks to automation, Air France needed only two people in the cockpit at any given time.

Four hours into the trip, midway between Brazil and Senegal, the plane crossed the equator. Most of the passengers would have been asleep. There were clouds from a tropical storm in the distance. The two men in the cockpit remarked on static electricity dancing across the windows, a phenomenon known as St. Elmo's fire. "I'm dimming the lighting a bit to see outside, eh?" said Pierre-Cedric Bonin, the pilot whose wife was in the passenger cabin. "Yes, yes," the captain replied. There was a third aviator in a small hold behind the cockpit, taking a nap. The captain summoned the third man to switch places, and then left the two junior pilots at the controls so he could sleep. The plane was flying smoothly on full autopilot at thirty-two thousand feet.

Twenty minutes later there was a small bump from turbulence. “It might be a good idea to tell the passengers to buckle up,” Bonin informed a stewardess over the intercom. As the air surrounding the cockpit cooled, three metal cylinders jutting from the craft’s body—the pitot tubes, which measure airspeed by detecting the force of air flowing into them—became clogged with ice crystals. For almost a hundred years, aviators have complained about, and safely accommodated, ice in pitot tubes. Most pilots know that if their airspeed measurement plunges unexpectedly, it’s likely because of clogged pitot tubes. When the pitot tubes on Flight 447 froze over, the plane’s computers lost airspeed information and the auto-flight system turned off, as it was programmed to do.

A warning alarm sounded.

“I have the controls,” Bonin said calmly.

“Okay,” his colleague replied.

At this point, if the aviators had done nothing at all, the plane would have continued flying safely and the pitot tubes would have eventually thawed. But Bonin, perhaps shaken out of a reverie by the alarm and wanting to offset the loss of the autopilot, pulled back a bit on the command stick, causing the plane’s nose to nudge upward and the aircraft to gain altitude. Within one minute, it had ascended by three thousand feet.

With Flight 447’s nose now pointed slightly upward, the plane’s aerodynamics began to change. The atmosphere at that height was thin, and the ascent had disrupted the smooth flow of air over the plane’s wings. The craft’s “lift”—the basic force of physics that pulls airplanes into the sky because there is less pressure above a wing than below it—began deteriorating. In extreme conditions, this can cause an aerodynamic stall, a dangerous situation in which a plane starts falling, even as its engines strain with thrust and the nose points skyward. A stall is easy to overcome in its early stages. Simply lowering the nose so air begins flowing smoothly over the wings prevents a stall from emerging. But if a plane's nose remains upward, a stall will become worse and worse until the airplane drops like a stone in a well.

As Flight 447 rose through the thin atmosphere, a loud chime erupted in the cockpit and a recorded voice began warning, "Stall! Stall! Stall! Stall!," indicating that the plane's nose was pointed too high.

"What's this?" the copilot said.

"There's no good . . . uh . . . no good speed indication?" Bonin responded. The pitot tubes were still clogged with ice and so the display did not show any airspeed.

"Pay attention to your speed," the copilot said.

"Okay, okay, I'm descending," Bonin replied.

"It says we're going up," the copilot said, "so descend."

"Okay," said Bonin.

But Bonin didn't descend. If he had leveled the plane, the craft would have flown on safely. Instead, he continued pulling back on the stick slightly, pushing the airplane's nose further into the sky.

Automation has today penetrated nearly every aspect of our lives. Most of us now drive cars equipped with computers that automatically engage the brakes and reduce transmission power when we hit a patch of rain or ice, often so subtly we never notice the vehicle has anticipated our tendency to overcorrect. We work in offices where customers are routed to departments via computerized phone systems, emails are automatically sent when we're away from our desks, and bank accounts are instantaneously hedged against currency fluctuations. We communicate with smartphones that finish our words. Even without technology's help, all humans rely on cognitive automations, known as "heuristics," that allow us to multitask. That's why we can email the babysitter while chatting with our spouse and simultaneously watching the kids. Mental automation lets us choose, almost subconsciously, what to pay attention to and what to ignore.

Automations have made factories safer, offices more efficient, cars less accident-prone, and economies more stable. By one measure, there have been more gains in personal and professional productivity in the past fifty years than in the previous two centuries combined, much of it made possible by automation.

But as automation becomes more common, the risks that our attention spans will fail as well. Studies from Yale, UCLA, Harvard, Berkeley, NASA, the National Institutes of Health, and elsewhere show errors are particularly likely when people are forced to toggle between automaticity and focus, and are unusually dangerous as automatic systems infiltrate airplanes, cars, and other environments where a misstep can be tragic. In the age of automation, knowing how to manage your focus is more critical than ever before.

Take, for instance, Bonin's mindset when he was forced to take control of Flight 447. It is unclear why he continued guiding the plane upward after agreeing with his copilot that they should descend. Maybe he hoped to climb above the storm clouds on the horizon. Perhaps it was an unintentional reaction to the sudden alarm. We will never know why he didn't return the controls to neutral once the stall alarm sounded. There is significant evidence, however, that Bonin was in the grip of what's known as "cognitive tunneling"—a mental glitch that sometimes occurs when our brains are forced to transition abruptly from relaxed automation to panicked attention.

“You can think about your brain’s attention span like a spotlight that can go wide and diffused, or tight and focused,” said David Strayer, a cognitive psychologist at the University of Utah. Our attention span is guided by our intentions. We choose, in most situations, whether to focus the spotlight or let it be relaxed. But when we allow automated systems, such as computers or autopilots, to pay attention *for* us, our brains dim that spotlight and allow it to swing wherever it wants. This is, in part, an effort by our brains to conserve energy. The ability to relax in this manner gives us huge advantages: It helps us subconsciously control stress levels and makes it easier to brainstorm, it means we don’t have to constantly monitor our environment, and it helps us get ready for big cognitive tasks. Our brains automatically seek out opportunities to disconnect and unwind.

“But then, *bam!,* some kind of emergency happens—or you get an unexpected email, or someone asks you an important question in a meeting—and suddenly the spotlight in your head has to ramp up all of a sudden and, at first, it doesn’t know where to shine,” said Strayer. “So the brain’s instinct is to force it as bright as possible on the most obvious stimuli, whatever’s right in front of you, even if that’s not the best choice. That’s when cognitive tunneling happens.”

Cognitive tunneling can cause people to become overly focused on whatever is directly in front of their eyes or become preoccupied with immediate tasks. It’s what keeps someone glued to their smartphone as the kids wail or pedestrians swerve around them on the sidewalk. It’s what causes drivers to slam on their brakes when they see a red light ahead. We can learn techniques to get better at toggling between relaxation and concentration, but they require practice and a desire to remain engaged. However, once in a cognitive tunnel, we lose our ability to direct our focus. Instead, we latch onto the easiest and most obvious stimulus, often at the cost of common sense.

As the pitot tubes iced over and the alarms blared, Bonin entered a cognitive tunnel. His attention had been relaxed for the past four hours. Now, amid flashing lights and ringing bells, his attention searched for a focal point. The most obvious one was the video monitor right in front of his eyes.

The cockpit of an Airbus A330 is a minimalist masterpiece, an environment designed to be distraction free, with just a few screens alongside a modest number of gauges and controls. One of the most prominent screens, directly in each pilot's line of sight, is the primary flight display. There is a broad line running across the horizontal center of a screen that indicates the division between sky and land. Floating atop this line is the small icon of an aircraft. If a plane rolls to either side while flying, the icon goes off-kilter and pilots know their wings are no longer parallel with the ground.

When Bonin heard the alarm and looked at his instrument panel, he saw the primary flight display. The icon of the plane on that screen had rolled slightly to the right. Normally, this would not have been a concern. Planes roll in small increments throughout a trip and are easily righted. But now, with the autopilot disengaged and the sudden pressure to focus, the spotlight inside Bonin's head shined on that off-kilter icon. Bonin, data records indicate, became focused on getting the wings of that icon level with the middle of his screen. And then, perhaps because he was fixated on correcting the roll, he failed to notice that he was still pulling back on the control stick, lifting the plane's nose.

As Bonin pulled back on his stick, the front of the aircraft rose higher. Then, another instance of cognitive tunneling occurred—this time, inside the head of Bonin's copilot. The man in the left-hand seat was named David Robert, and he was officially the "monitoring pilot." His job was to keep watch over Bonin and intervene if the "flying pilot" became overwhelmed. In a worst-case scenario, Robert could take control of the craft. But now, with alarms sounding, Robert did what's most natural in such a situation: He became focused on the most obvious stimuli. There was a screen next to him spewing text as the plane's computer provided updates and instructions. Robert turned his eyes away from Bonin and began staring at the scrolling type, reading the messages aloud. "Stabilize," Robert said. "Go back down."

Focused on the screen as he was, Robert didn't see that Bonin was pulling back on his stick and didn't register that the flying pilot was raising the craft higher even as he agreed they needed to descend. There is no evidence that Robert looked at his gauges. Instead, he frantically scrolled through a series of messages automatically generated by the plane's computer. Even if those prompts had been helpful, nothing indicates that Bonin, locked on the airplane icon in front of him, heard anything his colleague said.

The plane rose through thirty-five thousand feet, drawing dangerously close to its maximum height. The nose of the airplane was now pitched at twelve degrees.

The copilot finally looked away from his screen. "We're climbing, according to this," he told Bonin, referring to the instrument panel. "Go back down!" he shouted.

"Okay," Bonin replied.

Bonin pushed his stick forward, forcing the plane's nose to dip slightly. As a result, the force of gravity against the pilots lessened by a third, giving them a brief sense of weightlessness. "Gently!" his colleague snapped. Then, Bonin, perhaps overwhelmed by the combination of the alarms, the weightlessness, and his copilot's chastisement, jerked his hand backward, arresting the descent of the plane's nose. The craft remained at a six-degree upward pitch. Another loud warning chime came from the cockpit's speakers, and a few seconds later the aircraft began to shake, what's known as buffeting, the result of rough air moving across the wings in the early stages of a serious aerodynamic stall.

"We're in, ahhh, yeah, we're in a climb, I think?" Bonin said.

For the next ten seconds, neither man spoke. The plane rose above its maximum recommended altitude of 37,500 feet. To stay aloft, Flight 447 had to descend. If Bonin would simply lower the nose, all would be fine.

Then, as the pilots focused on their screens, the ice crystals clogging the pitot tubes cleared and the plane's computer began receiving accurate airspeed information once again. From this moment onward, all the craft's sensors functioned correctly throughout the flight. The computer began spitting out instructions, telling the pilots how to overcome the stall. Their instrument panels were showing them everything they needed to know to right the plane, but they had no idea where to look. Even as helpful information arrived, Bonin and Robert had no clue as to where to focus.

The stall warning blared again. A piercing, high-pitched noise called the "cricket," designed to be impossible for pilots to ignore, began to sound.

"Damn it!" the copilot yelled. He had already paged the captain. "Where is he? . . . Above all, try to touch the lateral controls as little as possible," he told Bonin.

"Okay," Bonin replied. "I'm in TO/GA, right?"

It is this moment, investigators later concluded, that the lives of all 228 people on board Flight 447 were condemned. "TO/GA" is an acronym for "takeoff, go around," a setting that aviators use to abort a landing, or "go around" the runway. TO/GA pushes a plane's thrust to maximum while the pilot raises the nose. There is a sequence of moves associated with TO/GA that all aviators practice, hundreds of times, in preparation for a certain kind of emergency. At low altitudes, TO/GA makes a lot of sense. The air is thick near the earth's surface, and so increasing thrust and raising the nose makes a plane go faster and higher, allowing a pilot to abort a landing safely.

But at thirty-eight thousand feet, the air is so thin that TO/GA doesn't work. A plane can't draw additional thrust at that height, and raising the nose simply increases the severity of a stall. At that altitude, the only correct choice is *lowering* the nose. In his startled panic, however, Bonin made a second mistake, a mental misstep that is a cousin to cognitive tunneling: He sought to aim the spotlight in his head onto something familiar. Bonin fell back on a reaction he had practiced repeatedly, a sequence of moves he had learned to associate with emergencies. He fell into what psychologists call "reactive thinking."

Reactive thinking is at the core of how we allocate our attention, and in many settings, it's a tremendous asset. Athletes, for example, practice certain moves again and again so that, during a game, they can think reactively and execute plays faster than their opponents can respond. Reactive thinking is how we build habits, and it's why to-do lists and calendar alerts are so helpful: Rather than needing to decide what to do next, we can take advantage of our reactive instincts and automatically proceed. Reactive thinking, in a sense, outsources the choices and control that, in other settings, create motivation.

But the downside of reactive thinking is that habits and reactions can become so automatic they overpower our judgment. Once our motivation is outsourced, we simply react. One study conducted by Strayer, the psychologist, in 2009 looked at how drivers' behaviors changed when cars were equipped with features such as cruise control and automatic braking systems that allowed people to pay less attention to road conditions.

“These technologies are supposed to make driving safer, and many times, they do,” said Strayer. “But it also makes reactive thinking easier, and so when the unexpected startles you, when the car skids or you have to brake suddenly, you’ll react with practiced, habitual responses, like stomping on the pedal or twisting the wheel too far. Instead of thinking, you react, and if it’s not the correct response, bad things happen.”

Inside the cockpit, as the alarms sounded and the cricket chirped, the pilots were silent. Robert, the copilot, perhaps lost in his own thoughts, didn’t reply to Bonin’s question—“I’m in TO/GA, right?”—but instead tried once again to beckon the captain, who was still resting in the hold. If Bonin had paused to consider the basic facts—he was in thin air, a stall alarm was sounding, the plane couldn’t safely go higher—he would have immediately realized he needed to lower the airplane’s nose. Instead, he relied on behaviors he had practiced hundreds of times and pulled back on the stick. The plane’s nose increased to a terrifying eighteen-degree pitch as Bonin pushed the throttle open. The plane moved higher, touched the top of an arc, and then started dropping, its nose still pointed upward and the engines at full thrust. The cockpit began shaking as the buffeting grew more pronounced. The plane was falling fast.

“What the hell is happening?” the copilot asked. “Do you understand what’s happening, or not?”

“I don’t have control of the plane anymore!” Bonin shouted. “I don’t have control of the plane at all!”

In the cabin, passengers probably had little idea anything was wrong. There were no alarms they could hear. The buffeting likely felt like normal turbulence. Neither pilot ever made an announcement of any kind.

The captain finally entered the cockpit.

“What the hell are you doing?” he asked.

“I don’t know what’s happening,” Robert said.

“We’re losing control of the airplane!” Bonin shouted.

“We lost control of the airplane and we don’t understand at all,” Robert said. “We’ve tried everything.”

Flight 447 was now sinking at a rate of ten thousand feet per minute. The captain, standing behind the pilots and perhaps overwhelmed by what he saw, uttered a curse word and then remained silent for forty-one seconds.

“I have a problem,” Bonin said, the panic audible in his voice. “I have no more displays.” This was not correct. The displays—the screens on his instrument panel—were providing accurate information and were clearly visible. But Bonin was too overwhelmed to focus.

“I have the impression we’re going crazily fast,” Bonin said. The plane, in fact, at this point was moving far too slowly. “What do you think?” Bonin asked as he reached for the lever that would raise the speed-brakes on the wing, slowing the plane even more.

“No!” shouted the copilot. “Above all, don’t extend the brakes!”

“Okay,” Bonin said.

“What should we do?” the copilot asked the captain. “What do you see?”

“I don’t know,” the captain said. “It’s descending.”

Over the next thirty-five seconds, as the pilots shouted questions, the plane dropped another nine thousand feet.

“Am I going down now?” Bonin asked. The instruments in front of him could have easily answered that question.

“You’re going down down down,” the copilot said.

“I’ve been at full back stick for a while,” Bonin said.

“No, no!” the captain shouted. The plane was now less than ten thousand feet above the Atlantic Ocean. “Don’t climb!”

“Give me the controls!” the co-pilot said. “The controls! To me!”

“Go ahead,” Bonin says, finally releasing the stick. “You have the controls. We’re still in TO/GA, right?”

As the copilot took over, the plane fell another six thousand feet closer to the sea.

“Watch out, you’re pitching up there,” the captain said.

“I’m pitching up?” the copilot replied.

“You’re pitching up,” the captain said.

“Well, we need to!” Bonin said. “We’re at four thousand feet!”

By now, the only way the craft could pick up enough speed was to lower its nose into a dive and let more air flow over the wings. But with such a small distance between the plane and the ocean’s surface, there was no room to maneuver. A ground proximity warning began blaring, “SINK RATE! PULL UP!” The cockpit was filled with constant noise.

“You’re pitching up,” the captain told the copilot.

“Let’s go!” Bonin replied. “Pull up! Pull up! Pull up!”

The men stopped speaking for a moment.

“This can’t be true,” said Bonin. The ocean was visible through the cockpit’s windows. If the pilots had craned their necks, they could have made out individual waves.

“But what’s happening?” Bonin asked.

Two seconds later, the plane plunged into the sea.

II.

In the late 1980s, a group of psychologists at a consulting firm named Klein Associates began exploring why some people seem to stay calm and focused amid chaotic environments while others become overwhelmed. Klein Associates' business was helping companies analyze how they make decisions. A variety of clients wanted to know why some employees made such good decisions amid stress and time pressures, while other workers became distracted. More important, they wanted to know if they could train people to get better at paying attention to the right things.

The Klein Associates team began by interviewing professionals who worked in extreme settings, such as firefighters, military commanders, and emergency rescue personnel. Many of those conversations, however, proved frustrating. Firefighters could look at a burning staircase and sense if it would hold their weight, they knew which parts of a building needed constant attention and how to stay attuned to warning signs, but they struggled to explain how they did it. Soldiers could tell you which parts of a battlefield were more likely to be harboring enemies and where to focus for signs of ambush. But when asked to explain their decisions, they chalked it up to intuition.

So the team moved on to other settings. One researcher, Beth Crandall, visited neonatal intensive care units, or NICUs, around Dayton, near where she lived. A NICU, like all critical care settings, is a mix of chaos and banality set against a backdrop of constantly beeping machines and chiming warnings. Many of the babies inside a NICU are on their way to full health; they might have arrived prematurely or suffered minor injuries during birth, but they are not seriously ill. Others, though, are unwell and need constant monitoring. What makes things particularly hard for NICU nurses, however, is that it is not always clear which babies are sick and which are healthy. Seemingly okay preemies can become unwell quickly; sick infants can recover unexpectedly. So nurses are constantly making choices about where to focus their attention: the squalling baby or the quiet one? The new lab results or the worried parents who say something seems wrong? What's more, these choices occur amid a constant stream of data from machines—heart monitors and automatic thermometers, blood pressure systems and pulse oximeters—that are ready to sound alarms the moment anything changes. Such innovations have made patients safer and have remarkably improved NICUs' productivity, because fewer nurses are now needed to oversee greater numbers of children. But they have also made NICUs more complex. Crandall wanted to understand how nurses made decisions about which babies needed their attention, and why some of them were better at focusing on what mattered most.

Crandall interviewed nurses who were calm in the face of emergencies and others who seemed on the brink of collapse. Most interesting were the handful of nurses who seemed particularly gifted at noticing when a baby was in trouble. They could predict an infant's decline or recovery based on small warning signs that almost everyone else overlooked. Often, the clues these nurses relied upon to spot problems were so subtle that they, themselves, had trouble later recalling what had prompted them to act. "It was like they could see things no one else did," Crandall told me. "They seemed to think differently."

One of Crandall's first interviews was with a talented nurse named Darlene, who described a shift from a few years earlier. Darlene had been walking past an incubator when she happened to glance at the baby inside. All of the machines hooked up to the child showed that her vitals were within normal ranges. There was another RN keeping watch over the baby, and she was observing the infant attentively, unconcerned by what she saw. But to Darlene, something seemed wrong. The baby's skin was slightly mottled instead of uniformly pink. The child's belly seemed a bit distended. Blood had recently been drawn from a pinprick in her heel and the Band-Aid showed a blot of crimson, rather than a small dot.

None of that was particularly unusual or troubling. The nurse tending to the child said she was eating and sleeping well. Her heartbeat was strong. But something about all those small things occurring together caught Darlene's attention. She opened the incubator and examined the infant. The newborn was conscious and awake. She grimaced slightly at Darlene's touch but didn't cry. There was nothing specific that she could point to, but this baby simply didn't look like Darlene expected her to.

Darlene found the attending physician and said they needed to start the child on intravenous antibiotics. All they had to go on was Darlene's intuition, but the doctor, deferring to her judgment, ordered the medication and a series of tests. When the labs came back, they showed that the baby was in the early stages of sepsis, a potentially fatal whole-body inflammation caused by a severe infection. The condition was moving so fast that, had they waited any longer, the newborn would have likely died. Instead, she recovered fully.

"It fascinated me that Darlene and this other nurse had seen the same warning signs, they had all the same information, but only Darlene detected the problem," Crandall said. "To the other nurse, the mottled skin and the bloody Band-Aid were data points, nothing big enough to trigger an alarm. But Darlene put everything together. She saw a whole picture." When Crandall asked Darlene to explain how she knew the baby was sick, Darlene said it was a hunch. As Crandall asked more questions, however, another explanation emerged. Darlene explained that she carried around a picture in her mind of what a healthy baby *ought* to look like—and the infant in the crib, when she glanced at her, hadn't matched that image. So the spotlight inside

Darlene's head went to the child's skin, the blot of blood on her heel, and the distended belly. It focused on those unexpected details and triggered Darlene's sense of alarm. The other nurse, in contrast, didn't have a strong picture in her head of what she expected to see, and so her spotlight focused on the most obvious details: The baby was eating. Her heartbeat was strong. She wasn't crying. The other nurse was distracted by the information that was easiest to grasp.

People like Darlene who are particularly good at managing their attention tend to share certain characteristics. One is a propensity to create pictures in their minds of what they expect to see. These people tell themselves stories about what's going on as it occurs. They narrate their own experiences within their heads. They are more likely to answer questions with anecdotes rather than simple responses. They say when they daydream, they're often imagining future conversations. They visualize their days with more specificity than the rest of us do.

Psychologists have a phrase for this kind of habitual forecasting: "creating mental models." Understanding how people build mental models has become one of the most important topics in cognitive psychology. All people rely on mental models to some degree. We all tell ourselves stories about how the world works, whether we realize we're doing it or not.

But some of us build more robust models than others. We envision the conversations we're going to have with more specificity, and imagine what we are going to do later that day in greater detail. As a result, we're better at choosing where to focus and what to ignore. The secret of people like Darlene is that they are in the habit of telling themselves stories all the time. They engage in constant casual forecasting. They daydream about the near future and then, when life clashes with their imagination, their attention gets snagged. That helps explain why Darlene noticed the sick baby. She was in the habit of imagining what the babies in her unit ought to look like. Then, when she glanced over and the bloody Band-Aid, distended belly, and mottled skin didn't match the image in her mind, the spotlight in her head swung toward the child's bassinet.

Cognitive tunneling and reactive thinking occur when our mental spotlights go from dim to bright in a split second. But if we are constantly telling ourselves stories and creating mental pictures, that beam never fully powers down. It's always jumping around inside our heads. And, as a result, when it has to flare to life in the real world, we're not blinded by its glare.

When the Air France Flight 447 investigators began parsing cockpit audio recordings, they found strong evidence that none of the pilots had strong mental models during their flight.

"What's this?" the copilot asked when the first stall warning sounded.

"There's no good speed indication? . . . We're in . . . we're in a climb?" Bonin responded.

The pilots kept asking each other questions as the plane's crisis deepened because they didn't have mental models to help them process new information as it arrived. The more they learned, the more confused they became. This explains why Bonin was so prone to cognitive tunneling. He hadn't been telling himself a story as the plane flew along, and so when the unexpected occurred, he wasn't sure which details to pay attention to. "I have the impression we're going crazily fast," he said as the plane began to slow and fall. "What do you think?"

And when Bonin did finally latch onto a mental model—"I'm in TO/GA, right?"—he didn't look for any facts that challenged that model. "I'm climbing, okay, so we're going down," he said two minutes before the plane crashed, seemingly oblivious to the contradiction of his words. "Okay, we're in TO/GA," he added. "How come we're continuing to go right down?"

“This can’t be true,” he said seconds before the plane hit the water. Then there are his last words, which make all the sense in the world once you realize Bonin was still grasping for useful mental models as the plane hurtled toward the waves:

“But what’s happening?”

This problem isn’t unique to the aviators of Flight 447, of course. It happens all the time, within offices and on freeways, as we’re working on our smartphones and multitasking from the couch. “This mess of a situation is one hundred percent our own fault,” said Stephen Casner, a research psychologist at NASA who has studied dozens of accidents like that of Air France Flight 447. “We started with a creative, flexible, problem-solving human and a mostly dumb computer that’s good at rote, repetitive tasks like monitoring. So we let the dumb computer fly and the novel-writing, scientific-theorizing, jet-flying humans sit in front of the computer like potted plants watching for blinking lights. It’s always been difficult to learn how to focus. It’s even harder now.”

A decade after Beth Crandall interviewed the NICU nurses, two economists and a sociologist from MIT decided to study how, exactly, the most productive people build mental models. To do that, they convinced a midsized recruiting firm to give them access to their profit-and-loss data, employees’ appointment calendars, and the 125,000 email messages the firm’s executives had sent over the previous ten months.

The first thing the researchers noticed, as they began crawling through all that data, was that the firm’s most productive workers, its superstars, shared a number of traits. The first was they tended to work on only five projects at once—a healthy load, but not extraordinary. There were other employees who handled ten or twelve projects at a time. But those employees had a lower profit rate than the superstars, who were more careful about how they invested their time.

The economists figured the superstars were pickier because they were seeking out assignments that were similar to previous work they had done. Conventional wisdom holds that productivity rises when people do the same kind of tasks over and over. Repetition makes us faster and more efficient because we don't have to learn fresh skills with each new assignment. But as the economists looked more closely, they found the opposite: The superstars weren't choosing tasks that leveraged existing skills. Instead, they were signing up for projects that required them to seek out new colleagues and demanded new abilities. That's why the superstars worked on only five projects at a time: Meeting new people and learning new skills takes a lot of additional hours.

Something else the superstars had in common is they were disproportionately drawn to assignments that were in their early stages. This was surprising, because joining a project in its infancy is risky. New ideas often fail, no matter how smart or well executed. The safest bet is signing onto a project that is well under way.

However, the beginning of a project is also more information rich. By joining fledgling initiatives, the superstars were cc'd on emails they wouldn't have otherwise seen. They learned which junior executives were smart and picked up new ideas from their younger colleagues. They were exposed to emerging markets and the lessons of the digital economy earlier than other executives. What's more, the superstars could later claim ownership of an innovation simply by being in the room when it was born, rather than fighting paternity battles once it was deemed a success.

Finally, the superstars also shared a particular behavior, almost an intellectual and conversational tic: They loved to generate theories—lots and lots of theories, about all kinds of topics, such as why certain accounts were succeeding or failing, or why some clients were happy or disgruntled, or how different management styles influenced various employees. They were somewhat obsessive, in fact, about trying to explain the world to themselves and their colleagues as they went about their days.

The superstars were constantly telling stories about what they had seen and heard. They were, in other words, much more prone to generate mental models. They were more likely to throw out ideas during meetings, or ask colleagues to help them imagine how future conversations might unfold or envision how a pitch should go. They came up with concepts for new products and practiced how they would sell them. They told anecdotes about past conversations and dreamed up far-fetched expansion plans. They were building mental models at a near constant rate.

"A lot of these people will come up with explanation after explanation about what they just saw," said Marshall Van Alstyne, one of the MIT researchers. "They'll reconstruct a conversation right in front of you, analyzing it piece by piece. And then they'll ask you to challenge them on their take. They're constantly trying to figure out how information fits together."

The MIT researchers eventually calculated that getting cc'd on those early information-rich emails and hashing out those mental models earned the superstars an extra $10,000 a year, on average, in bonuses. The superstars took on only five projects at once—but they outperformed their colleagues because they had more productive methods of thinking. Researchers have found similar results in dozens of other studies. People who know how to manage their attention and who habitually build robust mental models tend to earn more money and get better grades. Moreover, experiments show that anyone can learn to habitually construct mental models. By developing a habit of telling ourselves stories about what's going on around us, we learn to sharpen where our attention goes. These storytelling moments can be as small as trying to envision a coming meeting while driving to work—forcing yourself to imagine how the meeting will start, what points you will raise if the boss asks for comments, what objections your coworkers are likely to bring up—or they can be as big as a nurse telling herself stories about what infants ought to look like as she walks through a NICU.

If you want to make yourself more sensitive to the small details in your work, cultivate a habit of imagining, as specifically as possible, what you expect to see and do when you get to your desk. Then you'll be prone to notice the tiny ways in which real life deviates from the narrative inside your head. If you want to become better at listening to your children, tell yourself stories about what they said to you at dinnertime last night. Narrate your life, as you are living it, and you'll encode the experiences deeper in your brain. If you need to improve your focus and learn to avoid distractions, take a moment to visualize, with as much detail as possible, what you are about to do. It is easier to know what's ahead when there's a well-rounded script inside your head.

Companies say such tactics are important in all kinds of settings, including if you're applying for a job or deciding whom to hire. The candidates who tell stories are the ones every firm wants. "We look for people who describe their experiences as some kind of a narrative," Andy Billings, a vice president at the video game giant Electronic Arts, told me. "It's a tip-off that someone has an instinct for connecting the dots and understanding how the world works at a deeper level. That's who everyone tries to get."

III.

One year after Air France Flight 447 disappeared into the ocean, another Airbus—this one part of Qantas Airways—taxied onto a runway in Singapore, requested permission to begin the eight-hour flight to Sydney, and lifted into the bright morning sky.

The Qantas plane flying that day had the same auto-flight systems as the Air France airplane that had crashed into the sea. But the pilots were very different. Even before Captain Richard Champion de Crespigny stepped on board Qantas Flight 32, he was drilling his crew in the mental models he expected them to use.

"I want us to envision the first thing we'll do if there's a problem," he told his copilots as they rode in a van from the Fairmont hotel to Singapore Changi Airport. "Imagine there's an engine failure. Where's the first place you'll look?" The pilots took turns describing where they would turn their eyes. De Crespigny conducted this same conversation prior to every flight. His copilots knew to expect it. He quizzed them on what screens they would stare at during an emergency, where their hands would go if an alarm sounded, whether they would turn their heads to the left or stare straight ahead. "The reality of a modern aircraft is that it's a quarter million sensors and computers that sometimes can't tell the difference between garbage and good sense," de Crespigny later told me. He's a brusque Australian, a cross between Crocodile Dundee and General Patton. "That's why we have human pilots. It's our job to think about what *might* happen, instead of what is."

After the crew's visualization session, de Crespigny laid down some rules. "Everyone has a responsibility to tell me if you disagree with my decisions or think I'm missing anything."

“Mark,” he said, gesturing to a copilot, “if you see everyone looking down, I want you to look up. If we’re all looking up, you look down. We’ll all probably make at least one mistake this flight. You’re each responsible for catching them.”

Four hundred and forty passengers were preparing to board the plane when the pilots entered the cockpit. De Crespigny, like all Qantas aviators, was required to undergo a yearly review of his flying skills, and so, on that day, there were two extra pilots in the cockpit, observers drawn from the airline’s most experienced ranks. The review wasn’t perfunctory. If de Crespigny stumbled, it could trigger his early retirement.

As the pilots took their seats, one of the observers sat near the center of the cockpit, where standard operating procedure usually positioned the second officer. De Crespigny frowned. He had expected the observer to sit off to the side, out of the way. He had a picture in his mind of how his cockpit ought to be arranged.

De Crespigny faced the evaluator. “Where do you intend to sit?” he asked.

“In this seat between you and Matt,” the observer said.

“I’ve got a problem with that,” de Crespigny said. “You’re inhibiting my crew.”

The cockpit went silent. This kind of confrontation was not supposed to happen between a captain and the observers.

“Rich, I can’t see you if I sit in Mark’s seat,” the observer said. “How can I check you?”

“That’s your problem,” de Crespigny replied. “I want my crew together and I want Mark in your seat.”

“Richard, you’re being unreasonable,” the second observer said.

“I have a flight to command and I want my crew operating properly,” said de Crespigny.

“Look, Richard,” replied the evaluator, “if it helps, I promise I’ll be the second officer if I have to be.”

De Crespigny paused. He wanted to show his crew they could question his decisions. He wanted them to know he was paying close attention to what they had to say and was sensitive to what they thought. Just as teams at Google and *Saturday Night Live* need to able to critique one another without fear of punishment, de Crespigny wanted his crew to see that he encouraged them to disagree.

“Fantastic,” de Crespigny said to the evaluator. He turned back to the controls and began moving Qantas Flight 32 away from the gate.

The plane sped down the runway and lifted into the air. At 2,000 feet, de Crespigny activated the plane’s autopilot. The sky was cloudless, the conditions perfect.

At 7,400 feet, as de Crespigny was about to order the first officer to switch off the cabin’s seatbelt sign, he heard a boom. It was probably just a surge of high-pressure air moving through the engine, he thought. Then there was another, even louder crash, followed by what sounded like thousands of marbles being thrown against the hull.

A red alarm flashed on de Crespigny’s instrument panel and a siren blared in the cockpit. Investigators would later determine that an oil fire inside one of the left jets had caused a massive turbine disk to detach from the drive shaft, shear into three pieces, and shoot outward, shattering the engine. Two of the larger fragments from that explosion punched holes in the left wing, one of them large enough for a man to fit through. Hundreds of smaller shards, exploding like a cluster bomb, cut through electrical wires, fuel hoses, a fuel tank, and hydraulic pumps. The underside of the wing looked as though it had been machine-gunned.

Long strips of metal were bending off the left wing and whipping in the air. The plane began to shake. De Crespigny reached over to decrease the aircraft's speed, the standard reaction for an emergency of this kind, but when he pushed a button, the auto-thrust didn't respond. Alarms started popping up on his computer display. Engine two was on fire. Engine three was damaged. There was no data at all for engines one and four. The fuel pumps were failing. The hydraulics, pneumatics, and electrical systems were almost inoperative. Fuel was leaking from the left wing in a wide fan. The damage would later be described as one of the worst midair mechanical disasters in modern aviation.

De Crespigny radioed Singapore air traffic control. "QF32, engine two appears failed," he said. "Heading 150, maintaining 7,400 feet, we'll keep you informed and will get back to you in five minutes."

Less than ten seconds had passed since the first boom. De Crespigny cut power to the left wing and began anti-fire protocols. The plane stopped vibrating for a moment. Inside the cockpit, alarms were blaring. The pilots were quiet.

In the cabin, panicked passengers rushed to their windows and pointed at the screens embedded in their seats, which, unfortunately, were broadcasting the view of the damaged wing from a camera mounted in the tail.

The men in the cockpit began responding to prompts from the plane's computers, speaking to one another in short, efficient sentences. De Crespigny looked at his display and saw that twenty-one of the plane's twenty-two major systems were damaged or completely disabled. The functioning engines were rapidly deteriorating and the left wing was losing the hydraulics that made steering possible. Within minutes, the plane had become capable of only the smallest changes in thrust and the tiniest navigational adjustments. No one was certain how long it would stay in the air.

One of the copilots looked up from his controls. “I think we should turn back,” he said. Turning the airplane around in order to head back to the airport was risky. But at their current heading, they were getting farther away from the runway with each second.

De Crespigny told the control tower they would return. He began turning the plane in a long, slow arc. “Request climb to ten thousand feet,” de Crespigny radioed to air traffic control.

“No!” his copilots shouted. They quickly explained their concerns: Climbing higher might strain the engines. The change in altitude could cause fuel to leak faster. They wanted to stay low and keep the plane flat.

De Crespigny had flown more than fifteen thousand hours as a pilot and had practiced disaster scenarios like this in dozens of simulators. He had envisioned moments like this hundreds of times. He had a picture in his mind of how to react, and it involved getting higher so he would have more options. Every instinct told him to gain altitude. But every mental model has gaps. It was his crew’s job to find them.

“Qantas 32,” de Crespigny radioed. “Disregard the climb to 10,000 feet. We will maintain 7,400 feet.”

For the next twenty minutes, the men in the cockpit dealt with an increasing number of alarms and emergencies. The plane’s computer displayed step-by-step solutions to each problem, but as the issues cascaded, the instructions became so overwhelming that no one was certain how to prioritize or where to focus. De Crespigny felt himself getting drawn into a cognitive tunnel. One computer checklist told the pilots to transfer fuel between the wings in order to balance the plane's weight. "Stop!" de Crespigny shouted as a copilot reached to comply with the screen's command. "Should we be transferring fuel out of the good right wing into the leaking left wing?" A decade earlier, a flight in Toronto had nearly crashed after the crew had inadvertently dumped their fuel by transferring it into a leaky engine. The pilots agreed to ignore the order.

De Crespigny slumped in his chair. He was trying to visualize the damage, trying to keep track of his dwindling options, trying to construct a mental picture of the plane as he learned more and more about what was wrong. Throughout this crisis, de Crespigny and the other pilots had been building mental models of the Airbus inside their heads. Everywhere they looked, however, they saw a new alarm, another system failing, more blinking lights. De Crespigny took a breath, removed his hand from the controls and placed them in his lap.

"Let's keep this simple," he said to his copilots. "We can't transfer fuel, we can't jettison it. The trim tank fuel is stuck in the tail and the transfer tanks are useless.

"So forget the pumps, forget the other eight tanks, forget the total fuel quantity gauge. We need to stop focusing on what's wrong, and start paying attention to what's still working."

On cue, one of the copilots began ticking off things that were still operational: Two of eight hydraulic pumps still functioned. The left wing had no electricity, but the right wing had some power. The wheels were intact and the copilots believed de Crespigny could pump the brakes at least once before they failed.

The first airplane de Crespigny had ever flown was a Cessna, one of the single-engine, nearly noncomputerized planes that hobbyists loved. A Cessna is a toy compared to an Airbus, of course, but every plane, at its core, has the same components: a fuel system, flight controls, brakes, landing gear. *What if,* de Crespigny thought to himself, *I imagine this plane as a Cessna? What would I do then?*

“That moment is really the turning point,” Barbara Burian, a research psychologist at NASA who has studied Qantas Flight 32, told me. “When de Crespigny decided to take control of the mental model he was applying to the situation, rather than react to the computer, it shifted his mindset. Now, he’s deciding where to direct his focus instead of relying on instructions.

“Most of the time, when information overload occurs, we’re not aware it’s happening—and that’s why it’s so dangerous,” Burian said. “So really good pilots push themselves to do a lot of ‘what if’ exercises before an event, running through scenarios in their heads. That way, when an emergency happens, they have models they can use.”

This shift in mindset—*What if I imagine this plane as a Cessna?*—is what never occurred, tragically, inside the cockpit of Air France Flight 447. The French pilots never reached for a new mental model to explain what was going on. But when the mental model of the Airbus inside de Crespigny’s head started coming apart under the weight of all the new emergencies, he decided to replace it with something new. He began imagining the plane as a Cessna, which allowed him to figure out where he should turn his attention and what he could ignore.

De Crespigny asked one of his copilots to calculate how much runway they would need. Inside his head, de Crespigny was envisioning the landing of an oversized Cessna. “Picturing it that way helped me simplify things,” he told me. “I had a picture in my head that contained the basics, and that’s all I needed to land the plane.”

If de Crespigny hit everything just right, the copilot said, the plane would require 3,900 meters of asphalt. The longest runway at Singapore Changi was 4,000 meters. If they overshot, the craft would buckle as its wheels hit the grassy fields and sand dunes.

“Let’s do this,” de Crespigny said.

The plane began descending towards Singapore Changi airport. At two thousand feet, de Crespigny looked up from his panel and saw the runway. At one thousand feet, an alarm inside the cockpit began screaming “SPEED! SPEED! SPEED!” The plane was at risk of stalling. De Crespigny’s eyes flicked between the runway and his speed indicators. He could see the Cessna’s wings in his mind. He delicately nudged the throttle, increasing the speed slightly, and the alarm stopped. He brought the nose up a touch because that’s what the picture in his mind told him to do.

“Confirm the fire services on standby,” a copilot radioed the control tower.

“Affirm, we have the emergency services on standby,” a voice replied.

The plane was descending at fourteen feet per second. The maximum certified speed the undercarriage could absorb was only twelve feet per second. But there were no other options now.

“FIFTY,” a computerized voice said. “FORTY.” De Crespigny pulled back slightly on his stick. “THIRTY . . . TWENTY.” A metallic voice erupted: “STALL! STALL! STALL!” The Cessna in de Crespigny’s mind was still sailing toward the runway, ready to land as he had hundreds of times before. It wasn’t stalling. He ignored the alarm. The rear wheels of the Airbus touched the ground and de Crespigny pushed his stick forward, forcing the front wheels onto the tarmac. The brakes would work only once, so de Crespigny pushed the pedal as far as it would go and held it down. The first thousand meters of the runway blurred past. At the two-thousand-meter mark, de Crespigny thought they might be slowing. The end of the runway was rushing toward them through the windshield, grass and sand dunes growing bigger the closer they got. As the plane neared the end of the runway, the metal began to groan. The wheels left long skid marks on the asphalt. Then the plane slowed, shuddered, and came to a stop with one hundred meters to spare.

Investigators would later deem Qantas Flight 32 the most damaged Airbus A380 ever to land safely. Multiple pilots would try to re-create de Crespigny's recovery in simulators and would fail every time.

When Qantas Flight 32 finally came to a rest, the lead flight attendant activated the plane's announcement system.

"Ladies and gentlemen," he said, "welcome to Singapore. The local time is five minutes to midday on Thursday 4 November, and I think you'll agree that was one of the nicest landings we have experienced for a while." De Crespigny returned home a hero. Today, Qantas Flight 32 is taught in flight schools and psychology classrooms as a case study of how to maintain focus during an emergency. It is cited as one of the prime examples of how mental models can put even the most dire situations within our control.

Mental models help us by providing a scaffold for the torrent of information that constantly surrounds us. Models help us choose where to direct our attention, so we can make decisions, rather than just react. The Air France pilots didn't have strong mental models, and so when tragedy struck, they didn't know where to focus. De Crespigny and his copilots, in contrast, were telling themselves stories—and testing and revising them—even before they stepped onto the plane, and so they were prepared when disaster occurred.

We may not recognize how situations within our own lives are similar to what happens within an airplane cockpit. But think, for a moment, about the pressures you face each day. If you are in a meeting and the CEO suddenly asks you for an opinion, your mind is likely to snap from passive listening to active involvement—and if you're not careful, a cognitive tunnel might prompt you to say something you regret. If you are juggling multiple conversations and tasks at once and an important email arrives, reactive thinking can cause you to type a reply before you've really thought out what you want to say.

So what's the solution? If you want to do a better job of paying attention to what really matters, of not getting overwhelmed and distracted by the constant flow of emails and conversations and interruptions that are part of every day, of knowing what to focus on and what to ignore, get into the habit of telling yourself stories. Narrate your life as it's occurring, and then when your boss suddenly asks you a question during a meeting or an urgent note arrives and you have only minutes to reply, the spotlight inside your head will be ready to shine the right way.

To become genuinely productive, we must take control of our attention; we must build mental models that put us firmly in charge. When you're driving to work, force yourself to envision your day. While you're sitting in a meeting or at the dinner table, describe to yourself what you're seeing and what it means. Find other people to hear your theories and challenge them. Get in a pattern of forcing yourself to anticipate what's next. If you are a parent, anticipate what you expect your children to say at the dinner table. Then you'll notice what goes unmentioned or if there's a stray comment that you should see as a warning sign.

"You can't delegate thinking," de Crespigny told me. "Computers fail, checklists fail, everything can fail. But people can't. We have to make decisions, and that includes deciding what deserves our attention. The key is forcing yourself to think. As long as you're thinking, you're halfway home."