HindSight 17

The ability or opportunity to understand and judge an event or experience after it has occured

EUROCONTROL

Safety versus Cost

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Defining a Compliant Approach (CA)
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Summer 2013

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The success of this publication depends very much on you.
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Please send your message – rude or polite – to:
tzvetomir.blajev@eurocontrol.int

Or to the postal address:
Rue de la Fusée, 96
B-1130 Brussels

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EDITORIAL TEAM

Editor in Chief: Tzvetomir Blajev
Editorial Adviser: Captain Ed Pooley
Graphic Designer: Frédérique Fyon

Safer Network

Joe Sultana is Chief Operating Officer of the Network Management Directorate.
He graduated with an Engineering Degree from the University of Malta in 1975 and joined the Air Traffic Services Unit in Malta in the same year. He obtained ATCO Licences in Aerodrome, Radar and Area Control and was a Watch Supervisor for four years.
In 1982, he was appointed Head of Air Traffic Services in the Maltese Department of Civil Aviation.

Dear Reader,

I was reading with interest the articles for this issue of HindSight magazine and the 'virtual' discussion about what is the relationship between safety and cost of our operations. I see good points made on the dynamic nature of the balance between these two important properties of aviation system. This dynamic could be interpreted that sometimes safety and cost are in opposition to each other. The task is how to maintain the sometimes delicate balance between the two. We have to make difficult decisions on how much more the society is willing to pay for adding yet another safety barrier.

There are levels of safety that we should never compromise. Also, at the extreme of the safety-cost relationship we can even halt the aviation operations but preserve the flying public from unacceptable risks. You will remember the situation in Europe after the eruption of the volcano-with-the-difficult-name (for the record Eyjafjallajöekull) in April 2010 and the following Grimsvötn eruption in 2011. The aviation industry worked together during these contingencies and although from a commercial perspective was reluctant to do so, was ready to pay the huge price of grounding aircraft so as not to expose flight operations (and the flying public) to unacceptable or unknown risks.

I want also to give another perspective on cost and safety relationship, based on what we are doing in the Directorate of Network Management (DNM) of EUROCONTROL. I suspect that many controllers and pilots reading this magazine will have at sometime or another been involved in a case of call sign similarity. If you're lucky, the worst that happened was distraction and a temporary (but unwelcome) increase in your workload; however, if things conspired against you then situation may have escalated to a point where confusion reigned on the air waves resulting in a pilot acting on a clearance or instruction meant for another aircraft with all the attendant potential for level bust, runway incursion etc. Of course controllers are also fallible and it may be them and not the pilot who is confused and takes/makes an erroneous action.

Moreover, controllers may also have to contend with the added distraction of similar looking call signs on radar labels, flight strips etc. Whilst ICAO PANS ATM provides a short-term, palliative solution – you can ask pilots to adopt a different call sign for a specified period until the threat has

for less

passed - how realistic is this on a busy Approach frequency when you barely have time to get the normal flow of words out?

The EUROCONTROL DNM response to this long standing issue is the EUROCONTROL Call Sign Similarity Project. This aims to provide pan-European solutions at a more systematic level through the development and implementation a Call Sign Similarity Tool (CSST). The intent is to use the CSST to help Aircraft Operators (AO) to identify and resolve potentially conflicting call signs before the start of an IATA season.

Currently 15 AOs have used the CSST to partially or fully de-conflict their 2013 summer schedules. A further 35 have signed up for the use of a Network Manager Token to access the Tool and we hope that many of these will use it to de-conflict their 2103/14 winter schedules.

A Safety Performance Monitoring regime is in place to assess the effectiveness of the CSST in operations. Twelve ANSPs are currently sending us their call sign similarity and confusion data on a regular basis. The evidence shows that the number of internal (single) AO similarities is significantly reduced (if there are any at all) in those airlines that are using the Tool compared with those that are not. However, to be sure we need more data, so if you have a similarity or confusion event please report it through your SMS chain and check to see if it is being sent to us here in EUROCONTROL (via the EUROCONTROL Voluntary ATM Incidenrt Reporting (EVAIR) regime). As part of the safety performance monitoring, if asked, we can contact the airline(s) involved in CSS/C incidents and ask them to make ad hoc, mid-season changes if it is known that there could be a repeat of the event during the remainder of the season. Feedback is provided, so that as the reporter you can see what actions have been taken.

Our CSST is a perfect example of a positive relationship between cost and safety. Indeed, the safety benefits are obvious. Studies in the past showed that 1 flight out of 10 is a potential source of call sign confusion without any intervention at the flight scheduling stage to identify and resolve similar call signs. Moreover, air-ground communication safety events are one of the biggest ATM safety priorities and call sign similarity/confusion is one of the greatest single contributors to all ATC safety reports.

Reducing the safety risks in this case means also better business and less overall cost. CSST offers AOs the potential for significant savings in time and effort to de-conflict their flight schedules – typically this is reduced to a matter of hours rather than days. Imagine also the savings and the alternative use of resources that currently go in incident reporting, analysis and investigation of events (to some accounts up to 5% of all ATM reports) associated with similar call signs.

To conclude, I would invite you as a HindSight reader to make the most of the magazine, think how what you read applies to your work, discuss the content with your colleagues and by this help us to turn our cost for producing HindSight into safety benefits albeit intangible.

Big and small scale

Sending our families and friends to travel by air and worrying if their baggage will be lost or damaged or if they will arrive on time often without thinking about 'the worst' comes at a price. A price that may at first glance look as though it is paid by airports, ANSPs, airlines, regulators and other organisations involved in the chain that takes care of safety, but a price that is in the end somehow split between the people paying for their journey and Society in general.

It is easier to see the direct link between buying an air ticket and getting in return a safe service (although some airfares really stretch my ability to find a link between the fare paid and the service received – and here I am not talking only about super-expensive, one-operator-served routes. Nevertheless, at this small scale, I pay for a ticket and then I get transported. The relationship is direct and at my individual level I aim to optimise what would be the cheapest and yet still safe and comfortable service. At my small scale the trade-off looks simple – in principle, if I want to get more I have to pay more but if I can find a good deal, I can save some money!

Tzvetomir Blajev
Editor in Chief of Hindsight
Fellow of the Flight Safety Foundation

It takes a little bit more brainwork to figure out the cost that the Society pays towards by journey. Often it pays directly, since some aviation organisations still rely on public funds. But it also pays indirectly – by accepting the monetary and non monetary costs and the wider consequences which come with airports, noise, carbon dioxide emissions… Society pays towards the system because air transport is also a 'public good' and because the alternative way to achieve it may mean higher costs as well as larger environmental and socially negative impacts.

When we talk of Society the relationship between costs, benefits and safety is not that simple any more compared to my individual trade-off. Because Society operates on a large scale, costs for some are benefits for others. This paradox of the 'helicopter view' was explained well by the Nobel Prize winning economist Paul Krugman in his regular blog for the New York Times. The economy, as Mr. Krugman states, is not like individual families. Families try to maximise their earnings and minimise their spending. For families, spending and earning are very different things, in which the excess of the latter over the former equals their savings. For the economy, the product of all individuals' economic activity, spending and earning are interdependent. The more I spend, the more you earn and vice versa. If we all cut our spending at the same time, we would all have less earnings too.

So how can the large and small scale point of view be applied to the balance between cost and safety in aviation?

Zoom in!

The individual operations are diverse, performed at different airports and in different conditions. Let us take one particular example. An airport may be using High Intensity Runway Operations (HIRO) to get the most out of existing runway capacity. If the spacing on final is one of the 'bottlenecks' then it will be normal to expect aircraft closely spaced one after another. And when a 'system' like this works well without any buffer or slack, any small unexpected event, such as a rapid change of wind speed or direction, can interfere with our plan and cause an aircraft go-around.

But we know this will happen and we accept the cost of go-arounds as the price for maximising capacity. After all, go-around is a normal phase of flight and the operational risk associated with this phase should be comparable to those related to other phases. If the go-around procedures at this airport are well used, designed and managed then we will have just a small additional to risk coming from the additional 15 or 20 minutes of flight time which results.

It is different story if the airport lies in a complex terrain environment, with difficult missed approach procedures, challenging the crew with very low initial stop altitudes or early turns or lack of procedural de-confliction of the missed approach path from other traffic. It is an even more

different story if the go around is from a circling approach - although I have difficulty imagining HIRO and circling approaches being used together. The transition from visual circling to the prescribed instrument missed approach procedure may involve re-entering cloud during a complex but only loosely specified manoeuvre, in which the loss of visual reference increases the chances of losing positional awareness. Moreover, if the aircraft is below the minimum vectoring altitude, ATC may not be able to provide assistance.

As we see, when we zoom-in to our micro level, optimising cost can affect safety in many possible ways – the effect of safety can be positive, neutral or negative. But what will be the perspective when we take a view at the macro level of Society – are we going to find the same interdependence as Paul Krugman formulated for the economy?

Zoom-out!

Let us still use the go-around examples. The Flight Safety Foundation (FSF) has said that around a third of all aircraft accidents are runway excursions and that one of the greatest contributors to runway excursions is an unstable approach. An unstable approach should result in go-around but more often it does not. It has been stated that no other single safety improvement could have as great an impact on the overall industry accident rate as go arounds from every unstable approach. So why are some crews not going around when they should?

As part of the FSF go-around safety initiative a survey of pilots was performed, to try better understand the go-around decision making process. More than 2300 pilots from all over the world accepted the invitation to complete the survey, providing us with a macro view of the problem. The survey results include a lot of data and we will need some time to be able to digest it in full, but already some preliminary conclusions can be made. Pilots were asked to recall a recent event involving an unstabilised approach, When those pilots that recalled continuing to a landing rather than going around were asked whether their company was more likely to reprimand pilots for performing an unstabilised approach or a go-around, they reported expecting less company support for a go-around decision than a successful landing off an unstabilised approach.

In summary, when we look at the large scale, the decision with probably the highest return from investment in safety is being challenged by considerations of cost. It may well be that this is just a false pilot perception of pressure from their companies. But the point is that at the macro level, we are much more connected then we think. Policies and procedures should be well understood, well communicated and effectively embraced the industry to ensure that my safety gain is considered as well as your safety gain and, indeed, that the safety gain for Society is recognised too.

Enjoy reading HindSight!

Production and safety

by Professor Sidney Dekker

I was reviewing data from a site in Western Australia recently, and found, as you would expect, a correlation between levels of production and safety. Most people would think that the correlation would be negative. This has become all but the canon in the human factors and safety literature. It is about production versus protection.

You cannot have high levels of one and of the other: one is always the sacrifice of the other. If production is higher, safety is lower, and vice versa. The data from the site in Western Australia showed me something different, however. The correlation was not negative. On the contrary. As production was ramped up, safety figures improved! The more they produced, the safer they became. It suggested to me that the relationship between these two is at least a bit more complex than a simple opposition.

It probably also has implications for the connection between safety and cost. As I dug deeper, I found, not surprisingly, that the site had invested more as production went up. Producing more costs more, of course. Even as it generates more revenue. But safety does not have to be the casualty: it can in fact get lifted on the tide of such rising investment as well. You might get better technologies, a renewed focus on training, new equipment.

As cost pressure mounts, controllers may be asked to do more with less. Fewer manned sectors, same number of airplanes, for example. In other words, production pressure goes up. And is safety the casualty then? Intu-

are not opposites

ition suggests it could well be. Higher workloads, more fatigue, more to keep remember. There is, however, something really interesting about many of the people on the front-line of safety-critical organisations. The characteristics that make them suitable for the job in the first place – their willingness to show self-confidence in taking decisions, even under uncertainty and incomplete information, a mastery and control of complex and changing situations, a decisiveness – these are all characteristics that can make them willing and able to absorb and accommodate higher production pressures as a "normal" part of their operating culture. This may give operational and other managers the impression that cost pressures and production pressures get absorbed smoothly and unproblematically. The cost, in terms of higher workload, in terms of fatigue, in terms the longer time required to come down from the high of pushing tin, and pushing more tin, might be all but invisible to them. Smoothly accommodating production pressures, design problems, equipment malfunctions, cost cuts – this is what professionals do. It is in part what it means to be a professional.

One result, however, is the growth of a culture of production, a can-do culture. A culture that can do more with less, a culture that is not against showing that it can do more with even less. There is a professional pride that people inside the organisation derive from being able to manage a complex system despite the lack of organisational resources and support. A "can-do" culture is shorthand for "Give us a challenge and don't give us the necessary resources, and we can still accomplish it". Over the years, people in the organisation not only become able to prove that they are worthy; that they actually can manage such complexity and pressure despite the lack of resources and technical shortcomings. They also start to derive considerable professional pride from the fact that they are able to do so. And it might be more than just a source of pride. This ability to safely manage production despite cost pressures, can be a way to achieve some uniqueness, to help build esteem in a profession might otherwise be characterised by procedures, standardisation and 'routinisation'.

One result, however, is the growth of a culture of production, a can-do culture. A culture that can do more with less, a culture that is not against showing that it can do more with even less.

External pressure (pressure to generate more capacity, for example) gets internalised. Organisational goal conflicts are internalized and integrated by controllers, by shifts, by teams as a normal feature of their daily work. The organisation has to be safe, be cost conscious and offer high production capacity all at the same time. Shifts, managers and controllers can turn this organisation-level (or even national-level) conflict into their personal and professional problem, into their responsibility. Being able to resolve it locally can be an important source of professional satisfaction. This ability is a sign of competence and expertise; it shows that good operators can outsmart and compensate for higher-level organisational deficiencies and goal conflicts. People are proud of their ability to create safety despite the challenges and organisational limitations.

Perhaps we should try to get away from casting our work in terms of simple opposites – safety versus cost; production versus safety. These oversimplify the richness of our organisations and the capacity of people inside of them to adapt, learn, improvise, change and manage a variety of goals that are simultaneously relevant to the organisation. Rather than pitting safety against cost, or safety against production, we should be interested in the creation of safety *in* production, in the creation of safety under cost pressures. Cost pressures and production pressures will almost always exist. How people and teams and organisations absorb them, adapt around them, and still create safety inside of those constraints is what is interesting.

Professor Sidney Dekker

is Professor and Director of the Key Centre for Ethics, Law, Justice and Governance at Griffith University, Brisbane, Australia. Author of best-selling books on human factors and safety, he has had experience as an airline pilot on the Boeing 737.

Target culture: lessons in unintended consequences

by Steven Shorrock & Tony Licu, EUROCONTROL

Since we emerged from the depths of winter, many of us are still are afflicted by the 'potholes' that developed in the roads during the cold temperatures. These potholes are dangerous. They change drivers' visual scanning, cause drivers to swerve, and sometimes lead to loss of control, and ultimately to several deaths. Potholes are also very expensive in terms of the damage to vehicles and costs to authorities.

Tony Licu is Head of the Safety Unit within the Network Manager Directorate of EUROCONTROL. He leads the deployment of safety management and human factors programmes of EUROCONTROL. He has extensive ATC operational and engineering background (Masters Degree in avionics).

Steve Shorrock is a human factors specialist and safety psychologist with a background in research and practice in several safety-critical industries and Government in Europe and Australia. He is currently a Safety Development Project Leader at EUROCONTROL and an Adjunct Senior Lecturer at the School of Aviation, University of New South Wales.

A 2013 survey in England and Wales by the Asphalt Industry Alliance suggested a repair bill for local councils of £113 million just to fill the holes. In an era of austerity, potholes are a real headache for local authorities. To get them fixed British councils have set numerical targets to fix each hole.

Now imagine you are part of a road maintenance team, and you have to fix each pothole in 13 minutes, within 24 hours of the hole being reported. You know from your experience and records that this is well below the time needed to properly fill a hole. But the target has been set and you and the council will be evaluated based on performance against the target. So what would you do? Maintenance teams in the UK found themselves in exactly this situation. What they did was entirely understandable, and predictable: they made temporary fixes. According to Malcolm Dawson, Assistant Director of Stoke-on-Trent City Council's Highways Service, *"Ninety nine per cent of every single job that we did was a temporary job. That meant that the staff on site who were doing the value work knew that this would fail anything between two and four weeks, but we kept sending them out as management to do as many of them as they possible could."* (see video at http://vimeo.com/58107852.)

The target was achieved, but holes reappeared and more costly rework was needed. Several councils have now dropped the numerical repair time targets, aiming instead for permanent, 'right first time' repairs – an approach designed with the front line staff, using a 'systems thinking' approach.

Targetology

What does this have to do with air traffic management? Well, we too live in a world of performance targets. Numerical targets – whether they relate to cost-efficiency, capacity, environment, or safety – do affect behaviour and system performance. That is not in dispute: targets are powerful means of change. The question is, *do they affect performance in the right way?* This

article does not aim to answer this question specifically in the context of ATM. We don't have the data to answer that question. Instead, we examine the experience of other sectors and so encourage reflection about targets in our own sector. We are not talking about 'close-as-you-can-get targets' (such as 'zero accidents'), or 'far-as-you-can-get targets' (such as maximising return on investment), or competitive targets (such as to be the global leader in ATM). We would call these goals. We are talking about numerical targets, which are judged as either met or not met (see Meekings et al, 2011).

And why all this is important for you specifically, as Air Traffic Controllers – the main readers of HindSight magazine? Well, targets in ATM sooner or later affect your daily practice and we think it is important for you to have a glimpse inside the world of targets more generally.

There are several reasons why targets can seem like a good idea, but these are usually built on assumptions (see Seddon, 2003, 2008).

Targets set direction, don't they?

One justification is that targets set direction, so people know what to do, how much, how quickly, etc. Experience shows that numerical targets do indeed set direction; they set people in the direction of meeting the numerical target, not necessarily achieving a desired system state. In her book 'Thinking in systems' (2008), Donella Meadows said, "If the goal is defined badly, if it doesn't measure what it's supposed to measure, if it doesn't reflect

Target culture: lessons in unintended consequences (cont'd)

the real welfare of the system, then the system can't possibly produce a desirable result" (p. 138). She gives the example that if national security is defined in terms of the amount of money spent on the military, the system will produce military spending, and not necessarily national security. Targets can set a system in a direction that no-one actually wants.

Targets motivate people, don't they?

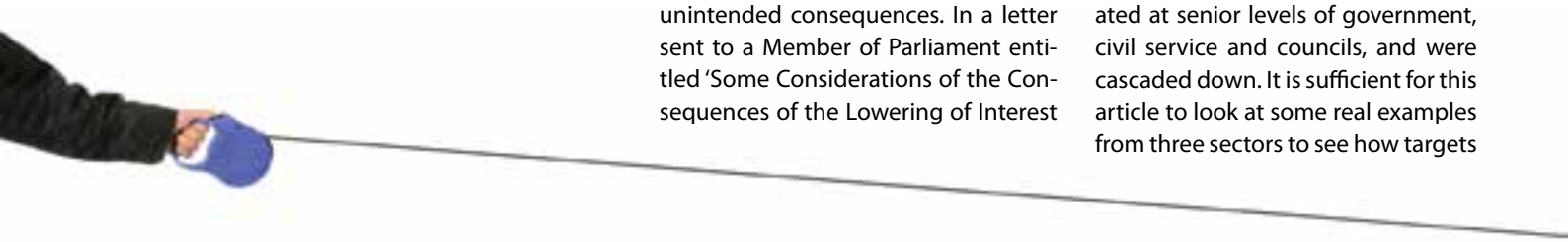
Another justification is that targets motivate people to improve. This assumes that people need an external motivator to do good work (contrary to research in psychology), and ignores the fact that the vast majority of outcomes are governed by the design of the system, not the individuals in the job roles. But targets certainly do motivate people. They motivate people to do anything to be seen to achieve the target, not to achieve the purpose from the end-user's perspective. Targets motivate the wrong sort of behaviour. And if a target is missed or unachievable, then what?

Targets allow comparison, don't they?

In a competitive world, where cost-efficiency is under the spotlight, it is tempting to think that numerical targets provide a means of comparing the performance of different entities. It is true that targets allow comparison, but experience shows it often allows comparing false, manipulated or meaningless data.

This may seem like a cynical set of responses to three of the most common reasons for targets. But the unintended consequences of targets have been well documented in many different types of systems. This isn't new. Economists and social scientists have known for centuries that interventions in complex systems can have unwanted effects, different to the outcome that was intended. Over 300 years ago, the English philosopher John Locke urged the defeat of a sort of target enshrined in a parliamentary bill designed to cut the rate of interest to an arbitrary 4%. Locke argued that people would find ways to circumvent the law, which would ultimately have unintended consequences. In a letter sent to a Member of Parliament entitled 'Some Considerations of the Consequences of the Lowering of Interest and the Raising the Value of Money' (1691), Locke wrote, "the Skilful, I say, will always so manage it, as to avoid the Prohibition of your Law, and keep out of its Penalty, do what you can. What then will be the unavoidable Consequences of such a Law?" He listed several, concerning the discouragement of lending and difficulty of borrowing, prejudice against widows and orphans with inheritance savings, increased advantage for specialist bankers and brokers, and sending money offshore.

Since then, there have been many examples of unintended consequences of government and industry targets in all sectors. A good case study of the experience of targets lies in British public services. This is not to say that other countries are different – targets in the public sector and business are prominent around the world, with the same effects now being recognised. But since the late 1990s, targets became a central feature of British government policy and thinking, and so it is a useful case study. Performance targets were created at senior levels of government, civil service and councils, and were cascaded down. It is sufficient for this article to look at some real examples from three sectors to see how targets



Targets can set a system in a direction that no-one actually wants

can drive system behaviour. As you read on, consider how top-down targets feature in your own national and organisational culture.

Healthcare targets

Healthcare in the UK was subject to a wave of top-down targets concerning waiting times and financial performance. The most well-known was a target of four hours waiting in accident and emergency from arrival to admission, transfer or discharge. Other waiting time targets concerned cancer treatment and ambulances. The targets were driven by needs of patients and budgeting, but ignored quality of care and had destructive effects, which are now being understood.

The disastrous consequences of a target culture in healthcare were tragically illustrated in the Mid-Staffordshire Hospital Trust scandal. It has been estimated, based on a 2009 Healthcare Commission investigation, that hundreds of patients may have died as a result of poor care between 2005 and 2008 at Stafford hospital.

A Public Inquiry report by Robert Francis QC was published on 6 February 2013. The report identified targets, culture and cost cutting as key themes in the failure of the system. According to the report, *"This failure was in part the consequence of allowing a focus on reaching national access targets, achieving financial balance and seeking foundation trust status to be at the cost of delivering acceptable standards of care"* (http://bit.ly/XVfeSa), The targets led to bullying, falsification of records, and poor quality care.

What stands out in the report is how targets affected behaviour at every level. This is best illustrated via the actual words of those who gave evidence. A whistleblower, Staff Nurse Donnelly, said, *"Nurses were expected to break the rules as a matter of course in order to meet target, a prime example of this being the maximum four-hour wait time target for patients in A&E. Rather than "breach" the target, the length of waiting time would regularly be falsified on notes and computer records."*

According to Dr Turner, then a Specialist Registrar in emergency medicine (2002-2006), *"The nurses were threatened on a near daily basis with losing their jobs if they did not get patients out within the 4 hours target … the nurses would move them when they got near to the 4 hours limit and place them in another part of the hospital … without people knowing and without receiving the medication."*

The pressure was not restricted to front-line staff. The Finance Director of South West Staffordshire Primary Care Trust, Susan Fisher, felt *"intimidated… and was put under a lot of pressure to hit the targets."* Even Inspectors were *"made to feel guilty if we are not achieving one inspection a week and all of the focus is on speed, targets and quantity,"* according to Amanda Pollard, Specialist Inspector. She added, *"The culture driven by the leadership of the CQC [Care Quality Commission] is target-driven in order to maintain reputation, but at the expense of quality".*

And consider the position of the Chief Executives. In the words of William Price, Chief Executive of South West Staffordshire Primary Care Trust, (2002-2006), *"As Chief Executives we knew that targets were the priority and if we didn't focus on them we would lose our jobs."* When a CEO is saying this, you know how much power those targets have.

Even the House of Commons agreed. A House of Commons Health Select Committee report on patient safety (June 2009, http://bit.ly/14YW07i) stated that. *"…Government policy has too often given the impression that there are priorities, notably hitting targets (particularly for waiting lists, and Accident and Emergency waiting), achieving financial balance and achieving Foundation Trust status, which are more important than patient safety. This has undoubtedly, in a number of well documented cases, been a contributory factor in making services unsafe."*

Target culture: lessons in unintended consequences (cont'd)

With hindsight, everyone from the front-line to the government agreed: the targets were toxic. They were set at the top without a real understanding of how the system worked. They were disconnected from the staff and the end-users. But at the time, hardly anyone spoke up, else they faced accusations of incompetence or mental illness, physical threats from colleagues, and contractual gagging clauses. The targets helped to create a culture of fear and in doing so they resulted in gaming, falsification and bullying.

There are many other examples. Surgeons stated that they had to carry out more operations to hit targets under pressure from officials. In Scotland, there was a large increase in the practice of patients being marked 'unavailable' for treatment between 2008 and 2011, at a time when waiting time targets were being shortened. Around the UK, ambulance waiting time targets had unintended consequences, and were often not met anyway.

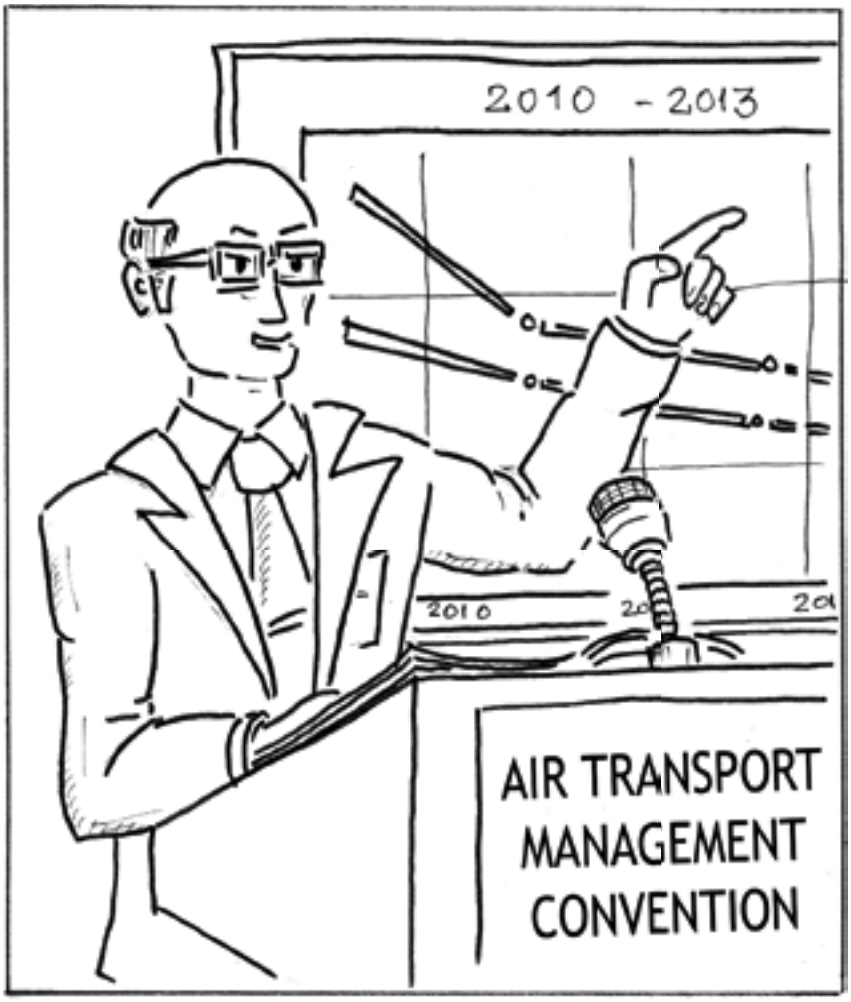
2 Police targets

The police were subject to probably more individual targets than any other sector in previous years. These related to the number of detections per officer, levels of specified offence types over specified periods, fear of crime, visibility of officers to the public, response times and public subjective confidence, among others.

There were many unintended consequences. In one sex-crime squad, the Independent Police Complaints Commission found that officers pressured rape victims to drop claims to hit targets, and that the squad drew up its own policy to encourage victims to retract statements and boost the number of rapes classed as 'no crime', improving the squad's poor detection rates threefold. Deborah Glass, the Commission's deputy chair, said it was a *"classic case of hitting the target but missing the point… The pressure to meet targets as a measure of success, rather than focussing on the outcome for the victim, resulted in the police losing sight of what policing is about."* (http://bit.ly/13kncMy).

In 2010, the British Home Secretary Theresa May told the Association of Chief Police Officers' conference that she was getting rid of centrally driven statistical performance targets. She said: *"Targets don't fight crime. Targets hinder the fight against crime".* Superintendent Irene Curtis said that performance targets were rooted in the culture of policing *"(This) has created a generation of people who are great at counting beans but don't always recognise that doing the right thing is the best thing for the public."* (http://bit.ly/12QgP3k).

Even those police forces that hit their targets were not so happy. Surrey Police was assessed as one of the best forces in England and Wales by Her Majesty's Inspectorate of Constabulary and the Home Office via an analysis of Statutory Performance Indicators for 2006-7. But a press release by the Surrey Police in response to the good news stated that, *"The assessment regime creates a number of perverse incen-*



And I am proud to inform you that we have at least reached one of out targets: 100% of aircraft that took off have reached the ground... one way or another...

tives which draw resources away from local priorities." Chief Constable Bob Quick said, *"The assessments were helpful a few years ago but the point of diminishing returns has long since passed. Some of the statutory targets skew activity away from the priorities the Surrey public have identified. We are at risk of claiming statistical success when real operational and resilience issues remain to be addressed."* (http://bit.ly/12QgP3k). The winners felt that leading a 'league table' built on targets did not equate to success.

Education targets

Education may seem to be more predictable than policing and healthcare when viewed as a system, and so if targets could work, you might think they would work here. The UK set statutory, numerical (percentage) targets on (for example): reduction of truancy, 11-year-olds reaching 'Level 4' in both English and maths tests, improvement between the ages 7-11, and pupils attaining five GCSEs at grade A*-C.

This latter target had a number of unintended consequences. Originally, the target did not specify which GCSE subjects were to be included, and so schools could claim success by including easier subjects, and not including English or Maths. As a result of this gaming, the target was revised in 2007 to include maths and English. But still it was then found that schools changed the way they worked to focus on pupils on the cusp of hitting Government targets – five C grades at GCSE. This meant that bright pupils tended to underachieve, while the target provided a perverse incentive to neglect those children with no chance of attaining five GCSE C grades.

Another form of gaming has involved entering students for two different tests for the same subject (GCSE and International GCSE). Reportedly, *"Hundreds of state schools are entering pupils for two English GCSE-level qualifications at the same time in a bid to boost their grades…with only the better grade counting towards league tables"* (http://bbc.in/Sj3Z6K). The government responded by drawing up reforms to league tables in a bid to reduce the focus on GCSE targets.

The targets on reducing truancy led to allegations of teachers manipulating attendance records by persuading parents of persistent absentees to sign forms saying they intended to educate their children at home. Overall, truancy targets were unsuccessful, and were abolished.

When asked what have been the consequences of targets and league tables in education, teachers have spoken out, saying that they promote shallow learning, teaching to the test, and gaming the system. As one teacher put it, *"I think that the targets culture is ruining education. Teachers and senior staff are now more interested in doing whatever it takes (including cheating) to get their stats up than doing what is best for the students"* (http://bit.ly/MAtkYp). The education targets are now under review.

The target fallacy

The British government's experiment with targets does not suggest that the targets were the wrong ones or that there were too many or not enough. It suggests that targets didn't work, or rather, they didn't work in the way that the target-setters thought that they worked. *Targets were meant to improve performance, but instead they made it worse.* People at all levels agreed, from nurses, police officers and teachers to Chief Executives, Chief Constables and government ministers. So why do targets fail again and again?

- **Top-down.** Targets are usually set from above, disconnected from the work. As such, they do not account for how the work really works.
- **Arbitrary.** Targets are usually arbitrary, with no reliable way to set them. They tend to focus on things that seem simple to measure, but are not necessarily meaningful.
- **Sub-optimising.** Targets focus on activities, functions and departments, but can sub-optimise the whole system. People may ensure that they meet their target, but harm the organisation as a whole, or allow other important but unmeasured aspects of performance to deteriorate.
- **Resource-intensive.** Targets create a burden of gathering, measuring and monitoring numbers that may be invalid.

Target culture: lessons in unintended consequences (cont'd)

- **Demotivating**. Targets can demotivate staff. Targets may be unrealistic, focus on the wrong things or provide no incentive to improve once the target is missed. What they often do motivate is the wrong sort of behaviour.
- **Unintended consequences**. Targets always have unintended consequences, such as cheating, gaming, blaming, and bullying. They make good people do the wrong things, especially if there are sanctions for not meeting the targets.
- **Ineffective**. Targets are often not met anyway, or else they become outdated, but are still chased.

Systems thinkers agree that there is rarely such a thing as a good target in a complex system. The organisational psychologist and management thinker Professor John Seddon argued that *"The whole notion of targets is flawed. Their use in a hierarchical system engages people's ingenuity in managing the numbers instead of improving their methods"* (Seddon, 2003, p. 78). Goals and measures are important, along with continuous improvement in performance. But once a measure becomes a goal in the form of a numerical target, both the original goal and the measure tend to become distorted. In a complex system, goals and measures need to reflect the real welfare of the system over time.

How this is relevant for you – Can you make a difference?

If you had patience to read up to here you are probably wondering how this could be relevant for an Air Traffic Controller or any other front-line operator in the aviation industry. Can you make a difference? Can you help prevent the kind of problems in aviation that we have seen in other industries? We think you can. Although targets may be cascaded down to you from your management and from regulatory authorities, you need to get involved. Reflect individually and collectively on how targets influence us and the system we work within. Talk with your colleagues and management – especially the supervisors who are the glue between senior management and operations – about targets in ATM, for instance:

- Do your targets echo the organisational goals?
- Are targets compatible with each other?
- Did you or your colleagues have a chance to advise in setting or reviewing your targets?
- Do targets reflect the real context of the daily operations?
- Do targets avoid putting pressure on staff?
- Are targets reviewed, modified, and removed to ensure they remain current?

If the answer to any of these question is 'No', then speak up – raise safety concerns, because this is relevant to your safety culture. Front line staff are not usually responsible for setting performance targets, but are the ones who are most affected.

Ultimately, we need to ensure that the possible unintended consequences of targets in ATM are understood by those who set and monitor targets. Remember that targets are supposed to be there to help us achieve our goals. And the primary goal of Air Traffic Management is to prevent collisions. Are targets helping us to achieve that goal?

LET'S TALK ABOUT TARGETS AND SAFETY CULTURE

If you feel that you do not know where and how to start to address these questions we have prepared a simple tool called Safety Culture Discussion Cards. These can help us to think and talk about our Safety Culture, including the culture of targets. Use those cards to make a difference. You can download the cards from SKYbrary at www.bit.ly/safetycards or ask for a personal printed copy via esp@eurocontrol.int or steven.shorrock@eurocontrol.int.

Further Reading

- Meadows, D.H. (2008). *Thinking in systems: A primer.* Chelsea Green Publishing Company.
- Meekings, A., Briault, S., Neely, A. (2011). How to avoid the problems of target-setting. *Measuring Business Excellence, 15*(3), 86 – 98. http://bit.ly/yeci8d
- Seddon, J. (2003). *Freedom from command and control: A better way to make the work work.* Vanguard Consulting.
- Seddon, J. (2008). *Systems thinking in the public sector: The failure of the reform regime… and a manifesto for a better way.* Triarchy Press.
- Senge, P.M. (2006). *The Fifth Discipline: The art and practice of the learning organization (Second edition).* Random House.
- Systems Thinking Review (2009). *A systems perspective of targets.* http://vimeo.com/58107852 (article and video).

So you want to improve safety reporting & learning?

1. Is the purpose of reporting understood and is it seen to support safety? Y N
2. Are people treated in a just and fair manner when reporting safety occurrences and issues? Y N
3. Is reporting free from possible incentives *not* to report such as targets, bonuses or prizes? Y N
4. Do people know how to report and have good access to a usable reporting method? Y N
5. Do people have appropriate privacy and confidentiality when reporting? Y N
6. Can people report voluntarily, outside of the mandatory reporting system? Y N
7. Is there a local culture of reporting, where reporting is encouraged by colleagues and supervisors? Y N
8. Are the issues investigated by independent, competent and respected specialists? Y N
9. Are reporters actively involved via discussion, and informed at key stages of the investigation? Y N
10. Does anything improve as a result of investigations, and are the changes communicated properly? Y N

If the answer to any question is N o, then what can be done to improve the system and continue learning?

Download the **safety culture discussions cards** from SKYbrary at **www.bit.ly/safetycards**

SKYbrary

EUROCONTROL

How much?

by Alberto Iovino

When I became aware of the chosen theme for this issue of "Safety versus Cost", I wondered whether the Editor had made a mistake, or, at least, if it would fit in a "Tales of operational Safety" column. Not because it looked like a hard-to-talk-about subject, on the contrary, it is an important and a widely discussed one. The point was that it instinctively appeared to me to be something distant from operations, something that lives elsewhere – in Head Office and at the desks of senior management and when it is mentioned in an ops room one should start worrying. But whilst working on this article, I found out that I was quite wrong. So, if you wish, let's take a look, and you will decide.

Alberto Iovino

is currently head of ATS Operational Procedures Unit of ENAV Italy. Formerly an airline employee for 8 years, he became an ATCO in 1997, working as tower, approach and area controller.

Human life is said to be priceless. Many people would agree, some perhaps with a degree of hypocrisy. In any case, whatever you think about this valuation, there are many alternatives. The U.S. Environmental Protection Agency (EPA) periodically sets what is called the "value of a statistical life." As the EPA itself clarifies, this is not intended to mean "placing a dollar value on individual lives", rather, it is a figure they use for cost-benefit analysis of new environmental policies.

To keep it (more or less) simple, if you ask a group of people how much they would pay to slightly reduce their individual risk of dying next year from adverse health conditions caused by environmental pollution (so that one fewer death may be expected, on average, among that group during that year), you will come up with an average figure that, multiplied for the number of respondents, will constitute a certain amount – the total amount that the group would be willing to pay to save one statistical life in a year. Between 2010 and 2011, by applying such methodology, the EPA set the value of life at $9.1 million, while other US agencies came to various figures in their different fields ($7.9 million for the Food and Drug Administration, around $6 million for the Office of the Secretary of Transportation).

Needless to say, these are not market prices to use when hiring a professional to get rid of your boss or your mother in law and, by the way, though I would expect such tariffs to be much more reasonable, do be careful about whose hands you put yourselves in. Instead, the goal of these agencies is to base political decisions on figures which they can claim represent - how accurately is anyone's guess - the view of the public on a subject.

In modern aviation safety, we are keen on being systematic and on turning into tangible figures concepts that are intrinsically abstract in the first place. Our approach towards a solution to the 'Manager's Dilemma' (production over protection may lead to disaster, protection over production may lead to bankruptcy) is widely based on setting target levels of safety, which are focused on both the quantity and severity of undesired outcomes rather than on the quantification of the economic value of resultant casualties.

In any case, finding an equilibrium is evidently not easy. With reference to the criminal trial following the Deepwater Horizon disaster, the New Orleans Assistant Attorney General declared that BP showed a company culture of prioritising "profit over prudence". Though the statement was in the first place related to how the company behaved in the aftermath of the oil spillage, it implies an opinion on how he considered they had positioned themselves overall.

A never ending story as it may seem, and while something more can always be done in theory, there has to be some sort of limit to the assumption that putting extra money into safety will make the system safer. On the one hand, sooner or later, the value of staying alive inevitably collides with the value of living, or you end up following the travel tips Snoopy typewrites, sitting on the roof of his kennel in a classic artwork by Charles M. Schulz: "How to avoid carsickness, seasickness and airsickness... Be careful what you eat. And stay home."

On the other hand, as for any kind of investment, those made for the sake of safety are not necessarily successful. In a 2006 book including analysis initially based on an article of his from the early

The consequences of implementing a new operational procedure but not properly applying it are in the end not much different from those of buying a new piece of equipment and not getting it to work.

nineties, Stephen J. Guastello remarked how "in spite of all the effort and money that goes into accident-prevention programs each year, there is scant information available on the relative merits of the known accident-prevention strategies. Decision makers are thus destined to make important decisions based on unreliable or disorganized information". Through his studies, Dr. Guastello – a Professor in the Department of Psychology at Marquette University in Milwaukee, IL – tried to compile evidence on the subject for a comparative evaluation. With specific reference to the FAA near-miss reporting program he identified, in spite of an established routine analysis of near misses, a lack of progress in reducing accident rates, which he tentatively ascribed to the extent to which action was being taken on the basis of the findings.

In other words, it should not only be a matter of how good one is at identifying problems, a task for which nowadays significant resources are often allocated, but also of how determined the recipient of the data is to find effective solutions and, eventually, to carry them through. If you can think of circumstances in your organisation which would fit such a view, then it is probably time for a thorough reflection on the subject. And then for some appropriate action, of course.

So one final perspective from which to look at this aspect of the subject might be by considering when it can really be said whether a particular 'safety investment' did or did not pay off. As a matter of fact, although some efforts are explicitly intended to achieve improvements in that field, in the case of aviation, a safety effect is embedded in most of the changes that are implemented. Anyway, it may be hard to reliably assess the real outcome of a safety plan, as it should be measured in the presence of an absolute stability in all other variables, which is very unlikely in complex systems. A criticism of Dr. Guastello's model arose from the fact that it assumed that the entire safety program was a single intervention, whereas in reality such a program would be likely to consist of a number of interacting interventions. This does not mean that we should not evaluate our safety performance and the results of whatever we do to try and improve it, rather that special care should be taken to neither overvalue, nor underestimate these efforts.

We have to accept that our endeavors in the field of safety do sometimes fail. Among the reasons why this is true are people not acting, or reacting, in the way they were expected to. In human factors documents, you can frequently find remarks about air traffic controllers being reluctant to change, presented as "scientific evidence" which, in my humble experience, has often, although not always, corresponded to reality. Organisational factors are widely held to be responsible for influencing individual behaviour more than anything else in a high-skill, performance-routine environment like ATM.

Yet, when it comes to thinking of possible weak links in the chain, I see where I was wrong. Actually, a different outlook may be applied to the otherwise well-established concept that controllers are safety professionals, and that responsibility is spread throughout the whole of an organization with everybody

Is 'value for money' always obtained in safety investment?

Captain Ed Pooley is an experienced airline pilot who for many years also held the post of Head of Safety for a large short haul airline operation. He now works with a wide range of clients as a Consultant and also acts as Chief Validation Adviser for SKYbrary.

How much? (cont'd)

being accountable for his/her own contribution to the achievement of the overall level of safety. In fact, any failure in the proper exercising of such responsibility may be harmful not only because it could directly produce unsafe conditions, but also in that it constitutes an unsuccessful result of an investment which the organisation made in the interests of safety.

The consequences of implementing a new operational procedure but not properly applying it are in the end not much different from those of buying a new piece of equipment and not getting it to work. Whatever effort lays behind them, however relatively big or small the quantity of intrinsically scarce resources involved, they are wasted twice, both because they did not yield the intended results and because they might have been used for something else. We should bear this in mind in our everyday working life. We can challenge the choices our organisation made and we should be prepared to, since that is the road to improvement. But we should also respect them and, as long as they are there, do our best to carry them through, because that is the direction defined for us and to go there we reasonably had to choose not to go somewhere else.

If, in the end, we share the conviction that the path we are taking is the right one, here's an extra good reason to be careful what we do as, needless to say, staying home is out of the question.

by Captain Ed Pooley

Safety is a great way to justify spending money. And a lot has been spent on all sorts of things in the name of safety over the years. I quite often hear things like "you can't have too much safety" and "in safety, you get what you pay for".

But my direct experience and my take on the bigger picture is that both are untrue, which is a particularly relevant observation in times where we want either the same benefit for less money or even perhaps 'more for less'!

Is 'value for money' always obtained in safety investment? (cont'd)

Sometimes, safety may genuinely be the primary driver for investment in new systems. I am sure we will all recognise examples such as TCAS (once it got past the 'experimental' stage and TCAS 2 appeared) and EGPWS (the first and still the predominant manifestation of Class 'A' TAWS). These two advances were such important 'final' safety nets against human performance deficiencies that it would be difficult not to have striven for them at (almost) any cost. The same can easily be said about the operational monitoring of aircraft flight data to validate that aircraft are being flown safely – a system unfortunately ignored in many parts of the world for so long because of domestic freedom of information problems which at first held up adoption of this obvious best practice in the US.

More often though, safety is always a good way to help justify the cost of investment which is usually primarily about efficiency. At the very least, it must be demonstrated that there will be no loss of safety. At best, a claim that safety improvement will result may be made.

However, staying for the moment with safety 'pure and simple' and with the realm of safety nets, the concept of MSAW is considerably older than EGPWS and the terrain database and accurate aircraft position that come with it. Nowadays, both serve as safety nets against the same threat – CFIT. But interestingly, despite its earlier origin, investment in MSAW did not really 'take off' until the direct alerting to pilots provided by GPWS and eventually EGPWS was available and being (understandably) mandated. You can probably agree that a direct alert to a pilot that CFIT may be imminent is likely to be a lot more effective (at least for most pilots) than a (delayed) instruction and / or alert from ATC. So has all the fairly recent safety investment in MSAW been worthwhile? Clearly it is not of primary relevance to aircraft which are mandated to carry Class 'A' TAWS.

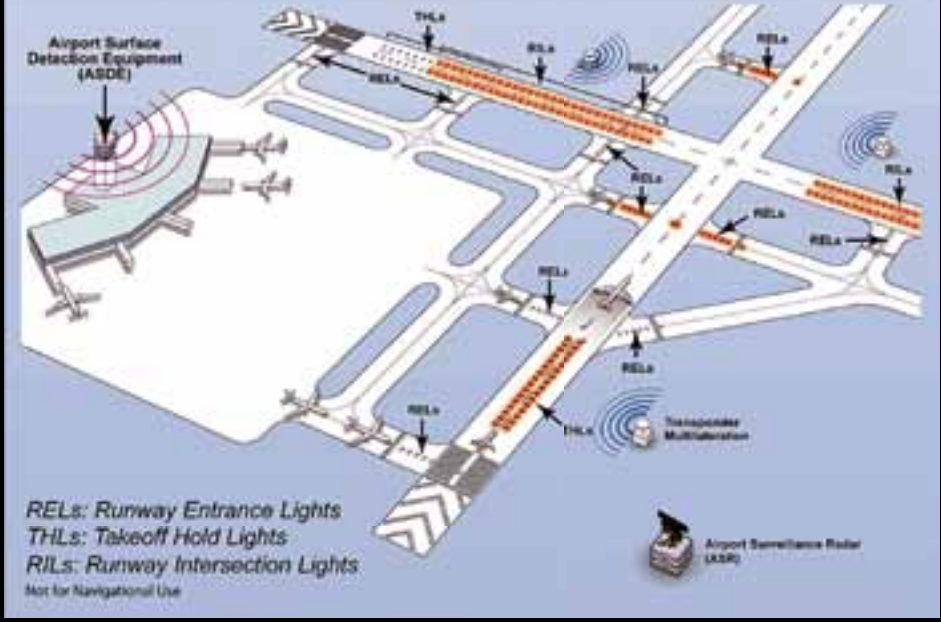
Anyway, whether the claim is that investment in new equipment will maintain or improve safety, and whether or not the investment is primarily justified by its safety case or otherwise, any extent to which the safety card is played invites very close scrutiny if we are to address the 'cost of safety' and ensure that the investment being made is actually likely to deliver the safety improvement claimed. Let me offer a couple of perspectives on this, the first one is strategic, the second one more practical.

A plausible proposition in respect of the operation of aeroplanes is that the commercial passenger flight accident rate is stable in the face of continuous growth in the number of flights because of automation rather than because of better pilot performance. The investment in increasingly reliable automation has reduced the size of the window of opportunity within which pilot error can precipitate an accident. However, when the now-normal high level of automation is suddenly reduced, 'basic skills' in both aircraft management and aircraft handling are not always available. Think of the 2009 loss of the Air France Airbus A330 'because' of the simultaneous disappearance, in stable cruise flight, of reliable displays of a single parameter – air speed – on all three indicators for less than a half a minute and on two out of these three displays (enough to be sure a reading is valid) for less than a complete minute. Awareness of airspeed is an important requirement for the normal operation of aircraft but transitory loss of just this alone is not critical.

The cost of the safety which is nowadays nearly always delivered by automation is user training in **both** the automation and the more 'traditional' way of operating aeroplanes. Unfortunately, this means that two sets of skills have to be trained **and retained** when only one is in use most of the time. There are often justifiable debates about 'training for change' but if the 'old' skills have to still be available, the real cost of safety-by-automation investment tends to be overlooked. There is a chance that the overall cost of recurrent training will increase because it must now address both the everyday use of automation and the (very) rarely used reversion to more basic methods. Of course it may be possible to reduce the time needed for recurrent training in the operation of the automation so much that the greater need to keep available the now rarely-used reversionary skills is facilitated without an increase in total training time. But those investing in automation are stuck with a regulated system of licence-holder training which has a history of following rather than leading as the aviation landscape changes. While this system catches up, the safety part of any business case for investment in automation would do well to be honest about the actual cost of maintaining or improving safety when the human task changes but the old methods of working must still be available 'just in case'.

That might all sound a bit esoteric. But perhaps my more front-line perspective on whether all investments in (or related to) safety are equally well justified in safety benefit terms will help.

I mentioned the case of the ground-based safety net MSAW earlier - and compared its 'safety improvement value' unfavourably to the direct warning provided by on-board EGPWS when this is fitted. I also characterised the direct alerting provided by TCAS II as



A typical deployment of a RWSL system (FAROS element not shown) diagram prepared by MIT Lincoln Laboratory

worth paying almost any price for as a means to avoid airborne collision. But when we move to high speed aircraft ground collisions, the cause of what is still the biggest-ever loss of life in any single aircraft accident at Tenerife in 1977, what about the huge sums of 'safety' money spent on attempts to develop meaningful controller alerting to such events? And by meaningful, I mean generating an alert which, at least at its final stage:

- Can't be missed (so it will need to be aural as well as visual)
- Is almost always a real conflict risk (both false and 'nuisance'[1] alerts are rare)
- Occurs with enough time for the controller to react, the 'solution' to be broadcast and the pilot(s) to respond accordingly

Of course the necessary leap forward is – you've guessed by now I'm sure – direct alerting delivered to the pilot(s). And it's available! After its ten years or so of development by the MIT Lincoln Laboratory in the US including five years of operational trials, the FAA have committed to a major installation program. It's called the Runway Status Lights (RWSL)[2] system. And it's being pioneered in Europe at Paris CDG where the inner runways in each parallel pair are being equipped with RELs and THLs – 09R/27L this year and 08L/26R next year.

In its final form, currently on operational trial in the USA, the three available RWSL components (see the representation above) are being linked with an add-on called the Final Approach Runway Occupancy Signal (FAROS)[3]. FAROS flashes the PAPIs at an approaching aircraft when a risk of runway occupancy by a vehicle or another aircraft is detected. Think of it all as rather like a TCAS TA-only system - although one which, despite also only providing risk awareness rather than risk resolution, leaves the pilot sufficiently informed in time to be able to avert a collision risk without undue stress.

Now that's what I call real safety improvement. Only this time the investor making the safety case is the same as the one with the chance to spend money on ever more sophisticated controller alerting systems driven by surface movement radar since both are ground based safety nets! As always, the leaders have to take a progressive path to the ultimate layer in the assembly of a family of safety nets in the familiar 'layered approach'. But in this case, do the eventual followers need to take the same incremental approach? Maybe if a choice between moving to the next stage of A-SMGCS as an improved controller-use tool or to a RWSL system utilising much the same technology is evaluated using comparative safety cases which are then input to a cost benefit analysis, a 'jump' to an RWSL system will be the winner. Of course, my examples of safety nets against both ground and airborne collision apply especially to relatively busy traffic environments – and if the budget is unlimited, don't choose, do both. But budgets are not usually like that….

So the lesson is that alternative safety investments, or indeed the safety consequences of alternative efficiency investments, especially but not only where more than one stakeholder is involved, can effect 'competing' safety improvements. This suggests than most safety spending really needs a somewhat more challenging examination than it often gets before we can allow ourselves to be convinced that it is worth it.

1- In the context of any safety net whether ground-based or on board aircraft, a nuisance alert should be understood as correctly functioning equipment generating an alert which has no actual safety value
2- see http://www.skybrary.aero/index.php/Runway_Status_Lights_(RWSL)
3- see http://www.skybrary.aero/index.php/Final_Approach_Runway_Occupancy_Signal_(FAROS)

The Luxembourg high
How capacity values are developed nowadays

by Eileen Senger

In the good old days when flying was a means of transport for the rich and the famous aircraft would take off and land whenever it suited the company or the owner best. With so little air traffic there was no need to regulate the air traffic flow.

Eileen Senger

is an Air Traffic Controller at EUROCONTROL's Upper Area Control Centre in Maastricht. She works in the Hannover Sectors which cover north-western Germany and is an OJTI.

After the introduction of large capacity jet airliners making flying affordable for most and the growing phenomenon of mass air tourism it was clear that in the mid 70`s something had to change. Delays for flights to popular destinations at peak hours were growing fast and rudimentary flow control was born.

Over the years this system has been improved and developed from a very rough estimating tool where estimated times over points were calculated using flying time tables to derive a rather approximate departure slot. On paper, by mental arithmetic, for every single flight. Nowadays computers do the calculating. The estimates have become rather precise, and variables such as wind direction and speed are taken into consideration. The role of Flow Management Position (FMO) staff role is mainly to monitor and to intervene only if a problem occurs.

But where is the fine line between busy traffic and too much traffic?

How many aircraft can be safely handled on one frequency simultaneously? Who decides on the figures between safety and capacity, safety and cost, safety and revenue?
The managers who have to defend the figures to the member states or the controllers who have to work with these figures?

In the Maastricht UAC, sector capacity is defined by four values:

- the hourly rate (x/60 mins)
- the entries for a sliding 20 minutes window (x/20 mins) = the sustained value
- the actual occupancy at every given minute
- the peak value (max x)

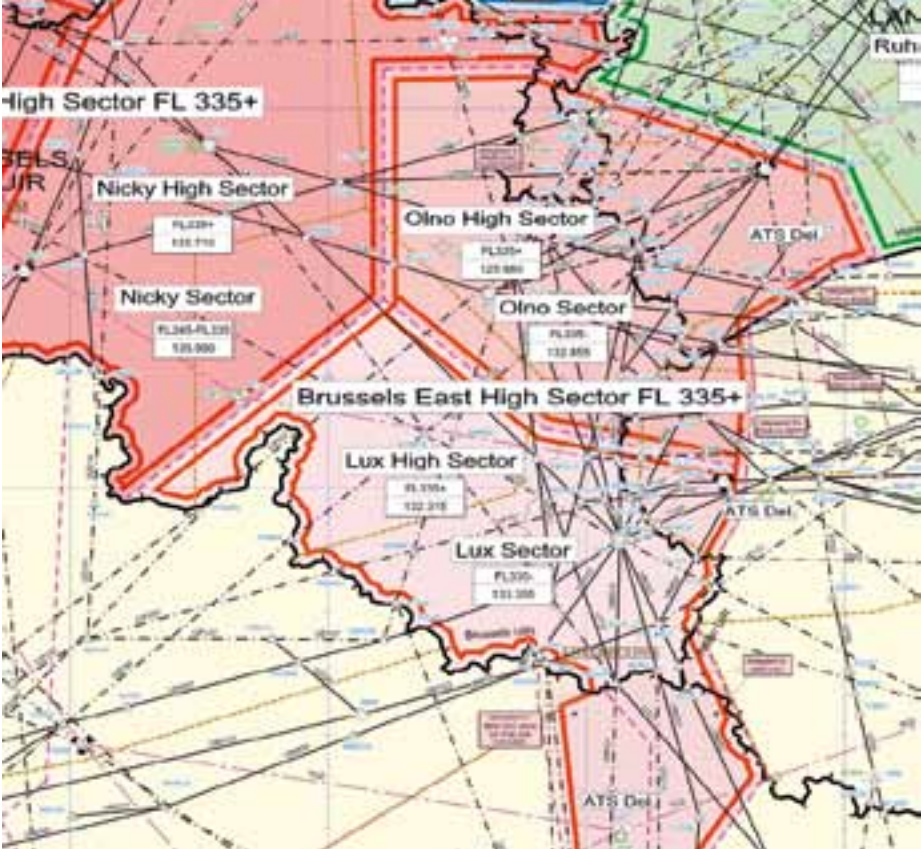
Traffic numbers are allowed to spike up over the sustained value for up to five minutes but should not exceed the peak value.

If a sector overload looks likely, the FMP officer and the Capacity Supervisor take a detailed look at the traffic predicted. On a flight list they try to estimate the complexity. How many aircraft are overflights? How many are inbound or outbound and will require vertical clearances? Is it a mixed traffic pattern or is everybody bunching up in one area of the sector? Is there military activity planned? Or maybe a test flight? If they decide that action is required they usually level-cap certain short haul flights. Hand picked flights are then not allowed to climb higher than a specified flight level or are instructed to stay clear of upper airspace. With this short-term tactical approach, broader protective restrictions that cause a lot of delay for hours can often be avoided.

The capacity figures which the computers and decision makers (FMP staff and sector supervisors) are working with are reliable data developed over many years. They are adjusted whenever a change in airspace or procedures takes place or when feedback is received that more traffic was workable or that the traffic capacity permitted was too great.

But how is a Traffic Monitoring Value (TMV) determined when a new sector is configured?

In Maastricht UAC, the Capacity Assessment Team (CAT) and the sector group experts will look at the existing sectors. Is there one that matches the new sector in terms of size or traffic flow? Then



they try to estimate the complexity. If a new sector is a result of a re-design in airspace structure, then simulations will have taken place beforehand to come up with realistic figures. In the end, the experts pick a figure and when the new sector first goes live, this figure is reduced by 25%. This is mainly done to allow controllers to get used to the new sector, the new structures and the new procedures with less traffic. Feedback forms are distributed and using this feedback the experts decide in their daily meetings whether to adjust the TMV.

That's the theory – but how is it done in practice?

On 4 April 2013, EUROCONTROL's Maastricht UAC opened a new sector in its Brussels sector group - the Luxembourg High sector. As the name implies it is a vertical split with the Luxembourg Low sector. Before, this sector could not be split vertically on its own, only when worked as a combined Olno/Luxembourg or 'East High' sector. The neighboring Olno sector could be split vertically on its own into a High and Low sector. Now the Luxemburg sector can be split vertically and the Olno sector can only be split vertically when there is a combined East High sector. The change was made to reflect the way the traffic flows have changed rather than to create extra capacity.

Of course, new procedures had to be developed for both the sectors changed and for neighboring sectors. This was done by a working group which consisted of airspace experts as well as current air traffic controllers licensed in the sectors concerned. Most of the procedures were taken over from the already existing combined Olno/Luxembourg 'East High' sector and it was anticipated that the change for the controllers would not be too big as they were already used to working this piece of airspace in a High/Low configuration.

After the implementation of the new sector, the CAT met twice a day to discuss the demand, traffic figures, regulations and the feedback received from the controllers. For the first few days the new sector was regulated to 75% capacity. This meant an hourly rate of 45 aircraft and a peak occupancy of 9 for the Luxembourg High sector. Although the controller feedback quickly indicated that they were happy to lift regulations and accept more traffic, it was decided to keep the regulations in place until at least 8 April in order to expose as many individuals controllers as possible to the new setup. On 9 April the CAT decided to lift the regulation for the Luxembourg High sector as it was felt by everyone involved that more traffic could be accepted and the restrictions had led to a bunching of traffic by the end of the restricted periods. Without the restrictions, it was anticipated that this traffic would be more spread out. However, the peak occupancy values for a split scenario were set to 9 for both High and Low sectors. On Thursday April 11 the CAT met for the last time. It was decided to lift all the interim restrictions and the TMV was established at 55/60 for the Luxembourg combined sector and the High sector with a peak occupancy of 14. For the Luxembourg Low sector the values were set at 50/60 and 12 aircraft as peak value.

The delays caused by the all the temporary restrictions had been well within acceptable limits with only a few flights being delayed by more than 40 minutes. Of all delayed flights, the average delay was 0.3 minutes. That is little delay compared to a day with active thunderstorms in Maastricht airspace.

Because the controllers were familiar with this airspace before the new scenario was introduced, little feedback was received.

After one week of restrictions and close monitoring, the Luxembourg High is now on-line at full capacity. It is delivering an optimised maximum capacity for this piece of sky with the same resources as the old sectorisation.

NOTE:

Unfortunately, after this article was written, controllers of the East High sectors became concerned with regards to the Paris TMA-inbounds whilst the Luxembourg High was open. After several meetings it was decided to keep the Luxembourg High configuration out of operation until these concerns were further investigated, simulated and addressed.

What you hear is

by Maciej Szczukowski

What is safety not? Safety is not a binary, zero-one, state. It is a consequence of a sequence of events, which may or may not end with an incident...

Maciej Szczukowski

has been an Air Traffic Controller, for over 10 years, at Warsaw Okecie Airport, Warsaw, Poland. He also holds a PPL.

Safety is not available in shops, even before Christmas and it cannot be created only with equipment, however advanced. Safety is not a permanent state either. The variables on one side and the barriers against failure on the other do change. Sometimes for better, sometimes for worse. A change from A-SMGCS Level 1 with identified surveillance only to A-SMGCS Level 2 with RIMCAS may sound like a big jump towards better safety on runways, just as STCA tries to provide in the air. But all our technology is only a step on the way to even better safety technology. Also, increasing the hourly capacity of a sector, closing a taxiway or reducing the range of airport radar may diminish the power of such systems instantly. To deal with what's left we have a human being – the last barrier. A pilot and a controller, who are responsible for the effects of their actions, are an integral yet inherently vulnerable part of the safety system.

With the rapid growth of information and computer technology capability, we have been able to broaden the scope of available safety-related information to an amazing extent. Often, a controller is able to 'see' massive volumes of airspace, to obtain almost any information about almost any visible traffic and to leave certain decisions to be made by computers for better efficiency of traffic flow. What a controller cannot see is what is happening in the flight deck beyond the radio transmissions made, which are just a small part of the task of the pilot. This makes a wider context, in which pilots make radio transmissions to ATC, largely unknown. As controllers we must first of all give correct instructions and then listen to what is read back. Of course, not only must we listen carefully to the read back, but also perhaps we can sometimes get a bit more from those pilot transmissions than words only. By this we may be able to advance the chances of a safe (or safer) outcome.

My own experience has taught me that attentive listening to the voices of the pilots I am talking to (and sometimes to those of my nearby colleagues too!) can provide me with useful information which can constitute an additional 'free' safety barrier. We all have probably detected, at some time, an evidence of apparent uncertainty, concern or overload in the flight deck, not (just) from the words used but from the way they were spoken. Such signs may identify stress. Experts in these matters tell us that when exposed to stress, the human voice often changes. We may tense our speech-production muscles and so increase our vocal pitch. We may talk more quickly or repeat words and phrases. Some people also have a tendency to mirror speech patterns - a person speaks fast so we respond by speeding up ourselves. Although in stressful circumstances, there may be no time to instantly reduce the stressor, the potential for stress-signs to be detectable over the air waves is at least worth remembering.

My own experience has taught me that attentive listening to the voices of the pilots I am talking to can provide me with useful information which can constitute an additional 'free' safety barrier.

what you get

Whilst for a controller, listening to pilots is as important as telling them what to do, we should remember that pilots listen to us too. The tone of our voice may sometimes 'give away' the existence of stress and provide an indicator of the level of confident control that we have in our sector. Still we should not expect pilots to do more than 'note' such signs in the context of their primary task of controlling their own particular aircraft.

How should one react hearing the "hidden" message of the voice in his/hers headphones ? Being an 'anti-mirror' maybe one of the ways. The faster people speak to you, the more you may try slowing down your speech rate. If a person expresses impatience or irritation, be certain to make your voice relatively more quiet, slow and less emotional. If you suspect that the pilot is reacting to overload, think what you can do to make their life easier and, whilst working this out, share some (relative) calm. I say "relative" because not all pilots remember (or want to remember!), when they're under pressure, that life as a controller can enter overload too. Also while it may be tempting to discuss an incident or mistake on the frequency immediately after it happened, don't even consider this option. Who ever made the mistake, the immediate aftermath is definitely not the time to discuss it. Both parties need, for the time being, to move on and deal with the evolving situation. Remember that you both need to keep concentration and memory, critical task facilitators intact. Looking back whilst necessarily moving on can

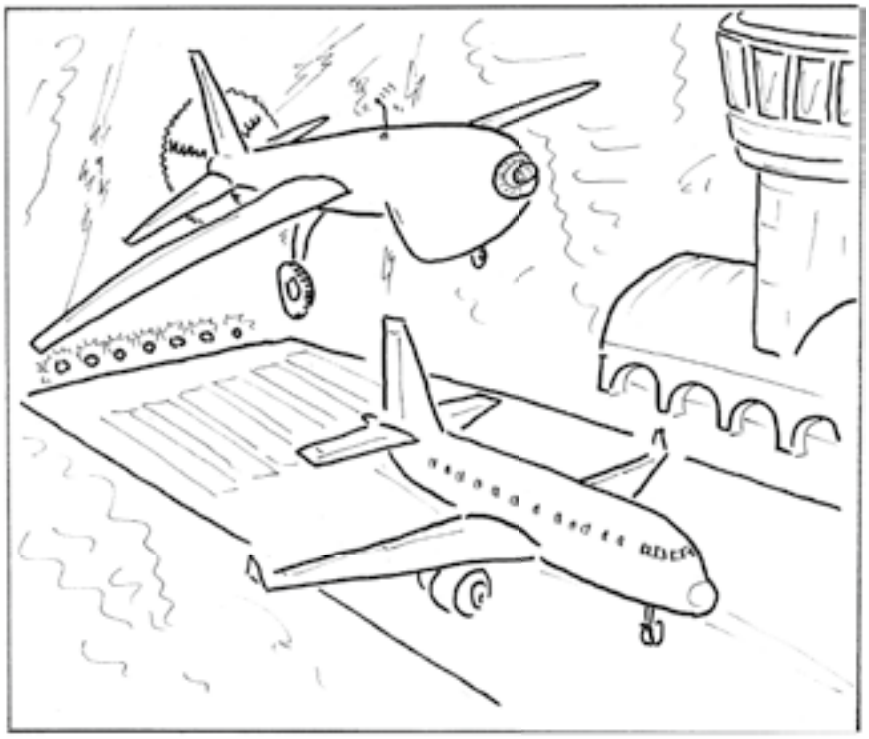
unnecessarily compromise your mental resources.

Just one more thing about the signs that come with speech, only in this case in respect of those you can see as well as hear – your controller colleagues. As we must require a read-back to be complete, clear and unambiguous, we should not forget that crucial exchange during hand-over. The "sound" of my colleague, either steady and convinced or distracted and pensive, becomes a clear "indicator" of whether a safety barrier, being created by us, is strong or not. If it seems like it may be weak, remaining for few minutes following a hand-over is always a good practice[1]. For those of us working in aerodrome control, the ability to be co-located with our colleagues and interchange roles promotes understanding, even when we're not handing over. It allows the sound of the voice, unlike that of a pilot, to be additionally associated with visual 'evidence'. An investigation of a runway incursion event at Zurich[2] questioned the absence of such co-location:

"The two services, "Zurich Apron" and "Zurich Ground", are accommodated in spatially separated operating centres and are provided by apron controllers and air traffic controllers, who are not mutually exchangeable. The question arises as to whether it is expedient to have this spatial separation between two services who have similar duties that complement one another and who must co-ordinate intensively."

There is a belief that safety comes from 'hard' actions. That to increase safety it is necessary to "do something visible' like buying new equipment or implementing a new activity or procedure. Or maybe as little as pressing one more button, making a phone call, using an extra flight strip holder. But all this costs money, energy or precious time. In fact safety is ultimately based on building and guarding barriers. The above remarks about R/T communications are one of the methods of creating them. "Active" listening (and hearing) is surely the cheapest, yet most effective, defensive barrier anyone can create.

I have been discussing a non statutory – and free – component of safety. Of course an idea that one should be aware of all the evidence around is not new. Despite the luck of all aviation, except Icarus' unsuccessful attempt in full sunlight, most of the ideas about human organisation and behaviour upon which aviation relies to achieve safety are firmly rooted in classical times. Quintus Horatius Flaccus, the Roman poet more often identified as Horace, wrote[3]: "nam tua res agitur, paries cum proximus ardet" which, written as advice that an unwelcome development next door may soon be happening to you if you do not take notice, has been translated as "it is your concern when your neighbour's wall is on fire." It is one of my mottos to build the "big picture" by trying to hear (hence understand) more than we are formally expected to, even if it requires extra effort. After all, we've got one mouth but twice as many ears. Let's use them. At least until the age of 100% CPDLC is upon us!



Pilot: No problem Control... Going around and holding... Will wait for another approach...
ATC: Listen to this guy! He is truly amazing... I don't know how he manages to keep cool **up there** under those circumstances...

1- See http://www.skybrary.aero/index.php/Hand-over/take-over_of_operational_positions
2- See http://www.sust.admin.ch/pdfs/AV-airprox/1788_e.pdf
3- in Epistle 1.18 published in 19 B.C.

SAFETY REMINDER MESSAGE

By Richard "Sid" Lawrence

Passing of 'level' information when providing Traffic Information

Synopsis

Released on 11 January 2013

The EUROCONTROL Safety Improvement Sub Group (SISG) is aware that when providing traffic information some air traffic controllers routinely use "relative vertical position" (e.g. "1000ft above/below") as the 'level' reference for other aircraft rather than referring to the other aircraft's actual or expected level (i.e. its flight level, or altitude/height in metres or feet) as described in ICAO PANS ATM. This practice has been adopted because pilots receiving PANS ATM compliant traffic information sometimes misinterpret the 'level' information as an instruction to climb/descend to the stated level rather than assimilate it as traffic information about another aircraft. This problem can be exacerbated on a busy frequency and the use of different languages, accents and dialects often compounds any difficulty.

Dear Readers,

In the pages that follow, I will describe one Alert that covers a topic that has been around for many years – namely how should we refer to the level of an aircraft when providing traffic information.

As previously, my intention is to try and bring new information to the table. The aim is to feature more in the way of feedback, responses, comment and analysis to get the most from each Alert.

If you would like to know more about the EUROCONTROL Safety Alert service, register as a subscriber, submit a suggestion or have a subject that you wish to consider, then please contact me at

richard.lawrence@eurocontrol.int.

The Alert for this edition of Hindsight is a Request for Support Message: Passing of 'level' information when providing Traffic Information.

ICAO requirements & guidance

ICAO PANS ATM 12.3.1.1 describes how the word 'level' should be used in the context of ATC Phraseology, namely:

*"**Circumstances:** DESCRIPTION OF LEVELS (SUBSEQUENTLY REFERRED TO AS "(LEVEL")) **Phraseologies:** a) FLIGHT LEVEL (number); b) (number) METRES; or c) (number) FEET."*

Subsequently at ICAO PANS ATM 12.3.1.6, the word 'level' is included in the phraseologies to be used by ATC when providing traffic information.

Analysis

Traffic information is intended to improve pilots' situational awareness. In response to unwanted manoeuvres and flight safety concerns, some national authorities and ANSPs permit controllers to use "relative vertical position" (RVP) as an alternative way to pass level information. For example, "traffic, 12 O'clock, 6 miles, opposite direction, 1000ft above/below". In some circumstances, e.g. when passing traffic information to an aircraft which is climbing or descending, the words "cleared level" are added, i.e. "…1000ft above/below cleared level" to provide additional clarity and situational awareness.

However, the use of "relative vertical position" across Europe is not uniform. SISG members wished to have more information about, and a better understanding of, the use of this practice with a view to assessing if it would be beneficial to consider changes to the current ICAO PANS ATM 'level' phraseology when passing traffic information.

Alternatively, register your interest through SKYbrary: ***http://www.skybrary.aero/index.php/Portal:EUROCONTROL_Safety_Alerts*** *where you can access the Safety Alert featured here and previous Alerts.*

REQUEST FOR SUPPORT MESSAGE (cont'd)

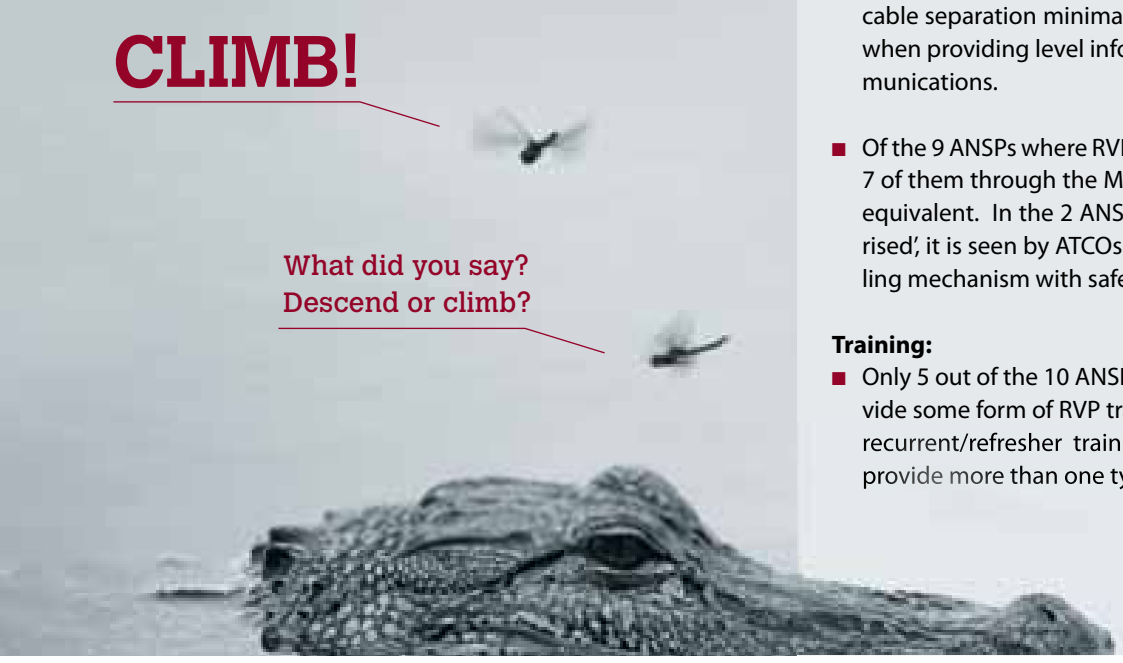
Support requested

The purpose of this message was to gather information about current operational practices and preferences with a view to informing ongoing debate on the topic.

ANSPs and national aviation authorities were therefore kindly invited to share their experiences related to the issue and provide information concerning:

- Any policy they have in force that permits controllers to use "relative vertical position" reporting when providing traffic information.
- Any recorded safety occurrences and statistical data that support the use of the "relative vertical position" technique as an alternative way to pass traffic information.
- How and when controllers are trained in the use of "relative vertical position" phraseology, e.g. during ab initio training, continuation training etc.
- How the policy is promulgated and accessible to both controllers and pilots: e.g. as a filed ICAO "difference", an AIP entry, in national or unit ANSP phraseology procedures or in widely available phraseology guidelines such as UK CAP 413.

Aircraft operators were also kindly invited to share their experiences and preferences on this issue.



Feedback

A total of 17 responses were received: 10 ANSPs, 4 National Authorities, 1 Association and 2 other independent professionals.

SUMMARY OF MAIN POINTS:

Use of Relative Vertical Position level information:

- Relative Vertical Position (RVP) is an option that is in use in 9 out of the 10 ANSPs who responded.
- For the majority of respondents, RVP and actual/indicated level are both acceptable methods of passing level information.
- However, the general consensus is that in most situations RVP is likely to give the pilot a more immediate clue as to the position of the other traffic in relation to their flight than the use of indicated/actual level information.

Policy/Authority for use:

- The situation regarding a formal policy or authority to use RVP varies amongst States and ANSPs.
- Some States (3) either actively promote the use of RVP as an option or in some cases mandate that the actual level should not be passed in certain circumstances.
- In one state RVP is used/authorised as an option in specific circumstances e.g. when in the opinion of the controller the proximity between aircraft may diminish to less than the applicable separation minima. In another State, RVP is authorised when providing level information in the context of STCA communications.
- Of the 9 ANSPs where RVP is used, the practice is 'authorised' in 7 of them through the Manual of Air Traffic Services (MATS) or equivalent. In the 2 ANSPs where RVP is used but not 'authorised', it is seen by ATCOs as a 'best practice' defensive controlling mechanism with safety benefits.

Training:

- Only 5 out of the 10 ANSPs who responded said that they provide some form of RVP training: ab initio (3); OJT/Unit (4); and recurrent/refresher training (2). Note: In some cases ANSPs provide more than one type of RVP training.

- In the States/ANSPs where RVP is used but where there is no formal RVP training, it is common for experienced controllers to promote its use as operational 'best practice'.

Promulgation:

- States do not promulgate the use of RVP in AIPs as an ICAO 'difference' because it is a PANS ATM provision and not an ICAO SARP.
- Some States have issued standards/guidance (e.g. UK CAP 413) which supports the use of RVP.
- Use of RVP, where authorised, is often published in the ANSP MATS (or equivalent).
- One ANSP specifically amended its MATS to include RVP as an option after publication of the RFS.

AOs' view:

- The use of RVP is already widespread and appreciated by flight crews.
- RVP is generally the preferred option to receive level information – it helps visual acquisition and complements TCAS displayed information.

Other Considerations

- Use if RVP needs to take into account the accuracy of the level information presented as 200 feet above could be at the same level.
- The use of RVP may be more or less beneficial depending on whether the receiving aircraft is in level flight or is manoeuvring. For instance, an aircraft subject to a clearance and therefore maintaining a level may be more likely to quickly assess the relevance to their flight of traffic information passed as an indicated level as opposed to manoeuvring traffic such as a VFR aircraft outside controlled airspace, where relative level may be more appropriate and quicker to assess.
- In situations where there are high closing vertical rates, the use of RVP can provide better awareness to pilots so they reduce the vertical rate as they approach a level thus further reducing the possibility of level busts.
- Many ANSPs include aircraft type (as per PANS ATM) when providing traffic information to help pilots identify the conflicting traffic and so reduce the possibility that they will take an incorrect action.
- ANSPs and States did not provide evidence of any safety reports to support the use of RVP. The rationale being that its widespread use is largely preventing the type of errors (i.e. pilots misinterpreting the information and then making incorrect manoeuvres) that led to its introduction in the first place.

Question:

- Do we need to change PANS-ATM to regularise what is a widespread common 'best' practice or should we leave things as they are?

Next Steps

- The overriding response of the SISG members to the question is that the matter should be taken forward for consideration by the EUROCONTROL ATM Procedures Development Sub Group (APDSG). The SISG's strong view is that by embellishing current ICAO 'level' phraseology a known operational and safety consideration could be improved.
- The intention would be to propose the use of RVP as the preferred method to pass level information in certain conditions/contexts. This option could be an addition to, rather than be a replacement of, the existing PANS ATM phraseology which should be retained for the controller to use as deemed necessary. As part of this process any proposal would be exposed to wider industry (controller and pilot) consultation. If there is broad agreement, then APDSG has the means to make a formal approach to ICAO.

Further reading

- SKYbrary Articles:
  - http://www.skybrary.aero/index.php/Traffic_Information
- ICAO Doc 3492: Manual of Radio Telephony.

Case Study - What friends are for

By Bengt Collin

The Airline Owner (after the event)

He was pleased to have hired Steve as ABC Airlines' Public Relations Manager. Knowing his experience and knowledge was one thing – what happened was better then expected.

The Reunion Meeting

This was his 30th annual staff meeting since being employed by the company. Chatting to some of his former controller colleagues was interesting for about fifteen minutes. The meeting was hosted by THE top manager, a man who had been recruited for his ability to continually reduce costs, an ambitious person with his own career progress as top priority. Following a reception with small canapés and soft drinks (he had expected more after thirty years), the manager made a presentation on how the company had finally turned red figures into black. Pretty boring – nothing about how it was thirty years ago, nothing. The manager continued explaining how big money would be saved by removing primary radar from approach and area control, they needed to reduce costs everywhere (except on management bonuses, the ex-controller thought). His friend on his right began to discuss where to head for once the meeting finished; neither, like most other attendees, was paying much attention to the speech.

Bengt Collin

worked at EUROCONTROL HQ as an Senior Expert involved in operational ATC safety activities. Bengt has a long background as Tower and Approach controller at Stockholm-Arlanda Airport, Sweden

The Airline Owner

He was a real self-made man, having started, operated and bankrupted two airlines already. On this third try he had leased three old aircraft from a leasing company based in Arizona. The financial risk was minimal and overall he considered this to be good business; business overheads should be low Recruiting cabin crew was absolutely no problem; young women obviously liked to become flight attendants for no money at all, asking no questions. The pilots were a little bit trickier, but he knew pilots, pay them enough and they fly almost anything.

The Captain

He did not really understand how this new ABC Airline found him. He had had a long career in aviation, including flying as a Captain on B747s, but that was some time ago. What the heck, this was an offer too good to refuse. His First Officer also had some 747 experience – he could always rely on him if things got difficult.

The ATC Meeting

The Controllers' Union had criticised the decision but management quoted changed international requirements and the present financial situation. The primary radar would be taken out of service the following month. The main discussion at the meeting focused on the fact that controllers were going to have to start paying for the privilege of parking right in front of the ATC building. They thought the proposed charge was very expensive, the daily rate being equivalent to the cost of a hamburger. Primary radar or not, the convenient parking is always more interesting!

The Journalist

He frequently heard from readers. Most of the time they had little of interest to say but this letter was hot stuff! A former employee at ABC Airline, who had been taken on as cabin crew after being laid off by the national carrier, wrote about serious breaches of safety standards. These included operating full flights with inoperative emergency escape slides stowed in the toilet compartments and about the lack of emergency training procedures. In addition she said that flights had been continued below required fuel limits. She knew this because the pilots had told the cabin crew (although not the passengers) about the risk of an emergency landing. She had recently left the company because she had felt unsafe.

The Captain

The aircraft arrived two hours late. It had had some technical problems at the previous destination and a technician was working in the flight deck. They would have to get going soon, the passengers were already boarding the aircraft. A blond woman dressed in a green Adidas replica jogging suit and red high heel shoes entered the

Considering our Company's minimum fuel policy, this seems to me to be a sensible thing to do... *

* Don't even try to find a link between this cartoon and the case Study

aircraft, continuous yelling at her young children. This would be a long flight for those sitting near her...

The load sheet arrived. They were operating a charter flight to the south of Europe and, according to the dispatcher, every seat would be taken.

"We still have an unsolved electrical problem, it's tricky to maintain this old stuff", the technician explained to the Captain calmly. "Is this a no-go item or not", asked the Captain. The technician paused for a few seconds before replying "well I guess you could fly with these problems, but I don't feel entirely confident without knowing why we are getting this fault". "OK thanks, let's go", the Captain quickly replied, "we are already late".

The Area Controller

She was in the middle of her shift. Her planner had just left temporarily for a private phone call. The traffic was unusually light and like most controllers she preferred having more to do… Strange I have so little to do she thought; she could overhear the adjacent sector, the west sector controllers sitting on her left side. They were extremely busy with a lot of weather avoidance due to a big thunderstorm. Why don't we have restrictions in place, she wondered. She thought this should happen more often but they were always told that efficiency measured by performance indicators mattered most and besides "you are paid to do this" etc. She never complained.

She had only one real conflict to resolve. Two flights from the west sector were expected to enter at different points but at the same flight level. It had to be fixed but no rush, there was plenty of time yet, neither had called on her frequency yet. She would descend one in her sector and let the other one maintain its flight level towards the south east. The controller covering the sector to her north called on the interphone, he had a business jet descending from a high level diverting to an executive airport below her sector. "It's already tried to divert once but couldn't be accepted because the apron was already fully occupied by other diverted aircraft because of the thunderstorm", he added, "I guess you should not turn it too much".

The first of the two aircraft from west called on her frequency, a B738 at flight level 350. The business jet from the north reported on frequency one minute later, descending through flight level 380 for flight level 360. She descended the Boeing 738 to flight level 250. The business jet would pass well behind the Boeing so she also re-cleared this aircraft to a lower level too.

The Captain

He was thinking about his new boat and his vacation plans. "Is that fault light for the transponder?" he asked his First Officer, pointing at a small red indicator. The First Officer, a younger man still keen to get his first command, looked at the light, "I think so, but I guess the ATC would have told us if the transponder had stopped transmitting, wouldn't they?" "I'm sure you're right" the Captain replied "and anyway you don't fly the aircraft with the transponder do you" he added and laughed. "At least the engines are running, I know that for sure".

The Area Controller

"Control…control, we just passed, just missed a 747 by a very small distance". What was this, who was calling on her frequency, what 747? There was nothing on her radar. "Control, this is Business Jet 123, we narrowly missed a 747 crossing right to left as we descended through flight level 350, we had nothing on TCAS".

Case Study
what friends are for (cont'd)

Her interphone rang; it was the busy planning controller for the west sector. "Sorry, we forgot to hand off ABC654 to you. He has disappeared from our screen, can you see him? He may be in your area already at flight level 350, I think his transponder may have failed".

The Journalist

A short item on his local radio station reported a near miss between two aircraft over the city. The story was broadcast without any comment but it was obviously close – one of the passengers had called the radio station. The airline involved was the same airline he had received information on safety concerns a few months earlier.

As soon as he asked for more information, the airline invited him over. At the meeting the following day he found, to his great surprise, that the Airline Public Relations Manager was a good friend from long ago. Steve and he had been at university together and had a lot of fun. "You have to understand that this incident had nothing to do with us, he said. The crew did not even notice what happened". "Trust me old friend, this airline always puts safety first" Steve continued. He smiled, "but why not discuss it over lunch shall we, we have a lot of catching up to do!

The Magazine Article

"According to well informed sources, human factors played a major role for the serious incident last week. The airline's pilots had no involvement at all. "There was absolutely nothing our pilots could do to avoid the incident, however our airline will continue to focus on safety. It is always our top priority", said Steve Bull, public relation manager at ABC Airlines. "The passengers can trust us"

Case Study Comment 1 by Eileen Senger

"You are paid to do this" is usually a sentence used to finish a conversation. The ultimate way to bring the discussion to an end.

All the characters in this story are paid to do their job – but do they live up to it according to modern standards? In our corporate world today, we have shifted away from the worker who is really only paid to do his, mostly heavy physical, job. Nowadays we want an engaged employee, who identifies him/herself with the company and, by constructive criticism helps advance the interests of the company. In the aviation world this is taken even further: we are brought up to care. It is part of our training to think further, to see things in context and to identify and address problems and potentially dangerous situations – our "Duty of Care".

The Area Controller in whose sector the Airprox takes place is the only one who can hardly be blamed. The only thing that they could be blamed for is that they didn't stop their planner from leaving for that private phone call. Then again there was nothing to do and, had it not been the phone call, then maybe it would have been a toilet break or a chat with the supervisor about the break plan. The fact that the controller is alone on position does not contribute to the events happening at all.

The Controllers in the neighboring west sector are extremely busy and because of all that extra workload caused by the thunderstorm, the planner forgets to hand off the 747. Mistakes happen. But this time, there is no safety net to catch it - the primary radar has been taken out of service to save money.

All the Controllers quickly accepted the management decision to switch off the primary radar. Parking fees seemed more important because they affect you every day. The primary radar is "only" there as a backup, hardly ever needed. But then comes this one

Eileen Senger

is an Air Traffic Controller at EUROCONTROL's Upper Area Control Centre in Maastricht. She works in the Hannover Sectors which cover north-western Germany and is an OJTI.

occasion where you do need it…The Controllers' Union protested against the decision to switch off the primary radar, so they lived up to the standards we expect from them. But when protest didn't help that was it. No more protest, actions, discussions. Why was there not more agitation from the controller's side? They probably didn't feel unsafe without a primary radar. Let's be honest, how often does it happen nowadays that an aircraft transponder fails when the flight is being operated with the other one already subject to 'deferred defect' status?

The Top Manager of the ATC company (probably the person paid most in this story) is worth his money in terms of optimising the financial performance of the business. But he fails to properly think things through to their potential conclusion. What is the price tag of a mid-air collision? For the lives that end? For your revenue, for your reputation, for your insurance premiums, for all the psychological damage it will cause? And how much was the annual cost of keeping that primary radar in service again?

The job offer too good to refuse has a little twist to it as have most things that seem too good to be true. The Captain is paid not to ask too many questions. When the ground technician explains his concern about not understanding the origin of the unsolved electrical problem, the only thing the Captain is interested in is whether it is a no-go item or not. The technician, who will stay with his two feet on the ground, seems more worried than the pilot who is actually entrusting his life to this pretty old machine. And not only his life but that of his crew and of all his passengers.

The former ABC Airlines cabin crew member is the only one breaking the cycle here. She came to the conclusion that despite the money she was being paid, she did not want to be part of this airline any more. She felt unsafe and concerned, so she passes her information on to the press. I am left wondering why she did not inform the aviation safety authority of her country. Was she scared that she wouldn't be able to get another job in the industry? It is sad that by turning to the press rather than the authorities, the problems with this airline were not dealt with.

The Journalist is not doing what he is paid for! Although he receives a report that ABC Airlines is not taking safety standards seriously, he does not publish a critical article. He does begin to do some research but when a near miss occurs involving the same airline, he allows himself to be diverted from objectivity by his "old friend", the public relations manager. Once they have done their "catching up" he accepts 100% of the ABC Airlines line about the incident and the resulting magazine article reads like a ABC Airlines press release. This journalist does not live up to the professional standards readers expect.

The airline Public Relations Manager is really worth his money! He does what he is paid for. Thanks to his connections and his charming manner, he manages to soothe all concerns and clear his company from any responsibility.

A RECOMMENDATION

Ask yourself! Are you just doing what you are paid for or are you keeping your eyes, ears and mind open? Are you living up to the standards that you would like everyone else to live up too as well?

Case Study Comment 2 by Keith Cartmale

It is worth taking both a 'micro' and a 'macro' view of this scenario from the perspective of the ANSP.

Keith Cartmale is the Safety Manager of EUROCONTROL's Maastricht Upper Area Control Centre, a cross border En Route ANSP. In addition to his standard duties managing safety and safety performance, he is the chairman of the Risks from Incidents and Safety Concerns (RISC) Group, an incident moderation panel which analyses incidents and makes recommendations aimed at preventing reccurrence.

First, the micro view. What is happening in the Operations Room? Several things are evident:

- The West Sector controllers are very busy, and have not applied restrictions;
- The East Sector controller is working (temporarily) on her own;
- There is no primary radar coverage;
- The West Sector Controller had not coordinated the ABC654 into the East Sector.
- The transponder of the 747 has failed;
- The aircraft transponder failure was not recognised at the time of failure by the West Sector Controllers;

Working a sector on your own is not a practice I would recommend, despite the light traffic, because situations can become complicated very quickly. It implies a lack of appropriate Operations Room discipline, and is a culture that can easily spread and lead to erosion of good practice.

I also see a 'can do' culture - let's handle as much traffic as possible, no matter what the weather or however complex the situation. This is exacerbated by a supervisory ethos which wants to avoid restrictions because this means delay and thus increases the cost per Unit.

However, the context is a fact of life. Cultures don't spring up over night - they develop over time and arise from the beliefs and values at all levels of the organisation. It is vital that all staff speak up when they have concerns and that supervisors and managers listen and act on concerns – a positive, open safety culture.

The impact on safety and capacity of the proposal to remove primary radar coverage should have been assessed to aid the decision making process. The impact of loss of individual/multiple transponder data would then be known, and any mitigation actions can then be taken prior to going ahead with removing primary radar. This lack of primary radar coverage increases the possibility of a false traffic display. If this had been recognised, the procedures for applying restrictions during adverse weather would have been tightened and enforced. Likewise, the controllers would have been given training on what to do in the event of a known loss of aircraft transponder data now that primary radar coverage is no longer available.

And then there is the macro view. From the total Systems perspective a lack of aircraft transponder data constitutes a single point of failure, something that all safety professionals are encouraged to design out of their systems.

With today's advanced ATM systems, especially in a Mode-S environment, consideration should have been given to developing and implementing a tool which automatically detects aircraft transponder data failures, then plots the predicted movement of the aircraft based on its previous known position, trajectory, flight path and destination. We could call this tool the AirCraft Transponder Failure Alerting and Subsequent Situation Tracking (ACT-FASST) tool. This would serve to warn the controllers, and allow them to take appropriate action, for example, confirming with the pilot that the transponder has failed, then periodically obtain updates of the aircrafts latest position and trajectory, to enable separation to be maintained, all be it based on degraded information.

A RECOMMENDATION

As a rule of thumb, when making recommendations following incidents, we only make recommendations that we can practically implement ourselves as an ANSP, i.e. in areas under our managerial control.

It would be great to make recommendations about reinstalling primary radar. State Regulations

Case Study Comment 3
by Captain Ed Pooley

We probably all recognise this type of Operator. They always have classic aeroplanes which if not leased cheaply would remain parked in the desert until scrapped for not a lot. We may know or have guessed that these aeroplanes are often crewed by almost-retired Captains over 60 years old accompanied by much younger First Officers with aspirations of a proper job. Meanwhile, these youngsters have little effect on their Captain's traditional approach to command ("I'm in charge") especially on a Classic 747 where there's likely to be an equally geriatric flight engineer with as much time on type and (consequently) almost as much 'authority' over the First Officer as the Captain. Examples of the genre are to be found more often outside Europe – such as the annual Haaj pilgrimage flights to Mecca and Medina. But as this sort of business is typically a long haul business model now that we have a proliferation of LCCs doing short haul, they sometimes have one end of the journey here, as in this story.

The attitude of the Captain to an unserviceable transponder doesn't surprise me much – although I'd expect the other one to have been available as a substitute whereas we are left to assume that it was defective already. Neither am I surprised by the reliance on SSR with no primary - although I did wonder if the airspace involved had been properly notified as a transponder mandatory zone….

The fact that there was defective safety equipment and that a cabin crew who had experience of something better felt moved to try and expose the fact didn't surprise me either. And as for the ease with which a non-specialist journalist can "have the wool pulled over has eyes" about safety issues, again no surprise. In fact this media problem actually works both ways – not only are real safety issues not appreciated for what they are, occurrences that aren't really about safety are often presented as though they are!

And what about the west sector team? They were certainly rather slow to spread the word that they thought the transponder on the old 747 may have failed? Definitely a poor response in SSR-only airspace – but had the controllers been properly prepared for the withdrawal of primary radar?

So where is there a chance to act to stop the next incident like this? Well quite possibly at the ANSP, but I am going to opt for the Flight Operation involved and specifically pick on the Regulator that issued an AOC to the airline involved. Such an act requires oversight of the holder **in proportion to the assessment of risk**.

A RECOMMENDATION

The Regulator which has responsibility for the AOC holder involved must recognise that their oversight effort cannot be based on fleet size and that this type of operation will need a lot more watching than many if an acceptable level of safety is to be maintained. Of course, I hope that the Regulation of operators like this one is provided by agencies which understand that their responsibilities extend beyond collecting the money. Unfortunately as with shipping on the high seas, outside of Europe, not all Regulators are equally competent…

could be strengthened to ensure this was a regulatory requirement. ANSPs have to balance safety with costs and they may decide not to operate primary radar if States do not require it.

I would be looking at how to bring about improvements in the safety culture, in particular improving communications between controllers, supervisors and managers, and seek to improve the balance between safety and capacity.

For this scenario, the recommendation would be to evaluate the feasibility, then develop and implement the ACT-FASST tool, including provision of user training in the use and limitations of such a tool.

Captain Ed Pooley

is an experienced airline pilot who for many years also held the post of Head of Safety for a large short haul airline operation. He now works with a wide range of clients as a Consultant and also acts as Chief Validation Adviser for SKYbrary.

Case Study Comment 4
by Captain Murray O'Shea

Most people involved in aviation are aware of the Swiss Cheese Model of accident causation. Originally proposed by James Reason, the Swiss Cheese Model relates system defences to a series of randomly holed slices of Swiss cheese arranged vertically and parallel to each other with a gap between each slice.

Murray O'Shea

is an experienced Captain with 16,000 flight hours and a combined military/civil aviation career spanning 35 years. He has flown the A320 and A330 for airlines on four continents and has been employed as a TRE/TRI on both types.

Murray has written numerous articles for the SKYbrary website.

In the model, the defences against a failure are represented by the cheese slices while the holes in the cheese represent the weaknesses in the individual parts of the system. These holes continuously vary in size and position on all of the slices or barriers within the model. The defence system fails when individual holes in each of the slices momentarily line up permitting a hazard to penetrate all of the barriers and thus lead to an accident.

In the context of the case study, I would submit that there is a price associated with Swiss cheese. You can always spend less money but you are likely to end up with either fewer slices or inferior cheese. In aviation, cost efficiencies that are implemented without first considering their flight safety implications can lead to an increase in the number or the size of the holes within the individual cheese slices or even the complete loss of one or more of the slices or barriers to an accident. In either case, accident potential is increased.

In the Case Study narrative, it becomes apparent that the primary focus of ATS management is cost reduction:

> *"...The meeting was hosted by THE top manager, a man who had been recruited for his ability to continually reduce costs... made a presentation on how the company had finally turned red figures into black."*

> *"...the manager continued explaining how big money would be saved by removing primary radar from approach and area control, they needed to reduce costs everywhere..."*

The Controller's Union is concerned about the loss of primary radar capability but that concern is diverted by the spectre of parking charges to be levied against individual controllers:

> *"...had criticised the decision but management quoted ... the present financial situation ... radar would be taken out of service the following month..."*

> *"...The main discussion ... focused on ... paying for ... parking..."*

The Airline owner's goal is to operate with the least possible financial risk and expense. He was, however, prepared to pay as required for pilots who would get the job done no matter what it took. He also realised that the cost of a well-connected public relations manager, who could put a positive spin on company related incidents, was far less than the cost of doing things properly:

> *"...he had leased three old aircraft ... the financial risk was minimal ... he considered this to be good business; business overheads should be low."*

> *"...but he knew pilots, pay them enough and they fly almost anything."*

> *"...was pleased to have hired Steve as ABC Airlines' Public Relations Manager. Knowing his experience and knowledge was one thing – what happened was better than expected."*

From the issues identified in the letter written by a former flight attendant, there were training deficiencies and both MEL and regulatory violations occurring on a continuing basis, all of which were indicative of reluctance, on the part of the airline, to spend money:

"...serious breaches of safety standards ... including ... lack of emergency training ..."

"...operating full flights with inoperative emergency escape slides... "

"...flights had been continued below required fuel limits... "

The incident Captain was aware that he was being well paid in spite of his very dated experience on type. He also understood that he was expected to get the job done with minimum fuss and, when confronted with an unresolved maintenance issue, did just that:

"...this was an offer too good to refuse..."

"...had a long career in aviation, including flying as a Captain on B747s, but that was some time ago ... First Officer also had some 747 experience - he could always rely on him if things got difficult..."

'..."We still have an unsolved electrical problem" ... the technician explained. "Is this a no-go item or not", asked the Captain. The technician ..."I guess you could fly with these problems, but I don't feel entirely confident"... "thanks, let's go", the Captain quickly replied..."

The unresolved electrical problem resulted in an in-flight failure of the 747's transponder. However, because of a high workload resulting from numerous deviations due to a thunderstorm, the sector controller did not notice the loss of the SSR information. Imposing airspace restrictions due to weather is contrary to local ATS policy which appears to have monetary roots:

"...efficiency measured by performance indicators mattered most and besides "you are paid to do this"..."

Loss of the SSR data resulted in a late handoff to the incident controller in the next sector. Unaware that the 747 was in her sector, and with no SSR information or primary radar capability, the incident controller gave the business jet clearance to descend through the 747's altitude precipitating the near miss.

In each previously described facet of this incident, there is a financial dimension. The Air Traffic management decision to decommission the primary radar was a cost savings measure. It was not contested by the Controller Union due to a distraction over parking charges. The minimum financial risk profile, as adopted by the Airline owner, resulted in old, poorly maintained aircraft flown by undertrained crews.

Captains were paid to "press on – regardless" and did so in spite of being uncertain of the serviceability status of the aircraft or in flagrant violation of regulatory or MEL restrictions. With each of these decisions, the barriers, represented by cheese slices in Reason's model, were eroded and the holes within those slices of cheese became larger and more numerous until an incident was inevitable. It would seem that the adage "you get what you pay for" applies equally to Swiss cheese and to Flight Safety.

A RECOMMENDATION

In aviation, virtually every management decision holds a flight safety dimension. This is especially true when cutbacks and cost reductions are under consideration as the negative impact on safety can be masked by the (more immediate) positive fiscal results. I would recommend that each organisation have a mechanism in place for examining the flight safety implications of monetary decisions and that the Accountable Manager should not approve policy or capability changes made solely to achieve cost reductions until satisfied that any flight safety implications have been addressed.

Case Study Comment 5
by Dragan Milanovski

Often, reading a magazine article about an event or topic well known to you makes you think this could not be further away from the truth. On the other hand, we tend to believe almost everything else we read. Is it because one could be biased, a different point of view or something else? It is an interesting "phenomenon"…

It is not too difficult to conclude that a simple transponder failure was the main factor that caused this serious incident. Clearly, this was not an "odd" case to be blamed on human factors, although human factors played a significant role in it. Unfortunately, there are other examples where a similar failure played a major role in incidents or accidents even with catastrophic outcomes (for example the 2006 mid-air collision over Brazil). The question is how a minor and relatively insignificant technical failure can lead to such a big incident.

The crew of the 747 could have done more to anticipate potential problems and think of possible actions long before the failure took place. Having in mind the technical problems before departure, the reaction to the fault transponder light was inappropriate and difficult to understand. The crew should have asked ATC immediately whether their transponder was transmitting or not. This would have enabled an early identification of the problem and probably prevented the incident. I have no doubt that an experienced Captain understands the potential consequences of a transponder failure and that you need a "bit" more than just engines to fly an aircraft safely. Working for an airline that does not value safety culture, where "cutting corners" here and there is part of daily operations, can probably make professionals act less "professionally" over time and start taking safety for granted.

Controllers learn and practice how to handle flights with transponder failure (with or without primary radar) – we all know it is not a big deal. But the skill did not get used in this case and ABC654 disappeared from the screen of a busy sector without being noticed. You might be thinking that the controllers manning the west sector made a mistake – they should have detected the situation a lot earlier and dealt with it. True, however there were a few factors that significantly contributed to this omission that are important to consider.

The controllers on the west sector were extremely busy dealing with a lot of weather avoidance due to thunderstorm and possibly overloaded, while the area controller had very little to do. Was the sector split done properly? I would expect that when this is the case, the workload is more evenly spread amongst the

Dragan Milanovski

is an ATC training expert at the EUROCONTROL Institute of Air Navigation Services in Luxembourg.

Most of his operational experience comes from Skopje ACC where he worked for a number of years in different operational posts.

Now, his day-to-day work involves ATC training design as well as Initial Training delivery for Maastricht UAC.

various sectors (I know… most of the time it does not feel like that).

It also looks like a dangerous culture of not using the restrictions has been introduced even when everybody felt they were needed with the excuse that efficiency measured by the performance indicator mattered most. What happened to "safety first"?

The primary radar was removed prior to the incident. Was this another mistake of the management motivated by financial efficiency? Usually it is not, if the change is managed properly and if the associated risks are mitigated. From the story we can not tell all details, but can be expected that the controllers were subject to an awareness campaign about the removal of the primary radar and the effect and changes it might bring to their daily job, the new threats and how to deal with them.

The area controller was not busy and had plenty of time. She was working on her own at the time of the incident, but I do not think this had a significant impact. Based on the workload described in the story, she could have looked at traffic about to enter the sector and potentially detected an aircraft that was overdue. Well… probably because this was not part of her daily routine, it did not happen. Her planner may have had a better chance, but we can not be absolutely sure about that.

A RECOMMENDATION

Most ATC systems have tools which help controllers detect situations like this by initiating a warning when a target correlated with an active flight plan disappears from the screen, or when an aircraft about to enter a sector is overdue. The management of the ANSP should have considered introducing something like this before the decision was taken to remove the primary radar. Even with primary radar, a tool like this definitely adds another safety barrier – immediate detection of a transponder failure is not always straightforward for controllers.

Those of you who feel that I have proved the point I made at the beginning of this article, well… in this case it is just a different point of view.

2012 the safest year ever for air travel again

by Paul Hayes

In 1943 the Curtiss-Wright Corporation delivered a secret report to the U.S. Government on the expected development of commercial aviation after the end of World War II...

The report was extremely positive and foresaw very considerable growth in air transport in the coming years. The only negative the company saw was the airline industry's poor level of safety. It concluded that 'if the accident rate remains the same as in the 1930s, the expected growth in commercial aviation after the War will result in an unacceptable number of accidents. This will, ultimately, limit this growth.'

In the late 1930s the US airline passenger fatality rate was about one per 50,000 passengers carried (the world passenger fatality rate at this time was probably closer to one per 10,000 passengers carried).

US (and world) airline safety did begin to improve after the War and, by 1950, when US airlines, including major airlines like American, Eastern, Northwest, TWA etc, suffered 15 fatal accidents in which 31 crew and 182 passengers died, the passenger fatality rate was twice as good as in the late 1930s - one passenger fatality per 100,000 carried.

Globally in 1950 there were at least 43 fatal accidents on revenue passenger flights resulting in some 831 passenger fatalities. In 2012 there were just 10 fatal accidents on revenue passenger flights world wide resulting in 362 passenger fatalities. None of the accidents in 2012 involved a US airline, 'major' or otherwise. In fact none of the airlines involved in the 2012 accidents is probably known outside the markets it serves.

Airline safety has continued to improve since 1950 and has not only managed to keep up with the huge expansion of air travel but has also got ahead of it, actually reducing the frequency of fatal accidents. In the immediate post-War years, typically, there may have been 40 to 50 fatal accidents involving revenue passengers each year but this has now more than halved to between 10 and 20 a year. Curtiss-Wright's fear that the public would be driven away from flying by increasing numbers of accidents has thankfully not been realized although, of course, there are still people who are scared of flying.

Paul Hayes

Few people in aviation can match Paul's nearly 35 years' experience in air safety and his achievements as a trusted advisor to governments, regulators, insurance markets and airlines worldwide. Paul joined Ascend in 1974, having previously worked for National Air Traffic Services at London Heathrow Airport.

Last year, 2012, the estimated passenger fatality rate had reached a high of one per 9.9 million passengers carried. This makes 2012 the safest year ever and some 20% better than 2011 when the passenger fatality rate was one per 8.2 million passengers carried; 2011 had itself previously been called 'the safest year ever.'

Although there were still 10 fatal accidents on revenue passenger flights and 362 passenger fatalities in 2012 and I am sure the general media, as always, ran 'thoughtful' stories questioning global airline safety, it will be noted that the passenger fatality rate last year was 100 times better than in 1950 and perhaps 1,000 times better than in the 1930's.

These numbers probably do not carry much impact by themselves – what, after all, do 100 or 1,000 times better mean in reality? However, put simplistically, without this 100 fold improvement in the passenger fatality rate, 2012 traffic levels, if still exposed to 1950 levels of safety, might have given rise to 1,000 fatal accidents – almost 20 per week or three every single day of the year – killing more than 36,000 passengers.

Would this accident frequency and death toll have limited the industry's growth or would fatal air crashes have simply ceased to be news? After all a similar number of people are killed on US or EU roads every year and road traffic accidents only get reported by the media in exceptional cases.

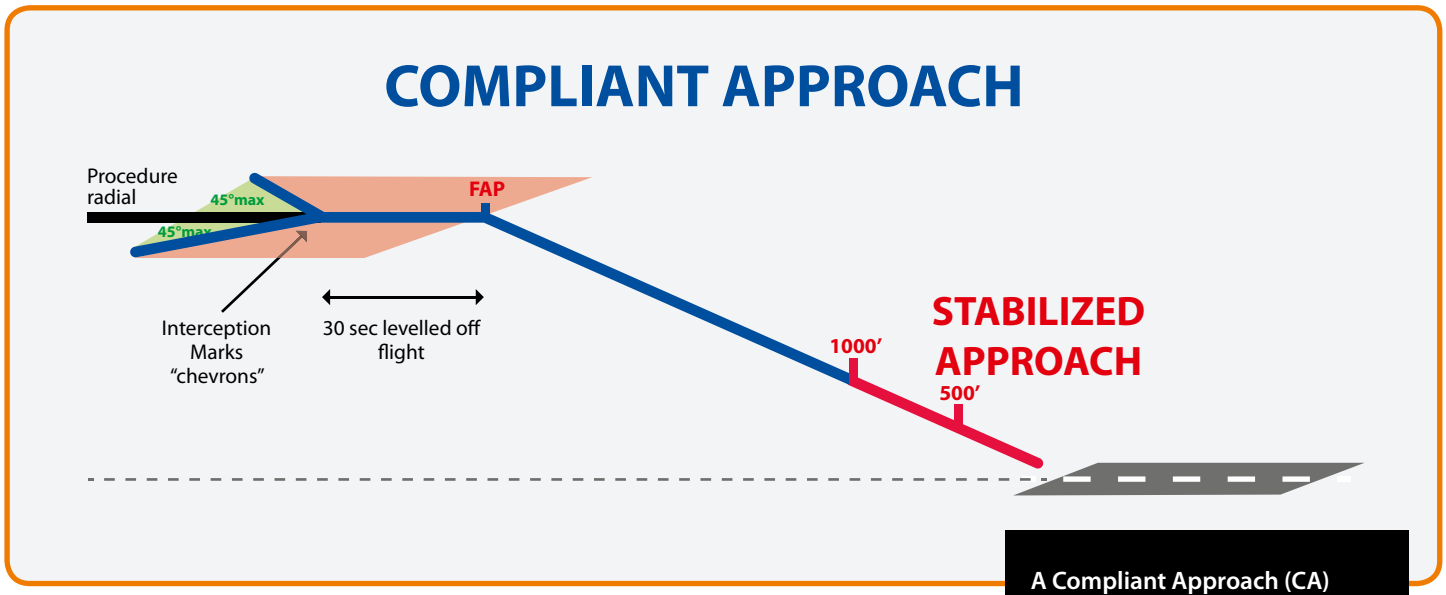
However, unfortunately, we do not believe that the world's airlines have become this much safer this quickly and 2012's accident rate, perhaps, should be considered currently to be more of a fluke than the new norm. We believe that the underlying global passenger fatality rate is probably about one per six million passengers carried – about three times better than during the 1990s but 'only' perhaps 60 times better than the 1950s. Nevertheless, airline safety is continuing to improve rapidly. The industry, on average, probably becomes twice as safe about every 10 years while traffic growth globally is only forecast to be between perhaps 3 and 4% per year over the same period. So, on average, we might expect about 30% fewer fatal accidents a year by 2023.

Meanwhile, 2012's accident rate has set the air safety bar very high and it may well be that this year (2013) will fall short with a worse rate and more accidents than last year but that would not mean that airlines have suddenly become less safe.

Defining a Compliant Approach (CA): A joint response to enhance the safety level of approach and landing

by André Vernay

The chances of a stabilised approach are improved if we look to the intermediate and final leg intercepting conditions and make sure that they support the outcome we are looking for where the aircraft passes successfully through the stabilised approach gate(s) late in the final approach.



According to clear international standards, recommendations and guidance such as ICAO Doc 4444, guidelines for RNAV approaches, ATM and Aircraft Operator SOPs, the ideal approach is fully defined. But experience shows that variations often appear due to pressure on crews' and air traffic controllers' or optimisation objectives.

The intermediate leg of an approach should prepare the aircraft for the stabilised final approach. It also offers the opportunity to prepare the aircraft in good time for the defined stabilisation gate(s) which seem to sometimes be treated like the "last chance" for a crew to configure their aircraft with very little time available to react in any unexpected situation.

Managing day to day variation in a whole system can appear difficult with the differing responsibilities of air traffic controllers, manufacturers or operators. The solution is to define what we term a **Compliant Approach (CA).** This depicts a shared safety objective which requires that the corresponding gaps with ICAO safety provisions are better handled.

A Compliant Approach (CA) requires (from the GREEN sector in the diagram):

- **A closing track to final approach of < 45° (or <30° on parallel active approaches)**
- **AND a level leg once established on the FAT of at least 30 seconds (or 2nm for GNSS approaches)**
- **AND glidepath interception from below**
- **AND the required airspeed until the FAP shall permit the aircraft configuration**

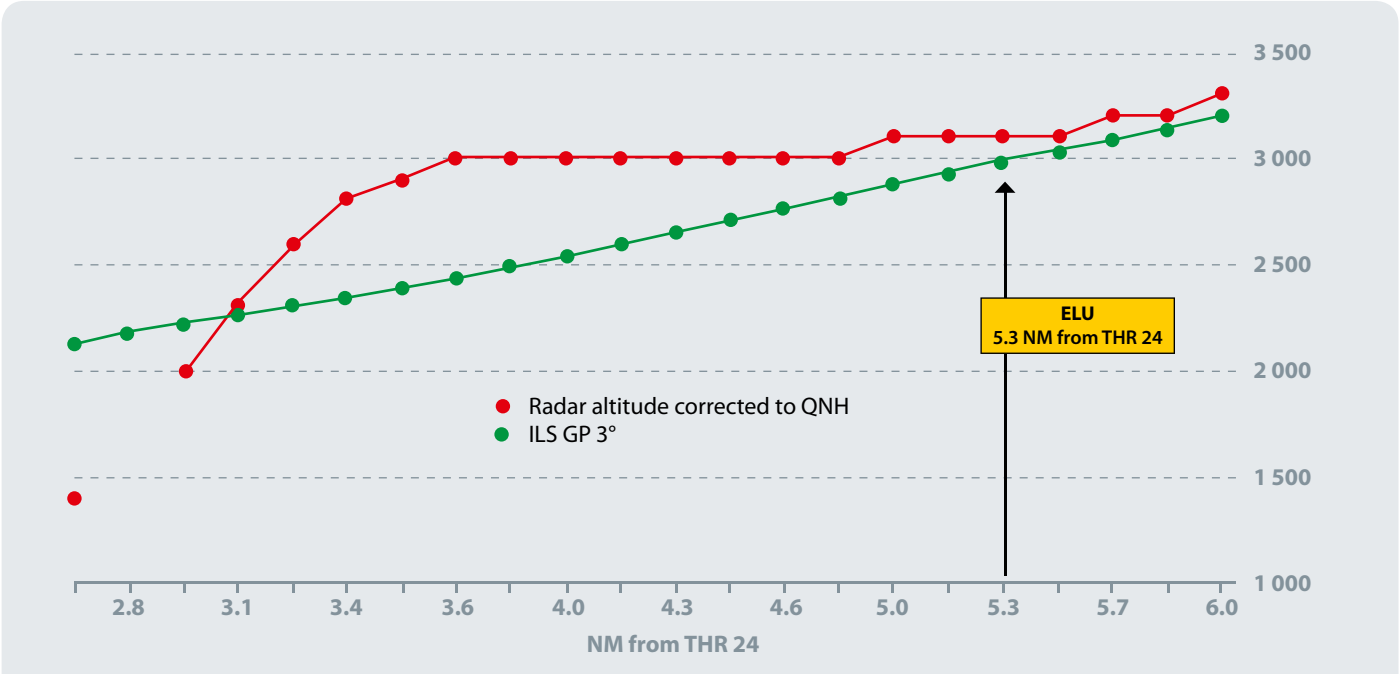
André Vernay

After a 20 year career as pilot, human factors specialist and investigator in charge in the Air Force, André joined the French DGAC to take charge of the interaction between aviation actors and systems in order to work on safety and security improvements and communication. A Paris Descartes University graduate, he is involved in developing the French SSP, safety reports analysis and monitoring SMS implementation. A Member of European working groups such as EARPG, ECAST, EHFAG, he participates in the ACARE work on the EC SRIA policy.

A Non CA may occur when aircraft is vectored or not, during instrument or visual approach and can be detected either by crew or ATC with the help of surveillance.

A CA will increase the chances of successful negotiation of the subsequent stabilised approach gate(s) and so reduce the chances of Runway Excursions (RE) and Controlled Flight into Terrain (CFIT). There is also a link between a CA and reducing Airborne Loss of Control (LOC-I) events. Non-CA has been involved as a precursor and contributor into at least five fatal accidents and four major incidents within the last 25 years in and near to France. This experience strongly supports the importance of prescriptively managing the whole of the approach, not just the last 1000 feet.

A focus over five scenarios picked up from this activity is described in our study. The investigated accidents highlight the strong influence of the lack of a CA and a live traffic survey at a major French airport (also mentioned in our study) also provides confirmation of this, as does a consultation of the ECCAIRS occurrence report database. An example of an approach which did not have a CA – and was therefore very likely to end up being an unstabilised approach as the safety nets fell away – is shown in the box:



The visibility for landing is initially below minima but when a sudden improvement is notified, the crews are tempted to change their mind. Their plan quickly changes from going around to continuing with the approach but an attempt to intercept the glidepath from above involves a big reduction in both speed and altitude to reach the threshold. This culminates in the prohibited use of reverse propeller pitch in the air to create this rapid descent. There is a complete change from a well planned and organised approach to a complete mess in less than a minute. In fact, in telling the crew about the weather improvement, the air traffic controller had intended to provide some useful information to help the crew but instead it provided an incentive for them by feeding a non renunciation of the approach and a way back to the holding pattern.

Defining a Compliant Approach (CA): a joint response to enhance the safety level of approach and landing (cont'd)

This French DGAC research topic, directed at all Aircraft Operators and ATM, is the result of combined and sustained efforts of many people and is already added to the risk portfolio of our State Safety Program as a major focus for safety enhancement. This work also highlights the missed approaches and the quality of their execution.

Today more than ever, resources to implement any initiative, whether financial and human, are hard to find; So, central to our CA cost-neutral recommendations is that no new regulation is called for. Instead, we propose to rely on developing guidance material and explaining and translating the elements into better practices and operational appliance for commercial flights.

Whilst technology is not a big part of our solution, training in unfamiliar situations that can lead to better quality landings is important too. The French DGAC therefore undertook a three-year internal study focusing on the major points of safety improvement included in the recently published European Action Plan for the Prevention of Runway Excursions (EAPPRE, part 3, chapters 3.3 and 3.4). Furthermore, a major French operator has already added this topic to the pilots' annual skills course after working with our Civil Aviation Safety Directorate (DSAC) office and the airline Training Department.

There is an obvious need to reach a wide audience with the information contained in this team work. Each organisation involved in the conduct of instrument approaches is invited to review and prioritise the proposal for a defined and well applied CA.

Our vision is now to proceed from a single issue of CA to develop a new family of incident classification and treat each one similarly, for example in-flight loss of separation. Sometimes, when regular experience is translated into "common habits", it is linked to an optimistic feeling that a successful outcome is assured ignoring the real threat and operational stress that may exist (helped by Human factors management). The efforts to develop a common and coordinated response, to what we believe is an important emerging topic, have already begun with both Operators and ATC and national coordination with the French Air Navigation Service Provider – DSNA is the first positive step which is confirmed by the major increase of safety reports identified not meeting CA criteria.

Our common cooperative intention is to enhance approach and landing safety by advocating the implementation of the recommendations our analysis contains: we now count on more stakeholders (authorities, operators, air traffic controllers, manufacturers…) to implement the CA criteria and work closely with us on their adoption.

Nb	Undesirable event identification	CFIT	LOC-I	Mid-air collission	Ground collission	RWY-EXC	Damage/ injury in flight	Damage/ injury on the ground
EI2.1	Unstabilised or Non Compliant Approach	X	X			X		X

The risk portfolio in the French aviation state safety programme

REF		RECOMMENDATION	OWNER	IMPLEMENTATION DATE	GUIDANCE
3.3.1		Ensure the importance of a stabilised approach and compliance with final approach procedures is included in training and briefing for air traffic control staff.	Air Navigation Service Provider	02 January 2014	APPENDIX C
3.4.7	GENERAL	The aircraft operator should ensure the importance of a stabilised approach and compliance with final approach procedures is included in briefing for flight crews. The commander should not accept requests from ATC to perform non-standard manoeuvres when they are conflicting with the safety of the flight.	Aircraft Operator	Immediate	APPENDIX E

Extracts from the EAPPRE Recommendations Summary

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Commercial pressure

by Captain Dirk De Winter

When speaking of commercial pressure in aviation there is no topic more sensitive than fuel!

Part-OPS for fixed wing commercial operations specifies that every operator must establish a company fuel policy on the minimum amount of fuel which must be on board before the departure of a flight.

The "basic procedure" has little extra margin. In the textbook scenario, the aircraft arrives at the destination airport and makes an approach, does not acquire the required visual reference at the applicable decision altitude, executes a go-around and continues to the specified alternate airport where it can hold for a maximum of 30 minutes before making an approach and landing. After landing it is permitted to be towed to the terminal because taxi-in fuel is not included. In practice, most flights land at their destination with the alternate and final reserve fuel and possibly the contingency fuel still in their tanks so they are a long way from this 'bottom line'.

In their daily operations, flight crew are guided in their calculations by the company operational flight plan (OFP). In many larger airlines using modern aircraft, this OFP is specific to the flight and derived from a database with all the possible permutations of departure, en route, arrival and diversion which could apply. In others, the OFP is still the type that every airline once used, generic to the route in all conditions rather than tailored to a specific flights.

```
OFP ROUTE:
-EGKK/08R F390 SAM3P SAM UN621 BASIK UZ150 NOVAN UN864 DELOG/F330
 UN864 NEA/F270 UN864 ORBIS ORBIS1Z LEMD/18R
-DIST 733-
```

Figure 1 : OFP for landing 18R

Carrying around unused fuel comes at a cost; it means increased weights so increased fuel consumption. This is why airlines promote the uplift of this OFP planned fuel unless needed for safety reasons.

So why do crews sometimes take more fuel then required by the OFP?

Is it the confidence in the OFP fuel calculations themselves? Most airlines which generate flight-specific OFPs have aircraft and engine performance monitoring programmes which allow the fuel calculations to be adjusted to the particular aircraft being used.

Is it the selected routing in the OFP? Flight specific OFPs are prepared in advance based on available weather forecasts. These will determine judgements on likely runway direction for departure and arrival and may influence the choice of the destination alternate.

Let's take for example the flight of a single aisle jet flying from London Gatwick to Madrid Barajas. The OFP has a departure from Gatwick on runway 08R, a cruise at flight level 390 and an approach and landing at Barajas on runway 18R. On that basis, the minimum block fuel is calculated as 6907kg.

TAXI	220	(0.22)
TRIP	4074	1.50
CONT 5%	204	0.06
ALTN	1405	0.35
FINRES	1004	0.30
ADDNL	0	0.00
TOTAL	6907	3.01

Figure 2 : fuel planning for landing 18R

What if the weather conditions change and a different landing direction is required at Barajas? Example 2 shows the same flight plan for an arrival to runway 32L. Note that there is a 400kg increase in the minimum required fuel because of a longer arrival routing (300kg) and a slightly longer routing to the alternate (75kg).

On the day of operation the flight crew needs to carefully check the validity of the expected routing during their preflight planning. Is there any prospect of the arrival runway being different to the one assumed? In that case, the flight would be 400kg short? To cope with unexpected events during the flight the "basic procedure" requires the inclusion of contingency fuel defined as 5% of the trip fuel. In the first

Dirk de Winter

is has over 11,000 hours flying time over the last 22 years. He started as a cadet pilot with SABENA in 1987 flying Boeing and Airbus aircraft. Before starting his flying career Dirk obtained an academic Master degree in Electronic Engineering at the University of Brussels. Since January 2009 Dirk has been working part-time in EUROCONTROL Agency.

What about the cost of carrying extra fuel? Increasing the take off weight on this flight by 1000kg would increase the trip fuel by 79kg.

flight plan this was only 204kg. While this is enough to cover the possibility of a lower cruise level (+39kg if limited to FL370 or +110kg if limited to FL350) it's not enough to cover the runway change shown in this example.

Is it the OFP selection of the destination alternate? If a diversion is unlikely, the closest possible suitable airport will usually be used to obtain the obvious fuel savings. If diversion is probable, a suitable commercial alternate may be selected which will minimise the operational consequences of a diversion – for example facilitate easy transfer of the passengers by bus.

Diversions are rare – a 'top 3' European airline reported only 0.17% of its flights diverted in 2012. But when they happen they are likely to bring a high workload for the flight crew who areoften very familiar with the destination routing and approach but may well be less so with the alternate arrival procedures. Additional communications with Company Ops and Cabin Crew will be needed and PAs must be made to inform the passengers of their situation. Effective task sharing by the crew is essential in order to maintain situational awareness and ensure sound decision-making is not prejudiced by time pressure.

So, a Captain may decide to uplift fuel in excess of the OFP minimum if they have any doubts about its appropriateness for their flight. They will usually have to provide a short explanation on the flight paperwork as to their reasoning for the decision.

What about the cost of carrying extra fuel? According to figure 5, increasing the take off weight on this flight by 1000kg would increase the trip fuel by 79kg. If low visibility procedures (LVPs) are expected to prevail at the destination, a Captain may typically decide to take this much extra to give 30 minutes of extra "thinking time".

However, it is easy to see why airlines are keen to minimise extra fuel. Whilst the routine carriage of 400kg extra fuel which would provide 10 minutes more "thinking time" or enough fuel for a go-around and a second approach would only increase trip fuel per flight by 30kg, the effect on the 'top 3' European airline quoted earlier would be around an extra 30,000kg of fuel a day.

So this subject, and the responsibility for the fuel loading decision, is another of the reasons why Captains get their four stripes! Diversions and significant routing changes are unusual and they can usually be foreseen before departure provided that the airline assists by providing an accurate and up to date OFP, accurate weather forecasts, easily-applied corrections and sufficient time to prepare the flight and assess any exceptional challenges that the crew can expect. And we should not forget about those operators who still use generic OFPs, because in these cases, the decision about fuel loading is potentially rather more complex than it is for those discussed here, who are fortunate enough to have complete clarity on what their minimum fuel load will do for them.

```
OFP ROUTE:
-EGKK/08R F390 SAM3P SAM UN621 BASIK UZ150 NOVAN UN864 DELOG/F330
 UN864 ORBIS ORBIS1C LEMD/32L
-DIST 778-
```

Figure 3 : OFP for landing 32L

TAXI	220	(0.22)
TRIP	4377	1.58
CONT 5%	219	0.06
ALTN	1480	0.35
FINRES	1005	0.30
ADDNL	0	0.00
TOTAL	7301	3.09

Figure 4 : fuel planning for landing 32L

```
TOW CORR     +1000 PLN BLK  +79 / -1000 PLN BLK -79
2000 BELOW          TRIP  +39 / TIME  1.51
4000 BELOW          TRIP +110 / TIME  1.53
```

Figure 5 : fuel corrections for weight or altitude

Sixteen-year-olds

by Stefano Paolocci

The Argentinean-Canadian writer Alberto Manguel noted in his book "The Library at Night" that "One man's experience can become, through the alchemy of words, the experience of all, and that experience, distilled once again into words, can serve each singular reader for some secret, singular purpose." ...

Stefano Paolocci

ATCO from 1992 (tower and approach controller, first experienced with the Air Force), Stefano is employed from thirteen years in the Safety Unit of ENAV Italy as investigator and Safety expert. Now is coordinating the activities of the Safety - Report & Communication Unit.

Personally, I would eliminate the conditional in his proposal altogether. On the other hand, how is it possible to disagree with someone who, already working at the Pygmalion Central Library of Buenos Aires at the age of sixteen, had been chosen to read aloud to a well-known blind visitor at his home? But above all, how can one do it knowing that the "well-known blind visitor" was Jorge Luis Borges? But it is this sentiment which is truly representative of the story that I would like to share.

A few months back, during the editing of the first issue of our safety magazine, "SafeBull", we identified as a case study an event that was ideal for a new magazine stimulating and relatively critical. The protagonists were two aircraft that, due to adverse weather conditions (fog) and increasing departure requests, had accumulated long delays. When they were finally authorised to taxi to the take off runway, the first of the two, which was near the Holding Point, asked to do an "engine run-up."

It should be noted that this was not unusual and was approved by the TWR controller after satisfying himself that there was a safe distance behind to protect the second (following) aircraft from any jet blast hazard. Precisely at this point, however, the Runway Visual Range suddenly began to decrease and Low Visibility Procedures came into force. This required increased separation between taxiing aircraft and, consequently, the taxiing authorisation already issued to the second aircraft should have been reformulated. Unfortunately, this did not happen and so, in this middle ground no longer guaranteeing the separation previously applied nor the required new one, the occurrence took place – an initial abrupt braking and then, later, following the investigation of the circumstances, a broader study on potential mitigating procedures for ground movement in LVP during sudden and unforeseen significant deterioration in visibility.

From the point of view of a lesson learned, everything was absolutely perfect: we had the experience of an event and the alchemy of words that, through our magazine SafeBull, had communicated the widely.

However, something was missing, something which Alberto Manguel had chosen to insert that something at the very end, almost to warn those who might conclude that the emotional transfer that allows what is written to be absorbed into one's own experience is a consequential phenomenon and therefore not to be pondered.

Nothing could be more wrong, because now the question was: how could that experience, included in the first issue of SafeBull, be "distilled once again into words (to) serve each singular reader for some secret, singular purpose"?

SafeBull is a new safety magazine produced by the Safety - Report & Communication Unit of ENAV Italy. Born to help operational air traffic controllers to share in the experiences of other controllers who have been involved in ATM-related safety occurrences, it is issued four times a year.

Once again, SafeBull was the solution when, in gathering material for the "Safety Alert" section of the magazine for its second issue, we came across something very similar to the event discussed in the first issue. It was so similar that, apart from the visibility conditions and the specific aircraft involved, the location was identical and there was the same "run-up" request during taxi.

What immediately struck us was why, at that airport, at that position, do some aircraft need to request a "run-up"? Was there a situation we should understand? We discovered that MD80 series aircraft operated mainly by Italian or Spanish airlines, needed to operate their engines at a thrust setting above the usual taxi setting under certain weather conditions (low temperature or high humidity) or following ground de/anti-icing in order to "clean" the turbines. However, such thrust increase did not correspond to the normal meaning of a "proper" "engine run-up" which could create a significant jet blast hazard and which would normally be carried out in an area of the airport identified exclusively for the purpose.

After this discovery, many things began to become clear, even if the question related to the jet blast risk was still important. In fact, apart from the aforementioned "run-up" request at the active runway Holding Point, the run up in the new event had a sequel - the pilot had subsequently lined up without clearance after wrongly believing that he had received clearance to do prior to beginning the approved "run up".

So why not propose whilst "distilling (the experience) once again into words" that pilots use the term "power check" if needing to follow this power assurance procedure during low temperature, elevated humidity or after ground de/anti-icing? And that is what happened! Through our magazine, we made such a proposal in the Safety Alert section and, to our surprise, found that many readers had had the same idea.

And thus we closed the circle that Alberto Manguel, had identified long before us. Compared to this great writer at sixteen years old, we had surely at most read aloud, "Where the Streets Have No Name", thinking we were in Los Angeles on the roof of a liquor store when we were in fact in front of the bathroom mirror attempting to overcome the infinite shyness of our age.

Striking a balance:

by Álvaro Gammicchia

Few industries were hit as hard by the economic crisis as the airlines. With fuel prices at record levels and stiff competition in the market, companies are looking for various ways to ensure profitability. Cutting the fuel bill, which often exceeds 30% of operating expenses for airlines, might from a financial perspective seem a good solution. Fuel, however, is not only a question of money but also one of safety.

We have entered 2013 with cheerful media reports running around the world on "extremely high" aviation safety levels. Researchers from the Aviation Safety Network identified a steady and persistent decline of the number of accidents and incidents worldwide, making 2012 the safest year for aviation since 1945. But while flying is safer, it is still not risk-free. From time to time, planes declare emergencies for various reasons such as a bird strike, a cracked windshield, smoke in the cabin or any other technical problem. In all cases, the crew makes the executive decision to bring the plane safely down. In reality however an emergency declaration is one of the most critical situations for both pilots and Air Traffic Controllers (ATCs) - an abnormal occurrence which should be prevented whenever possible.

On 26 July 2012 an aircraft with almost 200 passengers en route to Madrid diverted to Valencia due to severe thunderstorms over the capital. Being 4th in line for an approach, the pilots had to hold over Valencia, where it was already busy due to other diverted flights. After having circled above Valencia, pilots declared MAYDAY emergency due to low fuel. The plane was cleared for a straight-in approach and minutes after, it landed safely. Most stories such as this one end here.

Álvaro Gammicchia

started flying gliders at the age of 14 and is currently an airline pilot flying A320 series for Iberia. He is extensively involved in aviation safety through his work with the Spanish Pilots' Association, SEPLA, and as an Executive Board Director for Technical Affairs with the European Cockpit Association. Álvaro's work is in close cooperation with EUROCONTROL and is mainly focused on aerodromes, air traffic management and accident investigation and helicopters.

money versus safety

In this instance two more aircraft were forced to declare an emergency for the same reasons at the same airport. All three aircraft operated by the same European airline diverted to Valencia due to the weather conditions, all three had circled for a while, and all three were running low on fuel. Two aircraft landed with their final reserve fuel intact and one landed with less than this mandatory minimum amount in the tanks.

This final reserve fuel rule is a good example of the carefully designed "layers of protection" in aviation. If something goes wrong, there is another safety barrier which is supposed to prevent accidents and incidents. In the specific case, passengers were not at risk and the company operated in full compliance with European safety standards. Yet, the controversy of fuel emergencies goes beyond these incidents and invites many questions about the Captain's authority, the importance of Air Traffic Controllers and the challenge of striking the right balance when it comes to safety versus profitability.

The first unavoidable question is about the authority of the Captain to take enough extra fuel. The ultimate decision on how much fuel should be taken lies with the Captain. The European Commission Regulation on 'Air Operations' clearly outlines a fuel policy for the purpose of flight planning and in-flight re-planning to ensure that every flight carries sufficient fuel for the planned operation and reserves to cover deviations from the planned operation. The regulation specifies that the pre-flight calculation of usable fuel required for a flight includes: taxi fuel; trip fuel; reserve fuel consisting of contingency fuel, alternate fuel (if a destination alternate aerodrome is required), additional fuel (if required by the type of operation); and extra fuel (if required by the commander of the flight).

Yet this last point – extra fuel – is the one raising the most concerns due to its necessarily discretionary nature. With fuel prices skyrocketing, cutting the cost of 'extra fuel' seems to be a preferred option. Lately, evidence has begun to emerge about European airlines promoting flying with just the standard fuel reserves or even developing fuel saving incentive schemes for pilots. The less fuel used, the bigger the incentive. In other cases, various kinds of pressure or incentives can be exerted on pilots to take as little extra fuel as possible. Depending on the circumstance what may be interpreted as a de facto limit can be seen as interference with the Captain's authority to take safety decisions independently and this despite the fact that the Captain is the one ultimately responsible for the safety of everyone on board. This is a major paradox.

This final reserve fuel rule is a good example of the carefully designed "layers of protection" in aviation.

So even if an airline is within the legal framework and the passengers are not at risk, the question still remains, how overstrained Air Traffic Controllers will react in a situation when multiple aircraft start running out of fuel at the same time. In a TV-interview for the Dutch KRO Reporter program, broadcasted in December 2012, an Air Traffic Controller asked the same questions. Pilots facing imminent fuel exhaustion must opt for a precautionary landing otherwise they face an extremely hazardous alternative. Yet, ATC also face an extremely difficult situation when eleven other aircraft, are circling above the same airport. How do you prioritise in these situations if more of those 11 aircraft encounter the same problem?

In the past few years, Europe has witnessed bankruptcies, cost-cutting measures and job losses. This raises the question of the potential impact of the economic crisis and the related cost-cutting measures on passenger safety. While the practice of promoting flying with less extra fuel is not an infringement of the letter of the law, one could ask whether complying with any mandatory minimum standard is sufficient to provide adequate passenger safety. Promoting fuel saving might be helping to maintain profit margins, but it can also narrow the ones on safety.

Of course carrying too much extra fuel does not necessarily provide an extra margin of safety, while it does cost more. So fuel decisions and fuel policy is a balancing act in which the Captain should ultimately determine whether a plane can fly and land safely with a certain amount of fuel. At the end of the day, if you bear the responsibility you must also be given the authority.

The existence of several layers of protection, such as the mandatory minimum for final reserve fuel and the unprecedented safety levels of aviation cannot be used to play down any serious safety incident. Each should be properly investigated because they provide an excellent opportunity to learn lessons which may help better strike the right balance between safety and costs. Allowing pilots and air traffic controllers to exercise their authority and to take decisions on operational issues without being under any undue pressure is a must. Ultimately, flying with more extra fuel costs more money, but it will sometimes be the price of safety.

First ATC championship
It's all about safety...

by Rosen Garev, Branimir Chorbov, Vassil Dragnev and Plamen Georgiev

Generally most people share the opinion that the job of the air traffic controller is primarily focused on the safe and efficient provision of air traffic service and consider it to be too serious to go beyond this. As a whole this point of view is correct and that is what training for this very interesting profession is based on.

Rosen Garev is an OJTI and an active en-route controller. He also has previous experience as a tower controller.

Branimir Chorbov is an assessor, OJTI and an active en-route controller. He also has previous experience as a tower controller.

Vassil Dragnev is the Head of BULATSA's training centre. He also has previous experience as an air traffic controller and an ATM expert.

Plamen Georgiev is an active en-route controller and has previous experience as a tower controller.

However, a group of ATCOs have looked at this from a slightly different perspective. While preserving the main principles of the job, they have added a competitive element and an innovative assessment system. Imagine an environment resembling the real ops room with simulated air traffic and contestants in the role of controllers and what you get in your mind is the idea of the authors of this project – an ATC championship.

It is not an easy task to develop a system to evaluate a contestant's performance. Basically there are two approaches to determine if one contestant is better than another. You can have a set of strict rules that determine the result or you can use an oracle[1] to say that "Player "A" performed better than player "B"".

The first approach is used in most sports (e.g. football, basketball, high jump) and computer games. The issue here is to create rules that are simple to use, make the game interesting and challenging and ensure the better player usually wins. If the rules are not well balanced, the players will start to abuse their weaknesses and, unless proper measures are taken, ruin the game and spoil the fun.

The second approach is mostly employed when entertainment is involved (e.g. reality shows where the audience or a jury decides who is the best singer). Some sports like figure skating and rhythmic gymnastics also use it. The problem here is that different people have different tastes and therefore the evaluation is prone to be very subjective and it is quite possible to get (very) different scores for the same performance.

How might we evaluate air traffic control? There are two main components we have to measure – safety and efficiency. The objective evaluation of the safety component is relatively easy – if there is a separation breach, the student / examinee / contestant fails. Deciding whether or not a conflict has been spotted early enough is somewhat difficult, but is still do-able (e.g. by stating that if no adequate action has been taken by 4 minutes before the separation breach, then the student / examinee / contestant has not detected the problem early enough).

1- a 'voice' which is considered to be the source of ultimate wisdom and was traditionally inspired by the gods

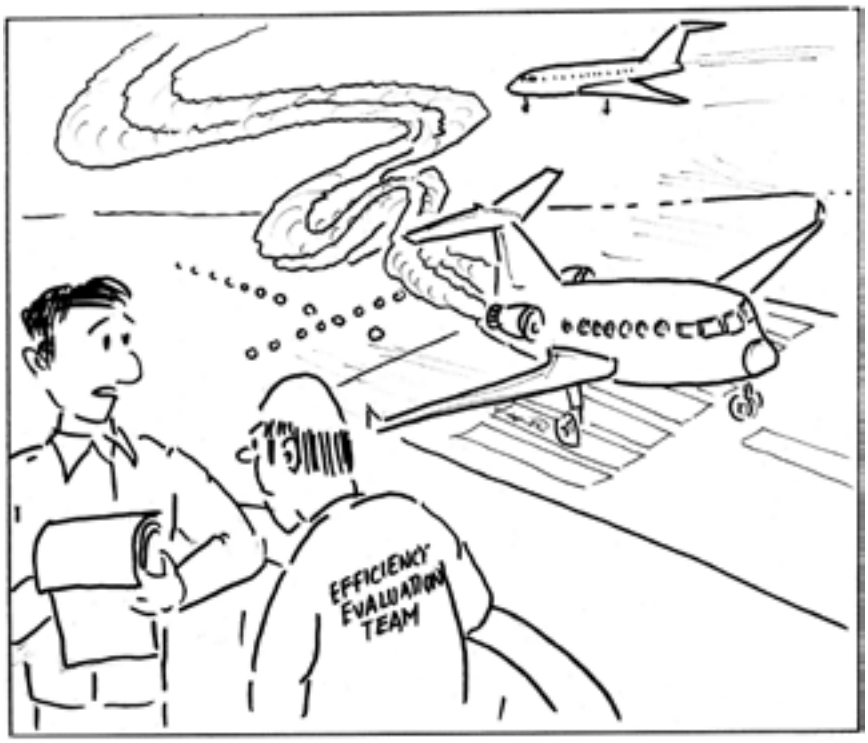
or is it?

The problem comes when we try to measure the efficiency of the service provided. Usually there is some mixture of the two approaches leaning toward the "artistic" one. There are some general standards (e.g. Mach number restrictions should be within ± 0.02 of the desired one, etc.). There are also situations where specific standards are applicable (e.g. when vectoring an aircraft in order to climb it above another one that is going the same route, the separation should be between 5 nm and 10 nm). The question here is what happens if the separation achieved exceeds 10 nm, perhaps it is 10.1 nm or 10.2 nm? This is where the oracle comes into play. It is up to the instructor/examiner/jury to decide whether 10.1 nm is a significant misjudgment or not and most people wouldn't consider it so when giving a final mark (and that's the right thing to do). After all, the job is focused on cooperation rather than competition, so in real life "stretching" the efficiency standard a little is not much of an issue.

In ATCO training a person's performance is compared against a minimum standard. This works well enough for the purpose but unfortunately cannot be used to justify that Controller "A" works better than Controller "B", which is exactly what any championship is all about. What is needed is a means of comparing the performance of one contestant against another. The objectivity of the standard suddenly becomes very important. It's unfair to "stretch" the rules for some person and use them strictly when evaluating another.

First ATC championship – It's all about safety… or is it? (cont'd)

Creating an evaluation system that would support controller-like behavior while at the same time being simple enough to be used by a machine could never be an easy task. It has to combine the points of view of an air traffic controller, a contestant and a computer. The computer would say "Keep it straightforward and simple, so that I can easily understand". The controller would claim "This solution is the best for this situation". The contestant would (of course) say "I only wish it's fair and just" and would (of course) also think "if only I could somehow find a way to beat the system". Taking into account all three points of view the PLANE system was developed.



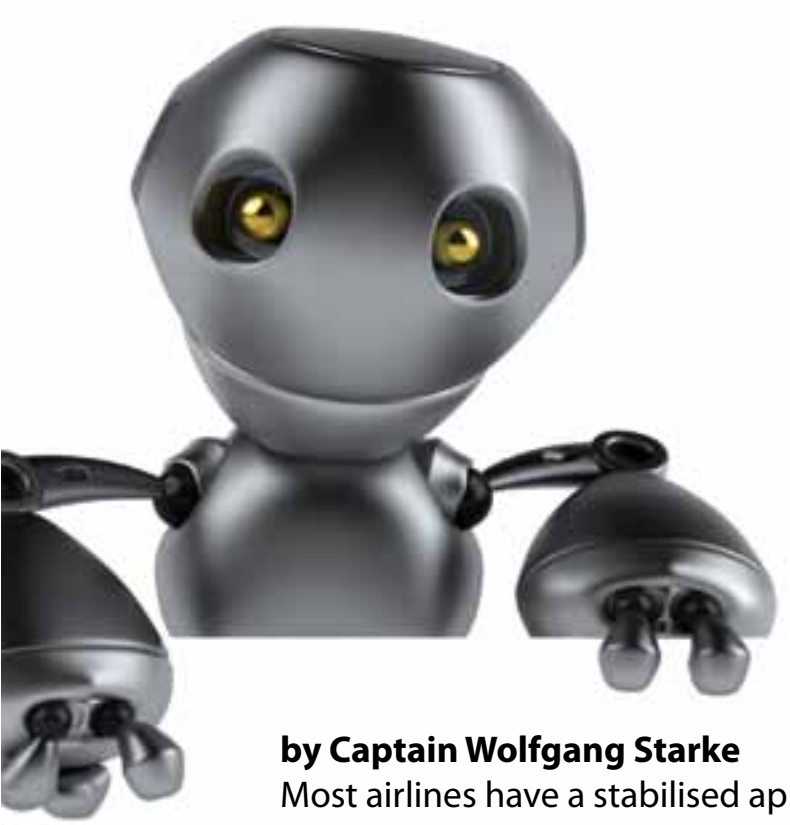
That rather original last minute vector on short final may only have saved a few seconds, but it certainly deserves a bonus for artistic impression!

The name is an acronym of its main features: Precise, Logical, Accurate and Non-biased Evaluation. PLANE is simple enough to be understood by a machine. It gives the user the freedom of choice and evaluates not just the actions themselves but also the outcome they lead to. One can use vectoring, speed control or a level change to solve any conflict but there is no best method as a general rule. It all depends on the circumstances. Just like in real life. Finally, the system is (supposed to be) tamper-proof. Doing things a controller would not normally do result in penalties that reduce the contestant's score compared to someone who is "doing it right".

Ah, yes, the penalties. PLANE is a point-based system, or, rather, a penalty-based system. Each contestant starts each exercise with exactly 121.5 points and tries to lose as few of them as possible. Most (almost all) actions lead to loss of points. That is not really an issue however, since all contestants are treated the same way. You see, it's not about getting a certain score like it would be in ATCO training. It's about getting the highest score amongst the contestants. It's just like any other championship.

So far the PLANE system has been developed for en-route (area) control only. One might argue that this might mean a lack of diversity which could become an obstacle and could spoil the idea after several championships. "We strongly believe that we have a solution." the authors of the project say. "A different block of airspace must be used for each championship. It will be either a real one or one that is actually used for initial ATCO training. And, since each airspace has its own local peculiarities, each event will be very different and will give everyone involved something new to think about To further enrich the experience, additional features will be added every now and then – non standard situations, special procedures, etc. This could also give us an added benefit. The creation of exercises and introduction of new procedures will be done in close cooperation with professionals from various countries. Over time, this process could help to further harmonise the standards and best practices at an international level."

The project aims to bring together people who have passion for the job in a way that has not been done before – an ATC championship. The best part of it is that when you gather people to do something new and exciting, the outcome will be beneficial for everyone whether you are a professional or not. What matters here is the Olympic Spirit and the attitude towards the air traffic control!



Children of the magenta

by Captain Wolfgang Starke

Most airlines have a stabilised approach policy, which mandates a go-around if the aircraft is not fully configured with the landing checklist completed when passing 1000 or 500 feet aal. Nevertheless, a considerable number of flights continue to land from unstable approaches...

A lack of confidence in the ability to safely perform such a non-standard manoeuvre could be one reason for pilot reluctance to fly a go-around when it is required. But is more pilot training in basic skills a reasonable mitigation of this issue?

Nowadays, flight management and guidance systems of aircraft are getting better and better. The majority of flights on suitably equipped aircraft types can be safely completed making maximum use of automation. Frankly speaking it could be said that if the magenta flight director command is in the centre of the artificial horizon, the flight is going well. And as use of automation is most of the time the best way to achieve both safety and efficiency, more and more pilots become "children of the magenta". They are managers of the flight and rarely use or train for manual flying. However, there are rare examples when automation malfunctions and intervention is required to continue safely. This is particularly true when aircraft are leaving the scope of normal procedures and need to be brought back to the standard 'condition' as quickly as possible.

This is a situation for which our flight guidance systems are not built. Therefore pilots must always be able to control the aircraft manually without flight guidance assistance during all times in flight even unexpectedly.

For example, in some aircraft when a stall is approaching, the flight director is removed and the autopilot and auto throttle are disengaged. Some aircraft automatically revert from automatic to manual flight the second you push the go-around button.

While an approach to stall in various configurations or a go-around from instrument minima is a well-trained manoeuvre, an in flight upset or a go-around from a completely unstable approach is not part of pilot training in many airlines. Also, since such events could occur in a wide variety of circumstances, it is simply not possible to develop standard procedures for every possibility. The key to maintain safety of flight during rarely encountered non-standard manoeuvres is, and will remain, manual flying skills and raw data instrument scanning.

In respect of training for raw data instrument scanning and manual flying there are different arrangements in place. Some airlines mandate the maximum possible use of automation. This should make their flights as safe and efficient as possible while reducing pilot workload so that they can better oversee and manage flight progress. Other airlines insist that pilots reduce the level of automation whenever workload allows and weather as well as the traffic situation is not critical. Such a policy allows manual flying practice in normal operations. The result is better raw data instrument scan and better manual flying skills. The down-

Wolfgang Starke

is an Embraer 190 Line Training Captain with the Air Berlin group. He has previously flown Boeing 737 and Bombardier Dash8-Q400 aircraft. He is the Co-Chair of the European Cockpit Association ATM and Aerodromes Working Group and a member of the Air Traffic Services and Airport and Ground Environment Committees of the Vereinigung Cockpit (German Air Line Pilots' Association) and IFALPA.

Children of the magenta (cont'd)

side of such policies is in the area of efficiency, maybe a partially non-optimum descent profile or an increased number of go-arounds.

But is this second way enough to cope with the risk of loss of control during flight? Or is more training required for pilots?

The clear answer is yes! Having counted just my own personal experiences in 2012, I have flown approximately 650 short haul sectors of which roughly 25% have been training flights with very inexperienced colleagues which, for example, may increase the chances of flying a go-around. During these 650 sectors I counted seven go-arounds, one rejected take-off, four low visibility approaches, three bird strikes and six other minor incidents including airworthiness issues like malfunctions of single aircraft systems. All together this makes 21 flights with non-normal experiences out of 650 sectors, a ratio of roughly 1:30. The ratio for my go-arounds was roughly 1:90 – one every two months. Of course for medium or long haul this can easily be less than one per year.

Those numbers show that a go-around is a relatively rare manoeuvre. Subtracting the number of go-arounds which are initiated with the aircraft fully configured from the total, we know that that the number of non-standard go-arounds initiated due to wind shear or unstable approaches is very much lower. But such go-arounds are a highly demanding manoeuvre that is often not trained. The result can easily be a fatal one like the crash of the Gulf Air Airbus A320 in August 2000[1] when a fully functional aircraft with 143 people aboard crashed into sea after the crew failed to properly fly a go around which they had initiated following an unstable approach.

It does not take an unstable approach for a go-around. The May 2010 crash of the Afriqiyah Airbus A330[2] followed a relatively normal approach albeit one not flown using the most appropriate FMS mode and therefore a bit lower than profile. But after initiating a go-around, everything suddenly went wrong resulting in the airplane impacting ground short of the landing runway at a descent rate of 4400 feet per minute with just one survivor.

What do these two crashes have in common, what can we learn from them?

In both cases, the aircraft itself was fully functional. Pilots simply lost situational awareness during go-around, resulting in inappropriate control inputs. This is clearly the evidence of lack of manual flying capability as well as raw data instrument scanning skills.

Better basic flight training could have prevented both crashes, as in both cases the inadequate execution of the go-around manoeuvre was what led to the accident.

When learning to fly a modern transport category aircraft, there is a chain of automation. The upper end of this chain is represented by high-level functions such as vertical or lateral navigation by the flight management system. Then there is mid-level automation such as heading select, vertical speed or level change (open descent) that constitutes the basic modes of autopilots. Next there is manual flight assisted by flight director guidance and at the lower end of this chain of automation comes basic pitch and power manual flying without any assistance of the flight guidance system.

As many changes to the status of the automated system are not directly recognisable - they are only annunciated silently on complex displays - it is widely recommended to take a step down the chain of automation whenever a pilot does not understand the behaviour of his aircraft any more. The problems with this recommendation start whenever pilots are not able to fully understand the situation based

1- See http://www.skybrary.aero/index.php/A320,_vicinity_Bahrain_Airport,_Kingdom_of_Bahrain,_2000_(CFIT_HF)
2- See http://www.skybrary.aero/index.php/A332,_vicinity_Tripoli_Libya,_2010_(CFIT_HF_FIRE)

on the raw data presented on their key displays. The performance of modern aircraft provides rapid acceleration upon advancing engine thrust. In combination with the large pitch changes necessary so as not to exceed the aircraft maximum speed for the existing configuration, the resulting g-forces can rapidly lead to spatial disorientation. This experience during an initial go-around can and does lead pilots to reduce their pitch angle dramatically. A finding, which is common to both the Afriqiyah and Gulf Air crashes.

required ones is rare in such an expensive device as a full flight simulator.

From the perspective of a manager, this is clearly understandable and logical. There is a target level of safety that needs to be met. This target is met and usually exceeded, so clearly there is no need to improve training – and by this spend more money – from a manager's point of view.

However, one should query himself whether we want to reach a level of safety which is set by authority as a minimum level of safety or if we want to strive for the maximum level of safety. There is a large margin between minimum and maximum level of safety. The position which can be reached somewhere in between depends mainly on the balance of safety versus cost. In times of economic downturn, the focus is often on cost, which is driving training more in the direction of telling pilots to follow the magenta.

The best protection for the safety of aircraft and people within these aircraft is a well-trained pilot.

This is just one problem in a long list of pilot problems during go arounds. But sticking to this one problem, appropriate reliance on instruments and good instrument scanning skills can eliminate the risk of CFIT in this situation. Such reliance on instruments and instrument scanning skills is part of initial flight training, but do we maintain these skills? In some airlines pilots do, in others, they do not. Thinking ahead, thinking about non-normal situations, do we train instrument scanning during these situations? Hardly ever!

There are many failures and emergency situations that have to be checked and trained during simulator sessions by regulation but there is often barely enough time to complete these requirements. Upset recovery and go arounds other than from the fully configured state at instrument approach minimum altitude are hardly ever trained. Required simulator training includes engine failures in various situations, faults of different systems and low visibility training. Spare time to practise situations other than the

We know that aviation safety is at a high level. But since this level could and should be even higher, more and better pilot training is required. Pilots should always be capable of retaining full control of their aircraft without any flight guidance or automatic protections. And if they are confident that they are able to do this, the ratio of go-around responses to unstable approaches should improve. This is a situation that is not covered by normal procedures and requires basic flying from pilots, so we are not just talking about CFIT. The question of basic flying skills affects other accidents like runway excursions and many more. The best protection for the safety of aircraft and people within these aircraft is a well-trained pilot. But this level of safety has its cost.

EDITORIAL COMMENT

EASA published on 23 April a Safety Information Bulletin (SIB) on Manual Flight Training and Operations: SIB 2013-05 encourages manual flying during recurrent simulator training and also, when appropriate, during flight operations.

A similar recommendation has been issued through other publications, such as the FAA SAFO 13002 of 4 Jan 2013.

The overall aim is to reach an appropriate balance between the use of automation and the need to maintain pilot manual flying skills, needed in case of automation failure or disconnection, or when an aircraft is dispatched with an inoperative auto-flight system.

The airlines have an important role to play here: operators should develop operational principles and include these in their Automation Policy, in accordance with Commission Regulation (EC) No 859/2008 of 20 August 2008 Subpart P 8.3.18.

Airlines should identify appropriate opportunities for pilots to practice their manual flying skills, taking into account factors such as phase of flight, workload conditions, altitude/Flight Level (non-RVSM), meteorological conditions, traffic density, ATC and ATM procedures, pilot and crew experience and operator operational experience. This SIB introduces also risk control measures by encouraging to use SMS and FDM to monitor the potential impact on the number, magnitude and pattern of deviations from consolidated average flight precision, to effectively balance the benefits and the drawbacks of manual flying and adjust policies accordingly. Also, operators implementing ATQP should tailor their training programmes based on available data.

Safety versus cost
the rush hour years of aviation

by Heli Koivu

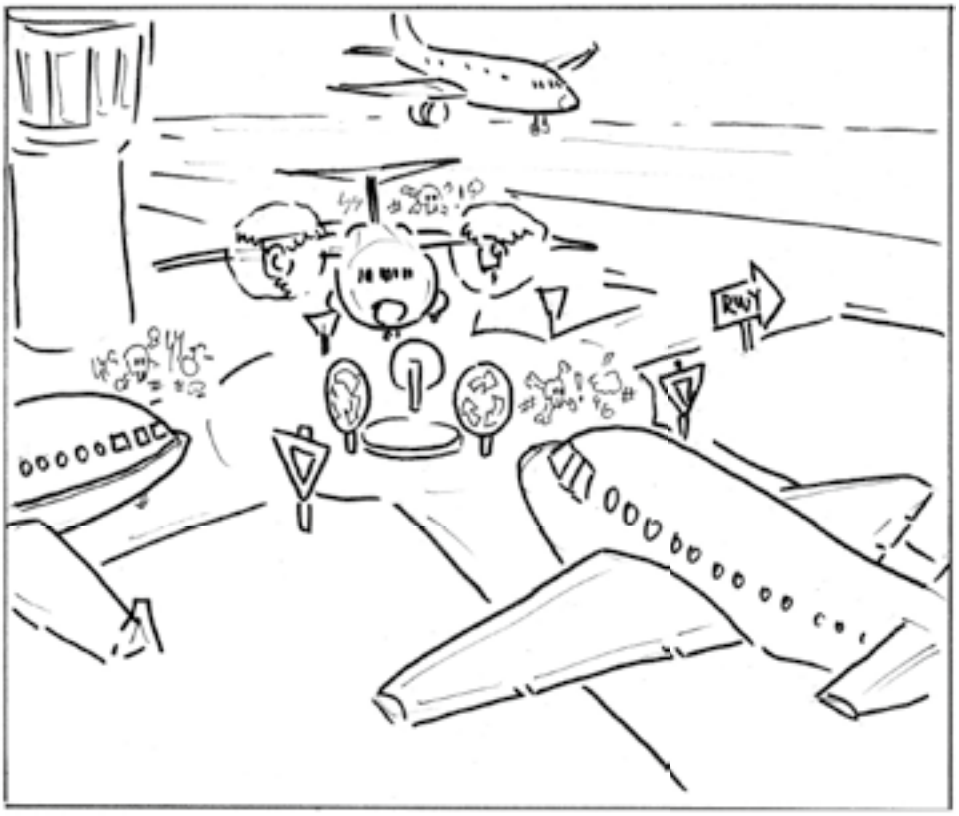
There is a term in the Finnish language that translates directly as 'rush hour years'. It is used to describe a life situation where all major events seem to be occurring at once: starting a family, building a house or moving to a larger flat, finding a position in working life. In aviation today, a lot of things seem to be happening at the same time; should we perhaps describe these as the 'rush hour years' of aviation?

Heli Koivu
Department Director, Transport Analysis
Finnish Transport Safety Agency TraFi

The regulated market and the detailed regulations defining the operating environment are in a state of flux, as opposed to the rather stagnant status quo of previous decades. Our term status quo comes from the Latin phrase status quo ante meaning 'the situation before' which in those days was often before a war as in status quo ante bellum. This seems quite appropriate: aviation is indeed waging a war, battling with severe competition and engaging in price struggles. On the other hand, statistically speaking, air travel has never been so safe. The number of accidents relative to passenger numbers is at an historical low. So why are we – the authorities, businesses and professionals – so worried?

Because of the "war" – the unhealthy competition. Healthy competition in business often improves safety, as it forces enterprises to do things better. Healthy competition likewise promotes balanced use of the various components of production such as human resourc-

es, equipment, systems and processes. But how can we know when competition turns unhealthy? One general indicator of unhealthy competition is that a large number of businesses in a given sector are not making a profit, and operating at a loss is the rule rather than the exception. Although some of the current heavy losses experienced by airlines may be due to historically accumulated corporate structures that are unduly heavy and are now being dismantled, this does not explain everything. Does the price of an airline ticket these days bear any relevance to the actual operating costs involved? Is there revenue under the bottom line for all actors in the production chain?



I'm beginning to think that out-sourcing ground movement wasn't such a good idea after all!

Aviation authorities face a challenge

National aviation authorities face a challenge: the ongoing reorganisation of the aviation sector has led to the disintegration of the traditional operating model for airlines and its gradual replacement with outsourcing, global sub-contracting chains and increased use of hired employees. Despite the harsh competition and the unfavourable economic climate, there are still plenty of enthusiastic and hopeful entrepreneurs in the airline business. How can the authorities respond to this challenge in terms of ensuring the safety of air travel? How can the sprawling network of actors, including those abroad whose actions affect the domestic situation be effectively supervised? How can authorities gain useful information and allocate resources to address identified safety threats within the constraint of existing resources? In short, how to do more with less?

Aviation authorities have an aviator's heart: although everyone knows that safety can only be absolutely guaranteed by grounding every single aircraft, no one wants to do that – quite the reverse. Amidst cut-throat competition, we need an impartial body to watch over the acceptable balance of values. The values of commercial air traffic include safety, efficiency, economy, reducing environmental impact, reliability and punctuality. We must have the capacity to identify situations where safety clashes with other values and address those situations. Yet legislation and the capacity of the authorities to take action do not deliver a complete solution. So what should we do?

How can we ensure safety?

At the heart of this discussion is what is commonly called a 'safety culture'. Is this a real thing or just an empty phrase? Having a 'safety culture' can be defined as being willing and able to undertake continuous improvement of the safety of operations. In any organisation, safety must be kept in mind at every level of decision-making. This means taking personal responsibility seriously and especially applies to senior management, who must be willing and able to understand the impact of financial decisions on safety. They must be able to anticipate and manage change. Tools relevant to this include information-based safety management systems (SMS). Both the authorities and enterprises must adopt a risk-based, data-driven method. In the future, occurrence reporting will be more important than ever before. An enterprise that does not want to implement effective reporting culture and practices and instead maintains a punitive atmosphere is turning a blind eye to correctable shortcomings in the safety of its operations and clearly does not really want to know how its resources are actually being used.

Safety versus cost
the rush hour years of aviation (cont'd)

It is of the utmost importance to establish a European consensus about what a risk-based approach means. The European Aviation Safety Agency (EASA) and national aviation authorities have already done a great deal of work on it. The aim is to find common ground not only on the principle but also on the practical ways for implementing a risk-based approach. This involves understanding how an SMS works and how it can be deployed so as to guide the approach to work of every single employee.

What about regulation, then? Is issuing prescriptive official directives somehow old-fashioned now that we have embraced the big picture? The globalisation of regulation is a feature of stiffening global competition, and in aviation a good start has been made. The promulgated regulations in force are generally consistent regardless of where in the world an airline operates or where a licence or rating has been issued. Close international cooperation between authorities in monitoring and regulation development will help ensure that both regulations and practical operations will respond to changes in the sector. Safety standards must be flexible enough to sustain any threats and changes in the operational environment. Organisations themselves must also take their share of the responsibility for delivering safe operations.

Tacit signals – conflict between safety and cost?

We, the authorities, are increasingly receiving tacit signals indicating that there is an ongoing conflict between safety and financial values. What are these signals? They may be links between hazards and occurrences – although it is sometimes difficult to know whether these are isolated cases or part of a growing trend because of variations in reporting. Tacit signals may also be found in reports from the inspectors monitoring aviation activity, and in informed debate in domestic and international media. All these signals help form a picture of current and potential threats in the industry. Traditionally, authorities must base their actions on facts, but authorities also have an important role in prompting public debate. This is why we have begun to analyse the situation in commercial air transport and present our findings. The impact on commercial air transport safety of changes in the operating environment is discussed in a thematic analysis by Mette Vuola, Aviation Safety Review Finland 2011[1], for instance in the column by Director General Compliance, Pekka Henttu and in the commercial air transport section.

We, the authorities, are increasingly receiving tacit signals indicating that there is an ongoing conflict between safety and financial values.

Who is seeing the big picture?

Times are gone when everyone in the aviation business worked for one organisation – the State. Aircraft operators were first to become private enterprises but more followed and more are to come. The airports are now full of many players from different enterprises with sometimes constantly changing workforce. Luggage handlers and fuel suppliers are pressed by their performance targets and are competing for easy and fast access to the aircraft on the stand during shorter and shorter turnarounds. There are slots for airports and there are ATC slots. Who is keeping the big picture? Aviation safety depends on all the aviation actors but how it is ensured in this constant rush and fragmented picture?

Examples of potential conflicts

Commercial air transport has traditionally been a show manned by well-motivated professionals. Will this continue to be the case? The competence of a given employee may be illustrated with the equation C = A (T+E), where C is competence, A is attitude, T is training and E is experience.

In today's cost-cutting world, training is more and more approaching the minimum levels specified by the authorities, which means that the adequacy of these minimum levels is being put to the test. Organisations and authorities should ensure that the minimum requirements are adequate enough to provide a safe operation. The volume of training is not an end in itself; high-quality training content is a tool for threat management. Quality and uniformity of training are of particular importance in bringing hired or contracted employees with potentially diverse training acquired in diverse operating cultures up to the standard required and for keeping the competence of a company's own employees up to date. For example pilots joining a new airline come with the baggage

1- See http://www.trafi.fi/filebank/a/1349727312/07ee62b11df4654567a22c5a58404a7b/10389-Trafi_Publications_25-2012_-_Aviation_Safety_Finland_2011.pdf

Source: Trafi, Photographer: Mika Huisman, Decopic

of ingrained operating procedures, and they must be trained for the procedures of their new employer and for effective cooperation in the cockpit. An estimated 70% to 80% of the hazards and deviations in aviation are principally due to human actions. A large number of these incidents would have been avoidable through good cooperation in the cockpit and crew resource management (CRM). Similar situation is when an air traffic controller or for example ground handling person is joining a new organisation. ATCOs must also be aware of this risk existing in commercial air transport organisations today. Employee attitude has components such as commitment, pride in one's work and participation in their employer's safety culture, all of which can be influenced, both positively and negatively. Although labour costs may account for more than a third of overall expenditure in a typical airline, the management must be aware of the impact of cost optimisation decisions on employee attitudes and above all ensure that the competence of the company's employees is maintained at a sufficient level under all circumstances. Amidst all the streamlining and cost-cutting, fatigue management is also important. It is essential to ensure that both short-term and cumulative fatigue among employees does not spiral out of control, exposing them to human error simply because they are tired.

Everything is in a hurry these days. Everything has to be done faster, and human beings have turned into homo concitatius – the busy human. Airports and their traffic volumes are growing. These flight factories with their network of criss-crossing runways and taxiways send up aircraft at minimum separations; the myriad of sub-contractors in ground operations form the machinery that is supposed to manage rapid turnaround of aircraft and supply air traffic control with a steady stream of flights to manage. Is this machinery running as well as it should be?

Air traffic controllers play a crucial role in managing the busy flow of traffic and in supervising the big picture. Pilots and air traffic controllers are routinely required to operate with a high workload, sometimes continuously, sometimes suddenly. Maintaining situational awareness in a busy situation is the key element in ensuring safety - analysis of incidents reveals that losing sight of the big picture has been a contributing factor in many hazardous occurrences. In a two pilot flight deck, situational awareness requires that at least one of the pilots in the cockpit concentrates on monitoring the environment, even if the other one has something else to do. It is also important to ensure that any important changes which occur whilst taxiing (changes in the takeoff runway or intersection, weight and balance calculations, or takeoff clearance) are dealt with correctly, monitored and cross-checked. Whatever the stress or time pressure may be, taxiing and takeoff are situations that must always be given enough time and space so that every item on the checklists can be gone through without the pilots having to compromise their situational awareness. This emphasises the importance of pacing and of good cooperation in the flight deck. Air traffic controllers have substantial potential for reducing pilot stress and there are also many opportunities for the pilot to reduce controllers' stress; the potential for human error can be considerably reduced if taxi and takeoff clearances are always given using standard phraseology and not until the aircraft is ready and in the right place, and if communication at critical points during the taxiing (runway crossings and line up) is kept to a minimum.

Aircraft turnround is a highly challenging function. Adhering to tight timetables imposes pressure on both airline and service provider employees. Unfortunate as it is, there are cases on record where corners are cut in agreed procedures at the expense of safety. Turnround times must be realistic. The minimum time in which turnaround can be performed under normal conditions must be respected. It should also be remembered that everything does not always go according to plan.

Safety versus cost
the rush hour years of aviation (cont'd)

Passengers off and on, catering, cleaning, refuelling, walk around inspections and any troubleshooting required and the takeoff slot assigned to the aircraft all have potential for taking longer than expected and nothing must be allowed to create pressures to take shortcuts that compromise safety. A constant sense of rush may increase the chance of human error. This threat must be acknowledged, and safety nets and procedures counteracting this tendency must be put in place. A workplace atmosphere must be created in which every employee is encouraged to take responsibility for the safety of their own actions, to keep an eye out for the safety of overall operations and to report any safety shortcomings observed. Employees should never be afraid to 'blow the whistle' when safety is being compromised or if they suspect this. A chain is only as strong as its weakest link. If a link in the chain fails, only a tight enough safety net can prevent incident to escalate into anything more serious. Take as an example the assessment of aircraft de-icing and anti-icing requirements. Crews unfamiliar with winter operations may have a difficult time assessing whether and how their aircraft requires de-icing or anti-icing. Under these circumstances, safety can be ensured by the airline having a robust safety culture in place, encouraging employees to elect the side of caution in unsure situations. The expertise of ground handling services and air traffic control, and intervention by them if necessary, are also important.

Source: Trafi, Photographer: Mikael Häggblom

There has been considerable debate among experts and in the media about aircraft fuel loads having less contingency than was typical in the past. Seeking to achieve savings by avoiding the carrying of excess fuel is perfectly reasonable as long as the regulatory procedures are applied in a way that respects the need for the aircraft commander to use their reasoned discretion to take account of weather conditions or anticipated delays en route. In any case, the prevention of needless tankering of fuel, the provision of predictable approach procedures and the optimisation of air space use all contribute to a more environmentally friendly aviation sector. Weather conditions, unexpected congestion and holdings or other factors that pilots learn to account for with experience may have a crucial impact on what is the 'right' amount of fuel in the situation at hand. The key issue is how the airline responds to extra refuelling and how transparent the debate on this matter is.

In addition to costs, increasing environmental demands, especially concerning noise, are a continuing issue for the aviation industry. Restrictions are often imposed on runway use or aircraft routing because of noise. However, air traffic controllers and their employers need to keep in mind that ultimately the designation of runway must be predicated on safety considerations. Air traffic controllers also need to be aware of the performance of aircraft – speed and climb rate, for instance – in order to be able to assist a smooth and safe flow of traffic whatever the weather. Finally, back to the question about safety versus cost. The only correct solution is when safety, cost and environmental issues are in an acceptable balance.

You as Air Traffic Controllers have the privilege often to see more of the big picture of aviation operations than the other players, you see the other traffic, the other actors at the airport, you are informed of the severe weather development and of airspace restrictions imposed by military and other airspace users. Keep in mind that, today when the cost is pressing all of us and the "picture" is very fragmented, If you are in doubt about anything with potential safety hazard – there is no doubt that you should inform the others!

Cash is HOT and safety is NOT

by Captain
Rob van Eekeren

After a serious safe-runway operations incident, the Dutch transport safety board concluded: *"Pilots and air traffic controllers are aware of the risks involved in taxiway take-off and will always try to avoid these. However, they also endeavour to operate as efficiently as possible. The procedure of offering and accepting a shorter route is part of such operational practice. The parties involved must weigh up the options and should obviously never sacrifice safety in an effort to be punctual."*

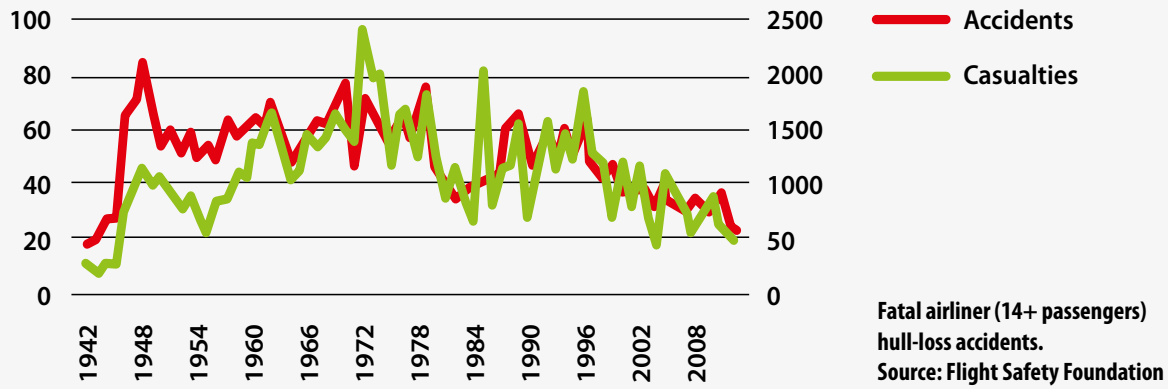
Cash is HOT and safety is NOT (cont'd)

What happened? Snowfall required de-icing that evening, which caused delays. The operator promoted a culture of being punctual and safe at the same time. The ground controller tried to help reduce delays by offering a non-standard taxiway routing for a non-standard intersection take-off. The pilots accepted this and so had to re-programme the flight computer as well as perform all the required checks and taxi the aircraft. This led to a take-off from a taxiway.

The recommendation by the Dutch transport safety board is clear: never sacrifice safety. Is that indeed a reasonable and practical recommendation in our present day world where the focus is on a financial crisis? This article aims to provide some food for thought.

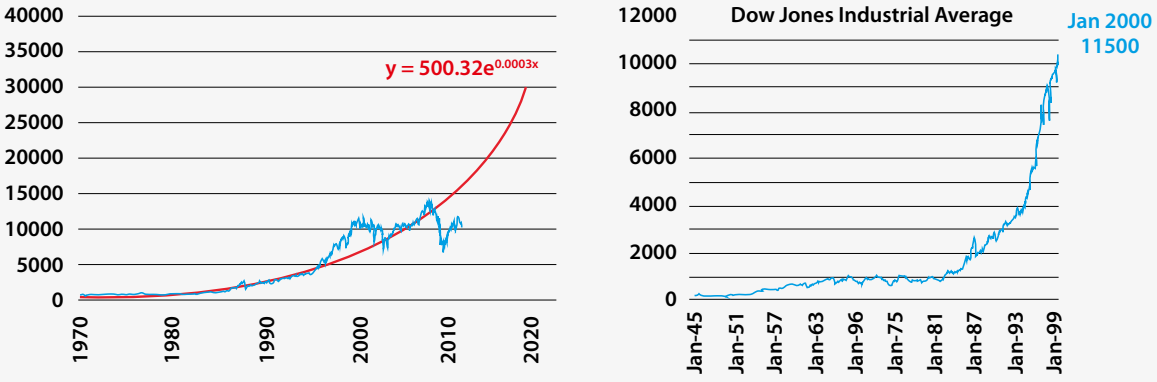
www.cheaptickets.xxx;
www. Safeflights.xxx

What happened with "safety first"? Has flight safety ever been the primary goal and is it now being seen as just another performance factor, following cost reduction initiatives? Various analysts see greed and a lack of adequate oversight in a liberalised banking system as major contributors to the present financial crisis. Ordinary people are now obliged to pay the price of that failed system with their life savings and pensions. A banking world that apparently considered earning money as being more important than responsibility to the financial system and to the people. This system was made possible by a failing oversight system. Is aviation going the same direction with more emphasis on cash and a paper-based safety oversight system?



Above: *Looking at the statistics one could conclude that the trend is down and that in the future lower numbers of aviation casualties and accidents may be expected.*

Below: *Looking at the statistics, one could conclude the trend is up and the forecast in 2000 was a sharp increase of the DJI to above 20.000 in 2012. How different reality looks now with hindsight.*



Dow Jones Industrial Average 1945-2012 with predictions to 2020

Banking booby-trap.
In aviation it seems that nowadays ticket prices are the only concern of passengers, whilst safety is taken for granted. Passengers can check to the penny accurate the cheapest airfares on www.cheaptickets.xxx, but show no apparent interest in the actual levels of flight safety. Are passengers aware of the safety records and risks of specific airlines, airspaces or airports? No, safeflights.xxx as an open source for actual safety levels does not exist. If it did exist, would passengers really avoid flying to airports, through airspace or with airlines, which indicated an increased risk to their safety? Passengers assume that their personal safety is assured by the authorities and consider ticket-price / cost as being the only decision they need to make. Like the banking sector, where customers trusted their bank as being completely safe, the public was caught out by this missing information. With hindsight, I believe that it is time that these lessons learned are also introduced to the aviation sector.

Liberalisation reduces costs.
A truly liberalised market is seen as being beneficial to customers. The conditions essential for a free market include an unequivocal priority for public safety, a level playing field meaning business rules for open competition and adequate oversight. The question is if this approach applies to European aviation. First, a level playing field requires that all transport competitors compete using the same set of rules in order to allow fair competition. This is not the case for European airlines. First they have to compete with subsidised alternative modes of transport such as the railway system[1] and with non – European airlines which do not have to comply with some specifically European rules. Second is the question of adequate safety oversight as a public expectation. With increasing financial cutbacks affecting the aviation authorities, it might be logical to conclude that less effort, less quality and less intensity of oversight activities might occur. Such a 'light' approach is presented as an alternative method of oversight which relies on inspection of focusing more on reliance of management systems rather than on operational inspections. Effective safety oversight requires both.

Paper safety ≠ Passenger safety.
Reducing operational oversight leaves more room for organisations to take their business decisions unimpeded by all types of "useless" inspections. This could reduce costs and help improve profits, which seems to be good for the cash, good for ticket prices and thus good for the consumers. Some organisations, however, will, in the worst case, unwittingly seek the edges of tolerance. When authorities shift to implementing alternative systems of oversight, it might seem on paper that all is well when in reality it is not. In the meantime, the travelling public is still relying on a certain level of safety being guaranteed by the authorities. Liberalisation with the benefit of cost reduction for the consumer is only possible within an environment of strict needs and proper oversight. Without this the gap between cash and safety would widen, with the primary beneficiaries being the balance sheets of Companies and States.

Economic reality forces pilots to accept lower standards.
Is the previous development only to be seen in the boardrooms? No, if we look at operational staff, for example at pilots, then curious phenomena can be seen. The European Cockpit Association claims that the new European Flight Time Limitations could result in fatigue and thus endanger flight safety. At the same time, an increasing number of European pilots join companies flying under these more relaxed flight time rules. So why would these pilots accept the risk of fatigue and jeopardise safety? Well, how much choice is there for a pilot with a training cost debt of > €150.000 and no other way to pay it off? Whatever the reason, also here counts: cash is hot.

Safety is in our blood.
Safety should be in the blood of air traffic controllers, aerodrome operators and pilots and regulators. If not, things will go wrong. Regulatory oversight is changing, environmental and economical pressure on regulators is rising. So what can be done at the operational level to guarantee the main cornerstone of aviation safety? Wait until ac-

1- Ticket fares for European flights can be as low as € 9, whilst € 50 for a ticket to Barcelona (2000km) is considered "normal". A return train ticket over de distance of a tenth of that distance, 200 km, is in the Netherlands also € 50. The difference between these prices is not "normal", especially when one realizes that each train ticket is sponsored by taxpayers money up to 70%. In addition: When a train does not run due to technical problems (FYRA), even for years or months, passengers are not legally compensated by €250 or € 400 as they are in aviation according to EU regulation. And last but not east: European train bombings killed more passengers than then bombings in aviation in the last decade, but there are absolutely no security queues to be passed prior to boarding trains. And you are even allowed to take a litre of coca cola with you!

Cash is hot and safety is not (cont'd)

cident and incident figures start to rise and sooner or later the emphasis will shift from cash to safety again? Should they "go with the flow", stick strictly to the procedures, make sure that they cannot be held liable and hope that incidents will happen to organisations overseen by someone else not themselves?

"No runway-no business".
Passengers pay airport tax, for parking, food, to buy tax-free, etc. They are a great source of income. The only reason of existence for an airport is the transfer of passengers from ground to air and vice versa. Every airport has one unique selling item: their runway. "No runway, no business". Having to close a runway due to an incident or accident could not only be the result of the loss of lives and property but it will also reduce revenues and may even incur a possible payment of passenger compensation fees, although not by the airport. Therefore keeping runways safe is essentially good business. It is also good risk management; the likelihood of an aviation accident is low, if it happens the price is high. This is the everyday challenge for ATCO's and pilots who must take into consideration economic pressure, opportunity, time and fatigue pressures in addition to the European weather.

Captain Rob van Eekeren

is executive director of the World Birdstrike Association (former IBSC). A former KLM A330 Captain, Rob has been involved in improving runway safety for more than a decade. He is a JAA aerospace lead auditor for safety and quality management systems and,. Rob recently served as Chairman of the national transport and environment committee and on the technical board of Dutch ALPA.

So what makes the runway so special? A runway is not only a high-personal safety risk area, where 180 tons of fuel, carrying ±200 passengers, travelling at high speed with little possibility to manoeuvre around obstacles is a regular occurrence, it is also a high business risk area. It is important to note that the runway is exactly that area where three organisations (the airport as owner, the air navigation service provider and the aircraft operator as users) physically meet. It is known that this introduces potential interface problems. They all need to work flawlessly together, clarity is required in this high-risk area. A safe runway is much more a systemic issue of awareness of roles and responsibilities and teamwork rather than the sole responsibility of one actor.

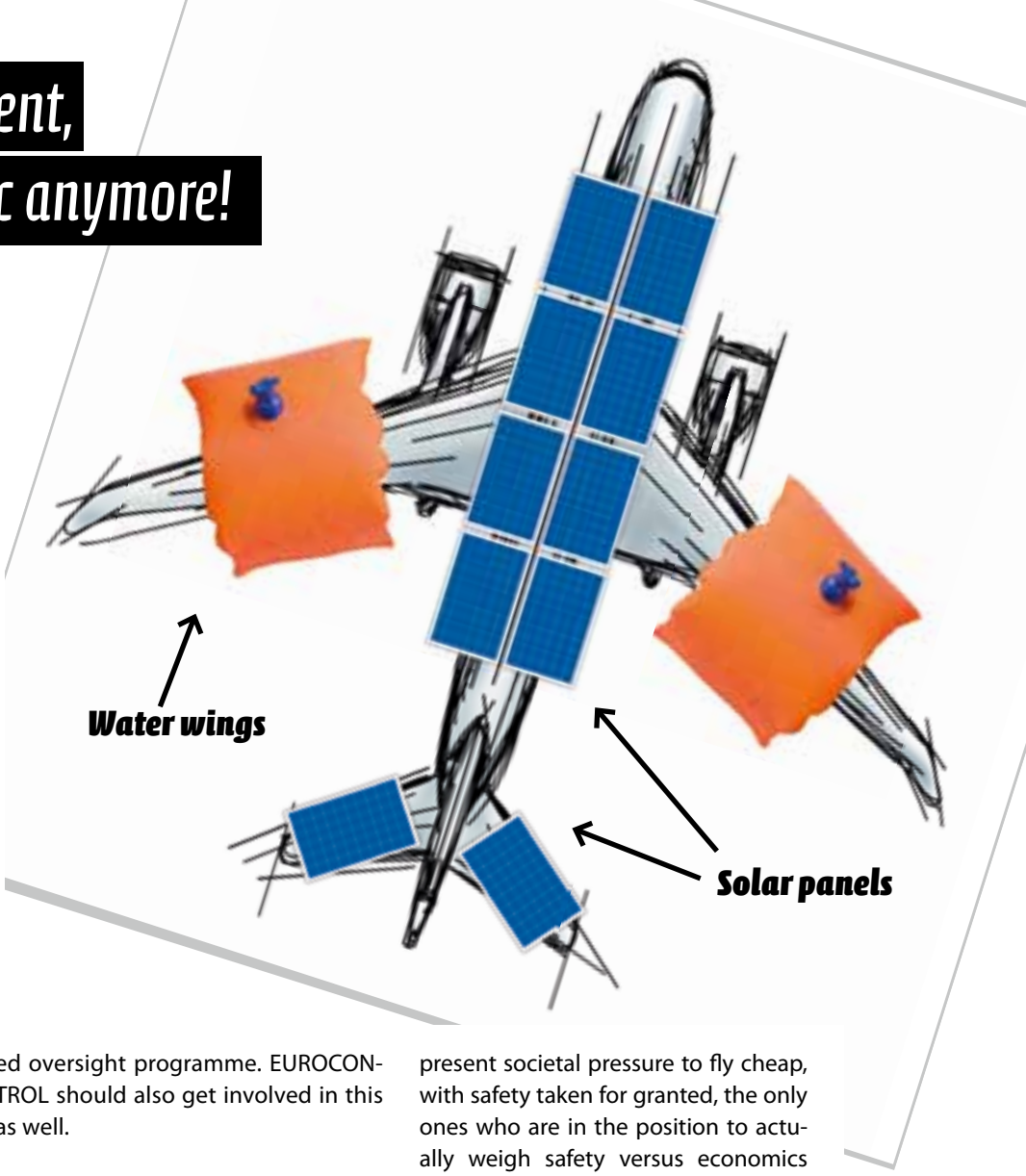
LRST
An important tool to overcome potential interface problems is the Local Runway Safety Team. For more than a decade, initiatives around the world have focused on improving runway safety, preventing runway incursions as well as runway excursions. Many of these initiatives were industry-driven and not initiated by the authorities. A group of industry representatives took the lead and worked together to identify best practices and new ideas and make recommendations. These people were not motivated by personal financial benefit but because aviation safety and responsibility towards passengers was in danger of being overlooked instead of overseen.

Even better was that during the whole process of drafting their documents, participating organisations began to adopt and implement some of the recommendations straight away. And even better than better was that other organisations started real innovations in countering the runway risks already during the whole process. As stated before, a LRST is one method to overcome potential interface problems. On many airports a LRST has been established, but it only exist on paper, so is it really breaking down interface problems? In other words, how effective is a particular LRST and who knows? Proper safety management systems will normally cover individual organisations like airlines, airports or ANSP's. However who monitors how they work together on, say the safety critical runway? I wonder if that fulfills the expectations of the traveling public and if it could be considered as good risk-management.

Risk management
In aviation the chance of being involved in a fatal accident is very, very slim. The Flight Safety Foundation reports 23 hull loss accidents in the year 2012 with 457 casualties. The top 50 airlines have a staggering 45,401,237,832,100 annual seat capacity. This means that the chance of a fatal accident would be almost 1: 100 billion. This makes a reactive safety approach not very comprehensive and makes a pro-active approach with proper reporting opportunities and operational and system inspections essential.

Due to the good safety records, the attention to safety may be overlooked; no wonder that the passenger focuses on ticket-prices. Although chances may seem very, very remote, actual risks may be unacceptably high and might even endanger your whole business. The core of an airport is its runway, not its security check or its tax free shop or the hotels or parking. No it is the runway. Therefore it is essentially good business to keep a safe runway.

Safer and cost-efficient, but not aerodynimic anymore!



Conclusion and recommendation:

Politics will continue to focus on consumer interest and will at the same time decrease government budgets for safety oversight. That could mean that authorities might reduce their direct oversight and audits, even in the increasingly liberalised market. The travelling public relies however on authorities guaranteeing adequate safety levels, not only security, but also including safety. Whether this is justified is not the issue, the fact is they do.

I believe that aviation safety is high because a combination of previous high levels of oversight within a just culture system and safety being in the blood of the major actors like pilots and air traffic controllers. Lack of adequate oversight in a liberalised financial market is seen by a number of authors as one of the major contributors of the financial crises. Drawing the parallel with the aviation industry, one could conclude that reliance based on statistics and the wrong approach to performance indicators, even when they look very promising, justifying the reduction of oversight by the authorities. This could prove to be very, very expensive and with hindsight of the banking crisis, immoral

With the political reality that perfect safety by oversight by the authorities is not to be expected, safety can only be achieved by a proper safety culture within the company and amongst other players in the aviation industry. The runway safety initiative proved that the aviation industry has the drive by itself to improve safety levels. Existing programmes like IATA's IOSA and ACI's APEX could form the basis of setting up a new voluntarily aviation industry initiated internal overall and integrated oversight programme. EUROCONTROL should also get involved in this as well.

In my opinion, the major problem however is that, contrary to, for example, security, there is no specific budget available for "safety". Either governments or passengers pay a "security tax", but a "safety tax" does not exist. In an era where cash is hot and safety not, this is a challenging topic. Here the European Commission could help by stimulating aviation industry initiatives to improve safety, by allocating federal budgets for aviation safety improvement. This would fulfil the expectations of the travelling public in respect of adequate oversight by guaranteeing that the just culture system in aviation is maintained.

The conclusion is that air traffic controllers and pilots face every day, day in day out, the pressure of capacity enhancement, delay recovery, punctuality, fuel saving and other economical factors. At same time they are also responsible for the highest possible standard of safety. With the present societal pressure to fly cheap, with safety taken for granted, the only ones who are in the position to actually weigh safety versus economics in the daily operations are pilots and air traffic controllers. They must have the courage and professionalism to withstand the pressure of their employers, the travelling public, politicians and society and focus always on safety. Without their professionalism a drift into failure could become a reality. Thus indeed, the Dutch Transport Safety Board were correct when they said that "The parties involved must weigh up the options and may obviously never sacrifice safety in an effort to be punctual".

Last but not least: I strongly believe that an integrated oversight should start with the topic of safe runway operations. Addressing safe runway operations as an integrated topic involving airport operators, air navigation service providers and airline operators via, external effective auditing will be beneficial for safety and economics. This approach will ensure that Cash and Safety are both HOT.

The use of non standard R/T phraseology

Editorial note: The situational examples have been based on the experience of the authors and do not represent either a particular historical event or a full description of such an event. The scenarios are rather exemplified facts aligned to illustrate operational safety and human performance considerations.

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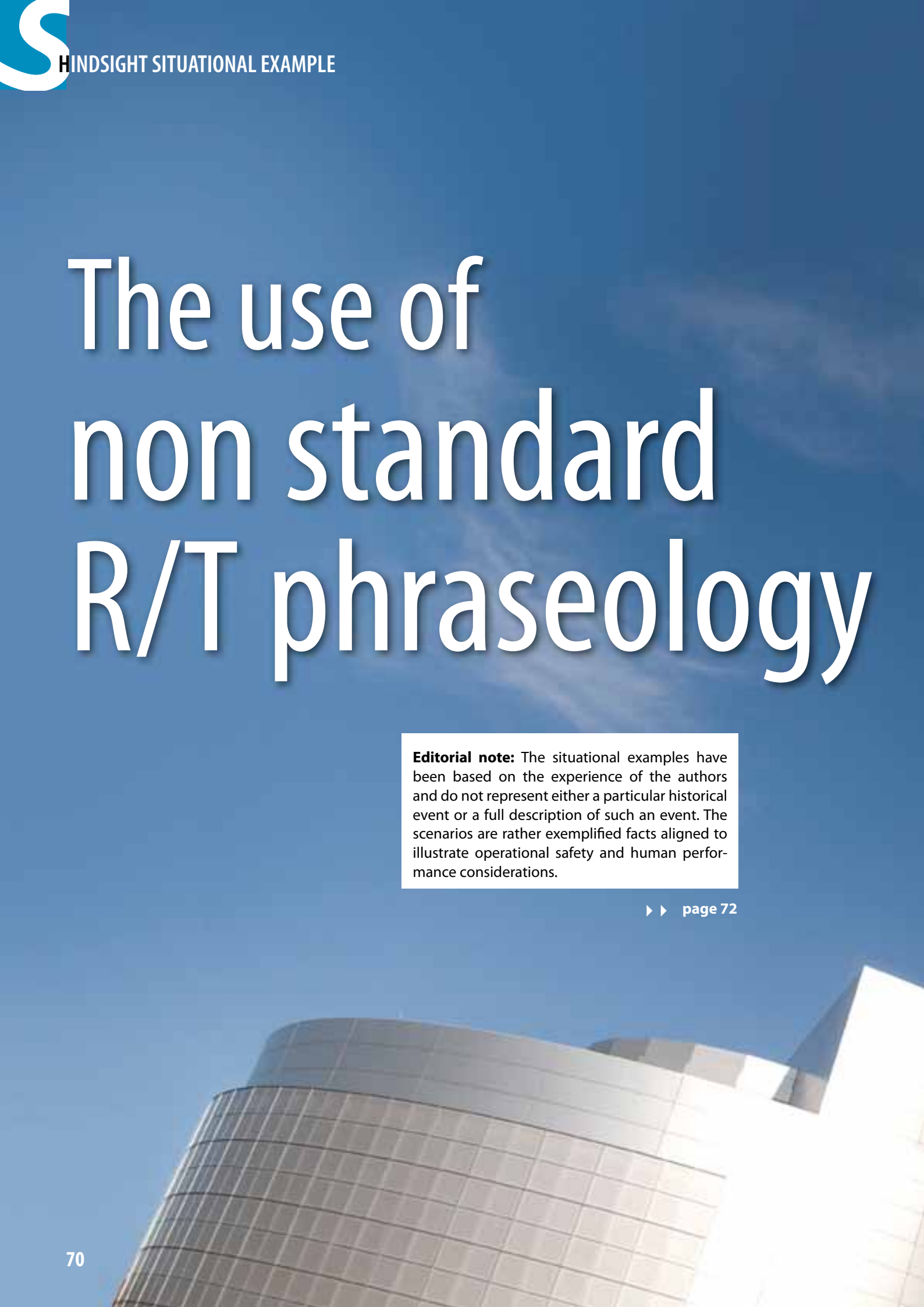
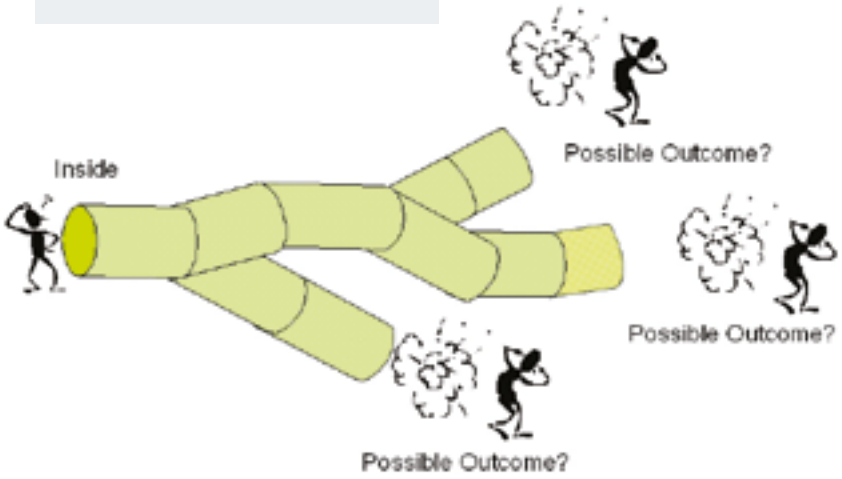



SAY WHAT?!

The use of non standard r/t phraseology (cont'd)

THE FACTS

Read the story as it develops, position yourself in the context without knowing the actual outcome. How confident are you that you would never get into a situation like this?



You're a Tower controller at an international airport. The aerodrome lay-out comprises two runways (08/26 and 01/19), of which the end of runway 08 intersects with the middle of the other runway. There are ICAO-compatible markings at the end of runway 08, including red runway-end lights, to denote the runway end before the surface of the other runway.

Under certain weather conditions runway 08 is used for landing traffic, and runway 01 for departures. Local procedures are in place for this situation, stipulating that traffic departing from runway 01 can only be cleared for take-off after traffic landing on runway 08 is on the ground and has slowed down to taxi speed.

Runway 08 has several intersections that aircraft can use to vacate the runway after landing. However, because of the location of the terminal building (and the aircraft parking stands), local operators tend to favour the use of the last exit in order to save some time when taxiing to their parking stand.

As an experienced controller at this airport you are familiar with this preference of the pilots, and you routinely try to accommodate the use of the last exit for aircraft landing on runway 08 when pilots request it. In fact you are so used to such requests, that you often include the approval for using the last exit already in your landing clearance – thus contributing to a more efficient radio telephony (R/T) communication between pilots and ATC.

On this particular day runway 08 is in use as landing runway, and there is an aircraft inbound of a foreign airline that has been operating flights to and from your airport for quite a number of years already. There are no other inbounds close behind this one, but you do have several outbound aircraft on their way to runway 01 for departure. The inbound aircraft checks in on your frequency.

What would you do?

You clear the aircraft to land on runway 08, you give a wind-check and you add that the flight can "vacate at the end" after landing. This is all duly acknowledged by the pilots, and while you exchange some routine R/T messages with pilots of the outbound flights you watch the inbound aircraft as it touches down on runway 08 and subsequently begins to slow down.

What would you think?

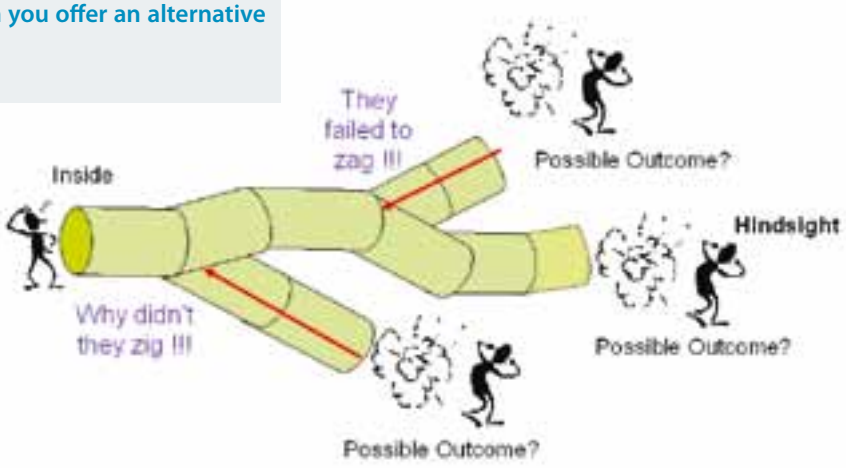
In the mean time the first of the outbound aircraft is approaching the holding point of runway 01. You see that the aircraft on runway 08 has slowed down to taxiing speed, and is on its way towards the last exit. Convinced that everything is fine you clear

the outbound aircraft for take-off from runway 01. The pilots of that flight correctly read back their clearance and you watch the jet aircraft starting to accelerate on the runway. Suddenly, from the corner of your eye, you notice with some disbelief that the aircraft on runway 08 has taxied past the last exit and is about to enter runway 01/19 in the middle.

What would you do?

Without hesitating you instruct the departing aircraft on runway 01 to "stop immediately" (i.e. to abort its take-off roll). You see that even during your transmission the engine reversers of the aircraft are deployed and that its speed is rapidly decreasing. The departing aircraft comes to a stop on the runway well before the intersection with the end of runway 08. Furthermore also the inbound aircraft appears to have stopped just before entering runway 01/19. You find yourself wondering why the pilots of that flight did taxi past the last exit.

This section is based on factors that were identified in the investigation of this occurrence. Read the story knowing the actual outcome. Reflect on your own and others' thoughts about the case, and see how easily these might become judgmental with hindsight. Can you offer an alternative analysis?



The terminal building is located to the south of the end of runway 08. This makes it attractive for pilots landing on runway 08 to make a long roll-out after landing and use the last exit, thus saving a little on taxi time and also on wear and tear of the brakes and tyres of the aircraft.

Pilots who are familiar with this situation have got into the habit of requesting permission from ATC to plan for that last exit when they receive the clearance to land. The correct ICAO phraseology for such a request is "request to vacate via exit [name][after landing]". However over time this has become substituted by other phraseology, e.g. "request to use the last exit", "request a long roll-out", "request to vacate at the end" and even "can we let it roll?"

The controllers at this airport do not consider it their responsibility to point out the use of incorrect phraseologies to pilots, although for a short period of time attempts were made to only reply to pilot requests with the correct R/T. This didn't last long however, for controllers found it easier and more effective to respond with the same words as used by the pilots, or by merely saying "approved" if the request could be accommodated.

In fact the controllers became so accustomed to pilots asking to use the last exit after receiving their landing clearance when runway 08 was in use that they got into the habit of automatically including the approval to use it in the landing clearance whenever it was possible. The controllers felt that this pre-empted the more-or-

The use of non standard r/t phraseology (cont'd)

less expected extra request from the pilots and thus made for a more efficient R/T exchange. This custom was also passed on to trainees in the Tower, even though no formal reference to it existed in the local procedures.

In their approach briefing the pilots of the inbound flight had planned on the use of normal braking and reverse thrust, in order to vacate the runway at an exit about halfway down the runway. When ATC cleared them to land, and added that they could "vacate at the end", they briefly discussed this new development and decided to change their initial plans. The Captain had been to the airport before and believed there was a taxiway connecting the end of runway 08 with the terminal area. In fact, this was not the case, but there was no time before the imminent landing to check the layout of the aerodrome on their chart. Yet, if ATC encouraged them to vacate the runway at the end there was probably a good reason for it so they prepared to continue to the end of the runway.

During the landing roll, the pilots heard the Tower controller clear an aircraft for take-off on runway 01. When they were about to cross the red runway-end lights, they realised they were consequently about to enter runway 01/19 and they immediately stopped their aircraft. While this happened they heard the Tower controller instruct the departing aircraft to "stop immediately" and they could see the aircraft coming to a halt on the runway a comfortable distance to their right.

The pilots later discovered that the page with the chart of the runway needed to be unfolded in order to see the far end of runway 08 and the available taxi tracks in that area. They therefore thought it unlikely that even if they had looked at the chart on final, they would have done anything different after landing.

Last but not least, some words about the controller's decision to instruct the departing aircraft to stop. In theory there was another option: the controller could also have instructed the landing aircraft to stop. In reality however this was not much of an issue:

> **When the controller saw that the landing aircraft had taxied past the last exit and was about to enter the other runway, the aircraft was already in the protected area of that runway. Telling that aircraft to stop would not change the situation, for it would still be in the protected area and as such pose a danger to the departing aircraft. Instructing the departing aircraft to stop was the only solution to prevent a potential disaster.**

> **The last traffic that the controller had been in contact with was the departing aircraft when issuing the take-off clearance. It therefore seemed quite natural that the subsequent transmission should also have been directed at this aircraft.**

> **While the controller was starting to make the transmission to the departing aircraft, the landing aircraft stopped on its own initiative (or rather that of its pilots) which was promptly noticed by the controller.**

There is only a limited "window-of-opportunity" for a Tower controller to instruct a departing aircraft to stop immediately. If the speed of the aircraft is above a critical point (V1) the pilots will normally not reject the take-off anymore. For a controller it's difficult to judge what the speed of an accelerating aircraft is at a given moment during the take-off roll, and whether or not it's still below that critical point.

> **Therefore the sooner the controller in the scenario could issue the instruction to the departing aircraft, the higher the likelihood that the aircraft would stop.**

Normalisation of deviance

Although in the past the Tower controllers at this airport would wait for a pilot request to use the last exit, the relatively high number of those requests - and the associated number of extra R/T transmissions on short final – caused some of the controllers to begin including the approval to use the last exit with the landing clearance. Since pilots seemed to appreciate this initiative from ATC, more and more Tower controllers adopted this style of working.

Avoiding (perceived) monotony

A second development, that occurred almost simultaneously, was the intrusion of alternative phrases to denote the last exit on the R/T. Pilots and controllers both began to use alternative words for "the last exit", as indicated in the text before, possibly because repeating the same phrase over and over again was perceived as monotonous.

Human Performance – TEM Analysis

Note: This section is offered as an alternative way of analysing the occurrence. For more information about the Threat and Error Management (TEM) framework, see the SKYbrary article at:
http://www.skybrary.aero/index.php/Threat_and_Error_Management_(TEM)

In the scenario the following Threats can be identified from the controller's perspective (in no particular order): the location of the terminal building relative to the runways, a runway layout involving a physical connection between the two runways and the lack of awareness on the part of the pilots of the landing aircraft of the exact location of the last runway exit.

The use of non-standard R/T phraseology by the controller can be classified as an Error.

An Undesired State occurred when the landing aircraft taxied past the last exit and was about to enter the other runway. This Undesired State was managed by the controller when he observed the position of the landing aircraft and ordered the departing aircraft to stop immediately.

The outcome was an incident, there were no injuries among the passengers or crew of the aircraft involved and there was no damage to any of the aircraft.

Prevention Strategies and Lines of Defence

The use of standard R/T phraseology by the controller, e.g. "Exit [name] approved", would have gone a long way to preventing the action of the crew of the landing aircraft. Although it can be tempting to break the perceived monotony of having to use a limited set of expressions, the event described above is a clear example of how a seemingly innocent choice of alternative words may lead to an unexpected – and unwanted - outcome.

At the individual level controllers should be aware of the dangers of assumption.

The controller assumed that the pilots of the landing aircraft were familiar with local customs at the airport, because their airline operated several flights per day to that destination. But just because the airline operates several flights per day, that doesn't mean the crews of those flights are always the same.

When the controller saw that the landing aircraft was reducing its speed after touchdown, he assumed that the pilots would use the last exit to vacate the runway. In fact they continued past that exit.

A generic "line of defence" that proved effective in the scenario above is for Tower controllers to constantly monitor traffic on runways.

When the controller scanned the runways he noticed that the landing aircraft had taxied past the last intersection and was about to enter the other runway. He reacted immediately by ordering the departing aircraft to stop its take-off, which saved the day.

KEY POINTS

Because of a local custom that developed over time among the controllers at this airport, standard R/T phraseology for an approval intended to help pilots was replaced by alternative wording that was potentially ambiguous. As a result of this ambiguity the pilots of a landing aircraft in their roll-out almost entered another runway from which a jet aircraft was departing. The tower controller managed to prevent a disaster by giving an adequate instruction to the departing aircraft, after observing that the landing aircraft was about to enter the other runway.

This scenario highlights the importance of:

- **adhering to standard R/T phraseology at all times**
- **scanning the runways**
- **avoiding assumptions**

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An article taken from **SKYbrary** is reprinted in each **HINDSIGHT**. For this issue, we have chosen **"Taxi-in Runway Incursions"**.

Taxi-in Runway Incursions

Description

A runway incursion by an aircraft which has just landed and which subsequently enters any active runway en route to parking, whether contrary to or in accordance with ATC clearance. Maximum danger comes when two aircraft are present on the same active runway at the same time, despite any late awareness of this circumstance on the part of either the controller(s) or pilots involved.

Discussion

An incursion of this type may occur in any ground visibility, by day or by night. It may be a consequence of error by either an aircraft crew failing to follow their acknowledged taxi-in clearance, a failure by ATC to communicate a correct or timely taxi-in clearance or a misunderstanding in respect of the transmission or interpretation of a taxi-in clearance. In general, this type of incursion is almost always caused by a failure of either a controller or a flight crew to respectively issue or comply with a valid taxi-in clearance.

Increasing attention has been given over the last 20 years to the development of alerting systems which can prevent an incursion which is about to happen or at least prevent it leading to a collision. Alerting systems which provide warnings directly to pilots have proved more effective than those which alert controllers who then have to respond rapidly with effective mitigation. Not only is there an inevitable delay, but there is a risk that an automatic (i.e. routine) instruction to an aircraft to stop may not necessarily be appropriate if that aircraft is already crossing ahead of an aircraft approaching at speed.

Whilst a post landing incursion can happen at any aerodrome - some incursions involve an aircraft inadvertently re-entering a runway which they have just landed on – a runway layout that requires aircraft to cross another active runway en route to their parking position has an inherently higher risk than one without this requirement. Layouts with parallel runways and / or intersecting runways increase the probability of both ATC issuing conflicting clearances and, occurrence of incursions as a consequence of flight crew errors. However, this will depend on the runway configurations used and the taxi routes from the runways to the parking areas.

It is important to review the probability of a occurrence of taxi-in incursions based on absolute number rather than using the movement-based rate, and to do this against a hypothetical baseline in which the only threat is an aircraft becoming lost after deviating from an accepted clearance given at an aerodrome which has a layout that inherently reduces both the probability of an incursion and its potential consequences. The latter is very much related to the point on a runway at which an incursion might occur relative to its length and the type of aircraft using that runway.

System Defences

- Implementing Optimum Airport Design. One of the best risk mitigations applicable to taxi-in incursions is a taxiway system which negates the need for any runway crossings at multiple runway aerodromes by avoiding intersecting runways and by provision of perimeter taxiways at or around the ends of runways. Such a design is found at the five-runway US international airport at Houston, the four runway German international airport at Frankfurt and (with one minor exception) at the five runway US international airport at Atlanta. Another appropriate design component for this type of incursion as well as generally is to ensure that all runway entry points are at 90° angles to the runway.

- Identifying Hot Spots with specific reference to designated taxi-in routes. One of the primary tasks of a Local Runway Safety Team (LRST) is the identification of Hot Spots and ensuring their effective depiction, via the AIP, on proprietary aerodrome taxi charts.

- All taxi-in routes should be identified in the context of runway use and any points where there is a high probability of an incursion occurring which would have severe consequences and could occur without much prior warning should be identified. The ultimate response or mitigation measure to the alerting action provided by hot spot designation is a detailed redesign of the taxiway/runway system at its immediate location. This is frequently a reactive measure taken as a consequence of a significant runway incursion but should be implemented proactively with LRST support. If the crossing of potentially active runways is unavoidable, then taxi-in routes should be as near to the beginning of runways being used for take off as possible and in all cases should ideally cross runways at a 90° angle, and should avoid runway entry for crossing purposes at obtuse angles to the direction of runway in use.

- Installation of appropriate signage, markings and lighting for all designated taxi-in routes. It should be possible to define taxi-in routes which avoid hot spots without unduly restricting operational flexibility.

- Installation of controllable lit stop bars at all entrances to every potentially active runway and their operation during all airport opening hours and in all visibility conditions.

- Installation of systems which provide conflict alerting to controllers such as A-SMGCS at levels 1 and 2 and the FAA ASDE-X system. These alerts must be able to be generated sufficiently far in advance of an incursion to provide a controller with enough time to intervene - which has frequently not been the case in the past. Many of these systems, just as has occurred with Safety Nets which alert controllers to airborne conflicts, have experienced considerable difficulty in balancing nuisance alert generation against activation criteria which ensure sufficient time for an effective response.

- Installation of systems which provide conflict awareness direct to pilots such as the planned A-SMGCS Levels 3 and 4 and the currently deployed FAA Runway Status Lights (RWSL) and FAROS systems.

- Recognition of the value of fitting RAAS to aircraft in the case where an incursion occurs against an aircraft about to land because the alert which the system provides is communicated directly to the pilot.

Taxi-in Runway Incursions

Operational Defences

- **ATC** – If prevailing visibility from the TWR and controller workload permits, which may be the case at small aerodromes, then visual monitoring may provide early indications that an inbound aircraft has deviated from its clearance. This method is often less successful if the source of the incursion is two incompatible instructions issued by ATC, especially if these have been issued by the same person. Such an error is a common cause of incursions by aircraft taxiing in. If an incursion appears to be imminent or has occurred where positive visual reference is not available from the VCR because of a permanent restriction to the line of sight, low visibility or darkness, then extreme caution should be exercised until the location of all aircraft has been reliably determined. It cannot be assumed that the flight crew of an aircraft which is uncertain of its position will be able to reliably communicate their actual position.

- **Flight Crew** – Pre briefing the aerodrome layout is extremely important, as is ensuring the PM understands the critical importance of verifying ground position throughout the taxi-in. Monitoring the radio frequency which is being worked and, subject to common language use, building up a mental picture of other aircraft in the vicinity of ones own is always good practice. However, this must be seen as a secondary task and navigating in accordance with the received and acknowledged taxi-in clearances must take priority, especially in low visibility.

Accident and Incident Examples

All of the following are Serious Incidents rather than Accidents. Whilst not necessarily a representative sample, they have not been selected with any intended bias in respect of causal or contributory factors and show that this type of incursion arises from a wide range of circumstances.

- **Chicago O'Hare IL USA 1999.** A Boeing 747-200 failed to follow its acknowledged clearance after a night landing in normal ground visibility and re-entered the same runway just as a departing Boeing 747-400 was reaching rotation speed. The departing aircraft made an abrupt rotation and immediately banked in order to miss the other 747.

- **Providence RI USA 1999.** A Boeing 757-200 failed to follow its acknowledged clearance in thick fog at night and re-entered the landing runway shortly before a Boeing 727 got airborne in the same vicinity. The controller then gave a Boeing 737-200 repeated take off clearance on same runway before reliably establishing the actual position of the 757. The 737 refused to take off until the 757 had reached the gate. The airport had no surface movement radar.

- **Dallas-Fort Worth TX USA 2001.** A Boeing 737-500 entered and crossed an active runway parallel to that which it had just landed ahead of a departing Boeing 737-300. Both aircraft had acknowledged corresponding clearances from the same controller. Upon seeing the departing aircraft approaching, the pilot of the taxiing aircraft increased thrust to attempt to clear the runway. Upon seeing the other aircraft beginning to cross in front, the departing aircraft pilot over rotated abruptly in order to achieve safe clearance but at the expense of a tail strike and subsequently returned to land. None of the controllers present in the VCR reported seeing the incident.

- **Manchester UK 2004.** A Boeing 737-200 crossed an active runway in normal daylight visibility ahead of a departing Airbus A321, the crew of which made a high speed rejected take off upon sighting the other aircraft when they heard its crossing clearance being confirmed. Both aircraft had been operating in accordance with their acknowledged ATC clearances issued by the same controller. An alert was generated by the conflict detection system but it was visual only and was not noticed.

- **Frankfurt Germany 2006.** A Boeing 747-200 failed to stop at its acknowledged clearance limit at night in normal visibility and crossed in front of a landing Airbus A320 which on sighting the other aircraft was able to increase deceleration sufficiently to avoid a collision. The crossing aircraft had read back its clearance incorrectly but this had not been noticed by the controller.

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- **Glasgow UK 2006.** A De Havilland Canada DHC-6 entered an active runway on which an Embraer 145 was about to land in normal daylight visibility contrary to its acknowledged clearance limit but upon seeing the other aircraft the crew powered back to the cleared holding point. The Runway Incursion Monitoring system had been incorrectly configured by ATC and so did not provide a useful alert.

- **New Chitose Japan 2007.** A Boeing 777-200 crossed an active runway on which a Boeing 767-300 had begun a take off in normal night visibility. Upon sighting the crossing traffic, the departing aircraft carried out a rejected take off. Both aircraft had been operating in accordance with their acknowledged ATC clearances issued by the same controller. None of the controllers present in the VCR reported seeing the incident.

- **Los Angles CA USA 2007.** A Boeing 737-700 began to cross a runway in normal daylight visibility from which an Airbus A320 was taking off because the crew had received a clearance to do after an ambiguous position report following a non-instructed frequency change. When the other aircraft was seen, the aircraft was stopped and the departing A320 passed close by. The AMASS activated, but with insufficient time to enable a useful controller response.

- **Seattle-Tacoma WA USA 2008.** A Boeing 737-700 failed to stop at its acknowledged clearance limit at night in normal visibility and passed almost directly underneath a departing Airbus A330.Neither aircraft crew had any awareness of the conflict. ASDE-X activated but did not provide a useful warning.

- **Allentown PA USA 2008.** A Cessna 172 which had just landed missed its runway exit point in normal night visibility but this was not noticed by the controller or promptly reported by the pilot and the controller gave a take off clearance on the same runway to a Bombardier CRJ700. Sighting of the single white navigation light of the Cessna led to a high speed rejected take off during which a deviation to avoid the Cessna was made.

- **Perth Australia 2010.** A Boeing 737-800 mistook an active runway for the specified runway exit in normal daylight visibility and turned onto it after a confusing intervention from the TWR controller during the landing roll.

- **Johannesburg South Africa 2010.** A Boeing 737-400 crossed an active runway in normal daylight visibility ahead of a departing Boeing 737-800 which on sighting the other aircraft made a high speed rejected take off. Both aircraft had been operating in accordance with their acknowledged ATC clearances.

- **Dubai UAE 2012.** An Airbus A320 failed to follow its acknowledged clearance to taxi-in via the central taxiway in reduced but not low daylight visibility and instead of making the necessary turn from the RET used to exit the runway, continued straight ahead where it passed the lit stop bar for the parallel runway at speed before stopping at the edge of the runway just as a departing Boeing 777-300 was about to lift off from close to that position.

- **Chicago Midway IL USA 2011.** A Boeing 737-700 taxiing in after landing on a parallel runway was about to cross another active runway as cleared when a late sighting of an approaching Learjet taking off led to an emergency stop being executed as the other aircraft passed nearly overhead. The investigation found that the same controller had issued conflicting clearances and that it had been the third similar conflict within six months resulting from an operational error by this controller.

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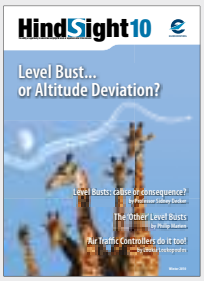

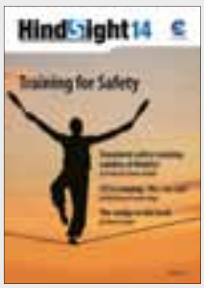

In the next issue of HindSight: Justice and Safety

EUROCONTROL

Putting Safety First in Air Traffic Management

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