

Aircrew Standard Operating Procedures, Gospel or Guidance?

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Date of Submission: 2018-09-25



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Lund 2018

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Number of pages: 31

Illustrations: 1

Keywords

Standard Operating Procedures, Rules, Aviation Safety

Abstract

Operators of complex systems (e.g. modern passenger Commercial Aircrafts) often take decisions in unique situations, which develop rapidly in everyday work. For most situations, they have detailed company policies and procedures at their disposal to help them deal with these events. But do these procedures and policies work exactly as written all the time? And does experience level and type of organization influence a pilot's reliance on these procedures?

The author tries to find answers to these questions with an anonymous online survey sent out to Indian Airline Pilots. Respondents are asked to decide if they wish to apply a given company policy in an unusual yet plausible event given to them. Four hundred and seven Indian pilots responded to the author's survey, representing seven percent of the total pilots employed by Indian Air Carriers in 2017, making this survey, the largest Indian Pilot study of its kind covering all major Indian airline companies.

The study also revealed that less experienced pilots from low cost airlines were more inclined to strictly follow company Standard Operating Procedure, while experienced pilots (Above 5000 Hours Experience) from legacy airlines were more willing to decide against following company

procedure in this particular scenario. This suggests that SOP culture of an airline and aviation experience both have an affect on a pilot's perception on SOP compliance.

Also it was found that majority of the pilots surveyed (Fifty Four percent) either agreed or strongly agreed to the fact that they have to adapt SOPs to meet efficiency targets on an everyday basis. This reveals a gap between 'work as imagined' and 'work as actually done' (Dekker 2006b: 86).

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Lund University, Lund 2018
Avdelningen för Riskhantering och samhällssäkerhet, Lunds tekniska högskola, Lunds
universitet, Lund 2018.

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ACKNOWLEDGEMENTS

This paper is a culmination of an amazing personal journey towards completing the Master's course at Lund University. It all began by some encouraging words from Dr. Niklas Dahlstrom, who despite his hectic schedule, has always been available, while mentoring me through the course, especially when I needed guidance in writing this paper.

I would also like to express my immense gratitude towards my wife Megha, for being understanding and supportive in moments when I struggled to pen down my thoughts during assignments and during the writing of this paper. Also my young children Navya & Neev were very understanding when they often saw me sit down to write at home.

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QUESTIONNAIRE ITEMS

DEMOGRAPHICS

- Gender
- Age
- Rank
- Aircraft Type
- Aircraft Manufacturer
- Member of pilot union
- Experience at current rank
- Total flying experience
- Current Base
- Type of airline

STANDARD OPERATING PROCEDURES AND AIRMANSHIP

- On every flight, I have to adapt SOPs to suit efficiency targets.
- In my flight operations department, deviating from SOPs is tolerated as long as it is justified as being the more efficient way.
- Tabletop simulation scenario question: See 2.1 The Scenario (Page 10).
- What is the most important attribute you desire in your flight deck colleague for safe flight?
- Frequent SOP changes every few weeks decreases safety rather than increase it

OPEN COMMUNICATION AMONGST FLIGHT CREW

- In the past 6 months, how many times has your first officer (or you yourself as first officer) raised concerns regarding the need for extra fuel for a flight?

JUST CULTURE AND REPORTING

- In the eyes of management, pilots who raise new safety issues are considered as troublemakers or "over smart".
- I submit safety reports more for regulatory compliance (DGCA) than for the benefit of the company.
- When I submit a safety report, I receive a feedback from the safety department.
- Most pilots over report small issues and try to hide big issues
- In my company I have heard instances of first officers filing safety reports
- When I'm unsure about busting a company policy, I prefer to not report it and let the company contact me, than to proactively report it

FATIGUE

- I have to extend my flight duty time every _____

AUTOMATION

- My company's strict automation policy does not allow me to practice manual handling skills, which are eventually checked in simulator evaluations. I find this unfair.

1 INTRODUCTION

1.1 Standard Operating Procedures

For organizations dealing with high risk, operating procedures have become an important part of the system's design to control risk. Lind (1979, in Dien 1998: 181) defines procedures in the following way:

“In general, a procedure is a set of rules (an algorithm) that is used to control operator activity in a certain task. Thus, an operating procedure describes how actions on the plant (...) should be made if a certain system goal is to be accomplished.”

Procedures are types of prepared scripts that equip an operator when faced with situations with certain telltale symptoms. Proceduralization reduces uncertainty of an event, and helps prioritize certain work in the face of time pressure. It also does the job of assigning legal responsibility of who does what, thereby acting as barriers to human errors.

In aviation, SOPs provide a standardized framework in an environment where a pilot is expected to operate aircrafts with a different colleague on a daily basis. In such operations, SOPs provide something of a shared mental model for the crew to conduct the flight.

Managers find it easy to add new rules, while old rules and guidance material may or may not be cleaned up. New procedures are then devised to comply with these rules, and just like old

rules, old procedures may or may not be cleaned up, increasing ambiguity. There are many examples of new set of rules being quickly introduced into the system as knee jerk reactions to major events. For instance, shortly after the fatal shoot down of two US black hawk helicopters over Northern Iraq by US fighter jets, “higher headquarters in Europe dispatched a sweeping set of rules in documents several inches thick to ‘absolutely guarantee’ that whatever caused this tragedy would never happen again” (Snook, 2000, p.201).

Over-reliance on procedures for safe operation may add additional layers of complexity rather than guide action and may become part of the problem rather than the solution. One example is how the crew responded to the fatal accident of Swissair 111 that crashed into the Atlantic Ocean after the presence of smoke in the cockpit promptly by adhering to the relevant checklist (Transportation Safety Board of Canada, 2003). Whilst the crew was following established procedures for this situation (aiming at finding the source of the smoke rather than extinguishing any fire or putting the aircraft on safe ground), the fire engulfed the aircraft. In this case following the procedures turned out to be the problem rather than the solution (Burian & Barshi 2003).

Scientific literature also recognizes the limits and costs of procedural approach to high demand situations (e.g. Vicente, 1999, Snook, 2000, Burian & Barshi 2003; Dismukes, Berman & Loukopoulos, 2007). Also Weick (2003) has elaborated on the difficulty of process of sense making in demanding situations that lie beyond procedural reach.

1.2 Indian Aviation and the rise of SOP culture:

Civil aircraft manufacturers of the world are looking at the growth of the Indian Airline Industry with great interest. Passenger traffic carried by Indian Air Carriers has grown at an impressive compounded annual growth rate (CAGR) of 9% during the period of 2007-08 to 2016-17, with the total number of passengers growing from 71.6 million in 2007-08 to 158.4 million in 2016-17 (DGCA, 2017).

Detailed SOPs however, are a recent addition to the Organizational Culture in Indian Airlines and have gained momentum since 2003, when the first low cost airline was launched in India. Since then, Indian aviation has witnessed the rise of low cost airlines consistent with the worldwide acceptance of this business model. Three major Indian Low Cost Airlines have been operating for over a decade and the success of these airlines demonstrates that the “lean” low cost airline model in India is here to stay. These airlines ushered a new era of strict procedural compliance and oversight of various departments as a means to control costs and reduce wastage of resources, thereby earning their “low cost” credentials. Flight operations departments of these new airlines also developed extensive company policies and procedures in addition to aircraft manufacturer guidelines in order to economize the use of resources. Pilots hired into these companies have SOP compliance engrained into them at the classroom induction level and the violators are made examples. These initiatives have also made the aviation regulator’s work easier as auditors observed standardized operations in these companies.

Legacy airlines, formed in the years prior to strong SOP culture, may find themselves less effective in implementing such controls over their pilots through elaborate policies, as the presence of pilot unions and their larger organizational size impedes the rapid implementation of constantly expanding SOPs. Legacy airlines have many experienced pilots in training positions, who themselves have learnt their skill during what could be called the “flying by the seat of the pants era ” of 1970s to early 1990s. Pilots of that era were encouraged by their seniors to hone their motor skills and cognitive skills along with acquiring technical and procedural knowledge. In those days, pilots routinely made decisions based on common sense and their deep systems knowledge rather than detailed SOPs, as back then, only basic operating philosophy and non-normal event checklists were written in Operating Manuals, and a lot of the tacit knowledge about the aircraft and general decision-making was passed on during informal discussions or learnt on the job.

1.3 Resilience

When certain systems such as aviation, nuclear energy and medicine began to be identified as complex socio-technical systems, cognitive ergonomics started providing description frameworks for safety measures. The evolution of these frameworks gave rise to a systems approach to safety (Rasmussen, 1986; Reason, 1990). This gave rise to the concept of Joint Cognitive Systems (Hollnagel and Woods 1983; Woods 1987) where systems came to be recognized as having the machine component along with the human element. Risks in these joint cognitive systems began to be perceived through the interaction dynamic, rather than through the risk of failure of a single component within the system. *Resilience was born out of*

the need for controlling safety in these complex dynamic systems in the real world (Amalberti 2008).

Resilience is when individual recognizes, adapts to and absorbs variations, changes, disturbances and surprises, especially disruptions, which fall outside the set of disturbances, the system has been designed to handle (Hollnagel and woods, page 3, 2006).

Woods (2015) mentions 4 concepts of resilience:

- 1) Resilience as rebound, expressing how a system rebounds from disrupting or traumatic events and returns to previous or normal activities.
- 2) Resilience as robustness, expressing the ability of a system to absorb perturbations.
- 3) Resilience as graceful extensibility, expressing how a system extends performance when surprise events challenge boundaries.
- 4) Resilience as sustained adaptability, expressing the ability of a system to adapt to future surprises as conditions continue to evolve.

He further concludes that a resilient system should be able to handle surprise events that are outside its design base.

Morel (2008) argues that the range of controllable situations that may be considered resilience could be a *natural expansion of expertise* and that a more resilient system is a more knowledgeable system.

However, today, to a modern pilot, it becomes challenging for anyone to expect such adaptability from them, as they are trained to follow rules, adhere to checklists and have been professionally indoctrinated to believe that there is a procedure for everything. This is because all Safety Management Systems are based on an assumption that people will follow procedures all the time.

1.4 Airmanship

It is widely accepted within aviation circles that airmanship is key to aviation yet there is considerable confusion as to what does airmanship actually comprise of (Ebbage & Spencer, 2003).

Many Researchers have attempted to define airmanship but as yet there is no universally accepted definition. Those definitions offered in literature include:

<p>“Airmanship is effective decision making to support a sequence of actions”</p>	<p>Training Development Support Unit 2000</p>
<p>“Airmanship is the care and attitude you bring to the conduct of your flying. It encompasses consideration for your passengers, care of your aircraft, courtesy to other airspace and airfield users and the self-discipline to prepare and conduct your</p>	<p>The Aviation Theory Centre 2001</p>

<p>flights in the most professional manner possible. It is not just flying skill that distinguishes a good pilot, it is his or her standard of airmanship.”</p>	
<p>“Airmanship is a personal and situational management state required to allow a human being to enter and exit, in safety, an environment, which they are not naturally designed to inhabit.”</p>	<p>Hayes, 2002</p>
<p>“Airmanship is the consistent use of good judgment and well developed skills to accomplish flight objectives. This consistence is founded on the cornerstone of uncompromising flight discipline and developed through systematic skill acquisition and proficiency. A high state of situational awareness completes the airmanship picture and is obtained through knowledge of one’s self, aircraft, team, environment, and risk.”</p>	<p>Kern 1996</p>

Recent aviation incidents (Hudson river landing by US Airways Flight 1549 in 2009, Air France 447 in 2009, Qantas flight 32 return to Singapore in 2010, Atlas global Airbus A320 landing in Istanbul in 2017) have demonstrated how airplanes with no single identifiable fault can challenge pilots with situations that require pilots to act in ways not documented in manuals and standard operating procedures. In these scenarios, Classic airmanship has been the difference between a positive or adverse outcome.

The importance of airmanship in aviation has been undisputed since the '80s when Tom Wolfe hinted at airmanship but never defined it in his book "The Right Stuff". He wrote that the US Navy fighter pilot squadrons "were divided into those who had *it* and those who did not. This quality, this *it*, was never named, however, nor was it talked about in any way"(Wolfe, 1979, p.17).

The overriding theme running through the above examples of effective airmanship is the ability of the aircrew to "control" a situation by using both their training and certain amount of on-the-spot ingenuity. Specific qualities associated with effective airmanship include the following: discipline, communication, teamwork, knowledge, expertise, situation assessment, judgment, decision taking, resource management and goal prioritization (Ebbage and Spencer, 2003).

2 METHOD OF INVESTIGATION

The main area of interest of the study was whether responses of inexperienced pilots differ from experienced pilots, particularly when concerning SOP and Airmanship.

For this study both qualitative and quantitative methods were chosen. The questions asked were different from those asked in a Safety Culture Survey Questionnaire. That is because there is still no consensus on if safety culture survey questionnaire help in measuring safety accurately. It was decided after consulting with two senior Indian pilots and an international human factors expert that the questions asked should be operationally relevant to the Indian pilots in order for them to feel strongly about completing the survey.

Demographic data comprised of number of hours of experience and type of airline they were working for, as the surveyor wanted to explore if experience and airline type had anything to do with the way a pilot responds to questions regarding SOP compliance and reporting.

The researcher's seventeen years of experience in commercial aviation proved to be an asset in formulating questions that would elicit a reasonable and honest response from the Indian pilot community. The author had been an airline pilot in India from 2001-2012, performing roles of first officer, captain and Instructor during that time. He is presently flying as Captain with one of largest International Airlines operating wide body aircraft. The twelve years spent working for an Indian Airline gave the author a unique insight into the changing Indian Aviation landscape associated with the rise of Indian Low Cost Airlines.

The questions were devised to help explore the Indian pilot's perspectives on various dimensions concerning safety. The Two Senior pilots from India (a wide body aircraft captain, and a narrow body aircraft Type Rated Examiner) along with a human factor professional from an international airline were again consulted and the questionnaire was amended through a series of iterations (e.g. reworking of language and increased operational relevance of questions), with each question being reviewed, amended and tested with a small sample of respondents.

The final survey comprised of fifteen items covering five dimensions of airline safety culture; standard operating procedures & airmanship, open communication amongst flight crew, just culture and reporting, fatigue and automation, along with ten demographic questions. These were: gender; age; rank; aircraft type; aircraft manufacturer; member of pilot union; tenure; flying experience; base of operation, and airline type. In addition, respondents were asked if they would like to participate in qualitative interviews, and were requested for their email addresses for the same.

The full set of study items are reported in the APPENDIX section (Page viii & ix).

2.1 The Scenario

The focus of the study revolved around a "Table Top Simulation" which forced the pilots to choose between a) strictly following the given SOP, or b) deviate from the SOP. The following excerpt from a major international airline SOP was provided to pilots for reference:

“Following a go-around or missed approach, it is the Commander’s responsibility to determine if a subsequent approach is to be conducted to the same runway. If the first approach is unsuccessful, the aircraft may hold until the situation improves sufficiently for a second approach. If a second approach is to be conducted the commander shall ensure that there is a high likelihood of a successful landing from that approach. If the second approach is unsuccessful, the aircraft shall divert to the alternate aerodrome, unless already committed to destination and unable to divert”.

A scenario was then set at an airfield with good weather conditions. It was informed that while on the first approach, a misjudged flare during landing results in the crew to abort the approach and execute a go around. The participants were then given the information that the second approach also results in a missed approach when ATC instructs the aircraft to go around due to the preceding aircraft failing to vacate the runway in time. The pilots were then asked to decide if they would a) land at destination or b) follow the above SOP and divert to alternate. It was mentioned that fuel remaining on board was not a deciding factor in the exercise.

2.2 Data Collection

The survey was electronic and managed through the “Survey Monkey” survey platform. It was distributed via an online link between 28th March and 28th May 2017. In total, the survey covered over seven thousand pilots who are actively engaged in the aviation industry in India and the aim of the study was to reach out to as many of these pilots as possible. The link was promoted via Facebook, WhatsApp and other social media platforms to reach a wider audience. A full service airline in India sent out an email to all its 200 pilots informing them of this survey along with the link to the survey website.

2.3 Participants

There were a total of four hundred and seven valid responses, making it the largest anonymous survey of its kind involving Indian pilots. Within these responses, there were still missing responses (e.g. to a single item). These are responses missing completely at random and these were handled using pairwise deletion. This means the responses that were missing were removed from the case, but all other responses from the respondent with missing data were included.

A total of eighty-seven email addresses were received from pilots who wished to participate in qualitative interviews. Twenty qualitative interviews were conducted at a time suitable to both parties. The qualitative interviews were carried out over the phone and lasted forty-five minutes to an hour. One interview in particular with a senior wide body examiner lasted more than two and a half hours. The interviews were recorded on a computer and were later transcribed to look for common phrases and patterns.

The survey did not sample any airlines directly, and participants were not asked to provide their employer's name, as this would have prevented pilots from responding freely to the survey items.

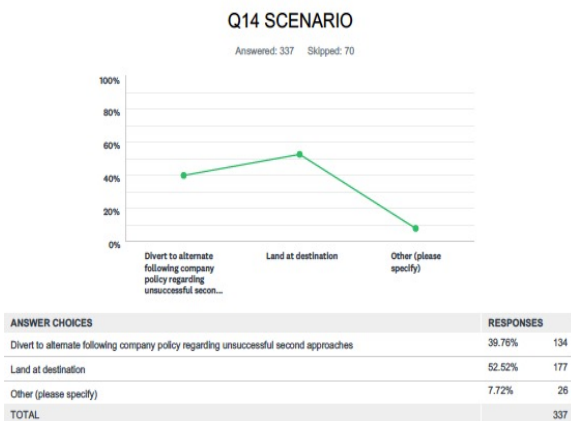
3 RESULTS

3.1 SOP Compliance (Land or Divert Scenario):

The results demonstrate two lines of thought. Strict procedural compliance in Indian pilots is observed among pilots with less than five thousand Hours of flying experience. These pilots have started their careers in the last ten years, obtaining jobs being created with the rise of new rapidly expanding low cost airlines. These Airlines had a culture of strict procedural compliance from the beginning. Experienced pilots with more than five thousand hours of flying experience however were found to be less likely to strictly apply company procedure.

Three hundred thirty seven pilots chose to respond to the Land or Divert Scenario question, while seventy pilots skipped the question. Those who skipped could have felt that even though the survey was anonymous, their decision-making would be scrutinized or judged, a fear all decision makers have.

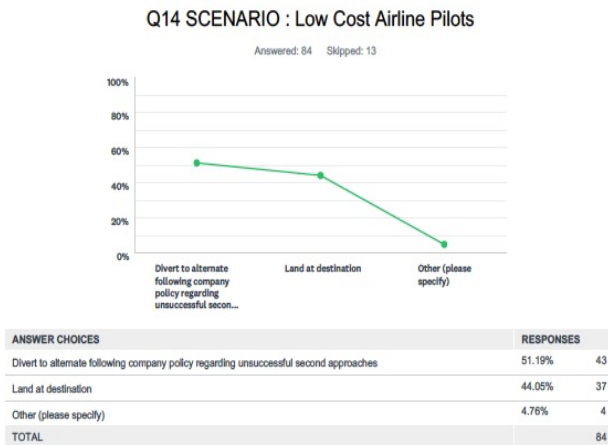
Group 1(a): Overall Sample Results



40% pilots decided to follow company SOP and divert to alternate airfield while 52% of the pilots decided to land at destination against the company policy. 8% chose the “other” option. Those choosing the other option asked for more information on weather and fuel and went on to

explain their decision more thoroughly.

Group 1(b): Low Cost Airline Pilots



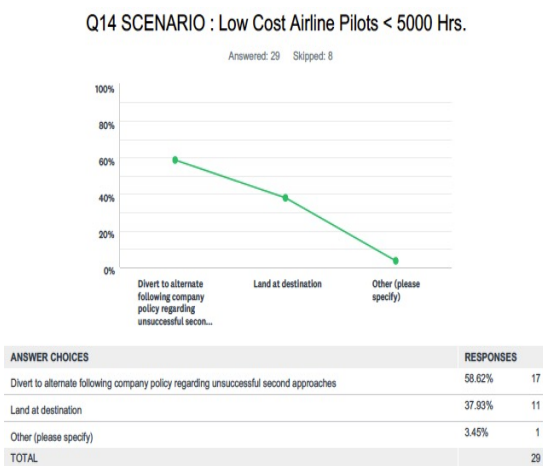
In this group, more than half of pilots (51%) decided to divert to alternate airfield, and strictly following company policy regarding unsuccessful second approaches. 44 % pilots decided to land at destination against the policy of the company.

Graph 1(b): All Low cost Airline Pilots.

This divide indicates a division in how Low Cost Airline Pilots approach this scenario. This group was further divided into experienced and less experienced pilots in the next two tables.

One Low Cost Airline was asked why would he choose to divert and not land, the pilot replied: *“It’s their airplane, their airline, I just play by their rules. Simple.”*

Group 1(c): Low Cost Airline Pilots with < 5000 Hrs. Table 4 (page 10)



59% of this group surveyed opted to divert to alternate following company policy. Most pilots from this group were in their first airline job.

When asked if it was a tough decision to make, one pilot immediately replied:

“No. If it’s written in black and white in the SOP, why should I use my brains?”

Group 1 (d): Legacy / Full Service Airline Pilots.

Q14 SCENARIO : Legacy / Full Service Airline Pilots



Only 36% of pilots from legacy/ full service airlines chose follow company policy and divert, whereas 55% chose to go against the company policy and land at destination.

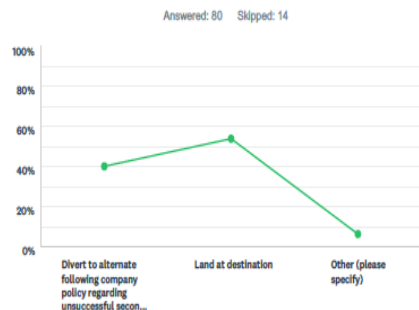
Table 1(d): Legacy/Full Service Airline Pilots.

When asked in interviews if the decision was hard or easy, generally pilots replied that the decision was hard but they were confident that the management would understand. One of the pilots said:

“I am confident I will be able to convince the management about how this decision was a better decision for the company and passengers on that day”.

Group 2 (e): Legacy / Full Service Airline Pilots with < 5000Hrs.

Q14 SCENARIO : Legacy / Full Service Airline Pilots < 5000 Hrs.



40% of pilots from this group decided to divert to alternate following company policy whereas 53% pilots decided to land at destination. This group is similar to Group 1 (b) which comprises of pilots who are working at their first airline job. One pilot from this group who chose to divert to alternate airfield spoke,

“My decision is influenced by the Chief Pilot. The last

Table 1(d): Legacy/Full Service Airline Pilots with <5000 Hrs.

Chief Pilot was ‘big picture’ so I would have decided differently, however this present one is quite strict on compliance.”

It is noteworthy that the scenario used in the survey was designed in such a manner that safety was not compromised in either of the two choices, as there was ample fuel in either case. Even then, some pilots with less than 5000 hours experienced believed that following company SOP is implicitly a “safer” option. When asked to explain this assumption, they were not able to substantiate this view with a reasonable explanation.

3.2 Most important attribute in your flight deck colleague for safe flight

Q15 What is the most important attribute you desire in your flightdeck colleague for safe flight

Answered: 334 Skipped: 73



ANSWER CHOICES	RESPONSES
Communication skills	82 (24.55%)
Knowledge of company procedures	86 (25.75%)
Respect and courtesy	39 (11.68%)
Manual Handling skills	7 (2.10%)
Airmanship	105 (31.44%)
Other (please specify)	15 (4.49%)
TOTAL	334

Airmanship was selected as the most important attribute by the largest number of participants (31%) followed by knowledge of company procedures (26%). Interestingly, manual-handling skill was selected by the least number of respondents (2%).

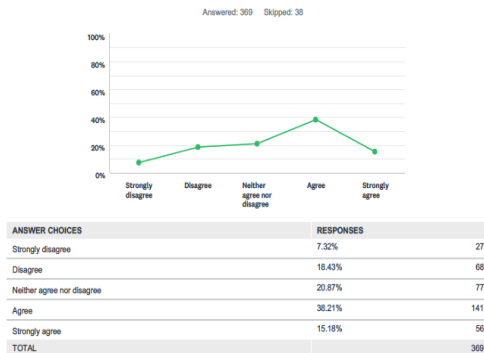
Table 2: Legacy/Full Service Airline Pilots

Of the pilots who selected the “other” option, most pilots wrote about situation awareness as the most important attribute. This result again points at the two lines of thinking amongst Indian Pilots. Some pilots consider SOPs as “the gospel truth”, the knowledge of which is a

must, whereas some consider SOPs as mere guidance and place higher emphasis on Airmanship as the most important attribute for safe operation.

3.3 Adapting SOPs to meet Efficiency Targets

Q12 On every flight, I have to adapt SOPs to suit efficiency targets.



More than half of the pilots (53%) who responded to the question agreed or strongly agreed with the statement that they had to adapt SOPs on an everyday basis to achieve efficiency targets. This response indicates a strong discrepancy between “work as imagined” (SOP) as against work done (line operations).

Table 3: All pilots.

Compared to legacy airline pilots, a higher percentage of low cost airline pilots were in agreement with the statement. One pilot pointed out that this could be the case because low cost airlines have more specific SOPs and have more efficiency targets to be met than their counterparts in legacy airlines, thus making adapting SOPs for efficiency a bigger everyday reality in Low Cost Airline operation.

3.4 Results of qualitative interviews on Airmanship.

When pilots were asked to define airmanship to a layman (to a company car driver), almost all pilots were observed to find it challenging. Most pilots took a 15-25 second pause to gather

their thoughts to give a lay explanation of airmanship. This is consistent with the literature on airmanship, which indicates that although airmanship as a term is often used; it lacks a clear definition (Ebbage and Spencer, 2003). There is general confusion on what airmanship actually means and there are many definitions of it, highlighting a set of skills, knowledge and attitude required to optimally make decisions on an everyday basis while successfully balancing safety at all times.

When asked to give examples of airmanship from their flights, it was noted that senior pilots (with more than Five Thousand Hours experience) from legacy carriers readily gave many examples of when they acted practically in certain situations and how they ‘bent’ the company SOP to accommodate the request of another aircraft on the ground or in the air. However pilots from low cost airlines were observed to take more time to recall examples of airmanship from their flights and in general were not very enthusiastic when it came to recalling instances of airmanship.

Example 1 of Airmanship

A senior pilot flying a wide body aircraft narrated one incident in extensive detail. It involved a delayed flight being planned on maximum operating Mach (a unit for speed at high altitudes) from Delhi to London, in order for the flight to remain under duty time limit restrictions of the crew. The senior pilot refused to operate at the fast Mach flight plan and proved to the company that due to the turbulent and cloudy conditions en route it was not safe to fly at that high speed. Interestingly he also proved that all they saved between a max speed plan and a regular speed plan was 8 minutes, while burning 900 Kilograms of extra fuel. He pointed out that the flight

was within the confines of the Flight duty time limit already under the regular speed schedule and using commander's discretion to extend flight duty time once the flight departed. This proved that overall good knowledge of procedures and tacit knowledge of flight in different weather conditions makes one make a decision, which can balance efficiency and flight safety.

Example 2 of Airmanship

This involved awareness of one's surrounding traffic while in cruise even though there is no regulatory requirement to do so and to anticipate early if higher cruising level would be "blocked" by other airplanes on the same route or not. All these examples pointed to a vast set of skills, which can be brought under the umbrella term of Airmanship.

Example 3 of Airmanship

A wide body aircraft first officer mentioned that on international flights, it becomes quite challenging to listen out to ATC controllers instructing his flight to change to different frequencies. To mitigate the risk of missing out on the calls, the first officer marks waypoints where the flight is expected to change to the next ATC, and scribbles the expected frequency on a notepad. Even though there is no SOP regarding the same, good airmanship makes him aware of his limitations of deciphering foreign accents, making him plan ahead.

4 DISCUSSION

4.1 Conventional Safety view & the “new view” of Safety

The results indicate that most inexperienced pilots (less than five thousand hours) have a conventional view on safety, that situations are binary or only “black or white” and that by only following SOP, they can limit human error, increase safety and also keep themselves away from safety investigations. Whereas experienced pilots, over their careers somewhere have understood the existence of “grey areas” in everyday operation and that safety is more than just elimination of human intervention and strict compliance to procedures. Conventional safety rests on the assumption that complex systems are basically safe, and that the system defenses are undermined by the unreliable actions of humans. So safety investigations are on the lookout for someone who ‘doesn’t do what they were supposed to do’ (cf. Hopkins 2000).

Safety science is now moving to a new view on safety (e.g. Rasmussen 1997, Hollnagel et al. 2006) and according to this view, safety is no longer seen as being achieved by reducing of human error, but is created through enhancing human practice instead (Dekker, 2006). In other words, safety is created by leveraging the human capacity to improvise and use less specified procedures, a facet of work humans perform better than machines (Fitts, 1951).

Most pilots in the survey (53%) agreed or strongly agreed that they routinely adapt SOPs to achieve efficiency targets. As almost all of these “adapted SOP” flights are still conducted within the permissible safety parameters, it can be inferred that safety can also be maintained while being at the boundaries of company SOP. The new view on Safety also recognizes that

there always seems to be some discrepancy between work as prescribed in procedures and the way work is actually carried out (Antonsen et al, 2008).

4.2 The trap of over regulation

One experienced legacy airline pilot reasoned that new pilots do not have the “back story” to recently introduced rules. These rules could have been added on as a result of knee jerk reactions to certain incidents, and thus their strict application could be unnecessary or even dangerous at times. It takes experience and a deeper understanding of procedures to correlate to which procedures align with the age-old aviation philosophy (Ex. “aviate-navigate-communicate”) and which ones are a result of the additive nature of rules and regulations. However with the rapid expansion of aviation in India, inexperienced pilots (less than 5000 Hrs.) are being promoted to Captain positions and there must be a process by which these Captains are made aware of why some rules came into existence in the first place.

In the following graph, Amalberti (2001) explains how the additive nature of regulation is constantly reducing the space where work is supposed to be carried out. Personal pressures, technological efficiencies and commercial forces are pushing the worker in the opposite direction, towards maximum performance. This force dynamic results in increasing the space where non-compliant yet safe work exists, and minimizing the space where work is thought to be carried out. This increasing space is the area where most pilots work when they mention that they make routine adaptations to SOP to meet efficiency targets.

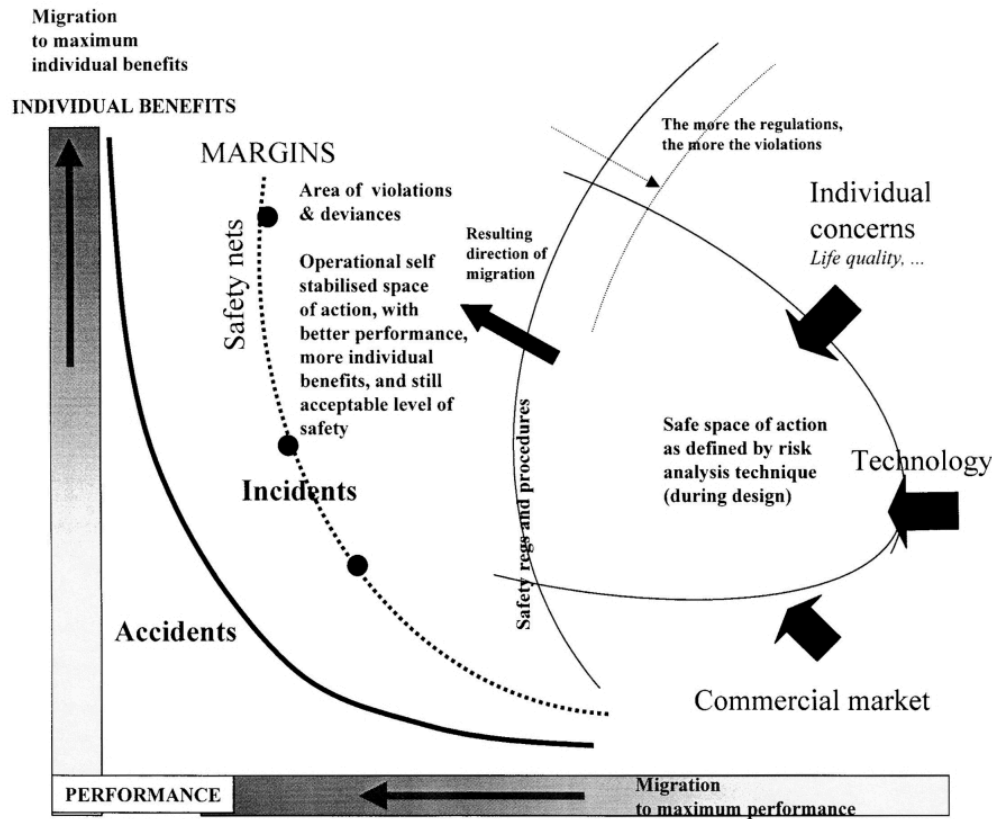


Fig. 1. The trap of over regulation. The safe space of performance, as expected and calculated during design, is contained within three boundaries: the individual and social regulations, market rules and safety rules. When in use, the system migrates through the safety boundaries towards more performance and more individual benefits (see Rasmussen, 1997, for development of this idea). The new resulting operational space of performance becomes largely positioned outside the initial safe space of performance. This new space is characterized by reduced margins to incidents and accidents (despite safety remains acceptable) and numerous violations and deviance. The safety trap should consist in that situation to continue a simple-minded strategy fighting violations with the development of new regulations. Cumulative regulations will then have the effect to change nothing in

operations (the system is stabilized), mechanically increase violations, increase reluctance and opacity in incident reporting and add noise in the safety monitoring strategy

4.3 Airmanship as “Aero Resilience”

Pilots in the survey were familiar with the term Airmanship, however did take time to define it in layman terms. When asked if airmanship can be taught, most pilots said no. When asked how did *they* learn airmanship, most pilots confessed they do not precisely know where, however they picked up these often acceptable and normative behaviors while flying as co pilots alongside senior commanders and that some commanders, who could communicate effectively, were able to pass on much more tacit knowledge than others. None of the pilots mentioned they learnt airmanship in the classroom, however two pilots did mention learning airmanship from senior pilots during simulator briefings.

Experienced pilots were asked if they could see a correlation between basic airmanship and the rise of SOP, they observed that with the rise in SOP, the inexperienced pilots were losing the ability to gain tacit knowledge and enhance their flying and airmanship skills beyond what was demanded by company SOP. Command training courses where co-pilots are trained to become captains were laying more emphasis on training mandatory drills and grading the pilots on predictable scenarios rather than exposing pilots to unique situations and encouraging them to display naturalistic decision making while in devising a plan, rather than quoting company policy. Although in the last one year, this trend is changing with the Indian Aviation Regulatory Agency’s acceptance of “Evidence Based Training” programs being recently introduced in some Indian Airlines.

4.4 Effect of national culture on SOP compliance, a topic for future research.

A number of authors have tried to map and analyze the effects of national culture on pilots. Helmreich & Merritt(1998) employed a number of Hofstede's cultural dimensions to study the effects of pilot culture in flight operations by means of a Flight Management Attitude Questionnaire (FQMA).The FQMA measured pilot attitudes towards command, communication, stress, rules, automation and others, and found that there are substantial differences in the way pilots conduct their work as a function of national culture and that there are areas of concern that have implications for safety (Meritt, 1996; Meritt & Helmreich, 1998).

In other words "*culture influences how we perceive, comprehend and interact with the world around us*" (O'Neil, 2006:1).

Major National Culture surveys such as The Global Leadership and Organizational Behaviour Effectiveness Research Project (GLOBE) (Javidan & House, 2001) have categorized Indian along with a few South Asian cultures, as rule followers with fairly high Uncertainty Avoidance when compared to certain western cultures.

The Indian Pilot survey conducted by the author indicates that this strict rule following culture weakens as the Indian pilot gains more experience, indicative of the fact that professional culture begins to have a bigger influence as compared to national culture on decision-making as aviation experience grows.

Critics of National Culture Surveys have argued that these surveys are old and do not represent the modern times. The study results make the author agree with the critics of these National Culture Surveys, especially in the Indian Pilot's context. Globalization, improved access to education and the rise of the urban middle class (which is not tightly bound by religion) may be altering the Indian Pilot's perception on strict rule following in aviation. Especially as a pilot's aviation experience increases.

Future research can be done at multicultural airlines to explore how different cultures perceive SOP compliance in such unusual yet plausible events.

5 CONCLUSION

The study's survey and interviews yielded three major findings that indicate the Indian Pilot's perceptions on Standard Operating Procedures.

1) All pilots in the study recognize standard operating procedures as an important tool however most (53%) of the pilots also admit to making regular adaptations to these SOP to enhance efficiency. Thereby proving the existence of work as imagined versus work as actually done.

2) Pilots with less than five thousand hours, tended to adhere more to SOP as they feel their job is to stick to SOPs, as this is what has been taught to them since the beginning of their career in low cost airlines.

3) Experienced pilots are quick to recognize grey areas in policy and firmly believe SOPs cannot be and should not be written for every situation. They tend to use common sense and airmanship to interpret the SOP for a particular situation.

6 RECOMENDATIONS

Based on the findings of this research, the following recommendations are presented for stakeholders:

1) Provide pilots with background on procedures and policies: Procedures can be often knee jerk reactions to major incidents (Amalberti, 2001). Pilots who are working for the company at the time of these incidents do get to notice this cause and effect. However, pilots joining afterwards are simply instructed to follow the procedure in the Company Manuals and are not aware of the origins of that procedure or policy. Providing background information to pilots about these company procedures and policies can reduce this knowledge gap.

2) Mentorship: Tacit knowledge is an invaluable asset gained only by practicing a skill over a period of time. This type of knowledge possessed by experienced pilots can be passed on to junior pilots through mentorship. Rapidly expanding airlines should initiate programs where inexperienced pilots are not just trained with books and manuals, but mentored by experienced pilots in formal and informal settings. These mentorships can be successful in increasing the “know-how” of inexperienced pilots, who only gain the “know-what” from company manuals. Discussions should also include “grey areas” where multiple reasonable “safe outcomes” exist depending on how a policy or procedure is interpreted.

3) Emphasis on “application of procedure” along with Procedural Knowledge:

Pilots should be mindful that if all you have is a hammer (SOP in this case), everything looks like a nail. Training must introduce mental models, which pilots can use to decide if a policy should be applied to the current situation or not. Decision-making must also include a review

of one's actions and to investigate if application of a policy is achieving the intended goals or not. Training events should be constructed where simply applying a policy might not achieve the desired objective. Pilots must be encouraged to come up with their own mental models, which induces deep learning and reasoning. Boundaries created of safety regulations and procedures, safety nets and absolute limits must be introduced to pilots, to make them aware of these limitations when making decisions in non-routine operations.

4) More research on the successes and lessons learnt of airlines, which have reverted to less specific SOPs.

There have been airlines in the recent past, which have embraced less specific SOPs of the aircraft manufacturer instead of their more specified company SOP. One particular airline in Netherlands introduced this new SOP with the slogan "less rules, more airmanship" (Van Der Lely, 2009). More research should be done on the result of such changes, and the impact of this change on safety within the airline.

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