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100 KNOTS

India's Premier Crew Magazine

Entrepreneur
Rajat Jaiswal

Art
Illustrative Storytelling

Health
Pilot Fatigue in Domestic Flying

Training
Aviation English

Technology
Advanced Air Mobility

Travel
Living in Luxembourg

Statistics
Scheduled Airlines Fleet

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EDITORIAL MESSAGE

Preet Palash
Editor

Dear Aviation colleagues

Welcome to the April edition of the 100 KNOTS Magazine.

March has been an exciting and challenging month for Aviation in India. We saw our community demonstrating unity, strength and resilience when all the operators came together to evacuate our fellow countrymen escaping war in Ukraine. My heartiest regards to everyone who participated in the mission.
March also saw DEFEXPO (10th-13TH March) and WINGS INDIA (24th-27th March) being concluded with huge success. Asia's largest civil aviation event, WINGS INDIA had exhibits from industry majors like Airbus, Embraer, NAL, Pawan Hans, Pratt & Whitney and Rolls Royce. I am also sure the entire industry is curiously waiting to see TATAs negotiation of the A350s with Airbus to go through.

Airbus released its India Market Forecast and the numbers are sunshine to the aviation community. Report indicates, India will be requiring 2,210 new aircraft over the next 20 years and an additional 34,000 pilots to fly them. Aviation Minister Jyotiraditya Scindia announced the target of creating 220 airports by 2025 including 80 new airports. Regarding the Pilot training industry, permissions are underway to set up 15 new flight training schools for pilots. All of this is pointing towards a very modest and sustained industry growth in the coming years.

In this magazine, we have covered scheduled airlines in India and their fleet details. Various Industry experts who have written on critical topics, both technical and non-technical that affects our daily operations.

I close this message by inviting everyone to submit their exciting ideas to 100 Knots. All papers are received with a high degree of enthusiasm and it will find a home in the future issues. We are committed to publishing all discoveries, methods, resources, and reviews that significantly covers Indian aviation sector at large.

Our sincere thanks to all the contributors for their support and interest. We hope to hear from you soon!

THIS ISSUE

Scheduled Airlines

Most Popular Aircraft

Total Aircraft – 726

Wide Body

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Narrow Body

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Turbo Prop

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(c) Vistara

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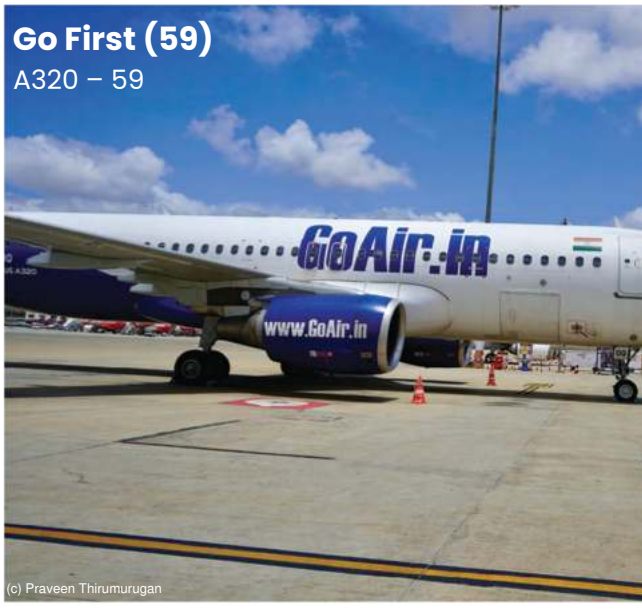

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flybig
(c) Flybig

Importance of Aviation English

Rajat Ahuja
Aviation English Examiner
Captain Airbus A380

Safety is a number one priority in aviation with effective communication being an essential contributing factor. Slight misunderstandings in language between pilots and air traffic controllers (ATCs) could affect the meaning of a message and become an obstacle that could lead to severe consequences. Introducing language proficiency requirements to demonstrate adequate knowledge of English is an extra layer of safety since there is less room for error or misinterpretation. Pilots and ATCs require intensive training throughout their careers and demonstrating language proficiency is one of them. The key to a successful relationship is effective communication and this couldn't be more applicable in this field.

For pilots and ATCs to communicate clearly and efficiently around the world, a universal aviation language had to be established. Both parties work closely together to exchange crucial information about the aircraft, flight, crew members, and passengers as well as other external factors and situational awareness that help ensure safe and efficient operations.

Phonetic Alphabet and Phonic Pronunciation

A ALFA AL-FAH	B BRAVO BRAH-VOH	C CHARLIE CHAR-LEE	D DELTA DELL-TAH	E ECHO ECK-OH	F FOXTROT FOKS-TROT
G GOLF GOLF	H HOTEL HOH-TEL	I INDIA INI-DEE-AH	J JULIET JEW-LEE-ETT	K KILO EY-LOH	L LIMA LEE-MAH
M MIKE MIKE	N NOVEMBER NO-VEM-BER	O OSCAR OSS-CAH	P PAPA PAH-PAH	Q QUEBEC KEH-BECK	R ROMEO ROW-ME-OH
S SIERRA SEE-AIR-AH	T TANGO TANG-GO	U UNIFORM YOU-NEE-FORM	V VICTOR =VIK-TAH	W WHISKEY WISS-KKEY	X X-RAY ECKS-RAY
y YANEE YANG-KEY	z ZULU ZOO-LOO	1 ONE WUN	2 TWO TOO	3 THREE TREE	4 FOUR FOW-ER
5 FIVE FIFE	6 SIX SIX	7 SEVEN SEV-EN	8 EIGHT AIT	9 NINE NIN-ER	0 ZERO ZEE-RO

Since miscommunication and language barriers are human errors that could gravely impact flight safety and put those on board at risk, the International Civil Aviation Organization (ICAO) established English Language Proficiency (ELP) requirements for pilots and ATCs. As English was chosen as the language of the skies at the Chicago Convention in 1944, ICAO first began addressing language proficiency for pilots and ATCs in September 1998. In 2008, an ELP test was established as part of the requirements for pilots and ATCs to be fully qualified.

Aviation English is known globally for the phonetic alphabet. The phonetic alphabet is called the International Radio Telephony Spelling Alphabet, International Civil Aviation Organization (ICAO) phonetic alphabet and the North Atlantic Treaty Organization (NATO) phonetic alphabet. The phonetic alphabet consists of distinct words assigned to each letter of the English alphabet.

While alphabet spelling was used in several ways through the history of aviation, naval communication and radio communication, the International Radio Telephony Spelling Alphabet was introduced in 1951.

An advantage of having a standard language for pilots and ATCs to communicate is that pilots flying in the same airspace can monitor air traffic transmissions and increase their situational awareness.

Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the views or positions of any institution or organisation the author may or may not be associated with.

The ELP rating scale established by the ICAO encompasses six levels, from Level (1) "pre-elementary" to Level (6) "expert."

Pilots and ATCs must demonstrate at least Level (4) "operational" proficiency, which calls for vocabulary that is "usually sufficient" to communicate on work-related topics and comprehend discussion of those topics and to engage in exchanges "even when dealing with an unexpected turn of events." It includes requirements for pronunciation and basic grammatical structure, and stresses that the person must "[deal] adequately with apparent misunderstandings by checking, confirming, or clarifying."

Regardless of the proficiency level, testing assesses Pronunciation, Structure, Vocabulary, Fluency, Comprehension, and Interaction. The validity of the test depends on the proficiency level acquired. Those who dominate the language at the expert level (6) do not need to be re-evaluated. Those at level (4) must test every three years, while those at level (5) every five years.

Communication Errors

Communication errors are one of the biggest causal factors in both level busts and runway incursions in aviation.
The information and instructions transmitted are of vital importance in the safe and expeditious operation of aircraft. Incidents and accidents have occurred in which a contributing factor has been the use of non-standard procedures and phraseology.
Phraseology has evolved over time and has been carefully developed to provide maximum clarity and brevity in communications while ensuring that phrases are unambiguous. Below are a few tips through which errors can be mitigated:

• Adhere to standard communication procedures and radio phraseology including readback unless - callsign abbreviation has been introduced by ATC, specifically adapting the callsign to mitigate the risk of callsign confusion.

• Not clip or cut off transmissions.

• Report to ATC immediately all deviations from a previously received clearance, as soon as they are identified.

• Always use headsets during times of high workload.

•At critical stages of flight, actively monitor ATC instructions and compliance with them.

• Request clarification should any ATC communication be unclear, or whenever any flight crew member is in doubt regarding a clearance, or an instruction received.

•Always question unexpected instructions for any phase of flight.

• Each ATC clearance should be readback by the Pilot Monitoring and confirmed by the Pilot Flying prior to acting on the clearance. Where a single pilot is acting as both the Pilot Flying and Pilot Monitoring an additional confirmation readback should be given to the ATC prior to executing a clearance.

For Example:
ATC - "Super 123, descend FL100".
Pilot – "Descend FL100, Super 123" (Confirmation 1) Pilot – "Super 123, leaving FL400 descending FL100" (Confirmation 2).

Introduction of Controller Pilot Data Link Communications (CPDLC) is the step in the right direction for safer and efficient skies

Controller Pilot Data Link Communications (CPDLC) is a means of communication between ATCs and pilots, using data link for ATC communications. (ICAO Doc 4444: PANS-ATM) Typically, communication between ATCs and pilots is done through radio calls either over VHF for short range communications (e.g., operating over the U.S. or Europe) or HF for long range communications (e.g., over oceanic areas). Radio communication suffers from several serious drawbacks:

- It is limited to one radio call at a time and if two stations call at the same time often neither are decipherable – you will often hear pilots call "blocked" on the frequency and the calls must be repeated.
- Voice calls take a certain amount of time – for example a clearance that is issued by ATC must be "readback" by the pilot and that readback in turn must be confirmed to be correct by the ATC.
- Poor reception and signal distortion in some areas is particularly relevant for long-range HF radio calls.

Advantages of CPDLC

- Increased ATCs efficiency by reducing required communications and reducing ATCs workload.
- A reduction in possible voice communication errors by both pilots and ATCs due to language barriers.
- Reduces the chances of VHF frequencies being "blocked" by simultaneous transmissions, thereby increasing airspace utilization.
- Allows different communications at the same time thereby increasing the speed of communication.

To conclude, it is imperative that Aviation English proficiency should not be limited just for the pilots and ATCs but also other departments within the aviation industry e.g., Airline Dispatch, Engineering, Cabin Crew, Ground Services, Medical Services, Emergency Services to name a few. As this will ensure an equitable standard within the industry in maintaining a safe environment.

ABOUT THE AUTHOR

Rajat hails from Jammu & Kashmir, India and is presently living in the United Arab Emirates. A certified commercial pilot with more than 9000 hours and 13+ years of continuous global flight experience on Airbus A380 & A320 aircrafts, Rajat is also a crew resource management Facilitator and Aviation English Examiner. Rajat founded VR Global in partnership with Aviation Academy Belgrade - Facilitating aspiring Pilots, Engineers and Air Traffic Controllers to successfully complete their training in Serbia. Rajat holds degrees in BSc Computer Sciences and MBA Human Resource Management.

Advanced Air Mobility

Providing hope for our travel woes

S Sabu
Type Rating Instructor
Air India

(c) Joby Aircraft

Japan Airlines recently announced that it intends to lease or purchase up to 50 electrical Vertical Take-off and Landing (eVTOL) air taxis with the goal of introducing eVTOL ride-sharing service in Japan which will usher in a new era of aviation - Advanced Air Mobility (AAM). These can carry seven people including the pilot and fly at speeds exceeding 320 kilometers per hour and has a range of 160 kilometers, a perfect fit for Indian conditions. It is also interesting that in the backdrop is another order by another Japanese conglomerate, Marubeni Corporation which has announced a pre-order

option of up to 200 such aircraft in September.
World over, a number of carriers have indicated their intentions to enter the AAM segment including Virgin Atlantic, Brazilian airline GOL, JetBlue, United Airlines and American Airlines.
One should appreciate the foresight of these carriers as the eVTOL aircraft themselves are yet to receive type certification from the regulatory authorities and this process will not be completed before 2022. But it is this very foresight that will enable them to launch services by 2023-24. Aircraft manufacturer, Airbus has created a separate entity to lead the development of its CityAirbus NextGen electric vertical take-off and landing vehicle.

For a country like India with its overcrowded roads and the resultant traffic congestion, eVTOL aircraft offers the perfect solution. Since these aircraft can takeoff and land vertically, they do not need a runway. Polluted cities will obtain immense relief when these aerial vehicles replace the fuel guzzling automobiles as they produce no emission and a low noise footprint. Apart from these tangible benefits, there are other benefits like the time one would save when using an eVTOL air taxi. Some of our new airports like Hyderabad and Bengaluru are located far away from the city and almost all the proposed new airports will also be inevitably located away from city centers.

An electric air taxi which can accommodate 4 passengers, and which has a range of 100-150 kilometers is an ideal solution to all our problems associated with getting to and from the airport avoiding urban traffic jams. Uber-USA has ambitious plans to launch urban air taxi service in select markets and has already signed a contract with a manufacturer for the same. Volvocopter, the German based company announced this week that it is partnering with Saudi Arabia to develop electric vertical takeoff and landing flight operations for a planned industrial, residential, and tourist zone called Neom and operations are slated to start in early 2022.

If India were not to miss the boat, the government should immediately set up a task force with the aim of drawing up a well-defined plan to tap the potential of this new segment. It will be essential for government agencies and departments to be coordinated and prepared to usher in this rapidly developing sector of aviation which will facilitate additional transportation options, create jobs, spur economic activity and competitiveness, advance environmental sustainability, foster further advancement in aerospace technology and support emergency preparedness.

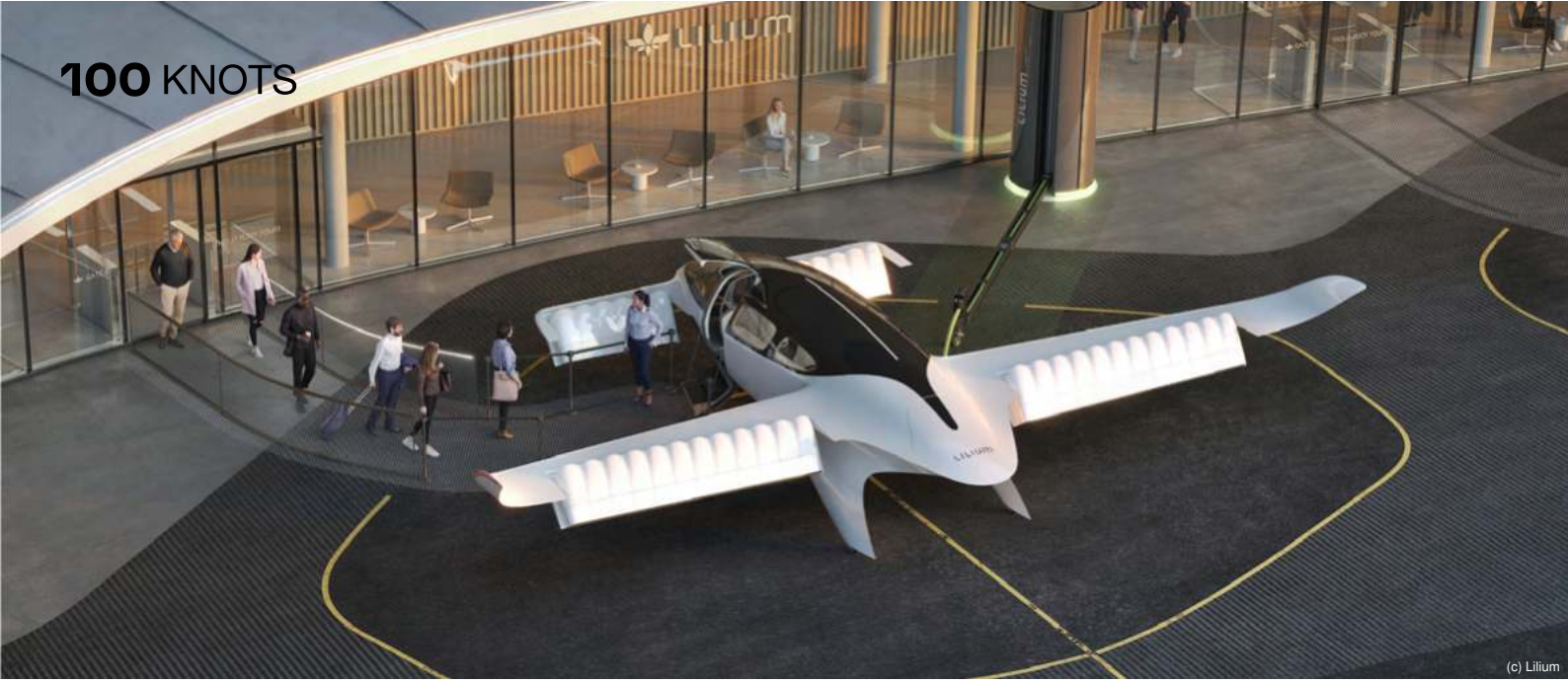
The U.S. Senate has passed legislation designed to establish an interagency working group to promote advanced air mobility (AAM) in the United States. The Advanced Air Mobility Coordination and Leadership Act calls for the Department of Transportation to create a group to "plan and coordinate efforts related to the safety, infrastructure, physical security, cybersecurity, and government investment necessary to bolster the AAM ecosystem.The present Minister of Civil Aviation is taking a keen interest in Unmanned Aerial Systems and eVTOL is nothing but an extension of that. The task force should be entrusted with the task of identifying the unique

Minister of Civil Aviation is taking a keen interest in Unmanned Aerial Systems and eVTOL is nothing but an extension of that. The task force should be entrusted with the task of identifying the unique challenges of incorporating this new mode of aerial transportation into our existing air transport infrastructure. The main challenges will be fourfold:

Pilot Training
Charging & Parking Infrastructure for eVTOLs
Air Navigation
Regulatory Framework & Clearances

Pilot Training

With a sizeable eVTOL pilot workforce needed, we need to shift the training paradigm for meeting the unique challenges and make strategic investments to position ourselves for the change. Since these aircraft are operated by a single pilot, eVTOL pilots should have a high degree of proficiency, even higher than that of a co-pilot of a scheduled air carrier as he/she will not only be burdened with aviating and navigating the craft through a busy airspace but will also have to make 'Command Decisions" in a challenging environment single handedly. This can only be achieved by the highest level of training. Several aspects of AAM operations will be different from conventional air operations and these must be addressed in pilot training. Off airport takeoffs and landings in confined spaces are very challenging and pilots must be trained to a high level of proficiency. As more automation is incorporated, the demand on the pilot might reduce to a great extent but the industry is still at its nascent stage and no compromise should be made in this aspect. There will be unique challenges in preparing pilots to fly this new aircraft platform. In the US, the manufacturers themselves have entered into agreements with training providers to train a huge workforce as they foresee



a huge demand for eVTOL pilots. California based Joby Aviation which is emerging as a leader in the field of eVTOL and the Germany based Lilium are creating their own pilot academies to train pilots to fly their aircraft. The government can think of establishing training centers exclusively for pilots of eVTOL aircraft or even think of private-public partnership in this sphere. Future service providers like Uber and Ola can think of investing in training eVTOL pilots. Companies like CAE, a global simulation provider and some other training organizations have made strategic investments to be in a leading position for this new segment. Though Covid 19 triggered a depressed demand for pilots, with the industry showing signs of a recovery, AAM will create a demand for a new kind of pilot workforce.

Charging & Parking Infrastructure

The biggest challenge will be recharging infrastructure. As eVTOL aircraft solely depend on the charge of their batteries, it is imperative that an infrastructure be put in place for recharging the batteries. Though it is easily possible to have charging ports at major locations like airports etc. it will need to be charged at other locations as well. As of now, only our airports have enough open space to handle the arrivals and departure movements of these aircraft. Each state governments will have to identify and prepare suitable real estate to facilitate landing and departure of these aircraft. These spots can be used by the service providers at a nominal fee. To further minimize the environmental impact the electricity to charge the aircraft should be from a renewable source.

Air Navigation

The existing Air Traffic System should be modified to absorb the heavy volume of air traffic that thissegment will generate. This would mean investing more on automation of the Air Traffic System and hiring professionals with specialized skill sets to manage the automation. Operations of these aircraft will have to be confined to certain 'Classes' of airspace initially and as the system evolves further changes can be made to allow more flexibility.

Regulatory Process

Currently there are no regulatory requirements for AAM operations including pilot training and licensing. Initially the existing regulations may be modified with added special requirements. The manufacturers of eVTOL aircraft should be invited to frame the required regulations to suit our requirements and also design the training program.

None of these challenges are insurmountable. If it is accessible and affordable it will democratize intra-city travel. Though initial passenger fares may be high, in a short time the manufacturers will be able to bring the cost of the eVTOL aircraft down and we will soon be able to witness fares falling to that of a regular cab ride. The viability of an Advanced Air Mobility system is a challenge, but with the right leadership and a good team in place we can overcome the myriad challenges and have an efficient and safe transportation system in place.

ABOUT THE AUTHOR

S Sabu started his career as a flight instructor and then joined Indian Airlines which subsequently merged with Air India. Currently a Type Rating Instructor on the Airbus fleet, his passion is grassroots aviation. He is a Life Member of the Experimental Aircraft Association, the International Aerobatic Club, the Vintage Aircraft Association and a Member of the Royal Aeronautical Society and the Flight Safety Foundation. He is Subject Matter Expert at the Aircraft Accident Investigation Board of India and an Associate Member of the International Society of Air Safety Investigators.

WAT-A-PILOT!

Rajat Jaiswal
By Shakshi Shreya & Prashant Prabhakar

Not many people know about the inspirational journey of an airline pilot who later added his name in one of the most successful and pioneered entrepreneurs of India. Rajat started his aviation career in 2009 as a commercial pilot with SpiceJet Airlines on their B737 fleet. Currently, he is flying as a captain for one of the India's leading aircraft operators on their A320 fleet.

Despite having a successful career as an airline pilot, Rajat never felt content and always coveted to create something of his own. Therefore, in order to give wings to his dreams, he, along with his co-founder, Farman Beig, founded the food chain namely, "Wat-a-Burger". Wat-a-Burger is now a very successful and popular food chain, known all over the country. Like every other successful story, Rajat's story also includes the self-built bridge of constant hustle, perseverance and hard work during a good span of time.

Entrepreneurial Journey

Wat-a-Burger is not my first foray into entrepreneurship. I have dabbled with multiple ventures prior, some of which have been successful while some haven't. Nevertheless, it has been quite of a learning journey and have been instrumental in getting me where I'm at, today.

I started my entrepreneurial journey by investing in a European ice-cream brand, way back in 2009. After having a successful run for about 3 years, I sold it off in 2012. I jabbed the flowing experience and funds and added all of it into my own venture, this time, in the Indian sub-continent and yet again, into the food & beverage industry. My prime focus was on creating a food chain which would cater to the Indian diaspora.

In 2015, I set up a food outlet in Noida, Uttar Pradesh, which was more or less an experimental one of sorts, with the main idea being to establish a proof of concept of my eventual start-up business idea. After about a year of experimentation and perfecting design, the concept finally came to fruition and I launched, what is now popularly known as "Wat-a-Burger".

Food & Beverage Industry vs Aviation Industry

Business has always been my focus and I've always wanted to start something of my own. The reason why I chose to foray into the food industry is because I felt, it was kind of recession proof. Regardless of the economic scenario, pandemic or not, one thing was sure, people are going to eat and nothing would stop them from doing so. The pandemic might stop you from getting out, but it can never stop you from ordering online. Now with restrictions being eased, more and more people are moving and eating out, so the way I see it, venturing into the food industry is a win-win situation and that's precisely one of the major reasons why I opted for this "off-beat" option.

Often times, I've been asked, why I chose to step foot into the food and beverages industry, despite having great insight and experience in aviation industry for a considerable period of time? Like I said, aviation, despite it glitz and glamour, has and will continue to be unpredictable. In my relatively small career of 12 years in aviation, I have seen airlines biting the dust which only goes to show how fragile and unpredictable this industry can be. Thereby, it was essential for me to secure myself financially for anything going down south. I had to do something and obviously it would have to be different from the aviation sector. It only made sense to venture into the food market as it is one discipline where you can bet your money on provided you get the other variables like the scaling and design architecture of the model, perfectly right. The way I see it, if either one of these were to go down, I'd have the other to lean on. Again, a win-win situation.

My experience with the European ice-cream brand, which of course turned out to be a profitable venture in the end, helped me immensely in establishing what I am doing today. The recent statistics show tier 2 and tier 3 cities doing twice as good as what NCR was doing initially.

I still remember a time when the western food giants used to take up a major chunk of the Indian market. Fast forward to today, thanks to the people's inquisitive nature to trying something different, Indian food start-ups have surpassed even their western counterparts in reaching out to tier 2 and tier 3 towns. Additionally, I was also fascinated by the marketing and logistics part of the food industry, which is also one of the reasons why I opted to go for this.

Yes, the Indian food market is coming up with new age entrepreneurs, all of them with unique ideas of different cuisine, although to say the market for burgers is saturated would be an understatement. In a country with roughly a population of about 150 crores, the market share for burgers is still very low. Hence, that makes it an interesting proposition to experiment and expand in this area.

We started at a time when the market was dominated by the western giants and maybe 1 or 2 Indian chains. What made us stand out though, was our concept of "Fusion Food"-wherein we fused Indian food into Western cuisine- an idea that is now adopted by western food giants, for instance the "Makhani" range of burgers by Burger King and 'Indian Dosa Burger" by McDonalds.

Secondly, as we grow as a chain, it becomes imperative that the menu served at one outlet is exactly similar to the ones served elsewhere. What that means is that the recipe has to be infused into the burger in a precise, pre-defined way to maintain uniformity and taste and burgers make it easier to accomplish all of that with minimal efforts.

Technically, a "burger" is all about assembly. In simple words, replicating a gravy with burgers makes it that much simpler. Thirdly, I found a lot of space in the burger market which was untapped. The western giants, apparently, were targeting a very mediocre range of audience with a very limited menu. Overall, the "enticing" factor was missing, is what I felt at that time and that was it. My team and I decided to cash in on these factors and fortunately, it has worked beyond well so far.

Why a burger?

Challenges while establishing a Food Chain

Obviously, the journey has had its share of ups and downs. Consistency is key and it couldn't be any different in the food industry either. We have about 78 outlets across pan India and given the size, maintaining consistency has been of the biggest challenges. We have a team comprising of people from different walks of life and at times, convincing them of certain standards of consistency, has been a challenge. Hence, we have tried to implement technology to try and maintain consistency. Technology based platforms are used to mitigate wrong usage of products or incorrect mixing of ingredients etc.

The entire process is centralized to ensure minimal intervention of other people. Product replication is one another liability associated with this industry. At a day and age where any products can be easily replicated, we control our recipes too. So technically, what that means is if there's a restaurant that wants to copy my menu, they can't as 90% of the recipes are centrally manufactured by us. Prior to any launch, establishing yourself as a brand is of paramount importance. Talking about a concept is one thing and executing it is another. And hence it becomes important to establish a proof of concept wherein now you pitch yourself with reliable and statistical data. From where we are at now, we can walk the walk and talk the talk as well.

Time Management

Being an airline professional first, I'm often asked about how I am managing with the tiring flying schedules and running a successful business model along with. To put it simply, if you have a passion for what you do, you will always find a way. Effective time management plays a critical role and it may mean different for different people. What may be a productive 24-hour day to one may translate to a 48-hour day to me. As pilots, we are inherently good task managers and this has helped me immensely to deliver my duties as a non-aviator! and that is purely what I have done from planning my leaves to utilising the minimal time I get while travelling to the airport to attend calls, I have managed to balance it all.

Of course, it was stressful in the first few years, as is with any new venture, once you get the hang of it, you're good to go. My team and I have worked diligently to create a self-sustaining business model wherein most of the tasks are digitalized. While the backend takes care of the administrative affairs, I handle calls that require my attention, which of course, can be done remotely as well. The bottom-line being, if you can master the art of effective time management, you can do a lot more things outside of aviation too. It's really not that difficult.

Ultimate plan

What does the future hold in-store for me? Well, as they say sky's the limit and you can only fly for so long. Flying has always been my get-away from the hustle-bustle of everyday life and when I'm there, I'm totally disconnected from the rest of the world. For that very reason, I'd like to fly for as long as I can. You can take the pilot of the sky but you can't take the sky out of the pilot!

Message for fellow Aviators

So, my fellow aviators out there, aspiring to take a stroll down the entrepreneurship lane, let nothing or no-one stop you from doing so. Ultimately, it all boils down to how effectively you manage your time and of course, consistency and perseverance is the key. Everyone has the same 24 hours. What matters is how judiciously you utilize those 1440 minutes of a day and make it count as a productive one. Find your passion and keep chasing until you achieve it. Everyone has their own way of working. Find yours and keep hustling. Eventually, you shall find a way. We always do.

Pilot Fatigue in **Domestic Flying**

Dr. S Bhargava MD
Consultant Aerospace
Medicine Specialist

Aircrew operating irregular work hours and flying to international destinations frequently experience fatigue from their job. Often this is a result of the irregular pattern of work and sleep required to maintain round-the-clock flight schedules. These long-haul operations and related fatigue & sleep loss problems have been well studied and documented. However, domestic, short-haul, operations have been largely ignored by all studies and agencies. Fatigue has been cited as a cause in many aviation accidents and is not affected by motivation, professionalism, training, or status.

There has been continuous advancement in aviation technology and operational requirement; however, the human element has been the weakest link in the complete 'man- machine' interphase.

Fatigue degrades most aspects of performance, including judgment, decision making, memory, reaction time, concentration, selective attention, fixation, and mood. Low arousal produced by sleep loss is accompanied by a greater performance decrement on simple rather than on complex tasks. Studies suggest most pilots require between 8 and 9 h sleep per night. Sleep duration is influenced by sleep timing. Hence, pilots crossing time zones can develop cumulative sleep deprivation. This fact is known and well-studied with long-haul pilots. Some studies for domestic flying have been conducted and they clearly show the reasons for fatigue may differ from those in long haul pilots. The main reason could be the FTDL rules which are not realistic to the ever-changing operational environment of the short-haul pilots.

Fatigue and the Reasons

Fatigue is an important influence on pilot performance in commercial airline operations. The work pattern of pilots flying domestic sectors often has several factors associated with increased reports of fatigue. Pilots flying short-haul operations are often rostered for an irregular pattern of early starts and late finishes, which can disrupt normal sleep routines and increase fatigue. In contrast to long-haul flying, the work pattern may involve multiple take-offs and landings, resulting in a more demanding workload across the workday. Furthermore, domestic flying is carried out by two-pilot crews so there are no in-flight rest opportunities and this has been shown to result in higher fatigue levels than three-pilot crews. The most important influences on fatigue are the number of sectors and duty length, which is an important cause of fatigue. Duty length and the number of sectors are known to increase fatigue linearly. Another fact is that fatigue cannot be represented as a simple summation of individual factors. This reflects the complex interaction between, on the one hand, the timing of duty related to the circadian rhythm of fatigue and, on the other hand, the duration of duty and its impact on the timing of sleep.

One study has demonstrated that 87% of the pilots studied were operating despite feeling severely fatigued. Surveys have suggested fatigue is a common problem in short-haul commercial pilots, with pilots identifying extended duty periods and successive early starts as the most important causes. The domestic rosters cause pilots to sleep less, wake earlier and have less restful sleep over the work period. The potential for more accidents with pilots operating when fatigued is high. The issue of managing fatigue in aviation operations must move beyond current regulatory schemes that are based upon long-haul flying while ignoring the increasing demands of commercial domestic flying. A range of approaches could be considered incorporating research, scientific data, and the experience of those flying.

What do we do?

Scheduling of adequate crew rest needs to consider several important factors. These include time since awake, time on task, type of tasks, extensions of normal duty periods, and cumulative duty times.

The “time since awake” is the starting point for fatigue to build. This can be prolonged prior to flying due to the effects of jet lag, early awakening due to disturbances in the sleep environment, the extra time needed to get up check out of a hotel and travel to the airport for flight check-in, and delays in getting started pre-flight procedures including for mechanical problems or weather delays. “Time on task” is the time required to pre-flight and fly. This is the time from check-in to block-in plus fifteen minutes on the last flight of the day. The “type of tasks” depends on the crew position, type of aircraft, and the nature of the flights. Extensions of normal duty periods can occur from events, which prolong the flight longer than scheduled. Such events include delays for en-route weather, rerouting due to traffic, or, more rarely, diversions. Research on-duty period duration suggests that duty periods greater than twelve hours are associated with a higher risk of errors. In determining maximum limits for extended duty periods, consideration needs to be given to all factors which contribute to fatigue including the number of legs in the day’s flight plan. “Cumulative duty times” are most fatiguing when there are consecutive flying days with minimal or near minimal crew rest periods. This can result in sleep debt, which requires additional time to overcome.

There is considerable variability in individual sleep needs. Some individuals do well with 6 hours sleep per night, yet others need 9 or 10 hours sleep. However, most adults require 8 hours of restful sleep to stay out of sleep debt. With aging, there is usually a significant decline in habitual daily sleep due to increased nighttime awakenings. Therefore, in older pilots decreased quality of nighttime sleep can result in increased daytime fatigue, sleepiness, dozing, and napping. Napping seems to compensate for the loss of quality sleep during nighttime hours, but the need for a mid-day nap may not be compatible with flight duty demands on short-haul flights. Research has demonstrated that pre-planned cockpit rest has

improved in-flight sustained attention and psychomotor response speed. In one of the studies, 53% of the pilots suggested controlled Micro Naps as essential in short-haul flying. Presently there are no regulations with DGCA to this effect.

What are the Solutions

The issue of managing fatigue in aviation operations must move beyond current regulatory schemes that are based upon long-haul flying while ignoring the increasing demands of commercial short-haul flying. A range of approaches could be considered incorporating research, scientific data, and the experience of those flying. Some important prevention strategies are required to be incorporated in the regulations. The most important physiological strategy involves making the sleep environment conducive to sleep. Operational countermeasures like involving in stretching exercises and social interaction in the cockpit remain the most essential elements to counteract fatigue.

Some of the important measures are:

• A sudden change of flight schedule should be done in exceptional circumstances. This prevents sleep deprivation.

• A brisk walk around the aircraft at intermediate halts to avoid boredom & fatigue.

• Drink adequate water and take a frequent but small helping of fruits & snacks.

• Aircrew rest cabins at all airports where crew can rest between flights. A simple solution to give an effective cure.

• FDTL rule needs to be changed as shorter haul operations happen in the window of a circadian low period.

• Yoga & pranayama helps in keeping fit & improving concentration.

• Preflight & Post-flight travel factors to be kept in consideration as duty time.

• Importance for pilots to report fatigue.

• Officially permit Micro – naps.

Conclusion

Pilot fatigue is a hazard in commercial flight operations. Many factors contribute to fatigue in the domestic commercial aviation environment. Reviews of various research activities and airline company scheduling policies are needed to correct existing problems. Enhanced pilot training is also needed to prevent fatigue, and to recognize it when it occurs so that effective countermeasures can be employed. Doing so will help ensure that pilots fly adequately rested and alert thereby improving flying safety.

ABOUT THE AUTHOR

Sanjay Bhargava is a consultant Aerospace medicine specialist is a renowned Class 1 medical examiner empaneled with DGCA. He is an alumnus of Armed Forces Medical College Pune. After completing his post-graduate in Aerospace medicine from the Institute of Aerospace medicine Bangalore, he worked as a specialist in Aerospace medicine in various appointments in Indian Air Force. He is a DGCA Class 1 examiner with extensive experience at AFCME, Delhi, AFS Tambaram, and as President MEC (EAST), Jorhat. He has been responsible for finalizing various policies at DGCA. He was the lead doctor for starting civil medical centers for class 1 medicals for DGCA. Over a while, he has been assisting aspiring pilots and solving their DGCA related medical issues through his website http://dgcamedical.in. He has a large following in social media and is respected for his advice given to pilots for the last 3 decades.

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ILLUSTRATIVE STORYTELLING

ANGAD MAOLANKAR

As I'm sure your readers will concur, aviation is an all consuming passion, a passion that manifests itself in (sometimes) weird And wonderful ways. I found myself about 1/3rd of the way towards earning myself a Commerical Pilots License, when the Covid-19 pandemic and it's associated lockdowns brought everything to a screeching halt. Finding myself with ample time on my hands, I figured now is as good a timer as any to make the jump from drawing on paper to designing on a tablet. I initially began posting my work on social media, in order to share my passion for all things aviation. These designs in turn began to garner attention, enough attention to allow me to turn my art into something I could monetise.

Considering the (interesting) times we live in, I've chosen to adopt a 'always say yes to everything' attitude, one which has served me exceedingly well. From just drawing to kill time, I soon found myself designing multiple magazine covers, with a side-gig as a travelling defence correspondent and several defence contracts. In the space of a year my work has found its way onto airfields, a museum, Air Force, Navy and Army squadrons, factories (both Indian and American) and even one Embassy. To highlight how far 'always saying yes' can take you, 2021 saw me going from twiddling my thumbs in Bangalore to shooting Kalashnikovs in Moscow, designing book covers to be released by the President and depicting Indian Naval Aviation in it's entirety on a billboard in Goa.

My nom-de-guerre Non Communist Mao is a play on the family 'call-sign' Mao (a shortened version of my last name) and on being an artist invested in a capitalist venture, juxtaposed against the ever famous/infamous Mao-tse-Tung

MY PROCESS

Purpose: What is the design for? Designing for hangar walls or designing for instagram feeds often require wildly different colours, sizes and the amount of detail

Conceptualisation: Understanding what the client is looking for and what they perceive to be a core attribute of their aircraft.

Study: Accuracy is key, a missing vent or aerial, once noticed is all that everyone is ever going to see. Beyond just the actual aircraft, in order to accurately depict concepts like Electronic Warfare, AEW&C, etc one often needs to spend countless hours reading and quizzing people in the know.

Rough Sketch: Often the step that takes longest and requires multiple re-draws. The process of actually putting pen to paper often reveals holes in a concept, both aeronautical (impossible manoeuvres, bad piloting, etc) and artistic (perspective errors, weird colours, etc)

Detail: The most excruciating step. A basic understanding of aerodynamics, control law and aero-structures help elevate a basic design and turn it into something way more than just another painting. Aerodynamics and control law play a part in how I go about depicting control surface deflection (i.e not drawing an aircraft that is moments away from departing controlled flight). Knowledge of aero-structures manifests itself in how I depict panel lines, knowing which components are composite (i.e no panel lines) and which are metal ensures accurate designs.

Colour: Understanding how different types of light interact with colours and different materials can make or break a design. Curiously, shades of pink, beige and purple feature widely in the predominantly white and grey world of aviation.

Easter Eggs: My favourite part of the process is including certain elements that only people Truly in the know will notice and appreciate.

Corrections: No one likes criticism, but one of the most important steps is to have the client, aerospace professionals and pilots review the design and point out any glaring mistakes. Sometimes these are quick 10 minute fixes, other times it can take weeks to rectify ones mistakes.

Promote and Gloat: Self explanatory

CONCEPT

DETAIL

REFINE

ART AND IT'S REAL WORLD BENEFITS

I truly believe aviation-adjacent hobbies play an oversized part in making individuals better pilots. My art and insistence on getting things right, forces me to build on my aerospace engineering background, developing a deeper understanding of control laws, why certain wing/fuselage elements are shaped in certain ways, etc all have the knock on effect of adding to my knowledge base. I don't claim to be a subject matter expert, but as I've been told many many times, a good pilot is always learning.

Indian Aviation history is not very well documented, and my process (as detailed above) often results in having to rely on first hand sources. First hand sources, like aircrew on the type in question, are now in their mid 80's and 90's, the information I glean from them and translate into graphic art, I hope, will serve as a resource in the future. A future in which such information is not as readily available.

ABOUT THE AUTHOR

Angad Maolankar is a self professed av-geek, aerospace engineer, trainee pilot and artist. Born into a family of pilots, and having had always lived in the vicinity of multiple airfields, he can often be found staring up at the sky.

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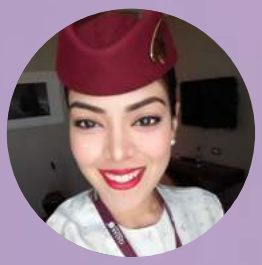


Modhureema Chatterjee
Ex Flight Attendant

Living in *Luxembourg*

In the end of 2021, my husband and I decided to bid our glorious life in the Middle East adieu and relocate to Luxembourg, a small country in the heart of Europe surrounded by Germany, France and Belgium. Even though it's amongst one of the smallest countries, the cultural diversity, beautiful landscapes, magnificent architecture and a booming economy makes Luxembourg very popular for domicile.

Small Country Big History

Founded in 963, Old Luxembourg was at the crossroads of Western Europe and stretched into present day Belgium, Netherlands, Germany and France. Hence along with Luxemburgish, French and German are the two official languages. During the course of the 19th century, European geopolitical situation coupled with both world wars pushed Luxembourg into a rural territory of no strategic interest. Since then, its leadership has changed multiple hands from Germany to Belgium and then finally Netherlands before being independent in 1867.

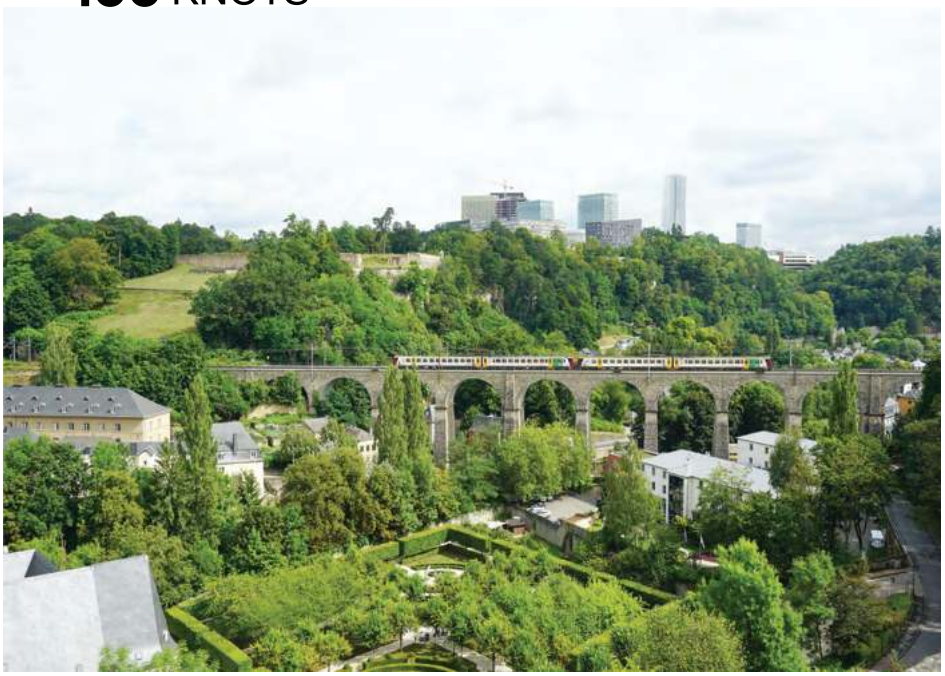
Ever heard of a Duchy?

Well, Luxembourg is the only Duchy remaining. Grand Duchy is a country where the official head of state or ruler is a monarch bearing the title of grand duke or grand duchess. These were territories of significant importance in political, economic or military matters without being of sufficient size or importance to be recognized internationally as a kingdom. Popular grand duchy in the past were Finland, Lithuania and Moscow. Luxembourg today is a representative democracy with a constitutional monarch, headed by Grand Duke Henri and is the world's only remaining sovereign grand duchy. Cool! Isn't it?

Tax haven

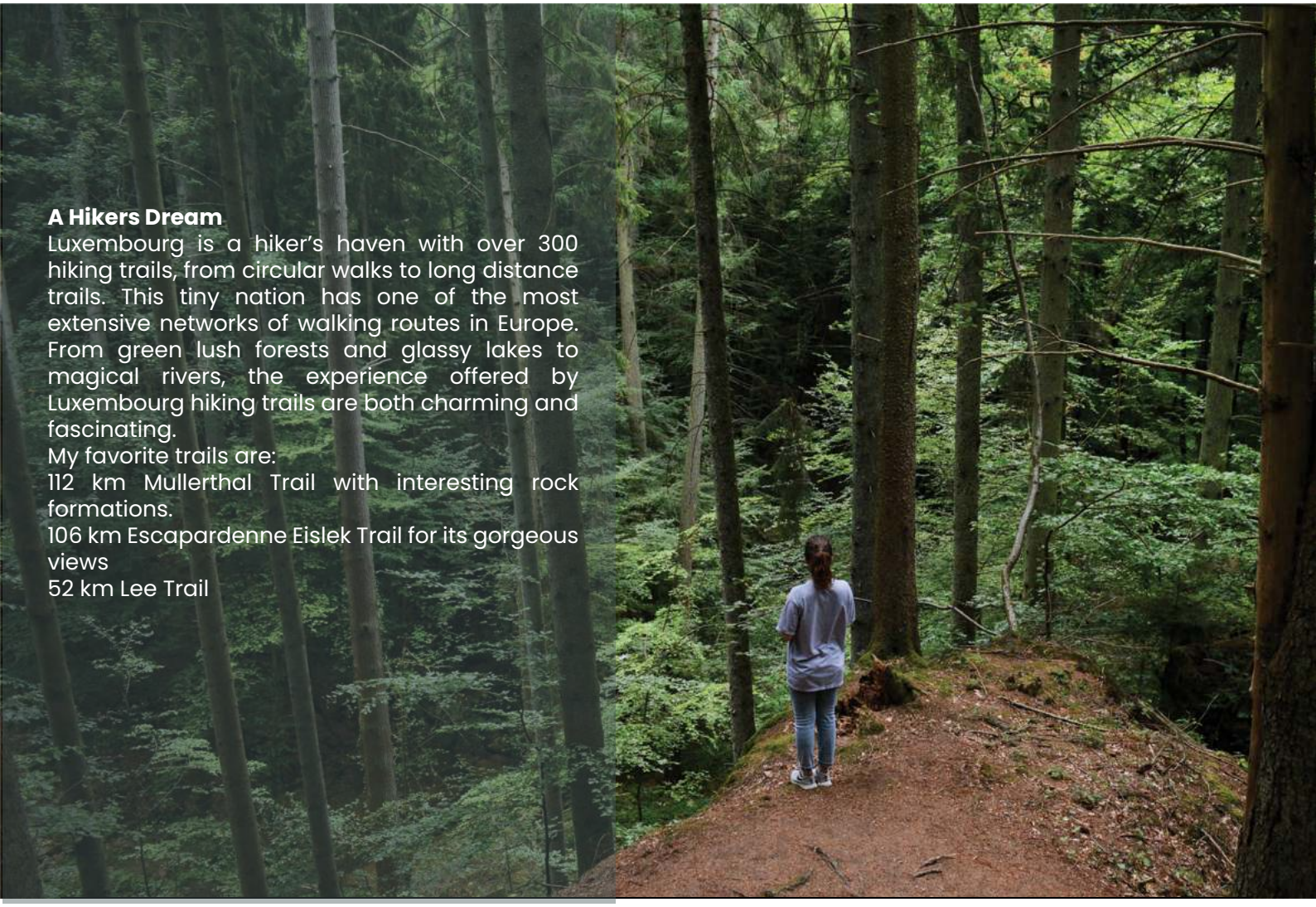
Tax havens are everybody's favorite, especially if you are super rich. Low tax rates coupled with financial secrecy and weak anti-money laundering frameworks means world's rich and famous can hide their wealth from tax collectors. Probably the reason why major companies like Microsoft and Amazon have set up offices here in Luxembourg.

Since the funds are always flowing, the finance sector is the go-to sector to work here. One of the reasons my husband and I chose this country. Being an Anti-Money Laundering compliance expert working in the Luxembourg Fund Industry has been fulfilling. The same goes to say for my husband who is an architect by profession. The growing population in Luxembourg has given rise to demand in housing creating lucrative job opportunities.



Getting here
Luxembourg is a member of the Schengen Agreement so as long as you have a Schengen visa, you are good. Luxembourg Findel International Airport is served by all major European airlines, unfortunately no direct flights from India. Luxembourg has an exquisite train station too and can be reached directly from major European cities in few hours.

A Hikers Dream
Luxembourg is a hiker's haven with over 300 hiking trails, from circular walks to long distance trails. This tiny nation has one of the most extensive networks of walking routes in Europe. From green lush forests and glassy lakes to magical rivers, the experience offered by Luxembourg hiking trails are both charming and fascinating.
My favorite trails are:
112 km Mullerthal Trail with interesting rock formations.
106 km Escapardenne Eislek Trail for its gorgeous views
52 km Lee Trail



What to eat
Luxembourg is home to a surprisingly high number of Michelin star restaurants. Traditional dishes are largely based on pork and potatoes reflecting the Grand Duchy's farming heritage. Some top foods on my list are:

Bouneschlupp - Thick soup consisting of green beans, potatoes, and bacon
F'rell Am Rèisleck - Fried trout in melted butter
Gromperekichelcher – Fried potato cakes or the way I call it "Fancy Aloo Tikki"

What to see
What many don't know, Luxembourg is not just Luxembourg city. The country has many other beautiful city like:
Echternach - Oldest city in Luxembourg
Vianden - Romantic village with stunning medieval Beaufort castle
Remich - All wines come from here

Having said that, the city of Luxembourg receives the highest footfall. It is located on a cliff, overlooking the narrow valleys of both the Alzette and Pétrusse rivers. Most of the old town is protected UNESCO World Heritage Sites. Some of my favorites are:
Gothic Revival Cathedral of Notre Dame
Grand Ducal Palace
Bock casemates
Neumünster Abbey
Place d'Armes

Language
Luxembourgish is the national language. Having said that, it is spoken natively by just over half of the native population. German also enjoys official status in Luxembourg, it is taught in schools, used by the press, court system, church, and is almost universally understood by the local population. That being said, everything from road signs to menus to information in stores, will appear in French, which is the main language of the government. But don't worry, you will do just fine with English. Over 60% of the native population of Luxembourg are fluent in English.

ABOUT THE AUTHOR

Born in Mumbai, Modhureema "Reema" works as an Anti-Money Laundering expert with a leading Luxembourg based accounting firm. Reema is married to Alberto "Tito" who is an Architect and they both reside in Luxembourg. Before moving to Luxembourg, Reema worked as a flight attendant with a leading middle east airline.

AVIATION NEWS

Times of India

India's 1st Indigenous Flying Trainer HANSA-NG Completes Sea-Level Trials

India's first indigenous flying trainer 'HANSA-NG' designed and developed by CSIR-National Aerospace Laboratories, has completed the sea-level trials at Puducherry. The aircraft was piloted by Wing Commander K V Prakash and Wing Commander Dilip Reddy of Aircraft & Systems Testing Establishment, ASTE. According to NAL, HANSA-NG is one of the most advanced flying trainers powered by Rotax Digital Control Engine with unique features like Just-In-Time Prepreg (JIPREG) Composite Lightweight Airframe, glass cockpit, bubble canopy with wide panoramic view, electrically operated flaps, etc.

Aircraft Wallpapers

India to restart scheduled international flights after 2 years from March 27

After a two-year suspension, India will resume scheduled international commercial flights from March 27. Air Bubble arrangements will also stand revoked thereafter. As the decision comes just ahead of the summer travel season, it will allow airlines to add international flights. This could result in the lowering of airfares on some international routes, which have risen in recent weeks due to increasing oil prices and the Ukraine crisis.

Chennai Airport (Twitter)

Chennai Airport introduces a new flight efficiency system to ease operations

The IP-based Automatic Message Switching System (AMSS) has been commissioned at Chennai airport. Nearly 120 hours before the departure of an international flight, a flight plan is prepared, sent to the origin, destination and airport en route. From aeronautical to meteorological information, several crucial operational messages are shared among several departments to transport a passenger safely. The AMSS will help airport management staff and ATC officials better coordinate with airlines and other airports at the same time helping plan their flight better, resulting in significant fuel savings and delays.

Wall Street Journal

US Aviation watchdog set to audit DGCA again

The US Federal Aviation Authority (FAA) is set to audit the Indian Directorate General of Civil Aviation (DGCA) this year. This audit will focus on the improvement in procedures flagged during the previous audit conducted in October 2021. A five-member team of FAA will also audit safety guidelines, licensing of personnel and airworthiness. On satisfactory completion, FAA will retain the category I status for India's aviation sector. Any dissatisfaction would lead to a downgrade, which would mean more scrutiny of airlines from India flying to the US.


IFS

GST rate on domestic MRO services for the aviation industry reduced to 5%

The Goods and Services Tax (GST) has been slashed from 18% to 5% on domestic maintenance, repair and overhaul (MRO) services for the aviation sector. The reduction in tax rate is expected to accelerate the pace of setting up MRO services in India. The expansion of the MRO sector will also assist in employment creation as the industry is labour-intensive. Like other industries such as information technology, where India has become the back office of the world, certain tweaks in taxation could see aircraft flying to India for MRO visits.

Jet Photots (Twitter

Singapore Airlines resume services from Mumbai with Airbus A380 jumbo

Singapore Airlines (SIA) Airbus 380 Superjumbo aircraft has resumed services from Mumbai. The superjumbo aircraft landed in Mumbai on March 14, 2022, after a two-year break in services. SIA said that the A380 replaced the Airbus A350-900 on the SQ 424/423 Vaccinated Travel Lane (VTL) services. SIA's A380 features 471 seats in four classes, six suites, 78 business class seats on the upper deck, 44 premium economy class and 343 economy class seats on the main deck. SIA was the first global carrier to fly the A380 superjumbo in October 2007.


India TV News

DRDO constructs a 7-storey building in 45 days for developing fighter jets

India's premier defence research institute DRDO has built a multi-storey facility for flight control system at Aeronautical Development Establishment, Bengaluru in record 45 days using in-house technology. The 7-storey building, with a plinth area of 1.3 lakh square feet, will house research and development facilities for the development of a fifth-generation fighter jet as part of AMCA project for the Indian Air Force (IAF).


Chetan Puthran (T)

Airbus in negotiation with Tatas for A350s

Airbus has confirmed negotiation with Tata Group for A350s. The A350 aircraft can fly non-stop on ultra-long-haul routes of 18,000 km. Powered by two Trent XWB turbofan engines that result from a very close collaboration between Airbus and the powerplant's manufacturer, Rolls-Royce, the aircraft can travel above 8,000 nautical miles, with a flying time of approximately 18 hours in one flight.


Aviation Int. News


Pipa News

B Ravi Pillai becomes the first Indian to own an Airbus luxury helicopter

B Ravi Pillai, chairman of RP Group of companies, became the first Indian to own an Airbus H145 helicopter, estimated to be worth around INR 100 crore. The helicopter was delivered by Airbus in Kovalam and took its inaugural flight from Kovalam to The Raviz Ashtamudi with the RP Group Vice-Chairman on board. It is the first Airbus D3 helicopter in India and the first five-bladed H145 helicopter in Asia. The helicopter is capable of handling up to seven passengers and two pilots and can land on and take off even at altitudes as high as 20,000 feet above sea level. The H145 is the latest member of Airbus' four-tonne-class twin-engine rotorcraft product range.

2 Training Aircraft Crash In A Day, Aviation Watchdog Orders Audi

Two training aircraft were involved in separate non-fatal accidents in India, following which DGCA has ordered a safety audit of all flying training organisations (FTOs).
The pilot allegedly forgot to open the landing gear in the accident in Jamshedpur in Jharkhand in the first incident, while the second plane crash-landed on the runway in Sultanpur in Uttar Pradesh, officials said. DGCA chief Arun Kumar said strict action will be taken against those compromising safety.

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