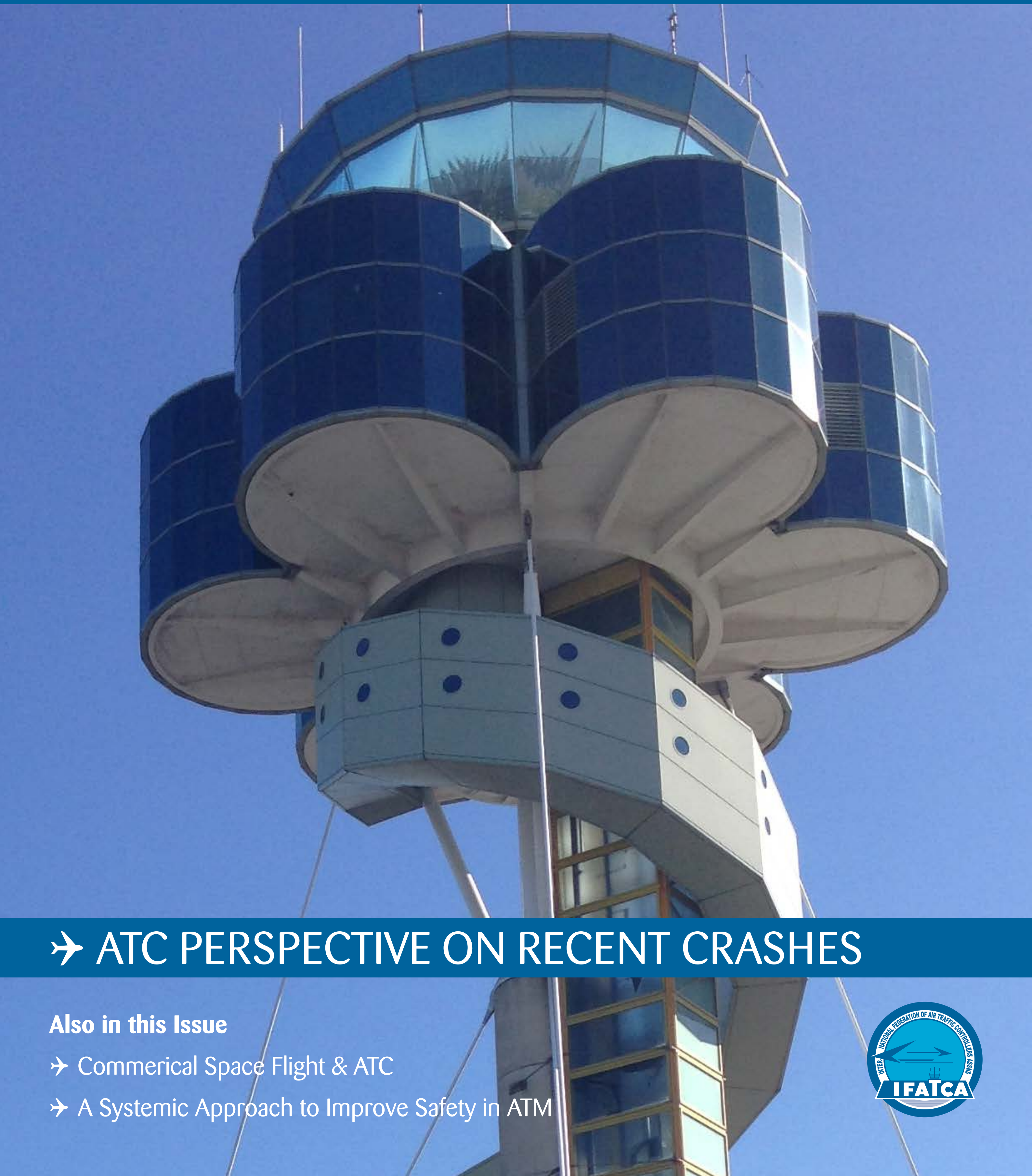
THE CONTROLLER

October 2014

Journal of Air Traffic Control



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In this issue

PUBLISHER
IFATCA, International Federation of
Air Traffic Controllers' Associations
360, St Jacques · Suite 2002
Montreal, Quebec · H2Y 1P5 · CANADA

Phone: +1514 866 7040
Fax: +1514 866 7612
Email: office@ifatca.org

EDITOR-IN-CHIEF
Philip Marien
Van Dijcklaan 31
B-3500 Hasselt, Belgium
email: editor@ifatca.org

DEPUTY EDITOR
Philippe Domogala
email: dp@the-controller.net

CORPORATE AFFAIRS
Vacant

REGIONAL EDITORS
Phil Parker, Asia Pacific
Serge Tchanda, Africa & Middle East

COPY EDITORS
Paul Robinson, Jez Pigden, Brent Cash,
David Guerin Alasdair Shaw & Helena Sjöström

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VALE, TINUS OLIVIER

On the 21st July 2014 IFATCA lost a good friend with the passing of Tinus Oliver, from South Africa, after a long illness. Tinus was known to many of us from his very active involvement in our South African member association, and his involvement with IFATCA's TOC and PLC, including as Chairman TOC. Tinus was instrumental in hosting IFATCA meetings in South Africa and was a valued supporter of IFATCA.

Tinus had a varied and successful career, in the South African Air Force, and then civil ATC in Cape Town, Johannesburg, Abu Dhabi and Dubai, and also in safety, regulation oversight and management roles. He achieved a lot in lifetime, personally and professionally, and was highly respected by all who knew him.

On behalf of his IFATCA friends all around the world, the Executive Board extends it's sincere condolences to Tinus's wife Corna, his children Skye and Louis, and the rest of his family, friends and colleges.

All of us who knew Tinus will have our particular memories of him, but perhaps his legacy for us may be found in the words of his favourite quotation:

"I do not see things the way they are, I see things the way they can be."

Rest peacefully our friend.

The IFATCA Exectuive Board and Editorial Team


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October 20th 2014

THE IMPORTANCE OF CONTINGENCY PLANNING

by Patrik Peters, IFATCA President & CEO

The world was shocked and mortified when MH17 crashed on July 17th this year. Nearly three hundred people - 283 passengers and 15 crewmembers - lost their lives. We joined the flying public and our professional friends in condoling all those who lost their loved ones and stood by the many people affected - controllers and pilots.

Immediately, there was a justified outcry, increasing the pressure to fully investigate the event in order to protect us all from this reccurring. Realizing the necessity to act, ICAO quickly called for a special meeting to create the 'Task Force on Risks to civil aviation arising from Conflict Zones' (TF RCZ). This team of professionals met twice in August, taking on the delicate task of defining conflict zones; identifying methods of sharing reliable information; confirming states responsibilities with regards to the Chicago convention; and respecting the requirements of industry partners.

"A risk assessment can only be as good as the information available in the first place". This statement from the industry partners puts pressure on the states to provide reliable information. Will states and their respective intelligence agencies be willing and able to circulate this information, especially if this involves a neutral information gathering network or cell? This question remains unanswered for the moment... Future meetings of the task-force will hopefully identify necessary steps and convince all involved of the necessity for this.

Even so, identifying the risks and taking action is only part of the problem. Looking at what happened when the Ukrainian airspace was closed following the crash of MH17, we saw massive re-routing of traffic through neighbouring states. In combination with other conflict zones which traffic started avoiding, several of our members struggled with the sudden and unforeseen surge of traffic in their sectors.

Without adequate technoglogy, procedures and lacking training, this re-routing put a high burden on many of our colleagues. Mitigating one risk by creating another cannot be accepted. IFATCA forwarded the urgent need for proper contingency planning to ICAO. Our industry partners welcomed this initiative and applauded our persistence in making this a high priority.

As is too often the case, it unfortunately still requires a major disaster to push decision makers forward into creating a safer system. Whether it is a crisis zone, a natural disaster, a health epidemic or an aviation accident. Be it war, a volcanic ash cloud, the bird flu or a mid-air collision, it always looks as if we're completely unprepared and have to improvise all the way...

Where does that leave us? As aviation professionals, we have a responsibility towards customers - airlines and the flying public and to our colleagues. What can we do – locally and as members of the Federation?

Too often, it seems contingency plans have been collecting dust in the drawers of air navigation service providers' desks. Some were written many moons ago and have never been updated, if they even exist at all. Fewer even were ever properly tested, let alone trained. Apparently we have a safe system where nothing unexpected or catastrophic will happen?

Every step towards a safer system will serve our profession and the flying public in general. I therefore reach out to you to assist us in looking at your procedures and plans. Recognize deficiencies and offer your expertise assisting your service provider in resolving identified shortcomings.

Be a proud aviation professional!
Never stop making the system safer!

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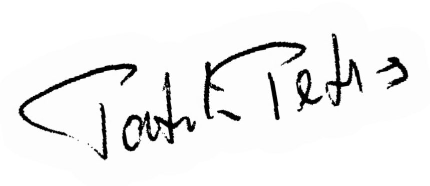


pcx@ifatca.org

MORONS AND THEIR ROCKET LAUNCHERS

by Philip Marien, IFATCA Editor

By the time you read this, the first of four regional meetings – the European one – will have been concluded. During our annual conference, it was decided to move the meeting from Kiev, Ukraine to Croatia, due to the political situation in the former. Little did we know how dramatically the situation in Ukraine would evolve: nearly 300 people – men, women and children – were killed when a Malaysian Boeing was shot down over the disputed eastern part of the country.

When safety experts discuss the top risks civil aircraft are exposed to, they don't seem to feature 'aircraft shot down' in their lists. Yet since the 1930s, well over 1,500 people were killed in over 20 civil aircraft that were shot down. Since 1980, more people (1,298 to be exact) have died in civilian aircraft that were shot down, compared to the 1,118 that have perished in mid-air collisions… That is a truly shocking statistic.

Shooting at a civil airliners cannot be classed as an accident: it's a deliberate action of people, involved in some conflict, shooting at an aircraft with the full intention of bringing it down. The excuse that they were targeting another aircraft is immaterial: killing someone even if you claim you were shooting at someone/something else is still murder.

Neither are these events acts of terrorism, committed by some bunch of fanatic morons. They are mostly committed by a state or at least a state-backed military entity. All major military forces in the world have the blood of innocent passengers on their hands. So-called civilized countries have downed civil airliners in the past 40 years. What is even more shocking is that the people responsible for these atrocities are rarely if ever brought to trial. They are protected by a military apparatus, complete with its own 'justice system' that has one purpose: to cover-up and/or protect everyone from the one pressing the button right up the chain of command.

Compare this to the judicial systems that hunts down front line operators such as controllers, pilots, train drivers or even medical personnel to court for their 'mistakes' in genuine accidents and you quickly realize that the moral compass of our world is pretty messed up.

And then there's the political correctness that seems to be required in discussing the latest event: a lot of people hide behind the fact that there's no proof yet that a rocket was fired at the aircraft. Or who fired the rocket… Yet when a professional person makes a mistake, everyone has his or her judgment ready of what he or she should or could have done to prevent the accident… So an idiot with a rocket launcher: let's be politically correct about it. A professional who makes a mistake: let's hang him from the highest tree we can find.

After the crash of AF447 and the disappearance of MH370, an often-heard remark is that it's bizarre that our phones can be found easier than a 300 million dollar aircraft. But isn't it even more concerning that the most powerful military forces in the world are seemingly unable of correctly identifying a civil airliner?

Sadly, nothing suggests that anyone will ever be held fully accountable for the loss of MH17 and its occupants. A worldniamhm31
in which this kind of "collateral damage" is tolerated has no moral authority to judge genuine accidents. All involved parties need to urgently work together on bringing those responsible for such inhumane acts to international, impartial justice. It is the only way that we might eventually make these imbeciles think twice before pressing a button…

ed@the-controller.net

"A large number of high-energy objects" aka a Russian-made and supplied surface-to-air missile launcher. Photo: wikipedia

REGIONAL UPDATES

European Region

by Željko Oreški, IFATCA EVP Europe

It’s hard to provide an update on what goes on in any of the 44 countries that make up IFATCA's European Region, which now includes Jordan. On one hand, rising traffic levels in most countries seem to indicate that our industry is recovering from a prolonged number of crisis years. On the other hand, the region also had to endure one of the darkest moments this century.

On July 17th, Malaysia Airlines flight MH17 broke up in mid-air as a result of structural damage caused by "a large number of high-energy objects that penetrated the aircraft from outside", according to the Dutch investigators' preliminary report. The Boeing 777 broke apart in mid-air on 17 July over rebel-held territory in eastern Ukraine, killing all 298 passengers and crew on board. The black boxes were eventually retrieved intact, with the flight recorders showing a completely normal flight right up to the catastrophic event. Air traffic controllers attempted to clear traffic as three other commercial flights, unidentified in the report, were in the vicinity – two other Boeing 777s and one Airbus A330.

At 12.53pm, Ukrainian air traffic controllers at Dnipropetrovsk asked MH17 to climb 2,000 feet to flight level 350 over eastern Ukraine, in accordance with the original flight plan, to clear a "potential separation conflict" with another Boeing 777.

The crew said they were unable to comply, possibly due to weather. Instead, at least one other plane climbed higher. Just after 1pm the crew, running into bad weather, requested to climb to 34,000 feet – to be told by air traffic control the plane should keep its altitude. At 1.20pm, MH17 disintegrated in mid-air.

All other events in European region pale in comparison: we could highlight some ATM systems that malfunctioned or failed for some hours, like in Madrid or in Zagreb; or about staff shortages and overtime that are needed to keep desired and forced performance according to upcoming RP2 targets. But everything fades in comparison with this tragedy in Ukraine. As professionals we go through great lengths to challenge business decisions that in our opinion affect safety. However the feeling of utter powerlessness prevails when those efforts to improve safety are destroyed at a simple press of a button in a military conflict. It’s tempting to think that countries in the European Region would know better, but sadly, we’re proven wrong time and time again…

evpeur@ifatca.org

Asia/Pacific Region

by Mike O' Neill, IFATCA EVP Asia/Pacific

The Asia Pacific Region will be attempting a first this year for the IFATCA regional meeting. As there was no host willing to hold this year's meeting, a decision was taken to hold it in the neutral country of Thailand, a non-member association. The ICAO regional office is headquartered there and the meeting will also coincide with the IFALPA Air Traffic Services committee annual meeting. Both organisations will participate in our meeting.

The topic for the meeting will be 'Human Factors in ATC'. It is not so much a theoretical look at Human Factors, but analysing across the region what we currently do and what actions can be eliminated or improved as a means of coping with rapidly rising traffic levels. NATCA has provided a specialist in the area of optimisation of airspace and procedures, where existing programs are underway in the USA, to take a fresh look at existing operations, using an adaptable model. Operations and airspace structures are analysed to look for efficiency gains and workload reductions for ATCOs. It will be very beneficial for countries in the region to see what impact such changes may bring in our region to streamline operations. All part of the evolution from Air Traffic Control, to Air Traffic Management.

To seek standardisation throughout the region it is hoped non member associations such as the Philippines, Thailand, Vietnam, Laos, Cambodia and Myanmar will be represented. By conducting a workshop in joint session with IFALPA, we hope to further identify areas of concern that may be improved upon, both on the flight deck and at the console.

Two major tragedies were contained within the IFATCA's sphere of the Asia Pacific region. Namely the disappearance of MH370 and the tragic shoot-down of MH17. No doubt the IFATCA family will endeavour to support our Malaysian MA in recovering from the impact of these two extraordinary occurrences.

evpasp@ifatca.org

EBOLA CRISIS IN WEST-AFRICA

Impact Of Large Outbreak Felt Across The Region And Beyond

by Serge Tchanda, Air Traffic Controller/IFATCA AFM RSGM

The outbreak of Ebola fever in a number of sub-Saharan countries causes grave concerns throughout the region, and indeed the world. According to World Health Organisation data, the deadly disease has claimed over 4,000 victims in the past 6 months. This has forced governments and decision makers to take some drastic containment measures.

The main focus is currently to try and control the disease's spread throughout the region. Amongst the more visible measures are quarantining affected areas and the closure of borders between affected countries, including Guinea, Liberia, Nigeria and Sierra Leone and some of their neighbours. Civil air transport, as one of the main bridges across borders, is of course also affected by the situation both from an economic and safety perspective.

© Sergey Uryadnikov | Dreamstime.com

Impact on economy

Airlines are faced with the cancellation of hundreds of flights from or to the aforementioned countries. This especially affects Nigeria, which is considered as one of the driving African economies today. Figures of passengers and goods flown by air in the sub region since April are not yet available but, it is felt that they have been heavily impacted: both from the containment measures and from the reluctance of travellers and traders. The resulting scarcity also generates inflated prices for basic items such as food, medicine and others.

Impact on air traffic safety

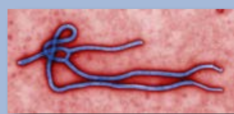
The deadly power of the disease in combination with the inability to contain it, have created a real social psychosis in the region. People no longer greet each other by shaking hands or kissing on the cheek. Visiting people is avoided as much as possible, as it sharing equipment as these are potential ways of contracting the disease. As one can easily imagine, this could also have an effect on air traffic controllers and their work.

In many of our control centres, shifts consist a team of up to a dozen people who share the equipment like microphones, telephones, keyboards, chairs etc. They also share common facilities like bathrooms and break rooms or even dining facilities. Therefore the risk of contracting any kind of disease is high, if proper hygiene and sanitation measures are not respected. In the current situation, the atmosphere in the control room is increasingly suspicious and fearful. It's hard to keep track of where and how colleagues live; nor is it obvious or predictable how the infection might spread among their families, friends and acquaintances. It's clear this can gravely affect team-work as well as the mindset of the individual controllers. This could seriously impact air traffic safety if preventive (or rather curative) actions are not taken in time.

Everyone will agree that this Ebola outbreak requires drastic measures to contain it. At the same time however, if this brings essential services like air transport to a complete stop, the resulting shortage of essential supplies may well cause outbreaks of other health problems and epidemics. Main actors (controllers, maintenance staff and management) in air traffic safety must pay a closer attention to the situation of ATC in the region as regarding the disease by working hand in hand to bring a consensual and adequate support needed to make the work environment a trustful and healthier one.

tchanda_serge@yahoo.fr

What is Ebola?



Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans. Ebola first appeared in 1976 in 2 simultaneous outbreaks, in Nzara, Sudan, and in Yambuku, Democratic Republic of Congo. The latter was in a village situated near the Ebola River, from which the disease takes its name.

EVD outbreaks were usually restricted to remote villages in Central and West Africa, near tropical rainforests. Fruit bats of the Pteropodidae family are considered to be the natural host of the Ebola virus. The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.

The average fatality rate of EVD outbreaks is around 50%, though peaks of up to 90% have occurred.

Severely ill patients require intensive supportive care. No licensed specific treatment or vaccine is currently available for use in people or animals.

Source: WHO

"PRACTISING WHAT WE PREACH"

EUROCONTROL Agency Adopts Just Culture Policy

by Philip Marien, Editor

The EUROCONTROL Agency has just adopted a new Just Culture Policy. The policy was developed and agreed by both management and staff, including significant input from EGATS, IFATCA's Member Association which represents operational staff working for the Agency. EURCONTROL's Director General Frank Brenner signed the policy during a special Safety Day, held at the Maastricht Upper Area Control Centre on 23 September 2014.

Addressing staff, Mr. Brenner explained: "When we talk about Just Culture, we think about the legal system and prosecution judiciary taking a rigid and narrow view of safety – seeking to pin blame on an individual or several individuals and, as a result, punishing the individuals for wrong doing. We have concentrated our efforts on changing the approach of the judiciary, so making it easier for people to report problems before an incident or accident occurs without fear of prosecution.

"Operational staff – in fact, all staff – need to feel free to report on safety issues without being worried about any repercussions – not just legal ones. This is one of the themes of a new White Paper that EUROCONTROL has published. It is called 'Systems Thinking for Safety - Ten Principles', it contains a lot of very interesting ideas, very much focusing on how safety happens in practice, rather than in theory."

"20 years ago already," observed Joe Sultana, Director Network Manager, "there was political pressure, both national and international, to address Just Culture issues. It is apparent that there is a need to obtain reliable safety data to help us circumvent accidents in the future. And there is a distinct need to protect both that data and those who provide it."

"The EUROCONTROL Just Culture Policy will form an integral part of the constitutional provisions of our organisation," pointed out Jac Jansen, Director of the Maastricht Upper Area Control Centre. "For an operational centre like ours, this is a very important and long overdue building block, where the sharing of good quality information is essential to help us learn and constantly improve.

Jac Jansen, Director of Maastricht UAC looks as EUROCONTROL Director General Brenner signs the Just Culture Policy.

Source: EUROCONTROL

"Not only is it important that all of us – managers, engineers, operational and support staff – are able to humbly and honestly admit a mistake, but it is also of capital importance to have the legal framework that allows us to do so without fear of terrible consequences for the good of the whole community."

Raf Vigorita, EGATS President, highlighted that it took nearly twenty years for the idea of Just Culture to ripen within the Maastricht Centre and the Agency. At the time, the idea that controller error could be avoided by punishing individuals was well engrained in the Maastricht Centre. It was EGATS who tabled a non-punitive policy in the mid-1990s, based on experiences of other Member Associations within IFATCA. He continued saying that the adoption of this policy is a tribute to all those who refused to give up on the idea during all those years.

Head of the Agency's Safetey Unit, Tony Licu, added: "Just Culture can be applied to any services we provide; not only operational people or engineers. We can all make mistakes. We are human beings. I like to think we come to work to do a great job and that our errors are just 'honest mistakes'. We shouldn't discipline people for making honest mistakes."

editor@ifatca.org

The New EUROCONTROL Policy

- EUROCONTROL strives to be a learning organisation. In order to maintain and improve safety levels, lessons learnt from the identification of potential risks, mishaps and real safety events are essential to prevent recurrence.
- Humans are an essential part of the ATM system as they provide the necessary flexibility and resilience to adjust to unforeseen circumstances. We will make every effort to create a system as resilient as possible in order to minimize the impact of any unforeseen event, including dealing fairly and justly with cases of human error.
- We take responsibility as an International Organisation for the full application of the Just Culture principles.
- We will engage with the judiciary authorities and inform through all relevant channels, including the media, national governments, international organisations and the general public that a just and fair culture that respects the Rule of Law is a fundamental principle of a civilised society and the only acceptable way to effectively maintain and further improve our safety levels.

TECHNOLOGY OVERLOAD

A Screen Too Far?

by Philippe Domogala, Duputy Editor

In Gran Canaria, the IFATCA Panel discussed the theme: "How Humans interact with technology". I would have loved to share the photo on this page with the audience. It shows Bodo Oceanic ACC in northern Norway. It was taken in May 2014 and as far as I know, the controllers are still working like this today…

It's an excellent illustration of the dilemmas associated with trying to integrate new systems into existing ones. There are fantastic studies about Human factors and man-machine-interfaces, but when introducing new systems into an existing ATC facility, merging it with established procedures and working habits, all too often, the result is one screen piled on top of another.

This particular photo was published in the Norwegian air traffic controllers' magazine (Flygelederen 2/2014) to illustrate an article. This highlighted that the new system (called BOAS for Bodø Oceanic ATM System, made by the Canadian firm Adacel), which is supposed to replace the current one (called BOSS, for Bodø Oceanic Surveillance System), was late and failed a few times during testing.

As is probably familiar to all those who've gotten new systems in the past, the new BOAS did not go on-line as planned in May 2014. As a result, controllers must still work the ever-increasing transatlantic traffic using the old equipment. And old it is: it was introduced in 1991 and is still MS-DOS based! Datalink, CPDLC and ADS-C are all foreseen in the new system, but tests have revealed some stability issues, crashing a number of times during the acceptance tests. Unfortunately, the old system is badly struggling and showing its own stability issues during peak traffic as well.

The situation is unfortunately not unique to Norway. You can find similar "frankenstein" or "hybrid" constructions everywhere. And considerable delays in getting upgraded equipment to work operationally is sadly also the norm rather than the exception. Welcome to the real, everyday reality of Air Traffic Control…

dp@the-controller.net

Roger Seljeseth, a Bodø ACC air traffic controller is working a combined procedural/radar sector: they have radar coverage in parts of their airspace, but all clearances west of the Greenwich Meridian are procedural. In total, his working position has ten (10!) screens: the big screen covered by Roger´s head is the standard radar display used throughout Norway. The two on his right are the information system (METARS, TAFs etc). Also to the right is the current BOSS screen that amongst other things shows the active flights. Above Roger´s head is an emergency screen. The VCS is covered by his body. In front of his nose there are two screens: the upper one is showing the synthetic tracks of the active traffic, the lower one shows the flight data portion of the normal Norwegian radar system. All eastbound flights must manually be fed into the system. Left of those screens is one showing the active oceanic flights. The other is the BOSS message queue. Above that is the RaADS (back up radar system). Lastly, there's one grey screen, which just displays what the camera on the left sees. The two cameras on top of the console show the flight strips to the HF operators down the hall, so they also can have a picture of the active traffic.

Photo: Terje Dahlseng Eide

COMMERCIAL SPACE FLIGHT AND ATC

Clear Need For Integrated Policies

by Dr. Ruth Stilwell, ICAO Representative

Space technology is at the edge of a radical breakthrough that could fundamentally change the way we transport goods, launch satellites and provide global communications. Commercial suborbital flight is no longer an imagined possibility; it is within our technological grasp.

Private enterprise has replaced governments in the launch of payloads into space and will soon take over the transport of individuals to the International Space Station. The size and cost of satellites have fallen to levels that allow ownership by academic and research institutions, and the ability to launch as secondary payload brings space research within reach of new markets. The opportunity to rapidly and dramatically expand the commercial applications of space technology exists today. This can have significant implications for air traffic control.

While we may have several decades before there is a need for space traffic control, the control of space vehicles through existing airspace has significant impacts on air traffic control today. This was one of many topics of discussion at the 2nd Manfred Lach Conference on Global Space Governance held in Montreal this year. The increasing variety of space vehicles under development, including suborbital space planes, changes the way in which space vehicles will interact with aviation. In addition, commercial spaceports are being licensed, changing the dynamic between governments and launch operators.

Historically, aviation and space policies have developed independently and issues of competition for airspace resources, particularly in the launch phase have not been addressed. Increasing airspace congestion, coupled with an increase in launch frequency will place added stress on the aviation system if an integrated policy approach is not embraced.

Airspace planning has evolved over decades to maximize efficiency and capacity. For example, there is a global recognition that segregated military use airspace has a negative effect on system capacity, fuel consumption and the environmental impact of civil aviation. States expend considerable resources to improve civil-military cooperation in order to mitigate these effects. So far the same approach has not been applied to the development of commercial space policy. This is beginning to change. The FAA maintains an office of Commercial Space Transportation that recently published a Concept of Operations for Space Vehicles that seeks a more integrated approach to the current airspace sterilization philosophy.

Aircraft reroutes, associated traffic congestion and delays, as well as traffic flow management are a significant part of any space launch activity.

Virgin Galatic's SpaceShipTwo is carried into space by mothership, which takes off like a conventional airplane.

List of Spaceports in the USA
Source: FAA FY2015 Budget Documents

Disruptive innovation in transportation is not a new concept, nor is conflict between the existing modes and the disruptive technology. One need look no further than the global challenges faced in the integration of Unmanned Aircraft Systems into civil airspace to understand the complexities involved with building acceptance of new commercial airspace users. However, space vehicles may present even greater challenges than unmanned aircraft, as they are not generally eligible for tactical intervention by air traffic control. As a result, space vehicles are given de facto priority over civil aircraft either through structured protected airspace or large safety buffers surrounding the vehicle.

Relative infrequency and State ownership has allowed the space industry to operate as though it is not an airspace user. While this is true for much of the operation, both the launch and recovery phase are significant airspace consumers. Commercial space launch planning and the designation of launch facilities should be an integral part of airspace and aviation infrastructure planning. The designation of a spaceport must consider a larger footprint than an airport as well as the associated airspace demands. The protected area on the surface is only part of the challenge.

Aircraft are able to respond to tactical intervention in flight in a manner that is not possible for spacecraft, particularly in a ballistic launch phase. This requires that the airspace around the launch site is free of conflicting traffic until the launch vehicle exits controlled airspace. In addition, the protected airspace necessary to provide an adequate safety buffer is much larger for a spacecraft launched by rocket than an aircraft propelled by jet engines. This will be true for both vertical and horizontal launches. A space plane with the capacity to take off like an aircraft will do so at considerably higher speeds requiring a larger amount of protected airspace.

This concept is not new. Separation standards frequently vary based on aircraft. Wake turbulence, required navigation performance and surveillance all play a role in dictating the applicable separation standard. However, in each of these cases the separation standard was developed within the aviation regulatory framework. As new types of space vehicles are developed, an examination of the necessary separation standard or protected airspace needed for the vehicle to transit through airspace is required. This should be done within the existing aviation regulatory frameworks where the effects on air traffic control can be considered.

Air traffic controllers do not have a passive role in a commercial space launch. Aircraft reroutes, associated traffic congestion and delays, as well as traffic flow management are a significant part of any space launch activity. Increasing the frequency of launches will have an effect, but more importantly, states not previously engaged in space activity are entering the market. This will require additional controller training and airspace planning to manage new entrants. States and IFATCA member associations with longer histories of space activity can provide valuable insight in this process.

ICAO has sent out a survey to states as the basis of the formation of a group to examine issues of commercial space and aviation and if there is an adequate response, we can expect a developing work program in 2015.

ruth.stilwell@gmail.com

AN IMPORTANT DIAGNOSIS

Is The Medical Framework For Controllers Futureproof?

by Dr. John Roberts, Chief Medical Officer NATS (UK)

A relatively small number of people play a key role in maintaining the safety of our skies. They have to deal with a constantly changing and ever more complex industry. And given that the rate of change will only accelerate, we should revisit the medical guidelines that determines their capacity for work.

A quick look at ATC development illustrates the dramatic scale of change. The first recorded use of any form of air traffic control for commercial flights was in the 1920s in the UK. At Croydon airport flags and coloured lanterns were used to give planes clearance for take-off and landings.

By 2008, more than two million aircraft were using UK airspace alone. The global economic meltdown means numbers have reduced slightly since but NATS still handles approximately 7,000 aircraft a day. In Europe, there are some 26,000 flights a day.

Acceptance of new technology is far more desirable than having new technology imposed upon them.

Various tools have been developed to help with this fundamental shift in aviation numbers. Radar and radio communications are backed up by advanced computer systems while data links help with flight planning and prediction.

But the key component at the present time is still the Mark 1 Human Air Traffic Controller (ATCO).

The selection process

ATCOs are specially selected to handle the complex ATC environment that exists today. They are highly trained individuals who are able to process all the various data inputs and are able to use their knowledge of aircraft types, performance characteristics, desired routing, and local weather to de-conflict the traffic by instructing aircraft to turn, climb or descend.

The task is no less complex when confined to the airport environment. Controllers here generally take aircraft when they are fully established on the approach and must ensure it is safe for aircraft to land and depart the airport as well as negotiating taxiing around the airport, avoiding other aircraft and ground vehicles.

NATS, as an example, typically has four new-entry courses per year. Typically, we would have 3,000 initial applicants per course. These go through an online sift and about 1,700 go on to the next phase of on-line assessments. About 600 come to face-to-face assessments and interviews and 120 to more detailed ATC assessments. From these some 25 are taken into training of which 20 will complete training and become valid. The whole process takes about three years or so.

A different look

At the same time, ATC is changing fast. New technology has increased controllers' capacity to handle busier traffic, but the controllers are still making the interventions. So, for many, it is time to call it a day on old systems and get something new.

So, whereas at present the majority of ATCO activity is in tactical controlling, instructing aircraft to climb, descend or turn, the future will be different. Planning will take on greater importance, allowing for conflicts to be reduced at the early flight

planning stage, possibly days before the flight takes off.

It is likely that ATCOs will no longer have sector but tool or system validations. In other words, the future role of controllers will look very different.

As these changes are in the near future, they will impact on current controllers who have been selected for their interventionist skills, which may not be the same as those required for a planning and monitoring role.

Change management

Aviation medicine experts need to consider and be able to advise the operational managers and regulators on these changes. Areas of special concern are change management, fatigue, medical standards and demographics.

Controllers are conservative by nature. They like to be in control! But they are intelligent enough to accept changes that improve the work place.

Acceptance of new technology is far more desirable than having new technology imposed upon them. There is nothing worse than having new technology thrust upon them just because it's new technology. This will lead to resentment, worry and increasing stress in the ATCO population, all of which impact on their capacity to work and hence safety. New programmes and technology should be introduced sympathetically and involve the operational community early in the planning stage.

We must also look at personal adaptability. Some people can accept and embrace change more easily than others. There may well be a requirement to identify change-resistant individuals and to look at ways to address any specific issues that may impact their ability to cope with change. A supportive attitude from the employer will be far more successful than a confrontational one.

Finally in this area, we will need to look at the required skill sets for future controllers.

Fatigue and medical standards

Fatigue is always a concern in air traffic management, and most ANSPs will have policies and educational programmes in place to give advice on the management of fatigue. With financial constraints possibly leading to a reduction in manpower mere may be pressure on managers to get more from staff.

ATCOs are also subject to a virtually continuous stream of new work programmes and new technologies. It takes time to learn new procedures and this requires increased mental capacity, which is in itself fatiguing. Could all of this change and constant learning of new systems and methods of work produce chronic change fatigue which could impact on safety? More objective evidence is needed to attempt to quantify fatigue and identify safe working practices in view of potential future demands.

As for medical standards, currently ATCOs are regulated medically to standards very similar to commercial pilots. The logic is that the ATCOs should have an acceptably small risk of an incapacitating event that could impact on flight safety. Commonly understood as the 1% rule it was based on data from the flight deck back in the 1970s. It did not take into account the very different work environments of controllers, and has not taken into account the additional safeguards derived from technology.

Research undertaken by Dr Maged Girgis of NATS and Dr Stuart Mitchel of the CAA has shown that these standards are far too prescriptive and may lead to ATCOs being excluded from the workplace by medical standards that are no longer appropriate. The planned technology of the future may bring additional safety benefits making it imperative that medical regulators review standards and change them to reflect the risks involved in actual work practices. They may otherwise be guilty of discriminating against people unnecessarily.

Getting old

Finally, the ATCOs of the future may be older than previously. European legislation makes discrimination based on age illegal, and so we may need to look at the aging controller more than we have done in the past.

Younger controllers have the mental capacity to process huge amounts of information, but evidence suggests that cognitive decline for some tasks begins in the early 30s. Older ATCOs freely admit that their processing capacity slows with age, but they rely on their experience to make up the shortfall.

That said, NATS does not yet have a single operational controller over 65.
As our ATCOs are extremely high value individuals it is cost effective to try and keep them in the best physical and mental health to allow them to continue to function at a high level as long as possible.

Evidence suggests that cognitive decline for some tasks begins in the early 30s.

Despite all our best efforts it is likely that the aging ATCO will eventually not have the processing capacity to continue in the role. Employing organisations will need to have policies and procedures in place to deal with this. There may be a temptation for employers to use the aging process to retire ATCOs on medical grounds. This should be resisted and employers should look at other ways of dealing with this based on competency.

It may be necessary to look at changing working practices to reduce fatigue and pressure on older controllers so that they can continue to work in some form of operational capacity for as long as it is safe for them to do so.

The next 5-10 years will see dramatic changes in air traffic management and there is no doubt that the role of the ATCO will change significantly.
It is vital that medical and human factors specialists are involved in research to inform and educate the future operators and ensure that medical regulation keeps pace with technological changes. ✈

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Challenging Quarter For Air Transport Safety

Recent Crashes Examined From An ATC Perspective

by Philippe Domogala, Deputy Editor

After a decade of rather high safety figures and an exceptionally safe 2013, the aviation industry was faced with four major accidents in a very short time: in March 2014, Malaysia MH370 went missing with 239 persons on board. Tragedy struck the same airline again in July, when they lost another Boeing 777 – more than likely shot down – killing 298 persons while flying overhead eastern Ukraine. Less than a week later, a TransAsia Airways ATR-72 crashed at Magong Airport (MZG), Taiwan, resulting in 48 fatalities. And the very next day, an MD-83 operated by Swiftair on behalf of Air Algérie, crashed in Northern Mali, killing all 116 people on board.

A number of smaller events made headlines as well. In that respect, I'd like to mention the loss of a private turboprop TBM-900 that crashed off the coast of Jamaica. Its two occupants most probably fell victim to hypoxia.

Air Traffic Control has been mentioned as a possible factor in all these cases. Not only by the traditional media outlets (and their 'specialists') but also in numerous internet chat rooms and online forums. From these discussions, it's quite clear that very few people outside our industry (and it seems even sometimes within the industry!) have a clear understanding of what ATC does. This leads to regular misunderstandings of what we can and cannot do.

MH370, a Boeing 777 from Kuala Lumpur to Beijing, is of course not the first aircraft to go missing.

But in the current days and age, with a GPS in every smart phone, apps to find friends, family and car keys and countless satellites watching over our every move, it is difficult to comprehend that a Boeing 777 can just vanish off the face of the earth. Looking at the preliminary report, issued on 26th June, any controller can see that, if this was a premeditated action, those who planned this had a very good idea of how ATC operates and where it's vulnerable. Switching off transponders, ACARS, ADS-B and VHF just at the transfer of communications between 2 international control centres, is a guarantee of at least 5 to 10 minutes of total freedom. Turning to fly along the FIR boundaries between States to avoid detection is also clever: at least for a while, both sides will be confused by the unusual situation. Or that's at least the case for the military parties involved: the civil controllers did not see any of it, as their radar range wasn't sufficient. The "return" from primary radar was only discovered (or at least made public) a few days later after looking at different recordings of military primary radars. So in this

There was no reason to question aircraft being sent on these routes at those levels.

✈ *Malaysia Boeing 777*
Source: Wikimedia Commons

TransAsia ATR 72
Source: TransAisa

case, it appears highly unlikely that Civil ATC of both Vietnam and Malaysia could have done anything more than flagging the disappearance of the aircraft.

MH17 was shot down over eastern Ukraine in July 2014. The B777 was cruising at FL330 on a routine flight from Amsterdam to Kuala Lumpur. The preliminary report, issued on 9 September by the Dutch team in charge of the investigation, contains the communication with ATC. It shows nothing but routine calls. The Ukrainian CAA had declared the airspace closed below FL320 due to the hostilities in the area and the fact that a number of military transport aircraft had been downed. But airspace at FL330 and above was considered as safe and beyond the reach of the fighting factions on the ground…

The Civil controllers from Dnipropetrovs'k ACC controlling the flight had little choice but to adhere to what their employer and the CAA tell them. For them, there was no reason to question aircraft being sent on these routes at those levels. Hundreds of flights had used that airspace before and the report even mentions 3 other aircraft (an Airbus 330 at FL400 and 2 Boeing 777s, one at FL350 the other at FL330) in the immediate vicinity of MH17. It seems that some intelligence agencies may have known about high altitude surface-to-air missiles being brought into the area. Some had passed this information to their national airlines, but no one had informed local ATC of the possible danger. Here again, it seems there's nothing any controller could have done in real time to prevent this accident…

Six days later, a TransAsia ATR 72 on a short flight from Kaohsiung, Taiwan crashed in bad weather, associated with Typhoon Matmo, on its 2nd approach to Magong in Penghu Island.

No preliminary report is available yet, but combining various bits and pieces suggests the following: Magong airport has a single runway 02/20. Only runway 02 has an ILS, making it the preferred option for the pilots. Because of the wind and visibility passed to the crew (wind 190-11 knots gusting to 15 knots and a visibility of 800 meters) the pilot opted to hold waiting for conditions to improve. In the meantime, an aircraft from another company (supposedly another ATR from Uni Air) requested an approach to runway 20 and landed successfully. After hearing this, the TransAsia crew changed their mind and requested to make an approach on runway 20. The controller cleared them to do so and updated them on the wind, now from 250 at 19 knots. The aircraft started the approach but on short final announced they were going around. During the go-around, they contacted trees and then houses. If this info is accurate – to date it has not yet been denied – there's again nothing the tower controller could have done differently.

Some local media began digging up stories trying to implicate ATC and the military, and although these allegations were strongly denied later, this kind of speculation tends to stick in people's minds.

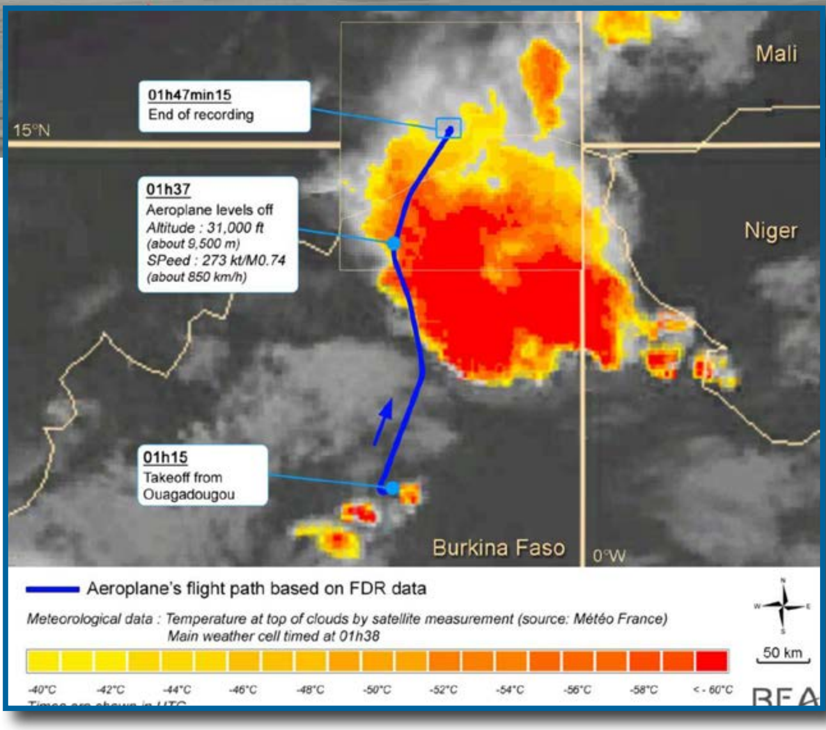
The very next day, an MD-83 from the Spanish company Swiftair crashed in North Mali. It was operating on behalf of Air Algérie, from Ouagadougou, Burkina Faso to Algiers, Algeria. The aircraft took off in the middle of the night, around 01:00 local and climbed to FL310, which it reached 20 min later. In a preliminary report from the French accident investigation board (BEA) issued on September 20th, it's apparent that the crew tried to avoid a thunderstorm, but that they had trouble contacing Niamey ACC. Both sides asked other aircraft to relay messages. Without weather radar the controllers could only accommodate requests based on what the pilot sees on his on-board weather radar.

Once more, with the tools and information the controllers had at their disposal, they could have done little more than accommodate the pilot as best they could...

Unfortunately, the cockpit voice recorder (CVR) was heavily damaged in the crash. It had also malfunctioned, as previous recordings weren't erased before being overwritten. This means several recordings overlap, making it difficult to determine what was said during the fatal last flight.

Lastly, there is the case of the TBM900, which crashed just north of Jamaica after the pilot stopped answering calls from air traffic control. The aircraft, which was less than 6 months old, took off on September 5th near New York towards Florida. Cruising at FL280, the pilot made the following call to ATC: "We need to descend to about 180. We have an indication that is not correct in the plane". The controller instructed the pilot to initially descend to FL250, which the pilot acknowledged and

Swiftair MD-83
Source: wikipedia



executed. The controller also gave him a heading to get him clear of conflicting traffic. He then cleared him to FL200 but the pilot's reply was incoherent: despite the response "FL200", the aircraft remained at FL250 in radio silence until it ran out of fuel off the coast of Jamaica.

The most likely explanation is that the aircraft had a pressurization problem, exposing the occupants to hypoxia: fighters that were sent up to intercept reported they could see the pilot unconscious in the cockpit. This suspicion lead press outlets like CNN and even the popular magazine "FLYING" to suggest that the controllers were at least partially to blame for not recognizing a pressurization problem: they should have cleared the aircraft down immediately.

For the controllers at the time, without hindsight and the information from the fighter pilots, it would have been impossible to deduce that the aircraft had a pressurization problem, let alone an accute one. If the pilot doesn't realise the nature of a problem and/or doesn't specify it to the controller, it is impossible for the latter to render adequate assistance.

A similar discussion took place after the Avianca 707 crash in New York nearly 25 years ago - see the box on the next page.

If a problem is not made explicitely clear, preferably using standard phraseology, then it's almost impossible for the controller to take the correct course of action and render the appropriate assistance to the flight.

While the circumstances of the ATR 72 in Taiwan were very different, and keeping in mind that there's no interim report yet with more information, it is again clear that ATC's role should be to try to accommodate pilot's requests, not take decisions for them.

Extremely frustrating in the Swiftair/Air Algérie case is that – just like in AF 447 (Rio-Paris) in 2009 – the preliminary report shows beautiful colour maps of adverse weather and CBs from various weather satellites with the track of aircraft across them.

Generally speaking, weather information available to pilots and controllers often lacks precision and/or it is not updated in real time. Given that such information is now even available via smartphone apps,

The TBM900 during delivery in March 2014
Source: AOPA

the general public does not understand why an aircraft would attempt to fly through a thunderstorm area and why ATC cannot help the crew to avoid these areas…

It may be that certification of those satellites images is an issue that needs to be tackled by the various regulatory bodies. But there may also be subscription costs for the airlines and for the airline operators, as weather information is increasingly commercialised. With Global Warming forecasts predicting an increase in so-called extreme weather across the globe, it might be an essential investment for all involved to consider...

The two Malaysia Airlines Boeing 777s show that there are lessons to be learned for States and the military. It's extremely hard to think of anything civil ATC could have done or done differently in both cases, even if they are very different. ICAO has held two special task force meetings on the risks associated with flying over conflict Zones (TF RCZ). Our President and CEO, Patrik Peters, participated in these. While some decisions were made, State sovereignty is still a very present and a "global" factor in this. A solution is sadly probably not for tomorrow. ✈

dp@the-controller.net

AVIANCA 52

On the evening of January 25, 1990, fog and wind conditions were causing congestion at New York's JFK airport . After holding for over one hour, Avianca Flight 52 from Medellín, Columbia, indicated that they needed "priority", probably relating to the fact that their plane's fuel was getting critically low. The first officer told air traffic control, "... we'll be able to hold about five minutes that's all we can do?" He also stated, "(our alternate) was Boston but we can't do it now we, we, don't, we run out of fuel now."

The controller never realized quite how urgent the fuel situation of the aircraft was. He cleared the aircraft for a final approach to runway 22L at 9:02 pm. The low fuel necessitated that the crew land the plane on the first attempt. During the final approach phase, the Captain was struggling to hear what the first officer and/or the controllers were communicating. The crew was fatigued because they were flying the aircraft manually, since the autopilot had malfunctioned along the way. This meant that the flight crew had to intercept the localiser manually and fly the glide slope by hand, which was made more difficult because of wind shear.

Kennedy tower cleared Flight 52 to land landing at 9:15 pm. Despite the critically low fuel and the fatigued crew, the approach and landing preparation was routine. At 9:22 pm at an altitude of 500 feet above the ground, the aircraft encountered wind shear. The nose dropped, causing the plane to descend dangerously near to the ground. The aircraft's ground proximity warning system was triggered, sounding warning alarms. When the crew couldn't visually acquire the runway, the Captain was forced to abort the approach. The first officer alerted the controller that they were low on fuel, and in a subsequent transmission stated, "We're running out of fuel, sir." The controller then asked the crew to climb, to which the first officer replied, "No, sir, we're running out of fuel."

At approximately 9:32 pm, the starboard engines flamed out. They reported this to the controller, who cleared the flight for another approach. The crew frustratingly tried to locate the runway in an desperate attempt to land. The two remaining engines soon also flamed out, causing the cockpit voice recorder to stop working. The controller lost radio contact with the aircraft at 9:34 pm. The aircraft lost height and crashed into a hillside on the north shore of Long Island, 16 miles (26 km) from the airport. Because there was no fuel, there was no fire, which may have contributed to saving some lives. 85 people survived the crash with injuries, while 73 passengers and crew died.

ATC and the controller were heavily criticised for not realising the precarious fuel situation the aircraft was in. While this was obvious in hindsight, in the given circumstances, it was anything but obvious to those talking to the aircraft at the time that he would actually run out of fuel... ✈

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Low Fuel Situations

An End To The Confusion?

by Ignacio Baca, Technical and Operations Committee IFATCA

Air traffic controllers are trained to handle emergency situations. As a general rule, we all know to give priority to the plane that is affected no matter the cause of the problem. One such instance is that of an aircraft in a low fuel situation. The current regulations/procedures however include some subtleties that are not exactly self-evident. More specifically, there's the concept of Minimum Fuel, which was the subject of a presentation by the Technical and Operations Committee (TOC) during the last IFATCA Conference in Gran Canaria.

ICAO provisions related to the fuel required to perform a flight are included in their Annex 6 - Aircraft operations, maintenance and general aviation. Different amounts of fuel are specified there: taxi fuel, trip fuel, alternate fuel, contingency fuel, etc. All of these are detailed and they all add up to the final quantity of fuel required at the beginning of the flight. One of the terms is of special interest for our purposes: the so-called final reserve fuel. Paragraph 4.3.6.3 of the ICAO Annex 6 defines it as follows:
For a turbine-engine aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m. (1500 ft.) above aerodrome elevation in standard conditions.

A similar definition is provided for aircraft with reciprocating engine(s). What it is of interest for us, air traffic controllers, is to know that the final reserve fuel is the amount that determines when a pilot has to declare an emergency. This reserve should be enough to allow the plane to land safely at a nearby aerodrome..

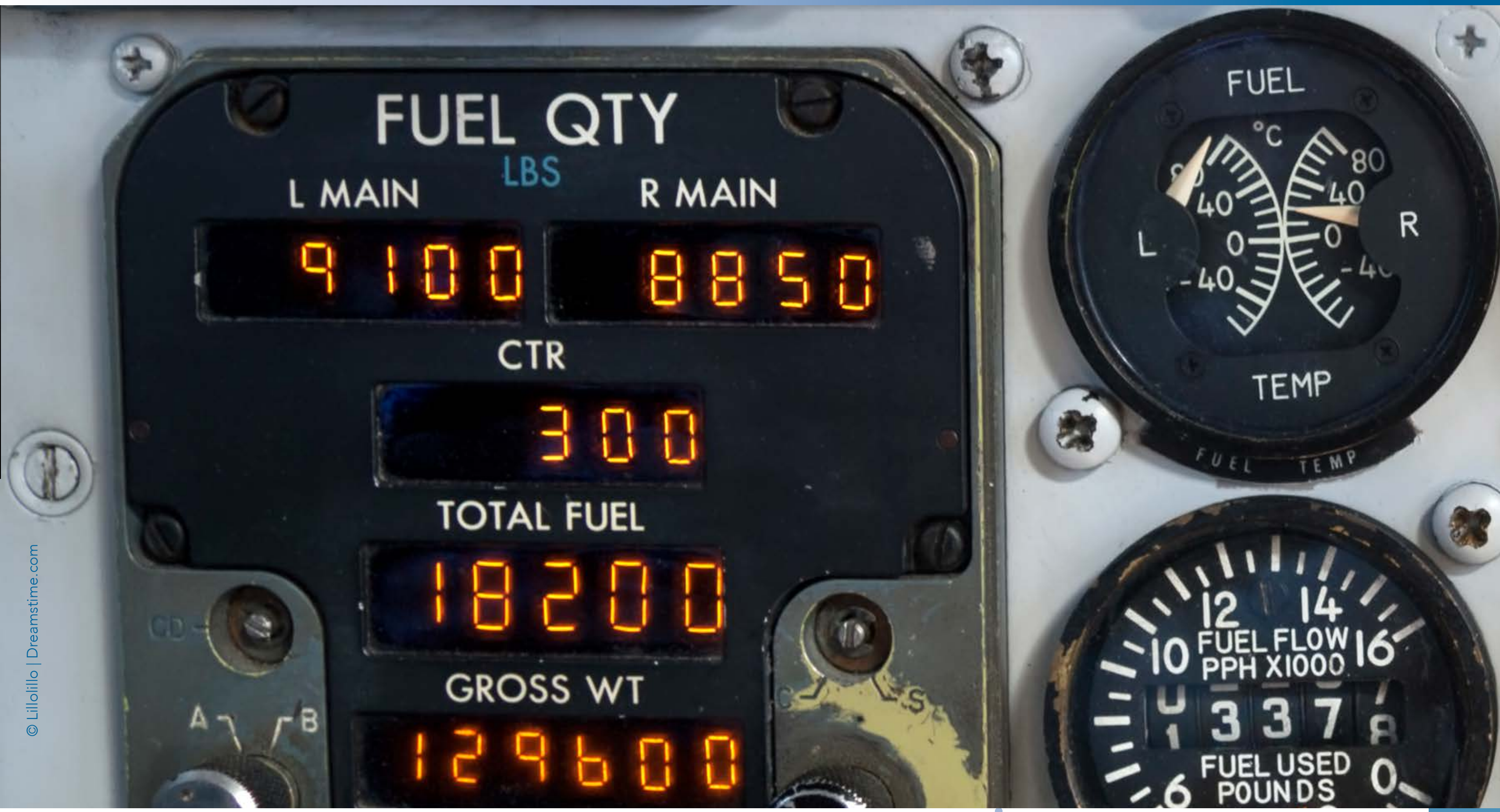
Prior to November 2012, when Amendment 36 to Annex 6 was introduced, there were no provision in the ICAO rules about when it was that low fuel emergency should be declared. This amendment changed that. Today, the final reserve fuel defined above must be protected: upon landing, an airplane must have at least an amount of fuel equal to the final reserve left in its tanks. At any time during the flight, it is possible to calculate how much fuel will be left upon landing. The pilot-in-command is obliged to declare an emergency as soon as the calculation shows that the plane will land with less fuel than the final reserve specified by the rules. As this reserve is a relatively large amount, there is a reasonable margin of safety.

This new provision puts an end to any ambiguity about the proper time to declare an emergency due to low fuel. In the past, a pilot could be reluctant to declare an emergency, when in his judgement, there would not be any further delays. If that was the case, such a declaration would be of little help if any. On the other hand, a pilot landing with an amount of fuel that could be judged as more than reasonable after having declared emergency, could easily be suspected of "cheating" to get priority at his destination...

With this in mind, pilots have reasons to welcome the change in the Annex. It draws a clear line by defining what is an emergency and what is not. Unfortunately, ICAO has also adopted a third possibility that somehow seems to blur this clear line: the Minimum Fuel situation. It happens when calculation shows that according to the current clearance, the plane will land with an amount of fuel slightly above the final reserve fuel, meaning that any delay, even a relatively small one, can result in the final amount left being below the low fuel minimum.

It must be noted that a declaration of Minimum Fuel is not a reason to expect priority because it is not a declaration of emergency. ICAO is very clear on the subject in a note to paragraph 4.3.7.2.2 of Annex 6: Minimum Fuel (…) is not an emergency situation but an indication that an emer-

Illustration: Ana María Vélez



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gency situation is possible should any additional delay occur.

With the introduction of this concept, we find three possibilities about the fuel situation. The first is the normal situation: the fuel calculations on board on landing are well above the final reserve fuel. There is no reason to declare fuel emergency nor to expect any complication due to fuel during the rest of the flight.

In the second case, the fuel calculations show that less than the the final reserve will be in the tanks on landing. The pilot must declare emergency and priority is to be given by the controllers to the airplane accordingly.

The third possibility is that calculations show the remaining fuel to be slightly above the final reserve fuel when landing. The pilot can declare Minimum Fuel as a warning that any additional delay can lead to emergency.

During the discussion following the presentation in Gran Canaria, a question arose: "What is slightly above?" Rules are very clear at present about when to declare emergency but the ambiguity lies now in when Minimum Fuel should be declared. Nonetheless this is a minor problem because the Minimum Fuel situation is not a reason to expect priority. It is just a report to inform than this plane may be forced to declare emergency if any unexpected delay occurs but nothing else. The controller has no reason to change the plan already prepared so a Minimum Fuel declared in advance has no consequence.

A second question arose almost immediately: knowing that no priority can be expected and that the controller is not going to change any plan, what is the declaration of Minimum Fuel good for? Why bother to declare it? The answer is that the controller is now aware that there is a plane close to emergency due to fuel. No priority must be given but it's imperative to keep the crew up to date of any additional delay. In such a situation, if an emergency is inevitable, the calculated amount of fuel on landing will be very close to the limit allowed, thus maximizing the safety margin.

To help illustrate this, a practical example was given in Gran Canaria. It was asked what would happen if the following dialogue would take place in the frequency:
Controller: "*ABC123 hold over NAVAID. Expect 10 minutes delay*".
Pilot: "*Wilco. Minimum Fuel. ABC123*"

A brief discussion followed this short example but the conclusion is clear: there is no reason to give any priority to the plane. According to the current clearance, which includes a 10 minutes delay, the plane will land with an amount of fuel above the final reserve, even if this amount is very close to the limit. But Minimum Fuel is not an emergency situation. If the controller has any doubt, a confirmation that the plane is not in an emergency can be requested from the pilot.

The situation described is almost normal but the controller must keep in mind that this plane is close to need priority even if there is no need to act yet. As Minimum Fuel means that any additional delay can lead to an emergency situation the proper way of handling it is to inform the crew of the plane affected of any new delay that may occur as soon as possible.

It must be noted that this article refers to the ICAO regulations but some differences can be found in different countries. For example, the European Union in the OPS 1.255 defines the final reserve for turbine engines as the fuel required to fly 30 minutes but it does not specify under which flight conditions. ICAO stipulates that these 30 minutes must be calculated at holding speed, 1500 ft above the aerodrome and under standard atmosphere conditions. Depending on the circumstances, it means European rules allow a smaller reserve than the ICAO ones. Nevertheless, these kinds of discrepancies do not change the way in which a controller should react if confronted with such a situation. ✈

ignacio.ifatca@gmail.com

A SYSTEMIC APPROACH TO IMPROVE SAFETY IN ATM

by Fabrizio Bracco, University of Genoa – Department of Education Sciences

Coupling and uncontrollability

The evolution of socio-technical systems during the 20th century has been characterized by the increase of two relevant factors for safety and effective performance: processes' coupling and complexity. The first parameter, coupling, refers to the interdependence among the processes of a system, where an anomaly could have unexpected and uncontrolled effects on the functions of other levels or phases of the process (Weick et al., 1999). Coupling could be associated with risk, since tight-coupled systems are also exposed to higher risks. A common understanding of risk is the balance between the probability and the severity of a bad outcome. Therefore, we could locate socio-technical systems along the risk axis, from low-risk systems (e.g., a post office), to medium-risk systems (e.g. a manufacturing company), to high-risk systems (e.g., a chemical plant). The combination of the probability to have a mishap with the gravity of the outcomes determines these systems' position along the risk axis.

Risk is not the only parameter we can take into account in analysing complex socio-technical systems, since there are considerable differences among systems that have the same level of risk (and, therefore, coupling). For instance, a dam and an air traffic control tower could have the same level of risk, since the probability of having an accident is low but, if it happened, the victims and the damages would be different. Therefore, what makes the two systems different? They have distinctive characteristics like the complexity of structures, processes, and dynamics. However, defining and measuring complexity is a challenging task and we could follow Erik Hollnagel's advice to change the term "complexity" to the term "manageability" (Hollnagel, 2009). A system is manageable when those running it have a clear, complete, and coherent representation of its functions and dynamics, are able to perceive and anticipate anomalies, can cope with unexpected situations, can foresee the outcomes of the current situation in the forthcoming future. A dam or a mine, no matter how complex they are, have more manageable dynamics. When something happens, it is possible to imagine its consequences all over the system. It is possible to foresee how the system will react to this event, since it is easier to build a complete and consistent representation of the system. Moving towards the Air Traffic Management (ATM) or a nuclear power plant, system controllability is reduced, since it is not always possible to take into account the interaction of all the factors occurring during an event. Furthermore, it is not easy to foresee the effects of a given situation, since these systems are characterized by dynamic and multifactorial conditions.

Therefore, manageability (or its reverse, uncontrollability) is the second parameter that could be taken into account in analysing modern sociotechnical systems. It tackles the very nature of these systems, that can be more or less successfully controlled by the synergic mix of human factors and automation. Along the uncontrollability axis we can find highly manageable systems, such as dams, and less manageable systems such as the ATM, or extremely uncontrollable and unpredictable systems such as financial systems or space missions.

A possible arrangement of sociotechnical systems according to the risk/uncontrollability trade-off is depicted in figure 1. There is also an arrow moving from the bottom left to the top right area, passing through the top left area of the picture. It represents the historical evolution of sociotechnical systems. At the beginning of the 20th century, we can locate low-risk and mostly controllable systems like assembly lines and manufacturing. After the Second World War we move upwards in the diagram depicted in figure 1 and we can find more dangerous systems like airlines and chemical plants. Moving rightward, we find current sociotechnical systems, characterised by high risks and low manageability. An extreme example is the financial system: we know the unexpected catastrophic (and therefore uncontrollable) effects of decisions made by traders and speculators, which had enormous drawbacks on normal investors that had nothing in common with the wolves of Wall Street. The location of sociotechnical systems in this diagram does not have the purpose of precision, it aims at showing the relative differences of these systems according to the two parameters of risk and uncontrollability and the need of a different approach to safety management. Obviously, systems can move along the axes also according to the evolution of operational contexts. The ATM system, for instance, can move rightwards and upwards, since the traf-

Participants of the ANACNA Seminar
Photo: ANACNA

fic volumes increase more and more, but could also move leftwards if the technological evolution could allow the managers a higher control of the key performance factors.
Therefore, the technological evolution in the last century seems to move first upwards, along the vertical axis of risk, creating systems that can have serious outcomes, but which are mostly controllable. In the second half of the century, however, the evolution moved towards the upper right side of the diagram, losing the power of manageability of systems. According to this evolution, several risk management systems have been developed, starting from a linear, reductionist, and mechanistic approach to safety, then moving towards systemic, multifactorial and complex approaches (Dekker, 2011). Adopting a linear and mechanistic approach to safety (developed to cope with systems in the lower left side of the diagram), for systems located in the top-right side (e.g., an emergency room) would be limiting and intrinsically wrong. The rationale here is that there is not a perfect approach to safety, its efficacy is based on the kind of system it is applied to. Adopting a linear method for managing risks in a multifactorial and complex system is wrong, as well as adopting a complex model to understand linear phenomena. Therefore, which approaches should be used in high-risk and low-manageable systems? Which perspective can improve safety in the ATM system?

Towards a systemic approach to safety: the human element as a complexity manager

The answer to this question has been the core of the seminar organized by ANACNA (Italian Air Traffic Controllers' Association) on April 2nd 2014 entitled "Operational Staff at the centre of the ATM system: Human Factor's systemic approach". The seminar hosted talks given by the ANACNA President Francesco Mazzoleni, Antonio Licu (Eurocontrol), Paola Lanzi (Deepblue), Ivonne Herrera (SINTEF), Antonio Chialastri (A320 captain) and Sidney Dekker, one of the most prominent experts of complex systems' safety.

Antonio Licu, head of the Eurocontrol Safety Unit, gave a speech entitled "From Safety I to Safety II - Safety Culture is seen as a strategic asset of the Air Traffic Management". "Safety I" represents an approach to safety typical of the bottom-right area of the diagram in figure 1, which was adopted, by inertia, also to the other area of the diagram. The ATM system cannot run the risk of adopting such a perspective to cope with its operational environment. From this obsolete point of view safety is defined as the mere absence of accidents, a mechanistic view is dominant and the cause-effect relationship is the main frame to interpret events. Moreover, it implies a clear distinction between the right and wrong performance, there usually is just one right way to do things and all the others are wrong. The human element is a threat rather than a resource, safety management is mainly based on the probability to have an unwanted outcome. The new perspective of Safety II, on the other hand, is based on the maximisation of the positive outcomes. Events are emergent properties of the system, there are no linear and cause-effect relationships among factors, but complex interactions that should be managed by the human element in order to provide flexibility and resilience to the system. This form of resilience implies a proactive attitude towards safety, it is based on anticipation rather than reaction, it aims at the investigation of the normal performance variability of the system's elements, understanding how they can interact and develop a functional resonance that could lead to a mishap. The cultural change towards Safety II requires to move the attention from what went wrong to what is going well, to the resources, skills and professional capacity of operators. In order to make this change, it is necessary to know the work as done on the frontline, other than the work as imagined by policy and procedure writers. Moreover, it is necessary to take into account the several perspectives on safety that could be adopted by the different actors of the complex system (e.g. the controller, the manager, the engineer, the supervisor, the account administrator, etc.). Safety is mainly grounded in the culture beneath an operational system. As a "safety culture" it becomes a crucial goal, to accomplish and develop together with a Safety Management System (SMS) and a safety regulation system. Safety regulation implies compliance, the SMS implies control and competence, and the safety culture implies commitment. Safety culture is a mix of national, organizational, and professional culture and determines the management commitment to safety, the active involvement of everybody in safety pursuit, the adoption of fair and effective reporting systems, and the learning attitude towards what emerges from the reporting systems. There are several methods to improve information circulation and safety culture within a system, some are well structured, like the reporting system, other are more informal, like focus groups, planning meetings between operators and managers, the adoption of safety cards as tools to trigger attitudes, opinions and beliefs about safety. Whatever the specific method, any approach inspired by the Safety II is focused on the excellence, the positive potential, the development of skills and resilience of workers and organisations.

Paola Lanzi, from Deepblue, a human factors and aviation consulting company, gave a talk entitled "Bringing liability in the design process: the Legal Case". She talked about the Legal Case methodological tool, aimed at taking into account the legal aspects of the high-automation activities starting from the very beginning of the design process of the technological system. This initiative has been developed by the network of legal research in ATM systems, a community with the aim of analysing the legal aspects in the air traffic control domain. This goal is even more important after the introduction of the highly automated ATM systems (as prescribed by the SESAR policy), whose ambition is to enhance performance while preserving high safety standards. High automation will change the role of human operators, shifting their task from the direct control to supervision and monitoring of processes. But what will the impact of automation on safety be? How will it be possible to manage dynamic, complex, and high-risk situations trying to harmonize the integration between the human element

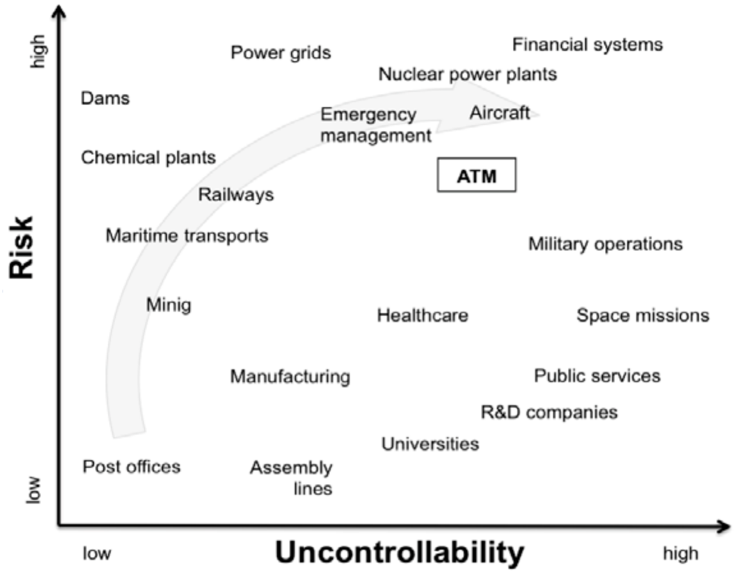
There are no linear and cause-effect relationships among factors, but complex interactions that should be managed by the human element in order to provide flexibility and resilience to the system.

and technology? What could be the liability consequences in case of decisions made by the automatic system? A paradigm shift is necessary, because tasks are changing and, together with them, accountability as well. In the near future the liability issues will be taken into account right from the beginning of the system design process, trying to provide the legal perspective with the systemic width typical of every approach to complex organisations. It is important to work towards a stronger integration among the several professions, a multidisciplinary perspective that will take into account the legal and technical issues. This is the main goal of the Legal Case, which is structured in several steps like the liability aspects of ATM activities, an assessment of the acceptability of the possible legal measures, an assessment of the typical ATM tasks and of the operational processes performed by the practitioners, and the identification of the desired level of automation according to the legal opportunities.

Ivonne Herrera, from SINTEF, presented a talk entitled "Development and application of the Functional Resonance Analysis Method (FRAM) for Air Traffic Management safety assessment". The FRAM method has been proposed by Hollnagel (2012) as a formal approach for the analysis of complex systems, grounded on the principles of Resilience Engineering (Hollnagel et al., 2006), mostly overlapping with those of Safety II described by Licu in his talk. According to Hollnagel, resilience could be defined as "the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions" (Hollnagel et al., 2011). According to this perspective, the focus of the analysis is on how and why things go right and how they may go wrong. Since current sociotechnical systems are mostly located in the top right section of the diagram of Figure 1, i.e., high risk and lack of manageability, it is necessary to adopt the right approach for the analysis of these properties. The FRAM method aims at taking into account the intrinsic complex quality of these systems, and is based on the concept of functional resonance of system elements, which are constantly involved in situations of performance variability. Resonance, as a mishap, could emerge from the interaction of normal variability among the elements, without a single specific cause. Actually, there are several functions involved in complex interactions and could be described according to six dimensions:

1. **input**: what arrives to the current function, coming form other functions;
2. **output**: what is produced by the function and could be sent to other functions;
3. **preconditions**: system conditions that must be fulfilled before the function can be performed;
4. **resources**: what is necessary for the function to be carried out (e.g. manpower, hardware, etc.);
5. **time**: the time available to perform the function;
6. **control**: that which supervises or adjusts the function (e.g. a checklist, a procedure, etc.)

Herrera provides examples of functions in ATM that could be described with the FRAM method. After a specific function is described (for instance, monitoring, the missed approach request, radio communication, etc.), the next step is the instantiation, i.e., the link between input and output of functions. The FRAM model helps the analyst to identify the functions and their performance variability, highlighting situations where it could be necessary to dampen the resonance before it becomes too dangerous. This method is more effective than the previous approaches to safety, because it is tuned on to the concept of functional resonance and of emergent property. It does not focus on persons but on functions, it does not look for the scapegoat, but looks for the undesired variability sources, it can represent the interactions occurring in a complex, dynamic and non-linear system.



✈ *Figure 1: Sociotechnical systems arranged according to the risk/uncontrollability trade-off. Note: the position of the labels is merely descriptive and is not the result of metric analysis. Modified from Hollnagel (2009).*

Antonio Chialastri, an Airbus A320 captain, gave a talk entitled "Automation in aviation: threat or resource?". Following the line of thought presented by the previous speakers, he discussed the relationship between operators and technology in order to develop a safe and resilient system. A proper integration between the human element and automation is possible only by taking into account human cognitive and physical characteristics without considering them as an imperfect version of a computer performance. Human beings are not computers, they have other abilities, qualitatively different from those of a highly automated system. Human beings are context sensitive, they can notice small qualitative changes in their environment, they can be flexible and creative, perform inductive reasoning and are good with making plans, imagination and creativity. Automation, on the other hand, is better at rapidly identifying and responding to predefined signals, at continuous monitoring, at controlling huge forces, at recording large amounts of data and at multitasking. It is therefore necessary to define complex activities where human operators and automation can share their tasks according to their specific skills. Sociotechnical systems are characterized by several kinds of activities. Many of them can be accomplished performing behavioural routines (the so called automated behaviours), working at the skill level, according to the Rasmussen (1983) model. Automation is very effective at this level, more than humans are. It is therefore pref-

erable to automate tasks that should be performed at the skill level (think about the autopilot, for instance). Other activities are based on the recognition of a specific situation, the choice of the proper procedure, and the correct line of actions to perform it. It is the so-called Rule level. Automation is increasing its efficacy also at this level and there are many applications where even complex procedures are skilfully automated (e.g. ECAM and EICAS systems). But complex systems are characterised by a varying amount of unpredictable situations, where procedures alone are not enough. It is necessary to be flexible, context sensitive, analytic and synthetic, and lateral- and creative-thinking (the so-called Knowledge level, according to Rasmussen's taxonomy). Automation is very poor at this level, while human beings are very good performers. They have perceptual and cognitive limitations, but at the same time they have abilities that have allowed them to create highly complex systems. Therefore, complex system's management is possible only through the proper integration between the human and the automation skills, where operators' abilities are optimized for safety's sake. Automation should continue to gain power at the Skill and Rule level, but what makes the system complex, the Knowledge level, is still under human control.

Sidney Dekker, human factors researcher, pilot, and one of the world-leading experts of safety and complexity gave the last talk of the seminar. It was entitled "Drift into failure. Just Culture - balancing safety and accountability". Dekker argued that, along the 20th century, every approach to safety moved just few steps beyond the traditional (and wrong) blame culture, where the human operator is considered the weak element of the system. Therefore the system management is focused on what could go wrong, the broken components, rather than the positive resources. He repeatedly asked the audience "what is the worst enemy of safety?". There are many enemies, but overconfidence based on past success is one of the most dangerous and devious. A positive safety record in a system's history does not mean that the system is intrinsically safe. Bureaucracy is another enemy of safety. It is based on a normative, legal approach to safety, where being safe means just to comply to rules without any attention to change and innovation. Within this perspective, the upward responsibility is dominant, i.e., everybody is accountable to those higher in the hierarchy, while the downward responsibility (towards the frontline operators) is lacking. Bureaucracy leads to rigidity in rule commitment, it neglects variety and considers it as just a deviation from the norm. But complex systems are in fact complex because they are characterized by variety and diversity. Neglecting it, not paying attention to it, and not giving it the right value is a short-sighted attitude that dooms the system to drift into failure. This approach to safety set the stage for the blame culture, where the human operator is considered the unreliable source of an excessive amount of variability and should be constrained and controlled. Following this rationale, safety is just the absence of accidents, absence of human errors.

To reinforce this perspective, Dekker tells the story of how RAF aircrafts analysed the shots of the Nazi flak after the raids over Germany during the Second World War. Unfortunately, many aircrafts were shot and did not manage to return to England. Those that did manage to return to the base were inspected all over their fuselage in order to spot the most vulnerable parts of the aircraft, just by looking at the distribution of the bullet holes. It may seem counterintuitive, but inspectors had to focus of the intact parts of the airplane, not on those with bullet holes. Because notwithstanding the bullet holes, the airplane managed to fly back to the base, while those that were shot in the intact parts lost control and were downed. Just like the vital parts of the aircrafts were those without holes, safety in complex systems should be promoted by reinforcing the intact elements, by trying to analyse situations before an accident happens, assessing risks when things go well.

This is a very radical proposal. It is a paradigm change towards a real "just culture". It does not mean to suspend people's responsibility, reducing accountability. On the contrary, it leads to an increase of commitment and even higher accountability. The blame culture has been the dominant paradigm up to recent years, and it was based on the definition of what was right and what was wrong according to a line drawn by somebody external to the system. Every accident investigation tried to answer the question whether the operators' behaviour was actually within or beyond this line. But the real issue is not concerning where to draw the line, but who should draw it. The acceptability line should be drawn by people working in the system, according to shared rules, and with the active participation of all the system members. In case of accidents, the main question should not be "who is responsible?" but "what is responsible?", focusing on processes rather than outcomes, on concurrent factors rather than people. Instead of reinforcing a retributive justice that tries to compensate the damage by means of an atonement, a punishment, Dekker proposes a restorative justice, that heals the damage, focuses on recovery, growth, opportunity. Making people accountable after the events is inevitably doomed by the hindsight bias, because human behaviour is interpreted after the event and is therefore unacceptable. It

In case of accidents, the main question should not be "who is responsible?" but "what is responsible?"

is rather necessary to promote a proactive accountability, where people are not problems to constrain and control, but resources to manage for safety's sake. Finally, in case of unwanted outcomes, it is necessary to remember that there are the first victims, i.e., those who got the damage, but there are also the second victims, i.e., the operators that were involved in the accident. They should be supported by the organization, they should not be left alone, blamed and stigmatized for an outcome that is not due to their irresponsibility but to the functional resonance of the system's elements.

The time and effort to change

A common thread connects the abovementioned talks. They are all oriented to demonstrate the importance of a new perspective for the analysis and management of complex systems, as ATM. This new approach is based on the principles of the sciences of complexity. It developed concepts like functional resonance, just culture, resilience, and emergent property. But, most of all, this approach puts the human element at the centre of the system, it aims at valuing people's competencies and grounds system's safety right

on human characteristics. In line with this tendency, we notice that in recent years highly reliable systems tried to promote a systematic improvement of the "non-technical skills" (NTS), i.e. competencies like communication, leadership, teamwork, situation awareness, decision making, and stress and workload management. (Flin, O'Connor, Crichton, 2008). Well-trained NTSs can give the right value to the human factor in order to develop the necessary resilience in the system to cope with complex situations.

Changing the paradigm is not easy. It takes a huge effort and asks people to abandon old and consolidated schemas, which proved to work well in the past. In order to sustain this change, we need to understand that the operational environment has changed, that we are moving in the top left part of the diagram in figure 1. We are therefore facing new challenges, different kinds of risk, coping with new, unpredictable sources of complexity. The old approaches are no longer effective in this new area, and operators' experiences are one of the clearest symptoms of this inefficacy. We just need to pay attention to what they say and feel working in complex systems with old and ineffective methods: we will listen to their frustration after being blamed for every adverse outcome, we will see their discomfort when they try to do their job notwithstanding procedures, rules, and constraints that were designed to control and dampen human fallibility rather than valuing their proactive attitude. Reallocating the human factor at the core of complex systems means giving operators new and even greater, but more sustainable, responsibilities. It is a kind of neo-humanism of complex systems, where people are the measure of the system that is built around them, and where people's safety and well-being are properties emerging from a virtuous functional resonance among all the elements of the system.

fabrizio.bracco@unige.it

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CAN ATCO PERFORMANCE BE MONITORED?

by Eric Risdon, IFATCA Executive Vice-President Professional

Generally speaking outside ATC, measuring performance is found in many areas including sports, finance, industry, education or many professional occupations to name but a few.

Performance can be measured on an international, national, regional, local or individual level. Results are normally used to compare yearly variations, improvement levels, personal achievements or for other reasons.

Being mostly commercial entities, the aviation industry and its derivatives measure performance in different areas such as safety, operations, administrative and finance. Results will indicate how they are doing in specific areas so managers can then react accordingly to meet corporate objectives.

In recent times, commercialisation of many Air Navigation Service Providers created new expectations such as offering a cheaper, faster and more efficient service thus inducing a quest for performance metrics and targets.

Overall and ideally, this performance measure should be employed to foster improvements.

As the controllers are recognised as a very important part of the operational performance of a unit, specifically in regard to capacity, it is understandable that from a managerial level, some form of measurement is made.

Should controller performance be measured, and if so, how and for what purpose?

It is already done in different ways. One example is to acquire an ATCO licence or to check the currency and competence of an individual.

Nevertheless, measuring ATCO performance is generally thought to be a nuisance by the individuals concerned.

As for measuring performance on a broader level in ATC, ICAO has produced a number of Key Performance Indicators (KPI). There are 11 of them:

- Access & Equity
- Capacity
- Cost Effectiveness
- Efficiency
- Environment
- Flexibility
- Global Interoperability
- Participation by the ATM community
- Predictability
- Safety
- Security

Each of the indicators is expected to be met by the ATM community so that performance objectives produce relevant and timely operational improvements.

Experiences at local, regional or national levels have shown to IFATCA that there is still a long way to go before ATM performance measurement will not be perceived as a hindrance to improving the overall performance of the ATM system.

In 1998, Eurocontrol created the Performance Review Commission. Its goal is to analyse the ATM performance in 4 of the ICAO 11 KPI, namely safety, capacity, environment and cost efficiency. It produces a yearly report that can be found on its web site.

The FAA of the USA recently produced a comprehensive report jointly with Eurocontrol. The objective was to make a factual high-level comparison of Air Traffic Management performance between the US and Europe.

Balance between acceptable performance and safety tolerable risk levels.

It can be said that air traffic control is an activity managing risk to an acceptable level. Absolute zero risk is unattainable unless all traffic is kept on the ground. But that would mean zero performance levels except for safety that would then be at a maximum.

There is still a long way to go before ATM performance measurement will not be perceived as a hindrance.

To find the best possible balance between maximum performance, which could be viewed as giving ATC services in a given space to an unlimited amount of traffic in all possible conditions, and utmost safety where zero accidents or incidents occur, we need to have guidelines for what is acceptable or tolerable risk.

So to what level of performance and how safe do we need to be and what is an acceptable risk level? Many industries use Safety Integrity Levels (SIL) that is a measure of safety system performance in terms of Probability of Failure on Demand (PFD). This convention was chosen based on the numbers as it is easier to express the probability of failure rather than that of proper performance (e.g., 1 in 100,000 vs. 99,999 in 100,000).

Level	PFD	
SIL 4	100,000 to 10,000	10^{-5} to 10^{-4}
SIL 3	10,000 to 1,000	10^{-4} to 10^{-3}
SIL 2	1,000 to 100	10^{-3} to 10^{-2}
SIL 1	100 to 10	10^{-2} to 10^{-1}

There are four discrete integrity levels associated with SIL: 1 to 4. The higher the SIL level, the higher the associated safety level.

Although these numbers did not originate in the aviation industry, it shows how some metrics can be applied to systems components. The controller is an important component of the total risk, however its metrics remains a highly variable and difficult measure to value.

In a recent FAA study, each system component involved in commercial airline transport should ideally achieve a PFD of 10^{-9}, (1 in 1,000,000,000) for every flight hour. The study however states that testing a system to ensure such a PFD isn't practically feasible.

Additionally, public opinion has a determining effect on tolerable risk. The year 2013 was a record low in aviation fatalities. Despite this, because of their highly spectacular nature, aviation accidents are still widely reported by the media. Other spectacular accidents like the Fukushima nuclear plant hit by the tsunami tend to trigger public outcries, leading authorities to make radical decisions like shutting down existing facilities or terminating future nuclear power plant projects.

Compare this to road fatalities that total over one million each year. Public opinion seemingly accepts this, thus very little is done to improve road safety.

Arguably, public opinion helped push the whole aviation industry to strive for and achieve the high safety standard that we enjoy.

Factors that enhance or deter performance

Compared to only a few decades ago, many ATM systems today incorporate electronic tools with varying functions intended to help the controller with routine tasks. Understandably, these tools play a role in enhancing safety but also, to a certain limit, may also improve the ATCO performance. However, it is recognised that any downgraded component of an ATC system like radios, radar consoles, other technical mishap or external phenomena like weather storms, will normally reduce the overall performance.

The controller, being essential to the overall performance of the ATM system, may be considered to be the most variable aspect because of his/her human nature. Some well-known factors that can enhance or deter the personal performance of an individual include general health condition, state of rest or fatigue, diet choices, personal life or family concerns, anxiety levels, pressure from peers, age, recent professional achievements, experience level, self-esteem, professional satisfaction, shift work cycles, etc.

Measuring performance for ATCO training evaluation and certifying

Generally speaking, measuring the performance of controllers is done in two ways. Performnce can be undertood to refer to the theoretical knowledge necessary for doing correctly the required job, and the level of skill demonstrated in either a live or simulated environment.

Throughout his/her training, a controller is expected to be continuously evaluated by varying methods.

Certified controllers should periodically be tested and evaluated. Regulators or even service providers, usually define the content, frequency and

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nature of these tests. Again, theoretical knowledge and practical skills should be assessed.

When regular, comprehensive and constructive evaluation is done, it will normally maintain and/or enhance the controller's knowledge and skill. This in turn should ensure continued optimum performance.

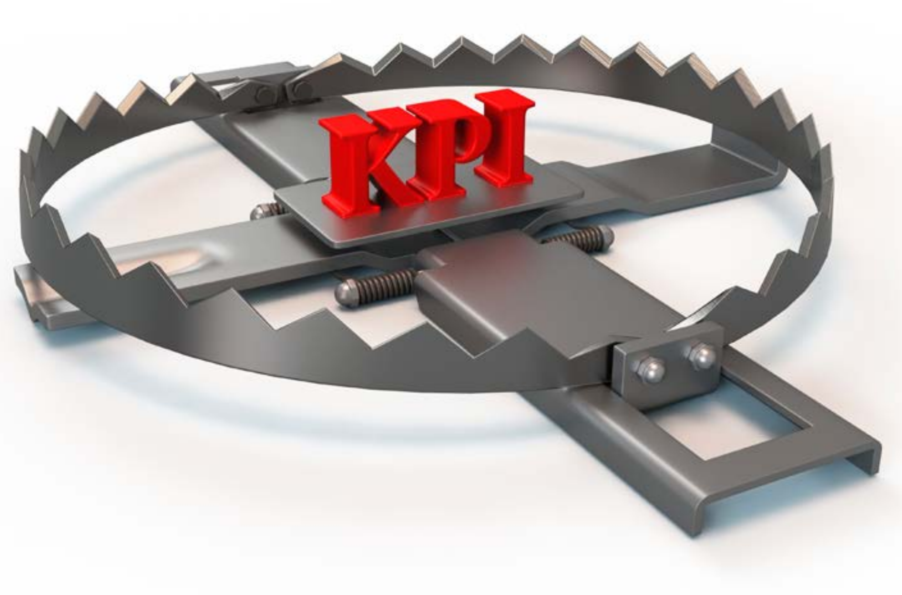
To obtain the best possible results from these tests and evaluations, they should be as close as feasible to the expected work profile. Many ANSPs today revert to what some call Competence Assessments (CA) to help maintain their workforce skill and knowledge to the highest degree. For these CAs to be constructive, they should not be punitive where/when they discover a knowledge gap or lacking skill. Instead, they should be there to identify weaknesses either on an individual or broader level and propose solutions to deal with them.

Can the actual Performance Indicators be considered valid metrics for an ATM system?

What is IFATCA's perspective on this?

The definition and use of Performance Indicators (PI) by service providers or regulatos cannot be controlled by IFATCA. They can however be examined and questioned as to their relevance to the ATC system. Presently, Performance Indicators tend to be defnied from a "user" perspective. Their definitions bring no particular problem and they are a fair indication for the user of the system as a whole.

IFATCA does understand the necessity for government to act as a control mechanism of commercialized air traffic service providers.



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Can the actual Performance Indicators be considered valid metrics for an ATM system? Arguably, from a controller's perspective, probably not as there are too many factors beyond the control of any individual controller, and even air traffic control centres, which can influence the outcome of these measurements.

Factors like equipment capability and serviceability, capacity, military activity, traffic priorities, resourcing, training, airspace design, over-demand and even weather are likely to affect performance results.

IFATCA reminds controllers and Members Associations to be extremely careful where these results are broken down to sector, console or individual controller level.

Performance Indicators as currently used have little direct relevance to the operational controllers' performance but are published for general, user or industry use to measure the overall system efficiency.

In a nutshell

Measuring performance in ATM is relatively new and may be difficult to quantify correctly but it is happening.

There are too many uncontrollable variables and undefined metrics preventing any practical ways of finding true balance to provide the best performance vs. the best safety.

Air Traffic Management systems are subject to many variables that will influence performance.

Student and certified controllers can expect to be regularly tested for knowledge and continuously evaluated for their skills. These tests and evaluations should not be punitive in nature but should strive to maintain or improve the knowledge and skills.

Member Associations and their members must be extremely careful when overall system performance measurements are directly transposed to controller level, as they have little or no relevance to individual controller performance.

evpp@ifatca.org

Related IFATCA Policies

Performance Indicators as published and used by Air Navigation Service Providers (ANSP) must not be linked in any way to the pay and/or working conditions of individual ATCO's.

IFATCA urges Member Associations (MA) to be involved in the creation of and application of an Air Traffic Management (ATM) Performance Measurement System.

ATM SAFETY MONITORING TOOL (ASMT) should not be used as a performance monitor for individual controllers.

PROFESSIONAL DEVELOPMENT FOR ATCOs

It Shouldn't End At Certification

by Dr. Ruth Stilwell, IFATCA Reprentative to ICAO

In any advanced profession, there is a career long concept of professional development. Doctors, lawyers, university professors, and career professionals of all kinds take classes to continually build their skills, keep up with new techniques and tools, and learn from others in their field. Traditionally, this concept has not included air traffic control. Of course, ATCOs are familiar with refresher or recurrent training designed to maintain proficiency in unusual situations, but it is not the same as skill enhancement or professional development.

The best controllers continue to build their skills long after certification. Experience is a great teacher, but in modern air traffic control, using experience as the only tool for skill enhancement can easily fall short. Many air traffic facilities around the globe have a wide range of tools and technologies available for training that are used only for traditional training phases. In many cases, this equipment may be idle for several hours a day and could be used for ongoing skill enhancement. Earlier this year, the Miami Center conducted an experiment to see if more could be done to give Certified Professional Controllers (ATCOs) access to skill enhancement opportunities using existing resources.

This was not a structured program or formal initiative, but rather a test effort under the Partnership for Safety Program between the FAA and NATCA. Its success may be partly due to the fact that it was informal. No entries were made in personnel files, no stigma was attached to requesting the training, no evaluations, and no formal scheduling for people or equipment was needed. It was crafted as a mentoring program. A senior controller volunteered to set up the problems and work with less experience certified controllers who signed up for voluntary skill enhancement. During periods when the simulation lab was not in use for formal ATCO training, and the controllers could be released from operational duties, they ran problems with goals set together. The simulations could be 200% of normal traffic volume, or designed with various levels of complexity, weather, aircraft performance or military operations. They could compress years of experience into the sessions rather than waiting for the traffic situations to occur in real time.

The program did not require any additional funding from the ANSP, it just required them to allow access to the training tools, like simulators and replay programs, to be used in this way. Management had to think in a new way, to accept that training tools can be used for something other than traditional training. Controllers had to think in a new way, too. They had to accept that taking on skill enhancement is not a punishment or admission of weakness, but the mark of a true professional.

On September 3, 2014 during the joint meeting of the IFATCA Technical and Operations and Professional and Legal Committees, the FAA presented NATCA member Jeff Warters, with the Vanguard of Safety award. He described his view in the FAA internal newsletter, Focus FAA by saying, "as controllers become more competent in their technical abilities, they become more confident in their work and, therefore, safer. With confidence" , he said, "controllers develop compassion for their peers and the pilots they communicate with to better understand what their needs are." This concept goes well beyond technical training and as a result is a key element in true professional development.

Perhaps more telling about the value of the effort is found in the words of the first certified controller to receive the skill enhancement training. "I believe I am a better, stronger, controller as a result of working with Jeff, and much more confident", says the ATCO at Miami Center. But being the first to step up in a new approach that breaks the stereotype of controller ego was not without challenges. She goes on to say, "I would work with him again and still take every opportunity to discuss situations, but the process was painful and almost shaming with my peers. It was an invaluable experience and once I let go of my pride, I learned a lot ."

It took a great deal of courage for a certified controller to be the first to test the program. The paradigm that once a controller is checked out that training is a sign of weakness or a punishment created a significant barrier to the effort. But she took on the challenge as a professional and hopefully more will follow. Professional development and career-long skill enhancement is viewed as a desirable, necessary part of other professions and there is no reason it should not be embraced as an integral part of the Air Traffic Control profession.

ruth.stilwell@gmail.com

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ATC GLOBAL 2014

17-19 SEPTEMBER 2014
CNCC. BEIJING. CHINA

Spearheading Growth

by Patrik Peters,
IFATCA President & CEO

Air Traffic Management professionals from around the world met in Beijing at the ATC Global Exhibition and Conference from 17-19 September 2014. This conference, previously held in Maastricht/The Netherlands and later in Amsterdam, for years hosted a one day controller forum, pertaining to the introduction of TCAS and other similar matters impacting the every day life of our profession.

Competing for attention with the CANSO ATM Congress, held in Madrid/Spain, ATC Global this year moved to Beijing, to pay tribute to the fast growing aviation sector in the Asia and Pacific region. Through strong support from China's Air Navigation Service provider (ATMB) and China's Aviation Regulator (CAAC), the event secured the attendance of a prestigious and engaged domestic audience, accompanied by key international stakeholders.

The organizing committee counted over 3,500 attendees who made their way to the China National Convention Centre over the three day event. A diverse range of exhibitors and comprehensive educational programmes worldwide occupied just a small part of this impressively large convention centre. Chinese and Russian vendors were prominently represented and the latest technology and improvement programmes mirrored those seen at previous European hosted events.

Also present were buyers from countries rarely seen at industry events including Lebanon, Cambodia, Zambia and Cuba.

Exhibitors and presenters showed solutions in the communications domain – such as Rohde & Schwarz with their VCS systems based on 4G IP, as well as global surveillance programmes – like Aireon's space based ADS-B system, which uses Iridium satellites and which is being promoted by NAV Canada, NAVIAIR Denmark, NATS UK and the Irish IAA.

Airbus briefed on their global market forecast for air transport, air traffic flow management initiatives in China, the widespread use of PBN in the region and cockpit design plans for new ATM technology.

The Eurocontrol agency promoted their vision of enhanced airspace management and centralized flow management, whereas the SESAR JU gave an insight into their vision of international collaboration and projects like Remote Tower Services, initial 4D (i4D) trajectory management and System Wide Information Management (SWIM).

IFATCA had been invited to present at the three-day conference paralleling the exhibition focusing on "Spearheading growth", with the intention to support the enormous growth in the region, respecting the lacking infrastructure. Some of the figures mentioned included passenger numbers expected to triple to over 2.2 billion. Cargo volumes are to rise at a rate of 6.3% per annum. Aviation's direct contribution to GDP will increase by 6.1% per annum in real terms. An additional 1.3 million jobs will be created across the region by 2030.

The speakers explored technical, regulatory and operational challenges surrounding the provision of a safe and efficient ATM framework required for air traffic growth. IFATCA's contributions included a presentation examining the potential benefits of implementing new technologies to support future growth safely and the moderation of two technical panels on communications and surveillance developments.

IFATCA's presentation highlighted 5 pillars of necessary improvements: training, culture, recruitment, harmonised technology equipage on the ground and on the aircraft and automation in support rather than to replace air traffic controllers.

ATC Global 2015 will take place on 5-7 October in Dubai. Dubai, home to one of the world's busiest international airports, was chosen for its connecting importance between Asia and the Western world. Following the success of this years' participation at the Beijing fair, IFATCA will certainly be part of the programme again.

pcx@ifatca.org

AVIATION DURING WORLD WAR I

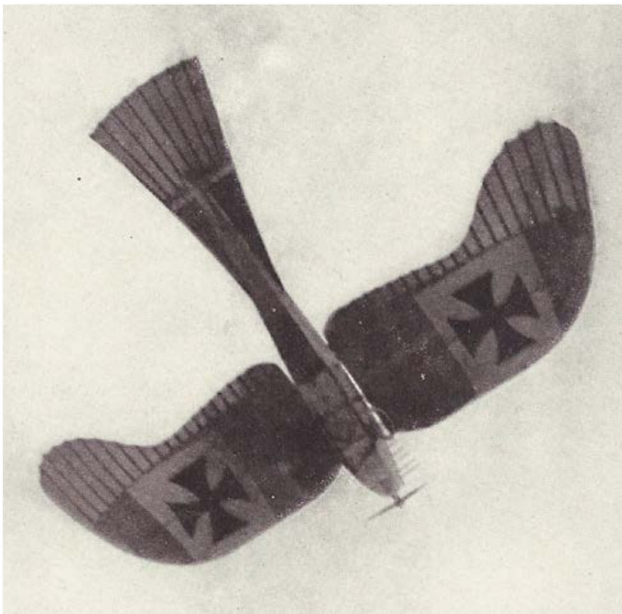
Part 1: Aerial Reconnaissance

by Philip Marien, Editor

This year it will have been 100 years ago that World War I broke out. The killing of Archduke Franz Ferdinand of Austria, heir to the throne of Austria-Hungary, in Sarajevo in June 1914, set events in motion that would claim the lives of 9 million combatants and 7 million civilians. It was one of the deadliest conflicts in history.

As is sadly often the case in human history, the atrocities of war result in massive technological advancements. In part due to the constant pressure to gain/retain the upper hand over the enemy, but also due to the near limitless budgets made available for military spending… During World War I, this is no more obvious for any other field than for aviation: just over 10 years since the Wright Brothers' first flight, fixed wing aircraft evolved from a past-time for some fanatics to an essential and permanent part of warfare. In doing so, it paved the way for other uses, including civilian applications, as we know them today…

At the start of the war, there was intense debate over the usefulness of aircraft in warfare. It was widely accepted that the main use would be for reconnaissance missions. Well-tried and familiar platforms like tethered balloons and kites could ascend to as high as a mile, but were easy to shoot down. They were also not very mobile, making them somewhat redundant.



The 1909 Rumpler Taube (pigeon), was the first military aeroplane to be mass-produced in Germany.

Photo: wikimedia commons

Dirigibles like the huge new German Zeppelins were initially considered to be top of the line: being relatively slow and stable in flight, they were ideally suited for reconnaissance missions. In addition, they were large enough to carry a limited load of shells, which were used in bombing raids – Liège and Antwerp in Belgium were the first to experience this, but later these airships went as far as Paris, London and Edinburgh to deliver their deadly cargo. However, their limited speed, manoeuvrability and size also made them easy targets for ground fire.

A German Zeppelin overhead Antwerp.

With this in mind, many senior officers were sceptical about the use of heavier-than-air aircraft, preferring to continue to rely on cavalry for reconnaissance. Very quickly however, they realized that the increased firepower of modern era weapons and the vastness of the front (stretching from the North Sea to the Alps), made conventional reconnaissance as good as obsolete.

Most of the combatant countries possessed a few military aircraft at the start of the war in August 1914. France was by far the aeronautical leader at the time, having held military aviation exercises from as early as 1911. The French Army began the war with several squadrons of Blériot observation planes.

Aerial photo taken from a German soldier showing the ruins of Ypres in 1915. Handwriting shows the photo was taken at 4200m altitude. *Photo: wikimedia commons*

The German Empire had great successes with the Zeppelin airships and this overshadowed the importance of heavier-than-air aircraft. Nevertheless, their army had about 180 operational aircraft by August 1914. Amongst the early successes was during the Battle of Tannenberg in East Prussia, where the German Army successfully countered a surprise Russian attack, which had been spotted from the air.

Great Britain's aviation industry had to play catch-up and had to initially rely on the French, especially for aircraft engines. The initial British contribution to allied air war was three squadrons with about 30 serviceable machines, out of a total of about 180 aircraft.

One of the major difficulties that needed to be overcome was that of communicating aerial observations as quickly as possible. Initially, it wasn't uncommon for aircraft to land next to command posts so the pilot could jump out and personally pass on what he had seen. This was impractical, especially for artillery spotting (directing where artillery should aim their fire), where speed is essential. The French experimented with air-dropping written messaging, coloured-coded flares, and pre-arranged aircraft manoeuvres to convey information. By 1915, France was reportedly the first to try airborne radios. These were not very popular amongst the crew, as they were heavy (especially the batteries) and tricky to operate. These early radios allowed only transmissions via Morse code. Rapid technology advances were made, including switching from spark coils to smaller valves. By 1915, Britain had developed a lightweight radio set of which nearly 4000 were manufactured and installed in their aircraft.

Enlist Your Lens in the Air Service

IF you have a powerful photographic lens, put it to work for our men "over there;" let it disclose from the skies of France hidden machine-gun nests waiting to spread death among advancing American troops; let it save hundreds of American lives from being snuffed out in the trenches by shells from concealed batteries. An official report calls the situation "critical," brooking no delay.

What is especially desired at the present time are lenses of from 7 inches to 24 inches focal length and with speeds of from F 3.5 to F 7.7. Practically all lenses of this type will be purchased as soon as they can be found. The following are some of the foreign makes wanted: Carl Zeiss Tessars, Bausch & Lomb Tessars, Voigtlander Heliar, Euryplan, Cooke, Goerz, Bush, Ross, Ross-Zeiss, Krauss, Krauss-Zeiss, Steinheil-Isostigmar, Rodenstock. In addition, matched pairs of stereoscopic lenses, with speeds of F 4.5, focal lengths of 4⅘, 5, 5½, 6, 6⅓, and 7 inches, are needed.

If you are in doubt as to the value of your lens, ask the nearest photographer.

Remember that you can probably replace your Anastigmat lenses with others just as serviceable for you but not adaptable for the army. If you have a lens such as your army needs, send at once its description and the price you think fair to

SIGNAL EQUIPMENT No. 33
WASHINGTON, D. C.

This page contributed to the U. S. Army by the National Geographic Society

While early reconnaissance from airplanes consisted of visual observation and written reports or drawings, aerial photography seemed like a logical step. Pilots began using handheld cameras but the results were at best disappointing: good photographs required both skilled flying and a steady hand. The obvious solution was to bring a second person on the flight, an operator who could concentrate on handling the camera and the unwieldy and heavy glass plates it required.

German optics, lenses and optical glass, were overwhelmingly superior. When the U.S.A. joined the Allied war effort in 1917, the Army urgently requested that American civilians turn in their lenses and optics, including telescopes and binoculars, for aerial use, specifically naming several sought-after German manufactures!

Mounted vertical cameras quickly began replacing handheld ones. This allowed longer focal length lenses making the cameras lighter and bigger, thereby allowing more detailed and sharper photographs. The cameras became mechanically very complex and the most advanced models could take overlapping stereoscopic photos. These required carefully timed exposures. As the aircraft were being pushed up to 18,000 feet, in order to avoid being shot down, aircrews began to use oxygen and heated clothing items. Germany began using electrically heated cameras and devised engine-driven generator power. Wind-driven generators, both venturis and small props, came into use for automation. Suction was used to keep film flat on the plate.

In addition to specialised aircrews, armies had to train staff who could interpret aerial and stereoscopic views. This was quite alien to what ground-based reconnaissance would see. They required extensive knowledge of military hardware. They had to develop techniques, for example on how to use shadows for size estimation and to detect the increasing use of camouflage and decoys. It's difficult to overstate the importance aerial reconnaissance gained during the First World War: towards the end of the war in 1918, Germany alone reportedly generated 4,000 images a day.

✈ An observer of the Royal Flying Corps demonstrates an aerial reconnaissance camera fixed to the side of the fuselage, 1916. Photo: Imperial War Museums collection

Aerial reconnaissance became so strategically vital, that the flights were soon escorted by armed fighter planes. This would lead to the first aerial battles, introducing some of these pilots into aviation legend. More on that in a future issue of The Controller.

✈ *An aero squadron's camera inventory with mobile development lab in the background.*
Photo: USAFA McDermott Library Special Collections

On the other hand, few, if any, reconnaissance pilots were ever recognised as heroes. The crews have remained largely anonymous, unlikely their colleagues distinguishing themselves in aerial combat. There are no "reconnaissance aces", despite the fact that their contribution was probably infinitely more important to the outcome of the war than that of the early "fighter pilots". Sadly, experts agree that most of this had to be relearned the hard way two decades later, at the start of WWII. ✈

editor@the-controller.net

CHARLIE'S COLUMN

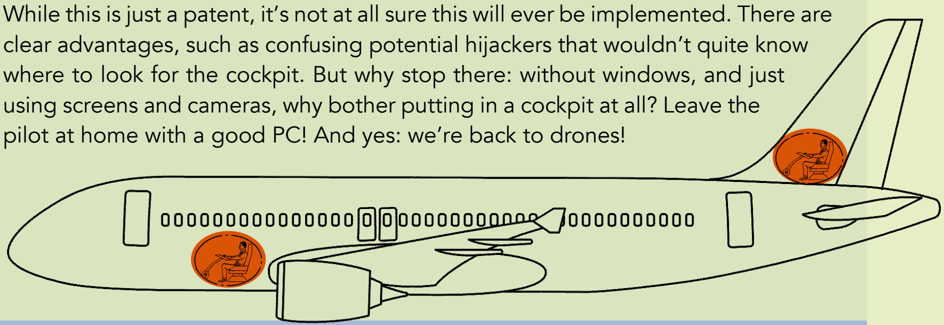
charlie@the-controller.net

Away With Windows

The Airbus engineers have been at it again. Apparently, they have filed for a patent in the USA for a window-free cockpit. They propose to replace the outside view through old-fashioned windows with large screens, cameras, head-up displays and sensors. And without windows, what's the point of having the cockpit up the front of the airplane? Indeed: none. The cockpit can be placed anywhere inside the aircraft, making more room for passengers seats in the cabin!

The text of the patent is interesting: it says amongst other things that: "*For aerodynamic reasons, the aircraft nose should ideally be lancet-shaped. However, the housing in the nose for radar, a landing gear, and especially for the cockpit, requires a much more complex shape and structure to be provided, [...] ... It would be better if the cockpit was moved into some other area of the aircraft and the pilot equipped with entirely electronic means [...] It also means that the cockpit could be placed literally anywhere inside the aircraft's volume, including in the cargo hold or even in or near the aircraft's empennage.*" Empennage is a fancy word, borrowed from French, for stabilizing surfaces near the tail, by the way…

While this is just a patent, it's not at all sure this will ever be implemented. There are clear advantages, such as confusing potential hijackers that wouldn't quite know where to look for the cockpit. But why stop there: without windows, and just using screens and cameras, why bother putting in a cockpit at all? Leave the pilot at home with a good PC! And yes: we're back to drones!



Overheard on the Frequency

Go Ahead... Make Her Day

You've all seen these Facebook: posters about what women say and what they really mean. When a woman says "Wow!", it is rarely if ever to be taken as a statement of admiration for your achievements. It is much more likely an expression of amazement at what she perceives as (male) stupidity. The same with "Go ahead", which is usually the opposite of an actual approval – more like Dirty Harry's "Go ahead, make my day!"

One known exception is of course when the woman in question is an air traffic controller, talking on the frequency. Or at least that's what I thought until recently.

A few weeks ago, while waiting to line up in my small aircraft on the ground frequency of a large European airport, I heard the following.

Young male voice: "*Ground this is ABC123, ready to push back, we are running a bit late. Could we taxi to Runway 23 via M, cut short from M4 to A3 and then back on A?*"
After a short pause, a very confident female voice came back to say : "*ABC123, push back and taxi Runway 23 approved, … M4 to A3? …. Whooow! … Yes you go ahead!*"

Unfortunately, I was transferred to Tower and had to leave the frequency before I could hear the end result, which I think would have been interesting!

Meanwhile in Japan...

The following conversation took place in Japan, between Ground Control and an aircraft during the soccer/football World Cup in Brazil.

Pilot: "*Control, TRS123 has a question, uuh, what was the result of Japan's World Cup game today?*"
Controller: "*Say again!? Are you asking the result of football game of Japan?*"
Pilot: "*Affirm*"
Controller: "*Let me check … OK, Japan 1 and Columbia 4. So Columbia WON*"
Pilot: "*Confirm Japan and Columbia both ONE? You mean they drew?*"
Controller: "*No, sorry I'm confusing you. Japan lost, they come back home*"
Pilot: "*Oh, Japan lost.... Oh! Sorry about that*"
Controller: "*No need to be sorry… I do not like football…*"

Low Cost Pizza

The no shortage of horror stories of how low-cost airlines treat their passengers. Fortunately, every now and then our faith in humanity, and low-cost, is restored.

The evening flight of Frontier Airlines from Washington D.C. to Denver was already one hour late taking off. On top of that, weather forced the crew to divert to Cheyenne Regional Airport. The captain realised that he had a cabin full of agitated and hungry passengers. His solution: he phoned a pizza delivery service to come and bring 35 pizzas, paying for them out of his own pocket.

He's not the only one that went out of his way that night: the owner of the pizzeria was about to close shop when he got the call. He convinced his staff to stay and fast-track 35 pizza's and deliver them to the aircraft.

Flight 719 left Cheyenne at approximately 10:30 p.m. local time, soon after the special delivery. It arrived at Denver International Airport just after midnight, nearly five hours after its scheduled landing.

Only question is: what's the phraseology for pizza delivery on the apron?

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