Sky Tales – the much-anticipated follow-up to Captain Lim Khoy Hing's first bestseller *Life in the Skies* – is a new fascinating collection of tips, advice, anecdotes and tales from his distinguished flying career.

In his entertaining and enlightening style, Captain Lim shares insights into aviation safety and the rigorous training airline crew go through, as well as information on aircraft technology and how it is used to navigate the plane in tricky weather conditions. He even advises us on whether or not you can be sucked down airplane toilets, and how we should react when confronted with a fellow passenger's smelly feet!

More than anything else, safety is at the forefront of Captain Lim's mind, and this book explains just how far airlines and their staff go to ensure every detail is accounted for to ensure the utmost safety and comfort for their passengers.

"[Captain Lim] has brought comfort to countless readers who, armed with a greater understanding of what happens before, during and after every flight, have been able to overcome their fear of flying."

Tan Sri Tony Fernandes
Group Chief Executive Officer, AirAsia

AirAsia

visit our website at:
www.marshallcavendish.com/genref

Marshall Cavendish Editions

TRAVEL/AUTOBIOGRAPHY
ISBN 978-981-4779-23-4
9 789814 779234

CAPTAIN LIM KHOY HING

SKY TALES

Marshall Cavendish Editions

ASIA'S BESTSELLING AVIATION AUTHOR

SKY TALES

MORE INSIGHTS FROM A LIFE IN THE SKIES

CAPTAIN LIM KHOY HING

SKY TALES

MORE INSIGHTS FROM A LIFE IN THE SKIES

CAPTAIN LIM KHOY HING

AirAsia

Marshall Cavendish Editions

Published by Marshall Cavendish Editions
An imprint of Marshall Cavendish International (Asia) Pte Ltd
1 New Industrial Road, Singapore 536196

Reprinted 2017

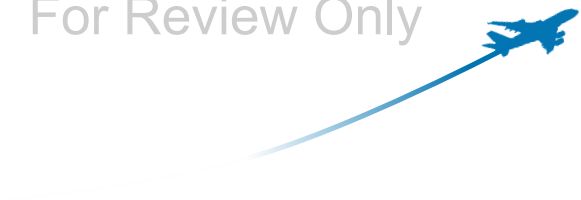
Other Marshall Cavendish Offices:
Marshall Cavendish Corporation. 99 White Plains Road, Tarrytown NY 10591-9001, USA • Marshall Cavendish International (Thailand) Co Ltd. 253 Asoke, 12th Flr, Sukhumvit 21 Road, Klongtoey Nua, Wattana, Bangkok 10110, Thailand • Marshall Cavendish (Malaysia) Sdn Bhd, Times Subang, Lot 46, Subang Hi-Tech Industrial Park, Batu Tiga, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia

Marshall Cavendish is a registered trademark of Times Publishing Limited

National Library Board, Singapore Cataloguing-in-Publication Data

Names: Lim, Khoy Hing. | AirAsia, publisher.
Title: Sky tales : more insights from a life in the skies / Captain Lim Khoy Hing.
Description: Singapore : Marshall Cavendish Editions ; [Malaysia] : Air Asia, [2017]
Identifiers: OCN 990164846 | 978-981-47-7923-4 (paperback)
Subjects: LCSH: Flight. | Aeronautics. | Flight crews.
Classification: DDC 629.1325--dc23

Printed in Malaysia by SSP Industries Sdn Bhd
No. 32/34 Jalan 18, Taman Sri Kluang
86000 Kluang, Johor
Malaysia



This book is dedicated to my wife, Koh Hui Ching;
my daughter and son-in-law, Lim Pei Mun and Jeff Shotton;
my son and daughter-in-law, Lim Kok Chian and Vivian Chok;
and my grandchildren,
Alex, Marcus, Annabelle, Yi Yin and Hao Vern

CONTENTS

PART FOUR – HEALTH AND MEDICAL ISSUES

PART FIVE – PLANES AND HARDWARE

PART SIX – WEATHER

FOREWORD

I remember when Captain Lim first approached me in February 2012 to do a book. He had been writing a monthly column on flying for AirAsia's inflight magazine, *Travel 3Sixty*, for four years then, and he felt he had enough material to compile into a single volume.

He first volunteered to pen the column, *Pilot's Perspective*, after noticing there were no articles about flying in the magazine, and because he felt it was important to demystify the flying experience for our guests. You could say the column was an extension of his personal blog, in which he aimed to shed light on various aspects of air travel, especially for the benefit of first-time flyers.

Captain Lim's commitment to making flying more enjoyable for everyone is laudable, so when he asked if I would sponsor his first book, I immediately said yes. He has a wealth of experience from decades of being a commercial pilot, and I believed a wider audience would benefit from his expertise and knack for explaining even the most complicated things in a way everyone can understand.

That first book, *Life in the Skies*, was a modest success, with 18,000 copies sold since October 2013, and more than 3,000 copies of the Chinese edition sold since July 2015. It was placed third in the POPULAR–*The Star* Readers' Choice Awards at Bookfest @ Malaysia 2015 (English, Non-Fiction category).

More importantly, the book has brought comfort to countless readers who, armed with a greater understanding of what happens before, during and after every flight, have been able to overcome their fear of flying.

Since then, Captain Lim has continued to inform and entertain with new columns — enough to compile into a second book, which is what you hold in your hands. His tireless dedication is the reason I could not be more thrilled or honoured to write a foreword for this book, in which Captain Lim continues to do what he does best — share his passion and knowledge about flying with the world.

PART ONE

SAFETY AND MYTHS

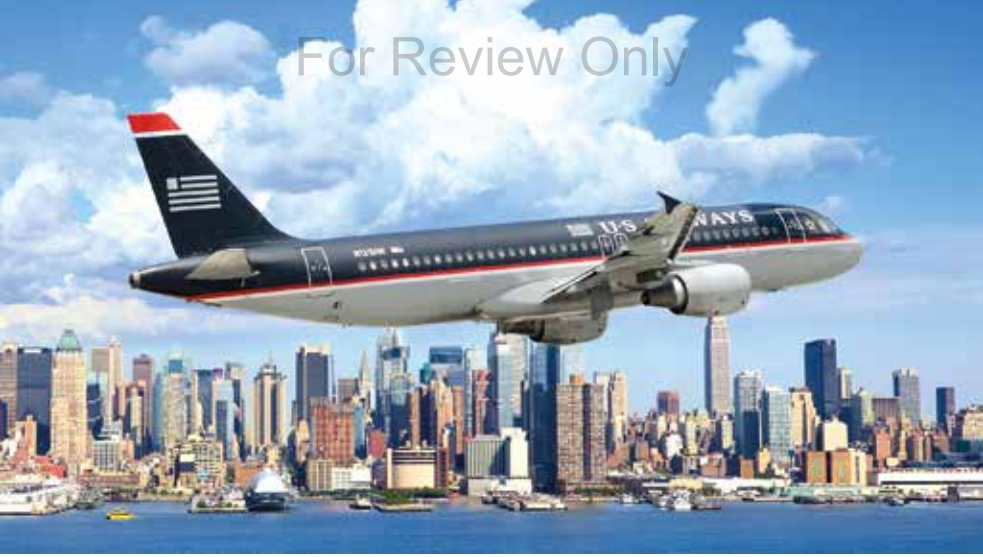
Chapter 1

MIRACLE ON THE HUDSON

What's the likelihood of surviving a water landing during an emergency? This is a question that pops up in my inbox frequently. Well, the 2016 movie, *Sully*, which depicts the famed "Miracle on the Hudson", shows how it is possible to emerge safely from such an unfortunate event. The movie, directed by Hollywood legend Clint Eastwood and starring Tom Hanks as Captain Chesley "Sully" Sullenburger, dramatises the US Airways Flight 1549 crash of 2009, in which all 155 passengers and crew on board were saved after a bird strike.

The Airbus A320 piloted by Captain Sully and First Officer Jeffrey Skiles was on a domestic flight from LaGuardia Airport in New York to Charlotte Douglas International Airport in North Carolina. Three minutes after taking off, the plane struck a flock of Canada geese at 3,000 feet, causing both the engines to lose power immediately.

Are pilots trained to handle two-engine failures? Yes. However, most flying practice focuses on only one engine getting knocked out during the take-off. To have two engines



A US Airways Airbus A320 with New York in the background.

fail once airborne is extremely rare. Dual-engine failure training is normally conducted at very high altitudes to show the distance a plane can glide without propulsion.

For instance, if dual-engine failure occurs at 40,000 feet, a plane can glide about 100 miles and stay in the air for 15 minutes easily. That would allow the pilot and crew sufficient time to prepare for a safe emergency landing.

In the Hudson River incident, both engines failed at a very low altitude, leaving Captain Sully and his co-pilot only about three minutes to decide what to do. When the birds struck the engines and the plane immediately began to lose height, Captain Sully first attempted to turn back to LaGuardia. He was also advised to land at another nearby airport, Teterboro, in New Jersey. Unfortunately, he realised that both options were not within the gliding range of the plane.

When I used to fly to New York City, I would land at Newark International Airport, to the south of Teterboro Airport. Hence I'm quite familiar with its location when approaching from the north, and am reminded of how daunting it would be to handle an emergency in such a congested environment.

Newark International Airport was my favourite destination during my flying days. It is about 15 miles southwest of Midtown Manhattan and was the first major airport in the United States. Up until 2013, it was also the busiest in the area in terms of flights.

In 2015, Newark handled 37.5 million passengers; John F. Kennedy (JFK) International Airport handled 56.8 million, and LaGuardia, 28.4 million. Combined, these three airports in the New York metropolitan area made up the largest airport system in the US and the largest in the world in terms of total flight operations.

As such, traffic within this airspace is always very busy. I always found it difficult to find a pause in between the streaming radio communications in order to pass a message to the air traffic controllers. The native New Yorkers would speak very quickly, and because the traffic was so busy, it could be quite awhile before you were acknowledged and notified of the landing sequence. This can be especially stressful when your plane's approach to the runway is imminent. It was always such a relief when they finally called through. The

best policy, I learned, was to be patient while the controllers were busy talking with the other pilots and say nothing until they called. It was certainly stressful!

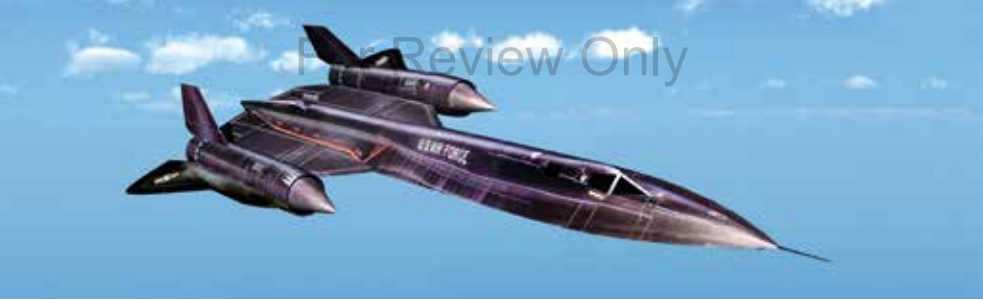
Fortunately, during an emergency, the plane affected is always given top priority. When Captain Sully informed air traffic control (ATC) of his predicament, he was given immediate assistance. Teterboro was suggested, but he declined and opted to glide over the Hudson River as the safest course of action.

He eventually ditched the plane off a point near the Intrepid Sea, Air & Space Museum. This museum has the fascinating SR-71 Blackbird parked on the deck of the USS Intrepid, an old aircraft carrier built during World War II for the US Navy.

THE SR-71 BLACKBIRD

I was rather intrigued by this plane and remember walking all the way from the Radisson Martinique on Broadway at 32nd Street, a block from the Empire State Building, to 46th Street just to see it.

The Blackbird was renowned as the Cold War spy plane. During aerial reconnaissance missions, it operated at very high speeds and altitudes, which allowed it to outrace any threat. If a surface-to-air missile launch was detected, the standard evasive action was simply to accelerate and outfly the missile!



The SR-71 Blackbird.

The SR-71 was used by the US Air Force from 1964 to 1998. A total of 32 aircraft were built; 12 were lost in accidents, but none to enemy action. This plane was developed after the US Air Force U-2 spy plane was shot down by the Soviet Union in 1960, in its airspace.

Some trivia about the Blackbird: It was designed to cruise at just over three times the speed of sound or more than 2,200 miles per hour (Mach 3.2), at altitudes up to 85,000 feet. The plane looked more like a spaceship than an aircraft and 90% of it was made of titanium to withstand extreme temperatures when flying at very high speeds.

The Blackbird was able to avoid being detected by radar because it was painted with a black paint filled with radar-absorbing iron. The US did not produce titanium, but it was able to acquire the ore through third parties from the Soviet Union. So, it was the 'enemy' that contributed to the success of this super spy plane.

THE AIRBUS DITCHING BUTTON

Back to Captain Sully and the spectacular water landing. The Airbus A320 has a ditching button to close all the valves

located underneath the aircraft, to prevent flooding during a ditching. However, in the Hudson River incident, the flight crew, in the heat of the moment, did not activate the switch.

Captain Sully later noted that it probably would not have been effective anyway as the force of the water impact tore holes in the plane's fuselage that were much larger than the openings sealed by the switch. He also noted that the impact could have been less violent, but was prevented from getting maximum lift manually during the crucial four seconds before the plane hit the water. This was because the software within the controls is specifically designed to prevent the plane from pitching down at low speed for safety reasons.

Questions continue to be asked about overall air safety. If you measure the number of crashes against the overall amount of aviation traffic, 2016 was one of the safest years in recent aviation history.

"We are ahead of the 10-year average with eight accidents and 167 fatalities compared to the average of 10 accidents and 205 fatalities," Geoffrey Thomas, an aviation expert and editor of Airlineratings.com, said in a CNN report dated May 20, 2016.

According to data released by the International Air Transport Association, in 2015, more than 3.5 billion people flew safely on 37.6 million flights (31.4 million by jet and 6.2 million by turboprop).

As for commercial airlines, there is no other form of transportation that is so thoroughly investigated and monitored to enhance air safety. Arnold Barnett, a professor of statistics in the Massachusetts Institute of Technology (MIT), said the fatality risk per flight in the US was one in seven million.

You may say statistics do not allay your fear of flying and think that perhaps travelling by train would be safer. I hope the facts will help you reconsider.

According to rail accident records over the past 20 years, the chances of dying on a transcontinental train journey are one in a million, compared with one in seven million on a plane. And, according to figures from the Natural History Museum of Los Angeles County, the odds of dying from a bee sting are higher than in a commercial flight crash!

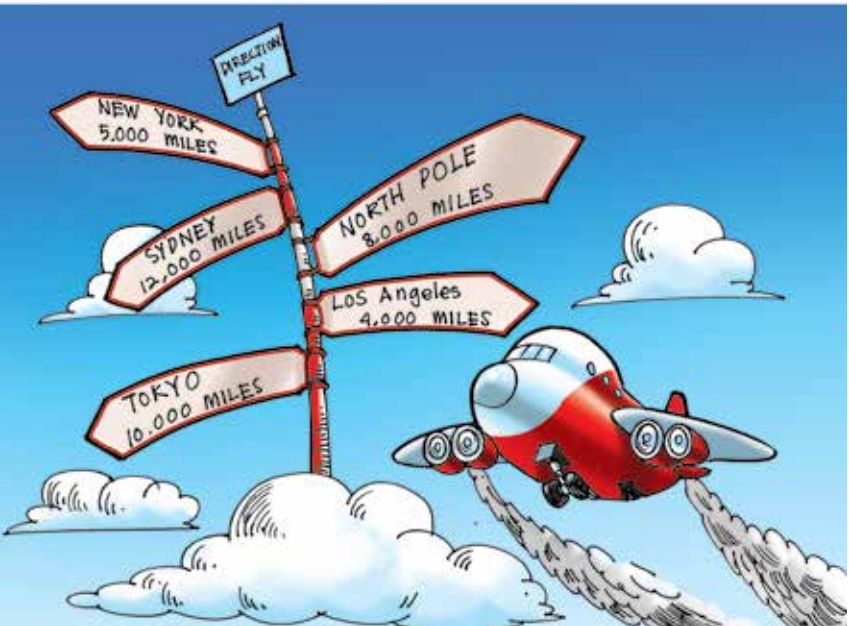
PART TWO

FLYING THE PLANE

Chapter 5

NAVIGATING THE BLUE SKIES

How does a pilot navigate in what looks like an empty sky? Even though the sky may look empty from the ground, it is a web of many invisible airways. Indeed, a flight from, say, Kuala Lumpur to London traverses many routes or airways. Unlike highways where motorists can rely on signboards and exit markers, the skies have no road signs. As such, pilots are trained to navigate from point A to point B from the day they start learning to fly.



In fact, "navigate" is one part of the first golden rule in the aviator's mantra: aviate, navigate, communicate and manage. In aviation terms, to navigate basically means to plan the course of a plane by using flight instruments or maps.

A pilot does not need to remember the airway he is flying in as he can refer to airway charts and use a flight management computer. Here, I will explain the various navigation techniques, from the very basic to more advanced forms.

AT ITS MOST BASIC

From day one, a pilot trainee is taught the basics of navigation: recognising ground landmarks such as buildings, rivers, shorelines, mountains, etc. This is typically mastered in flying clubs or schools that use smaller planes. Note that such basic navigation is only good for flying in perfect weather, at low altitudes and for short distances.

RECKONING ONE'S POSITION

The next basic means of navigation is to calculate a plane's position based on its known speed and direction. For example, if you know your position from 10 minutes earlier and you know that you have travelled due west at 480 knots (or eight nautical miles a minute), simple calculation will show that you are now 80 nautical miles west of your previous position.

This, in air navigation terms, is known as dead reckoning. It requires an accurate fix or position of where the plane is, in what particular direction it is heading, and at what speed. (Mathematics is a mandatory subject that one must excel in to qualify as an airline pilot.) As the pilot progresses to more advanced flying in bigger planes, at higher altitudes and for longer distances, navigation by other means becomes necessary.

NAVIGATING BY RADIO

Radio navigation works by picking up signals from a transmitter on the ground. When a plane is tuned to the frequency of a particular airport station down below, a pointer or dial on the instrument panel in the cockpit will home in on that station. So, in that sense, navigation from the air is easy — just fly towards the station!

But this technique of homing a plane in on a particular point or airfield following radio signals is susceptible to weather interference, which can affect navigation. A more reliable radio navigation aid is the Very High Frequency Omnidirectional Range (VOR) beacon, which transmits stronger and more accurate signals from the ground. VOR stations are often located with a Distance Measuring Equipment (DME) transmitter and, together, they enable a pilot to know exactly how far the aircraft is from the station.

In that sense, when he is within a maximum range of 250 to 300 nautical miles, the pilot is always able to determine the plane's location.

INERTIAL NAVIGATION

If you understand the principle of dead reckoning, then inertial navigation is easy to comprehend. While the former requires the human brain to compute the position of a plane, the latter is performed automatically by a system of gyroscopes.

Put simply, inertial navigation uses three sensitive gyroscopes to measure changes in speed in three directions. The changes are then used to calculate the speed and position of the plane.

Inertial navigation is used in larger planes. Like dead reckoning, it requires an accurate fix or position. However, this system has since been replaced by the even more accurate global positioning system (GPS), similar to those used in your car, such as Garmin, or by the ubiquitous apps on the smartphone, like Waze.

GLOBAL POSITIONING SYSTEM

In aviation worldwide, the GPS has been further refined to provide very accurate guides that enable planes to land in difficult terrain. Using GPS, airplanes can now manoeuvre between canyons and make precise turns onto a runway

without seeing more than just clouds. The GPS guides the plane to safely break out of clouds and aligns it straight on the centre line of a runway. But such approaches can only be flown by aircraft equipped with GPS systems that have been certified to a certain level of accuracy. The pilots must also be specially trained to fly with such navigational aids.

PART THREE

FLIGHT CREW

Chapter 17

SALUTING THE CABIN CREW

Comprehensive training, a cool head and a big heart all figure in the make-up of the glamorous jet-setting crew.

Captain Sully was praised in the media for the way he handled the Hudson landing, but the other quiet hero of the day was flight attendant Doreen Welsh, who efficiently evacuated the cabin, instructing passengers to jump over the seats to move forward. She was so focused on guiding the passengers to safety that she failed to notice a large cut on her leg.

Flight attendants are trained to handle many tasks on board the plane.

Flight attendants have been called "trolley dollies", a term coined in an earlier era in reference to how cabin crew served

drinks and other refreshments from a trolley. In the early days of aviation, the job of a flight stewardess (the preferred terminology now is flight attendant or cabin crew) was an enviable one as it allowed these sophisticated and fashionable women to fly around the globe and stay at top-notch hotels in exotic places while visiting wonderful attractions beyond the reach of regular folks. People perceived flying to be a dream vocation. However, the job is not without its challenges.

TRIALS AND CHALLENGES

The life of the flight crew in general is one of constant travel, navigating time zones and combating jet lag. A flight attendant's schedule differs with every trip. Some flights are night departures while others take off during the day. Domestic flights rarely involve overnight stays while international flights may mean being away from home for one to four days.

For cabin crew, a typical day begins with them reporting at the flight operations centre, where they check where their airplane is parked, meet other crew members and attend a briefing by the senior cabin crew to discuss any extra services needed for the upcoming flight, such as wheelchair assistance for senior guests or special aid for couples travelling with babies and young children. Being well-prepared ensures a smooth flow during the flight.

Their duties once inside the plane include pre-flight checking of the cabin, and then boarding passengers, assisting them where necessary and making sure that the aircraft compartment is ready for take-off. Once all the passengers have boarded, the crew will do a headcount check and make sure that everyone is buckled up, with their belongings safely stowed. They also perform a safety demonstration to ensure all guests know how to buckle and unbuckle their own seat belts, use oxygen masks if necessary, and are aware of safety protocols aboard in the unlikely event of an emergency.

During the taxi, when the plane moves slowly to the runway for take-off, a senior cabin crew member will make a departure announcement while the rest of the team checks to see that everyone is ready for take-off before notifying the flight crew. At this point, all cabin crew would need to be buckled up safely as well. After the aircraft is airborne but below 10,000 feet, the Sterile Cockpit Rule is observed: Cabin crew are not permitted to communicate with the pilots, except on essential matters that affect safety.

Once the aircraft has climbed above 10,000 feet, or about four minutes after take-off, the fasten seat belt sign is switched off and the cabin crew will begin preparing the food and beverage carts for inflight service. At cruise altitude, a beverage service is provided which may include

snacks, or on longer flight, meals too. During the flight, the cabin crew would walk up and down serving drinks and meals, clearing away used cups and eating utensils, attending to passengers' needs, and generally ensuring the comfort of all in their charge.

The flight crew would usually inform cabin crew when they are about 30 minutes from their destination, and issue another reminder when descending below 10,000 feet. This is to give the latter adequate time to prepare for landing and ensure that all passengers have their seat belts securely fastened and baggage stowed away properly.

Upon landing, an arrival announcement is made and once the aircraft is parked at the arrival gate, the cabin crew will commence disembarkation and assist guests where required. Once all the passengers have left the aircraft, the cabin crew perform another check to ascertain that everyone has deplaned and nothing has been left behind. On short-sector flights, the crew perform cabin maintenance during turnaround for the next batch of guests, including scanning the cabin for foreign items, fumigating (to conform to health and agricultural regulations), rearranging aircraft paraphernalia and cleaning the seats — all within 25 minutes on low-cost carriers like AirAsia.

A lot happens in a single day and it can be pretty exhausting as cabin crew are often on their feet the entire time.

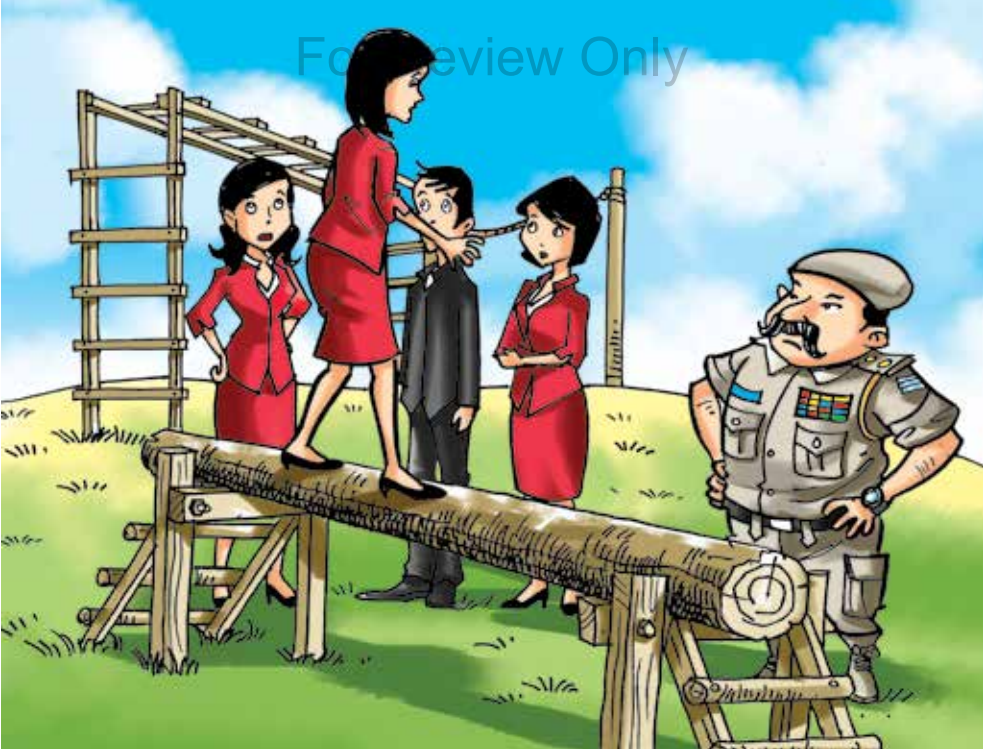
RIGOROUS TRAINING

As cabin crew are always in the front line of customer service, they are an important bridge between passengers and the airline. Yet few travellers realise that the exemplary service they are accustomed to comes only second to a flight attendant's top priority — safety.

Flight attendants are trained to be proficient in the use of safety equipment, such as fire extinguishers, first aid kits and defibrillators, and must be able to perform basic medical assistance such as cardiopulmonary resuscitation (CPR). They are also required to memorise the layout and emergency exits on each aircraft type. Before they can be confirmed as cabin crew, candidates have to demonstrate their ability to handle everything, from first aid to life-saving procedures, in a calm and professional manner. To ensure that they are always up to date, cabin crew are required to undergo a refresher course every year.

You may also have noticed cabin crew requesting guests to return their seats to an upright position, open window shades and switch off electronic devices prior to take-off and landing. These are necessary safety protocols that the crew are tasked with enforcing.

Cabin crew are also trained in soft skills to defuse any tense situation on board before it gets out of hand. Failing that, they are trained to restrain unruly guests, but only as a



The cabin crew's job comes with interesting challenges.

last resort and only if they believe that person to be a threat to other passengers on the flight.

TOUGH PREREQUISITES

In the heyday of aviation, circa the 1960s, there were strict requirements for flight attendants. Back then, female cabin crew were not permitted to marry or have children, and were even required to retire by the age of 32. As a result, most women averaged just 18 months on the job. Today, many of these rules have been relaxed. Marriage restrictions have been abolished and the mandatory retirement age is no longer an

issue. Some retired flight attendants who have had children have even been re-employed; they are known as "flying mothers".

Rules imposed on recruitment today are generally centred on safety. For instance, for height requirements, cabin crew have to be tall enough to reach the overhead compartments. This is to ensure they are able to help passengers properly stow their baggage overhead.

At AirAsia, the typical requirements advertised for cabin crew are a minimum height of 157cm and a maximum height of 170cm for women, and between 170cm and 180cm for men; fluency in English and the local language; an outgoing, vibrant and fun personality, inexhaustible smiles and energy; good communication skills and a positive attitude. Cabin crew are usually aged between 20 and 35 years, and there are no restrictions on marriage or having children. Here, AirAsia looks for natural team players who are dedicated to providing excellent service and can work with people of all cultures and backgrounds. This is because the airline's dynamic workforce is extremely diverse, with people coming from across the Asean region and beyond, and guests today are from all walks of life.

ACKNOWLEDGING THE UNDERAPPRECIATED

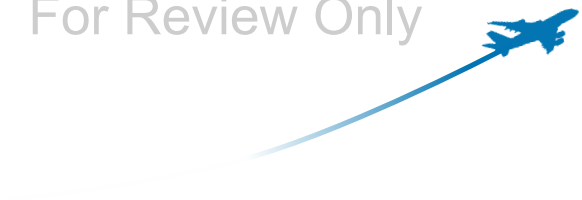
It is the responsibility of the cabin crew to ensure the comfort

and well-being of all passengers on board throughout the journey. To do this, cabin crew undergo rigorous training to comply with the standards set globally by the International Civil Aviation Organization (ICAO).

As such, the term "trolley dollies" is discourteous. It does not adequately describe the skills and responsibilities of the amazing cabin crew who dedicate themselves to the service of passengers. They deserve our utmost respect and I, for one, am honoured to have served alongside outstanding cabin crew who proved time and again that they have both professionalism and heart. In fact, AirAsia made history when it became the first low-cost carrier to be selected as Asia's Leading Cabin Crew at the prestigious 2015 World Travel Awards (Asia and Australasia) and again when it won the World's Best Inflight Service at the 2016 World Travel Awards. These incredible accomplishments just go to show that low-cost does not mean compromising on quality.

PART FOUR

HEALTH AND MEDICAL ISSUES



Chapter 21

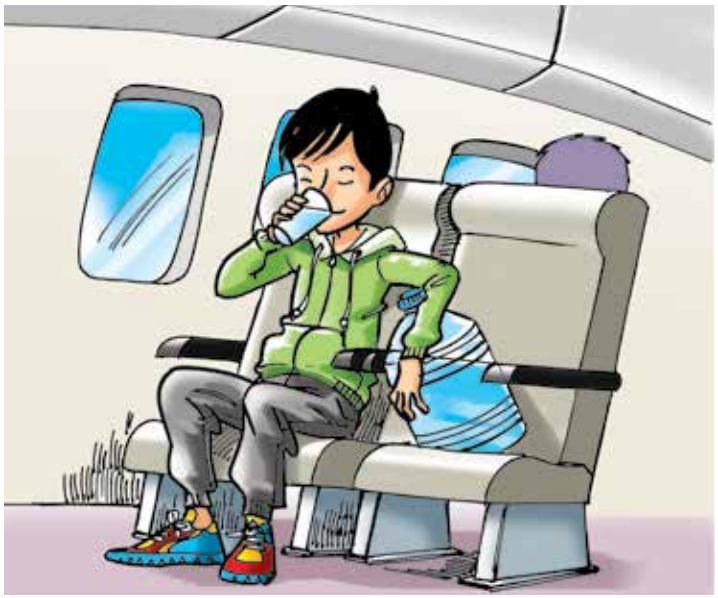
THE DRY DILEMMA

A guest asked me for tips on overcoming the problems caused by dry air. Could the air in the cabin be the reason his nose often bled while flying?

Air inside an airplane can indeed be very dry — it has a very low relative humidity of about 10%. Compare this with the Earth's desert regions, where humidity is around 20% to 25%, or the tropics, where the average relative humidity is 85%.

In the dry environment of the cabin, the skin can lose as much as eight ounces of moisture per hour. According to some medical sources, those with very sensitive skin may find that the delicate sinus membrane inside their nose tends to dry out fairly quickly. This may cause the nose to bleed.

Dehydration may also be the cause of cracked lips, as well as a burning sensation in the eyes, headaches and lethargy. Less obvious consequences of dehydration include stress on the body, reduced mucus production and a weaker immune system.



An adult should drink about eight ounces of water for every hour he is in the air on a long flight.

TACKLING NOSEBLEEDS

To keep hydrated, drink lots of water while on board a plane. The Aerospace Medical Association suggests that an adult drinks about eight ounces of water for every hour he is in the air on long flights. Beverages such as alcohol and coffee should be avoided as they act as diuretics, further dehydrating the body. While flying, one should eat foods that are low in salt and sugar to help the body retain moisture. Finally, be sure to carry a small tube of moisturising lotion to avoid the irritation of dry, flaky skin.

If nosebleeds still occur inflight despite taking all reasonable precautions, it may be necessary to request the assistance of the cabin crew or arrange to see a doctor upon landing.

There are conflicting views among the scientific community as to the main cause of nosebleeds in flight. One doctor commented that if dry air and low humidity were indeed the case, then all those who live in very cold regions of the world and where humidity is very low would experience frequent nosebleeds, as would the majority of air passengers and cabin crew.

Others state that nosebleeds are the result of a common cold or upper respiratory tract infection. In fact, because the nasal blood vessels are very fragile, any irritation to the delicate sinus tissue may cause bleeding.

It has also been shown that there is barely any difference in the incidence of nosebleeds between people working long hours in the cold storage rooms of food processing factories, those working in air-conditioned rooms with low humidity and others working in normal environments.

THE TRUTH ABOUT CABIN AIR

Cabin air may be dry but rest assured that it is very clean. On all modern aircraft, passengers and crew breathe a mixture of fresh and recirculated air. Using this combination rather

than fresh air makes it easier to control cabin temperature and maintain a certain level of humidity.

Occasionally, on some flights, you may notice a strong odour similar to that of exhaust fumes in the cabin shortly after pushback. Usually, this only happens when the exhaust air is drawn into the air-conditioning system when the plane engine is started. Wind is often to be blamed because it causes the air to flow back through the air-conditioning system. The smell normally lasts a minute or so, until the engines are running and have stabilised. It may be unpleasant but it is not much different from the fumes you sometimes inhale in your car while stuck in a traffic jam.

Studies have shown that a crowded airplane is no more germ-laden than other enclosed spaces. In fact, an aircraft's underfloor filters have been described by manufacturers as being of hospital quality.

STRANGE EFFECTS

According to Dr Tom Finger, a professor at the University of Colorado's School of Medicine, dry air can affect how we perceive aromas. "Dry air doesn't help our sense of smell either. Typically, odorants are transported to olfactory receptors in the nose via the mucus lining. When the nasal cavity is dried out, the efficiency at which odorants are detected by the

brain is reduced. When you lose the olfactory component, you lose much of the flavour component of food," he said.

Low humidity and the dried-out sinus cavity may explain why food sometimes tastes different in the sky, compared with on the ground. You may find that the favourite snack you snuck onto the plane no longer tastes the same.

Taking into account how aroma affects taste buds, airlines usually enhance the flavour of inflight dishes to ensure guests always enjoy their meals in the air. Of course, once you have touched down at your destination, you can always get your local fix.

PART FIVE

PLANES AND HARDWARE

Chapter 29

TRAVELLERS' QUESTS

DOES A JET AIRCRAFT NEED TO CONSTANTLY ADJUST DOWN TO FOLLOW THE CURVATURE OF THE EARTH?

A plane will generally fly at a constant altitude and follow the curvature of the earth. It would not gain altitude during a level flight.

Two basic instruments, an altimeter and a vertical speed indicator (VSI), enable a plane to maintain a specific altitude. The VSI provides short-term changes in pressure and indicates whether the plane is climbing or descending, so the pilot can level the plane to maintain a level altitude, say, 35,000 feet. He would adjust the controls very slightly using the elevator and trims. Normally, this is performed by the autopilot. As such, the flight controls are constantly moving very subtly to maintain the correct attitude.

There is the assumption that if the plane was trimmed for a straight and level flight, it would gain altitude while in the sky owing to the curvature of the earth. This happens only in a perfectly motionless atmosphere, where the plane flies dead ahead and over time, gains altitude as the earth

curves away from under the aircraft — provided it has sufficient thrust.

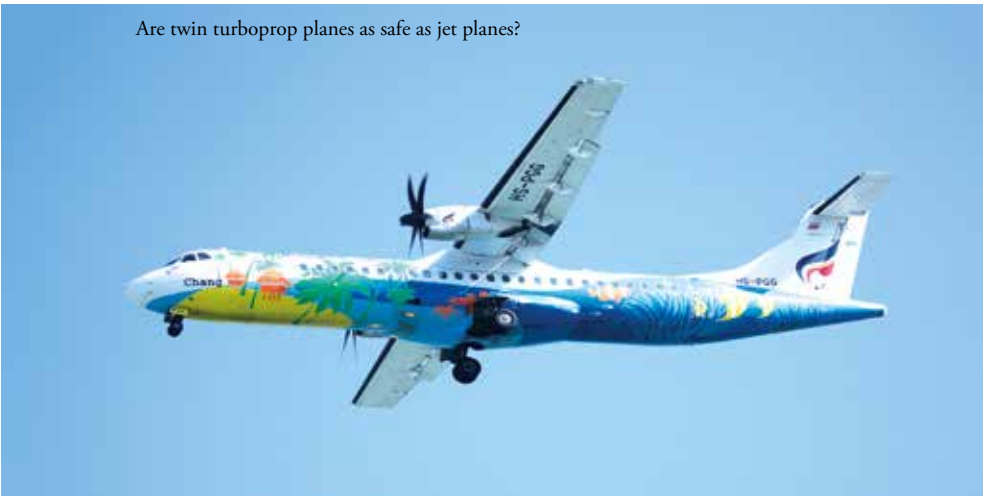
In reality, a constant altitude must be kept using the standard pressure and that means maintaining a fixed distance to the earth's centre of gravity, making the path of the plane a curved one. This is only obvious on very long flights.

ARE TWIN TURBOPROP ENGINES AS SAFE AS TWIN JET ENGINES?

There are some differences between twin turboprop and twin jet planes. A turboprop plane has a smaller jet engine to turn the propellers, whereas a jet engine has a bigger pure jet engine providing the thrust. Both basically have a jet engine.

A turboprop plane must not be confused with a plane that uses a piston engine to turn the propellers. (Turboprop engines are more reliable than piston engines, found in smaller planes such as the Cessna 172.)

Are twin turboprop planes as safe as jet planes?



My view is that both turboprop and jet engines are equally safe, although a turboprop plane has more moving parts, which increases the likelihood of mechanical issues. Nevertheless, if the engines are properly maintained, they are safe regardless of their type.

However, both types of engines can suffer from bird strikes. A small bird will just go through the engine and come out fried or vapourised. If the bird is of average-size, it may cause some damage to the engine. If it is large, like the Canada geese in the "Miracle on the Hudson" incident, it can cause severe damage to the engine.

Turboprops planes may be a little noisier but they are actually safer when landing on shorter runways. They are able to respond and stop much faster because the propellers provide extra drag and help the aircraft to stop when needed.

The other reason turboprops may be more suitable for certain routes is cost. Although jet planes are faster, for flights of less than 500 nautical miles, the additional time spent in the air is insignificant when compared with the fuel savings when you fly a turboprop.

DO AIRLINE PILOTS SUFFER FROM SUNBURN DURING LONG-HAUL FLIGHTS?

An aspiring pilot asked me whether flying, especially at high altitudes, can increase the risk of skin cancer. He also

observed that windshields in the cockpit are laminated and have a vinyl inter-layer to block out most types of ultraviolet rays, including both UVA and UVB.

It is true that airline pilots are more prone to UV radiation than the man in the street and, unfortunately, UV intensity does increase with altitude. This is part of the occupational hazard of being a pilot.

A study published in the *JAMA Dermatology* medical journal found that spending 56 minutes behind the controls in the cockpit at 30,000 feet is equivalent to spending 20 minutes stretched out on an average-strength sunbed.

The UV levels could be even higher when pilots fly over thick clouds and snow fields, which can reflect UV radiation.

Furthermore, airplane windshields do not completely block out UVA rays, which can pass through glass and penetrate the skin and eyes more deeply than UVB rays.

As such, pilots may be at increased risk of skin cancer because of frequent exposure to UV rays. That is why whenever I fly, I always pull down the cockpit window sunscreens to shield off the sunlight.

WHAT IS FLY-BY-WIRE?

When the Wright brothers first flew more than a century ago, their flight controls were fashioned from a unique idea known as wing warping. Wilbur and Orville Wright used a hip cradle to warp the wings of their Flyer. The wings were coupled to the rudder, and the tips could be twisted using a series of cables. The pilot shifts a simple wooden lever with his left hand to control the elevator in order to climb or descend.

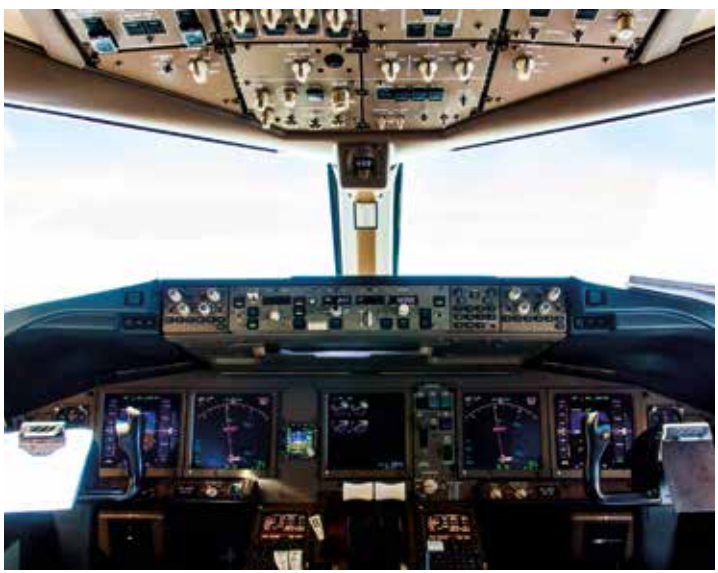
Modern airliners no longer use wing warping to turn. They now employ ailerons, the moving sections on the wings.

When you next travel on a commercial plane, watch the wings during the turns. The pilot will roll the aircraft in the direction of the turn. You will probably be surprised to note how little deflection is necessary to turn a large airliner.

Gradually, as planes became larger, the heavier flight control surfaces had to be moved by cables and hydraulics. Today, cables have been replaced by the fly-by-wire (FBW) system.

THE FBW SYSTEM

"Wire" here refers to electrical signals. Prior to FBW, the flight controls of planes were connected to the pilots by physical cables, similar to those used to steer the rudder of a motorboat. For example, on old planes such as the Boeing 707, to commence a climb, the pilot would have to pull the flight control wheel up. This in turn moved the elevator control at the rear of the plane. This movement was possible because of cables. These cumbersome, lengthy and heavy cables are now replaced by electrical wires, reducing weight and thus saving cost. Hence the term "fly-by-wire".



The flight controls of the Boeing 777 are operated via the fly-by-wire system.

When a pilot intends to perform a climb on the Airbus A330, he gently pulls back the sidestick controller. The signal from the control is transmitted instantaneously to the elevators near the tail, not through cables but wires that run about 200 feet from the cockpit to the back.

As such, there are no direct mechanical links, cables or hydraulics between the pilots and control surfaces in the FBW system. This reduces the problem of removing cables, linkages and hydraulic tubing during maintenance. It also facilitates the use of software that can be incorporated into the autopilot system for safer flying.

The first flying machine to use the FBW concept successfully was the Apollo Lunar Module, in 1969. Apollo was able to take men from Earth's orbit to the surface of the moon. The landing of the rocket required a deftness and control that no human being could master then. The FBW concept was soon applied to new-generation military aircraft.

Even though the military had adopted FBW by the early 1980s, the commercial sector was less enthusiastic. The argument then was that commercial jets did not need the agility required to fly a fighter, nor did they have to worry about designing for stealth. But the fact is, FBW offered lower fuel costs as well as smoother flights in bad weather.

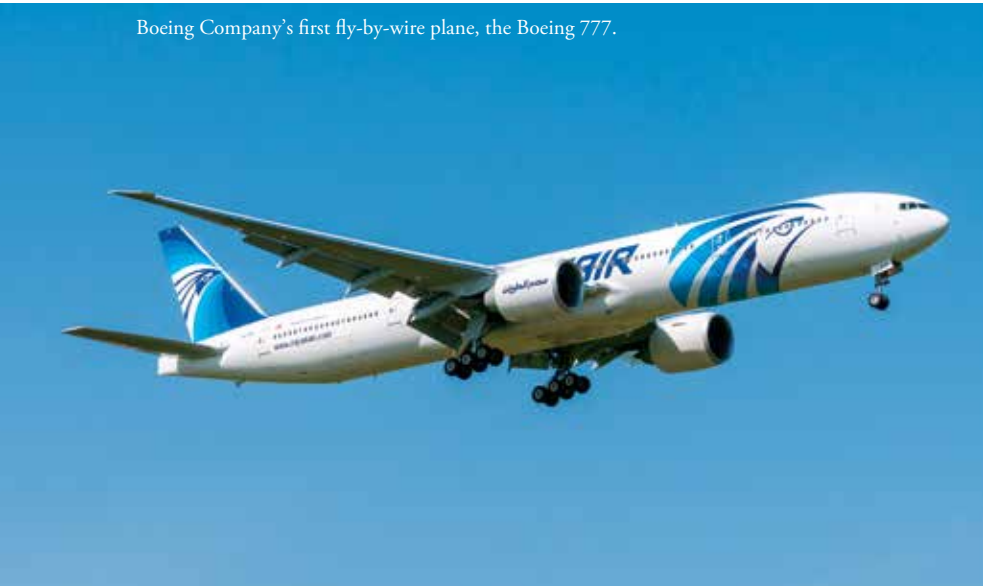
The Aérospatiale/BAC Concorde was the first FBW airliner, but this technology was slow to be introduced into

commercial airlines until Airbus Industries did so in 1984, in its A320 airplanes. Ten years later, the Boeing Company followed suit with digital controls in its 777 planes. Thus, the FBW concept, basically the result of wanting to put man on the moon, has become an accepted part of modern aviation design.

BOEING'S PHILOSOPHY VERSUS AIRBUS'

Although the Boeing 777 and 787 and the Airbus A320, A330, A350 and A380 have adopted the FBW concept, there are slight differences in their applications. Airbus has taken a much different philosophical approach to using computers, designing its new FBW jets with built-in protections.

Boeing, on the other hand, believes pilots should have the ultimate say, and allows them to override onboard



Boeing Company's first fly-by-wire plane, the Boeing 777.

computers and their built-in limits, if necessary. The issue is should the pilot or a computer have ultimate control over a commercial jetliner as the plane approaches its design limits in an emergency?

There are strong arguments by pilots from both sides of the debate. Some are of the opinion that Airbus' computer protection is better whereas others support the Boeing philosophy that they should have the final say in controlling the airplane.

When the Airbus A320 first came out in 1987, it was marketed as a very safe plane. In other words, it was not possible to stall the plane in flight owing to a special inflight protection known as an alpha floor. When the plane approaches a predetermined attitude, the thrust levers will automatically apply full power to the engines to prevent the plane from falling off the sky.

However, an unfortunate accident happened shortly after the plane came onto the market during an air show in June 1988. An Airbus A320 crashed into the trees while making a low-and-slow fly-past in Habsheim, France. It was supposed to fly by with the gear down at about 100 feet. Instead, it came in at less than 30 feet off the ground. According to the captain, who survived the incident, there were issues with the radio altimeter and power acceleration which were not made known to them by the company.

PART SIX

WEATHER

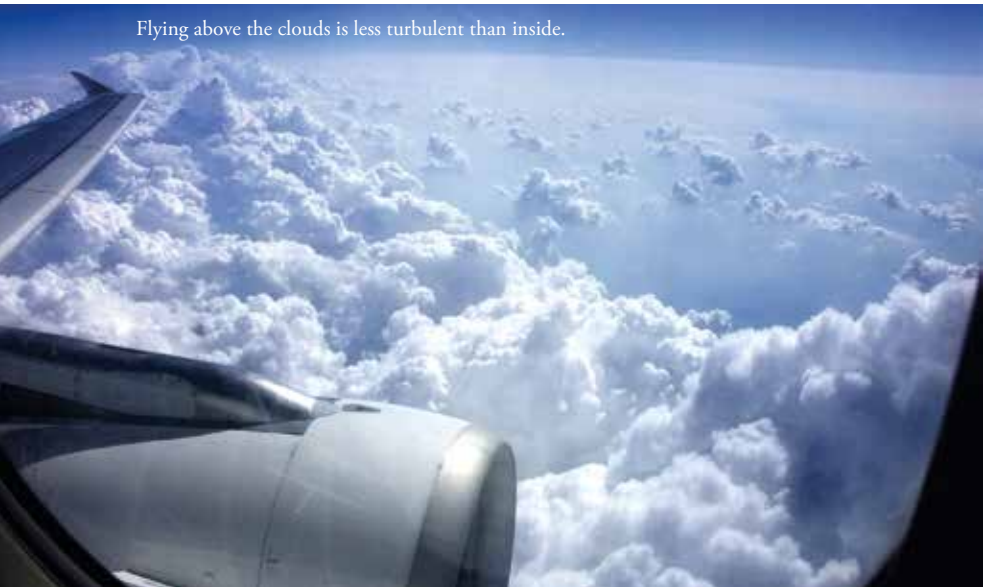
Chapter 35

WEATHERING OBSTACLES

Flying has come a long way since the Wright brothers first flew the Kitty Hawk in 1903. Many issues on weather that once affected flight safety have since been understood and addressed.

Aircraft are much better equipped and good flying techniques are constantly being introduced to ensure that passengers travel in utmost safety and comfort.

Pilots take great pains to plan every flight, as carefully as if their very own families were on board. Prior to



Flying above the clouds is less turbulent than inside.

every departure, the captain and his first officer will run through a series of briefings, especially on how to manage threats or deal with errors with regards to the weather for the day.

When I was flying, I would first check if my flight would encounter turbulence or thunder clouds (cumulonimbus), or whether there would be any rain or poor visibility which could potentially hamper my landing.

HANDLING TURBULENCE

Turbulence is a common topic discussed by air travellers. A plane flying in the air is just like an ocean liner at sea. When the sea is rough, the ship will rock. Similarly, a plane will shake on encountering turbulent air.

There is nothing for passengers to worry about as long as they have their seat belts securely fastened. In fact, the captain would generally know in advance that he will be approaching an unavoidable patch of irregular air mass.

Visually, he would know that the rocky ride would soon affect his plane and he would try his best to manoeuvre away from the turbulent air.

A pilot can also check the smoothness of his journey by reviewing the route forecast on the flight plan, as every segment of his flight would have an indication of the severity of turbulence the plane would encounter, known as shear rate.

Shear rate ranges from a figure of 0 to 20, and anything rated five upwards is a warning to the captain to be on his toes.

Depending on the ride, he may caution passengers by switching on the seat belt sign. Prior to encountering the "roller coaster ride", he would reduce his speed just like a motorist approaching a speed bump on the road would.

Turbulence is normal. It may, at times, cause the wing tips of the aircraft to flex a little and the engines to shake slightly on the pylon. But they are designed to do so. Structurally, the wings of most modern planes are very strong and are constructed to withstand about 150% of the strongest force that the plane can encounter in flight.

AVOIDING THUNDERSTORMS

Thunderclouds are shown on the radar screen of the plane as red at its most intense spot and pilots avoid them like the plague. Flying in their vicinity would make for a choppy ride and lightning strikes become a possibility.

Depending on the height of the plane and the clouds, the captain may request deviation of around 20 nautical miles to stay clear of turbulence associated with these clouds. However, lightning in the vicinity of a thunderstorm, though fearsome, is generally not dangerous to the airplane or its passengers. Even if there is a direct strike, it will not penetrate the cabin. Modern airliners are built to absorb over

eight times the energy carried by a bolt of lightning. When an airplane is struck, the electrical charges just traverse the length of the aircraft and exit through static dischargers at the trailing edges of the flaps or tailplane. I have personally experienced lightning strikes on my plane when flying and treated it as a routine occurrence. I merely reported the encounter to the engineer upon landing.

NAVIGATING WITH POOR VISIBILITY

Poor visibility is a factor to be considered for safe landing. A well-trained flight crew will be able to land an aircraft even in very poor visibility of 100 metres, using the ILS, a highly accurate and dependable system that is fully capable of guiding an airplane to a runway in poor weather conditions. For airports without ILS, visibility has to be good for a pilot to attempt landing.

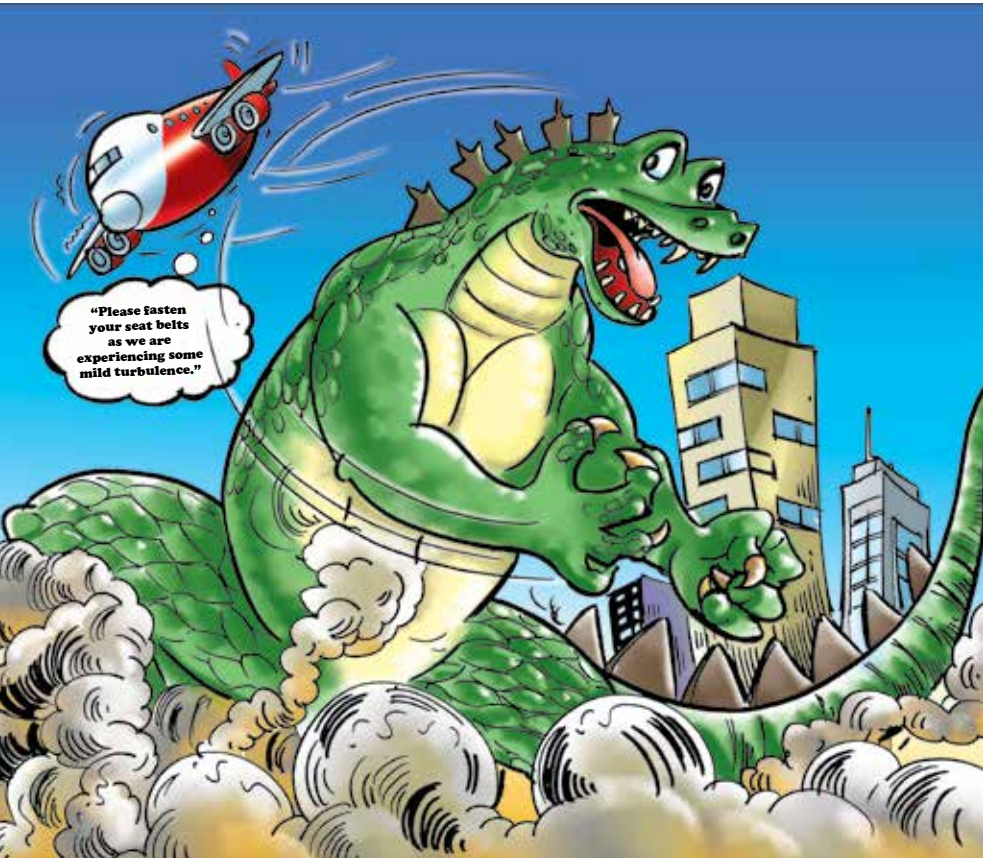
The conventional wisdom among pilots is that they should not attempt a third landing once they have tried twice to land in poor visibility without the aid of the ILS. Instead, they should divert to another airport. Statistics have proven that doing otherwise is ill-advised.

FLYING IN THE RAIN

Rain may reduce visibility during take-off or landing. Commercial airliners have strict rules about weather

conditions, including minimum visibility. There are operational limitations. For instance, I have refused to take off in the rain with crosswinds during an approaching typhoon, a decision that incurred the ire of some passengers. Such actions are taken with the safety of passengers in mind.

Passengers are quite delighted when a landing is smooth. That usually happens on a good day when the runway is dry. However, landing smoothly is not necessarily desirable all the time. When the runway is wet, a firm, positive touchdown



or landing is necessary in order to prevent aquaplaning. Too smooth a landing will fool the computer into believing that the plane has not landed and the anti-skid system operation may not kick in. Advanced avionics and computerisation have made it possible to land in low visibility without much fuss.

COOL IN THE COCKPIT

While you might imagine that the cockpit crew are working furiously when the plane is encountering turbulence, the truth is that your pilot is probably wondering if there are any passengers who may have forgotten to buckle up when the seat belt sign is switched on. To the flight crew, turbulence is a normal part of flying.

The wings and body structure of a plane are incredibly strong and can withstand very strong pressure exerted on them. Even in very poor visibility, auto landing will safely deliver you to your destination.

ABOUT THE AUTHOR

Captain Lim Khoy Hing is an ex-airline pilot. Prior to his retirement from the airlines, he flew all the latest fly-by-wire planes such as the Boeing 777 and Airbus A320, A330 and A340. He has logged a total of 25,500 flying hours.

Captain Lim was trained by the RAF in the United Kingdom in 1967. He served with the Royal Malaysian Air Force for about 13 years prior to joining Malaysian Airline System Berhad (now known as Malaysia Airlines Berhad).

In 2006, he flew with another airline, AirAsia, then AirAsia X until 2011, when he retired at the age of 65. He is now a flight simulator instructor with AirAsia X. Occasionally, he also trains airline pilots at the Asian Aviation Centre of Excellence.

Captain Lim pursued his law studies as an external student of the University of London while he was with the airlines. He has an LLB (Hons)(London) degree and a Malaysian Certificate of Legal Practice, but is not a practicing lawyer.

Captain Lim is happily married with a son (engineer), who lives in Kuala Lumpur, and a daughter (IT consultant), who lives in London. He has five grandchildren.

Captain Lim and his family.

His first book, *Life in the Skies*, was published in 2013. It has since become a regional bestseller and won third prize in the POPULAR–*The Star* Readers' Choice Awards at Bookfest @ Malaysia, in 2015.

He now spends his time with his grandchildren, occasionally writing articles for *Travel 3Sixty* magazine and running his website at www.askcaptainlim.com for the benefit of aspiring pilots and fearful flyers. He can be contacted via his website.