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ON COMMERCIAL AVIATION SAFETY

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Front Cover Picture: DHL Boeing 757 - 200SF

FOCUS is a quarterly subscription journal devoted to the promotion of best practises in aviation safety. It includes articles, either original or reprinted from other sources, related to safety issues throughout all areas of air transport operations. Besides providing information on safety related matters, **FOCUS** aims to promote debate and improve networking within the industry. It must be emphasised that **FOCUS** is not intended as a substitute for regulatory information or company publications and procedures.

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New Chief Executive – Initial Thoughts

by Rich Jones

It was with great pleasure and some trepidation that I took over as the Chief Executive of the UK Flight Safety Committee on the 4th February 2008. The pleasure was in no small part due to the very positive advice and encouragement I have received from the Executive Board and UKFSC membership before and after my appointment. The trepidation arises from my moving out of the military environment of the Royal Air Force into the civilian world of work and the commercial aviation community in particular. I will not rehearse my past experience in detail here, save to say that I have been involved in aviation and the application and operation of air power for the past 32 years; for the curious amongst you, my CV is lodged on the UKFSC Website.

From my initial analysis of the UKFSC, an impressive number of strengths have come to light. Leafing through the UKFSC's Constitution, the current five objectives remain valid and valued within the flight safety community and have stood the organisation in good stead over time. The Committee's influence and reputation have been felt beyond the UK commercial aviation business with a number of international bodies adopting the UKFSC constitution and model for air safety information exchange into their ways of working. Alongside our 69 UK members, we are privileged to have 18 international members who further enrich our experience and knowledge base and add considerable weight and value to our association.

Beyond the bi-monthly Safety Information Exchange meetings and its resultant Minutes, the wide circulation of this FOCUS Magazine, the UKFSC website, our indigenous Flight Safety Officers course and access to other Flight Safety Fora are all areas ripe for development to provide added value for our membership. My aim is to review each of these elements over the coming months in order to maximise their impact and effectiveness. But I cannot, nor would wish to, do this without hearing the views and suggestions from across the entire membership spectrum; I am very keen to receive feedback from anyone and everyone and my intention is to visit as many of you as possible to collect your individual inputs, as well to learn how you do your business at the sharp end.

Even in my short time in post, I have been astounded by the plethora of commercial, governmental, charitable and private interest organisations involved in Air Safety and all its aspects. Whilst it could be argued that it is impossible to overemphasise the importance of safety, there is undoubtedly much duplication of effort around the world as a result of information overload or poor communication and co-ordination between the players. As we all know, the commercial airline business is technically and financially complex, highly dynamic and global; therefore it would be foolish to underestimate the challenges involved in seeking better connectivity and dissemination of safety critical information, but this must be a vital part of our vision.

There is no shortage of important aviation safety developments and issues to be addressed and I have attempted to raise some of them in the compilation of this Summer addition of FOCUS. One my early surprises during my baptism into commercial aviation safety has been the degree of immaturity in progress with the implementation of Safety Management Systems among some airline operators. In my previous military career, the civil aviation sector was invariably held up as the market leader on SMS implementation. In my previous role as Boss of the Air Safety Group in the military, I was charged with establishing a formal SMS for the RAF and was regularly encouraged to formulate a system that was 'at least as good as the commercial airlines'. Although the concept of SMS has been around since the start of this century or even before, there appears to be significant variations in understanding precisely what its aims and objectives are, how it is applied in practice and to whom it should concern within the organisation. Further confusion arises from the differing and often unhelpful competition between SMS and previously established Quality Management approach, particularly amongst our engineering brethren. In trying to identify the way ahead on SMS, I have recently joined the EASA European Commercial Air Safety Team where a Working Group has now been established to develop SMS advice and guidance which will be based on the EASA Rule Makers' output. The reference material being used by the Working Group is identified; it is being lodged or linked on the UKFSC website, in order to keep our Members apprised of EASA thinking at the earliest opportunity.

Another important but relatively new aviation safety phenomenon is the increasing stringency of security at airports and the impact on flight crews and engineers. There has been much anecdotal reporting of the stress induced by an overzealous or inflexible application of security procedures, but little in the form of categorical evidence. I have attended several fora where this topic has been raised as an increasingly serious problem but with frustration being expressed about the somewhat neutered response from the Governmental departments who cite the lack of definitive evidence upon which to act. The MOR scheme is now being harnessed by the operators to provide the vital catalyst needed to engage the Department For Transport. However, any additional MORs which clearly spell out the flight safety consequences would significantly help the cause.

In closing my initial contribution to my first FOCUS, I would take this opportunity to repeat my thanks to those from UKFSC membership whom I have encountered so far for their friendly welcome and positive advice. I very much look forward to meeting many more of you and your teams in the coming months.

"Hah! That Was a Bum Note You Played There Sean!"

by Robin Berry, CTC Aviation Services Ltd

Those immortal words from a rather heretical 60s version of "Finnegan's Wake" often drift through the nether regions of my ageing brain. The ensuing pitched battle serves as a constant reminder that none of us like to be criticised, particularly in our professional work!

But what is it that makes a group of otherwise intelligent beings so prone to doing the unimaginable on occasion? My time as a company investigator of aviation incidents taught me that it is not ***what*** happened that is important, but ***why*** it happened. Why did that crew choose to ignore company SOPs? Why did they then ignore the three clear opportunities they had to redeem the situation? Why did they not respond to the resulting EGPWS warning in the way they had been trained? Why did another crew only retard one thrust lever of a two engine aircraft on touchdown resulting in a fatal over-run? Why did another crew retard both thrust levers on touchdown but then apply high power on one side leading to another fatal over-run? Why did the crews in two separate fatal accidents not respond to the persistent EGPWS entreaties to "PULL UP"?

As a professional pilot trainer I naturally look to that important area of every pilot's career to see whether there are deficiencies there. Were all the important aspects of operating a particular type covered during training? Were they understood? Was sufficient time allocated or were there time constraints that led the trainer to "overlook" deficiencies?

Ask any airline what they want from their pilot training and they will tell you "Safe pilots". Ask any training organisation what the airlines want from them and they will say "Minimum cost"! Yes, we all want Harrods quality at Aldi prices! But who is keeping the account? At what point does safety become compromised by the need to minimise the damage to the sacred "bottom line"?

That there are recognised deficiencies in some aspects of training at present is well illustrated by one regulator's sponsoring of research into the problems and desire to discover the elusive "better way". So sad, then, that the research was hampered by getting the cart before the horse. Instead of finding out what was required and then asking "How can we deliver this for an acceptable cost?" the project got off on the wrong foot by trying to shoehorn its good ideas into an existing course in order not exceed the current cost. Sorry chaps, but it must be better to pay a bit more for the right training if it produces overall cost benefits in reduced safety erosion in day-to-day operations. Training is expensive, but so are accidents!

But training isn't the only area of concern. I am constantly amazed at the efforts needed in this industry to convince pilots not to push their luck in continuing unstable approaches. OFDM (or FOQA) covers a lot of operational areas but few would deny that the prime motivation in making it compulsory was the need to reduce the number of "rushed" or "unstable" approaches that were leading to accidents. Operators are constantly trying to devise new ways to tackle the problem. I was particularly impressed by one operator's move to take the decision as to whether the stable approach criteria were met or not away from the Handling Pilot and place it with the less biased Monitoring Pilot.

With all the psychology expertise now available how do we persuade pilots that it is NOT a sign of personal failure to go-around when things aren't right? That a successfully concluded unstable approach is not good airmanship but "getting away with it this time"? That it only takes one more unexpected thing to go wrong to turn "getting away with it" into disaster? That being "stable" at 500' isn't the end of the story, approaches can de-stabilise below that height and you are not committed to landing until reverse is selected?

Then, of course, there is the "immortality syndrome". Some guys are blessed with the ability to "get away with it" for a whole career. But they are still dangerous – they are passing their bad habits to another generation who just might not be so lucky.

So, as I hand over the tiller to my successor, I leave you with this thought – Is it bolder to live with dangerous elements in your operation because you think you understand the risk or to use the training tools available to groom them out?

UK FLIGHT SAFETY COMMITTEE OBJECTIVES

- **To pursue the highest standards of aviation safety.**
- **To constitute a body of experienced aviation flight safety personnel available for consultation.**
- **To facilitate the free exchange of aviation safety data.**
- **To maintain an appropriate liaison with other bodies concerned with aviation safety.**
- **To provide assistance to operators establishing and maintaining a flight safety organisation.**

Airspace Safety Initiatives (ASI)

by Commander Paul Brundle MBE RN Directorate of Aviation Regulation & Safety (DARS) SO1 Operations Support

So, what is the airspace safety initiative – is this just another good idea and how will it affect what I do?

If you fall into any of the following categories, namely professional aviator, recreational aircrew, or air trafficker, read on as the decisions made by the ASI WILL affect you. Why? Let us start with the background to the creation of the ASI. The process was instigated following concern raised by civil operators and civil air traffic service providers, that Commercial Air Transport (CAT), flying in Class G and F airspace, are at risk such that a mid-air collision between a military aircraft and CAT was inevitable. Clearly this view gained the attention of Secretary of State for Transport and his aviation safety responsible officer, the Chairman of the CAA. It was decided that a high-level group should be formed of the major stakeholders, namely the CAA, MoD and NATS, to look at all the risks associated with flying in Class G; this included airspace infringements, level busts, TCAS alerts (often caused by military aircraft conducting high energy manoeuvres adjacent to controlled airspace) and the misunderstanding by aircrew, and misapplication by controllers of Air Traffic Services Outside Controlled Airspace (ATSOCAS). The vast majority of these issues were already the subject of various working groups and review studies. However, there was a general consensus that these groups were not sufficiently joined up, despite being inextricably linked. The ASI was formed to act as an all-encompassing umbrella over these groups, at its head was the top-level decision making oversight group consisting of the Chief Executive NATS, Chairman of the CAA and Assistant Chief of Air Staff (ACAS) as the MoD Senior Responsible Officer (SRO) for military aviation safety.

Beneath this group a Steering Group was formed at 1*/AD level to oversee and pull together the vast array of workstrands, provide direction and make recommendations to the oversight group.

The ASI has already produced some 'quick wins' and has several long-term projects in the offing. One area of particular interest to the military is the issue of low cost airlines operating CAT aircraft into regional airports without the protection of controlled airspace. These airports are only too glad of the added revenue these airlines provide but, without the benefit of controlled airspace, their civil controllers face a dilemma of trying to provide separation, as they would in controlled airspace, but in an unknown environment where conflicting traffic may be conducting high energy manoeuvres, or flight paths are unpredictable. All too often this can result in AIRPROX reports being filed by the CAT aircraft or civil controllers, as either party may consider safety has been compromised based on the fact that the intentions of other aircraft are unknown. Frequently the 'other aircraft' had the CAT aircraft in sight, and operating under 'see and avoid', there was never a risk of collision. The regional airports, in developing their case for controlled airspace, often cite AIRPROX and incident data to support their arguments for the development of controlled airspace and connectivity to the airways structure; although these arguments alone do not provide adequate evidence to develop controlled airspace, they nonetheless add weight. Previously this process has been a frustration to both the military aviation and General Aviation (GA) communities who see commercial operators only too willing to set up an operation at a regional airport outside of controlled airspace, with apparently little consideration for the risks associated with doing so. Under ASI this has changed and the CAA now provides guidance to airlines on the requirements for a safety case for 'start up operations into aerodromes outside controlled airspace'. Operators must show that the risks associated with the operation have been adequately recognised or mitigated. Furthermore, with effect from Jul 08 EU regulation comes into force that will require all EU based CAT aircraft to ensure that ground facilities and services, including meteorological services, are provided which are adequate for the planned operation. As such, airlines will have to demonstrate through an effective safety management process that risks have been mitigated to As Low As reasonably Practicable (ALARP), before expanding operations into regional airports outside existing controlled airspace. This may help reduce part of the demand for controlled airspace expansion around the newer regional airports, thereby helping to alleviate some of the squeeze on Class G airspace.

Another safety initiative has been the wide publicity campaign to encourage GA pilots to always squawk mode 3/A with Altitude (Mode C). Some members of the GA community fly around with their transponders switched off for fear of being tracked if they infringe controlled airspace and subsequently being taken to court. This is simply not the case and the CAA will only prosecute if a pilot has deliberately infringed controlled airspace; in fact a pilot squawking, with mode C, is far less likely to be prosecuted than a pilot who elects not to squawk. The latter is considered to be irresponsible by effectively removing several safety nets, namely TCAS and ATC short-term conflict alert systems, and it is this, safety area where the publicity has been focused.

ACEP

Responsibility for the promotion and education process of initiatives and changes from the ASI falls to the ASI Communications and Education Programme (ACEP). As part of the ASI process, it was argued that there had to be a robust and coordinated method of getting a single coherent message/ notification of change, across to the wide

aviation community. As such, the ASI Communications and Education Programme (ACEP) group was established with the aim of studying the communication and education safety issues identified by the Airspace and Safety Initiative Steering Group (ASISG), by collating a database of all existing airspace safety education and communication initiatives and, developing and implementing a strategy to better coordinate future airspace safety education initiatives. The general objective of the ACEP is to approach airspace safety education and communication from a holistic viewpoint, in liaison with existing groups to ensure the resources of all stakeholders are utilised to best effect to improve airspace safety. The ACEP is only responsible for the co-ordination of airspace communication and education initiatives and not for facilitating any specific training requirements; the latter remains the responsibility of the appropriate body. An ASI website has been established through the ACEP and can be found at www.airspacesafety.com. This website not only contains details of ASI changes but also additional useful aviation information and links to other aviation safety groups.

DASC represents the MoD interest on the ACEP and views the group as an ideal conduit to push across the military message; for example the low flying publicity video is now posted on the website along with information for GA pilots on how to cross specific Danger Areas (where most infringements occur). The website is regularly updated and DASC are keen to add any safety messages that personnel feel would benefit the wider aviation interest. It is also considered that DASC is the most appropriate organisation to represent the MoD and publicise changes across the military aviation community through the normal media channels[1].

Royal Air Force Air Traffic Controllers at Swanwick

ATSOCAS

Finally ATSOCAS. It remains the military belief, and that of the CAA, that aircraft flying in Class G are not exposed to significant additional risk when compared to those flying in regulated airspace, provided suitable mitigation measures are taken, such as the request for and provision of the appropriate level of air traffic service, commensurate with the operation and flight conditions. In essence, CAT and aircraft flying in IMC (even for short periods), should be under the highest service (currently Radar Advisory Service (RAS)), as statistical evidence and studies into AIRPROX clearly demonstrate that under this service the chance of an v9 compromised. AIRPROX data collected since 1991 demonstrates that AIRPROX involving aircraft under an RAS, from a military unit, only account for 1.7% of all AIRPROXs. Military controllers will always endeavour to provide the ATSOCAS requested, provided the aircraft is within radar/radio coverage and above specific safety altitudes; however, the same has not in the past been true for all civil Air Navigation Service Providers (ANSPs), where their priority largely lies with services to aircraft in controlled airspace. Again what has this to do with ASI? In simple terms ATSOCAS change.

The main thrust for change is to provide a set of services that satisfy the requirement (customer need), are unambiguous (pilots know and understand what they are getting) and are uniformly available and applied by both civil and military controllers. Prior to ASI, an ATSOCAS review had been carried out by staff (military and civil) from the CAA Directorate of Airspace Policy (DAP); started in 2003, this review canvassed a large part of the UK aviation community the results of which were put into producing a Statement of User Requirement (SUR). This SUR was to provide the basis for any changes to the current ATSOCAS. The review was subsumed within the ASI process in 2006, and re-energised into an ATSOCAS change; this was considered fundamental to improving safety outside controlled airspace as it was regarded, by many, that the current ATSOCAS application by civil and military controllers had grown poles apart and this only added to aircrew misunderstanding and expectation of the services. The new services were developed by a joint civil/military group with the aim of producing a set of services that could be commonly applied and understood across the whole aviation community in the UK. Following several workshops and 'blue sky' thinking the draft ATSOCAS, contained within a single publication CAP 774, was put out for public consultation on 14 Sep 07. This was the first opportunity for those not involved in developing the services to proffer opinion, changes or challenge the process. The military used the Air Command-chaired, Military Users Airspace Coordination Team (MUACT)[2] committee forum to receive and

debate individual concerns and issues, of which there were several. These were collated and taken back to the ATSOCAS WG for consideration and key points were included in the formal MoD response to the CAA. This formal response called for some changes to the CAP, not least the ability to continue to take 500ft vertical separation against civil participating traffic (with pilots' agreement); ability for the military to impose specific service levels within UK FISs in order to achieve the required operational output in a safe and expeditious manner, and the need for pilot compliance to heading and level changes under the highest level of service unless the safety of the aircraft was compromised. In addition, the MoD raised concerns regarding the proposed implementation date of 10 Apr 08, given that final details of the new services were unlikely to be available before the end of Jan 08 and therefore training for both controllers and aircrew would have to be conducted within a very short time frame.

Royal Air Force Air Traffic Controllers

Royal Air Force Air Traffic Controllers on duty in the new control tower at RNAS Yeovilton

The Air Traffic Centre Swanwick in Hampshire

The ATSOCAS consultation period closed in Dec 07 and it was apparent from the consultation responses that the time scale for implementation (Apr 08) was too ambitious given the training requirements for both civil and military controllers. In addition, there were significant differences between main ANSPs regarding the uniform availability of services. The MoD considers it essential that all service providers offer the full range of ATSOCAS, in particular the higher level of service; this is seen as a significant enhancement to aviation safety within Class G and F airspace. There is still work to be done refining the services and overcoming this and other issues before an ATSOCAS change can take place. However, there is a will and confidence to make the necessary changes, and it is expected implementation could still occur this year although probably not before Winter 08/09. Progress and updates will be available from the ASI website or from DARS as the MoD ACEP representative.

The ASI process is now regarded as the forum to which all UK airspace and ATC service provision safety issues are tabled. The single oversight function is considered essential in ensuring that a wide variety of work strands are brought together in a coherent manner. The ACEP provides the necessary conduit to publicise changes and flight safety related airspace issues across the whole aviation community. ATSOCAS is probably the most significant change that will take place although work continues in many other areas to improve safety in Class G and F airspace.

The New ATC tower at RNAS Yeovilton

If safety initiatives are not embraced by the military, the stark alternative will be significantly more controlled airspace in the UK.

Notes
[1] DARS Heads Up, Aviate magazine.
[2] This Forum captures all MoD aviation stakeholders through wide representation on the committee.

Target Zero: A Culture of Safety

by Richard Burman, Bristow Group – Senior Vice President, Bristow Eastern Hemisphere
by Andy Evans, Bristow Group – Global Quality & Safety Standards Manager

Introduction

There is much attention in the civil aviation industry currently on safety management systems (SMS). From 1 January 2009 the International Civil Aviation Organisation will make having regulatory requirements for an SMS for civil operators, maintenance organisations, air traffic service providers and aerodromes a standard for each member nation. Proactive organisations have already established their own SMS and they have the advantage they can look beyond SMS. One observer has written:

The systematic application of safety management principles, culminating in the formal assurance that the goals can and are being achieved, can significantly help to achieve high levels of safety. However, such systems are, by their very nature, paper based and bureaucratic. They tend to set minimum common standards and can easily result in no more than the achievement of such standards, especially when there is competition for managerial attention and resources. A safety management system therefore defines sound systems, practices, and procedures, but is never enough if practised mechanically; an SMS requires an effective safety culture to flourish.[1]

Bristow Group is the world's leading provider of helicopter services to the oil and gas industry, operating around 400 aircraft in over 20 countries, flying around 300,000 hours each year in a range of demanding environments. The sustained high oil price means both an exceptionally high operational tempo currently and that we are undergoing our most sustained fleet renewal programme for a generation. Additionally Bristow is a highly experienced provider of search and rescue (SAR) services and flight training. It is one of the two partners behind FB Heliservices (a joint venture with the Cobham Group) providing a range of aircraft and services to the UK military. FBH account for a large proportion of the other 150 aircraft Bristow either owns or maintains.

While Bristow is best known in the UK for supporting the oil and gas industry in the North Sea, its SAR operations and for its involvement in FBH, Bristow aircraft can be found patrolling the Alyeska pipeline that runs across Alaska, providing SAR in the Netherlands, supporting the Australian Regional Aid Mission Solomon Islands (RAMSI) and a host of diverse operations in between.

Bristow have a fleet of 6 S-92s operating from the Shetlands in support of oil & gas exploration. Bristow's Norwegian associate Norsk Helicopters introduced the S-92 to Europe in 2005 and now also have 6. Their fleet leader is flying 2,000 hours per month.

This unique multinational operational portfolio means that we are exposed to the latest safety thinking in the aviation industry, the energy sector and the military.

Evolution of safety

It is already a well established concept that there are 3 'eras' of safety attention.

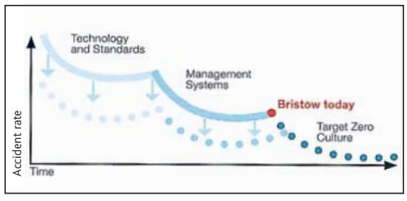

Figure 1: Three Eras of Safety Attention

The first era was mainly reactive. Safety improved as newer technology solved the problems with previous equipment and isolated reactive improvements were made in standards (procedures and training), often only after accidents. In the second, management system era, organisations become more proactive and system focused. They are monitoring service experience, making continuous improvement in standards and being more proactive in owning, assessing and managing their risks. A management system approach gives senior management better, more integrated, insight into their operations to enable better decision-making. Quality management systems have been common for many years and the SMS concept is simply an expansion of the application of management systems. One paradox with the SMS concept is that if you only have one because it is a regulatory requirement, then you probably are not truly embracing ownership of your own risks! The third age is one where attention is paid to an organisation's safety culture, both in itself and to make the SMS 'flourish'.

It is important to recognise that technology and standards, management systems and culture are not 3 mutually exclusive philosophies. As safety has evolved in each era, then the new philosophy has supplemented and enhanced the previous. Proactive organisations seek continuous improvements in each area. The relationship between technology and standards and management systems is straightforward. Management systems provide a means to manage proactive improvements in your assets and your procedures. The relationship between culture and management systems is less distinct.

The term 'culture' began to be used in relation to organisations in the early 1980s and 'safety culture' started to become widely used after the International Atomic Energy Authority published a report that discussed the concept in 1988, following the Chernobyl accident.[2] There have been many academic debates over

what a culture is and specifically what a safety culture is.[3] There has also been sound research on the observable signs that allow cultures to be classified,[4] and critical components of a safety culture such as reporting, just, flexible and learning elements have been identified.[2]

One definition of 'culture' is that it's 'the way that we do things around here'. Such a simplistic description does lead to confusion when interpreted as being a combination of what an organisation's procedures state (when they are followed) and what violations occur (when the procedures are not followed). Those who use this interpretation often conclude that an SMS is thus the solution to obtaining the desired safety culture.

We disagree and believe that culture is an attribute of the community of an organisation and how collective values, beliefs, expectations and commitments actually affect individual behaviour at all levels. So we believe that to influence culture you need more than management.

The greatest concern for any safety-conscious organisation should be how they influence their own culture to be a positive 'culture of safety' and that key aspect is rarely explained by this research.

Bristow is convinced that the way to proactively develop a 'culture of safety', a culture that allows the full advantage of the SMS concept, is through leadership.

Management and leadership are fundamentally different activities both generally and in relation to safety. It has been said that management is about coping with complexity whereas leadership is about coping with change.[5] Leadership focuses more on people and ultimately influences their behaviour, whereas management focuses more on analysis, control and scheduling of resources. It is important to understand that although different, these complementary activities are both vital to the successful functioning of any organisation. So if you have a vision for the future of your organisation, you need to combine management and leadership. Within Bristow we use this model to explain the relationship between management and leadership:

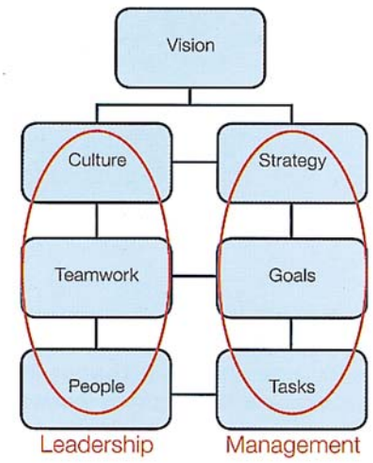

Figure 2: The Relationship between Leadership and Management

It is management activity that controls the SMS, but it is leadership that drives the safety culture. In the model there are links between strategy and culture, goals and teamwork and tasks and people. These links emphasise that management and leadership activities must be aligned.

While managers are appointed, leadership is not linked to one's position in the organisation. One of our beliefs at Bristow is that 'everyone can be a safety leader' and influence our culture of safety. One of our aims is to put that belief into action. Though when potential leaders do not understand the culture in which they are embedded, it is the cultures which will control them.[6]

Target Zero – the vision

Prior to 2004, for mainly historic reasons, Bristow Group had operated its Eastern Hemisphere operations (Europe, Africa, Asia and Australia) and Western Hemisphere operations (North and South America)

Bristow has provided search & rescues services to government agencies and oil & gas companies globally for 35 years.

independently. During that year a conscious decision was made to operate in a more integrated and global way. That meant starting to establish a single culture across these 2 organisations and our future acquisitions. A first step was holding a joint management conference in late 2004 and agreeing a common set of core values to set out on how we will conduct our business:

- Safety: Safety first!
- Quality and Excellence: Set and achieve high standards in everything we do.
- Integrity: Do the right thing.
- Fulfilment: Develop our talents and enjoy our work.
- Teamwork: Communicate openly and respect each other.
- Profitability: Make wise decisions and help grow the business.

You might wonder why a commerclal company would place profitability as the last on a list of values. That's because Bristow believe if we do the other 5 we will make a profit.

The next step, during 2005, was to develop a charter for how we expect leaders to behave.

Our Leadership Charter
Leaders in Bristow Group are committed to:

- **Leading by example** in accordance with the company's core values.
- **Building the trust and confidence** of the people with which they work.
- **Continually seeking improvement** in their methods and effectiveness.
- **Keeping people informed.**
- **Being accountable for their actions** and holding others accountable for theirs.
- **Involving people,** seeking their views, listening actively to what they have to say and representing these views honestly.
- **Being clear on what is expected,** and providing feedback on progress.
- **Showing tolerance of people's differences** and dealing with their issues fairly.
- **Acknowledging and recognizing people** for their contributions and performance.
- **Weighing alternatives,** considering both short and long-term effects and then being resolute in the decisions they make.

Figure 3: The Bristow Leadership Charter

Simultaneously, we set out to define our safety vision, a vision of where we would like to be in safety terms. Bristow is already an industry leader in safety performance. Over the past 5 years our air accident rate has been less than 40% of the air accident rate for that of all operators supporting the very demanding oil and gas industry worldwide. We concluded that the right vision for the future was one where we operate without accidents and without harm to people or the environment. That can be summed up in just two words 'Target Zero':

That vision was accompanied by its own logo, with a tag line that associates that vision with

Bristow operates Bell 412s in Trinidad, Mauritania and Nigeria

TARGET ZERO
The Bristow Group Culture of Safety
Zero accidents.
Zero harm to people.
Zero harm to the environment.

Figure 4: The Bristow Safety Vision: Target Zero

a 'culture of safety'. In order to build a global Target Zero culture of safety we decided to market Target Zero in a high quality campaign, making 'Target Zero' shorthand for what we want to achieve. Similarly, the simple but distinctive logo was designed to be a graphical representation of our safety vision.

Some might think that 'zero' is an idealistic but impossible target in a high hazard industry. However, at Bristow we believe that accidents do not just 'happen', but are 'caused', and so all accidents are therefore potentially preventable. Target Zero is a challenging target, which sends the clear message that we believe that accidents can and should be prevented and that we have a duty to strive to not only reduce risks to as low as reasonably practical but to look to advance the state of the art to seek new ways to further reduce risk. We don't believe we can be in business, even a high hazard business, and have an 'acceptable' attrition rate.

This continues a tradition that Bristow have had for many years of taking a direct role in advancing safety. In the late 1980s, Bristow's design group developed and introduced one of the first helicopter Health & Usage Monitoring Systems (HUMS), integrated with a flight data recorder. Today we are pushing this technology further in joint in-service trials with the UK Civil Aviation Authority (CAA) and General Electric into cutting edge data processing techniques to improve the current HUMS effectiveness. In the late 1990s we started our Helicopter Operational Monitoring Programme (HOMP) that has demonstrated the great safety benefit of flight data monitoring for helicopters. In 2007, in partnership with a small but dynamic US avionics company, Appareo, we developed a new lightweight, $5,000 flight data recorder and HOMP system called ALERTS (the Aircraft Logging and Event Recording System for Training and Safety). This will spread this benefit to smaller helicopters, and revolutionise safety in the general aviation market. Currently we have 45 of our own aircraft equipped with ALERTS. Meanwhile we have had another world first with the first demonstration of Airborne Collision Avoidance System 2 (ACAS2) technology on a helicopter.

These are good examples of how a desire to prevent accidents can drive a management system to identify technology and standards improvements to improve safety in an integrated way.

Figure 5: Would you...?

To back up the vision a more specific set of safety beliefs, expectations and commitments were developed. The final step before we started to communicate the Target Zero message was to conduct a survey in 2006 across all our operations to get an understanding of how our employees perceived safety.

Target Zero – enhancing our culture

In early 2007 we launched Target Zero. There was a conscious decision not to centrally organize cascade briefings. Target Zero will only be credible if everyone's own supervisor and line manager is actually exhibiting appropriate safety leadership behaviours, and that includes communicating the message. Briefing and engaging their own teams is thus a fundamental initial demonstration of such leadership behaviour, and as one researcher wrote:

When leaders walk into the workplace they see the behaviour of their people, but they also see ref/ected in them their own behaviour.[7]

While improving a culture is a long-term project, destabilising a culture can be an unintended consequence of just a few misguided words or actions.

So a group of over 500 managers, supervisors and others in positions of influence took part in a series of 24 Safety Leadership Workshops. Twenty were held in just 7 weeks in 9 locations in the US, UK, Nigeria and Australia to generate a high level of momentum, with 4 more to subsequently satisfy the demand.

In these workshops our aim was to enhance their leadskills so the participants could:

1. Confidently convey the Target Zero message when they engage with their own teams face to face.

2. Seek some tangible safety improvements to demonstrate commitment.

3. Lead on safety by example and hold their own teams accountable for their safety behaviour.

As well as explaining the Target Zero concept, each 2-day workshop covered coaching and leadership skills, featured a safety decision making exercise, an accident case study, a description of our key SMS principles and a physical team exercise to practise safety leadership. To show that these workshops were designed to be just the first stage of an ongoing process each participant had to then develop their own Target Zero implementation plan to make a difference in their own workplace. They were supported with a range of briefing and campaign materials.

During these workshops we also developed the idea for our first poster campaign, one that emphasises that we except people to 'see the dangers, say something, listen and take action'.

One issue that had been the subject of a lot of management attention in 2006, and highlighted also in our safety survey that year, was the difficulty of finding high quality new pilots. At the same time we launched Target Zero we also took decisive action by purchasing a high quality flight training school in the US. Now re-branded as Bristow Academy they have 4, soon to be 5, campuses in the US and UK. They do European JAA, US FAA and military training in the US and in the UK they conduct instrument training at Norwich and are introducing an EC225 and S-92 simulator centre at Aberdeen. Bristow Academy will now allow us to select and develop our own pilots in-house, exposing them to the Target Zero culture from day one.

At the end of 2007 we ran our second safety survey, which has given us good feedback on both our successes, and further opportunities for improvement.

During 2008 a major new element will be the development of a network of Target Zero Champions to facilitate specific safety improvement campaigns. Their first project will be to roll out an enhanced version of our existing behavioural-based safety scheme. This initiative will train all employees to make safety observations and interventions to reinforce safe behaviours and eliminate at-risk behaviour. Linked with this we will be introducing a means to reward and recognise proactive safety efforts to further reinforce positive safety behaviour.

Conclusions

By clearly identifying safety culture as something that must be handled in a different way to an SMS, Bristow has identified leadership as the 'secret ingredient' necessary to build a strong 'culture of safety' and to thus make our SMS even more effective.

Are we where we want to be yet? No! As we have set a demanding vision we have a long journey ahead, however we are confident that we are equipped to improve our safety performance and become a better organisation generally.

Notes

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Wheel/Tyre Pressurisation: Simple Precautions Can Save Lives

by Chris Dubuque Senior Engineer, Landing Gear Systems

In the last 20 years, a number of severe injuries – including several incidents of dismemberment and three fatalities – occurred during the inflation of nose wheel/tyre assemblies on airplanes. Over-pressurisation can cause an explosion that fractures the wheel during tyre inflation, ejecting fragments at high velocity. Typically, an unregulated nitrogen supply is responsible for the explosion. Virtually every accident involving nose wheel/tyre inflation can be prevented by consistently following simple precautions.

Inflating a commercial airplane's tyres is a routine task that occurs without problems thousands of times each day. Yet this job can turn deadly if standard safety precautions are not followed.

This article provides information to operators and maintenance, repair, and overhaul (MRO) shops to help prevent injury or death when maintenance personnel are inflating a wheel/tyre assembly.

Causes of Wheel/Tyre Assembly Explosions

Airplane wheel/tyre assemblies are inflated to high pressures, often in excess of 200 pounds per square inch (psi). Because the pressure in a nitrogen bottle or tyre-servicing cart can be as high as 3,000 psi, connecting the nitrogen source directly to the wheel without a regulator subjects the wheel to sudden high pressure that can exceed the design limits for the wheel, the wheel tie bolts, or the tyre. Consequently, the wheel, the wheel tie bolts, or the tyre can explode and become projectiles (see fig. 1), causing severe injuries, dismemberment, or death.

In most of the reported cases of related injuries, the wheel/tyre assembly that exploded was a nose wheel on a smaller-configuration airplane such as a 737 or DC-9. These tyres present a greater risk because their smaller size means they reach dangerous pressures faster than the tyres on main landing gear.

Figure 1 – Wheel damage due to overinflation
A maintenance worker was fatally injured in 2006 during inflation of a 737 nose wheel/tyre assembly with an unregulated nitrogen pressure source that allowed the wheel to be exposed to the full pressure inside the nitrogen bottle. In this case, the nitrogen bottle was reported to be at 3,000 psi while the service pressure for the wheel was 166 psi.

Tyre Inflation Precautions

Whenever an airplane tyre is being serviced, three layers of protection are normally in place to protect maintenance workers from wheel fracture:

- A pressure regulator on the nitrogen supply.
- A pressure relief valve on the tyre inflation tool.
- An overinflation pressure relief (OPR) valve installed in the wheel.

Pressure regulator on the nitrogen supply. Maintenance personnel should never attempt to inflate a wheel/tyre assembly in any maintenance or shop location without a regulator between the pressure source – such as a tyre-servicing bottle or cart – and the inflation valve on the wheels. It is *essential* that operators ensure regulated nitrogen sources are correctly used.

Boeing also recommends operators have back-up protection (such as additional regulation or pressure-relief devices) installed in *all* high-pressure nitrogen sources in case the primary regulator is not adjusted correctly or fails to properly regulate. Procedures for inflating the wheel/tyre assembly when it is installed on the airplane are located in Chapter 12 of the Airplane Maintenance Manual (AMM).

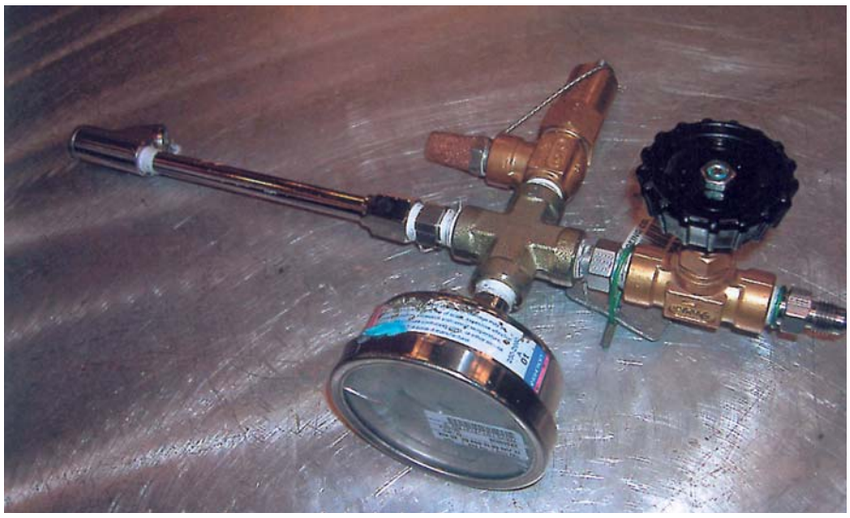

Figure 2 – TYRE INFLATION TOOL
A tyre inflation tool such as this adds another level of protection that can help prevent over-pressurisation of the wheels/Tyre.

Pressure relief valve on tyre inflation tools. Because many inflation valves on airplane wheels are similar to automotive valve designs, automotive tools are frequently used for airplane wheels. However, many Boeing AMMs specify a tool for tyre inflation that incorporates a pressure relief device designed to release at a pressure slightly higher than the tyre service pressure, providing an additional layer of protection if the nitrogen source is inadvertently at high pressure (see fig. 2).

OPR valve installed in the wheel. The risk of explosion increases greatly on wheels that are not equipped with an OPR valve. An OPR valve is a device similar to that shown in figure 3. It is included in many wheel assemblies to limit the pressure in the wheel/tyre assembly. If the pressure in the wheel exceeds a predetermined value, a disk in the OPR valve will rupture, allowing the gas to escape while reducing the pressure in the wheel before it can fracture. After the disk ruptures, the gas in the wheel exits through the OPR valve. The valve is designed so that when the disk ruptures, the gas will exit from the wheel faster than it can be supplied from the pressure source. Certain older wheels do not include this valve. As a result, Boeing recommends the following retrofits:

Figure 3 – OPR VALVE
An OPR valve should be installed on every wheel assembly. It provides a valuable layer of protection that can help prevent wheel/tyre explosions that result from introducing an excess of pressure to the airplane tyre.

DC-9/MD-80 operators: Boeing recommends retrofitting an OPR valve into all nose wheels per McDonnell Douglas Air Operator Letter 9-2274, "Nose Landing Gear Wheel Assembly Failure," dated July 21, 1992.

737-100/-200 operators: Boeing recommends retrofitting the OPR valve into all nose wheels per Honeywell Service Bulletin 2601045-32-002, "Modification of the 737-100/-200 Nose Wheel Assembly P/N 2601045-2 Into Assembly P/N 2601045-3, for Installation of a Safety Relief Valve" dated August 31, 2000.

Using Portable Nitrogen Carts

Portable nitrogen carts (see fig. 4) are often used to service high-pressure equipment (such as accumulators) as well as low-pressure equipment (such as tyres). To accommodate this range of equipment, nitrogen carts are typically equipped with both a high-pressure regulator and a low-pressure regulator.

It is essential that operators ensure the hose and fitting sizes are different between the high- and low-pressure sides so that the high-pressure side cannot inadvertently be used on a low-pressure device. The high- and low-pressure sides also should be clearly marked.

Inspecting Wheel Tie Bolts, Nuts, and Washers

Because worn or damaged wheel tie bolts, nuts, or washers can cause (or contribute to) a dangerous wheel fracture, it is essential that operators and MROs place proper emphasis on inspection and replacement of this hardware. Each wheel Component Maintenance Manual (CMM) or overhaul manual provides specific inspection and rejection criteria for wheel tie bolts, nuts, and washers.

The Importance of Ongoing Training

Boeing recommends that operators and MROs train shop and maintenance personnel about the hazards associated with inflating wheel/tyre assemblies. Boeing also recommends that operators and MROs place extra emphasis on wheel tie bolts, nut, and

washer maintenance because this hardware can cause (or contribute to) dangerous wheel fractures.

Summary

In the past 20 years, several accidents have occurred during tyre servicing in which the wheel exploded because of over-pressurisation, causing dismemberment or death to service personnel or damage to equipment. It is essential that tyre-servicing equipment be equipped with a regulator to prevent tyres from being subjected to excessive pressures that can result in an explosion. In addition, strict adherence to established procedures in the AMM and CMM will help ensure the safety of maintenance personnel during tyre servicing. For more information, please contact Chris Dubuque at christopher.v.dubuque@boeing.com.

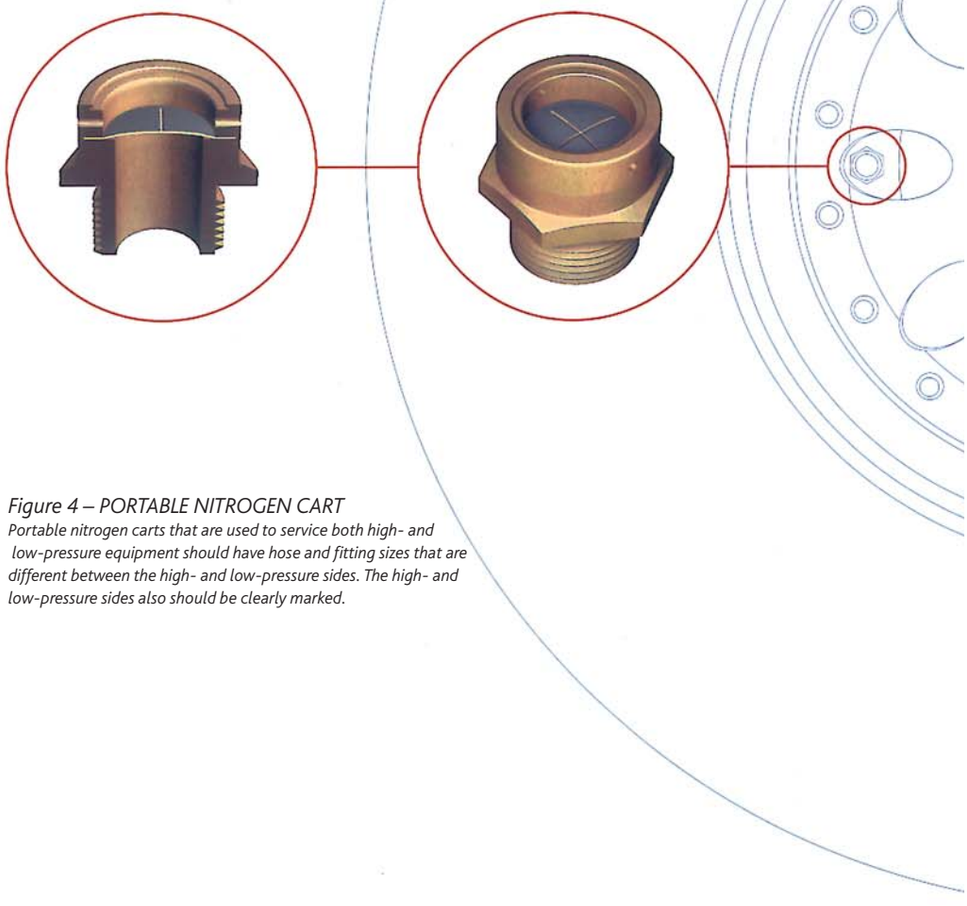

Figure 4 – PORTABLE NITROGEN CART
Portable nitrogen carts that are used to service both high- and low-pressure equipment should have hose and fitting sizes that are different between the high- and low-pressure sides. The high- and low-pressure sides also should be clearly marked.

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Corporate Manslaughter

by Edward Spencer & Stuart Broom, BLG

As the Corporate Manslaughter and Corporate Homicide Act comes into force, we examine how it compares to the existing common law offence and also identify its potential application to air operators - both domestic and foreign.

The Corporate Manslaughter and Corporate Homicide Act 2007 came into force on 6 April 2008 creating an offence of Corporate Manslaughter in England and Wales, and Corporate Homicide in Scotland. An organisation will now be guilty of the offence of Corporate Manslaughter if the way in which its activities are managed or organised causes a person's death and amounts to a gross breach of a duty of care owed to that person, provided that the way in which the activities are managed or organised by its senior management is a substantial element of this breach.

The Act will have no application to individuals, and therefore the common law offence of gross negligence manslaughter can still be committed by individuals within a company. In addition, the Act will not prevent action being brought by the Health and Safety Executive under s.37 of the Health and Safety at Work Act.

The new Act, so far as corporate liability is concerned, replaces the previous common law regime in which the "controlling mind" of the company had to be responsible for the way in which the management or organisation of the corporation led to a person's death. This was ultimately regarded as too onerous a threshold, as reflected by the fact that, since 1992, there have only been approximately 30 prosecutions for work-related corporate manslaughter. The test was particularly difficult to satisfy in respect of large organisations with complex management structures. Therefore, it was mainly very small companies who were successfully prosecuted.

The new offence will be markedly different. It will analyse whether the "senior management" of a corporation was responsible for a substantial element of the gross breach of the duty of care. The definition of "senior management" within the Act is very broad. It includes persons who play a significant role in the making of decisions about how the whole or a substantial part of the organisation's activities are to be managed or organised, or the actual managing or organising of the whole or a substantial part of its activities. The Act is obviously in its infancy, and there is therefore little further guidance as to the practical scope of this definition. However, it will clearly be important for organisations to recognise this expansion of responsibility, and to ensure that all members of its management team are aware of the potential liabilities involved.

When a jury is deciding whether or not there has been a breach of the duty of care, and whether the senior management were responsible for a substantial element of the breach, they can take into account a wide variety of factors. These include the attitudes, policies, systems or practices within the organisations that were likely to have encouraged such a breach, or have produced a tolerance of this level of behaviour. They will also have regard to any health and safety guidance relating to the breach, and any other relevant factors. Therefore, the jury will be given access to a very wide range of information relating to all aspects of the organisation in order to reach a verdict.

There are some limitations to the application of the Act. It only applies to deaths caused within the UK or its territorial waters. However, the aviation industry should be aware that under s.28(3) of the Act, it extends to include harm resulting in death caused on a "British-controlled aircraft" - wherever it may be - within the meaning of s.92 of the Civil Aviation Act 1982. In essence, this means that all operators of UK-registered aircraft will be potentially subject to the new offence. However, by virtue of the definition of "British-controlled aircraft" for the purposes of s.92 of the Civil Aviation Act 1982, there may be limited circumstances in which operators of foreign or non-registered aircraft are exposed to the new Act by virtue of UK business connections they may have.

If an offence is committed by a company then it will be liable to pay an unlimited fine, and may be given a publicity order and/or a remedial order. The level of fine will reflect the seriousness of the offence and ensure that those responsible for governance of the organisation are properly aware of the need for a safe environment. Although there is no statutory limit, the Sentencing Advisory Panel have suggested between 2.5% and 10% of average turnover calculated over a three year period. This will then be increased if there are aggravating factors (e.g. multiple persons killed, failure to act on cautions/warnings etc.), and reduced if there are mitigating factors (e.g. an employee was acting outside the scope of his/her authority when the incident occurred).

Remedial orders can also be made requiring specified actions which will address the cause of the deaths.

A new sanction soon to be made available under the Act (but not currently in force) is a publicity order. This is potentially a very damaging penalty to a company. It allows the court to publicise in a specified manner the conviction and the particulars of the offence, along with the terms of the remedial order imposed. These orders may have a major impact on the reputation of the company, and will have knock-on effects on business, share prices and insurance premiums to name but a few.

With the creation of this new offence, corporations would be well advised to review their health and safety procedures and ensure that the senior management team is aware of the new Act and is able to develop appropriate safety management programs, risk assessment modelling and ongoing safety audits of the organisation's operations. Promoting a culture of safety consciousness in this way is critical for obvious reasons. It may also be necessary to review the wording of existing insurance policies to ensure that they will provide adequate cover for legal fees arising out of a prosecution.

Why is DHL Air undertaking a Line Operations Safety Audit?

Foreward by Capt. Gordon Hutchins

When an airline decides to undertake a Line Operations Safety Audit, LOSA, it is not just opening up its entire operation to detailed scrutiny, it is also making a long term commitment to make the necessary changes to improve its safety culture. The whole process will take a couple of years and begins with a series of observations of normal line flying.

Once the observations are complete, there will be many months of work sorting and analysing the data collected before the final report is written. This "warts and all" report, which will be available to the crews, details in safety terms; what the airline does well, where the airline needs to improve its operation and the most significant problems that the crews face on a daily basis.

The emphasis of LOSA then shifts to departmental level, where the issues highlighted in the report are targeted directly by the managers responsible. Now, you might be forgiven for asking why any Airline would ever consider embarking on such an endeavour and indeed that was the main question that I asked before becoming involved in the project.

So what's in it for DHL Air?

Traditional flight safety tools such as ASRs and the QAR only report on what has already happened and only show a trend when a problem has occurred a number of times. On the other hand, LOSA takes a snapshot of the real life operation and is able to highlight systemic weaknesses before they have a chance to lead to Flight Safety issues. From the Companies viewpoint, it is a way of strengthening and enhancing the Flight Safety infrastructure. However, it also has financial benefits because it helps to target departmental resources much more effectively.

Now consider LOSA from the crew's perspective. Within the spirit of LOSA crew participation is entirely voluntary. So when you are approached by an observer who wants to conduct an observation on your flight you have the option to invite him along for the trip or turn him away. It's your choice. However, spare a moment to consider the benefits of LOSA for you and the line pilots as a whole. In essence, **'what's in it for me?'** By agreeing to be observed you will be allowing the observer, who is a fellow line pilot, a chance to share and document what happened on a particular flight. For the first DHL Air LOSA, up to 90 normal line flights will be observed and from this, both strengths and weaknesses in the system will become apparent. We can all have a guess at what we think the main issues are within the operation and indeed LOSA provides a very valuable opportunity to express your concerns by way of a crew survey. The bottom line is that the LOSA process is probably the best way we will ever have available, as crew, to formally document and address the issues we face daily on line flying.

DHL Air is planning to start the LOSA observations in autumn this year. In the meantime probably all the information you will ever need to know on LOSA is contained in this comprehensive article from the Flight Safety Foundation, Flight Safety Digest, Feb 2005. If you have any comments or questions then please contact myself, Captain Gordon Hutchins or Gavin Staines, (01332 8578 66 or email: gavin.staines@dhl.com) to learn more. Within the spirit of LOSA, we will endeavour to deal with any questions as openly and honestly as we can.

Line Operations Safety Audit (LOSA) Provides Data on Threats and Errors

by Flight Safety Foundation Editorial Staff

Structured observations of routine flight operations help reveal an airline's strengths and weaknesses. The nonpunitive data-collection program – a planned cornerstone of internationally required safety management systems – is being adapted to other areas, including flight dispatch, apron operations and air traffic control.

The line operations safety audit (LOSA) – which involves the collection of data by trained observers during routine flights to determine how flight crews detect, manage and mismanage threats and errors – has been endorsed by the International Civil Aviation Organization (ICAO) as a tool for monitoring normal flight operations and developing countermeasures against human error.[1]

ICAO in 2002 published Document 9803, Line Operations Safety Audit (LOSA), which contains detailed information on planning and conducting a LOSA. The manual provides guidelines for airlines on using LOSA data to gauge op-erational strengths and weaknesses. LOSA also enables airlines to compare data among de-identified data gath-ered by other airlines.

"Document 9803 is the bible of LOSA," said Capt. Don Gunther, director of human factors and safety for Continental Airlines.[2] "The beauty of following the guidelines in '9803' is that you can compare your data with all other airlines that have done LOSAs. You don't know who the other airlines are, but the de-identified data indicate how you com-pare to the industry.

"If you have an issue, and no one else does, you can find out what you're doing wrong. If you have an issue, and everybody else does, too, you know it's an industry issue; and collectively, we might be able to find a solution."

LOSA complements other safety-data-collection systems such as flight-data monitoring (e.g., flight operational quality assurance [FOQA] programs) and voluntary reporting (e.g., aviation safety action programs [ASAP]).

Capt. Daniel E. Maurino, coordinator of the ICAO Flight Safety and Human Factors Program, said that the organiza-tion currently is drafting standards for safety-management systems that will include LOSA, FOQA and ASAP as es-sential components.[3]

"LOSA has raised the level of safety analysis and provides airlines with earlier warnings of potential problems," he said. "With FOQA, for example, we know that we have a problem with unstabilized approaches, but we need to expe-rience the unstabilized approaches to trigger the data capture. It's the same thing with ASAP."

LOSA conferences are conducted annually by ICAO. The first conference was in Hong Kong, China, in 2000. Sub-sequent conferences were conducted in Panama City, Panama; Dubai, United Arab Emirates; Dublin, Ireland; and Seattle, Washington, U.S.

Program Initiated to Check CRM

With funding from the U.S. Federal Aviation Administration (FAA), the University of Texas at Austin (Texas, U.S.) Hu-man Factors Research Project (UTHF) in the early 1990s placed trained observers in aircraft jump seats to help air-lines gauge the effectiveness of crew resource management (CRM) during routine airline flights.

The flight observations were the precursors of LOSA. Robert L. Helmreich, Ph.D., a professor of psychology at the University of Texas and leader of the UTHF, said that the first flight observations were conducted in 1994 at the re-quest of Delta Air Lines.[4]

"This study involved the observation of 480 line flights," Helmreich said. "Delta Air Lines had developed and imple-mented an intensive multi-day CRM training course, which it believed had improved crew coordination and enhanced safety. However, senior airline management felt it important to confirm whether the behaviors being taught were, in fact, practiced during line operations." Similar flight observations were conducted by Air New Zealand, American Airlines, Continental Airlines, Trans World Airlines and US Airways. The observations showed that the practice of CRM on the flight deck was substantially dif-ferent than in airline training environments and resulted in the development of advanced CRM concepts and "new ways of thinking about crew performance," ICAO said. Helmreich said that the early flight observations did not provide adequate

information about how flight crews adhere to standard operating procedures (SOPs) or about environmental influences on crew performance. UTHF and Conti-nental Airlines in the late 1990s expanded the concept and methodology to include the recording of threats (e.g., adverse weather conditions) and errors (e.g., human mistakes) and how flight crews deal with them.

"This change greatly enhanced the usefulness of LOSA for airlines, expanding it from a CRM audit to one which places CRM skills into perspective as operational threat-and-error countermeasures," he said.

TEM Model Provides Focus

The concept and methodology of LOSA currently are based on the threat-and-error management (TEM) model developed by UTHF (Figure 1). ICAO calls TEM the "fifth generation of CRM," which, in the context of LOSA, is based on the premise that "human error is ubiquitous, inevitable and a valuable source of information."[5]

"Essentially, the model posits that threats and errors are integral parts of daily flight operations and must be man-aged," ICAO said.[6] "Therefore, observing the management or mismanagement of threats and errors can build the desired systemic snapshot of performance." ICAO said that the TEM model provides a framework for data collection and categorization, and helps to answer questions such as the following:

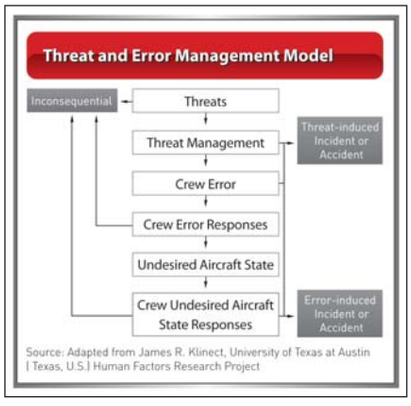

Figure 1

- "What type of threats do flight crews most frequently encounter? When and where do they occur, and what types are most difficult to manage?
- "What are the most frequently committed crew errors, and which ones are the most difficult to manage?
- "What outcomes are associated with mismanaged errors? How many result in an undesired aircraft state [e.g., al-titude deviation, marginal fuel supply, unstable approach]? [and,]
- "Are there significant differences between airports, fleets, routes or phases of flight vis-à-vis threats and errors?"

Threats are defined as expected or unexpected external situations that must be managed by the flight crew.

"[Threats] increase the operational complexity of the flight and pose a safety risk to the flight at some level," ICAO said.

Threats Include Errors by Others

Threats include adverse weather conditions, hazardous terrain, aircraft and aircraft system abnormalities and mal-functions, time pressures and unfamiliar airports. Threats also include errors that are committed by others – including ground-handling personnel, maintenance technicians, dispatchers, flight attendants and air traffic controllers – and that must be managed by the flight crew.

Flight crew errors are defined as actions and inactions that lead to deviations from the intentions or expectations of the flight crew or the airline.

"Errors, in the operational context, tend to reduce the margin of safety and increase the probability of accidents or incidents," ICAO said.

The TEM model characterizes flight crew errors as follows:

- Intentional noncompliance errors are "willful deviations from regulations and/or operator procedures," ICAO said. Examples include violating the "sterile-cockpit rule,"[7] omitting required callouts, using nonstandard pilot-controller communication phraseology, conducting checklists from memory, and failing to re-spond to traffic alert and collision-avoidance system (TCAS) warnings or terrain awareness and warning system (TAWS) warnings;[8]
- Procedural errors are "deviations in the execution of regulations and/or operator procedures [in which] the intention is correct but the execution is flawed." This category includes errors in which flight crewmembers forget to do some-thing. Examples include failing to conduct checklists, incorrectly setting instruments and failing to cross-check instru-ment settings;
- Communication errors include "miscommunication, misinterpretation or failure to communicate pertinent informa-tion among the flight crew or between the flight crew and an external agent [e.g., air traffic controller, ground-handling personnel]." Examples include failing to hear air traffic control (ATC) instructions, failing to read back ATC instructions and crew miscommunication;
- Proficiency-based errors involve "lack of knowledge or psychomotor ('stick-and-rudder') skills." Examples include inadequate knowledge of aircraft systems and equipment that contribute to hand-flying errors, automation errors or other errors that can influence the direction, speed or configuration of the aircraft; and,
- Operational decision errors are "decision-making errors that are not standardized by regulations or operator pro-cedures and that unnecessarily compromise safety." ICAO said that an operational decision error includes at least one of the following conditions: the flight crew ignores a more conservative option; the crewmember who took the decision does not brief other

crewmembers about the decision; or the crew does not use available time to evaluate options. Examples include navigating through known areas of adverse weather and accepting ATC instructions that result in an unstable approach.

The TEM model posits that when an error occurs, the flight crew either traps (i.e., detects and manages) the error, exacerbates the error with action or inaction that results in additional error, or fails to respond to (i.e., ignores) the error.

Crews Trap Most Errors

Most errors that occur during routine flight operations are trapped and thus have inconsequential outcomes, ICAO said. When a crew exacerbates an error or fails to respond to an error, the outcome could be an undesired aircraft state, an accident or an incident.

Maurino said that the concept of undesired aircraft state is a hallmark of LOSA.

"An undesired aircraft state is a transitional state, and the crew is still in the 'driver's seat,' so to speak," he said. "An airspeed deviation, for example, might be corrected by the crew before the approach becomes unstabilized. The observer can capture what the crew is doing – successful strategies to prevent an unstabilized approach. And that is a success story."

Following are examples of incidents observed during flight observations and how they fit in the TEM model:[9]

- Before departure, the first officer committed a procedural error when he entered an incorrect waypoint in the flight management system (FMS). The error was inconsequential because it was trapped during a subsequent cross-check of FMS data;
- A communication error was committed when the pilot not flying told the pilot flying to taxi onto the wrong runway. The pilot flying exacerbated the error by taxiing onto the wrong runway. The outcome was inconsequential because the unde-sired aircraft state (being on the wrong runway) was managed by a review of the airport chart and by taxiing the aircraft off the wrong runway; and,
- Nearing Flight Level (FL) 220 (approximately 22,000 feet) during climb, the controller told the crew to maintain FL 220; the captain committed a procedural error when he inadvertently pushed the autopilot altitude-hold button twice, thus engaging and disengaging the altitude-hold mode. The crew did not notice the error, but the captain observed the undesired aircraft state (altitude deviation) and recovered by flying the aircraft to the assigned alti-tude and properly engaging the altitude-hold mode.

ATC Threats Are Most Frequent

As of October 2004, 21 airlines worldwide had conducted LOSAs or were conducting their first LOSA. Three airlines had conducted multiple LOSAs.[11]

UTHF presented data from 1,310 U.S. airline flight observations at an FAA conference in October 2004; the data showed the following:

- One or more threats occurred during 90 percent of the flights;
- Crew error resulting from mismanaged threats occurred during 22 percent of the flights;
- The most frequent threats were from ATC (encountered during 47 percent of the flights); weather conditions (40 percent of the flights) and aircraft malfunctions or

minimum-equipment-list items (23 percent of the flights);

- Among the ATC threats, 50 percent involved the issuance of difficult/demanding clearances and 20 percent in-volved a runway change; 14 percent of these threats were mismanaged; and,

- Of the mismanaged ATC threats, 66 percent occurred during descent, approach and landing.

The data showed the following results about errors:

- One or more errors occurred during 64 percent of the flights;

- The most frequent errors involved hand-flying (21 percent); checklists (20 percent) and communication/coordination between flight crews and ATC; and,

- Most of the errors (43 percent) occurred during descent, approach and landing; 27 percent occurred before de-parture; 22 percent occurred on takeoff; and 4 percent occurred during cruise.

Multiple Audits Identify Trends

Data collected by a U.S. airline during its first systemwide LOSA showed an undesired number of below-standard lead-ership ratings of captains, a high number of approaches that did not meet the airline's criteria for stabilized approaches and a low rate of error trapping.[12]

Among actions taken by the airline were the implementation of a leadership module in its recurrent training syl-labus, revision of stabilized-approach procedures and implementation of error-management training for pilots and check airmen.

When the second LOSA was conducted three years later, the airline found a significant improvement in leadership ratings, a 70 percent reduction in unstabilized approaches continued below 1,000 feet and a twofold increase in the error-trapping rate.

Specific Operating Characteristics Defined

Although airlines are encouraged to set their own goals and to determine how a LOSA can be conducted most ef-fectively to meet their needs, ICAO has established the following specific operating characteristics that must be in-corporated in a LOSA:

- Jump-seat observations during normal line operations. Observations must be conducted during routine flights, rather than during line checks or training flights when the presence of another observer would increase "an al-ready high stress level, thus providing an unrealistic picture of [flight crew] performance";

- Joint management/pilot sponsorship. Among the first steps in conducting a LOSA is to achieve a signed agreement between airline management and pilots (typically, the pilot organization) and to form a steering committee comprising representatives of both parties. The function of the steering committee is to oversee the planning and scheduling of flight observations, and the verification of data collected during the observations;

- Voluntary crew participation. A flight observation cannot be conducted without the flight crew's permission. "The crew has the option to decline, with no questions asked," ICAO said. "The observer simply approaches another flight crew on another flight and asks for their permission to be observed";

- De-identified, confidential and safety-minded data collection. Observers must not record anything that could identify flight crews or flights – including names, flight numbers and dates. "This allows for a level of protection against disciplinary actions," ICAO said. "The purpose of LOSA is to collect safety data, not to punish pilots... If a LOSA observation is ever used for disciplinary reasons, the acceptance of LOSA within the airline will most probably be lost forever";

- Targeted observation instrument. Most airlines use the LOSA observation form developed by UTHF to record general flight information (e.g., city pairs, aircraft type, crew experience), crew performance in detecting and managing threats and errors during various phases of the flight, and other in-formation. "It is not critical that an airline use this form, but whatever data-collection instrument is used needs to target issues that affect flight crew performance in normal operations," ICAO said;

- Trusted, trained and calibrated observers. Observers typically are selected from among the airline's line pilots, in-structor pilots, safety pilots and management pilots, and from the pilot organization's safety committee members. "It is critical to select observers [who] are respected and trusted within the airline to ensure the line's acceptance of LOSA," ICAO said. Before conducting flight observations, the observers must receive training on LOSA concepts and methodology, including the use of the targeted observation instrument;

- Data-verification round tables. "A round table consists of three or four department [representatives] and pilots' association representatives who scan the raw data for inaccuracies," ICAO said. "The end product is a data-base that is validated for consistency and accuracy according to the airline's standards and manuals, before any statistical analysis is performed";

- Data-derived targets for enhancement. "As the data are collected and analyzed, patterns emerge," ICAO said. "Certain errors occur more frequently than others, certain airports or events emerge as more problematic than others, certain SOPs are routinely ignored or modified, and certain maneuvers pose greater difficulty in adher-ence than others. These patterns are

identified for the airline as LOSA targets for enhancement. It is then up to the airline to develop an action plan based on these targets"; and,

- Feedback of results to the line pilots. "Pilots will want to see not only the results but also management's plan for improvement," ICAO said.

LOSA Collaborative Provides Assistance

Most airlines that have conducted LOSAs since 2001 have engaged the services of a private organization, the LOSA Collaborative, in the program.

James R. Klinect, CEO and managing director of the LOSA Collaborative and a part-time UTHF researcher, said that he formed the organization after FAA reduced funding for LOSA.[13]

"FAA was interested in funding work done with U.S. airlines," he said. "Over time, we noticed that the funding was constantly being cut. Because of the funding shortfalls and because we had done cross-cultural work before and wanted to branch out from the U.S. airlines, we formed the LOSA Collaborative. Instead of having airline LOSAs funded by research dollars, we have passed the costs along to the airlines."

Among the organization's services are participation in program planning and observer training. Independent observ-ers trained by the LOSA Collaborative are available to participate in flight observations.[14]

"We have a cadre of about 12 observers based around the world (Australia, England, New Zealand, Singapore and the United States)," Klinect said. "All of our observers are retired pilots. Many of them are former check airmen, and some were training-program developers. We ask the airline for copies of their manuals several weeks before a pro-ject, so we can have some familiarity with their operation.

"Since the start of the LOSA Collaborative in 2001, the only non-pilot from our group conducting observations has been me. I try to conduct one or two observations during every project to keep current." Nevertheless, airlines sometimes use non-pilot employees as observers.

"Non-pilots are not used unless they have enough familiarization with company SOPs and are able to anticipate flight crew actions in a cockpit," Klinect said. "Therefore, non-pilot ground school or simulator instructors are great examples and have been used as LOSA observers representing the airline. This is rare, though; most LOSA ob-servers representing their airline are current line pilots."

The LOSA Collaborative provides a computer program that facilitates the recording of notes and data gathered by observers.

"The files are sent to the LOSA Collaborative, and we build a database," Klinect said. "We conduct round tables with airline personnel to verify the data – ensuring, for example, that the observed errors are actually errors according to the airline's flight standards. We then analyze the data and provide a full report of our findings to the airline."

The final report identifies targets for enhancement and de-identifies, aggregate data from other airlines, where appropriate.

"When we provide the final report, we include a comparison with other airlines on data such as threat-management rates, automation errors and so forth," Klinect said. "We might say, for example, that 40 percent of the customer-airline's observed flights had an aircraft-malfunction threat that the crew had to manage, compared to 10 percent to 15 percent of the observed flights at other airlines. We'll tell the customer airline that this is a target for enhancement, that they might want to look at this because their rate is so much higher than other airlines."

Fees for the organization's services vary according to the scope of the LOSA. Klinect said that fees typically range from about US$50,000 for a relatively small airline to about $100,000 for a large airline.

"Seventy-five percent of that fee is for data verification and analysis, and for preparing the final report," he said. Klinect said that he knows of only two airlines that have conducted LOSAs adhering to all 10 operating characteris-tics specified by ICAO without the assistance of the LOSA Collaborative: Futura International Airways and Lan Chile.

"I don't know of any major carriers that have done it by themselves," he said. "Airlines that conduct their own LOSAs do not send their data to the LOSA Collaborative; their data likely would not match our database."

Klinect said that only UTHF researchers have access to de-identified data that airlines have agreed to submit for re-search. Otherwise, all data are kept in confidence within the LOSA Collaborative.

Steering Team Guides Program

The LOSA steering team should be led by the airline's safety department, which typically conducts internal audits, con-fidential incident-reporting systems and flight-data-monitoring programs, and "often holds the trust of the line pilots regarding confidential information," ICAO said.[15]

The steering team decides which flight operations will be observed and selects specific targets for the observations.

"One common mistake is to try to tackle too much at one time," ICAO said. "When doing this, the effort can be enor-mous and the data findings can be overwhelming."

Focusing a LOSA on a specific fleet or flight operation can help keep the program manageable. For example, one airline decided to conduct its first LOSA on international operations and to focus on domestic operations in a later LOSA.

ICAO said that although observations of every flight crew would be ideal, this is not necessary to collect sufficient data. Depending on the size of the fleet or flight operation, observation of

30 flight crews to 50 flight crews is suffi-cient to provide statistically valid data. Findings from confidential-reporting programs and from FOQA can help in the selection of specific targets, such as checklist usage and approach stabilization.

Good Observers Are 'Flies on the Wall'

Observers should be selected carefully because "the quality of data collected depends entirely on who is collecting that data," ICAO said. An important requirement is knowledge of the airline's procedures and operations. Check air-men and instructors, however, must step out of these roles when conducting LOSA observations.

"Observers should create an environment where the crews hardly realize that they are being observed," ICAO said. "It is imperative that crews do not feel as if they are being given a check ride... The LOSA observers must clearly understand that their role is limited to collecting data, not to disciplining or critiquing flight crews."

Experience has shown that the best data-collection results have been achieved by observers who used a "fly-on-the-wall" approach.

"The best observers learn to be unobtrusive and nonthreatening; they use a pocket notebook while in the cockpit, re-cording minimal detail to elaborate on later," ICAO said. "At the same time, they know when it is appropriate to speak up if they have a concern, without sounding authoritarian."

Results Should Be Shared With Pilots

After analysis of the data is completed, a written report should be prepared for airline managers and pilots. The report should present the overall findings clearly and concisely.

Capt. Alex de Silva, division vice president of safety, security and environment for Singapore Airlines, which con-ducted a LOSA in 2003 and

will conduct another audit in 2006, said that the recommendations included in the final report are a crucial element.[16]

"The LOSA steering committee should address all the issues identified in the report," he said. "Subject-matter ex-perts from each area should formulate a two-pronged action plan that combines specific approaches and systemic approaches to resolve the areas identified as targets for enhancement."

ICAO said, "The LOSA report should clearly describe the problems the analyzed data suggest but should not provide solutions. These will be better provided through the expertise of each of the areas in question [e.g., operations, training, standards]."

ICAO recommends the following report outline:

- "Introduction – Define LOSA and the reasons why it was conducted;
- "Executive summary – Include a test summary of the major LOSA findings (no longer than two pages);
- "Section summaries – Present the key findings from each section of the report, including:
  - "Demographics;
  - "Safety interview results;
  - "External threats and threat-management results;
  - "Flight crew errors and error-management results;
  - "Threat-and-error countermeasure results; [and,]
  - "Appendix – Include a listing of every external threat and flight crew error observed, with the proper coding and an observer narrative of how each one was managed or mishandled."

ICAO said that the airline must then take action on the identified targets for enhancement, or the LOSA data "will join the vast amounts of untapped data already existing throughout the international civil aviation community."

Data Must Be Protected

Specialists agree that LOSA – like other aviation-safety-data-collection tools – will not be effective if the data cannot be protected from unwarranted use in judicial proceedings and disciplinary actions.
LOSA has the support of the International Federation of Air Line Pilots' Associations (IFALPA) because of the pro-tections included in its definition.

"It is interesting to note that six out of the 10 operating characteristics of LOSA specifically protect pilots who take part in a LOSA audit," said James Eales, technical officer for the IFALPA Human Performance Committee.[17] "An audit will be successful only if the safeguards incorporated are enforced; without them, the audit will have a nega-tive effect on safety."

Eales said that IFALPA has drafted a policy on auditing systems for consideration at the organization's annual con-ference in April 2005.

"The [draft] policy clearly states the requirements necessary for an audit to be acceptable to IFALPA and highlights the safeguards that we think are necessary," he said. "The main requirement is that the audit should be a tool for enhancing safety and not used for disciplinary purposes or personnel checking. LOSA meets our requirements."

Capt. Carlos Arroyo-Landero, chairman of the IFALPA Human Performance Committee, said that a recent resolution adopted by the ICAO Assembly is "the necessary first step" to ensuring the protection of aviation safety data.[18]

The resolution, adopted by the ICAO Assembly in September 2004, instructs the ICAO Council to develop legal guidance to assist member states to "enact national laws and regulations to effectively protect information from safety-data-collection systems, both mandatory and voluntary, while allowing for the proper administration of justice in the state."

Concept Expands to Other Operations

The LOSA concept currently is being applied to other operations. Continental Airlines has applied the concept to monitor dispatch operations and apron (ramp) operations. ICAO is adapting the concept to monitor ATC operations.

In late January 2005, Continental had completed the first phase of its dispatch LOSA, which involved observa-tions of routine dispatch operations by three dispatchers trained in the LOSA concept and methodology. The air-line also had completed the training of ground-handling personnel to conduct the observations of routine ramp operations.

"The preliminary data from the first phase of the dispatch LOSA looks really promising," Gunther said. "Again, we're going to do the data collection in three parts: the observations, the survey and the interview.

"The ramp is very different than flight operations, which has two people in a very confined environment. On the ramp, there are several people in a much more open environment. We have studied the ramp, and we know what areas we're going to target."

Maurino said, "We have received a mandate from our customers – our states – to explore the extension of the con-cept of monitoring routine operations to ATC, using as a basis the LOSA methodology adapted to the ATC environment."

ICAO has formed the Normal Operations Safety Survey (NOSS) Study Group to advance the concept.

"Instead of calling it LOSA in ATC, we're calling it NOSS," Maurino said. "The NOSS Study Group has had one meeting, and we have made an analysis of the LOSA methodology. We identified aspects that can transfer directly to ATC and other aspects that need considerable rework. All in all, the conclusion of this first meeting is that we can develop a methodology to observe normal ATC operations based on the LOSA methodology."

Development of NOSS methodology, including an observation form and observer-training procedures, currently is underway. The group plans to hold a conference in Europe near the end of 2005 to brief the community on its progress.

Maurino said that the LOSA concept likely will be extended into other operations.

"There is no question that the methodology is valid across the board for different activities in aviation," he said. "There is no reason why the methodology could not be applied in maintenance, for example. It should be, and it's quite possible. The crux of the question is the level of trust between the work force and the organization. If there is no trust, it is impossible to have an external observer looking over your shoulder. You have to be comfortable."?

Notes

[1] International Civil Aviation Organization (ICAO). Line Operations Safety Audit (LOSA). Document 9803. First edi-tion, 2002.

[2] Gunther, Don. Telephone interview by Lacagnina, Mark. Alexandria, Virginia, U.S. Jan. 28, 2005. Flight Safety Foundation, Alexandria, Virginia. U.S.

[3] Maurino, Daniel E. Telephone interview by Lacagnina, Mark. Alexandria, Virginia, U.S. Jan. 7, 2005. Flight Safety Foundation, Alexandria, Virginia, U.S.

[4] Helmreich, Robert L. "Crew Performance Monitoring Programme Continues to Evolve as Database Grows." ICAO Journal Volume 57 (Nov. 4, 2002).

[5] ICAO. Human Factors Training Manual. Document 9683. First edition, 1998.

[6] ICAO. Document 9803.

[7] The sterile cockpit rule refers to U.S. Federal Aviation Regulations (FARs) Part 121.542, "Flight Crew-member Duties," which states: "No flight crewmember may engage in, nor may any pilot-in-command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications be-tween the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft. For the purposes of this section, critical phases of flight in-clude all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, except cruise flight." European Joint Aviation Requirements JAR–OPS 1.085, "Crew Responsibilities," states that the commander (pilot-in-command) "shall … not permit any crewmember to perform any activity during takeoff, initial climb, final ap-proach and landing except those duties required for the safe operation of the aeroplane."

[8] Terrain awareness and warning system (TAWS) is the term used by the European Joint Aviation Authorities and the U.S. Federal Aviation Administration (FAA) to describe equipment meeting ICAO standards and rec-ommendations for ground-proximity warning system (GPWS) equipment that provides predictive terrain-hazard warnings; enhanced GPWS and ground collision avoidance system are other terms used to describe TAWS equipment.

[9] Helmreich, Robert L.; Wilhelm, John A.; Klinect, James R.; Merritt, Ashleigh C. "Culture, Error and Crew Re-source Management." In Improving Teamwork in Organizations: A Guide for Professionals, edited by Salas, E.; Bowers, C.A.; Edens, E. Hillsdale, New Jersey, U.S.: Erlbaum, 2001.

[10] Tesmer, Bruce. Telephone interview by Lacagnina, Mark. Alexandria, Virginia, U.S. Jan. 31, 2005. Flight Safety Foundation, Alexandria, Virginia, U.S.

[11] Helmreich, Robert; Klinect, James; Merritt, Ashleigh. "Line Operations Safety Audit: LOSA Data From U.S. Airlines." Paper presented at FAA Shared Vision of Aviation Safety Conference, San Diego, California, U.S., Oc-tober 2004.

[12] Ibid.

[13] Klinect, James R. Telephone interview by Lacagnina, Mark. Alexandria, Virginia, U.S. Jan. 6, 2005. Flight Safety Foundation, Alexandria, Virginia, U.S.

[14] Klinect, James. E-mail communication with Lacagnina, Mark. Alexandria, Virginia, U.S. Feb. 7, 2005. Flight Safety Foundation, Alexandria, Virginia, U.S.

[15] ICAO. Document 9803.

[16] De Silva, Alex. E-mail communication with Lacagnina, Mark. Alexandria, Virginia, U.S. Jan. 31, 2005. Flight Safety Foundation, Alexandria, Virginia, U.S.

[17] Eales, James. E-mail communication with Lacagnina, Mark. Alexandria, Virginia, U.S. Dec. 20, 2004. Flight Safety Foundation, Alexandria, Virginia, U.S.

[18] Arroyo-Landero, Carlos. "IFALPA's View on LOSA." Paper presented at the Second ICAO/IATA LOSA/TEM Conference, Seattle, Washington, U.S., November 2004.

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Quality and Safety –What Next?

by Alan Munro

Some years ago, the UKFSC's now retired CE, Ed Paintin, discussed in these columns the differences between Quality and Safety, and that should have been the end of the matter. Essentially he stuck to the regulator's understanding of Quality's purpose, in other words a small part of an organisation's management to demonstrate regulatory compliance to the FOI.

And of course he was right, in that this is essential to a National Aviation Authority's (NAA) oversight, and indeed the minimum that many airline managements want, to keep the FOI off their back. However, where JAR-OPS requires a 'Quality Management System' to deliver safe operations and airworthy aircraft, safety was quickly (but wrongly) seen as the proactive side of management which JAR Quality could never deliver. Try an accident and see how reactive safety becomes.

- it was minimalist;
- it was about adequacy rather than excellence;
- it was reactionary;
- its scope was restricted to regulatory matters;
- it ignored any Quality tool other than auditing;
- it ignored other management disciplines seen as essential in most other industries;
- it split Quality Assurance away from management;
- it confused QA and QC;
- it made integration with other commercial and regulatory processes difficult;
- it's not what the rest of the world thinks of as Quality!

With a few honourable exceptions, it could have been so much more.

So some operators started to develop commercial systems that took full account of modern management requirements, and some started work on separate Safety Management Systems (SMS), in which the UKFSC became involved at least 10 years ago. Sadly, the concept of a single management system to deliver regulatory compliance to a number of different regulators (Ops, maintenance, H&S, financial, environmental etc, common in other industries) was seen as too difficult and futuristic, and not tried. In part, of course, this was sadly because individual inspectors were frightened that they'd lose control, of which there are still regular examples.

So we've come to the point where pressures beyond Europe, the JAA and EASA have brought about the changes to Annex 6, that require larger aircraft operators to have in place a working SMS by the end of 2008, and rightly so. We've come a long way from my days as an FSO, when I was told to go away and get on with it!

However, the road ahead is not that straight forward, in part because EASA operators have their new EU-OPS manuals as a priority, but mainly because EU-OPS has no Section 2. In other words there is no longer any specification for even a minimalist management system.

For some operators this might be the start of a new dawn, where they could have for the first time a single management system to deliver safety and excellence, reactive and proactive with full integration across the entire company. There are management models available for just this. ISO 9001 : 2000 contains many essential management disciplines, taken à la carte if you will, such as, perhaps, Planning, Supplier Management, and Change and Improvement, all of which have a direct impact on the delivery of a safe operation.

CAP 712, a specification for a Safety Management business model, and its companion CAP 726, are excellent but difficult and generally untried. In fact the Hong Kong CAD has made an excellent job of extracting the essentials from both.

The big question, though, remains the same. Should a management system, designed for both profit and safety, be for the company's use as a tool for safety and excellence, open to all regulatory oversight, or is it an expensive add-on to keep a regulator happy?

After all, are not compliance, air and ground safety, data management, green issues, security and so on, all processes that an operator has to manage? Is it vaguely sensible that the NAA should actually create barriers to effective process management by insisting each to his own micro-system? But it's happening as, for example, the UK CAA currently tries to split Quality away from Safety.

EASA, however, has not missed the point, and an imminent NPA with a management specification for Compliance (let's call it that) and Safety Management is eagerly awaited. Whether this will be a genuine management tool, where an operator can share process measurements with the NAA, yet use it at the same time for excellence and improvement, remains to be seen. As a minimum it has to deliver regulatory oversight, but as some airlines stagger into bankruptcy, it might also be the yellow brick road to safety and survival. Let's hope so.

Alan Munro was a member of the UKFSC in the 90s. He is now Director and co-owner of Shape Aviation Ltd (part of the new 4AVIA Training), instructing and consulting in Quality and Safety issues, also most allied disciplines. Shape's ethos is that flying and commercial operations are inextricably linked, and that safety is generally a management issue. It's about how to manage the data once you have it.

After 50 years flying, while no longer a commercial pilot, he actively promotes air safety in many parts of the world. He continues to glide and to fly both land and sea light aircraft.