February 2024

100 KNOTS

India's Aviation Ecosystem

Flight Safety
Emergency Evacuation

Pilot Fatigue
Fatigue Risk Management System

Aviation Editing
Creative Journey of Alaqmar

Report
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Policy and Reality

Vinay Dube
Akasa Air Boeing 737 MAX Order

A Kerospace Solutions Company

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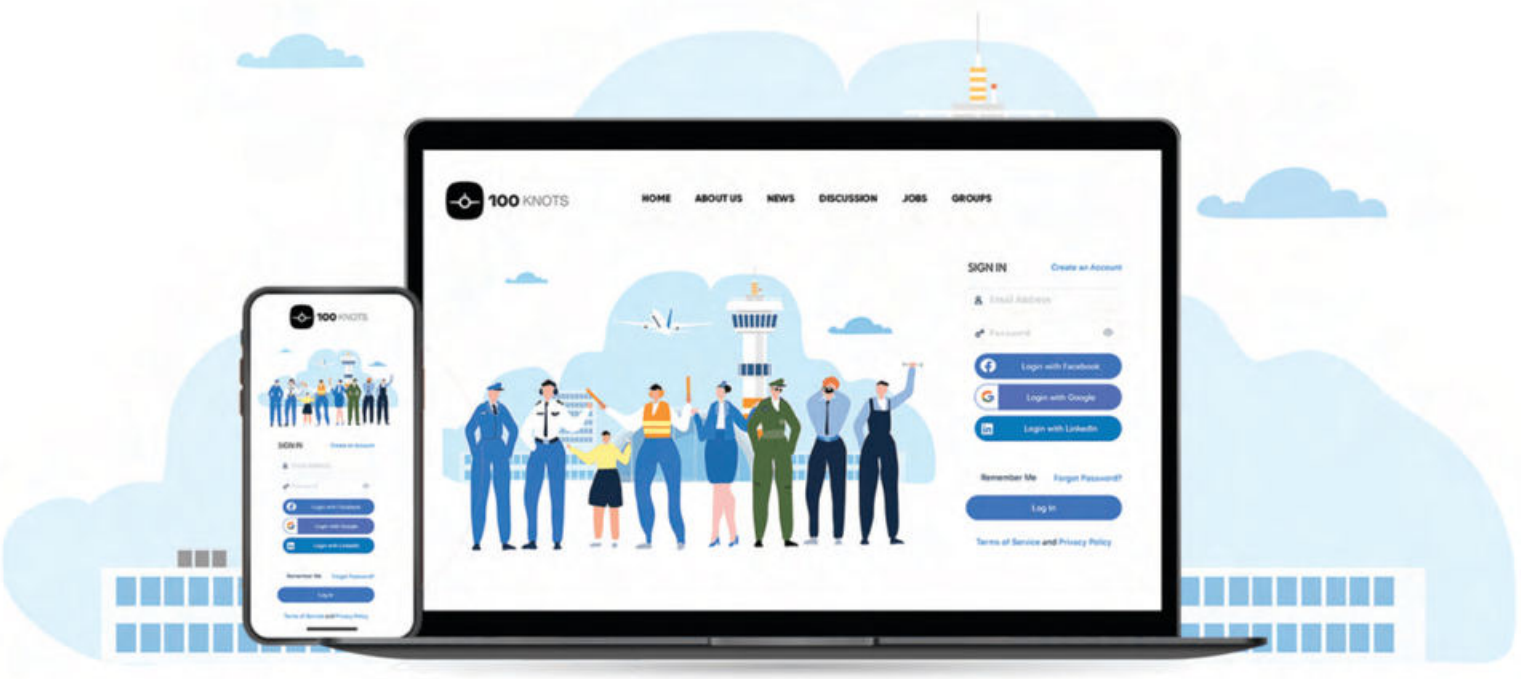

EDITOR'S LETTER

Radhika Bansal
Assistant Editor

Dear Colleagues,

Welcome to the February 2024 issue of the 100 Knots Magazine.

Indian Aviation started the month of January with a bang. Aviation enthusiasts were delighted, from billion-dollar deals signed at WINGS India 2024 to the introduction of Airbus A350 to Air India's Fleet. This annual spectacle of WINGS India has captured the hearts of aviation enthusiasts and attracted global attention, contributing significantly to India's economy. The impressive turnout and positive reception underscore its role as a premier showcase for cutting-edge technology and aerospace advancements.

More reasons to celebrate were added with the recent financial quarter that has witnessed a remarkable surge in growth and profitability. I want to take this opportunity to applaud IndiGo for its impressive financial growth, symbolizing resilience and determination in challenging times. This achievement highlights the airline's robust business strategy and its significant contribution to the economy.

In this edition, we are privileged to have a note from Mr. Vinay Dube, CEO of Akasa Air, who sheds light on how Akasa Air is transforming India's air transportation ecosystem. At WINGS India 2024, Akasa Air has achieved another milestone by placing an order for 150 fuel-efficient Boeing 737 MAX aircraft, making Akasa the only Indian airline to exceed an orderbook of 200 aircraft orders within 17 months of operation. This historic achievement places Akasa Air on track to become one of the world's top 30 airlines by the decade's end.

As always, Contributions, comments, and feedback are always welcome. All papers are received with a high degree of enthusiasm and will find a home in future issues.

Our sincere thanks to all the contributors for their support and interest.

We hope to hear from you soon!

Happy Reading!

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Vinay Dube
Founder and
Chief Executive
Officer
Akasa Air

Akasa Air was born with a purpose to contribute to transforming India's air transportation ecosystem and to cater to the growing demand for air travel across the country by connecting people, cultures and regions. In just 17 months, we executed an ambitious scale-up plan, emerging as the preferred carrier for an increasing number of Indian travelers. Our rapid growth is evidenced by the record fleet size of 22 aircraft within 17 months of commencing commercial operations, marking one of the fastest expansions in global aviation history.

In 2021, we signaled our solid financial foundation with an initial order of 72 aircraft, followed by an additional 4 in June 2023. At WINGS India 2024, we set another milestone by placing an order for 150 fuel-efficient Boeing 737 MAX aircraft, making us the only Indian airline to exceed an orderbook of 200 aircraft orders within 17 months of operation. This historic achievement places Akasa Air on track to become one of the world's top 30 airlines by the end of the decade, embodying the essence of New India, and characterized by progress and perseverance.

These strategic fleet additions will fortify our operations as we expand domestically and venture into international routes. Our commitment to connecting people, places, and cultures remains unwavering, and we are confident in our ability to serve millions of satisfied travelers worldwide in the next phase of our growth.
Since our inception, Akasa Air has redefined the Indian airline landscape through innovative offerings such as Café Akasa, Pets on Akasa, and a signature warm service on the ground and in-flight. Our commitment to excellence is reflected in consistent passenger load factors and positive customer feedback. We have established a strong presence, linking major cities with tier 2 and 3 cities nationwide, serving over 6.3 million passengers across 20 cities since August 2022.

While expanding operations, we prioritized reliability, achieving the highest on-time performance for six months in 2023 and maintaining an average passenger load factor of more than 85% for the last 12 months. This success is a testament to the dedication of all Akasa employees and our unwavering adherence to the airline's values and culture.

Proud of the accomplishments in terms of reliability, service excellence, and safety standards, I am optimistic about Akasa Air's future. With plans to expand in India, the Middle East and Southeast Asia, this latest order will support our ambitions and help cater to the country's burgeoning air travel demand with India poised to become the world's largest aviation market by 2047.

2023 In Numbers

Cargo Operators
2

Public Airports
98

Private Airports
7

Flight Schools
35

Charter Operations
112

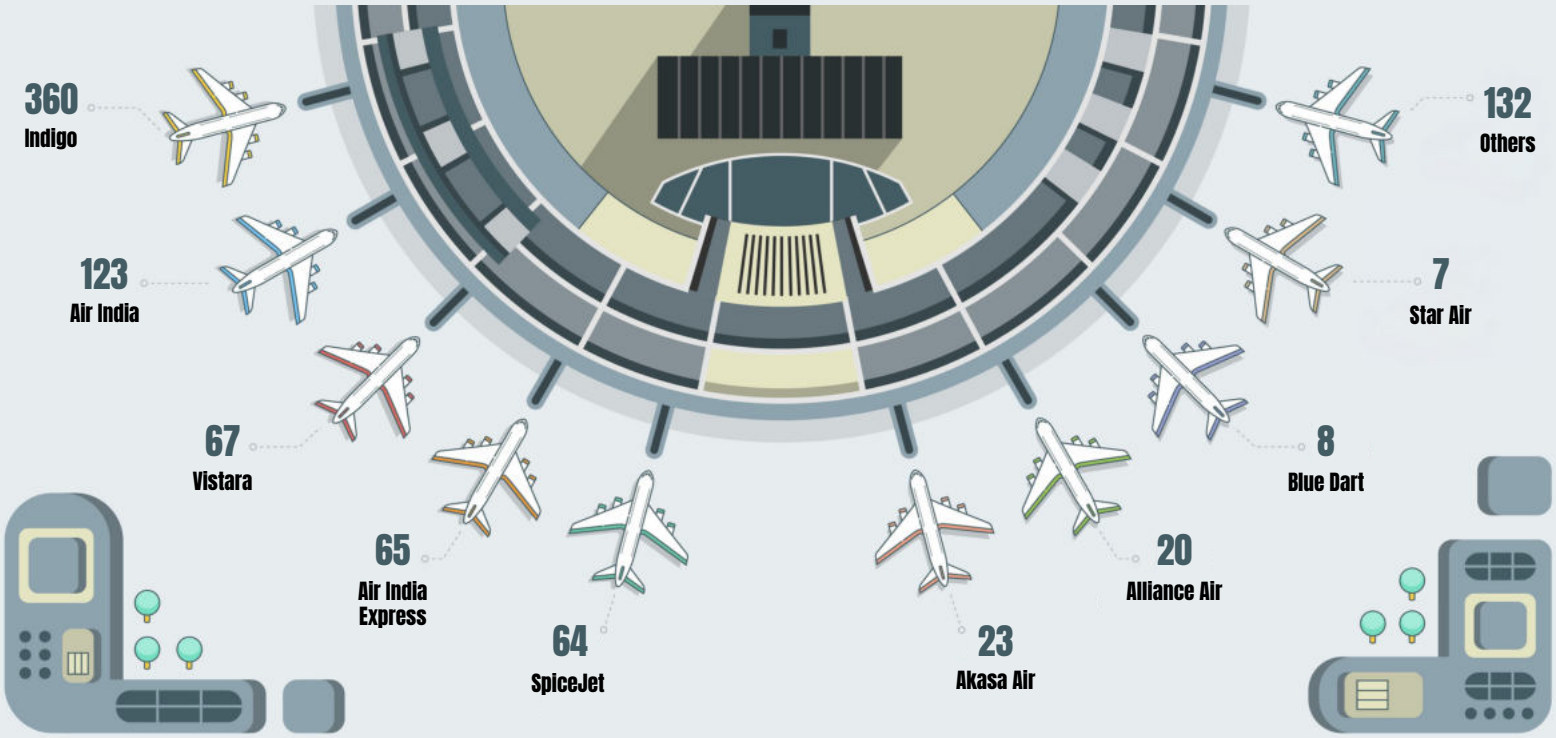
Scheduled Operators 16

Scheduled Operations	2022	2023	Change %
Total Departures (Domestic)	943,553	968,606	+2.65
Total Departures (International)	112,399	156,102	+38.88
Total Passengers (Domestic)	123,242,014	138,243,178	+12.17
Total Passengers (International)	17,212,093	25,632,497	+48.92
Total Cargo Domestic – in Tonnes	684,051	676,687	-1.08
Total Cargo International – in Tonnes	146,204	189,903	+29.89

Passenger (Dom)	2022	2023	Change %	Market Share (2023)
	10,774,438	12,934,853	+20.05	9.36%
	0	274,902	-	0.20%
	11,359,128	12,529,121	+10.30	9.06%
	7,673,068	10,041,369	+30.86	7.26%
Total AI Group	29,806,634	35,780,245	+20.04	25.88%
	69,093,198	83,411,468	+20.72	60.34%
	10,671,150	7,618,052	-28.61	5.51%
	776,118	5,626,695	+624.98	4.07%

January Fleet Report

Scheduled Operations



New Deliveries	
Airbus A320 NEO	4
Boeing B737 8 MAX	3
Boeing B777-300ER	2
Boeing B737-800	1
ATR 72-600	1
Total	11

Returns	
Airbus A319-100	6
Airbus A340-300	1
Airbus A320-200	1
Boeing B737 8 MAX	1
Embraer ERJ 145	1
Total	10

Deliveries

		VT-IQS	31-Jan	Airbus A320 NEO	IndiGo
Akasa Air		VT-YBA	31-Jan	Boeing B737-8 MAX	Akasa Air
AIR INDIA express		VT-BXF	27-Jan	Boeing B737-8 MAX	Air India Express
AIR INDIA express		VT-BXQ	26-Jan	Boeing B737-8 MAX	Air India Express
AIR INDIA		VT-RTJ	26-Dec	Airbus A320 NEO	Air India
		VT-IQQ	26-Jan	Airbus A320 NEO	IndiGo
		VT-IQP	23-Jan	Airbus A320 NEO	IndiGo
AIR INDIA		VT-AEM	22-Jan	Boeing B777-300ER	Air India
		VT-IRM	05-Jan	ATR 72-600	IndiGo
		VT-AEP	04-Jan	Boeing B777-300ER	IndiGo
SpiceJet		TC-CON	03-Jan	Boeing B737-800	SpiceJet

AIR INDIA

A319-100	A320-200	A320 NEO	A321-200	A321 NEO	A350-900	B777-200	B777-300ER	B787-800	Total
11	9	37	13	4	1	8	17	27	127
▼6		▲1				▼6	▲2		▼3

AIR INDIA express

B737-800	A320-200	A320 NEO	B737 MAX 8	Total
26	23	5	11 (+2)	65
			▲2	▲2

vistara

A320 NEO	A321 NEO	B787-900	Total
51	10	6	67

IndiGo

A321 NEO	A321 P2F	A320 200	A320 NEO	ATR 72	B777-300ER	Total
94	3	30	187	44	2	360
		▼1	▲3	▲1		▲3

SpiceJet

A340-300	B737-700	B737-800	B737-900ER	B737 MAX 8	DHC-8	Total
0	8	18	3	12	23	64
▼1		▲1		▼1		▼1

Akasa Air

B737 MAX 8	Total
23	64
▲1	▲1

A320-200	A320 NEO	Total
5	49	54

ATR 42	ATR 72	Total
2	18	20

ERJ 145	ERJ 175	Total
4	3	7
▼1		▼1

BLUE DART

B737-800	B757-200	Total
2	6	8

flybig

DHC-6	Total
2	2

QUIKJET AIRLINES

B737-800F	Total
2	2

PRADHAAN AIR EXPRESS

A320 P2F	Total
1	1

ZOOOM

CRJ 200	Total
4	4

Emergency Evacuation

PP Singh
Ex-Accountable Manager
Jet Airways

On the night of the 2nd of January 2024, a Japan Airlines Airbus A350 collided with a Japan Coast Guard Dash 8 on Runway 34R of Haneda Airport in Tokyo. While the A350 was coming in for landing, the Dash 8 entered runway 34R at an intersection without clearance by the ATC. The flight crew of the A350, for reasons not known yet, were not able to discern the presence of the Dash 8, and collided with it on the runway, coming to rest on the grass verge. A fire developed at the back of the A350 fuselage, which progressed forward and eventually engulfed the entire aircraft. All 379 occupants of the A350 aircraft safely evacuated, but it took around six hours for the fire to be extinguished by the Rescue and Fire Fighting Service (RFFS). The dramatic footage of the crash and the visuals of the charred wreckage are still fresh in our minds.

In contrast, stands the British Airtours Boeing 737 accident at Manchester airport on 22nd of August, 1985. During take-off, its left engine suffered severe damage and an uncontained failure resulting in a fire. The take-off was aborted and the aircraft stopped successfully. An evacuation was carried out and the airport RFFS attended to the aircraft without any delay. However, 55 out of the 137 occupants tragically lost their lives, mainly due to smoke and toxic fumes inhalation. The investigation report highlighted, among other factors, a delay in evacuating passengers as a major cause of the fatalities.

While the investigation report on the Tokyo accident is awaited, one fact that clearly stands out is the importance of a properly executed passenger evacuation in saving the lives of the occupants in an air crash. In the following paragraphs, we will examine the regulations and operating procedures that make the key difference between life and death in such situations.

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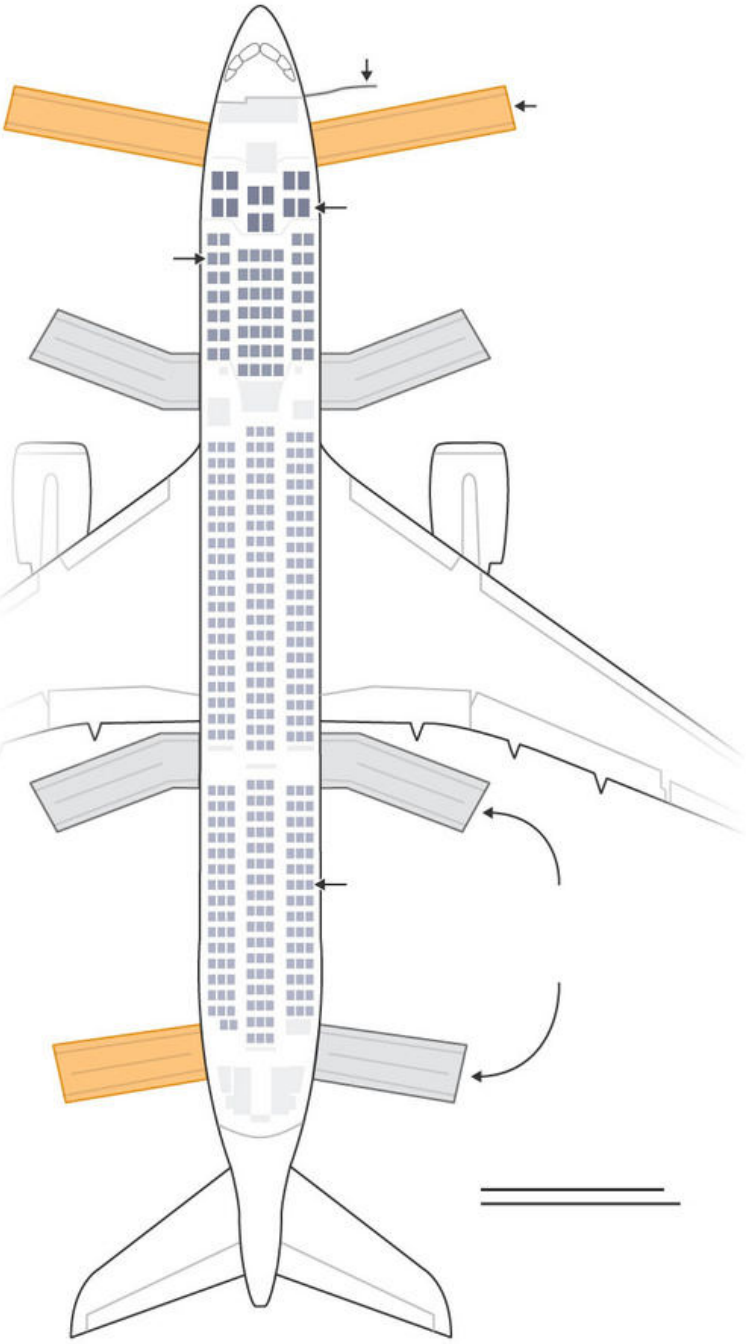


© WSJ

Beginning in 1965, the Federal Aviation Administration (FAA) required each air carrier operating under Part 121 of the Federal Aviation Regulations to perform full-scale evacuation demonstrations under simulated emergency conditions before receiving operating certification for new aircraft or seating configurations. The air carrier demonstration was designed to evaluate crew training and the adequacy of evacuation procedures. FAA initially imposed a 120-second maximum egress time limit for evacuating all passengers and crew, which it later revised to 90 seconds in 1967. It attributed the change to advances in slide technology that had occurred since the initial standard was released. In 1978, the FAA amended the rules to allow 'partial evacuation demonstration' based on a combination of analysis and component testing which can provide data equivalent to that obtainable through full-scale demonstration. This change was prompted by the incidents of injuries sustained by participants during demonstrations.

As per the Federal Aviation Regulations, to obtain type certification, manufacturers of aircraft having more than 44 passenger seats must conduct emergency evacuation demonstrations that test the following:

- Basic aircraft design;
- The efficiency with which passengers can safely be evacuated from the aircraft;
- The emergency evacuation system; and
- The manufacturer's FAA-approved emergency evacuation procedures.

The manufacturers typically elect to conduct the demonstration to serve both the type and operating certification requirements. FAA full-scale evacuation demonstration criteria include the following requirements:

- All passengers and crew must be evacuated from the aircraft to the ground within 90 seconds;
- The demonstration must be conducted during the dark of night or with the dark of night simulated so that the airplane's emergency lighting system provides the only illumination of the exit path and slides;
- A specified mix of passengers "in normal health" must be used- for example, at least 30 percent must be females and at least 5 percent must be over 60 years of age;
- The passengers may not have participated in a demonstration in the previous 6 months;
- Not more than 50 percent of the emergency exits may be used.

The number, duties, and location of flight attendants are specified in national regulations. Flight attendants perform numerous safety-related duties before, during, and after each flight. The individual air carriers provide flight attendants with their initial emergency procedure training, and additional refresher training each year thereafter. Current regulations broadly require 1 flight attendant for every 50 passenger seats installed in the aircraft. For example, the minimum cabin crew requirement laid down by the DGCA (India) is as follows:

- For an aeroplane or a helicopter cabin having seating capacity of more than 50 passengers
- Two cabin crew Plus one cabin crew for each unit (or part of a unit) of 50 passengers seats above a seating capacity of 99 passengers.

Exits

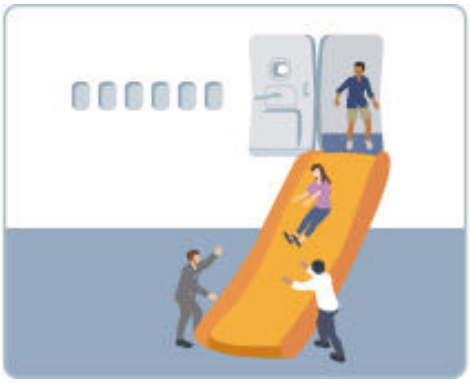
Since 1967, the FAA has regulated the location of emergency exits on airplanes with the following requirements:

- Specific types and numbers of exits must be provided for given numbers of passengers;
- Exits must be located to provide the most effective means of passenger evacuation; and
- Exits must be distributed as uniformly as practical with respect to passenger seating.
- Exit arrangement, deployment, marking, and emergency lighting must meet specific criteria.

Slides

To prevent injury to passengers and crew escaping through floor-level exits located more than 6 feet above the ground, assist devices such as slides or slide-rafts are required.

The rapid deployment, inflation, and stability of evacuation slides are critical elements of the evacuation system. Slide design and performance requirements are contained in technical standard orders.



Operational Aspects of Evacuation

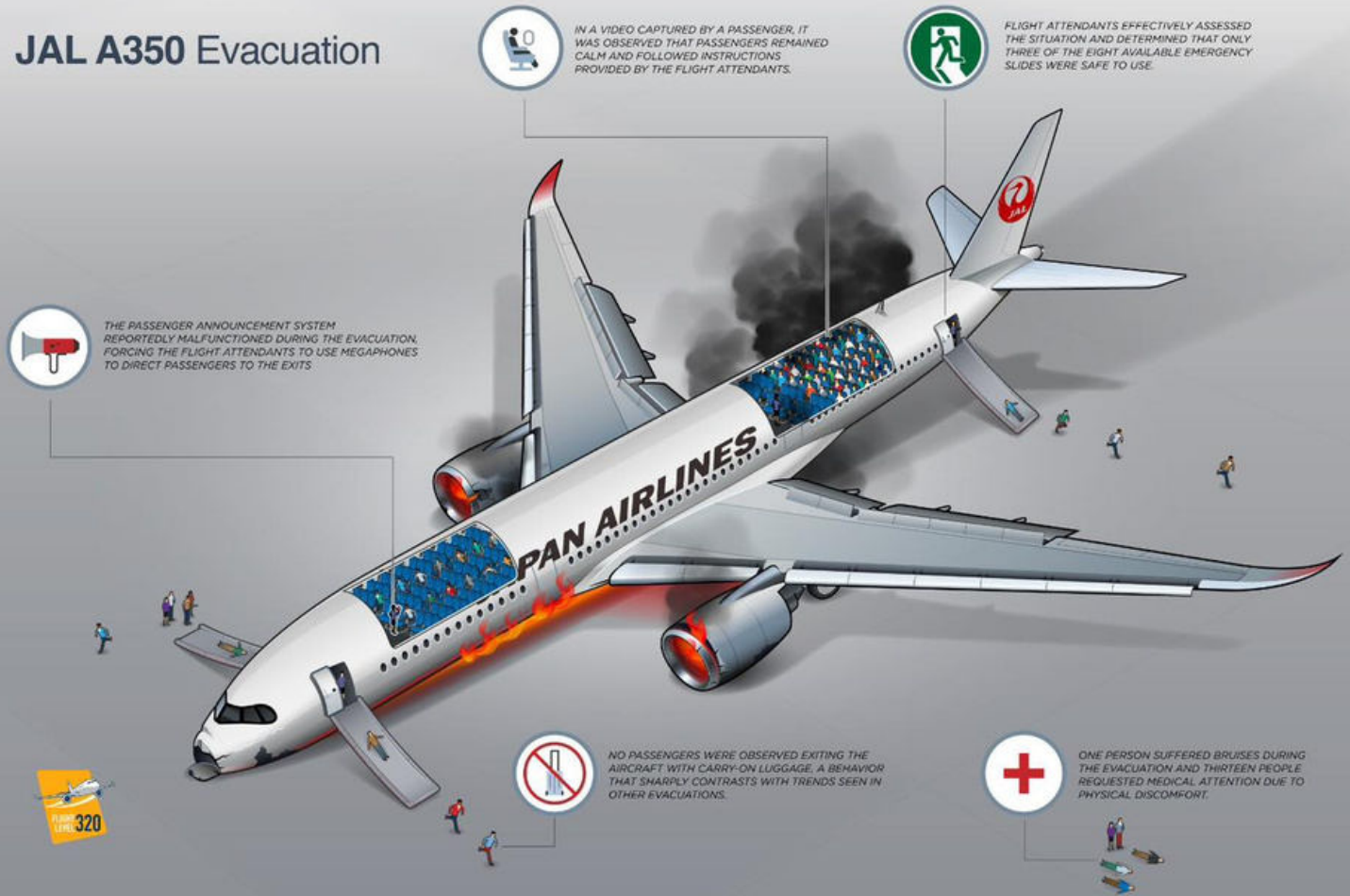
Successful evacuation in an actual emergency depends on more than the passenger flow rates or benchmark egress time demonstrated for certification. Factors influencing the outcome of a real-life emergency evacuation may be listed as follows:

Actual Accident Conditions Such as Fire and Smoke

The impact of these hazards, in turn, depends on the strength of seat attachments and restraints, airframe energy absorption, and the fire resistance of the cabin lining and seating materials.

Crew Capabilities

Evacuation performance depends equally on the design and operation of emergency equipment, and pilot/flight attendant training. The ability of flight attendants to quickly assess and respond to an in-flight or ground emergency affects passenger safety as much as the design of the aircraft and the performance of emergency equipment. The National Transportation Safety Board (NTSB) believes that as the crashworthiness of aircraft and survivability continues to improve, flight attendants are assuming a more critical role in ensuring passenger safety. However, the quality of their initial and recurrent training remains the most crucial factor. Flight attendants rely heavily on this training in emergency situations because real emergencies are rarely encountered in commercial aviation, providing little opportunity to practice the necessary skills. Technologies assuming a larger role in training flight attendants include motion-based cabin simulators and full-scale cabin mock-ups. However, training done in cabin mock-ups without passengers may not provide crew members with sufficient skills to motivate passengers to evacuate more efficiently and assess flow control problems.



Aircraft Integrity and Seating Technologies

Aircraft design requires enhanced cabin safety to preclude incapacitation from impact, smoke, heat, and toxic gases before egress can be achieved. Two key elements of evacuation systems are heat-resistant slides that inflate and deploy automatically and floor-level path lighting which provide an efficient means of reaching the exits in adverse conditions.

Passenger and Baggage Characteristics

To be able to leave one's seat, move toward an exit door or hatch, and escape from the aircraft is highly dependent on the passenger's physical and mental condition at that point in time. No matter how well-designed an aircraft or how well-trained the flight attendants are, passengers can undermine the safety performance by bringing on board excessive or inappropriate carry-on baggage, damaging safety equipment, or drinking to the point of becoming unable to respond to emergency instructions. The presence of certain types of carry-on baggage can impede passenger movement from seat to aisle and aisle to exit in an accident. In addition, passengers often stop to retrieve carry-on items, which flight attendants have to remove before the passengers use the slide

For instance, in the 1992 evacuation from a TWA L-1011 at New York JFK airport, one passenger insisted on taking a set of large animal horns while he exited the plane.

Strict enforcement of carry-on luggage rules and measures to further improve comprehension and retention of safety instructions by passengers have often been recommended by safety experts. Many operators have spent a lot on slick videos to heighten passengers' attention to the airline's safety briefing.

There is wide variation in the mobility, strength, and perceptive capabilities of aircraft passengers. Under existing aviation regulations, airline operators restrict seating in exit rows to those persons willing and able to read, hear, and understand emergency instructions and operate evacuation equipment.

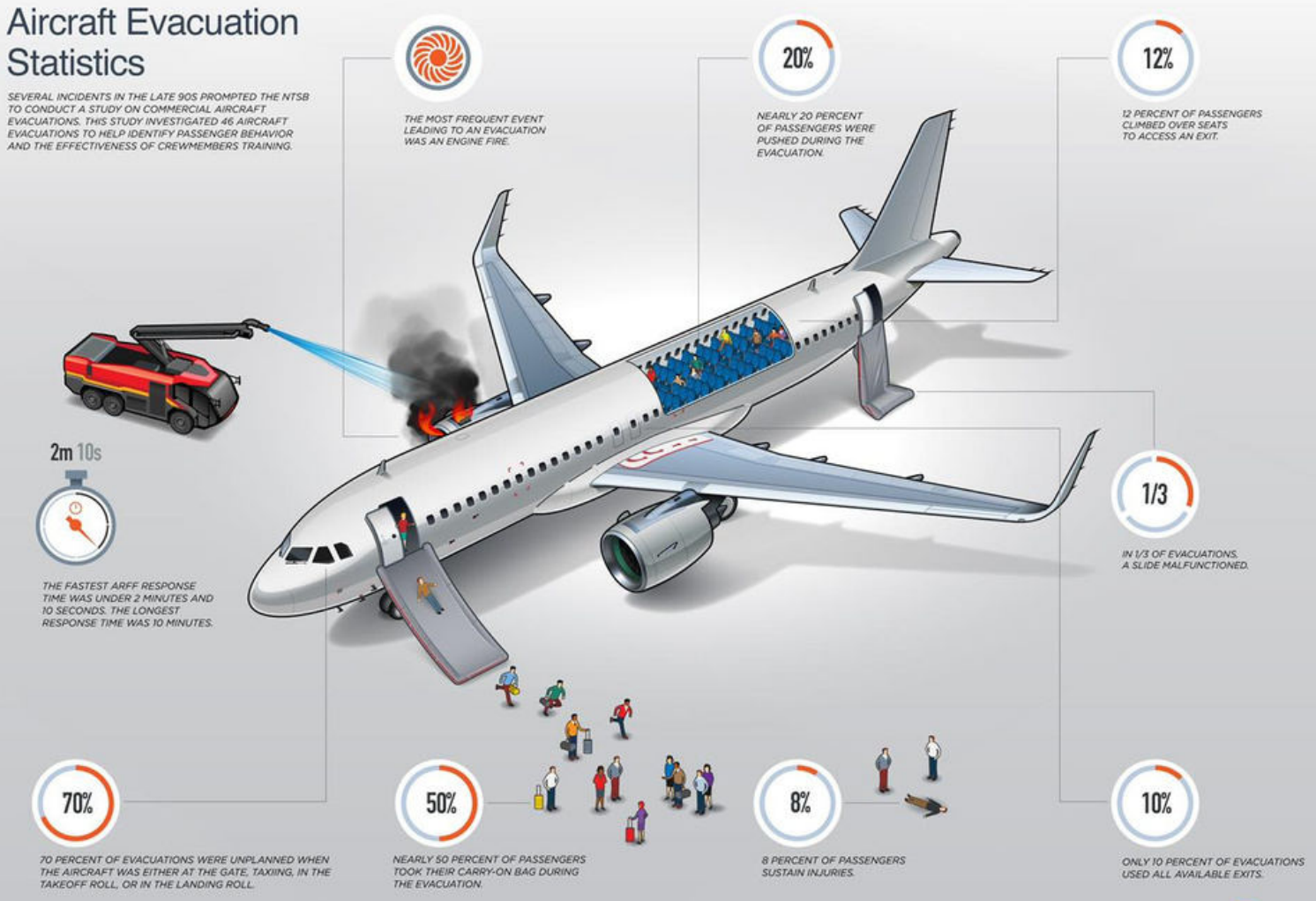
Conclusion

Survivability in commercial air transports is improving, largely through the introduction of technologies that mitigate impact forces, better training, and more effective operating procedures. Research suggests that improved technology to suppress or mitigate thermo-toxic conditions will likely aid passenger survivability more than any efforts to further speed up evacuations. Changing demographics suggest that the passenger evacuation rates will be, paradoxically, slower in the future instead of improving. Speeding up evacuation through small incremental changes in technology would be difficult, and achieving significant reductions in evacuation times from typical seating configurations would require either the addition of more doors or a reduction in passenger capacity.

Both of these possible solutions will add weight, increase cost, and cause revenue loss, and hence would not be palatable to the industry.

Many things are beyond the control of the Regulators or the Operators and therefore must be addressed at the industry level. The most crucial of these factors is passenger behaviour. Aircraft Evacuation certification requirements must take realistic passenger compositions and behavior into consideration. Of particular concern is the issue of carry-on baggage, which should be treated as something bigger than a commercial issue and its impact on safety during a possible evacuation needs to be the deciding factor.

The safety briefings and cards need to be more effective in reminding passengers to familiarize themselves with the emergency exit system and emphasise the requirement to leave the baggage behind in case of an evacuation.



To summarise the extent of the problem, here are a few excerpts from industry reports:

> "An NTSB passenger survey indicates that 13% did not watch the safety briefings, while 48% claimed to have watched 75% of the briefing. 68% of the surveyed passengers indicated that they completely ignored the safety cards, with 89% of these claiming that they had read them before. A total of 44% of surveyed passengers, reported that they had neither listened to the safety briefing, nor read the safety card."

> "Less than half of passengers look at or read safety information cards, and under present regulations, this is the only means by which such information is provided to them before departure." [TSB Canada Report A05H0002]

The undisputed fact is that crew training and passenger actions will continue to remain as crucial to successful evacuations as the aircraft's design and equipment.

About the Author

As the Ex- Accountable Manager and Vice President for Jet Airways (India) Ltd, Capt PP Singh was the Key Management Person in this world-famous airline brand's resolution and revival process. He has been an aviation professional since 1984, possessing extensive training and checking experience accrued with major Indian and foreign international carriers as an instructor and examiner on large commercial jets. Over the past three decades, Capt Singh has held crucial appointments in the senior management teams of Jet Airways and Nepal Airlines in various regulatory and leadership roles. After graduating from the University of Delhi, he started his aviation career with the Indian Air Force and moved to civil aviation in 1994. He is currently responsible for the operations, training, safety, and engineering functions of Jet Airways.

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Fatigue Risk Management System

© Ryan Stone

It was a cold winter night on 12 February 2009, when Continental flight Colgan Air 3407 took off from Liberty International Airport in Newark, on what should have been a fairly routine flight. But five miles north-west of its intended destination in Buffalo, the plane stalled before plunging into a house below, killing both the pilots, as well as two flight attendants, all 45 passengers and a man on the ground. The pilots had failed to properly respond to cockpit warnings that the plane was moving too slowly through the air, raising the plane's nose, slowing it even further.

The accident report said that ahead of the flight, both pilots had long commutes and slept in the crew lounge, instead of a hotel. Tiredness was cited as one of the major factors in the crew's failure to respond quickly and appropriately to the aircraft's loss of speed.

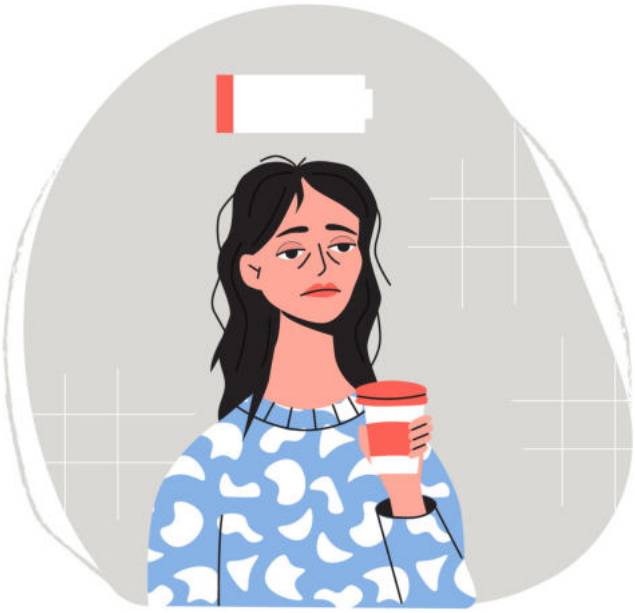
In 2010, aircraft attempting to land in Mangalore, India, over- shot the runway and plunged off a cliff, killing 158 people. The ensuing investigation found that the pilot, who was recorded snoring loudly in the cockpit, had committed several critical errors of judgment during the flight, including neglecting the urging of his co-pilot to abort the landing. An investigation by authorities attributed the impaired judgment and flying abilities of the flight crew to the debilitating effects of fatigue.

Other failed landings have had less tragic outcomes, such as the American International Airways Flight 808 in 1993 at US Naval Air Station Guantanamo Bay, Cuba. In accordance with standard procedures, the pilot had planned to approach the runway from over the sea and then carry out a late right turn toward the runway so as to avoid entry into Cuban airspace, which began a mere three-quarters of a mile west of the touchdown area. However, the crew, who had been awake for over 19 hours continuously, overbanked the aircraft, causing it to stall and crash. The impact, together with a resulting fire, destroyed the multimillion-dollar aircraft, and the three-member crew suffered serious injuries (although fortunately nonfatal).

A survey by the British Airline Pilots' Association (BALPA) of 500 of its members showed 43% had involuntarily fallen asleep in the cockpit, and of those, 31% said that when they woke up the other pilot was also asleep. Aviation accidents are still extremely rare, but when they have occurred, figures show that 80% are a result of human error, with pilot fatigue accounting for 35-40% of human error in fatal accidents.

Since the crash of Flight 808 in 1993, the NTSB and its international counterparts have investigated thousands of transportation accidents, searching through evidence to piece together the circumstances and precise chronology of events. Such inquiries can often reveal the role of fatigue as a contributing factor, but practical remedies to the challenges posed by fatigue remain far from clear.

What is Fatigue?



For those of us who are all too familiar with the effects of fatigue in our lives, it may be surprising to learn that there is no consensual definition among scientists on what fatigue actually is. In the scientific literature, definitions vary depending on the discipline (physiology, psychology, human factors) and the task at hand, which may call for physical or mental exertion or a combination of the two. Some definitions focus on the underlying causes of fatigue (such as duration or intensity of work or limited opportunities for sleep), whereas others focus on the consequences, which can range from a subjective feeling of sleepiness to reduced general alertness and, most important, to significant impairments in job performance.

© Jim Wickey

ICAO defines fatigue as a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's alertness and ability to safely operate an aircraft or perform safety-related duties.

Another way of understanding fatigue is to focus on the manner in which it builds up over time, by distinguishing between acute fatigue (associated with short-term duty effects) and chronic fatigue (which develops when the rest time between consecutive duty periods is insufficient to fully restore cognitive and physiological functions).

In the United States, NASA established an international collaboration in the 1980s aimed at determining what factors contributed to fatigue, what the consequences were, and how the impact of these consequences might be mitigated. One such collaboration between NASA and the Federal Aviation Administration (FAA) relied heavily on the continuous collection of brain activity and eye-movement data, as well as subjective measurements (for instance, questionnaires) to determine the physiological alertness of pilots. This research provided valuable information about the effects on performance of work duration, time of day, and travel across time zones.

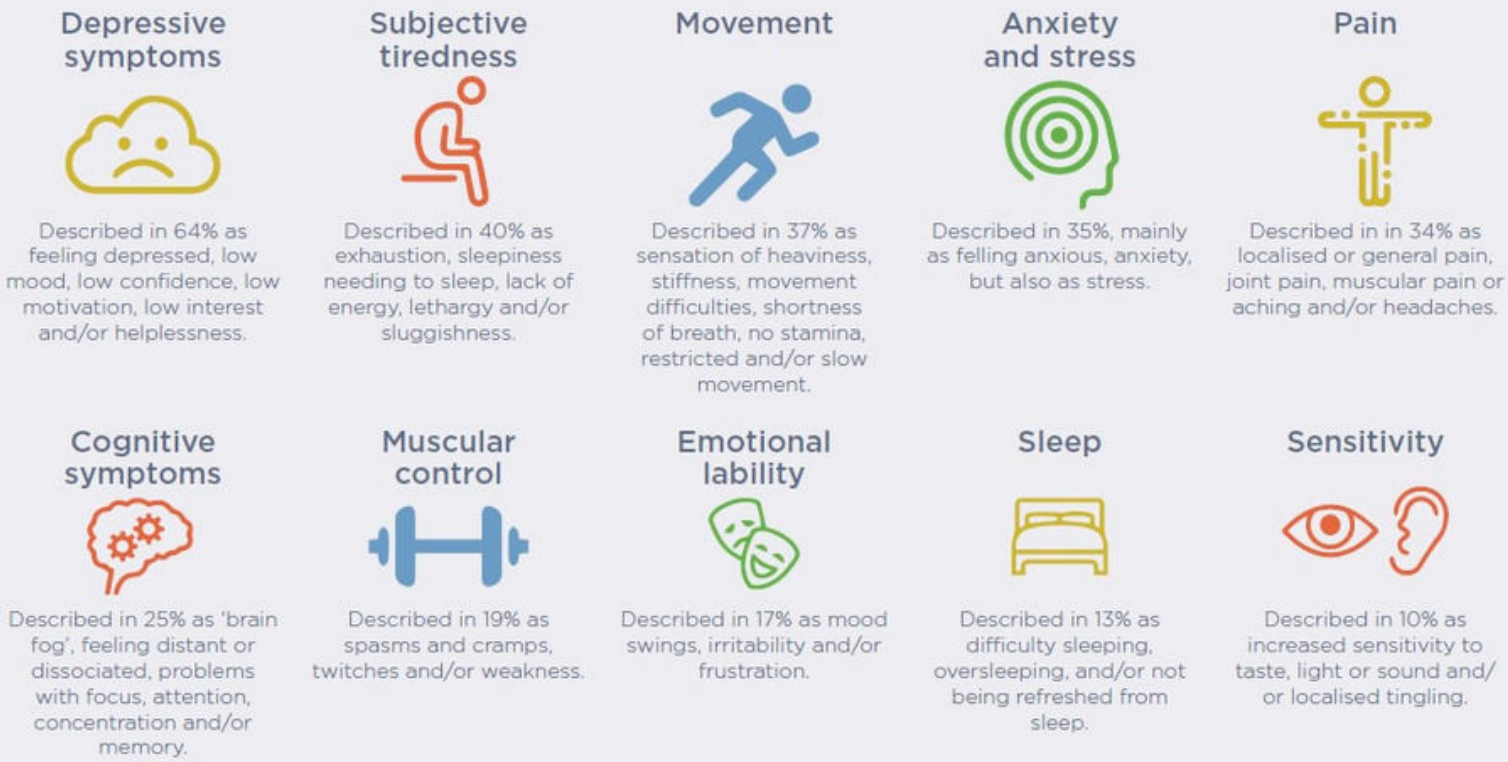
One finding of particular interest was that a 40-minute rest period provided to pilots during long-haul flights significantly improved their alertness.

Subsequent research has demonstrated that fatigue-related performance impairments fluctuate across the daily cycle of the circadian biological clock, so the risk of fatigue is greater at night and during the early hours of the morning. The risk of impairment also increases with the length of time spent awake, work duration, and work intensity, as evidenced across numerous laboratory and field studies.

During the Industrial Revolution, when the commonality of 10 to 16 hour working days under harsh conditions prompted social reformers, such as Robert Owens, to call for change. Owens is credited with coining the slogan, “Eight hours labor, eight hours recreation, and eight hours rest,” which reflected his belief that workers should be afforded a more equal distribution of life experiences over 24 hours. This concept eventually led to the establishment of regulations that stipulated how long employees could be asked to work.

Changes in the global economy and working life have increased the speed of business processes and the emergence of an increasingly ‘24/7 society’. The rhythm of work in much of the developed world has become more intense and faster-paced. Time pressure has increased. Work can, and is often required, to be done at any time. In many sectors, the need to increase work force flexibility and productivity has lengthened the average work day, shortened average recovery times and increased the irregularity of start and finish times.

Fatigue, psychosocial workload and insufficient sleep have been recognized as major consequences of this increased work intensity amongst working populations. Indeed, fatigue is a common, almost universal feature of modern life. The effects of fatigue can vary but are best viewed as a continuum, ranging from mild, infrequent complaints to severe, disabling manifestations including burnout, overstrain, or chronic fatigue syndrome. More recently, a link has been established between reduced sleep duration, obesity and diabetes, suggesting an additional physiological mechanism linking work- related fatigue to adverse health outcomes.



10 most commonly described symptoms of fatigue © Cambridge Cognition

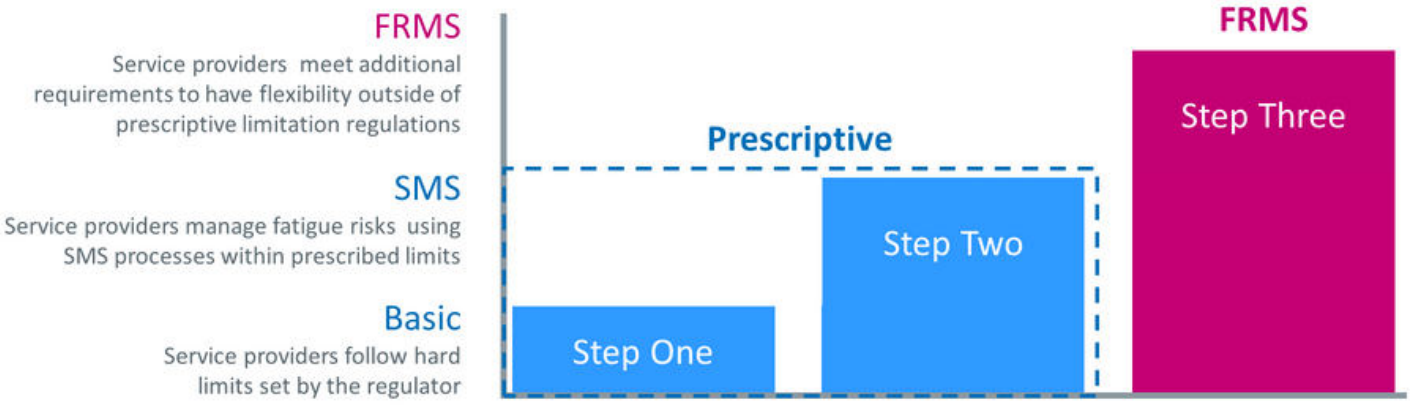
Fatigue Management

To manage crew member fatigue, ICAO requires States to develop regulatory limits on flight times, flight duty periods, and duty periods. These limits should be identified over specific periods (for example daily, monthly, yearly) to give crew members an adequate opportunity to recover from fatigue and to limit the build-up of transient fatigue across each duty period and the accumulation of fatigue across multiple duty periods. The objective of these prescriptive limits is to ensure that flight and cabin crew members remain sufficiently alert to be able to operate at a satisfactory level of performance and safety under all circumstances.

In general, the ICAO SARPs (Standard and Recommended Practices) support two distinct approaches for fatigue management:

1. The operator complies with prescriptive Flight and Duty Time Limits (FDTL) defined by the regulator, and manages fatigue hazards using the SMS (Safety Management System) processes that are in place for managing other types of hazards; or
2. The operator develops and implements a Fatigue Risk Management System (FRMS) that is approved by the regulator. These approaches share two important basic features. First, they are based on scientific principles and knowledge as well as operational experience. Second, because fatigue is affected by all waking activities (not only work demands), fatigue management has to be a shared responsibility between regulators, operators and crew members.

In the prescriptive fatigue management approach, operations must remain within prescribed limits established by the regulator for flight time, flight duty periods, duty periods and rest periods. In addition, an operator should manage fatigue hazards using the SMS processes that are in place for managing other types of hazards. Fatigue science suggests that staying within the prescriptive limits may not be enough on its own to manage fatigue. For example, daily prescriptive flight duty period limits are the same for day 1 and day 5 of a trip. They typically address each duty period in isolation and do not take into account cumulative effects. For example, they do not take into account the fact that on day 5, crew members may be starting duty with cumulative sleep loss and higher fatigue than on day 1.



The FRMS approach represents an opportunity for operators to use advances in scientific knowledge to improve safety and increase operational flexibility. An FRMS is a system that uses a service provider's SMS processes and procedures to specifically identify and manage crew member fatigue as a hazard. It addresses actual fatigue risk in the operations to which it applies, rather than predicted risk which is the basis of prescriptive limits. FRMS has additional requirements to ensure a level of safety that is at least equivalent to that achieved by operating within the prescriptive flight and duty time limits and using generic SMS processes to manage fatigue hazards.

Where an airline operator already has sufficiently mature SMS processes in place, it should not be necessary for it to develop entirely new processes to implement FRMS. Rather, the operator can build upon the organization's existing SMS processes to address the added requirements of an FRMS.

Having an FRMS still requires having maximum limits, but these are proposed by the operator and must be approved by the regulator. To get approval, the operator must demonstrate to the regulator that it has appropriate processes and mitigations to achieve an acceptable level of safety.

Fatigue Risk Management System (FRMS)

The most recent product of all these efforts has been the international adoption of fatigue risk management systems (FRMS) as an alternative to prescriptive limits on work duration. By definition, FRMS is A data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness. It involves a continuous process of monitoring and managing the risk of fatigue and, according to its advocates, can either complement regulatory work–hour limitations or act as a substitute for them.

There is a wrong pre conceived notion amongst operators or individuals that FRMS is applied to the Airline as a whole and could replace prescriptive FDTL. Instead FRMS currently is applied to routes and not to the whole organization at times.

In France, for example, the civil aviation authority allows an airline to grant rest periods to pilots that fall below regulatory limits if the airline also implements an FRMS. The airline must demonstrate that fatigue risk is managed at all levels, and it must prove explicitly that the reduced rest does not compromise safety as compared to a standard rest period a requirement calling for specific provisions, such as proximity of the hotel to the airport, to reduce the flight crews' travel time.

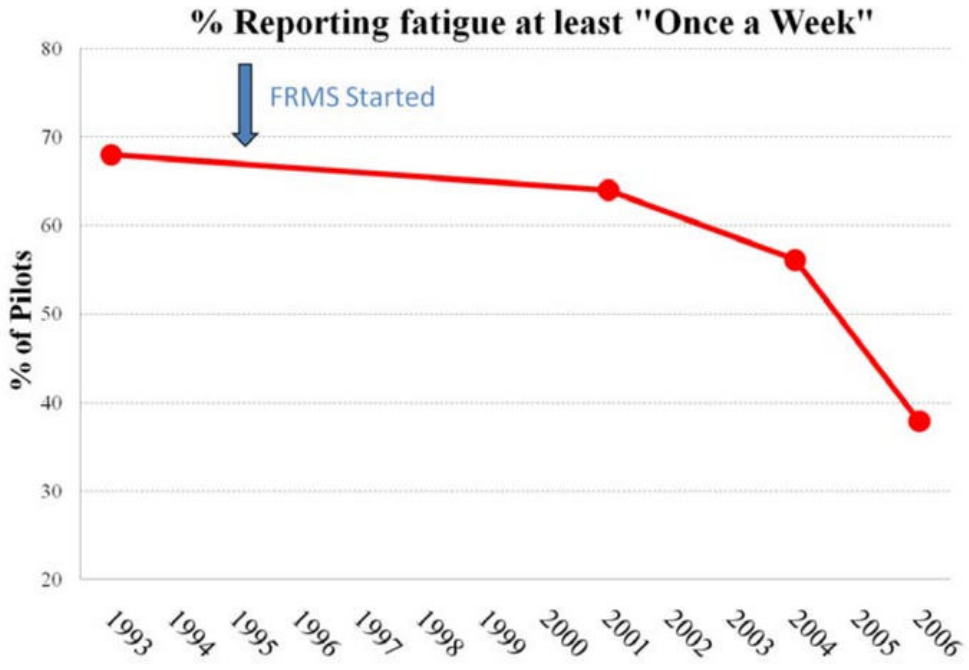
Other international air carriers have also applied FRMS principles. An extreme and necessary example is Qantas Airways, which currently operates one of the longest nonstop flights in the world: The journey from Sydney, Australia, to Dallas, Texas, covers some 8,500 miles and takes approximately 15.5 hours to complete. Such ultra-long haul flying exceeds regulatory limits and hence requires careful balancing of the work periods among the 15-plus flight attendants and pilots onboard to minimize the impact of fatigue.

Does it really work?

As for the practical considerations, these are particularly weighty in the airline industry, because its structural constraints high fixed costs and systemic overcapacity act together to keep profit margins small.

Narrow profit margins, coupled with volatile fuel prices (which today account for up to 40 percent of operating expenses as compared with only 15 percent a few decades ago), mean that airlines are continuously looking for ways to cut costs. According to a report in the New York Times, Delta Airlines saved $250,000 in one year by shaving an ounce from each of the steaks it served on board, whereas American Airlines is said to have saved $40,000 a year by removing a single olive from every salad it served to passengers.

Viewed strictly in terms of the bottom line, laws aimed at managing fatigue impede cost-cutting efforts by adding an extra layer of operating expenses to balance sheets that are al- ready in the red. An example often cited on this point is a rule recently set by the FAA to minimize pilot fatigue by placing limits on night flying and the number of permissible daily take offs and landings. (The rule was prompted by the 2009 crash of Colgan Air Flight 3407 near Buffalo, New York, which killed all 49 passengers and was attributed, in part, to fatigue spoken earlier in this article.) The rapid rise of low-cost airlines in aviation is a testament to this inconsistency: Because the work force represents an airline's second- highest operating expense (the highest being fuel), a large portion of cost savings comes from maximizing the



productivity of newly hired, low-pay workers. In some cases, employees also work longer shifts, because some airlines maximize the daily flying time of their aircraft by scheduling the first departure early in the morning and the last arrival late at night. Clearly, customer concerns over fatigue are tempered by the prospect of flying from London to Frankfurt for $23.99.

Perhaps technology can provide solutions as scientific advances facilitate the creation of a brave new world—one in which increasing service demand can be effortlessly satisfied with fewer workers, simply by an increasing reliance on automation. With all due recognition of the capabilities that new technology offers, we do well to remember that in unexpected circumstances, when technology is most likely to behave unreliably, humans will still be called upon to act as a backup, fulfilling our role as ultimate guardians of complex systems.

Perhaps the question that should keep us awake at night is whether the pilot flying our airplane has slept well last night?

Gender Mainstreaming Initiatives

Gender Equality in Aviation Policy and Reality

Cdr Amogh Warhadpande (Retd.)

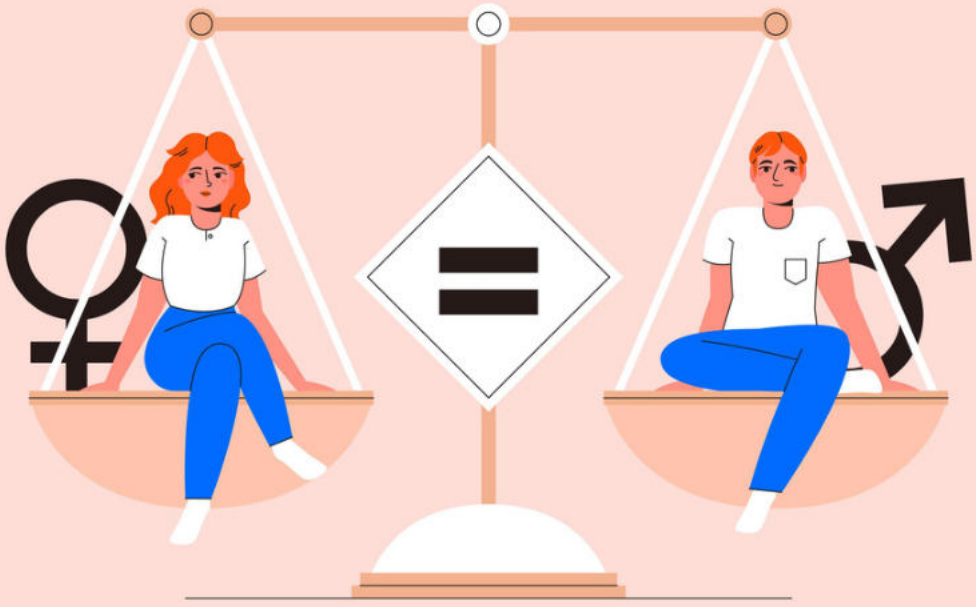
Lack of Gender Equality puts women at a disadvantage and is detrimental to economic and social growth. Scholars have recommended that Gender Mainstreaming is a good tool to achieve Gender Equality. This article highlights the initiatives taken by major stakeholders in Civil Aviation Industry to strive for Gender Mainstreaming to achieve to Gender Equality.Academic Research has predominantly featured topics relating to parity in compensation, access to education and decision-making roles and terms and conditions of employment contracts for women and discriminatory behaviour being faced by women, but effectively implementable solutions need to be found. This is possible through a study of initiatives taken to achieve Gender Equality. This can then serve as a starting point to decide on governance structures and effective implementation of policies that can bring about the desired changes.

Introduction

As early as 1792, Mary Wollstonecraft defined Women's emancipation as "education of girls on the same footing as boys, an end to prejudice against women, and that women should be evaluated on their own merits". It is important to bring in clarity at the outset and understand a few terms that are sometimes used interchangeably. In 2005, the United Nations Population Fund (UNFPA) defined gender as "economic, social and cultural attributes and opportunities associated with being male or female". "Gender" is thus a social construct associated with norms and roles and must be differentiated from "sex" which is biological. "Gender Equity" is defined as the "process of being fair to women and men" which results in "Gender Equality" - equal enjoyment of socially valued goods, opportunities, resources, and rewards". Gender Equality thus prevents exclusion or disadvantaging a particular sex in decision-making and access to resources. UNFPA also defines "Gender Mainstreaming", as "a strategy for integrating gender concerns in the analysis, formulation and monitoring of policies, programmes and projects to promote Gender Equality and the empowerment of women".

Gender Equity has been a distant goal despite the certainty that economic and social progress cannot be achieved without it. (Cuberes D, 2014) (Gender Discrimination and Growth, 2004.) (Minasyan A, 2019) (HM., 2017). According to the International Center for Research on Women (2014), "Globally, only 23% of parliamentarians are women, 33% girls in the developing world get married before age 18, and about 11% before age 15". Organization for Economic Co-operation and Development (OECD), 2015 reports "access to primary schooling is still an issue for women in 68 countries and gender inequality in institutional treatment and well-being outcomes exists".

In 2019, The International Labor Conference adopted the recommendations of the "Violence and Harassment Convention" in accordance with specific ILO standards. Gender Equality is one of the UN's 17 Sustainable Development Goals (SDGs) to be achieved by 2030 (70 Women Inspiring Generations of Aviation Professionals, 2015). UNICEF, Gender Action Plan (GAP), 2022–2025 and Gender Policy 2021–2030 have been framed to achieve this target.
The Aviation industry accounts for 3.5% of the world's GDP and employs 10 million people directly or indirectly worldwide. Workforce shortages, escalating inventory, turnover and attrition are predicted for this industryin the next two decades. In the context of importance of Gender Equality, the high-risk job profiles associated with Aviation, retention of workforce in general and women workforce in particular cries out for getting the attention it deserves. This article highlights a few global best practices being implemented to achieve Gender Equality through Gender Mainstreaming.



Can Aviation do without Women?

Women's contribution to Aviation emphasizes the necessity of their continued presence. They have made their presence felt within a few years of the first recorded successful manned engine powered flight. Katherine, (sister of the Wright brothers) contributed significantly to the process to perfect the Wright Brother's aircraft. The lists of womenwho have been flag bearers for aviation is long and distinguished (WIAAB Recommendations Report, 2022)

Raymonde de Laroche	1909	First woman to fly solo, and get a pilot's license
Harriot Quimby	1912	First woman to cross the English Channel
Katherine Stinson	1912	Youngest woman to get a pilot's license, aged 18
Katherine Stinson	1915	First woman to finance a flight school
Phoebe Fairgrave Omlie	1927	First woman to receive an airplane mechanic's license
Olive Ann Beech	1932	Co-founder of Beech Aircraft Company
Amelia Earhart	1932	First woman to fly solo across the Atlantic, and co-founded the International Ninety-Nines
Beryl Markham	1936	First person to fly solo into the wind across the Atlantic

Despite their contributions to the war effort, women pilots faced pay disparity in the Second World War. They had to seek alternate employment after the war even though most of them wanted to continue, due to protests by male pilots. (Seligson, 2019). It took 30 years for women to return as pilots in the United States Navy and Air Force. Women continue to be under-represented in Aviation and data seems to indicate a reluctance on the part of the industry to provide them a conducive environment to choose careers in aviation. 17 countries have laws in place that do not allow women to access civil aviation occupations. (Group T. W., 2020.) Women have subsequently contributed to aviation development in various sectors like military, space programs and commercial aviation. Even though almost half the world population comprises of women, and the "in principle acceptance" that gender diversity "enhances innovation and brings different skill sets to the workplace", efforts towards attracting and retaining more women in Aviation seem to be falling short.

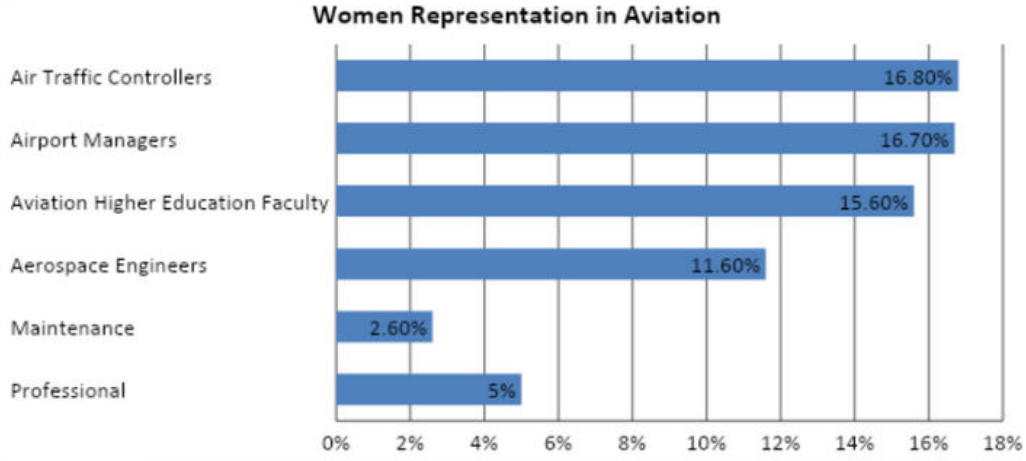
Amelia Earhart prior to her transatlantic crossing of June 17, 1928
© Wikimedia Commons

Gender Equality in Aviation

There's more to it than meets the eye

In most aviation occupations, women make up less than 20% of the workforce. (WIAAB Recommendations Report, 2022) Lack of Female representation is alarming, especially, in senior leadership positions. The scarcity of women is evident from the graphic –

Women percentages in Air crew and Maintenance crew alike, shows evidence of a stagnating trend. For commercial pilots, the change has been 1% in 10 years and a disappointing 2.6% for technicians in last 60 years. (WIAAB Recommendations Report, 2022) Women currently hold only 10% of the C-suite roles and make up only 3% of airline CEOs. The highest percentage of women pilots 7.4% (United Airlines) and 13.9% (IndiGo) is a stark contrast to flight attendants (81% women), a role that is subject to discriminatory and often intrusive terms and conditions of work.



Initiatives by International / Regulatory Bodies and Industry

Gender Mainstreaming in Aviation

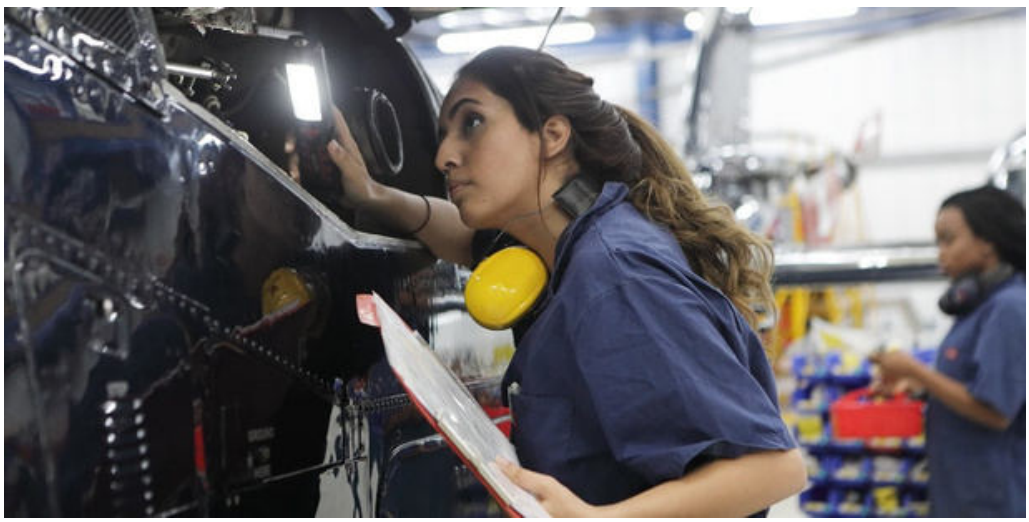
Most notably, the French Government has implemented a legislation to promote Gender Equality through Gender Mainstreaming in the aviation sector. The "Coppé Zimmerman" law sets quotas for women on boards of directors and supervisory boards, requiring a minimum representation of 40%. Groupement des Industries Françaises Aéronautiques et Spatiales (GIFAS) has created the "Feminizing Aerospace Jobs", with stakeholders committed to promoting gender diversity. Significant initiatives by stakeholders are highlighted:

International Civil Aviation Organization (ICAO), along with UNESCO, in the Global Aviation Gender Summit, 2018 charted a Road Map for enhancing Gender Equality in Aviation by formulating Policy and Action Plans, elimination and mitigation of Barriers, collection and analysis of Data, and Forge partnerships with UN Women (HeForShe campaign, UN System Wide Action Plan on Gender Equality and the Empowerment of Women), UNESCO (on education and STEM) and with industry (scholarships and internships). Additionally, initiatives like “Next Generation of Aviation Professionals (NGAP)”in 2009, scholarships in collaboration with International Aviation Women’s Association (IAWA), “Dreams Soar Project” (first ever Afghan American female pilot, Shaesta Waiz, encourages young women to become pilots) have been implemented.

International Air Transport Association (IATA) Campaign “25 by 2025”, aims to address diversity and inclusion by targeting a 25% or up to a minimum of 25%, by 2025 for IATA member airlines. Additionally, leadership awards for women under 30 and a report on best practices for publication in 2019 have been instituted.

Federal Aviation Administration (FAA) has taken steps to ensure diverse representation for members of the Women in Aviation Advisory Board (WIAAB). It also initiated High School Cadet Programs to help women pilots with licenses, Toolkit for Aviation Industry to Create Qualification and programs for Mentorship, Gender Stereotyping awareness, working contracts, career growth, Industry Annual Public Reporting/Tracking of Data for DEI. Grants for further Research in areas of recruitment, retention, and advancement of women have been made.

Airports Council International (ACI) Young Aviation Professionals Programme (YAPP), 2013 in collaboration with ICAO and IATA, partnership with IAWA to provide education, training, job search support, scholarships for leadership and technical programs (2014), 'Soaring Through the Glass Ceiling' study to identify barriers and solutions for advancing women into leadership roles in the industry (2020), “World's Sustainability Strategy for Airports Worldwide” (2021), and “White paper on “Evolution of the Airport Workforce” (2022) are some main initiatives. ACI collaborated with IATA for the 25by2025 (IATA, 2023) and conducted training for women on “Airport Executive Leadership” and “Global Aviation Leadership”. (ICAO, 2023)



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European Union Aviation Safety Agency (EASA) April 2023 data shows that 32% of the EASA workforce comprises of women with 19% representation in the Lead and coordination roles, 14% in Delivery Roles, and 64% in support roles. In 2017, EASA launched “Junior Qualifier Programme” to attract women and initiated a partnership with Academia for research opportunities and making STEM education more attractive to young women. It targets to achieve gender parity in its management at all levels and balancing representation by gender and nationality by the end of 2024. (ICAO, 2023)

International Federation of Air Traffic Controller’s Association (IFATCA) Implementation of a data gathering mechanism by a voluntary reporting system (2023), establishing an Equity, Diversity, and Inclusion Task Force (EDI-TF), collaboration with industry associations to promote empowerment and conduct of studies to improve tools used in the selection process to make it more inclusive and conducive to attracting and retaining women candidates. (ICAO, 2023)

SAFRAN’s goal for 2023 is to have 19% executive positions filled by women. Their initiatives include collection of annual data on the Gender Equality Index, gaps in Gender pay, promotions, and ensuring equal benefits for women to promote gender equality and women's empowerment in the aviation sector, obligation for balanced representation for women in executive and governing bodies in accordance with the "Rixain" law, penalties for non-compliance, establishment of Women@Safran networks, development of a feminization plan, collaboration with "Elles bougent" where 450 employees promote 46 women's roles in the aerospace industry among students at different educational levels, and "CGenial, Foundation, to introduce Safran professions to classrooms and schools ". Additionally, they implemented training programs on biases, enhancing the attractiveness of STEM education, affirming an inclusive culture, increasing visibility of women's representation and careers in media, evaluating processes to prevent discrimination, and creating stronger academia – industry connections. They enhance the company’s attractiveness through cultural change and acceleration of women's professional development. High-potential women employees are identified and supported in their career paths through inclusion in succession plans, promoting professional development, and encouraging innovation. The company highlights the profiles of their successful female employees through regular communication both internally and externally and showcases the achievements of women in aviation as role models. (ICAO, 2023)

Other Companies Airbus has Programmes aimed at attracting women to work in aviation. General Electric implemented an Aviation Action Programme “Cultivate”, to develop and retain women engineers in aviation. British Airways, Virgin Atlantic and EasyJet promote diversity among their workforce with the aim of achieving GE and Alaska Airlines has started a “Forum for Engaging Men, Advancing Women”, in which leaders discuss how men can support and advance women in the workplace.

First women firefighter squad of Asia: Bengaluru Airport © AAI

Barriers to Gender Equality

Gender Mainstreaming in Aviation

The main reasons for women constituting only 20% of the aviation workforce (ACI), are lack of awareness, high entry and Training Costs, unsupportive Industry Culture, career stagnation, sexual harassment and the lack of adequate compensation, representation in decision making roles, job security, and basic amenities. IAWA reports that only 32% of women agreed that their senior leadership was committed to GE in leadership roles. An IAWA and Oliver Wyman study found that 59% of the women surveyed had considered leaving their careers in aviation due to untenable working conditions unlike men who leave for more attractive opportunities. In a 2018 survey of Women in Aviation International (WAI) members, 62% of respondents indicated that sexual harassment remains a significant problem in the industry with 71% respondents reporting experiencing sexual harassment in the workplace and 81% reported having witnessed sexual harassment. 51% of the women who had reported harassment experienced retaliation. (WIAAB Recommendations Report, 2022)

It is therefore not very difficult to understand as to why women do not feel at home in Aviation. To overcome these obstacles, it is important to effectively implement the GM to achieve GE.

Conclusion

Is India Doing Enough?

ICAO studies forecast that in 2037, civil aviation will require approximately twice the number of pilots, air traffic controllers, maintenance technicians and cabin crew (a higher rate of demand than most other occupations) (Seligson, 2019). Human safety will be impacted by the ageing aviation workforce, technician retirements outpacing the supply pipeline (Pipeline Report & Aviation Maintenance School Directory, April 2020) and a predicted growth of inventories. Considering that India will probably see a faster rate of growth than any other nation in the next two decades, we need to introspect whether we are doing enough on ground to ensure Gender Equality and making women feel welcome in Aviation. With the women forming 49% of the nation's population, the question is whether we can afford to close the door to half the nation's working population in an industry that needs a high-quality workforce?

About the Author

Cdr Amogh Warhadpande (Retd) served in the Indian Navy for 24+ years as a Naval Aviation specialist. He is an alumnus of the National Defense Academy, Pune, Naval Engineering College (B Tech), Indian Institute of Technology Madras (MTech, Controls and Instrumentation) and Faculty of Management Studies, Delhi University (MBA). He is a certified PMP from PMI, USA.

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Navigating the Creative Journey of Alaqmar

Digital Artist and Founder of Aeroconcepts

In the vast expanse where technology and the boundless skies intersect, a passion for aviation editing takes flight. As an enthusiast navigating the digital airspace, I find myself captivated by the dynamic blend of creativity and precision that defines this thrilling passion. Join me on a journey into the cockpit of my fascination, where pixels meet altitude, and imagination soars to new heights.

From crafting mesmerizing visuals that echo the grace of flight to honing technical skills that mirror the precision of a well-executed manoeuvre, the world of Aviation Edits and Graphics is a canvas where creativity takes off.

My journey into this fascinating passion began with a simple curiosity—an intrigue sparked by the intricate dance between technology and the sheer beauty of an aircraft. As I delved into the intricacies of aviation editing, each brushstroke and pixel became a medium for expressing the sheer magic that happens when reality and imagination merge into one – which then led to the birth of my passion which I name it as “Aeroconcepts” indicating the creative merger between Aeronautics and Concepts.

Aviation editing isn't merely about enhancing visuals; it's about unveiling the soul of flight. From crafting riveting images of sleek airliners streaking through the clouds to delving into the historical archives to breathe life into vintage aircraft by painting it with a modern livery or a modern aircraft by painting it with a vintage retro livery, every edit tells a story. Join me as we explore the palette of possibilities, where the mundane transforms into the extraordinary through the lens of digital artistry.

In the world of aviation graphics, precision is paramount. The sleek lines of an aircraft demand meticulous attention, and every detail—even the glint of sunlight on metal wings—contributes to the narrative. Here, we'll unravel the delicate dance between artistic expression and the demands of accuracy that define the art of aviation editing.

As we embark on this journey, fasten your seatbelt, for we are about to ascend into a world where pixels soar, creativity takes flight, and the allure of aviation editing and graphics knows no bounds. Welcome aboard my digital cockpit, where the horizon is limitless, and the sky is not the limit—it's just the beginning.

From my earliest memories as a child, the dream of becoming a pilot ignited a passion within me that flowed through my veins and arteries. Unfortunately, due to certain constraints, pursuing a career in aviation wasn't a feasible option at the time. However, the fervor for aviation persisted, and I was determined to find a way to merge my deep-rooted passion with another undiscovered talent.

In my pursuit to follow my heart, I decided to channel my creative instincts and spark the artistic nerve within me. This led me to the fascinating intersection of aviation and digital artistry. By combining these two seemingly disparate interests, I discovered a unique way to express my love for flight and design.

Now, as I navigate the passion of digital rendition with an aviation-inspired touch, I find fulfillment in blending my childhood dream with my artistic endeavors. This journey has allowed me to soar creatively and bring to life a harmonious fusion of my passions. While I may not be in the cockpit, my designs take flight, carrying the spirit of aviation that has always been a part of who I am.

Shall we begin our journey into the world of editing? We'll peel back the layers of this fascinating process, exploring its intricacies and methodologies through a meticulous step-by-step analysis.


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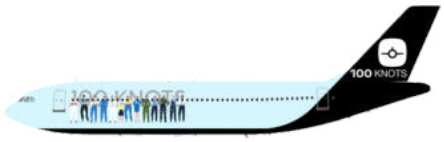

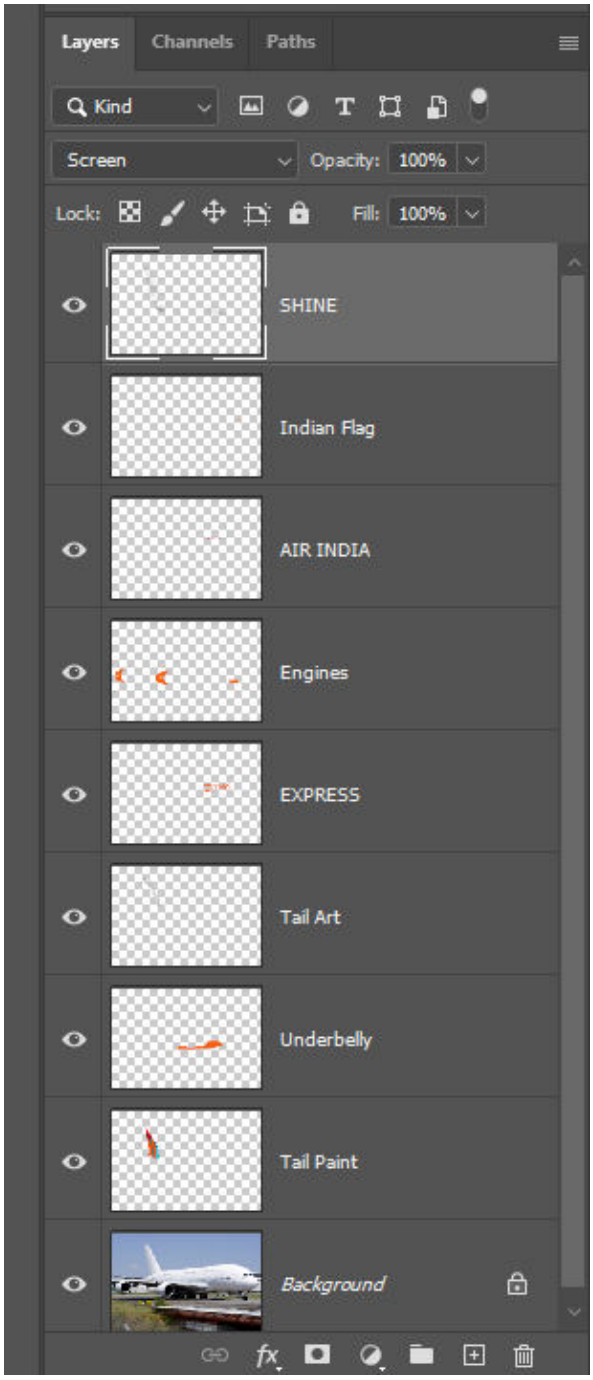

100 KNOTS
Airbus A310-300

Embarking on the journey of my passion for creating Aviation Edits, I encountered a unique challenge that reminded me of the dual nature of any endeavor. While crafting artistic renditions, I found myself at a crossroads when a major airline in India approached me with a request to take down my posts. The reason behind their request was a concern about the potential confusion arising among their clients. The line between reality and artistic representation had become blurred for some, prompting the airline to express their concerns.

This experience served as a poignant reminder that, along with the joy of pursuing one's passion, there's a need to be mindful of the impact on others and the potential consequences. It reinforced the notion that every coin has two sides, and while following our dreams, it's essential to navigate the challenges and responsibilities that may arise on the flip side.

About the Author

Hello, I'm Alaqmar, a 31-year-old professional Digital Artist, Photographer, and a budding Cinematographer. Passionately curating content on the popular social media handle Aeroconcepts, I also share my expertise through sessions at a leading university in Surat. Join me in exploring the intersection of creativity and aviation, where every image and session tells a unique story.

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