Civil Aviation Legislation & Oversight

Can it guarantee safety?

ECA Piloting Safety
European Cockpit Association

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Introduction

Thesis

The world is going through a period of change. The ongoing financial and economic crisis is providing a difficult climate for the industry to thrive. At the same time politics seem to run from one fire outbreak to another without offering an overall solution. The tensions in Europe are rising, the belief in the European project is dwindling.

Aviation is an industry that is only hindered by borders. As such, a harmonised European aviation system should be a conditio sine qua non. The industry however has problems of its own. The economic downturn is putting pressure on profit margins pushing operators to cut costs where they can. This may erode safety margins which were well above the legal minima in the past but now are quickly approaching these limits.

The complexity in the aviation system is rising as well. Operator A, sells tickets under company B, hires planes from company C, hires crew from company D, and flies from country E to country F, and this increasingly with one operator having bases in several different countries. Complex operations like these require for an operator to have an extremely good handle on safety. And it demands for an oversight authority with a lot of expertise and skills so it can correctly assess the operator's safety performance.

Different industries have experienced in the past what can happen if management and oversight authorities are not up to the task of maintaining safety. We will look at some of these examples which are highly visible cases that grasped the world's attention for weeks if not longer.

We will draw lessons for the aviation industry from these high profile cases and pinpoint where the European aviation safety system has to focus its attention on. That the European Aviation Safety Agency (EASA) will have to play a key role in the solution is a given.

Definitions

Defining 'Inadequate' Regulation

Due to the inherent safety risks of flying, historically, a broad set of regulatory requirements has emerged to enhance aviation safety. Sometimes however these requirements fail to offer adequate protection or to respond to emerging trends or technologies. It is important to mention that when we talk about 'inadequate' regulation this covers the entire legislative circle, which includes legislation (writing and content of the rules) and oversight (enforcing them).

In view of the ongoing change to the regulatory system i.e. the shift from a compliance-based to a risk-based system, looking at both the regulatory provisions and the deficiencies in oversight is equally important. The way rules are developed either as compliance-based or risk-based system is different but also the way authorities and operators have to deal with these rules and the ways these rules have to be overseen are also poles apart.

A review on the current system

Historical cases

Alaska Airlines sundial memorial

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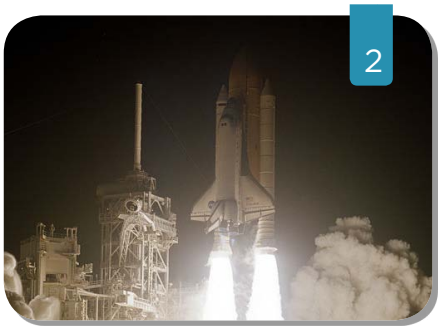
Alaska Airlines

On January 31, 2000, Alaska Airlines flight 261 impacted with the Pacific Ocean, killing its crew and 83 passengers.



Columbia Airspace Shuttle

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Space Shuttle Columbia

On February 1, 2003, Space Shuttle Columbia disintegrated during its re-entry into Earth's atmosphere, killing all 7 crew members on board.

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Fuel policies

On July 26, 2012 four aircraft were compelled to land in Valencia under emergency procedure due to dwindling fuel reserves.

Alaska Airlines flight 261 [i]

In the afternoon of January 31, 2000, Alaska Airlines flight 261, a McDonnell Douglas MD-80 impacted with the Pacific Ocean, instantly killing its crew and 83 passengers. There was no unlawful interference, no pilot error involved. Everything was completely legal.

The investigation revealed that the immediate cause of the accident was a failure of the jackscrew-nut assembly of the horizontal stabiliser, rendering the aircraft uncontrollable. The assembly failed because it was not properly lubricated. However, the lubrication interval used was perfectly legal. When the aircraft was launched in the mid 1960s, the manufacturer recommended that operators lubricate the trim jackscrew assembly every 300 to 350 hours. In 1985, as an accompaniment of deregulation in the airline industry, the lubrication was to be accomplished every 700 hours, at every other B-check. In 1987, the B-check was extended from 350 to 500 hours, which put the mandatory lubrication interval to 1000 hours. In 1988, B-checks were eliminated and tasks redistributed to A and C-checks. The lubrication was to be done each eighth 125-hour A-check: still every

Alaska Airlines Boeing 737-890 © Wikipedia / Creative Commons

1000 hours. Then, in 1991, A-checks were extended across the entire industry to 150 flight hours, leaving lubrication every 1200 hours. Three years later, the A-check was extended again, this time to 200 hours. Lubrication was now scheduled for every 1600 hours. In 1996, Alaska airlines removed the lubrication task from the A-check and specified the lubrication for every 8 months. This meant the interval was now about 2550 hours.

From the lubrication interval of 300 to 2550 hours, each of these changes was legally approved, being proposed by the industry and justified by the industry-supplied data. The airline and its maintenance arm was abiding by recommendations from the manufacturer and the rules set by the regulator, the regulator was approving successive maintenance intervals on the basis of the evidence that was presented and deemed appropriate and sufficient at the time. The people doing the maintenance work followed the rules and procedures.

Aviation is a complex socio-technical system, rendering it impossible to predict all the possible relationships and impacts of a change. Keeping aircraft airworthy is the simpler, more straight-forward part of the system, lacking the social component. The components behave by recognised physical rules and interactions are predictable. It could therefore be assumed the regulation could keep the system under control. This case shows it cannot.

Space Shuttle Columbia [ii]

On February 1, 2003, Space Shuttle Columbia disintegrated during its re-entry into Earth's atmosphere, killing all 7 crew members on board. The triggering event was the strike of an iced chunk of insulating foam during the launch, 16 days earlier. The strike created a breach in the aircraft's wing which during re-entry allowed the superheated air to penetrate the wing and eventually melt the aluminium wing spar.

The investigation report went on beyond the immediate cause of the accident – ice debris falling from the main fuel tank and damaging the wing heat tiles – and listed a number of factors which have contributed to the disaster. Most strikingly – it appears that the cause was already known before the accident but inadequate assessment and failed communication flow have impeded management to

act. A conclusion lying beforehand is that the people responsible for regulation were either denied the information of the problem or behaved in an irrational way to allow the operation to continue with the problem not rectified. Both assumptions are wrong: the regulatory system was simply unable to do its job.

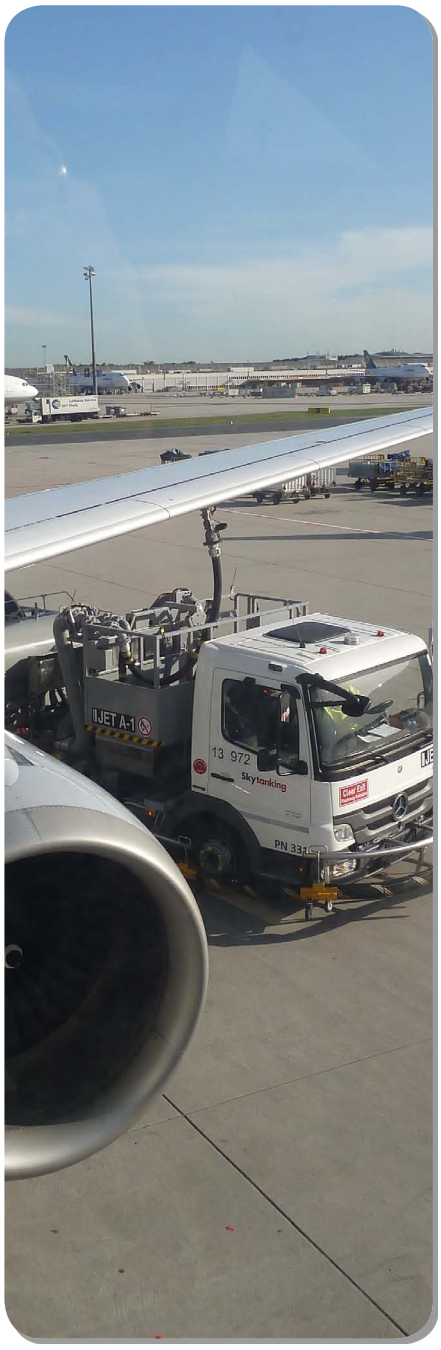
The decisions at all levels in an organisation are based on some sort of information. Inevitably, the way in which the information is selected and presented has consequences for what people will see as the problem to be solved, and which aspects of that problem are relevant and which are not. One critical feature of the information environment in which NASA engineers made decisions about safety and risk was bullet points – those little black circles in front of phrases that were supposed to summarise things in Microsoft Office PowerPoint.

Bullet-point presentations collapse data and conclusions into slides, which are then dealt with quicker than technical papers. Bullets dominated technical discourse and, to an extent, dictated decision-making, determining what would be considered as sufficient information for the issue at hand. Consequently, it was after the Columbia accident that the Mission Management Team "admitted that the analysis used to continue flying was, in a word, "lousy". This admission – that the rationale to fly was rubber-stamped – is, to say the least, unsettling." [iii]

The use of bullet points shows how organisational (and regulatory) decision makers are exposed to an impoverished information environment. As information gets passed up to management, the flow could be obstructed by structural deficits, the message might be lost or become distorted during transmission through a reductionist, abbreviated medium.

"As information gets passed up to management, the flow could be obstructed by structural deficits, the message might be lost or become distorted during transmission through a reductionist, abbreviated medium."

Regulation and economic pressures: fuel policies



Fueling aircraft © ECA

On July 26, 2012 four aircraft were compelled to land in Valencia under emergency procedure due to dwindling fuel reserves. The flights had been diverted from Madrid due to severe thunderstorms over the capital. There, the pilots had to call mayday emergencies because they were running low on fuel.

Those incidents gathered a lot of attention and sparked a debate on whether safety had been compromised or laws had been broken. The responsible civil aviation authority and the airlines have continuously repeated that "no rules were broken".

And in fact, they are correct in saying that. By current regulation, the amount of usable fuel remaining on board is to be "no less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining upon landing". [iv]

This regulatory minimum is indeed safe, on the condition that the flight in question is the sole arrival at its destination and alternate, and the weather follows the specifications of the weather forecast. In the real world, it is hardly ever the case.

Weather permitting, alternate airports chosen are the ones with the least trip fuel from destination to alternate. Therefore, a preferred alternate to a large hub will be a smaller airport, with less capacity. Should a hub become unavailable for whatever reason, it will become unavailable to many if not all flights in a specific period and this traffic will risk overflowing to the smaller alternate. Having less capacity, delays will inevitably occur, breaking the alternate fuel planning assumption of being the only aircraft in the sky. Consequently, there is a risk that there will not be enough fuel to complete the flight legally or even not enough to complete the flight at all.

With increasing economic pressures, aided by ever-increasing fuel prices and carbon emissions trading schemes, the airliners are flying with fuel levels closer and closer to the regulatory minimum. While these practices do conform to law they also drastically narrow the safety margins.

A repetitive history:
Cases of failed regulations in other industries

1

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2

Deepwater Horizon explosion

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3

Fukushima

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Financial crisis

In 2008, the US housing market bubble exploded. What brought the world's financial banking system on the brink of collapse were: complex products, lack of adequate and sufficient oversight, deregulation and wrong incentives.

BP Deepwater Horizon

On 20 April, 2010 the Deepwater Horizon drilling rig exploded in the Gulf of Mexico, causing one of the largest environmental disasters in US history.

Fukushima

On 11 March 2011 a 9.0 magnitude earthquake occurred near the island of Honshu in Japan. The resulting tsunami struck the Fukushima nuclear plant which had not been designed for a tsunami of that size.

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The 2008 financial crisis

Even though the financial crisis started in 2007 and escalated in 2008 with the US housing market bubble exploding, the sources for that bubble can be traced back to the eighties when President Ronald Reagan started the deregulation process. A protagonist of the free market, he amended laws to ensure US capitalism could thrive without limits under the principle that the market will always regulate itself. It was on this fertile soil that the banks started to grow and expand their portfolio with new products (derivatives). In order for the economy to continue growing, consumers had to increase their spending, so banks introduced credit cards. People used these credit cards to build up debts and used other credit cards to pay off debts incurred on their first cards. Banks allowed the system as their income depended on the high interest rates and on the provisions they received (both from the spenders and the shops that had to allow the use of the credit card).

To push consumption even higher, people were allowed to (re)-mortgage their house (several times) because housing prices would always grow. At the end of the bubble there were people with an income of 14.000 $ who had mortgages for 6 houses totalling

750.000 $. This was possible because there was not enough oversight on how loans were granted and credit agencies that did perform oversight (by giving ratings to banks and bank products) paid staff wages which were a fraction of the salaries paid in the banks where the financial constructions were designed.

This partly explains why rating agencies so grossly misjudged the credit default swaps granting them the highest protection (triple A) whilst in reality they were junk. These financial products found very eager export markets oversees resulting in banks from around the globe holding triple A derivatives which in reality were worth only a fraction of their capital.

In the meantime, in 1999, President Clinton withdrew the Class-Steagall act which had been in force since the great depression in the 1930s. The withdrawal meant that commercial and investment banking no longer had to be separated. This resulted in mergers and banks which we know today as 'too big to fail'. It also meant that all losses incurred on the investment leg of the bank (dealing with derivatives) had an effect on the commercial side (which deals with the savings of the clients). The overturning of the successful 1933 legislation was part and parcel of an ideology that was a major factor in the crash: the erroneous belief system that banks can self-regulate. This manifested in a variety of bad ideas, poor oversight and worse legislation. When the house price growth finally choked and foreclosures started to rise, banks found themselves full of toxic products and over-leveraged. They had to be bailed out by the State resulting in the socialisation of the losses whilst during the bubble (and even during the bailouts) top managers received high bonuses reaping in the profits.

What brought the world's financial banking system on the brink of collapse were: complex products, lack of adequate and sufficient oversight (partly due to lack of expertise), deregulation and wrong incentives (where bonuses are calculated based on short term profits even if it means risking the company on the longer term). [v]

All these contributory factors are very much present in the European aviation industry. Deregulation, liberalisation, outsourcing and alliancing are driving the industry towards more and more complexity. Safety oversight, as we argue in this paper, is not adequate. Short term savings often surpass long term goals (especially in times of financial crisis).

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BP Deepwater Horizon Oil spill

On 20 April, 2010 the Deepwater Horizon drilling rig exploded in the Gulf of Mexico, causing one of the largest environmental disasters in US history. The explosion claimed the lives of 11 workers aboard and resulted in a 4,9 million barrels of oil being spilled in the Gulf.

An investigation into the accident resulted in a 2011 Report to the US President by the National Commission on the BP Deepwater Horizon Oil spill and offshore drilling. The report lists the causes of the disaster and, notably, the failures of the system:

"As a result of our investigation, we conclude:

- *The explosive loss of the Macondo well could have been prevented.*
- *The immediate causes of the Macondo well blowout can be traced to a series of identifiable mistakes made by BP, Halliburton, and Transocean that reveal such systematic failures in risk management that they place in doubt the safety culture of the entire industry.*
- *To assure human safety and environmental protection, regulatory oversight of leasing, energy exploration, and production require reforms even beyond those significant reforms already initiated since the Deepwater Horizon disaster. Fundamental reform will be needed in both the structure of those in charge of regulatory oversight and their internal decision making process to ensure their political autonomy, technical expertise, and their full consideration of environmental protection concerns.*
- *Because regulatory oversight alone will not be sufficient to ensure adequate safety, the oil and gas industry will need to take its own, unilateral steps to increase dramatically safety throughout the industry, including self-policing mechanisms that supplement governmental enforcement."* [1]

1 Deep Water – The Gulf Oil disaster and the future of Offshore Drilling, Report to the President

Some other remarkable statements can be found in the same report:

"Complex Systems Almost Always Fail in Complex Ways" (page viii)

"But most of the mistakes and oversights at Macondo can be traced back to a single overarching failure—a failure of management." (page 90)

In the run-up to the disaster, self-regulation and voluntary oversight had taken over from externally dictated regulations and close government monitoring. Oil rig inspections by the government in the Gulf took the form of helicopter visits to drilling platforms. With only 60 inspectors to oversee 4,000 rigs, regulators could do little more than sift through documentation and sit through presentations during their site visits. The complexity and the expertise required to make sense of the operations would have defeated attempts at meaningful regulation in any case. Such practices, assumptions and expectations and their legitimised, legal results got taken as a basis for confidence that risk is under control, that organisations were striking a good balance between safety and production. [vi]

With EASA admitting to be short of resources, and industry players routinely citing regulatory compliance to justify cost-cutting measures, the Deepwater Horizon report seems uncomfortably familiar.

The key lesson is that inadequate regulation was cited as one of the main reasons for the Deepwater Horizon catastrophe. What seems to be clear for oil industry in hind-sight, might hopefully become clear for the aviation industry in advance.

The Fukushima disaster

On 11 March 2011 a 9.0 magnitude earthquake occurred near the island of Honshu in Japan. The resulting tsunami struck the Fukushima nuclear plant which had not been designed for a tsunami of that size. Three of the six reactors were operating at the time. The earthquake and tsunami resulted in a series of failures at the nuclear plant leading to the release of radioactive materials. It is the second disaster in history that measured level 7 on the international nuclear event scale.

Fukushima ©Wikipedia/Creative Commons

The official report of the Fukushima nuclear accident independent investigation commission by the National Diet of Japan was released in July 2012. **The report is very open and direct and includes some statements on how Japanese culture was partly to blame:**

“What must be admitted – very painfully – is that this was a disaster “Made in Japan.”

“Its fundamental causes are to be found in the ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to ‘sticking with the program’; our groupism; and our insularity.” [2]

2 The National diet of Japan – the official report of The Fukushima Nuclear Accident Independent Investigation Commission

The report also points at deficiencies within the regulator, the oversight and the relationship between authority and industry:

"serious deficiencies in the response to the accident by TEPCO, regulators and the government"

"The TEPCO Fukushima Nuclear Power Plant accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly "manmade." We believe that the root causes were the organizational and regulatory systems that supported faulty rationales for decisions and actions, rather than issues relating to the competency of any specific individual."

"The Commission has concluded that the safety of nuclear energy in Japan and the public cannot be assured unless the regulators go through an essential transformation process. The entire organisation needs to be transformed, not as a formality but in a substantial way. Japan's regulators need to shed the insular attitude of ignoring international safety standards and transform themselves into a globally trusted entity."

"TEPCO did not fulfil its responsibilities as a private corporation, instead obeying and relying upon the government bureaucracy of METI, the government agency driving nuclear policy. At the same time, through the auspices of the FEPC, it manipulated the cosy relationship with the regulators to take the teeth out of regulations."

The disaster showed that next to the need for adequate oversight, company safety ethos is also important to ensure the safety of a system. When relationships between companies and regulators become too close, the risks of having toothless regulation and weak oversight increase.

What could an airline do?

Hypothetical Scenario

Regulation and economic pressures: fuel policies

The previously discussed incidents in Valencia illustrate how complying with the bare legal minimum requirements can lead to multiple MAYDAYs when aircraft have to divert from a major hub to a smaller alternate airport due to weather conditions. Within the context of increasing economic pressure on airlines and ever higher fuel costs, regulation which affects this economic pressure is even more important. The example of multiple MAYDAYs despite compliance with the legal minimum requirements is a striking example of a potential minimalistic legal approach. If economic pressure continues to push the system into saving fuel/weight propelling a downward spiral on safety.

Regulation decreasing safety: ramp checks and paperwork

It is well established that a number of key tasks are to be performed during a turnaround of an average mid-range passenger jet crew:

1. Disembarkation of passengers
2. Removal of cargo and baggage
3. Toilet service
4. Potable water service
5. Cleaning of cabin
6. Security check in/outside
7. Embarkation
8. Loading of cargo and baggage
9. Fuelling
10. Aircraft technical status (MEL)
11. Walkaround check
12. Loadsheet & performance check
13. Weather and NOTAMs check
14. Navigation setup and briefing
15. Threat assessment/ management
16. Checklists

In real world, these tasks are set in a defined time period, limited by an ATC slot or at least by the desire to depart on time. Turnaround time for airlines means money. The less time planes spend on the ground between flights the more time they can spend in the air making money.

But if we try to identify the tasks having a direct impact on flight safety (not theoretical or low-probability), these would be the tasks from number (10) to (16). In a common case of a shorter than planned turnaround (due to e.g. late arrival from the previous flight), there will be pressure to spend less time on the ground, to rush through each task. However, the tasks from number (1) to (9) cannot be significantly shortened. Therefore, the pressure to hurry is concentrated on tasks (10) to (16), exactly those tasks which could impact flight safety, if overlooked.

In the last decade most regulatory changes increased paperwork (European Security checklist, technical log book requirements, etc.), in turn, increasing crew workload, decreasing the time available and putting more pressure to rush through the safety-critical tasks.

Shifting responsibility downwards: self-regulation

In recent years, all the responsibility has been gradually transferred to airlines (on a large scale) and to the crews (on an operational scale) through the regulatory system.

For example, airlines are responsible for ensuring that the passengers do not enter the aircraft carrying weapons. The airport and the security company at the airport are just providers of security services. The airline must ensure that the airport and the security company have good procedures, manuals, adequate equipment, training of staff, servicing, etc.

But how are airlines supposed to ensure that if they have 50 airplanes and fly from 250 different airports per year? Who is going to pay for all those audits? Is an airport really going to close if a major finding is presented to them?

Airline responsibility is applicable to ground handling, maintenance, spare parts, flight simulators, nav database etc. There is a reason why an Aviation Authority has issued certificates for e.g. airports, maintenance organisations, spare parts providers, navigation charts providers, training organisations. Question is, why is the airline, and from an operational point of view, the crew, still responsible for their job?

There is a reason why an examiner has signed the pilot's license and ratings. With this signature the pilot is certified to be capable of performing his/her duties as a pilot and as the Commander. In order to perform these duties, they must be well trained and fit to fly (rested, under as little stress as possible); relieved of all unnecessary activities; and ultimately, have simplified tasks, with the primary concern – safety.

Immediate causes for inadequate regulation

Some of the examples of inadequate regulations and oversight discussed previously contain a reference to what the underlying problems were or what contributed to the deficiencies. Such was e.g. the case with the Space Shuttle Columbia, where insufficient or rather inadequate communication was one of the underlying reasons why regulation did not take place. But there could be many and various reasons why legislation is flawed or inadequate.

How is legislation written

An analysis of the hidden traps in policy-making reveals that there are several key issues when it comes to drafting legislation, which could affect its quality.

Key issues:

1. Rulemaking methodology

2. Balance of inputs

3. Relevance of legislators' expertise

4. Scope

5. Decrementalism

6. False presumption of positive market influence

7. False presumption of corporate governance

>> Methodology

Currently, the common standard when drafting legislative texts is to use the allocated resources and put forward a set of proposals which might eventually contain production flaws. The legislator then counts on correcting the omissions through subsequent stakeholder discussions, expert comments and scientific input. Such a rulemaking process however is flawed in its nature and far from adequate. The assumption that at a later stage someone will amend rules or suggest improvements is not a reliable practice.

>>Inputs

Aviation, as any other complex socio-technical system, consists of several organisational and professional groups, with sometimes conflicting interests. The influence of these groups on legislation is not equal. Ideally, their contribution will be proportional to public safety. Yet, in practice, it is rather proportional to their (political) influence. As a result, legislation is often a near-image of an industry wish-list.

All legislation is subject to change. Usually, this change serves production, not protection[3]. As pointed out by leading safety researchers (Reason 1997, Weick 1995, Dekker 2011), safety in those cases may not at all be the result of the decisions that were or were not made but rather an underlying stochastic variation that hinges on a host of other factors, many not easily within the control of those who engage in a fine-tuning process [vii]. Empirical success, in other words, is no proof of safety. Past success does not guarantee future safety. Borrowing more and more from safety may go well for a while but we never know when we are going to hit the limits. [viii]

>> Legislators' expertise

Legislation is not written by the people who conduct the actual operations. These are often two distinct groups of people, with different educational backgrounds. Therefore, legislators have typically a limited expertise and experience in the area they are trying to regulate.

3 Although there is a number of regulatory requirements that are purely safety related, experience has shown (not just in aviation but in every conceivable industry) that an invention, even if it is a purely safety device, always ends up enhancing production, while safety remains on the previous level – better protection simply allows an organisation to exploit areas previously deemed too risky.

It is therefore only possible for the legislator to get the necessary know-how from external sources. The selection of the know-how source will, as already explained, often be based on political influence. As a result, it is not unthinkable that decisions could often be based on biased data.

>>Scope

Also the scope of regulation is often limited to what is at hand. Aviation organisations, be it airlines, airports, MROs or ANSPs are complex socio-technical systems. So far, all individual components of those systems have been brought to near-perfection: technology is highly reliable, personnel are well trained, responsibilities are well defined etc. Yet, accidents and incidents still happen.

One reason is that in high-reliability organisations "accidents come from relationships, not broken parts"[ix]. These "relationships" comprise of "soft", difficult to describe, issues such as organisational safety culture, safety data handling, decriminalization, reporting culture, etc. Being hard to describe, these issues are hard (if not impossible) to proscribe. Finally, the aviation world could end up with a set of rules that ignore the most common causes of accidents in aviation.

>>Decrementalism

Legislation however is not set in stone. Under reflux of changes in the overall social, economic and political context it may change over time and those changes are usually towards production, not protection.

Safety is hard to measure – it is usually hard to produce robust evidence where the safety limits lie or how it could be maintained if efficiency-oriented measures are implemented. The most convenient answer is limitation of change or reluctance to fundamental changes in legislation. This approach gives green light to small, piecemeal changes of laws and regulations, which however could be equally dangerous and detrimental. But a small change is considered to have low risk potential and is therefore acceptable.

Unfortunately, these small changes are not limited in number. What was seen as a small and insignificant amendment becomes then a new norm and the basis for the next small change. The best known example is Air Alaska accident of 2000: a gradual eightfold increase in proscribed maintenance interval of the failed component has resulted in a tragic accident. [x]

>> False presumption of positive market influence

It can be argued that market forces should oblige operators to "behave" if they don't want to be recognised by the travelling public as unsafe or even get blacklisted from a certain market. However, market forces are also acting in the opposite way. If the operation is to be conducted in the area of weak regulatory oversight, a substandard carrier will have lower cost and therefore a competitive advantage over a carrier with an adequate safety standard. Balancing between production and protection, the area between bankruptcy and accident just gets thinner. The moral for the carrier is clear: in order to keep a competitive advantage, one must not excel from what an authority can enforce.

It is usually presumed that "safety is expensive, but cheaper than accidents". In some cases this is not true. For an airline with a leased fleet, contract workforce and no direct marketing, the indirect costs of an accident could be minimal.

>> False presumption of corporate governance

In an ideal world, we will be able to rely on corporate governance and accurate external assessment of companies' management practices. But the truth is that the people governing the airlines usually have only a limited term management contract and no ownership share.

By definition, excessive cost-cutting on safety will have an immediate positive effect on the financial side, while the negative safety effect will only be visible in the future. Moreover, in a complex system like airline operations, the negative safety effect will be difficult to trace back to a certain bad decision. Even if it is traced, it is very likely the manager in question will be long gone.

Therefore, there is a strong possibility the short-term financial gains (over which one can reap a bonus) will prevail over long-term safety concerns (for which one will hardly be made responsible). This is called a lack of "skin in the game"[4] and is a risk for any operation which is at the mercy of such a manager with no skin in the game. The philosophy of self-regulation relies on the presumption that corporate decisions will be made with safety as a priority. And yet this is in not necessarily the case.

4 Antifragile' by Nassim Taleb

How oversight is conducted

In addition to how the rulemaking process is structured, a number of regulatory oversight flaws could result in an ineffective approach. Traditionally, regulatory oversight is the most up-front method of ensuring the safety standards of any organisation. However, as the organisation evolves in size and complexity, if regulatory oversight does not keep up, it becomes less effective.

Key reasons for regulatory oversight ineffectiveness are:

1. Limited financial resources of oversight authorities;

2. Limited human resources in terms of experience and know-how;

3. Limited scope of oversight;

4. Fragmentation of oversight authorities.

>> Oversight resources

Financial crunch or not, (government) institutions entrusted in regulatory oversight are always limited in the financial and human resources at their disposal. This leads to less than adequate frequency and depth of oversight activities for larger organisations (e.g. airlines and major airports) and low prioritisation for small organisations (e.g. corporate and general aviation) that are in many cases almost left on their own.

The magnitude of the problem is in reverse proportion to the size of a state's aviation system. Compared to Western Europe, transition countries are not only less wealthy but the fragmentation of larger states at the beginning of 1990s led to the fragmentation of national civil aviation authorities, with related fragmentation of resources available.

Centralisation of aviation expertise in one EU Safety Agency – EASA – has often become the trigger for national authorities to shrink their national expertise because of the false-sense that 'everything is done by EASA'. This is not nearly the reality nowadays. National Civil Aviation Authorities (CAAs) still have an important role to play in implementing the rules and performing oversight. Especially smaller national authorities have recognised they can no longer fulfil this role adequately and are calling EASA for help (by pooling inspectors to manage the oversight in those countries).

EASA itself has budget problems as well – due to the economic crisis the European Commission decided to cut budget with 1% per year over the next 5 years. In the meantime, the Agency's competences continue to grow and industry refuses to pay more (or higher) fees and charges. Workforce in EASA has difficulties to cope with workload already and no prospects for improvement are currently in sight.

>> Inspectors' expertise

Another significant hurdle to performing adequate oversight is the expertise of the ones responsible for the process. Lack of experience and know-how is partially related to the limitations in financial resources. It is unrealistic to expect an industry expert to agree to civil servant rewards. Even with a competitive rewarding scheme, an expert dedicated to oversight is slowly but surely loosing on expertise, being less in touch with industry developments. The problem is exacerbated by the apparent need of authority personnel to display a degree of stateliness, which is sometimes preventing them to seek additional understanding of industry practices.

>> Oversight methodology

An essential element of effective oversight is objectivity throughout the entire process. It is not uncommon, that external and internal pressures influence the outcome of oversight activities. In an effort to limit those forces as much as possible, oversight is nowadays based as much as possible on pre-defined, standardised requirements. This implies that oversight often comes down to a checkbox exercise whether certain legislative requirement is met or not.

It is impossible for any set of requirements to cover all safety aspects. For example, it can be required and verified whether an organisation has a safety reporting system. However, there are no requirements or even guidelines on the reporting rate. Therefore, an organisation can have an illusory safety culture with no incoming safety reports, but still be fully compliant with all requirements for a safety reporting system. This is comparable to checking if all engine parts are present but never bother to see if the engine runs.

In recent years, aviation stakeholders have been pleading for a performance-based approach to rulemaking and oversight. The common practice to draft regulations and requirements before checking if operators' policies and procedures reflect them has been heavily criticized as inefficient. This has also been recognized indirectly by EASA with its planned switchover to so-called "soft law". However, if safety does not underpin the corporate ethos or the organisation only strives to comply with regulatory minima, safety again would remain an elusive target.

Soft and performance-based rules will be more likely to come under pressure when the companies themselves are under commercial pressure. Checklists should be as detailed and precise as possible, to ensure the organisation is truly committed to safety, not just fulfilling requirements. For example, airlines might be required to maintain a call centre for emergency response. If there are no further specifications however a call centre may be understood by airlines as a person with a phone. This call-centre, which is absolutely not sufficient for the task that the legislator had in mind might, in the end of the day, be sufficient to satisfy the requirement.

Checklists should also address whether a safety system is actively used for its purpose or if it only exists to formally fulfil the legislative requirements. For example, airlines are required to develop a policy which encourages flight crew members to report an observed safety event. [xi] However, there is no further inquiry whether that policy actually works. An operator can have zero recorded safety events and still be perfectly eligible. This essentially comes down to assessment of safety culture – a challenge that is yet to be addressed.

To summarise, even the perfect, resource-unrestricted oversight can only ensure regulatory compliance. It can never ensure safety.

>> Fragmentation

In Europe, oversight activities are still performed by national authorities. In aviation, the object of oversight is often a complex international system.

The combination of liberalisation and wet/dry-leasing is making it increasingly difficult to control any such operation. While it is all legal, in real world it is hard to perform adequate oversight of an operation in country A, marketed by airline from country B, which is wet leasing aircraft and crew with Air Operators Certificate (AOC) of country C, whose crew is actually certified in country D and the responsible managers are managing it all from country E. Even when malpractice is proven and the AOC is lost, with no owned assets and contract workforce it is too easy to just rebrand and apply for another AOC, probably in another country.

Soon Europe will shift away from a Member State-based regulatory oversight system to an EASA-centred system. This proves the described problem is recognised by EASA. However, the solution can only be partial, as fragmentation is global, not only intra-European problem.

EASA's role

All those hidden traps when drafting rules and performing oversight are a stumbling stone for the European Aviation Safety Agency. It is now facing three major challenges in its continuous efforts to establish and maintain a high uniform level of civil aviation safety in Europe.

1. Stabilising the Agency after 10 years of continuous extensions to its scope and remit whilst ensuring the shift to performance based regulations and oversight is well managed with a constant and watchful eye on avoiding any safety lacunae.
2. Establish and maintain a high uniform level of civil aviation safety in Europe whilst air traffic may double in the next two decades and the aviation system and operations become ever more complex.
3. The collective ability of the European aviation system to generate and analyse the safety/occurrence data necessary to not only strive for a more predictive, risk-based safety management at company and authority level, but to actually implement it.

A risk-based approach calls for two prerequisites: a compliance-based regulation as basis, i.e. setting the basic safety standard and safety level everybody has to meet, and the capacity to perform a qualitative oversight (in addition to the compliance-base oversight abilities). The risk-based approach can improve safety but it could also endanger safety if implemented and/or overseen poorly. It should not provide an excuse to simply cut costs, its driver should not be economical. On the contrary, implementing it in a robust way could actually mean more resources are necessary for oversight.

As the Agency is providing a fundamental task on behalf of society, this funding should come from the Community budget. The community budget, in turn, is also under pressure due to the current austerity in Europe. The economic crisis should not be an excuse to limit the Agency's budget. On the contrary, the budget should be increased. The safety of the travelling public – and those living under the flight paths – is a public good and needs to be adequately resourced and be financed mainly out of public funds.

Performance-based regulations and oversight cannot replace the current approach overnight. The implementation will have to be a slow and gradual process which must be overseen both at national level and by EASA at EU-level.

One main concern is how authorities e.g. from smaller countries will be able to deal with their increased responsibilities. Or any national authority faced with severe budget cuts and the related 'brain-drain' and loss of expertise. And it will be a challenge to implement a risk-based approach across Europe in a harmonised manner. Various national authorities have developed their own system to assess SMS systems. The Agency will have to make sure, whatever system is used nationally to assess a risk-based system, does so in a harmonised and repeatable way.

Another main challenge stems from the predicted doubling of air traffic in the next two decades. To achieve the same level of safety as today with twice as much traffic, enormous efforts will be required, in terms of oversight at national level, solid and deep standardisation checks on national authorities and their ability to adequately oversee the growing industry, and in terms of adequate EASA safety regulation ensuring highest safety levels across Europe.

The challenge is even bigger in the current climate of economic crisis and ever increasing competition in the aviation market, where all players naturally are driven to cut costs and to operate as close as possible to the legally still permissible limit. The complexity of aviation operations constitutes a formidable challenge for an authority: which authority can fully comprehend and oversee the operations of company A, that sells tickets under company B, hires planes from company C, hires crew from company D, and flies from country E to country F, and this increasingly with one operator having bases in several different countries? Without a significant increase of resources at national and European/EASA level, it is unlikely that the same safety level can be maintained.

Another challenge for EASA – and Member States – will be the collective ability of the European aviation system to generate and analyse the safety/occurrence data necessary to not only strive for a more predictive, risk-based safety management at company and authority level, but to actually implement it. EU-wide data-sharing, standardisation and analysis, as well as pooling of the related resources will be a precondition for the system to work. The new Occurrence Reporting Regulation, currently on the EU legislative process, is an important step in that direction, including its attempt to facilitate and protect a Just Culture environment at all levels of the industry. As proposed by the Commission, the new Regulation – and the role foreseen for EASA – will become an essential pillar for Europe's future safety management system.

"...This can only be possible if the Agency receives the necessary additional resources, both financially and in manpower "

EASA has received additional responsibilities since its creation. It is just finalising the rulemaking for the latest extension dealing with ATM and airports. After having grown rapidly over the past 10 years, it may be wise to allow for a consolidation period. The main challenge is to advance safety and ensure that the implementation of performance-based regulation and oversight does not reduce safety.

EASA to become stronger

Today the principal objective of EU Regulation 216/2008, which defines the EASA's role and responsibilities, is to establish and maintain a high uniform level of civil aviation safety in Europe. This objective should be kept and strengthened. 'Maintain a high uniform level of civil aviation safety in Europe' unfortunately does not set a quantitative goal. At various occasions the Agency and the European Commission have expressed their ambition to make Europe the safest aviation area in the world. To achieve this goal, this principal objective should be introduced in the basic regulation.

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Every year EASA defines its European Aviation Safety Plan (EASP) for the next four years. However, this EASP is voluntary and open for Member States to follow or not. If Europe is serious about the EASP, then it cannot be that the EASP remains voluntary. The EASP has to be a high level document that steers the EASA actions and which Member States have to use as basis for their national aviation safety plans.

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The challenges the European aviation system faces should be met by a strengthening of the Agency by giving it the authority to organise oversight across Europe. In the longer-term and in a step-by-step process, national authorities could become national EASA 'satellites' that will receive support from the EASA head office for their duties.

This can only be possible if the Agency receives the necessary additional resources, both financially and in manpower.

As a step towards such a more central and coordinated structure, the pooling of NAA resources and expertise – with the involvement of EASA – should be seriously explored. This would help NAAs from smaller, less-well resourced countries and allow preventing the emergence of de facto under-regulated and/or insufficiently overseen operators in some parts of Europe. Such disparities in safety oversight would finally result in (unfair) competition on the basis of lower de facto safety standards.

Conclusion

A strengthening of the principle objective of the basic regulation could set the goal for EASA in the years to come.

The combination of an aviation industry under economic pressure, an aviation system that grows in traffic and in complexity, and the gradual implementation of a risk based system presents an enormous challenge for the Agency and Member States. Making better use of the European Aviation Safety Plan, generating and analysing safety/occurrence data, and strengthening the oversight are preconditions to reinforce the safety barriers. This can only be achieved if EASA receives the necessary budget and resources to correctly fulfil its tasks. ECA will continue to support EASA in its endeavour to make Europe the region with the highest aviation safety in the world.

Endnotes

[i] Based on National Transportation Safety Board. (2000). *Factual Report: Aviation (DCA00MA023), Douglas MD-83, N963AS, Port Huneme, CA, 31 January 2000*. Washington, DC: NTSB and Dekker, S. (2011). *Drift into Failure: From Hounting Broken Components to Understanding Complex Systems.* Fanham, UK: Ashgate Publishing Ltd.
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[xi] IOSA FLT 3.15.1.

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